Part VII – Technical Specifications

Contents

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 **Two (2) Mobile Response and Command Platforms (each a "MRCP"** or **"Vessel"**) for use by the Hong Kong Police Force ("HKPF" or **"user department"**).

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 Part II - the Conditions of Tender, failing which its tender will not be considered further.

1.1.4 All (a) Essential Requirements **[E]**, (b) if and to the extent the Contractor has indicated compliance, Specifications without Label, and (c) if and to the extent the Contractor has indicated compliance, Desirable Specifications labelled with **[D]**, 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 specified RO as well as by the Government New Construction Section ("GNC") and HKPF prior to the manufacture of the Vessel (collectively, "GNC/HKPF"). Where the 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:

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

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

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

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

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

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

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

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

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

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

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

1.2 Statement of Purposes of the Vessel

1.2.1 The Vessel to be procured shall be two (2) marine aluminium alloy catamaran high speed craft powered by a waterjet propulsion system, including a Daughter Boat and a Hovercraft per Vessel for used in Hong Kong waters use by the HKPF. The Daughter Boat and the Hovercraft will be purchased under two other procurement contracts and will not be included in this Contract.

(a) The Vessel is to be used by the HKPF for law enforcement and rescue and emergency operations [within the Hong Kong waters and all waters to a limit of approximately 50 nautical miles ("nm") outside the boundary of the Hong Kong waters]. It shall be equipped with capabilities to perform its major function as a response and command platform during major incidents and disaster, etc.

(b) In addition, it is to be deployed to perform other maritime law enforcement roles such as:

(1) Operational Incident Response;

(2) Counter Terrorism;

(3) Search and Rescue ("SAR") in Hong Kong and nearby waters, the area is to a limit of approximately 50 nautical miles(nm) outside the boundary of administration;

(4) Casualty Evacuation;

(5) Immigration, Excise and Conservancy Law Enforcement;

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

(7) Maritime Security; and

(8) Logistical Support.

1.3 Authorities

1.3.1 The 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 firm 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., the Technical 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 Recognized Organization ("the RO"), GNC and HKPF. If no period is specified, they shall be submitted and approved by the RO, GNC and HKPF (as the case may be) before the construction of the relevant part of the Vessel. 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 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 19 (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 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 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 GNC and the HKPF.

1.4.2 The Daughter Boat and the Hovercraft will not be purchased under this Contract but will be delivered to the Contractor in Hong Kong before the Official Sea Trial in Hong Kong and to be fitted onboard by the Contractor. Apart from those already set out in this Part VII, the detailed information of the Daughter Boat and Hovercraft will be available to the Contractor in the design phase of the project.

At no additional charge to the Government, the Contractor shall be responsible for the following:

(a) Fit, install and secure the Daughter Boat and the Hovercraft on the Vessel in Hong Kong before conducting the Stages 2 and 3 of the Technical Acceptance by the Contractor to meet the requirement of RO and to the satisfaction of GNC;

(b) Supply one (1) Launched-And-Recover ("LAR") system as more particularly described in Paragraph 4.28.5 (a), (b), (c) and (f) for the launching and recovery of the Daughter Boat and one (1) Marine Hydraulic Knuckle Boom Crane as more particularly described in Paragraph 4.28.5 (d), (e) and (f) for launching and recovery of the Hovercraft;

(c) Provide proper supporting structures on the Vessel to support and secure the Daughter Boat and the Hovercraft;

(d) The structures of the Vessel shall be strengthened up to support the Daughter Boat and the Hovercraft on the Vessel to meet the requirements of the RO and to the satisfaction of GNC.

(e) Ensure the Daughter Boat and Hovercraft be fitted, installed and secured properly on the Vessel and can be LAR smoothly from and to the Vessel to the satisfaction of the RO, GNC and the HKPF; and

(f) Take the lead and work with the Daughter Boat supplier and the Hovercraft supplier to achieve the tasks mentioned in above Paragraphs 1.4.2(a) to (e).

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 fifteen (15) 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 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 "the RO" in this Part VII shall mean the RO as specified in Part V, Schedule 9; and (b) references to "the 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 Annex 9 to this Part VII may be designated for confirmation of compliance with the relevant requirement, references to "RO" shall mean any such other RO. References to "IMO requirements" shall mean the latest and as amended requirements published by the International Maritime Organization ("IMO") and available on its

website and applicable to the relevant subject matter in the relevant paragraph where it is required that IMO requirement shall be complied with provided that where the IMO requirements are of any convention or resolution or other multilateral treaty of the IMO (including any amendment thereto), Hong Kong has joined in as a party to such IMO requirements.

1.6.4 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 stipulates or agrees otherwise.

1.6.6 Notwithstanding the submission of the preliminary plans and drawings by the Contractor then as part of its tender for the Contract, all plans and drawings of the Vessel except the design stresses and scantling, shall be submitted to GNC for approval before completion of the Vessel design.

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

1.7 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 Stage 3 of the Technical Acceptance.

1.7.3 Subject to Paragraph 1.7.8 of this Part VII, an advance written notice of not less than ten (10) working days where the Contractor's shipyard is located in Asia, and twenty (20) working days where the Contractor's shipyard is located outside Asia, must be given to GNC before the representatives of GNC and other Government officers are invited to conduct a survey visit of the Vessel. The Contractor shall be fully responsible for any delay if the Contractor fails to give adequate notice of the aforesaid.

1.7.4 The Contactor 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 of the instalment specified in Schedule 3 of Part V of the Contract if any of the timetables required herein has not been submitted for GNC's approval or GNC does not approve any of them or if the progress of work does not comply with any of them as approved by GNC.

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

1.7.7 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.

1.7.8 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.

1.7.9 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 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.

1.7.10 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/heating, have internet access with WiFi connection, and a copying and printer machine. Cleaning of the space shall be carried out on each working day.

1.7.11 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.

1.7.12 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, 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-Shipment Construction and Handling Inspection or, otherwise, as agreed by the Government.

1.7.13 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 3.3.4 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 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 3.3.9 and 3.3.10 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. As part of the aforesaid requirements, the Vessel shall be with the Daughter Boat and Hovercraft onboard, of which the existence shall be represented by equivalent weights at the corresponding equivalent centre of gravity locations.

(b) System Inspection Test

The Contractor will propose and demonstrate to 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-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 Vessel shall be with the Daughter Boat and Hovercraft on, of which the existence shall be represented by equivalent weights at the corresponding equivalent centre of gravity locations. 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.

(d) 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.

(e) 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.

(f) Factory Acceptance Test

All factory acceptance tests mentioned in this Part VII shall be conducted as part of this

Stage 1 of the Technical Acceptance. The Contractor shall provide to 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.

(g) External Fire-Fighting System

The performance and functional tests of the External Fire-Fighting System ("EFFS") shall be included as part of the Technical Acceptance in Stage 1 of Technical Acceptance - Pre-Shipment Construction.

(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 shall 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 the GNC officers or consultants and the HKPF representatives. The Daughter Boat and Hovercraft shall be installed and secured on the Vessel in Hong Kong before the Official Sea Trial.

(b) Launch-and-Recovery Test and Trial for the Daughter Boat and Hovercraft

The Daughter Boat and Hovercraft shall be installed on the Vessel. The Launch-and-Recovery operations for the Daughter Boat and Hovercraft shall be tested and trialed to the satisfactory of the RO, GNC and the HKPC. The corresponding Testing and Trial programme with detailed procedures shall be submitted to the RO for approval and acceptance by GNC in advance.

(c) 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, endurance test, manoeuvring test, steering 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.

(d) 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 but not limited to 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.

(e) 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 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(c) 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 and shall be weighted and recorded.

(f) Loading conditions for all tests and trials of the Official Sea Trial

The Daughter Boat and the Hovercraft shall be installed and included as part of the Vessel and secured and stowed at their normal designed locations.

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

Conditions at all tests & trials		
1	Person onboard	19 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 80% tank capacity
4	Store/Utilities	500 kg
5	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 complied by using the approved final lightship weight and centre of gravity. All such loading conditions shall meet the intact and damage stability criteria as specified in Paragraphs 3.3.9 and 3.3.10 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.

(g) 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:

(1) Start test for the main diesel engines, diesel generators and related equipment;

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

(3) A noise emission test to confirm compliance with the requirements stipulated in Paragraph 4.1.20(a)(3) of this Part VII;

(4) A megger test as stipulated in Paragraph 8.3.7 of this Part VII;

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

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

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

(h) 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 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).

(1) The Official Speed Trial is to be carried out referring 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.

(2) 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.

(3) 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 calculated by measuring the time of the Vessel running for one nautical mile by a measuring method acceptable to GNC.

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

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

(5) The Contract Speed is considered not achieved if the Contract Speed cannot be attained during the official speed trial after a minimum of two sets and a maximum of FIVE sets with each set comprising two runs (in opposite directions).

(6) 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 100% Maximum Continuous Rating ("MCR"). The Contract speed shall be calculated 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.

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

(i) 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 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 engine(s) rpm and power, with particulars of the Vessel loading and displacement during the test(s).

(j) Manoeuvrability Test

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

(1) All engines running;
(2) Port engine running; and

(3) 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 turns 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 intervals at every 2 knots.

The test shall not be continued any further when the corresponding heel angle is equal to or greater than 10 degrees or the vessel presents a dynamically unstable behaviour. The corresponding Vessel speed and engine RPM shall be recorded.

(l) Steering Test

The steering and reversing performance of the water jet system shall be tested to meet the RO and manufacturer requirements.

(m) Crash Stop Test

This Test shall determine the minimum time and distance required for the Vessel to move from running full ahead to stopping 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.

(n) Astern Running Test

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

(o) 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.

(p) Bow Thruster Test

This test shall be carried out whilst the Vessel is stationary in the water, heading into wind, with the wind speed less than Force 2 on the Beaufort Wind Force Scale. With the bow thruster operating at full capacity, the time it takes 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.

(q) Position Keeping Test

This test shall be carried out to confirm the capabilities of the position keeping system specified in Paragraph 7.10 of this Part VII. This test shall confirm that:

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

(2) The weathervaning position keeping function shall be tested. With both the main propulsion waterjets and the bow thruster engaged, the Vessel shall be able to hold station and head onto the incoming weather without drifting off in conditions of WMO Sea State 4 and Beaufort Wind Force 5; and

(3) 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-plots, shall be provided by the position keeping system manufacturer to the satisfaction of GNC in order for the test to be considered passed.

(r) The performance and functional tests of the EFFS shall be repeated as part of the Technical Acceptance in Stage 2 of Technical Acceptance.

(s) 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.

(t) 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.

(u) The Contractor shall re-perform the tests and trials as mentioned in this Paragraphs 1.8.2 above as part of Stage 2 of the Technical Acceptance even if these tests have already been performed as part of Stage 1 of the Technical Acceptance. If these tests and trials are not passed under Stage 2 of the Technical Acceptance, the whole of the Technical Acceptance shall not be deemed to have been successfully completed.

(v) 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 GNC. The Report shall contain, but not be limited to the speed, engine/waterjet 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 GNC before Delivery Acceptance.

1.8.3 Stage 3 of Technical Acceptance – Operational System Acceptance

(a) The Contractor shall re-perform the tests as mentioned in this Paragraphs 1.8.3(b) and 1.8.3(c) below as part of Stage 3 of the Technical Acceptance even if these tests have already been performed as part of Stage 1 or Stage 2 of the Technical Acceptance. If these tests are not passed under Stage 3 of the Technical Acceptance, the whole of the Technical Acceptance shall not be deemed to have been successfully completed.

(b) The Contractor shall under this Stage 3 of the Technical Acceptance carry out the bench acceptance test and on-site commissioning test for Operational Systems 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.

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

(d) 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) to 1.8.3(c) of this Part VII.

(e) If the Vessel cannot pass all of the tests and trials comprising the Technical Acceptance (viz., all tests and trials as set out in Paragraphs 1.8.1 to 1.8.3 of this Part VII) 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 all stages 1 to 3 as mentioned in Paragraphs 1.8.1 to 1.8.3 above (collectively, "Technical Acceptance"), shall be delivered at the Contractor's expense to the Government Dockyard. If there is any delay in the delivery of the Vessel in Ready to Use condition for more than 120 days after the scheduled 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 the Delivery Acceptance shall be provided in accordance with Paragraph 11.2 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 is ready to be delivered for the Delivery Acceptance. The Government will not accept delivery if, after undergoing the tests and trials in the Technical Acceptance, the Government does not consider that the Vessel is in a Ready to Use condition.

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

(e) The items specified in Paragraph 11.2 of this Part VII, all items listed in Annex 7 to this Part VII, all items set out in the Inventory List in the form as approved or stipulated by the Government, and all other items which are required to be delivered under this Part VII as part of the Delivery Acceptance shall be delivered to GNC as part of the Delivery Acceptance of the Vessel.

(f) During the Delivery Acceptance, the Contractor must demonstrate to 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.

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

(h) Aside from passing the Technical Acceptance and the Delivery Acceptance, the 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 Government will issue the Acceptance Certificate.

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

1.10 Support Services

1.10.1 The Vessel must be designed for through life support and easy maintenance in the HKSAR based on 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 provide a whole life support plan for the timely procurement of spare / replacement parts and the undertaking of preventative maintenance with the Vessel as specified in Paragraph 11.2.3 of this Part VII.

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 VII, 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 Two (2) MRCP for the 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 ("Conceptual GA Plan") at Annex 10 to this Part VII serves only as a set of reference drawings to assist explaining the tender requirements stated in this Part VII, and is by no means a suggested or preferred design layout of the Vessel.

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

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

(a) The same as the design of any other existing catamaran vessel, whether designed and built or just built by the Tenderer or another person, where the proposed hull form for the offered Vessel shall have the same principal dimensions of the hull including length, breadth and depth, and the same hydrostatic particulars and hull characteristics as that existing catamaran vessel, which is in service before the Original Tender Closing Date ("existing catamaran"). The existing information regarding Power/Speed relationships for the Contract Speed of such other existing catamaran in compliance with the requirements in Paragraph 2.3 of this Part VII. **[E]**

(b) A design with modifications from the design based on an existing catamaran vessel with a length of the hull between 30m and 45m (both figures inclusive) with similar hull characteristics of the offered hull form ("existing catamaran"), which is in service before the Original Tender Closing Date. The design with modifications shall meet the minimum Contract Speed requirements specified in Paragraph 2.3 of Part VII. Whilst the Government reserves the right to ask for submission if found missing in the tender after the Tender Closing Date, the Tenderer shall prove that the modified design comply with the minimum Contract Speed requirements as aforesaid by either through the provision of the corresponding model test report or the corresponding report of computation fluid dynamic calculations. In case with model test report, it shall be in relation to a model test conducted no earlier than 60 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 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, waterjet 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 the RO specified in Schedule 9 of Part V in the version as at the Contract Date unless the rules and regulations of the 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 in the certificate of classification to be issued by the RO upon completion of the Vessel, which class notation as proposed in Schedule 9 of Part V shall meet the requirement specified in this Part VII. The Tenderer shall state in Part V, Schedule 9, which RO (to be selected from the definition of "Recognised Organisation" in Clause 1.1 of Part IV (which is repeated in Annex 9 to this Part VII) and its rules and regulations and what 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. This is unless where it is expressly stated that any other RO as listed below (which list is repeated in Annex 9 to this Part VII) other than the RO specified in Schedule 9 of this Part VII may apply. 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 SA	BV
(c)	China Classification Society	CCS
(d)	DNV AS	DNV AS
(e)	Korean Register	KR
(f)	Lloyd's Register Group Limited	LR
(g)	Nippon Kaiji Kyokai	NK
(h)	RINA Services S.p.A.	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 IMO.

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

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

(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 (o) above are applicable, then the applicable standards as specified by the applicable organizations below shall be complied with:

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

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 with the Daughter Boat and the Hovercraft onboard, when propelled by its two main diesel engines each running at its 100% maximum continuous rating ("MCR"), shall not be less than **25** knots, when running under the conditions of WMO Sea State Code 0 to 2 and under the loading and test conditions more particularly described in Annex 5 to Part VII and further observing the requirements specified in Paragraph 2.3.2 below. **[E]**

2.3.2 The guaranteed speed prescribed above shall be achieved without porpoising, or other dynamic instabilities. The waterjet propulsion system selected shall match the engine profile and avoid cavitation.

2.3.3 The Vessel shall also be designed for cruising and loitering operations during which both engines operate continuously, at the following Vessel speeds:

Cruising speed:	18 to 20 knots
Loitering speed:	5 knots

2.4 Principal Dimensions

2.4.1 The Vessel shall comply with the following:

Length Overall (LOA):	Between 39 and 41 metres. (Fenders included)	**[E]**
Breadth (B):	≤13 metres. (Fenders included)	**[E]**
Depth (D):	Designed to suit	
Maximum Draught(T):	≤3.0 metres.	**[E]**
Air Draught:	≤16 metres from keel and ≤14 metres from the waterline in any of the operational mode of the Vessel.	

"Length Overall" means the distance between the foreside of the foremost fixed permanent structure and the aft side of the aftermost fixed permanent structure of the Vessel (transom) including fenders, but does not include the waterjet system and out-fittings. The Tenderer shall indicate the length overall of the Vessel in dimensional scale in the Preliminary General

Arrangement Plan submitted according to Schedule 7 of Part V.

2.5 Material of the Structure

2.5.1 The Vessel shall comply with the following:

Material of the Hull structure:	Marine grade aluminium alloy	**[E]**
Material of the superstructure:	Marine grade aluminium alloy	**[E]**

2.6 Propulsion System

2.6.1 Two waterjet propulsion units shall be driven by two marine diesel engines. The port and starboard propulsion systems shall be identical from the same manufacturer, and of the same model and deliver the same horsepower and have all other specifications identical with each other. **[E]**

2.7 Vessel Operating Profile and Environment

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

2.7.2 The Vessel shall comply with the following operational profile: **[E]**

Number of hours/day:	20 hours/day
Number of days/year:	250 days/year
Endurance for fuel capacity:	72 hours (For the calculation purpose, 12 hours within the 72-hour period will be at 100% MCR, whilst the remain period will be at 5 knots)

2.7.3 The Vessel shall be designed for deployment by the HKPF for all of the following operating configurations:

(a) Patrol configuration:

(1) Carries 19 crew;

(2) Full Speed (25 knots): 2 hours;

(3) Cruising speed (18-20 knots): 4 hours;

(4) Loiter (5 knots): 4 hours;

(5) Idling at sea: 10 hours; and

(6) Tied up at berth: 2 to 4 hours.

(b) Response, Command and Control configuration:

(1) Carries 19 crew and at least 100 police officers;

(2) Maximum Speed to an Incident Location: 2 hours; and

(3) Loiter or Position Keeping: 24 hours × maximum of 3 days.

2.7.4 The Vessel shall be capable 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 the 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.

2.7.5 Ambient Conditions - All machinery, equipment, 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 ℃

2.8 Markings and Colour Scheme

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

2.8.2 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 schemes for fittings shall be agreed by GNC.

2.8.3 All labelling shall be in both Traditional Chinese and English and as per applicable rules and regulations.

2.8.4 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 GNC.

2.8.5 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.

2.8.6 Exits shall be identified, labelled and supplemented by reflective direction signs. In addition, emergency escape lights shall be installed in cabins/ compartments. Stowage locations for LifeSaving Appliances ("LSA") including but not limited to life jackets and quantities of life jackets shall be identified as per the requirements specified under the Safety of Life at Sea ("SOLAS") regulations.

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

2.8.8 Trip hazards shall be avoided aboard the Vessel as much as possible and, otherwise, shall be appropriately marked.

2.9 Tally Plates

2.9.1 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.

2.9.2 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 contained within consoles;

(b) Electrical and communications 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, warning and other information as required by GNC.

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

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

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

2.10 Other Design Features

2.10.1 The berthing requirement of the Vessel shall match the designated points of berth at the Government Dockyard and at the HKPF's operational bases.

2.10.2 A 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 degrees.

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

2.10.4 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.

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

2.10.6 The contractor shall request the RO to carry out a measurement of the Vessel's Gross Tonnage ("GT") and Net Tonnage ("NT"), as defined in the 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 recording purposes.

2.11 Failure Mode and Effect Analysis – "FMEA"

2.11.1 A comprehensive, systematic and documented investigation (Failure Mode and Effect Analysis – "FMEA") shall be conducted to establish the important failure conditions of the Vessel and to assess their significant effect with regard to the safety of the Vessel, its occupants and the environment as required. The effect of any likely failure in handling and control devices, services or components shall be assessed to maintain at a safe level of craft operation. FMEA shall include but not be limited to the following:

(a) Machinery system and their associated control;

(b) Directional control system; and

(c) Position keeping system.

The Contractor shall submit a FMEA report regarding evaluation, identification, analysis, verification trial and test, recording the test results and submission of relevant document in various stages for critical systems. The FMEA report shall be in accordance with the IMO 2000 HSC code, in the version as at the Contract Date unless it specifies that version as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein, and submit to the RO for approval before sending to GNC for acceptance. FMEA conclusion trial shall be conducted and verified in the presence of the RO.

Chapter 3 Hull and Deckhouse

3.1 General Requirements

3.1.1 The Vessel shall be designed and built with a catamaran hull form, with the hull structure and the superstructure to be constructed of marine grade 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 the 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 the construction of Vessel shall be provided to the RO surveyor and the 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 the 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 the 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 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 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, and rules from American Welding Society (“AWS”) or other international standards acceptable to 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 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 listed below (but not limited to these items) are required to be recorded by the Contractor and submitted to GNC before commencing fabrication:

(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 requirements. 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 GNC presenting their findings;

(e) Records of maintenance and calibration of the welding, machining, measuring and inspection equipment;

(f) Records of 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 revisions and updates and records for any re-issue of drawings.

3.2 Structures of the Hull and Deckhouse

3.2.1 General Workmanship

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

(b) Fittings and openings through decks and bulkheads for pipes and cables shall be properly designed using approved fittings to maintain watertight integrity, reduce transmission of heat, and to minimise transfer of machinery vibration and noise to the hull structure;

(c) Limber and vent holes shall be cut as necessary to ensure proper venting and drainage of all tanks, compartments, pockets, and voids. All tanks shall have limber holes and vent 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; and

(d) Sharp corners shall be avoided.

3.2.2 Tightness

(a) Tanks shall be tested by pressurizing to the equivalent of a head of water from the tank bottom to one metre above the top of the vent loop subject to RO requirements. If

pressurized by air, all fittings and welding shall be checked by application of a soap solution. No leakage is permitted. During testing, tanks shall hold their pressure without leakage for six hours;

(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 GNC; and

(d) All structures and fittings shall withstand the tests described above and any weakness shall be made good, and at the expense of the Contractor.

3.2.3 Fairness

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

3.2.4 Decks, Platforms, Flats and Stiffness

(a) All decks, platforms and walking flats shall be sufficiently reinforced to prevent deflection that might be caused by service load, an individual walking or standing on the deck and/or by structural flexion of the hull and/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 the diesel generators, without moving the main diesel engines;

(c) The deck area shall have a camber at 1/50 of the beam of the deck edge and may slope up towards the bow at the forward part; and

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

3.2.5 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; and

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

3.2.6 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 GNC;

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

for acceptance;

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

(d) 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 the Bow Thruster Rooms. Soft patches or gaskets shall be secured properly to the satisfaction of GNC;

(e) A minimum of one watertight hinged cover shall be provided for access to and from the main deck to each of the fore peaks;

(f) A minimum of one flush watertight hinged cover shall be provided for access to and from the main deck to each of the Engine Rooms, the Jet Rooms, the Bow Thruster Rooms and the other underdeck compartments;

(g) 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; and

(h) All access closings shall be able to be opened and closed from both sides.

3.2.7 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 provide 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; and

(e) The warning "Door must be kept closed when underway" shall be marked on both sides of the watertight door.

3.2.8 Deckhouse Closures

(a) Weathertight doors are to be provided for access into the deckhouse. Entrances shall be made from the 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 main deck level deckhouse with direct access from the aft deck space by a minimum clear opening to the satisfaction of GNC and HKPF;

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

(d) Appropriate locking mechanisms/methods shall be provided for all access doors;

(e) 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; and

(f) 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.

3.2.9 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; and

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

3.3 Stability

3.3.1 Before the Tender Closing Date, the Tenderer shall submit the tender with a Vessel engineering and stability package that clearly defines the Vessel's performance, structural and operational capabilities viz., covering those items as identified in the table set out in Schedule 7 in Items 7 and 8 about this Paragraph 3.3. The Vessel shall have the Daughter Boat and Hovercraft onboard, which shall be part of the lightship. The reference dimensions and weights of the Daughter Boat and Hovercraft are given in Paragraphs 4.28.5 (c) and (d) of this Part VII. The calculations shall be carried out using a proven computer system, with evidence (viz. recognised by a government authority or any one RO listed in Annex 9 of this Part VII). The Contractor shall further develop and refine the above package upon commencement of the Contract as needed and shall seek the written approval of the Government of such revised package.

3.3.2 The Vessel shall comply with the intact and damaged stability requirements stated in Paragraphs 3.3.9 and 3.3.10 of this Part VII as well as with applicable RO requirements.

3.3.3 A final stability assessment of the sea trial loading condition using final lightship data shall be approved by the RO before being delivered to GNC prior to the Official Speed Trial mentioned in Paragraph 1.8.2 of this Part VII.

3.3.4 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 with the Daughter Boat and Hovercraft onboard, in accordance with Chapter 8 and Annex 1 of the International Code on Intact Stability, 2008.

Since the Daughter Boat and Hovercraft will be installed on the Vessel in Hong Kong, the inclining experiment shall be carried out with equivalent weights representing the Daughter Boat and Hovercraft at the corresponding Centre of Gravities positions at the construction yard before pre-delivery test and sea trials.

GNC shall have the final decision on whether both Vessels will undergo another inclining experiment in Hong Kong. At the RO's and/or GNC's request, the Contractor shall carry out the final inclining experiment in Hong Kong with the Daughter Boat and Hovercraft installed and secured on the Vessel at their designated locations;

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

(1) The proposed date, time, and place for the inclining experiment;

(2) The anticipated water depth at the time of the inclining experiment;

(3) A recent photograph of the site of the inclining experiment;

(4) A recent photograph of the Vessel to be inclined. That includes its external view and hull superstructures and main deck situation;

(5) The name of the RO representative and the name of the Contractor's representative who will attend and be responsible for the inclining experiment;

(6) 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 including:

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

(7) The proposed initial locations and the subsequent movements of the inclining weights;

(8) The calculation of the estimated heel of the Vessel before and during the inclining experiment;

(9) The proposed number, location and lengths of pendulum used; or other methods of measuring heel angles (that must be of a type acceptable to GNC);

(10) 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 tank capacity tables;

(11) The list of data to be measured (i.e. drafts, specific gravity of floating water, etc.) in accordance with IMO requirements;

(12) The lightship weight, centers of gravity, the draft, trim and the metacentric heights of the Vessel after each and every shift of inclining weight shall be determined in accordance with IMO requirements applicable to the Vessel; and

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

(c) The inclining experiment shall only be conducted:

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

(2) In the presence of the RO and 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. The free surface of liquids remaining onboard shall be minimised and taken into account.

(d) For the avoidance of doubt, if there is any liquid on board, the worst possible free surface effects of all liquids on board shall be taken into account in all calculations;

(e) The PRELIMINARY Inclining Experiment Report which shall be submitted to the RO and GNC not later than fourteen (14) working days before the Official Sea Trials. This shall include a statement from the Contractor stating that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract;

(f) The FINAL Inclining Experiment Report shall be approved by the RO before submitting to GNC for further comments and acceptance; and

(g) In addition to the above the requirements for conducting and reporting the Inclining Experiment, the Stability Information Booklet shall also follow any specific requirements given in this Part VII.

3.3.5 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 (IMO 2000 HSC Code) and International Code on Intact Stability 2008. 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 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, 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, GZ curves and values of the stability criteria according to the IMO codes;

(d) Any other information as reasonably required by the RO and/or GNC; and the Inclining Experiment Report approved by the RO; and

(e) In the preliminary and final stability calculations, the estimated and final (obtained after conducting the inclining experiment) lightship data with the Daughter Boat and Hovercraft onboard the Vessel 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 (%)	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	8
2	Full Load Departure	98	98	10	10	19	100 (Police Officers)	500	8
3	Full Load Arrival	10	10	98	98	19	100 (Police Officers)	500	8
4	Crew only Departure	98	98	10	10	19	0	500	10
5	Crew only Arrival	10	10	98	98	19	0	500	10
6	Fire-Fighting	50	50	50	50	19	0	500	8
7	Crane Operation (Hovercraft)	50	50	50	50	19	0	500	5
8	Davit Operation (Daughter Boat Launch and recovery)	50	50	50	50	19	0	500	5
9	Search and Rescue	50	50	50	50	19	No. of survivors to be determined by the Contractor	500	5, 8 &10

The following notes from (1) to (10) shall be applied to the appropriate loading conditions in the intact and damage stability calculations:

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

(2) The weight of each crew and each Police Officer is assumed to be 82.5kg with each carrying personal effects of 20kg (for 19 Crew and 100 Police Officers in total);

(3) The weight of each survivor is assumed to be 82.5kg with no personal effects.

(4) The VCG of each person, while standing, shall be assumed to be 1000 mm above the deck where they are likely to be situated. The LCG of each person shall be in their most likely position onboard. The likely positions of these persons shall also be agreed by GNC and HKPF;

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

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

(7) Heeling moment and change of centre of gravity 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;

(8) Heeling moments and change of centre of gravity due to the movement of the deck crane with maximum moment applied to port and starboard in the Crane Operation condition shall also be considered in the stability calculations. That shall include the launch/recovery of the Hovercraft whichever is worst;

(9) 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;

(10) An exceptional stability case is to be assessed assuming that the Vessel is to recover survivors from the water. In accordance with IMO 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 with the condition specified in the table above; and

(11) A passenger heeling calculation shall be carried out for the Search and Rescue condition 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 GNC at Delivery Acceptance.

GNC is the ultimate body to give the final acceptance of the Stability Information Booklet and the Inclining Experiment Report.

3.3.6 The PRELIMINARY Stability Information Booklet based on the estimated centre of gravity ("CG") positions of the Vessel with the Daughter Boat and Hovercraft onboard shall be submitted to GNC during the design stage and within two months after the Contract Date, to show that the Vessel can fulfil the required vessel stability specified in this Part VII as well as any other stability requirements required by GNC to be considered, during the design and construction stage.

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

3.3.8 The Official Sea Trial shall only be carried out after the results of the inclining experiment show the position of the Vessel's actual centre of gravity is consistent with the information given in the PRELIMINARY Stability Information Booklet, and that the Vessel is safe to proceed with the sea trials.

3.3.9 Intact Stability Criteria

The stability of the Vessel with the Daughter Boat and Hovercraft onboard shall show its compliance with the applicable requirements in Chapter 2 and Annex 7 of the IMO 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]**

3.3.10 Damaged Stability Criteria

(a) Transverse bulkheads shall be arranged to maintain the stability of the Vessel with the Daughter Boat and Hovercraft onboard even there is flooding of any one underdeck compartment occurred. The corresponding residual stability shall meet the applicable requirements in Chapter 2 and Annex 7 of the IMO 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 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;

(d) Transverse bulkheads shall be arranged to maintain the stability of the Vessel with the Daughter Boat and Hovercraft onboard even there is flooding (i.e. total flooding, partial flooding and progressive flooding) of any one of the underdeck compartments occurred, and when there is asymmetric flooding to any one of the underdeck compartments. For this calculation, the extent of partial and total flooding shall be decided by GNC; and

(e) It is OF THE ESSENCE that the residual stability of the Vessel with the Daughter Boat and Hovercraft onboard in the above mentioned damage condition shall be sufficient to maintain adequate stability for her to return to the base/deport.

3.4 Painting and Cathodic Protection

3.4.1 Paint shall be used on surfaces and any parts of the hull, deck, machinery and fittings as directed by 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 GNC before commencement of work. The proposal shall contain a list and the detailed specifications 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 GNC with a letter of certification from the paint manufacturer signed by qualified coating inspectors to certify that the paint has been applied under the paint manufacturer's quality control and in accordance with the manufacturer's requirements including but not limited to the surface preparation, 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 aluminium alloy walls and floor plates shall be degreased and cleaned before painting. The surface treatment and costing application shall follow the manufacturer's recommendation. A painting schedule shall be proposed by the Contractor, in consultation with the paint suppliers/ manufacturers, and submitted to GNC for approval.

3.4.9 All deck areas shall be covered with hard wearing and anti-slip 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 completed before painting of any surface.

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

3.4.13 Underwater cathodic protection (self-sacrificing anodes) suitable for a minimum of one year life shall be fitted to the hull bottom. No toxic substances are to be released from sacrificial anodes.

Chapter 4 General Arrangement

4.1 General Provision

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 and in no way a suggested or preferred layout of the Vessel. The Contractor is encouraged to produce their own design which meets the requirements of Technical Specifications in this Part VII. This Conceptual General Arrangement Plan shows a reference layout of the accommodation and compartment arrangement of the Vessel with the following maximum/minimum dimensional guidance considered:

Upper Deck side walkway width	Minimum 800 mm
Main deck side walkway width	Minimum 1000 mm
Clear headroom (Throughout Vessel)	Minimum 2000 mm

Obstructions to the walkway on the main deck shall be avoided as there can be a large number of passengers or rescued persons using the passageway.

4.1.2 The breadth of the upper deck shall be at least 0.4m (200mm each side) less than the breadth of the main deck in order to minimise the possible impacts between ships alongside.

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

Number of Crew	19	**[E]**
Number of Police Officers	100	**[E]**

4.1.4 The Tenderer shall submit the Preliminary General Arrangement Plan in Schedule 7 of Part V for Government’s consideration at the tendering stage. Although the procurement of the Daughter Boat and the Hovercraft are not included in this tender, Tenderer shall present their existences on the proposed Preliminary General Arrangement Plan and shall considered them in the proposed design. During the design and construction of the Vessel, the Contractor shall submit a detailed General Arrangement Plan for GNC's approval and acceptance.

4.1.5 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 completed "As- built" Vessel delivered to the Government. The presence of the Daughter Boat and Hovercraft shall be included.

4.1.6 The Tenderer should note that the requirements given in this Part VII (the TS) are in addition to the RO requirements and IMO requirements and shall be met by the design and construction of the Vessel.

4.1.7 Subject to full compliance with the requirements of stability and subdivision, each hull is to be subdivided by transverse watertight bulkheads into different compartments. Each compartment shall not be greater than 40% of the Vessel's length overall. As a reference, it can be divided as follows, subject to individual design:

(a) Fore Peak (P/S);

(b) Bow Thruster Room (P/S);

(c) Equipment Room / Chiller Room;

(d) Pump Room / Tank Space;

(e) Engine Room (P/S); and

(f) Jet room (P/S).

4.1.8 The superstructure shall comprise of two (2) tiers of deckhouses:

(a) Deckhouse on the upper deck (Paragraph 4.1.9 of this Part VII); and

(b) Deckhouse on the main deck (Paragraph 4.1.10 of this Part VII).

4.1.9 The deckhouses shall be subdivided into a series of compartments. Designs affecting habitability, including all elements of design and construction, shall be considered to make the Vessel more liveable and comfortable. The arrangements of accommodation 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 the Mess Room.

4.1.10 The deckhouse on upper deck shall comprise one each of the following compartments:

(a) Wheelhouse;

(b) Server Room (this also can be on the main deck, subject to the Tenderer's design);

(c) Store Room;

(d) Commander's en-suite Cabin;

(e) Crew Cabins;

(f) Crew Shower and Toilet Facilities;

(g) Mess Room; and

(h) Galley.

4.1.11 The deckhouse on the main deck shall comprise one each of the following compartments:

(a) Command and Control Suite;

(b) Command Office;

(c) Passenger Cabins;

(d) Passenger Shower and Toilet Facilities;

(e) Standby and Briefing Area (also be another Evacuation Zone, if situation requires);

(f) Weapons and Ammunition Storeroom;

(g) Pyrotechnics Storeroom;

(h) Evacuation Zone;

(i) First Aid Room;

(j) Engine Room Control Office;

(k) Special Equipment Storeroom;

(l) Wet Room with Drying Locker;

(m) Fresh Air Pre-treatment Room;

(n) Battery Room; and

(o) FM200 Room.

4.1.12 Subject to structural design considerations, the deckhouse shall be subdivided by structural and non-structural bulkheads as required. 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, structural bulkheads shall not be located in and shall be kept away from passageways, showers, washrooms and water closet spaces.

4.1.13 External deck spaces shall include:

(a) Flat bow and aft main deck areas for efficient mooring operation;

(b) Side walkways on the Upper Deck and Main Deck for easy access to the fore deck and aft deck. The walking area on the deck should be well illuminated for dark environments and night operations. Illumination lights should not obstruct the movement of personnel;

(c) Flat lowered platforms of the main deck side walkways on both port and starboard sides for efficient boarding and forming the Rescue Zones;

(d) Flat and sufficiently large aft upper deck for helicopter winching;

(e) Detachable life rails or lifelines shall be installed along all boundaries whenever there is a danger of personnel falling overboard. Railings and handrails shall be provided where necessary. Handrails shall be positioned internally and externally throughout the Vessel to GNC's satisfaction. Railings and handrails shall be made of stainless steel with SS316. Openings in railings and easy removable stanchions shall be provided at the embarkation locations, Rescue Zone, area for open deck operations around mooring equipment for the Vessel and area around the Daughter Boat and Hovercraft. 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; and

(f) All railings and handrails shall be secured to provide support for persons on board, to prevent them from falling on to or being thrown on to the deck or overboard in adverse weather and sea conditions. The design shall consider the circumstances when persons on board are lined up together on one side of the deck in case of an emergency at sea.

4.1.14 All interior decks shall be covered by non-slip vinyl sheet flooring with the colour to be approved by GNC and the HKPF.

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

4.1.16 Ballistic Protection

(a) 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, excluding the windows therein; **[E]**

(b) The service life shall not be less than 13 years for composite armour to ensure only one replacement during a 15-year service life for the Vessel; and

(c) Certification confirming the compliance of the STANAG 4569 Level 2 (or equivalent) shall be provided by a laboratory acceptable to the HKPF.

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

4.1.17 Windows

(a) All windows shall be of RO approved type;

(b) 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 rattlings, and to provide a cushioning effect to protect the glass;

(c) The details of all windows shall be submitted to GNC and the HKPF for approval. Weathertightness tests shall be carried out after window installation as per RO requirements and to the satisfaction of GNC; and

(d) RO type-approved retractable solar UV roller blinds shall be installed on all side windows

throughout the Vessel. The blinds shall be capable of being retained in various positions, including partially lowered or fully lowered, without swinging due to Vessel's motions at sea.

4.1.18 Lighting

(a) The lighting shall consist of fixtures installed throughout the Vessel for general illumination;

(b) The 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;

(c) 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;

(d) 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 being 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 found in Chapter 8 of this Part VII;

(e) Emergency egress routes shall be lit by emergency lighting (including specific capsize lighting) and include emergency escape path markings in both LED and luminescent versions to ensure visibility during low light or smoke conditions;

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

(g) 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; and

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

4.1.19 Furniture and Fittings

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

(b) Lockers shall be provided with built-in locks and keys in cabins and other locations. They shall be designed and fitted to the satisfaction of GNC;

(c) All fittings and hardware installed onboard the Vessel (e.g. screws, hasps, hinges, handles,

sliding bolts, coat hooks, ceiling lights, bulkhead mounted lights, etc.) shall be of a high-quality stainless steel or other metals with chrome finish provided that galvanic corrosion due to contact of dissimilar metals shall not be permitted. They shall be properly installed in all spaces as directed by GNC;

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

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

4.1.20 Insulation and Lining

(a) Insulation:

(1) Boundaries and ceilings around the inside of the deckhouse shall be insulated against heat and sound and shall be fitted with Rockwool of appropriate thickness (minimum 50 mm) or equivalent 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 shall be acceptable to GNC; and

(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.

(b) 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 and the HKPF; and

(2) The deck or floor of the wheelhouse, officer cabin and crew cabins 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.

4.1.21 Access, Doors, Ladders and Hatches:

(a) All outfitting including, but not limited to, doors, hatches, ladders, ventilation heads, shall be type approved by the RO for this type of Vessel, or other entities acceptable to GNC. These shall require GNC acceptance and approval before installation;

(b) Ladder/stair rungs and steps shall be of an anti-slip type and be acceptable to GNC and the HKPF.

(c) Detailed specifications of these items shall be provided by the Contractor to 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 GNC;

(d) Flush RO type approved watertight manhole covers shall be used where necessary;

(e) 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 the inside and the outside of the compartment. All covers and doors shall be fitted with a retaining device. Hatches/ covers providing 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 practicable;

(f) 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;

(g) All door openings to external deck space shall be RO type approved and of an outwardly opening weathertight type. All doors shall be fitted with hooks or other means to secure them in the fully open position;

(h) 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;

(i) 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;

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

(k) Exterior handrails on upper deck and main deck shall be constructed of aluminium and stainless steel respectively, painted and strongly secured to the perimeter of the upper deck and the main deck to provide support for persons onboard, to prevent them from falling or being thrown on to the deck or overboard in heavy weather and adverse 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;

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

(m) All underdeck compartments (excluding Fore Peak (P/S)) shall be provided with two widely separated means of access/escape and the size of opening shall be with a minimum dimension of 700 mm x 700mm; and

(n) The accommodation compartments shall be provided with two widely separated means of escape and the size of opening shall be with a minimum width of 800 mm.

4.1.22 Ventilation:

(a) The requirements for ventilators and the ventilation system shall comply with RO Requirements;

(b) Wheelhouse and accommodation compartments shall be protected from gas or vapour fumes from machinery, engine-exhaust gas and smells from the fuel system;

(c) The toilets and the galley shall be fitted with an exhaust fan with a capacity of not less than 36 air changes per hour; and a louvre 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;

(d) 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 requirements;

(e) 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; and

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

4.1.23 Equipment fixtures and fittings on board 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 or during emergency crash stops, and during ship manoeuvres.

4.1.24 A general emergency visual and audible alarm system shall be provided for the Vessel. The alarms shall be audible throughout the vessel and the sound pressure level shall be at least 15 dB(A) above the ambient noise levels anywhere in the Vessel and its spaces and compartments when the Vessel is in its normal operational conditions. The alarm shall continue to function after it is triggered until it is turned off or is temporarily interrupted by a voice message on the public address system.

4.1.25 A public address system shall be installed covering all areas and spaces of the Vessel, including escape routes, to which the crew have access. The system shall be installed in such a way that the system would not be rendered inoperable in the initial stages of flooding or fire in a compartment.

4.2 Wheelhouse

4.2.1 A wheelhouse shall be located at the front of the deckhouse on the upper deck. The Contractor shall supply a 3D computer model of the Vessel interior for review by GNC and the HKPF within two months after the Contract Date. This shall be supplied in a format acceptable to GNC with no paid-license required. 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 GNC and the HKPF before the design is finalised.

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 (except right backwards) at the steering/helm position. Pillars shall not be fitted inside the wheelhouse to avoid obstructing 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 for 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:

This shall be located in the wheelhouse on the centreline, arranged so the Coxswain and Officer On Watch ("OOW") are facing forward with an unobstructed view forward and to the sides of the Vessel. As a minimum, the Ship Navigation Control console(s) shall comply with the IMO requirements. This station shall be designed for the Coxswain and OOW to operate the Vessel. Details of controls, displays and equipment to be set up in this station are set out in Paragraph 4.2.13 of this Part VII.

(b) Aft Command and Control Station:

It shall be located on the aft end of the wheelhouse. This station shall be designed for the the Commander, the Engineer, Electro Optical Sensor System ("EOSS") / Marine Situational Awareness System ("MARSAS") Operator and Communications and

Navigation Officer to operate the Vessel. Details of controls, displays and equipment to be set up in this station are set out in Paragraphs 4.2.14 to 4.2.20 of this Part VII.

4.2.4 Wheelhouse Marine Shock Mitigating Seats:

(a) Six (6) heavy duty pedestal seats with hydraulic damping system, armrest with safety belts shall be provided for the following personnel (one seat for each member of the personnel):

(1) Commander;

(2) Coxswain;

(3) OOW;

(4) Engineer;

(5) MARSAS / EOSS Operator; and

(6) Communications and Navigation Officer.

(b) The requirements of the marine shock mitigating seats are listed as the followings:

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

(2) Material of the structure: stainless steel and/or aluminium alloy;

(3) Materials of upholstery: heavy duty vinyl or leather;

(4) Height, direction and fore and aft positions of these seats shall be adjustable and suitable for those of Asian statue of 1.64m tall;

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

(6) Suspension seats with multi-level adjustable dampers which provide progressive damping, and allow vertical and longitudinal adjustments; and

(7) Shall be a proprietary made product.

4.2.5 The Forward Ship Navigation Control Station shall be situated at the centreline of the Vessel and be at a forward position in the Wheelhouse. Dedicated seating shall be provided at the control station for the Coxswain and OOW. The Coxswain seat should be situated immediately to port of the Vessel's centreline. The OOW seat should be situated immediately to starboard of the Vessel's centreline. Controls for steering shall be easily reachable by a person of Asian stature of 1.64m tall in the seated position without the need to extend his/ her arms, and without obstructing the Coxswain and the OOW's all-round field of view.

4.2.6 Essential controls for the use in adverse sea conditions shall be integrated to the seat and armrests, which shall be direct accessible by Coxswain, to mitigate the increased Occupational Safe and Health risks of crews for leaning forward to manipulate controls in a dynamic environment. Details will be addressed in kick-off meeting.

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

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

4.2.9 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 GNC and HKPF prior to installation.

4.2.10 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.)

4.2.11 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 time 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 two steering thrust control heads and a quick action lever control (joystick);

(b) Position keeping control panel and joystick;

(c) Engine speed and clutch controls;

(d) Steering angle indicators;

(e) Rate of turn indicators;

(f) Bow thruster control panel;

(g) Fire-fighting monitor control panel for the External Fire-Fighting System;

(h) Watertight and weathertight doors and hatches open/close monitoring and alarm system;

(i) Operational systems and displays;

(j) Speed log;

(k) Echo sounder;

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

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

(n) Instruments, controls and alarm systems for major machinery together with start/stop switches;

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

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

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

(r) Magnetic compass;

(s) Wind speed and direction display; and

(t) Electronic navigation equipment and displays.

4.2.14 The Wheelhouse Engine Remote Control Console with two multifunction displays (Paragraph 9.3.2 (h) of this Part VII refers) shall be installed at the Aft Command and Control Station and shall be equipped to facilitate the engineer(s) to monitor the Engine Room condition, respond to any alarm expeditiously and operate and control the machineries in the Engine Rooms remotely.

4.2.15 The instrument panels for the emergency controls and monitoring of the fire-fighting systems shall be at the Wheelhouse Engine Remote Control Console of the Aft Command and Control Station. The locations shall be clearly defined and agreed to by GNC and HKPF.

4.2.16 The engineering systems being monitored and controlled at the Wheelhouse Engine Remote Control Console through a monitoring and control system as more particularly specified in Paragraph 8.15 of this Part ("MCS") shall be displayed on the Multi-Function Displays together with links to the Vessel's CCTV system. Details shall be discussed at the kick-off meeting. These equipment and their information to be displayed through the MCS shall include but not be limited to:

(a) All the main diesel engine alarms and running parameters;

(b) All the diesel generator alarms and running parameters;

(c) All the water-jet alarms and running parameters;

(d) All the gearbox alarms and running parameters;

(e) AC Electrical system;

(f) Water mist system and alarm;

(g) Fire detecting system and alarm;

(h) FM-200 system and alarm;

(i) Fans (under main deck) control;

(j) General engineering system including fire pump control, bilge alarm and pump control, and tank level alarm and gauges (freshwater tank, fuel oil tank, lubricating oil, oily bilge tank, etc.);

(k) Sewage system;

(l) Oily water separator;

(m) Marine growth protection system;

(n) Air conditioning system;

(o) Intercom between Wheelhouse Engine Remote Control Console and Engine Control Console in the Engine Room Control Office;

(p) Bow thruster monitoring system;

(q) External Fire-Fighting System (including fire monitor pumps alarm and monitoring panel);

(r) Other related alarm signal and any other signal (if applicable); and

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

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

The above MCS shall be an additional and shall not replace any remote control system and operating panel provided by engine or system provider e.g. main engine, generator engine water jet, fire-fighting system, etc.

In addition, the Multi-Function Displays of the MCS including the one at the Wheelhouse Engine Remote Control Console shall also be capable of connecting to and controlling the CCTV system onboard.

4.2.17 Monitoring, control and operation of engineering systems shall be replicated at the Engine Control Console in the Engine Room Control Office on the main 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 Engineering Officer to select which control console is the Master Station with control function, while the other be the

Slave Station with display function only. Interlock protection shall be in place to ensure that only the Master Station is in command.

4.2.18 The following displays and equipment shall be incorporated into the Launch 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 9.3.2(e) of this Part VII, one (1) 32" high definition multi-function display, which is the dedicated display and control panel for the X-band solid state Marine High Performance Radar, shall be capable of displaying at least the following systems' images via the Integrated Navigation System:

(1) X-band solid state Marine High Performance Radar;

(2) X-band IMO Compliant Navigation Radar;

(3) ECDIS;

(4) EOSS; and

(5) MARSAS provided by the HKPF as described in Paragraph 9.32.3 of this Part VII.

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

4.2.19 The following displays and equipment shall be incorporated into the MARSAS / 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 9.3.2(f) of this Part VII, two (2) 32" or larger multifunction display, acceptable to the HKPF, is to be located at this Operator's console. The display shall be dedicated for operating the EOSS and MARSAS respectively; and

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

4.2.20 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 9.3.2(g) of this Part VII, one (1) 32" high definition multi-function display which can display at least the following system and other systems via the Integrated Navigation System:

(1) ECDIS;

(2) EOSS;

(3) X-band solid state Marine High Performance Radar; and

(4) MARSAS provided by the HKPF as described in Paragraph 9.32.3 of this Part VII.

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

(1) Secure AIS;

(2) GPS;

(3) Direction Finder;

(4) VHF; and

(5) Police MRCS radio system (to be supplied by the HKPF).

(c) An operator panel for the 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 9.3.2(i) of this Part VII, within close proximity to the Communications and Navigation Officer's console, there shall be a large working chart table designed and installed as follows:

(1) Provision shall be made 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;

(2) 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;

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

(4) The 55" Display shall be capable of displaying at least the following system's images via the Integrated Navigation System: -

(i) EOSS;

(ii) X-band solid state Marine High Performance Radar;

(iii) ECDIS; and

(iv) MARSAS.

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

4.2.21 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) CCTV cameras shall be fitted at the port and starboard sides amidships, to facilitate direct downward viewing to the side of the Vessel;

(d) Visual blind spots or sectors shall be minimised (i.e. as few and of as small an angle as possible), and in any case, they must not adversely affect the keeping of a safe lookout 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.

4.2.22 Wheelhouse Windows

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

(b) 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 outwards 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 windows shall be fitted with retractable tinted solar blinds with RO type-

approval to reduce glare. 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 and allow a crew to be able to pass through the sliding window in emergence situation. 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 on 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 in a location adjacent to the window wiper controls; and

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

4.2.23 The following fittings and equipment shall be provided, as a minimum, in the wheelhouse to the satisfaction of GNC and the HKPF:

(a) One (1) display board for posting plans, charts, 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) magnetic compass with independent illuminated dimmer switch;

(h) One (1) electrically powered marine wall-mounted clock;

(i) Seven (7) cup holders;

(j) Two (2) wastebaskets (to be concealed and secured);

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

(l) Three (3) lockable storage boxes, with closed cell foam lining, 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;

(m) Seven (7) coat hooks;

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

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

(p) Non-slip handholds at suitable locations to facilitate safe crew movement in rough sea conditions;

(q) One (1) approved type first aid box; and

(r) Five (5) wall mounted (220V AC) electrical sockets (Type G for Hong Kong).

4.2.24 The wheelhouse shall be ballistically protected. For details refer to Paragraph 4.1.16 of this Part VII.

4.3 Server Room

4.3.1 The Server Room may be located on either the upper deck or main deck, but the location shall be as close as possible to the wheelhouse and the Command and Control Suite to minimize cable run lengths. The sever room shall be directly accessible from the main corridor to facilitate the possible transports of heavy equipment into/out from the room.

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

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

4.3.4 The Server Room arrangement, stowage of computer equipment and server racking is to be designed and submitted to the COMMS of HKPF for approval before installing it onboard the Vessel.

4.3.5 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.

4.3.6 The Server Room shall be large enough to install ten (10) 600(L) x 600(W) ETSI standard equipment cabinets with doors and locks with door access to the front and rear of the cabinet. The height of cabinets may 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. There shall be enough space in front of and behind the cabinets for operation and maintenance.

4.3.7 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 6kW. The power loading shall be discussed with the HKPF during the kick-off meeting. The Contractor shall provide at least sixteen (16) fuse spurs for each power supply.

4.3.8 The Server Room shall have cable containments, which can reach but not be limited to the Wheelhouse, mast, main deck, under deck and Command and Control Suite. The end-to-end cable containment locations shall be discussed with and to the satisfaction of HKPF during kick-off meeting.

4.3.9 Circuit breakers shall be provided for major components of INS and ENE stipulated in Paragraphs 9.3.2 and 9.4.1 of the Part VII respectively. The actual devices to be equipped with circuit breakers shall be subjected to approval by HKPF. 30% spare of circuit breakers, circuits and power supply loading shall be provided for future vessel system use.

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 There shall be one (1) 26” multifunction display, as stated in Paragraph 9.3.2(j) of this Part VII.

4.4.3 The Commander's Cabin shall, as a minimum, include the following:

(a) One (1) single bed;

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

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

(d) One (1) desk with drawers;

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

(f) One (1) wall mounted clock;

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

(h) Two (2) wall mounted (220V AC) electrical sockets (Type G for Hong Kong);

(i) Four (4) clothes hooks;

(j) One (1) talkback station; and

(k) One (1) en-suite bathroom with hot and cold-water supply which shall incorporate the following features:

(1) The en-suite bathroom door shall be fabricated from aluminium and open outwards and be capable of being opened from the outside. The lower portion of the door should have a louvre. All fixtures, partitions and laminations shall be approved by GNC and the 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 coating for bathroom.

(2) 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.

(3) Sewage flushed from toilets shall be piped to a sewage treatment plant before discharge overboard;

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

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

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

(7) One (1) non-slip shower tray separate from the toilet with shower curtain extending to the base of the shower tray. The shower shall be fitted with hot and cold-water mixer unit.

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

(9) One (1) toilet paper holder;

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

(11) One (1) secured waste bin; and

(12) Drain(s) to be provided to avoid water accumulation on the toilet floor. The floor covering shall pitch to a floor drain. The grey water shall be discharged overboard through a non-return shipside valve. The arrangement shall meet the RO's requirements and acceptable to GNC.

4.5 Crew Cabins

4.5.1 Crew cabins shall be designed and sufficient for eighteen (18) officers on the upper deck.

4.5.2 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.

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

(a) Bunk beds with dimensions agreed by 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 220V AC electrical sockets (Type G, Hong Kong) 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 drawers and one (1) desk chair with no wheel; and

(k) One (1) talkback station.

4.5.4 Emergency escape from the crew accommodation area directly to the main deck shall be provided.

4.6 Crew Shower and Toilet Facilities

4.6.1 Two (2) crew bathrooms shall be provided on the upper deck within the crew accommodation area and shall be designated as separate male and female bathrooms.

4.6.2 Each bathroom 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. The crew bathrooms shall be provided with hot and cold water supply and, as a minimum, shall include the following:

(a) The bathroom doors shall be of aluminium opening 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;

(b) The bathrooms shall be fitted with non-slip flooring and waterproof grating;

(c) Sewage flushed from toilets shall be treated by the sewage treatment plant before discharge overboard;

(d) The sewage system shall be designed in such a way that no foul odours are generated by the breakdown of organisms in the sea water flushing and other system components;

(e) As a minimum, each male bathroom shall incorporate the following:

(1) One (1) seated toilet and two (2) urinals;

(2) A stainless steel wash basin (with hot and cold fresh water mixer tap) including a towel bar, grab bar, and soap dish;

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

(4) One (1) shower with a non-slip shower tray and shower curtain extending to the base of the shower tray, which shall be fitted with a hot and cold water mixer unit.

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

(6) One (1) toilet paper holder;

(7) One (1) waste bin;

(8) Three (3) clothes hooks; and

(9) Drain(s) are to be provided to prevent water accumulation on the toilet floor. Floor covering shall pitch to a floor drain. The grey water shall be discharged overboard through a non-return shipside valve. The arrangement shall meet the RO's requirements and acceptable to GNC.

(f) As a minimum, each female bathroom shall incorporate the following:

(1) One (1) seated toilet;

(2) A stainless steel wash basin (with hot and cold fresh water mixer tap) including a towel bar, grab bar, and soap dish;

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

(4) One (1) shower with a non-slip shower tray and shower curtain extending to the base of the shower tray, which shall be fitted with a hot and cold water mixer unit.

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

(6) One (1) toilet paper holder;

(7) One (1) waste bin;

(8) Three (3) clothes hooks; and

(9) Drain(s) are to be provided to prevent water accumulation on the toilet floor. Floor covering shall pitch to a floor drain. The grey water shall be discharged overboard through a non-return shipside valve. The arrangement shall meet the RO's requirements and acceptable to GNC.

4.7 Mess Room

4.7.1 The Mess Room, which shall be close to the Galley, shall provide seating for not less than 10 persons and the following equipment, as a minimum:

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

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

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

(d) One (1) stainless steel rubbish bin with cover suitable for food waste;

(e) Four (4) 220V AC electrical sockets (Type G, Hong Kong);

(f) One (1) refrigerator, the size and type of the refrigerator to be determined by the HKPF;

(g) One (1) microwave oven;

(h) One (1) distilled water dispenser with hot and cold water supply function;

(i) One (1) 50-inch 4K UHD LED wall mounted TV; and

(j) One (1) talkback station.

4.8 Galley

4.8.1 A galley shall be closed plan layout and equipped with cold and dry food storage shall be designed. That shall allow full-unencumbered safe operation to serve four meals for twenty (20) persons underway per day. The galley shall have a direct access to the mess room.

4.8.2 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) electric wall mounted clock;

(d) One (1) refrigerator, the size and type of the refrigerator to be determined by the HKPF;

(e) One (1) freezer, the size and type of the freezer to be determined by the HKPF;

(f) One (1) microwave oven;

(g) One (1) stainless steel sink having a tap with hot and cold water supply and with a water filter, the type to be determined by the HKPF;

(h) One (1) oven;

(i) One (1) electric kitchen range hood;

(j) One (1) stainless steel potable hot water heater;

(k) One (1) stainless steel paper towel dispenser;

(l) One (1) stainless secured steel rubbish bin with cover suitable for kitchen waste;

(m) Stainless steel cabinets/ cupboards and drawers for storage of food and snack;

(n) Eight (8) 220V AC Electrical Sockets (Type G, Hong Kong); and

(o) One (1) talkback station.

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

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

4.9 Command and Control Suite and Command Office

4.9.1 A Command and Control Suite with a Command Office provides the core functions of the Vessel. That shall be located at the main deck and, if possible, directly under the Wheelhouse to provide ease of access and shorten cable runs. The purpose of the Command and Control Suite is to facilitate operation in the event of a major incident and/ or disaster during which multi-agency personnel would be involved and required to go on board the Vessel.

4.9.2 Within the Command and Control Suite, there should be a space/area designated for communications with the Wheelhouse above or land-based command centres. The personnel in the Command and Control Suite shall be able to view the displays and access to the information/data from the Wheelhouse. However, they shall not be able to control any

navigational related equipment or displays at the Wheelhouse.

4.9.3 There also shall be an independent room, the Command Office, intended for confidential conference within the Command and Control Suite but separated from other parts of it.

4.9.4 The Command and Control Suite shall be designed to accommodate not less than fourteen (14) persons and the Command Office shall be designed to accommodate not less than eight (8) persons.

4.9.5 The Command and Control Suite shall be provided with the following installations and fittings:

(a) One (1) conference table suitable for seating 14 persons comfortably. The size, type and storage spaces underneath the table are to be determined by the HKPF;

(b) Not less than fourteen (14) conference chairs without wheels;

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

(d) Locker, multi-tray cabinet and storage space

(e) Fourteen (14) cup holders;

(f) Two (2) wastebaskets (to be concealed and secured);

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

(h) Fourteen (14) coat hooks;

(i) One (1) distilled water dispenser with hot and cold water supply function

(j) Three (3) 75" or larger multi-touch anti-glare smart board multifunction display providing the functions specified in Paragraph 9.3.2(l) and (m) of this Part VII;

(k) Locker, multi-tray cabinet and storage space

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

(m) One (1) talkback station;

(n) One (1) display board for, but not limited to, posting plans, maps, notices, etc.;

(o) Wall-mounted electrical sockets for facilities including but not limited to photocopier, computer, notebook computer and mobile phone charging station shall be provided. The number of and the location of sockets shall be proposed and submitted by the Contractor to HKPF for approval;

(p) Spare 220V AC and 24V DC sockets are to be supplied for operational needs. The numbers of spare sockets shall be agreed with the HKPF; and

(q) CAT6e Ethernet socket as specified in Paragraph 9.22.12 of this Part VII. The corresponding details shall be discussed at the kick off meeting.

Details shall be discussed at the Kick-off meeting.

4.9.6 The Communications Area shall be provided with the following installations and fittings:

(a) One (1) 'L' shaped table of suitable size. Storage spaces underneath the table shall be agreed with the HKPF;

(b) Three (3) chairs without wheels;

(c) Three (3) cup holders;

(d) Two (2) 32" or larger multifunction displays for the MARSAS and EOSS as specified in Paragraph 9.3.2 (k) of this Part VII;

(e) Two (2) 32" or larger multifunction displays for Special Police IT Equipment, which will be installed upon the completion of the Vessel;

(f) Locker, multi-tray cabinet and storage space;

(g) Wall-mounted electrical sockets for facilities including but not limited to photocopier, computer, notebook computer and mobile phone charging station shall be provided. The number and location of sockets shall be proposed by the Contractor and be subject to the HKPF approval;

(h) Spare sockets for 220V AC and 24V DC to be supplied for operational needs. The number of spare sockets shall be agreed with HKPF; and

(i) CAT6e Ethernet socket as specified in Paragraph 9.22.12 of this Part VII. The corresponding details shall be discussed at the kick off meeting.

Details shall be discussed at the Kick-off meeting.

4.9.7 The Command Office shall be provided with the following installations and fittings:

(a) One (1) conference table suitable for seating eight (8) persons comfortably. The size, type and storage spaces underneath the table are to be agreed by the HKPF;

(b) Eight (8) conference chairs without wheels;

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

(d) Eight (8) cup holders;

(e) One (1) water dispenser with hot and cold water supply function;

(f) One (1) 55" or larger multi-touch anti-glare smart board multifunction display for providing the functions specified in Paragraph 9.3.2(n) of this Part VII.

(g) Locker, multi-tray cabinet and storage space;

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

(i) One (1) display board for, but not limited to, posting plans, maps, notices, etc;

(j) Sockets for 220VAC and 24VDC are to be supplied for operational needs. The number of sockets shall be agreed with the HKPF;

(k) The insulation and lining of this office shall have good sound insulation and been approved by the HKPF;

(l) Video conferencing system as specified in Paragraph 9.29 of this Part VII. Details shall be finalised in the Kick-Off meeting with HKPF; and

(m) CAT6e Ethernet socket as specified in Paragraph 9.22.12 of this Part VII.

4.10 Passenger Cabins

4.10.1 Two (2) passenger cabins shall be provided and shall be sufficient for comfortably accommodating eight (8) police officers and shall be located on the main deck.

4.10.2 The two (2) passenger cabins shall include two (2) bunk beds in each, with a normal capacity of four (4) persons in each cabin. The passenger cabins and bathrooms shall be designed in accordance with the applicable requirements of the Maritime Labour Convention (MLC), 2006.

4.10.3 Each passenger cabin, as a minimum, shall include the following:

(a) Bunk beds with dimensions agreed by GNC and the 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 220V AC electrical sockets (Type G, Hong Kong) 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; and

(j) One (1) talkback station

Subject to the availability of space, there should be one (1) desk with drawers and one (1) desk chair without wheels.

4.10.4 Emergency escape from the passenger accommodation area directly leading to the muster station shall be provided.

4.11 Passenger Shower and Toilet Facilities

4.11.1 One (1) male and one (1) female bathroom shall be provided on the main deck within the passenger accommodation area.

4.11.2 The male 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 louvre;

(b) All fixtures, and partitions are to be commercial grade stainless steel and approved by GNC and HKPF;

(c) All wet spaces shall be provided with a surrounding coaming fully welded to the Vessel's deck;

(d) The bathroom (including the toilet unit and the shower unit) shall be fitted with non-slip flooring and a waterproof grating;

(e) Sewage flushed from toilets shall be treated by the sewage treatment plant before discharge overboard. The sewage system shall be designed in such a way that no foul odours are generated by the breakdown of organisms in the sea water flushing and other system components;

(f) One (1) electric exhaust fan capable of not less than 36 air changes per hour. The exhaust air shall be routed to the outside of the Vessel;

(g) One (1) seated toilet and two (2) flush urinals;

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

(i) One (1) water tap under the wash basin with a plastic hose for bathroom cleaning;

(j) One (1) shower with a non-slip shower tray and shower curtain extending to the base of the shower tray, which shall be fitted with a hot and cold water mixer unit.

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

(l) One (1) secured waste bin with lid;

(m) Four (4) clothes hooks; and

(n) Drain(s) to be provided to prevent water accumulation on the bathroom floor (including the toilet units and the shower units). Floor coverings shall pitch to a floor drain. The grey

water shall be discharged overboard through a non-return shipside valve. The arrangement shall meet the RO's requirements and acceptable to GNC.

4.11.3 The female bathroom shall be provided with hot and cold water supply and, as a minimum, shall include the following:

(a) The bathroom door shall be made of aluminium and open outwards, and capable of being opened from the outside. The lower portion of the door should have a louvre;

(b) All fixtures, and partitions are to be commercial grade stainless steel and approved by GNC and the HKPF;

(c) All wet spaces shall be provided with a surrounding coaming fully welded to the Vessel's deck;

(d) The bathroom (including the toilet units and the shower units) shall be fitted with non-slip flooring and waterproof grating;

(e) Sewage flushed from toilets shall be treated by the sewage treatment plant before discharge overboard. The sewage system shall be designed in such a way that no foul odours are generated by the breakdown of organisms in the sea water flushing and other system components;

(f) One (1) electric exhaust fan capable of not less than 36 air changes per hour. The exhaust air shall be routed to outside of the Vessel;

(g) One (1) seated toilet

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

(i) One (1) water tap under the wash basin with a plastic hose for bathroom cleaning;

(j) One (1) shower with a non-slip shower tray and shower curtain extending to the base of the shower tray, which shall be fitted with a hot and cold water mixer unit;

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

(l) One (1) secured waste bin with lid;

(m) Four (4) clothes hooks;

(n) Drain(s) are to be provided to prevent water accumulation on the bathroom floor (including the toilet units and the shower units). The floor coverings shall pitch to a floor drain. The grey water shall be discharged overboard through a non-return shipside valve. The arrangement shall meet the RO's requirements and acceptable to GNC;

4.12 Standby and Briefing Area

4.12.1 The Standby and Briefing Area shall be located near amidships within the deckhouse on the main deck and shall be an open plan area. The purpose of this area is to provide a multi-function space suitable for fulfilling a range of purposes, including the briefing of officers, seating for passengers and rescued persons and, as well as, an additional open space for stretcher cases in the event of a major incident. It shall be able to provide comfortable secured seating, which shall be removable and compact, for not less than fifty (50) emergency service personnel, with the details to be discussed at the kick off meeting.

4.12.2 All the side windows, if any, shall be weathertight and capable of being opened to increase the ventilation if needed. Fans shall be provided to cover the area to the satisfaction of GNC and HKPF.

4.12.3 Secured chairs, which may be foldable single or bench type seats without wheels, shall be easily

fitted and removed using a track system. After removal, the deck shall be flush.

4.12.4 The Standby and Briefing Area shall also serve as the second Evacuation Zone, but cannot replace the original one, in the event of major incidents.

4.12.5 The Standby and Briefing Area shall be provided with the following installations and fittings:

(a) Not less than fifty (50) removable chairs are to be secured to the deck using a flush mounted track system;

(b) Six (6) wall mounted fans of diameter 300mm;

(c) Two (2) secured wastebaskets;

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

(e) Twenty (20) coat hooks;

(f) One (1) secured distilled water dispenser with hot and cold water supply function;

(g) One (1) 75" or larger multi-touch anti-glare smart board multifunction display providing the functions specified in Paragraph 9.3.2(o) of this Part VII;

(h) Locker, multi-tray cabinet and storage space;

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

(j) One (1) display board for, but not limited to, posting plans, maps, notices, etc.;

(k) Eight (8) wall mounted (220V AC) electrical sockets (Type G for Hong Kong); and

(l) One (1) talkback station

4.13 Weapons and Ammunition Storeroom

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

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

4.13.3 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.

4.13.4 Compartments/facilities adjacent to the Weapons and Ammunition Storeroom should not contain high fire risk stores, equipment (including electrical items), processes or activities. Such compartments/facilities 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.

4.13.5 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.

4.13.6 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 ship structural maintenance.

4.13.7 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.

4.13.8 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.

4.13.9 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) Four (4) Long Barrel Weapons;

(b) Twenty (20) Handguns;

(c) Twenty (20) Pairs of handcuffs;

(d) Twenty (20) Extendable batons;

(e) Two (2) Signal Pistol;

(f) Twenty (20) OC Foam irritant aerosols; and

(g) Drawers for the safe stowage of approximately 4000 rounds of small arms ammunition of various calibres.

4.13.10 Suitable racking, drawers, cupboards, cabinets and a safe are to be designed to securely and 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.

4.13.11 Stowages shall be designed to allow water from the fire suppression system to cool all weapons and ammunition in the stowage. Any shelving shall have one or more drainage holes to allow water from fire suppression systems to cool weapons and ammunition in the stowage.

4.13.12 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.

4.13.13 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.

4.13.14 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; and

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

4.13.15 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.

4.13.16 The Weapons and Ammunition Storeroom shall be lockable with a built-in lock. Three (3) sets of keys shall be provided. All keys shall be tagged for identification.

4.14 Pyrotechnics Storeroom

4.14.1 A separate Pyrotechnics Storeroom shall be provided.

4.14.2 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) Twenty (20) 1" white signal cartridges;

(d) Twenty (20) 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 the Vessel's 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].

4.14.3 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.

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

4.14.5 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.

4.14.6 Stowage 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.

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

4.14.8 The height of stowage 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 stowage and sprinkler heads should not be less than 300 mm.

4.14.9 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.

4.14.10 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.

4.14.11 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.

4.14.12 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.

4.14.13 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.

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

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

4.14.16 The Pyrotechnics Storeroom shall be lockable with a built-in lock. Three (3) sets of keys shall be provided. All keys shall be tagged for identification.

4.15 Evacuation Zone and First Aid Room

4.15.1 The Vessel shall be designed with an Evacuation zone and a First Aid Room located to the rear of main deck. The first aid room shall be accessible directly from the evacuation zone. These two areas shall be directly accessible from the open external deck and also from the stretcher lift to carry casualties to and from the helicopter winching area on the upper deck.

4.15.2 As a minimum, the Evacuation Zone shall be equipped with the following:

(a) One (1) water dispenser with hot and cold water supply;

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

(c) All the side windows, if any, shall be weathertight and capable of being opened to increase the ventilation if needed. Fans shall be provided to cover the area to the satisfaction of GNC and the HKPF;

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

(e) One (1) wastebasket;

(f) Four (4) wall mounted (220V AC) electrical sockets (Type G for Hong Kong); and

(g) Suitable storage lockers and racks. Details to be discussed in the kick off meeting.

4.15.3 The First Aid Room is to provide medical care when required. As a minimum, it shall be equipped with the following:

(a) Suitable numbers of wall mounted (220V AC) electrical sockets (Type G for Hong Kong) shall be provided. Details to be discussed at the Kick-Off meeting;

(b) Locker for 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) electric powered marine wall-mounted clock;

(g) 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 imitated leather. Removable side rails shall be provided to prevent patient falling off the couch in heavy seas. Storage space with sliding doors shall be provided under the couch;

(h) Medical lockers for storage of medical supplies;

(i) One (1) electric exhaust fan capable of not less than 36 air changes per hour. Covers shall be provided for exhaust fans and are to be capable of being closed to prevent the ingress of rainwater and seawater spray;

(j) 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;

(k) Direct access to the external open main deck; and

(l) Direct access to the helicopter winching area including via stretcher lift.

Details to be discussed at the kick-off meeting.

4.15.4 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.

4.15.5 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.

4.16 Wet Room with Drying Locker

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

4.16.2 The Wet Room floor shall be non-slip wash down with deck drains provided to avoid water accumulation. The floor covering shall be pitched to a floor drain. The grey water shall be discharged overboard through a non-return shipside valve. The arrangement shall meet the RO's requirements and acceptable to GNC.

4.16.3 A floor tracking system shall be run fore and aft throughout the Wet Room 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.

4.16.4 Two (2) Electric exhaust fans 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.

4.16.5 Suitable built-in dehumidifier(s) with self-draining facilities shall be provided in the Wet Room for dehumidifying purpose.

4.16.6 Two (2) mesh drying storage cabinets capable for hanging eighteen (18) crew members' foul

weather gear and personal protective equipment (including life jackets and helmets) shall be provided.

4.16.7 Suitable robust racks and hooks for hanging and drying of six (6) sets of personal diving equipment, including mask and snorkel, wet suit, buoyancy control device (BCD) vest, fins, and others. Besides, securing straps should be provided for securing twelve (12) scuba air tanks on the floor.

4.16.8 One (1) shower and one (1) water tap, both be fitted with hot and cold water mixer unit, shall be provided for rinsing of foul weather gear and diving equipment.

4.17 Engine Room Control Office

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

4.17.2 The Engine Room Control Office, as a minimum, shall include the following:

(a) Display with CCTVs images to show the Engine Room condition;

(b) Suitable number of multi-function display screens to monitor, control and operate various engineering systems. This is a replicate of the Wheelhouse Engine Remote Control Console described in Paragraphs 4.2.16 and 8.15 of this Part VII.

(c) One (1) L-shape Desk

(d) One (1) chair without wheels;

(e) One (1) wall mounted fans of diameter 300mm;

(f) One (1) cup holder;

(g) One (1) 32” or larger multifunction display for providing the functions specified in Paragraph 9.3.2(p) of this Part VII with regards to the CCTV system;

(h) Two (2) 32” or larger multifunction displays for providing the functions specified in Paragraph 9.3.2(q) of this Part VII with regards to the Monitoring and Control System (MCS);

(i) Locker and storage space;

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

(k) Four (4) wall mounted (220V AC) electrical sockets (Type G for Hong Kong; and

(l) One (1) talkback station.

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

4.17.4 The Engine Room Control Office shall also house the remote control system and operating panel provided by engine or system provider such as for main engine, generator engine, water jet, fire-fighting system, etc.

4.17.5 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 the proposed IMACS was deployed on either a government or a commercial vessel of a similar or larger size than the Vessel.

4.17.6 An on-board data server shall be provided to allow real-time data to be securely transmitted to a shore office or an onshore command 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.

4.17.7 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.

4.17.8 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.

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

4.17.10 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 Engineering Officer 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.

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

4.18 Special Equipment Storeroom

4.18.1 A designated room shall be designed and located on the main deck for stowage of specialist equipment. Specialist equipment storage will include Life Saving Appliances, Fire Fighting Equipment, Unmanned Aerial Systems (UAS) and Remotely Operated Vehicle (ROV) with the specific storage dimensions to be provided by the HKPF at the kick-off meeting. Unmanned Aerial System (UAS) and Remote Operated Vehicle (ROV) shall be supplied by the HKPF.

4.18.2 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 GNC. In addition, space is required for 100 Thermal Protection Aids and any other associated equipment as specified by GNC. The Contractor shall provide the corresponding common lifejackets and Thermal Protection Aids.

4.18.3 Stowage facilities for spare fire extinguishers shall also be provided.

4.18.4 The storeroom shall be provided with lockers, shelves and racks acceptable to GNC.

4.19 Fresh Air Pre-treatment Room

4.19.1 A designated room shall be designed and located on the main deck for pre-treating fresh air and feeding it to the individual fan coils of the air-conditioning system. Fresh air shall be pre-treated before being fed into the air-conditioning system to avoid undue condensation forming on any metallic surface on board the Vessel. This fresh air pre-treatment room shall be located as far away as possible from the accommodation spaces.

4.19.2 There shall be enough space for the operation and maintenance of the Fresh Air Pre-treatment Plant.

4.19.3 Suitable numbers of wall mounted (220V AC) electrical sockets (Type G for Hong Kong) shall be provided.

4.20 Battery Room

4.20.1 A dedicated battery room shall be provided for the storage of the batteries mentioned in Paragraph 8.4 of this Part VII. The space shall be designed to meet the RO's requirement and to the satisfaction of GNC.

4.20.2 The designated battery room shall be:

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

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

(c) Suitable ventilation system together with air temperature controls shall be provided in accordance with RO/ GNC.

4.21 FM200 Store Room

4.21.1 A designated store room shall be designed and located on the main deck for the storage of the FM200 bottles for the Fixed Fire-Extinguishing System specified in Paragraph 5.3 of this Part VII.

4.21.2 The store room shall be directly accessible from the open external deck. The door shall be fitted with a high-quality stainless steel or bronze commercial-grade marine-type locks. Three sets of keys shall be provided. All keys shall be tagged for identification.

4.21.3 An alarm shall be fitted and shall be protected to prevent accidental activation of the FM200 Fixed Fire-Extinguishing System

4.22 Bosun's Store

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

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

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

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

4.23 Fore Peaks (Port and Starboard)

4.23.1 The fore peaks (Port and Starboard) shall be arranged at the foremost part of the hulls. 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.

4.23.2 A flush watertight hatch cover shall be provided on the main deck for accessing each fore peak. An access ladder shall be provided for each fore peak.

4.23.3 A storage space with aluminium alloy walls shall be arranged inside the connecting underdeck bridge between the fore peaks. 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.

Suitable means of drainage shall also be provided. When required, it shall be possible to pump water out from this space.

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

4.24 Bow Thruster Rooms (Port and Starboard)

4.24.1 The Bow Thruster Rooms (Port and Starboard) shall be located under the main deck and aft of the fore peak of each hull. Suitable ventilation shall be provided for the rooms and shall meet the requirements of the RO.

4.24.2 A flush watertight hatch cover shall be provided on the main deck for provide access to each bow thruster room. An access ladder shall be provided for each compartment.

4.24.3 Each room shall be sufficient to house the following equipment:

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

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

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

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

4.24.5 Forced ventilation shall be provided for the Bow Thruster Rooms in accordance with RO requirements.

4.25 Equipment Room, Chiller Room, Pump Room and Tank Space

4.25.1 An Equipment Room, a Chiller Water Room, a Pump Room and a Tank Space shall be located under the main deck and aft of the Bow Thruster Room of each hull. These four compartments with the equipment and tanks shall be arranged to maintain the Intact Stability Criteria specified in Paragraph 3.3.9 of this Part VII and the Damaged Stability Criteria specified in Paragraph 3.3.10 of this Part VII and shall be accepted by GNC and the HKPF. Suitable ventilation shall be provided for the compartments which shall meet the requirements of the RO.

4.25.2 A flush watertight hatch cover shall be provided on the main deck for accessing each compartment. An access ladder shall be provided for each compartment.

4.25.3 The four compartments shall be equipped with the following:

(a) Reverse osmosis desalination unit;

(b) Accumulators(for fresh water);

(c) Accumulators(for sea water);

(d) Water mist pump;

(e) Emergency Fire Pump;

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

(g) Sea water cooling pumps;

(h) Chilled water pumps;

(i) Chilled water plant;

(j) Oily bilge Separator;

(k) Sewage treatment plant;

(l) Fresh water, fuel oil, diesel oil, lubricating oil and other liquid tanks; and

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

The arrangement of the equipment and tanks above shall be so arranged as to provide simple efficient operation and maintenance. Forced ventilation shall be provided for the four compartments.

4.25.4 In each hull, these compartments, Engine Rooms and jet rooms shall be connected from fore to aft with a through walkway of a minimum width of 600 mm and with flush RO type-approved watertight doors on the watertight bulkheads between different compartments.

4.25.5 The Contractor shall design and install these four compartments 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.

4.26 Engine Rooms (Port and Starboard)

4.26.1 The layout of Engine Rooms shall be in accordance with the IMO and the RO requirements and shall be approved by GNC and the HKPF. For the avoidance of doubt, the Vessel shall comply with the specific requirements in this section.

4.26.2 Special attention shall be paid to the layout of the Engine Rooms ensuring easy and convenient installation, operation and access for maintenance/repair.

4.26.3 The Engine Rooms shall be designed for unattended Engine Room operation and protected by a fixed FM200 Fire-Fighting system. Any one of the RO listed in Annex 9 approved water-mist system shall be provided as the secondary fire suppression system.

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

4.26.5 A separate store complete with special protective flooring and shelves is to be provided either inside or next to the Engine Rooms.

4.26.6 All hot surfaces susceptible to contact with flammable liquids shall be insulated. The insulation shall be impervious to flammable liquids and vapours.

4.26.7 Splash plates, casings, fenders, screens, etc. shall be provided for the protection of personnel and machinery.

4.26.8 Floor plates, handrails and guards shall be referenced to Paragraph 7.21 of this Part VII.

4.26.9 Forced ventilation shall be provided for the Engine Rooms in accordance with RO requirements.

4.27 Jet Rooms (Port and Starboard)

4.27.1 The layout of the jet rooms shall be arranged for easy and convenient installation, operation and access for maintenance/ repair.

4.27.2 The space shall be readily accessible to and from the main deck and from below decks via a watertight hatch and door respectively.

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

4.27.4 The floor shall be covered with aluminium chequered plate.

4.27.5 Aluminium chequered plates adjacent to valves, shafts, etc., shall be easily removable for ease of maintenance.

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

4.27.7 Forced ventilation shall be provided for these Jet Rooms.

4.27.8 An Engineer's Store/Locker shall be provided for the storage of lubrication oil, refrigerants, grease and ready to use tools, spares, etc. The Store/Locker should be situated in one of the jet rooms. This store/locker is to be provided with special protective flooring. Details shall be discussed at the kick-off meeting.

4.28 External Deck Area

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

4.28.2 Bollards, fairleads and cleats shall be arranged for mooring the Vessel, as required and arrangements shall be submitted to GNC and the HKPF for acceptance.

4.28.3 In addition to requirements specified in other sections, the forward main deck area shall be designed and installed as follows:

(a) The deck area shall be protected by a raised foredeck;

(b) The deck area shall be clean and simple for efficient anchoring, mooring and operating the external fire monitor;

(c) The deck area geometry of the Vessel shall be carefully designed to facilitate safe mooring to the satisfaction of GNC and the HKPF. Fenders specified in Para. 4.31 of this Part VII shall be fitted adequately to protect the Vessel;

(d) There shall be a weathertight aluminium alloy locker on the fore main deck area for the stowage of portable fenders and mooring lines;

(1) The locker shall be fabricated with a hinged lid capable of being opened to 90° with a locking device fitted to prevent the lid inadvertently closing, whilst the locker is in use; and

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

(e) There shall be two stairways (Port and Starboard) up to upper deck and two stairways to side deck areas from the raised foredeck; and

(f) In addition to requirements specified in other sections, the raised foredeck shall have the following equipment/ fittings:

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

(2) One (1) windlass as detailed in Paragraph 4.30.2 of this Part VII; and

(3) Typhoon mooring equipment as detailed in Paragraph 4.30.8 of this Part VII.

4.28.4 In addition to requirements specified in other sections, the side main deck area shall be designed and installed as follows:

(a) The width of the side deck on both sides of the main deck shall be at least 1 metre for the safe passages of crew/other persons. Access shall be provided on each port and starboard side on the main deck;

(b) Components including but not limited to air vents and pipes should be recessed into the deckhouse sides; and [D]

(c) The still water freeboard at the weather deck sides shall be lowered at and near amidships at the port and starboard sides – known as the Rescue Zones, for a deck length of not less than 3 metres, to facilitate easy boarding of the rescued persons from liferafts and from sea or operational personnel from Rigid Hull Inflatable Boats (RHIBs). The Rescue Zones shall be designed and installed as follows:

(1) The Vessel configuration shall also comply with IMO passenger vessel stability requirements.

(2) Steps with a slope not more than 45 degrees to the main deck shall be provided in the rescue zones, but the port side rear steps shall be replaced by a ramp with a slope less than 15 degrees.

(3) A total of four sets of Jason's cradles used as scrambling nets/boarding ladders/ stretchers shall be provided at the Rescue Zone and the aft main deck for retrieval of survivors from the water. Suitable sockets or fixing devices shall be fitted for securing the cradles in nearby areas; and

(4) The rescue zones 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 and RHIB specified in Paragraph 4.30.9 of this Part VII.

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

4.28.5 In addition to the requirements specified in other sections, the aft main deck area shall be designed and installed as follows:

(a) One (1) Davit Launch And Recovery System ("Davit LARS") compliant with the requirements of SOLAS (where applicable) for stowing, launching and recovering of one (1) ≤ 6.8 m self-righting daughter boat, as further specified in Paragraph 4.28.5(c) of this Part VII (viz., the Daughter Boat). The LARS shall be designed so that launch and recovery of the Daughter Boat, with a minimum of two crew onboard the Daughter Boat, can be performed safely using a dedicated control panel. The Davit LARS, based on the design and model as proposed in Schedule 6 of Part V, shall be proprietary made; **[E]**

(b) The Davit LARS shall be designed and installed as follows to the satisfaction of the RO, GNC and HKPF:

(1) Integrated Independent Hydraulic Power Pack;

(2) Small footprint, easy for installation onboard;

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

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

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

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

(7) Self-lubricating bearings;

(8) A fixed control stand;

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

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

(11) Integrated shock absorber (hydraulic dampener);

(12) Integrated boat supports;

(13) 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

(14) 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) The Daughter Boat will not be procured under this Contract. The particulars of the Daughter Boat for reference are listed as follows:

(1)	Length (overall):	6.0 to 6.8 metres (both figures inclusive, include any fendering, transom overhang, crash bar and engines)
(2)	Breadth:	2.4 to 2.8 metres (both figures inclusive);
(3)	Crew:	2 persons at 82.5 kg with 10 kg effect;
(4)	Passenger:	2 persons at 82.5 kg with 10 kg effect;
(5)	Kit:	100kg;
(6)	Contract Speed:	35 knots;
(7)	Aluminum Hull;	
(8)	Twin outboard engines;	
(9)	Fitted with Ant-Pendulum device; and	
(10)	Lightship Weight:	2.0 tonnes (estimated for reference only)

A conceptual general arrangement of the Daughter Boat is shown in Annex 10 for reference. The corresponding location on the Vessel is also shown in the Conceptual General Arrangement of the Vessel in Annex 10 for reference. Detailed information of the daughter boat shall be provided in the kick-off meeting.

(d) The Hovercraft will not be procured under this contract. The particulars of the Hovercraft for reference are listed as follows:

(1)	Length Overall:	6.0 – 7 metres (both figures inclusive, including any fendering, transom overhang, diving platform, etc.);
(2)	Extreme Breadth:	3.5 – 4 metres (both figures inclusive);
(3)	Maximum Height:	2.5 – 3 metres;
(4)	Maximum payload:	400kg;
(5)	Persons:	2 crew and 2 passengers;
(6)	Aluminium hull; and	
(7)	Lightship Weight:	1.8 tonnes (estimated for reference only).

A conceptual general arrangement of the Hovercraft is shown in Annex 10 for reference. The corresponding location on the Vessel is also shown in the Conceptual General Arrangement of the Vessel in Annex 10 for reference. Detailed information of the hovercraft shall be provided in the kick-off meeting.

(e) One (1) Marine Hydraulic Knuckle Boom Crane ("Crane LARS") with anti-pendulum block and constant tension winch, which shall be proprietary made (as defined in Part IV) and commercially available. It shall be fitted on the aft main deck. The crane shall be used as a LARS for the Hovercraft, assist in the recovery of unconscious persons from water

and other lifting requirements. The crane shall be designed as follows:

(1) To have sufficient lifting capability within the allowable Safe Working Load ("SWL") at the corresponding outreach with a good clearance from the side of the Vessel for launching and recovering the Hovercraft with full load;

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

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

(4) The crane shall be a marine type of class certified by any one RO listed in Annex 9 of this Part VII and acceptable to GNC. It shall be installed and tested in accordance with the RO Requirements to the satisfaction of GNC.

(f) The design of the davit and 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". All lifting gear, davit and crane shall be tested with a proof load in accordance with the Schedule 1 of CAP 548I together with a valid "certificate of test and examination" provided;

(g) One (1) diving platform with foldable diving ladder shall be located at the stern end of the main deck either on the port or starboard sides;

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

(i) The aft main deck area shall be large enough for the arrangement of the Daughter Boat, the Hovercraft and their associated LARSs. The clearance between them shall be sufficient for the safe movement of crew on deck with sufficient space for safely conducting routine mooring operations.

Details are to be discussed in the kick-off meeting.

4.28.6 In addition to the requirements specified in other sections, the aft upper deck area shall be designed and installed as follows:

(a) One (1) dedicated Helicopter Winching Area shall be clearly marked on the deck, and shall be situated at the aft section of upper deck to meet the needs of operational and emergency situations including evacuation of casualties;

(b) The winching area arrangement shall make reference to and should meet the requirements of the section "Winching Area on Vessels" of Chapter 10, CAP437 by UK Civil Aviation Authority in the version as at the Contract Date unless it specifies that version as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein. Details shall be discussed in the kick-off meeting;

(c) The Helicopter Winching Area shall be located over an area to which the helicopter can safely hover whilst hoisting to or from the Vessel. Its location shall allow the pilot an unimpeded view of the whole of the clear zone whilst facilitating an unobstructed view of the Vessel;

(d) The winching area shall be located so as to minimise aerodynamic and wave motion effects;

(e) The area shall preferably be clear of accommodation spaces and provide adequate deck area adjacent to the manoeuvring zone to allow for safe access to the winching area from different directions;

(f) In selecting a winching area, the desirability for keeping the hoisting height to a minimum should also be borne in mind;

(g) The winching area shall provide a manoeuvring zone, in which a clear zone shall be centred. This clear zone shall be at least 5 m in diameter and shall be a solid surface capable of accommodating personnel and/or stores during hoisting operations. No obstruction shall be within this centre clear zone. It is accepted that a portion of the manoeuvring zone, outside the clear area, may be located beyond the ship's side;

(h) Outside the centre clear zone, the winching area shall also provide the manoeuvring zone with a minimum diameter of 1.5 and 2.0 times the overall dimension of the largest helicopter permitted to use the area for the inner and outer portions of the manoeuvring zone respectively. No obstructions shall be higher than 3 m and 6m for the inner and outer portions of the manoeuvring zone, respectively. It is accepted that a portion of the manoeuvring zone, outside the clear area, may be located beyond the ship's side but should nonetheless comply with the following obstruction requirements;

(i) According to the information from Hong Kong Government Flying Services, the largest helicopter used in the fleet is Airbus Helicopter H175B at the moment. The corresponding details shall be used in designing the winching area;

(j) Winching area markings shall be located so that their centres coincide with the centre of the clear zone. The 5 m minimum diameter clear zone shall be painted in a conspicuous colour, preferably yellow, using non-slip paint;

(k) A winching area outer manoeuvring zone marking shall consist of a broken circle with a minimum line width of 30 cm and a mark: space ratio of approximately 4:1. The marking shall be painted in a conspicuous colour, preferably yellow. The extent of the inner manoeuvring zone shall be indicated by painting a thin white line, typically 10 cm thickness;

(l) Within the manoeuvring zone, in a location adjacent to the clear area, 'WINCH ONLY' should be easily visible to the pilot, painted in not less than 2 m characters in a conspicuous colour;

(m) Where hoisting operations to Vessels are required at night, winching area floodlighting with emergency back-up power shall be provided to illuminate the clear zone and manoeuvring zone areas. Floodlights shall be arranged and adequately shielded so as to avoid glare to pilots operating in the hover;

(n) The spectral distribution of winching area floodlights shall be such that the surface and obstacle markings can be clearly identified. The floodlighting arrangement should ensure that shadows are kept to a minimum;

(o) To reduce the risk of a hoist hook or cable becoming fouled, all guard rails, awnings, stanchions, antennae and other obstructions within the vicinity of the manoeuvring zone shall, as far as possible, be either removed, lowered or securely stowed. All dominant obstacles within, or adjacent to, the manoeuvring zone shall be conspicuously marked;

(p) Suitable arrangements such as fold down nets shall be made to minimise the risk of personnel sliding off the platform in accordance with the RO Requirements;

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

(r) Stairway with handrails down to main deck and ladder to compass deck shall be provided;

(s) Fire-fighting equipment, suitable for use on flammable liquid fires shall be provided in close proximity to the area to the satisfaction of GNC; and

(t) An electrical hydraulic stretcher lift ("Stretcher Lift") shall be provided to transfer casualties on stretchers between the main deck and the aft upper deck for helicopter winching. The Stretcher Lift shall be sufficient to accommodate a stretcher and shall be

supplied with anti-slip flooring and safety handrails. The platform shall be operated by hydraulic means with a local control panel. Full details are to be discussed in the kick-off meeting.

4.28.7 In addition to other requirements specified in other sections, the compass deck area shall be designed and installed as follows:

(a) Compass deck area shall be fitted with a hydraulic powered collapsible mast specified in Paragraph 4.29 of this Part VII, IMO required navigational lights, shapes, sound signals, radar scanner and other electronic and navigational equipment, including the lightning arrestor, ensign hoist, signal hoists, antennas and UHF mobile transceiver etc. as required by the operation of the Vessel;

(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) Safe access for the maintenance and servicing to equipment and its fittings shall be provided;

(d) All hardware for them, such as screws, hooks, hasps, hinges, handles, sliding bolts etc. shall be made of stainless steel and be with proper galvanic corrosion preventive measures at their contact points with the hull/superstructures; and

(e) Vessel identification shall be marked on compass deck as large as possible.

4.29 Mast and Ensign Staff

4.29.1 The mast shall be fitted on the compass deck with navigational lights, police blue lights, diving light, horn signals, radar scanner and other electronic and Navigation Equipment, including the lightning arrestor/dissipater, ensign hoist, two signal hoists, antennas, GPS, VHF, UHF and mobile transceivers. Antennas, GPS, VHF, UHF, mobile transceivers and radar scanner shall alternatively installed on the Compass Deck (as indicated on the Conceptual General Arrangement Plan). Details shall be discussed in the kick-off meeting.

4.29.2 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, as well as, flags provided by HKPF;

(b) The mast shall be constructed in such a way that no vibration is experienced in any operating conditions. The mast design shall be of appropriate size/strength to suit its intended purpose; and

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

4.29.3 Two ensign staff for flags shall be supplied with the length and size to be confirmed with GNC and HKPF. One ensign staff should be placed at the mast and the other one to be placed at the top of the aft main deck. All hardware for the ensign staff, such as screws, hooks, hasps, hinges, handles, sliding bolts etc. shall be made of stainless steel.

4.29.4 The mast and antennas shall be designed and installed to be foldable by powered mechanism and shall be controlled directly from the Wheelhouse and locally, if required, to comply with the air draft, docking and helicopter winching requirements stipulated in Paragraph 2.4 and 4.28.6, respectively, of this Part VII.

4.30 Anchoring and Mooring Equipment

4.30.1 In addition to the requirements specified in other sections, the anchoring equipment shall meet the requirement as follows:

(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 the Vessel and acceptable to GNC shall be provided with its associated swivel, shackles, stowage cable or cable and warp, as well as, means of recovery;

(c) The Vessel shall be provided with an 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 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; and

(i) Quick release arrangements shall be provided to release the anchor in emergencies.

4.30.2 In addition to the requirements specified in other sections, the windlass for anchoring shall meet the requirement as follows:

(a) An electric/hydraulic 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 acceptable to the RO and shall meet the IMO requirements. The unit shall be fitted with an emergency manual operating mechanism;

(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; and

(e) A canvas/tarpaulin protection cover for the windlass shall be provided.

4.30.3 The Vessel shall be protected from the possibility of being damaged by the anchor and cable during operation (including in adverse weather and rough sea conditions).

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

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

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

4.30.7 A double cross bollard shall be mounted on the aft main deck at the Vessel's centreline for towing a vessel of similar size and displacement at a speed up to five (5) knots. The double cross bollard is to be sized in accordance with RO Requirements.

4.30.8 Typhoon mooring

(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 of the 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, and shall incorporate snap back arrester technology;

(d) The typhoon mooring lines are to be made fast onto port and starboard side mooring double bollards in a figure of eight. At the buoy end, the termination of the fibre mooring rope shall be fitted with a suitable shackle, or other suitable quick connecting and releasing devices, in order to connect 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;

(e) 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; and

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

4.30.9 The Vessel shall be capable to moor two RHIBs (one (1) on the port side and one (1) on the starboard side). For reference, each RHIB to be moored shall have an LOA of 10.7m – 14.0m. Mooring facilities for the RHIBs shall be arranged around the low false freeboard amidships area, the rescue zone, as shown in Annex 10 for reference. However, the facilities shall not be an obstruction for boarding the vessel or perform rescue operation.

4.31 Fenders

4.31.1 Bow pushing Head Fenders

(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°; and

(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.

4.31.2 Side and Stern Fenders

(a) Fixed hollow D shape rubber fenders of a suitable size acceptable to GNC shall be fitted continuously along the ship sides and stern at the main deck level. The arrangement of the fenders shall also provide protection between the waterline and main deck;

(b) The hull structures shall be suitably strengthened for the proposed fendering arrangement;

(c) The size and number of rubber tyre fenders specified by the HKPF shall be provided on each side of the Vessel at the main deck level, with stainless steel securing devices. The arrangement shall also be submitted to GNC for approval prior to installation;

(d) Considerations to protect the side fenders against shearing should be given, for the situation when a vessel of similar size is directly moored at side of the Vessel, due to the rolling of the vessels and ship-to-ship contacts; and

(e) Considerations should be given to protect the Vessel, adequately, when the RHIBs stated in Paragraph 4.30.9 of this Part VII are moored alongside the Vessel.

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

4.32 Marine Growth Protection System

4.32.1 The Vessel shall be fitted with a Marine Growth Protection System. The system is to produce copper ions in the water system to protect the pipeline/machinery systems from marine growth.

4.32.2 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.

4.32.3 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 the calculation is to be submitted for approval by GNC prior to installation.

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

4.33 Lightning Protection

4.33.1 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.

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

4.33.3 The strength of lightning rod and the supporting structures shall be properly designed. The possible dynamic inertia loads due to the motion of the Vessel in design waves as well as the gravity shall be considered in the design.

Chapter 5 Fire Safety Equipment

5.1 General Provisions

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

5.1.2 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 Rooms, Bow Thruster Room, Galley 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 FTP Code 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, deck head 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 a non-combustible or fire-restricting type material. Vapour barriers and adhesives used in conjunction with insulation, as well as insulation of pipe fittings for cold service systems when accepted by RO, need not to be non-combustible or fire restricting. However, 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, stairway enclosures, 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 with escape path illumination being provided.

5.1.13 Hose reels with attached fire hoses should be installed in both Engine Rooms for ready-to-use condition with sufficient length to cover the length of the whole ship.

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 of sufficient volume and distribution, so 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 Console in the Engine Room Control Office.

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 GNC and the HKPF.

5.3 Fixed Fire-Extinguishing System for Machinery Spaces

5.3.1 Fixed Fire extinguishing systems in the Engine Rooms and other applicable spaces including but not limited to Bow Thruster Rooms, Battery Space(s), etc. shall be a fixed FM200 fire-fighting system in complying with the applicable 2000 HSC Code and RO requirements for Engine Rooms / machinery spaces 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 audible and visible in the Wheelhouse, Engine Room Control Office and spaces to be protected e.g. Engine Rooms, 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 Rooms, 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 Rooms, via quick-closing devices; and

(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 the external weather environment, 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 main 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-spray fire-fighting system) shall be installed as a supplementary system in the Engine Rooms 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 Rooms, the Engine Room Control Office and other applicable spaces as required. The water-mist system diagram is to be submitted to the RO for agreement and subsequently GNC and the HKPF for acceptance prior to installation onboard the Vessel.

5.3.7 The water-mist system shall be connected to the fresh water tank. A low level alarm shall be fitted at the fresh water tank and shall 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 the 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 Fire Safety System Code (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 fire extinguisher of the relevant type for that particular space shall be positioned outside each entrance, including the Engine Rooms, Pump Room, Bow Thruster Room 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 shall 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 At least two fire pumps shall be provided. The arrangement of the fire pumps shall be such that in the event of a fire in any 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 Isolating valves, to separate the section of the fire main within each 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 each 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.

5.5.4 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.

5.5.5 Two jets shall be capable of being produced simultaneously to reach any position of the Vessel. The jet produced shall also reach the highest point of the vessel.

5.5.6 Hydrants shall be so arranged in accordance with the RO Requirements to the satisfaction of GNC.

5.5.7 A separate deck washing pipeline shall be provided from a fire main line at the discretion of GNC and the HKPF.

5.6 Fire Control and Safety Plan

5.6.1 The Fire Control and Safety Plan shall be framed and permanently displayed for the guidance of the ship's crew at the Wheelhouse and at appropriate locations on the main deck, using graphical symbols in accordance with IMO Resolution A.654(16) as amended.

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.

5.6.4 Details to be finalised in the Kick Off Meeting.

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 at the top of the deckhouse to alert persons ashore for the situation.

5.7.2 The additional protection shall 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's 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 the 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 any one RO listed in Annex 9 of this Part VII.

6.1.4 A Lifesaving Arrangement Plan approved by the RO, GNC and the HKPF shall be framed and 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 19, for everyday use, shall be provided by the HKPF;

(b) One hundred (100) common lifejackets (Developed Common Lifejacket for both adults and children MD Notice No.69 of 2019 refers) 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 Special Equipment Storeroom referred to in Paragraph 4.18 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 the Vessel Name; and

(e) One hundred (100) Thermal Protection Aids are to be provided by the Contractor, as stipulated in Paragraph 4.18.2 of this Part VII.

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 adverse sea and weather conditions.

(c) Subject to RO approval, four (4) 30-person liferafts, positioned in a cradle, two (2) on the port side and two (2) on the starboard side, 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 be 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 4.28.4 (c)(4) of this Part VII. Details shall be discussed at the kick-off meeting.

6.1.9 Ten (10) sets of safety harnesses 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 Ten (10) 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 are 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 the 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 within the Hong Kong waters and all waters to a limit of approximately 50 nautical miles (nm) outside the boundary of the Hong Kong waters. 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 in Hong Kong. Good technical support and maintenance services shall also be available locally in Hong Kong on top of a competent local agent in Hong Kong to be appointed for performing the Warranty Services as detailed in Paragraph 1.1 of Annex 1 to this Part VII.

7.1.2 The Vessel shall be fitted with all machinery described in this Chapter 7 of this Part VII. The Spare Parts to be provided shall be of the same model as those equipment and machinery supplied for the Vessel and shall equally comply with all specifications set out in Chapter 7 of this Part VII.

7.1.3 Two means of access separated by a reasonable distance shall be provided to each Engine Room. One of them shall be directly from the main deck. The design and the layout of the Engine Rooms shall be approved by the RO and agreed by GNC. The machinery with the associated piping systems and fittings relating to the main diesel engines and diesel generators shall be of a design and construction adequate for the intended purpose. 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 consider the materials used in Vessel's construction, the purpose of the equipment, the working conditions to which the equipment will be subjected to regarding the onboard environmental conditions. Cushioning / impact protections shall be provided on the overhead cable trunks for preventing crew head injuries.

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, the deck house or shell plates.

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 the main diesel engines, diesel 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 prevent leaked fluids from spilling into the Vessel's bilges.

7.1.8 Lifting brackets for moving heavy equipment shall be provided at appropriate locations in the Engine Room, the Engine Room entrance and other locations as deemed necessary. The lifting capacity with its Safety Working Load shall be marked after a load test was conducted 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. An unmanned duty alarm system shall be provided. The monitoring and controls, including automated 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.

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

7.2 Main Propulsion Engines

7.2.1 The Vessel shall be equipped with two electrically started, fresh water cooled marine diesel engines of adequate power for the Contract Speed. The rating of the engines for the Vessel shall have an annual operation of 5000 hours. The diesel engines shall meet IMO Tier II emission requirements. **[E]**

7.2.2 A type approval certificate issued by any one RO listed in Annex 9 but not necessarily the RO specified in Schedule 9 of Part V or other entities acceptable to GNC showing that the proposed model of marine main diesel engines complies with IMO Tier II emission requirements shall be provided.

7.2.3 General features of the main engine:

(a) The main engines (M/E) shall be marine diesel engines of proprietary make, electrically started by 24 Volt-DC, and shall have integral fresh water/sea water heat exchangers, fresh water pump, sea water pump, LO pump, fuel lift pump (if required), FO filters, LO filters, engine-mounted instrumentation panel with essential gauges and protective devices, and any other ancillary equipment and fittings as recommended by the engine manufacturer for the efficient operation of the engines;

(b) Flexible mounting shall be used to contain the noise levels in accommodation spaces and not to exceed 75 dB(A);

(c) An engine-mounted charging alternator, with a capacity of not less than 60 amperes and with built-in voltage regulator, shall be provided on each M/E for charging their respective starting batteries;

(d) The design of the main diesel engines and its control systems shall have been approved by one of the RO listed in Annex 9 to this Part VII;

(e) The engine aft end shall be connected to the water-jet units via a gearbox through a flexible coupling;

(f) To facilitate LO renewal, a suitable hand pump connected to the LO sump shall be provided for each diesel engine so that LO can be drained from the lowest point of the engine LO sump;

(g) The main diesel engines shall drive the waterjet impellers through reduction gears;

(h) The main diesel engines' exhausts and silencers shall be insulated and protected according to the requirements of the RO as the hot surface presented as a risk to the onboard personnel and minimise the heat transfer into the machinery space. All components of the exhaust system shall be mounted or suspended by hangers which shall not transmit heat, noise or vibration to the Vessel's structure. The exhaust outlets shall be positioned at the inboard side of the hull on the side shell with a minimum of 300 mm vertical distance above the loaded waterline and shall meet the requirements of the RO. Expansion bellows shall be provided;

(i) The minimum time for the first major overhaul of the main propulsion engines since new shall not be less than 10,000 hours and the same minimum time shall apply between every two major overhauls; and

(j) The main diesel engines shall be capable of operation on diesel complying with specifications set out in Cap. 311L, Schedule 1 – Air Pollution Control (Motor Vehicle Fuel) Regulation of the Laws of HK.

7.2.4 Engine Performance

(a) The estimated engine propulsive power from all engines required for attaining the Contract Speed of the Vessel under the Official Speed Trial conditions as stated in Paragraph 1 of Annex 5 to Part VII, together with a descriptive account of the engineering principles and methodology employed for such propulsive power estimate and evaluation shall be provided by tenderer. The Tenderer shall also submit the estimated speed-power requirements and characteristic curves of the propulsion system for the Vessel to support its claim for the achievable at least 25 knots Contract Speed at 100% MCR; **[E]**

(b) The manufacturer's full power shop trial certificate for a continuous running test at full load for four hours for each main diesel engine must be submitted to GNC before the official sea trial as part of the Technical Acceptance;

(c) The governor control of the engine must be capable of proper control, when the engine is suddenly unloaded from a fully loaded condition as the seawater suction of waterjet units suddenly emerge out of water; and

(d) The main diesel engines shall always be in a standby mode and shall be pre-lubricated.

7.3 Main Diesel Engine Control

7.3.1 The controls and instrumentation of the main diesel engines shall be designed for operation with an engineer either at the Wheelhouse Engine Remote Control Console or at 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 4.2.12 and Paragraph 4.17 of this Part VII.

7.3.2 The design and installation shall follow the RO and IMO requirements and, where applicable, also comply to the IMO 2000 HSC code requirements.

(a) For the avoidance of doubt the following requirements shall also be met:

(1) Instrumentation and control systems for the main and auxiliary machinery shall be designed for unmanned machinery space operation;

(2) Both the Wheelhouse Engine Remote Control Console in wheelhouse and the Engine Control Console at the Engine Room Control Office on the main deck shall be designed for one-man operation. Each one of these control console and control box shall centralise all the instrumentation and control devices for the remote operation of the main engines and major machinery on board. There shall be one Engine Control Console for both port and starboard engine compartments. This Engine Control Console shall be interlinked;

(3) 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;

(4) The LOP for each engine shall be situated close to each engine for convenient engine-side control;

(5) The monitoring probes and sensors fitted to the main and auxiliary machinery shall be of a type-approved by any one RO listed in Annex 9 of this Part VII. These units shall be the sources of signals for the Control Consoles, LOP gauges and communication panels. If a LCD display is used for the system, it shall be easily seen by the operator; and

(6) All rescue and berthing controls shall be controlled from the wheelhouse.

(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:

(1) 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;

(2) A RPM control device for each of the main diesel engines;

(3) Clutch control and on/off indication devices for each of the clutches used in the propulsion system;

(4) Engine tachometers with running hour meter;

(5) Sea water cooling pressure;

(6) Coolant water temperature and pressure;

(7) Engine lubricating oil temperature and pressure gauges;

(8) High cooling water temperature alarm;

(9) Engine low lubricating oil pressure alarm and trip;

(10) Engine exhaust gas pyrometer;

(11) Overspeed alarm and trip;

(12) Real-time fuel flow rate; and

(13) Any other instrumentation recommended by the engine maker.

7.3.3 Standard manufacturer's local control panels shall be fitted in the Engine Rooms.

7.4 Diesel Engine Electric Generator Sets (Diesel Generators)

7.4.1 Two (2) or more electrically started and fresh water-cooled diesel generators of brushless self-excitation and ventilated type compatible with the design of the power distribution system as stated in Paragraph 8.2 Electricity Distribution Network of this Part VII shall be installed. The rating of the engines of the diesel generators shall be for Unrestricted Continuous Operation and the alternator shall have 10% overload capability for not less than 15 minutes of time. Synchronizing operation is required. **[E]**

7.4.2 Type approval certificates issued by any one RO listed in Annex 9 of this Part VII or other entities acceptable to GNC, showing the proposed model for the diesel generators' compliance with IMO Tier II emission requirements shall be provided.

7.4.3 The diesel generators installed on the Vessel shall be capable of operation on 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:

Supplying all full operational electrical loads for the whole Vessel including air conditioning system running at full capacity, but excluding the EFFS and Bow Thrusters, as specified in Chapter 10 and Paragraph 7.9 of this Part VII, respectively, plus not less than a 15% reserve margin

7.4.5 Both two diesel generators together, at their continuous service rating, shall have sufficient capacity for:

(a) Supplying the full operational electrical load of the whole Vessel (including air-conditioning system, Bow Thrusters, and EFFS running at their full capacity) of the Vessel plus 15% reserve power; and

(b) Starting of the largest motor without causing any motor to stall or any other device to fail due to excessive voltage drop of the system two diesel generators are working in parallel.

7.4.6 Electrical load analysis and calculations shall be provided and acceptable to GNC. The Tenderer shall provide this information in the Table of Schedule 7 as part of the tender evaluation during tendering stage.

7.4.7 The exhausts from diesel generators shall be equipped with a water-lock/lift-silencer to reduce the noise levels. This shall be configured with a hose running from the diesel generator (wet outlet) and a wet hose outlet:

(a) All components of the exhaust system shall be mounted or suspended by the hangers which shall not transmit heat, noise or vibration to the Vessel's structure. The exhaust outlets shall be at the inboard side of the hull on the side shell with a minimum of 300 mm vertical distance above the loaded waterline and shall meet the requirements of the RO. Expansion bellows shall be provided;

(b) The exhaust systems shall be designed appropriately to comply with the diesel generator and exhaust manufacturers' requirements. The diesel generator exhaust system shall be arranged to provide reasonable access to Engine Room machinery;

(c) RO approved expansion bellows shall be used; and

(d) Flexible sound reduction lagging for exhaust pipe works shall be based on the manufacturer's/appropriate industrial standard and meet the lagging/noise control requirements.

7.4.8 The design and installation of diesel generators, switchboard and associated wiring shall be in accordance with the RO Requirements as well as the following:

(a) Each diesel generator shall be provided with a Type Approval Certificate from any one RO listed in Annex 9 of this Part VII confirming compliance with Paragraph 7.4.2 of this Part VII;

(b) Each diesel generator shall be resiliently mounted; and

(c) The arrangement of electrical and piping systems shall allow quick dismantling and replacement of the unit.

7.5 Diesel Generator Control

7.5.1 The controls and instrumentation of the diesel 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 for starting and stopping the diesel generator shall also be provided in the Engine Room Control Office. The instrumentation in the consoles shall be comprehensively displayed on the Multi-Function Display and shall include but not be limited to the following information:

(a) RPM;

(b) Running hours;

(c) Cooling water temperature;

(d) Cooling water flow/pressure;

(e) Exhaust gas temperature;

(f) Lubricating oil pressure;

(g) Battery charger ammeter;

(h) Fault indicating and alarms;

(i) Protective functions such as over speed, low lubricating oil pressure and other functions as required by the engine manufacturer, RO and GNC;

(j) Any other parameters and protective functions recommended by the engine manufacturers; and

(k) 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 control for remote operation and monitoring of the main diesel engines, diesel generators and other auxiliaries to facilitate unattended Engine Room operations.

7.6.2 One fire detector panel, one Engine Room FM200 panel and one 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 any one RO listed in Annex 9 of this Part VII. The Contractor shall provide copies of the type approval certificates to GNC before the Delivery Acceptance.

7.6.4 All indication lights and the illumination of instrumentation gauges fitted on the consoles in the Wheelhouse shall be fitted with dimmers for both day and night time operation.

7.6.5 Emergency stopping functions for 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 Each of the reduction gearboxes shall be properly mounted to the ship structure and shall be equipped with clutches, alarm sensors, and switches.

(a) Each reduction gearbox shall include the following:

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

(2) Built-in gear type oil pump;

(3) Low oil level alarm;

(4) High oil temperature alarm;

(5) Higher oil temperature cut out; and

(6) Heat exchanger.

(b) Gearbox oil heat exchangers shall be mounted on the reduction gearbox and piped to the engine cooling circuits as specified by the manufacturer;

(c) Reduction gears shall be sized to provide both low and high-speed performance; and

(d) Repeated cycling of the clutches in and out of gear is not permitted in any case to obtain low speed operation (i.e. 5 knots speed in loitering). If required, the Vessel shall be fitted with a gearbox configured with a trolling clutch to permit low-speed operation.

7.7.2 The gearboxes shall be provided with alarms for low oil level and high oil temperature. Alarms shall be repeated both locally and at each remote control station as required.

7.7.3 Sufficient spaces at the engine side for maintenance and repair shall be required.

7.7.4 The gearboxes shall be supplied with a Type Approval Certificate from any one RO listed in Annex 9 of this Part VII.

7.8 Waterjet Propulsion System and Control System

7.8.1 The design and installation shall follow the RO and the IMO requirements and, where applicable, shall also comply with the IMO 2000 HSC code requirements.

7.8.2 For the avoidance of doubt, the following requirements shall also be met:

(a) The waterjet propulsion system shall be installed in accordance with the engine maker's instructions and RO requirements.

(b) The Vessel shall also be provided with the following items:

(1) The design of the whole waterjet propulsion system and the control system shall be of a patent design approved by any one of the ROs set out in Annex 9 to this Part VII;

(2) The RO's design and construction inspection certificates for the waterjet propulsion units shall be submitted to GNC before the Delivery Acceptance;

(3) The waterjet propulsion system shall be installed in accordance with manufacturer's instructions as well as the RO's requirements; and

(4) Torsional vibration calculations approved by the RO for the shafting system shall be provided to GNC before the Delivery Acceptance.

7.8.3 The Waterjet Propulsion Units

(a) General

(1) One (1) waterjet unit shall be driven by one (1) main diesel engine through one (1) reduction gear and flexible coupling. There shall be a total of two (2) waterjet units.

(2) The waterjet propulsion system controlling and monitoring both waterjet units shall include the following alarms with individual warning indications at the Wheelhouse Engine Remote Control Console and Engine Control Console in the Engine Room Control Office:

(i) Control System power failure;

(ii) Alarm system power failure;

(iii) Lubricating oil tank low level (if provided);

(iv) Lubricating oil pressure Low (if it is a forced lubricating oil system);

(v) Low hydraulic oil pressure;

(vi) Safety system power failure; and

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

(3) Grates shall be provided across the area at the water intake to discourage sticks and other debris from entering the water intake.

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

Controls and instruments for the main diesel engines and waterjet units shall be designed for a one-man operation of both units in the Wheelhouse Engine Remote Control Console and Engine Control Console in the Engine Room Control Office.

(c) Back-up Control System

(1) Besides the ordinary steering control system being duplicated (the port and starboard systems are entirely separated, all the way from the control lever in the wheelhouse down to the water-jet units), there shall also be a reserve manoeuvring control system, as a back-up completely separated from the ordinary steering system, extending all the way from the Wheelhouse Engine Control Console down to the water-jet units;

(2) A similar back-up system shall also be provided at the Engine Control Console in the Engine Room Control Office and both local control stations;

(3) The back-up system shall be capable of being used immediately if a fault occurs in the main system;

(4) The switch-over shall not be automatic but controlled by the coxswain with the selector button situated in the vicinity of the back-up levers;

(5) All manoeuvring actions performed by the main system shall be capable of being performed by the back-up systems; and

(6) Training for the use of this back-up control system, including steering and reversing, shall be provided by the Contractor to GNC and HKPF designated officers.

7.8.4 Emergency Steering

(a) The Vessel shall be designed so to remain safely controllable in event of any loss of control functions;

(b) The Vessel shall be capable of being manoeuvred under reduced speed by directly operating the emergency steering system located in the port and starboard side Engines Rooms or Jet Rooms/Aft Peak compartments;

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

(d) The Instrumentation and Alarm Panel for the waterjet system shall contain all the essential instrumentation and alarm devices for the effective monitoring and control of the waterjet units;

(e) Communication between emergency steering positions and other stations shall be provided; and

(f) Steering angle and reverse angle indication shall be provided in the Jet Room.

7.9 Bow Thruster

7.9.1 The bow thrusters of an AC electric variable speed type are to be fitted for docking and position keeping. Each Bow Thruster Room shall be equipped with one bow thruster making a total of two (2) bow thrusters. Centralised and individual back up controls are to be provided for the bow thrusters.

7.9.2 The bow thrusters are 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 60HP.

7.9.3 The proposed system, components, arrangement and design shall be submitted for RO and GNC approval.

7.9.4 The bow thruster shall keep the Vessel in a stationary position when the fire monitor of the specified external fire-fighting system is working at 45 degrees to horizon at the same side with 15% reserve power remaining available to counteract the wind and current forces.

7.9.5 The bow thruster shall be positioned as far forward as is 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.

7.9.6 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.

7.9.7 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) The concerned alarm and status of the bow thruster should also be provided on the wheelhouse engineer control console.

7.9.8 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.) and the external fire-fighting (Fi-Fi) pump motor with similar configuration as the bow thruster motor, if applicable. 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, as follows:-

(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; and

(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, GNC and the HKPF.

7.9.9 An aluminium alloy 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's Requirements.

7.9.10 A flexible coupling is to be fitted between the bow thruster motor and the drive shaft.

7.10 Position Keeping

7.10.1 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 waterjets and bow thrusters and adjusting the jet stream angles of the waterjets. A control panel shall be fitted at the Wheelhouse Control Station within the reach of coxswain to enable the aforesaid control and adjustment. **[E]**

7.10.2 In addition, the position keeping system shall also provide an additional function, namely weathervaning position keeping. When this position keeping function is selected, the system shall automatically hold the Vessel in a predetermined position but weathervane without holding a specific vessel heading in order to weathervane to a heading with the least combined environmental load from wind, wave and current. **[E]**

7.10.3 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.

7.10.4 It shall be possible to manually control the system to drive the Vessel 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.

7.10.5 The position keeping system shall be designed and installed to receive input data from the DGPS, Gyro Compass and anemometer for wind speed/direction.

7.10.6 A position keeping test is to be carried and meet the requirements as detailed in Paragraph 1.8 of this Part VII.

7.10.7 Any one of the RO listed in Annex 9 (Dynamic Positioning) DP notation for the Vessel and the position keeping system is not required.

7.10.8 The Contractor shall provide a position keeping capability report from the position keeping system manufacturer/provider within 2 months after contract date.

7.11 Engine Room and Other Machinery Spaces Ventilation

7.11.1 The Machinery Spaces Ventilation system shall be designed to the satisfaction of RO and GNC.

7.11.2 This system shall provide sufficient air to the engines and shall provide adequate protection against damage due to ingress of foreign matter.

7.11.3 The air supply inlets shall be connected to louvers designed to effectively prevent ingress of water during extreme sea states and weather conditions. The fire dampers of the vents shall be capable of being remotely and locally controlled. The coaming of the vents shall be of adequate height.

7.11.4 The Engine Room shall be adequately ventilated even when machinery are operating at full power in all sea and weather conditions, including heavy sea and adverse weather during a typhoon. An adequate supply of air shall 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 spots or "dead air" areas are avoided; and

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

7.11.5 Waterjet unit compartments/Jet Rooms 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.

7.11.6 As a guidance, the ventilation air to the compartment as stated should limit the temperature rise in a machinery space to 10℃ above the ambient temperature.

7.11.7 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 the manufacturer's prescribed requirements to the satisfaction of GNC.

7.11.8 Automatic shut-off devices shall be provided according to the RO Requirements when the FM200 system is to be activated.

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

7.12 Air-Conditioning System

7.12.1 The air conditioning system shall be a central sea water cooled chiller type. Two sea-water cooling chilled water air-conditioning system shall be provided. Each system shall incorporate a chiller unit and a chilled water circulating pump to distribute chilled water to individual temperature controlled fan coil unit. 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 areas 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 system shall be sufficient for nineteen (19) 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.

7.12.2 The refrigerant shall be CFC and HCFC free.

7.12.3 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.

7.12.4 Mold and bacteria resistant replacement filters shall be fitted at air inlets.

7.12.5 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 being given to the air moisture levels in the sea environment. Condensation drains are to be fitted and routed directly overboard. The location of all such equipment shall be accepted by GNC and the HKPF prior to installation onboard.

7.12.6 The cooling air shall be evenly distributed. An individual control unit for temperature and airflow shall be provided in each compartment.

7.12.7 Fresh air shall be pre-treated before being fed into the system in order 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 nineteen (19) 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.

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

7.12.9 All air-intakes shall be located away from the machinery exhausts and exhaust fans from the First Aid Room to maintain the on-board air quality.

7.12.10 Fresh air shall be induced into the fresh air pre-treatment unit and shall be pre-treated. The pre-treated fresh air shall be in the same condition as the cabins (i.e. 21℃ for 60% relative humidity) and shall be cooled down by the chilled water supplied from the system.

7.13 Piping System

7.13.1 Piping connections and joints shall be constructed and designed in accordance with the RO's requirements. Pipe bends should be kept to a minimum in number and shall have sufficiently large radii to facilitate a smooth flow.

7.13.2 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.

7.13.3 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 that no undue load is carried by the pipe connections, pumps or fittings to which they are attached. Proper insulation shall be applied to avoid galvanic corrosion.

7.13.4 Suitable provision for expansion shall be made, where necessary.

7.13.5 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.

7.13.6 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.

7.13.7 Watertight bulkheads, decks or structural members having pipeline penetrations shall be designed and installed in accordance with the RO's Requirements. Watertight and structural integrity must be maintained and approved by the RO and to the satisfaction of GNC.

7.13.8 The material of 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.

7.13.9 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.

7.14 Fuel Oil System and Fuel Oil Tank

7.14.1 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 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, which contains a fatty acid methyl ester content up to 5%.

7.14.2 The fuel oil system shall be designed that condensation of water and foreign objects are prevented from entering the system as far as possible. Moreover, prevention of "Diesel Bug" shall also be taken into account in the design of fuel oil system and fuel tanks.

7.14.3 The fuel oil of the main diesel engines and diesel generators shall be supplied from one or more fuel oil tanks through daily service tanks. The Contractor is free to design the number and location(s) of the fuel oil tank(s) to fulfil the specific requirements. The arrangement is to be submitted to the RO and GNC for approval prior to construction and installation onboard the Vessel.

7.14.4 Quick closing valves (controlled from the main deck) shall be fitted to the fuel oil tank outlets along with drip trays.

7.14.5 The system design and filtration systems shall be approved by the main diesel engine and diesel generator manufacturers.

7.14.6 The tanks shall be tested according to the RO requirements and witnessed by the RO and GNC.

7.14.7 An electric motor-driven pump shall be provided for transferring fuel between tanks.

7.14.8 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.

7.14.9 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 under normal operating conditions, e.g. grease, lubricating oil, bilge solvents and sea water.

7.14.10 The filling pipe shall be of a metallic construction and be a permanent fixture from the main deck and secured to the tank. A coloured 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.

7.14.11 Duplex filter sets shall be fitted in the fuel supply lines to each of the main engines and diesel generators. The arrangements shall be such that any filter can be cleaned without interrupting the supply of filtered fuel oil to the engines.

7.14.12 Water separators with drains shall be fitted to each fuel supply line to the engines.

7.14.13 The material and design of the fuel piping system shall meet the RO requirements.

7.14.14 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. However, if required, fuel oil shall 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;

(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:

(1) A tank contents 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;

(2) A high-level alarm is also to be fitted;

(3) The following shall be provided for each tank;

(i) Rigid fuel suction pipe intake with appropriate clearance to the tank bottom in accordance with the RO's requirements;

(ii) An inspection hatch;

(iii) Air vent with flame trap on deck;

(iv) Remote quick closing device operated at the fixed fire-fighting control station (from the main deck);

(v) A drain pipe with self-closing valve/cock;

(vi) Drip traps underneath the drain valve/cock, fuel filter and water separator;

(vii) Sounding pipes with stainless steel doubler welded on the bottom of the tank, self-closing device and a chained cap; and

(viii) Tank drain plug at a location as low as practically possible within the fuel oil tank(s).

(g) Fuel oil sloshing in the tanks shall be minimised and trapped vapour or airlocks shall be avoided;

(h) 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

(i) 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.

7.15 Fresh Water System

7.15.1 Fresh Water Tank Arrangement:

(a) One independent fresh water tank with a total capacity of not less than 6000 litres shall be arranged in the Vessel to supply fresh water to the main deck, under-deck and upper deck crew spaces; and

(b) The fresh water tank should be installed in the under-deck compartment space as designed by Contractor according to the RO's requirements. [D]

7.15.2 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 with PVC braided/reinforced transparent hoses shall be fitted to locations to

provide a rinse off facility for cleansing purposes and shall be to the satisfaction of GNC and the HKPF.

7.15.3 The fresh water tank shall be flushed clean before installation and delivery of the Vessel. The tank shall be tested by a head of water equal to the maximum to which the tank may be subjected to, 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

7.15.4 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 content 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

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

7.15.6 The tank 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 at sea without damaging the integrity of the tank and the Vessel's structure.

7.15.7 The fresh water pump shall be provided with a starter, pressure switch, pressure gauge, relief valve and suction valves. Accumulator shall be fitted in the system to keep stable the system pressure automatically.

7.15.8 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.

7.16 Seawater Desalination Plant

7.16.1 One (1) sea water desalination plant applying the Reverse Osmosis Principle with very low maintenance needs shall be installed. The plant shall be comprised of duplicate Reverse Osmosis units. Individual Reverse Osmosis units shall be capable of being isolated without affecting the normal operation and performance of the system. The capacity of the plant shall not be less than 6000 litres per day. The produced water quality shall comply with the guideline for drinking water quality recommended by the World Health Organisation (WHO).

7.16.2 Suitable pipelines shall be installed with isolating valve such that water produced by the desalination plant can be transferred to the Fresh Water Tank. Both "Auto/manual" functions shall be provided. Once the auto function is selected, the plant shall be automatically started, operated, monitored and stopped until the corresponding target water level (pre-set) of the Fresh Water Tank has been reached.

7.16.3 After the final stage of ultraviolet sterilizer of the desalination plant, the piping leading to the Fresh Water Tank shall be copper piping.

7.16.4 The desalination plant shall be started up at the local control station or Engine Room. It shall be interfaced and be part of the Monitoring and Control system stated in Paragraph 8.15 of this Part VII.

7.16.5 The desalination plant shall be of proprietary made and shall be commercially available. It shall consist, at least, of the following:

(a) Pre-filters;

(b) Sand filter equipped with differential pressure gauges and back flush facilities;

(c) Oil water separator;

(d) Booster pump;

(e) High pressure pump;

(f) Product flow meter;

(g) Brine flow meter;

(h) Salinity probe;

(i) All unit piping and fittings shall be of high pressure stainless steel;

(j) Sampling points before fresh water tank;

(k) Local control/start up station;

(l) Auto back flushing function/ arrangement for membrane; and

(m) Maker's recommended alarm function.

7.16.6 Post treatment arrangement shall consist of:

(a) Charcoal filter assembly; and

(b) Ultraviolet sterilizer

7.16.7 Selector switch shall be provided at both local and remote station(s) to facilitate selecting parallel (both Reverse Osmosis units in service) operation and single unit operation, if the other Reverse Osmosis unit fails or is undergoing maintenance.

7.16.8 In the event of failure of any one of the units, a red light alarm indication shall be provided until the fault is rectified.

7.16.9 The intake of sea water for this plant shall be as far as practicable from any water discharge from grey and black water system, Engine Room and any areas with possible contamination.

7.16.10 The brine shall be directly discharged overboard and a non-return discharge valve shall be installed.

7.16.11 The sea suction of the plant shall be installed below the water line.

7.17 Bilge System

7.17.1 The Vessel shall be fitted with a bilge system designed and installed in accordance with the RO's Requirements.

7.17.2 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.

7.17.3 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 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. The system shall be powered by 24V from DC Power Source.

7.17.4 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.

7.17.5 Individual bilge pumps shall be provided for each underdeck compartment. Moreover, any bilge water in the Engine Room, Jet Room, Tank Space(s), Chiller Room, Pump Room and Bow Thruster Compartment shall also be capable to be pumped to the bilge water holding tank by a bilge transfer pump.

7.17.6 An oily water separator (OWS) is to be fitted in order to comply with the latest 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's 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 system shall stop the overboard discharge automatically;

(e) Local servicing and maintenance, including provision of spare parts to be available in Hong Kong; and

(f) Type Approved by the RO.

7.17.7 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.

7.17.8 All bilge system pipework shall be made of stainless steel 316L and is to be designed and installed in accordance with the RO's Requirements to the satisfaction of GNC.

7.17.9 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.

7.18 Seawater System

7.18.1 All seawater valves shall be compatible with the aluminium hull material.

7.18.2 Separate sea chests shall be provided for the main diesel engines, diesel generators and air-conditioning system, 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 adverse sea conditions.

7.18.3 Seawater piping shall be constructed of marine grade 316L stainless steel pipe or equivalent in accordance with the RO's 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.

7.18.4 Cathodic protection and marine growth protection system are to be installed as detailed in Paragraph 3.4 & 4.32, respectively, of this Part VII.

7.19 Sewage Treatment Plant

7.19.1 The Sewage Treatment Plant (STP) shall be designed and installed as follows:

(a) The STP is to be a biological plant suitable for a minimum of 19 persons;

(b) The plant is to be compact in design so as not to encroach on available Vessel space;

(c) The plant is to be fitted in either the Tank Space(s), Engine Rooms or Bow Thruster Rooms and shall be easily accessible for maintenance and servicing;

(d) Low power consumption;

(e) The STP shall 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.

7.19.2 Two sanitary/sea water pumps shall be provided and installed in Engine Rooms to supply sea water for sanitary services. One sanitary/sea water pump shall be in normal operation and sufficient to provide the sea water supply whilst the other one shall be in auto-standby mode. Stable pressurized sea water shall be distributed to toilets for flushing.

7.19.3 Black water from toilets shall be designed to discharge into a biological type sewage treatment. Alternative piping shall be arranged for the toilet to be discharged directly overboard through a non-return shipside valve, if needed. Wash basins and galley sink shall be discharged overboard through a non-return shipside valve, as needed.

7.19.4 The sewage treatment shall be fitted with a “Tank Full” indicator installed in a highly visible location in the wheelhouse.

7.19.5 Treated sewage shall be pumped directly overboard via a non-return valve.

7.19.6 Grey water from drains of bathroom floor (including the toilet units and the shower units), wash basins and galley sink shall be discharged overboard. Grey water pump and piping shall be provided and arranged to pump the grey water directly overboard through a non-return shipside valve, as needed.

7.20 Open Deck Drainage System

7.20.1 The Vessel shall be fitted with an open deck drainage system to the RO’s Requirements.

7.20.2 Scupper piping is to be constructed of marine grade stainless steel. Means shall be provided to avoid any possible galvanic corrosion.

7.21 Floor Plates, Handrails and Guards

7.21.1 The floor of the Engine Rooms, Jet Rooms and Bow Thruster Rooms 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. Suitable damping arrangements shall be provided for plates to avoid generation of rattling noise.

7.21.2 For easy maintenance, floor plating shall be easily removable to facilitate access to the bilges, pumps, shaft, pipework and strainers. Removable access plates shall be fitted to provide access to valves.

7.21.3 All boundary bars, handrails, gratings, ladders, platforms, stanchion and vertical supports in the Engine Rooms, Jet Rooms and Bow Thruster Rooms shall be of lightweight construction and

fulfil the requirements of the Code of Practice for HK Local Vessels.

7.21.4 Removable guards for the protection of personnel and machinery shall be provided over exposed moving parts of the machinery, hot pipe work, etc.

7.21.5 Splash plates, casings, fenders, screens, etc. shall be provided for the protection of personnel and machinery.

Chapter 8 Electrical System

8.1 General Requirements

8.1.1 All the electrical equipment and their installations shall 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 to 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 selecting protective systems and devices. The selection shall comply with RO and IEC requirements and be agreed by GNC.

8.1.6 All electrical apparatus shall be so constructed and installed as not to cause injury when handled or touched in the normal manner.

8.1.7 Exposed metal parts of electrical machines or equipment, which are not intended to be live but are liable under fault conditions to become live, shall be earthed.

8.1.8 A 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.

8.1.9 A two-wire insulated distribution system shall be used for the DC system.

8.1.10 All metal sheaths and armour for cables shall be electrically continuous and shall be earthed.

8.1.11 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.

8.1.12 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.

8.1.13 Cables and wiring shall be installed and supported in such a manner to avoid chafing or other damage.

8.1.14 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.

8.1.15 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 indication of abnormally low insulation values shall be provided.

8.1.16 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 by the submission date as stated in Annex 3 to this Part VII (viz., within 2 months from the Contract Date).

8.1.17 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.

8.1.18 All installations shall be provided with manuals in both English and Traditional Chinese for operation and maintenance.

8.1.19 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.

8.1.20 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.

8.1.21 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.).

8.1.22 All equipment installed onboard shall comply with IEC and RO requirements and be subject to final approval from GNC.

8.1.23 If electrical fittings, not made of aluminium, are connected to aluminium, suitable means is to be taken to prevent electrolytic corrosion.

8.1.24 The IP grade of electrical equipment installed in the water mist system protect area should have protection to match or exceed IP44 grade.

8.2 Electricity Distribution Network

8.2.1 The main electrical AC power supply shall be provided by two diesel generators. Synchronising and parallel running operation is required.

8.2.2 The diesel generators shall be sized based on a 15% growth margin above the predicted maximum load condition. The Vessel's electrical load calculation shall include summer and winter, static and transient, loads on AC, DC, shore power, and ship service systems. The Vessel's electrical load calculation shall be approved by any one RO listed in Annex 9 of this Part VII and accepted by GNC.

8.2.3 The diesel generator will maintain an output voltage within ±5% over the entire load range and frequency within ±1.5 Hz.

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

8.2.5 The diesel generators shall be protected against short-circuits and overloads by multipole circuit breakers (overload protector).

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

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

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

8.2.9 Twenty (20) percent of spare wiring penetrations or two spare wiring penetrations, whichever is the greater, shall be provided through each bulkhead except the forward collision bulkhead. Spare penetrations shall be plugged watertight with rubber plugs. The rubber plugs shall be RO approved watertight, fire resistant and gastight in way of watertight bulkhead or deck penetrations

8.2.10 All three/single-phase loads shall be balanced on each feeder. Loads of one type such as heaters or receptacles shall not be concentrated on a single branch or leg.

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

8.3 Switchboard

8.3.1 Two main switchboards shall be provided and installed in separate locations. The two main switchboards shall be so arranged that any fire in vicinity of any one of them shall not render emergency fire pump inoperable.

8.3.2 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.

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

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

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

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

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

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

(a) Sector for three phase supply 380-415 V AC (designed by Contractor); [D]

(b) Sector for single phase supply 220-240 V AC (designed by Contractor); [D]

(c) Sector for 24V DC supply; and

(d) Sector for shore power supply.

The AC system is described as 380/220V AC in this Chapter.

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

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

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

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

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

(a) Diesel Generator Sector with the following:

(1) Circuit breaker of adequate capacity with over-current trip and short circuit trip;

(2) Voltmeter, ammeter, wattmeter and frequency meter;

(3) Indication lights for "Power Available", "Breaker Opened" & "Breaker Closed"; and

(4) All necessary fittings and any other protective devices.

(b) 220V Single Phase Sector with the following:

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

(2) Moulded case circuit breakers with over-current and short circuit trips for the distribution of 220V AC power supply to their components including but not limited to lighting services, fans and motors; and

(3) Any other necessary fittings and protective devices.

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

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

(2) Magnetic automatic relay switch for activating emergency 24V DC supply in event of AC power failure;

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

(4) Ammeter for charging unit;

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

(6) Metres or earth lamps to indicate the state of insulation;

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

(8) Any other necessary fittings and protective devices.

(d) Shore Power Connection Sector:

(1) Moulded case circuit breaker for shore connection box shall be provided on the main switchboard;

(2) The shore connection box shall be capable of receiving 380V three phase 50 Hz system and the cables between the connection box and the main switchboard shall be of sufficient capacity to supply the necessary electrical equipment;

(3) An earth terminal shall be provided for connection of the Vessel's earth to the shore earth;

(4) An instruction shall be provided at the connection box to provide full information about the system and the procedures for carrying out the connection; and

(5) The shore connection sector shall be capable of adjusting the phase sequence automatically.

8.4 DC Power Source

8.4.1 Batteries for Main Engines and Diesel Generator Starting

(a) Independent bank of 24V batteries shall be provided for starting each of the two main engines and the diesel generator(s);

(b) The capacity of the batteries shall be sufficient to provide at least six consecutive starts of each one of the main engines and at least three consecutive starts of each one of the diesel generator from cold, without recharging;

(c) Electrical connections shall be arranged so that the batteries can be selected to start either main engine or diesel generator engine by operating a manual change-over switch in the Engine Room;

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

(e) Batteries are to be of maintenance-free type

(1) 24V batteries shall be charged directly from engine driven alternators and diesel generator. There shall be one battery set allocated to each engine; and

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

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

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

8.4.2 Batteries 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 related control systems) to take 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, the capability to maintain the emergency supply shall be less than for a period of six (6) hours;

(e) 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; and

(f) 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 the ingress of water. The batteries shall be positioned and installed in accordance with the RO requirements to the satisfaction of GNC.

8.4.3 12/24V DC services shall be supplied from the switchboard in the steering console through a 2-wire insulated system to the following items:

(a) Navigation light control panel and navigation lights;

(b) Horn;

(c) Emergency lighting;

(d) Fire detecting system;

(e) Compass light;

(f) Instrument panel in control console;

(g) CCTV;

(h) Public address system;

(i) One hand-held searchlight and one fixed searchlight (for aft);

(j) Siren;

(k) Watertight door indicator and alarm system;

(l) Unmanned duty alarm system;

(m) Gyro compass system; and

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

8.4.4 The batteries as required in Paragraphs 8.4.1 and 8.4.2 shall be subjected to continuous trickle charge under normal operation of the Vessel through an automatic battery charger. in the event of the batteries are fully discharged, the charger shall be able to perform a quick charge function.

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

8.4.6 Battery charger installations shall meet all regulatory body requirements including:

(a) One (1) set of charging and discharging board with one charger for routine and emergency batteries located in the Engine Room. The charging method shall be float-charging type and boosting charge type with manual voltage adjuster;

(b) The charger is equipped with a rectifying device. When the main power supply is normal, the rectifying device provides 24V DC power. When the main power fails, it shall automatically switch to battery for power supply. The character of the battery charger shall be 220V (AC) with 50Hz input while the maximum output voltage shall be approximately 28V (DC);

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

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

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

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

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

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

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

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

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

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

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

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

8.5 Shore Power Supply and Connection

8.5.1 The required AC loading and charging power shall be proposed by the Contractor and agreed by GNC at the kick-off meeting.

8.5.2 An isolation transformer shall be fitted. A moulded case circuit breaker for the shore connection box shall be provided on the main switchboard.

8.5.3 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.

8.5.4 The shore power shall be arranged to supply the loading of the Vessel whilst the Vessel is berthed alongside and the corresponding distribution panel is to be provided. The arrangement shall be

such as to avoid the necessity of starting up the diesel 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.

8.5.5 An earthing terminal shall be provided for connecting the Vessel's earthing to the shore earthing.

8.5.6 An instruction shall be provided at the connection box to provide full system information and the procedures for the connection.

8.5.7 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" shall be fitted and shall be with phase sequence automatic adjustment device.

8.5.8 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.

8.5.9 The watertight connection box shall be designed with a quick release device.

8.5.10 Not less than 30 meters of shore connection power cable of adequate rating with quick release watertight plug shall be provided.

8.5.11 The shore connection power cable shall be fitted with compatible connections to connect to existing facilities at the Government Dockyard as identified by GNC. Suitable stowage onboard shall be provided for the cable.

8.6 AC Distribution Boards and Circuit Breakers

8.6.1 Electrical distribution shall be installed throughout the Vessel for AC electrical distribution. Distribution panels shall be of a drip-proof steel construction with hinged doors.

8.6.2 Moulded case circuit breakers are to be fitted as far as possible on all sub-circuits. Wherever this is not possible, fuses may be used subject to GNC acceptance. Wherever the sub-circuit is three phase or the current is above 60 Amps, the moulded case circuit breakers shall be fitted with thermal and magnetic tripping devices.

8.6.3 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.

8.6.4 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.

8.6.5 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.

8.7 Motor and Control Gear

8.7.1 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) inside the wheelhouse console.

8.7.2 Soft-starting shall always be taken into consideration to avoid excessive system voltage drop.

8.7.3 Motors installed in the Engine Room and other enclosed spaces shall be of semi-enclosed drip-proof type. Motors installed in locations exposed to weather or moisture shall be of waterproof

construction. Insulation of motors shall not be less than Class B standard under IEC Regulations for the Electrical and Electronic Equipment.

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

8.7.5 A Permanent Magnet Motor shall be adopted for the fire pump of the external fire-fighting system.

8.7.6 Individual Starter:

(a) Starters, which are not contained in the group starter panels, are to be mounted in the drip-proof metal cabinet; and

(b) The cabinet shall be bulkhead mounting type near the respective motor.

8.7.7 Variable-frequency Drive (VFD)

(a) VFDs shall be provided for the fire pump of the external fire-fighting system and bow thrusters;

(b) The VFD provided shall be a marine type with RO approval certificates; and

(c) The contractor shall provide protection against braking energy feedback to the motor drive.

8.8 Level Alarm and Indicator Panel

8.8.1 The Contractor shall provide a level alarm and indicator panel in the Wheelhouse with 24V DC power supply from general batteries.

8.8.2 All bilge water high level alarm signals shall be connected to the unmanned duty alarm system.

8.9 Cable, Wiring and Fuse

8.9.1 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 by chafing. When cables pass through bulkheads and decks with certain fire protection requirements, integrity shall not be weakened.

8.9.2 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.

8.9.3 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.

8.9.4 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.

8.9.5 Cabling for emergency systems shall also comply with the higher fire survival rate stipulated in IEC 60331 and the RO requirements.

8.9.6 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.

8.9.7 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.

8.9.8 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.

8.9.9 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.

8.9.10 Cabling shall be run along perforated metal trays and shall be secured in such positions as to allow easy maintenance.

8.9.11 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.

8.9.12 RO approved watertight, fire resistant and gas tight cable sealing systems shall be provided at watertight bulkhead or deck penetrations. The penetration should be located as high as practicable and well clear from the ship side.

8.9.13 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'.

8.9.14 Each electrical cable, that is part of the electrical system, shall have means to identify its function in the system.

8.9.15 Cables and the wiring terminals of different AC and DC power supply voltages in the junction box, the fuse box and the equipment terminal box shall be laid separately and shall have a distinctive code and labelling system for easy identification.

8.9.16 Tally plates showing the cable size shall be provided for each of the main power cables.

8.10 Lighting Fixtures

8.10.1 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.

8.10.2 The general lighting system described herein shall consist 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.

8.10.3 General lighting shall have individual or group switches to conserve power.

8.10.4 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.

8.10.5 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.

8.10.6 Suitable lighting shall be provided in all working areas such as the Galley, crew’s and commander's desks, First Aid Room, chart table and other areas determined by GNC.

8.10.7 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.

8.10.8 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.

8.10.9 All sockets, terminal blocks, switches and receptacle interiors shall be made of non-flammable phenolic material.

8.11 Navigational Light

8.11.1 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 any one RO listed in Annex 9 of this Part VII shall be provided before the Delivery Acceptance at the latest.

8.11.2 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. The navigation light control panel alarm shall have communication interface to the Voyage Data Recorder (VDR).

8.11.3 Navigation light circuits shall be independent of any other circuit. There shall be two essentially separate power supply systems to the distribution board; namely, one from the main AC power source and one from the emergency DC power source.

8.11.4 The following navigational and signal lights with double-pole circuit breakers and shapes shall be provided:

(a) Port-side light (double tier, easy to access together with the corresponding controls);

(b) Starboard-side light (double tier, easy to access together with the corresponding controls);

(c) Stern light (double tier, easy to access together with the corresponding controls);

(d) Masthead light (double tier, easy to access together with 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 COLREGs 1972 to indicate a tow less than 200m;

(i) Horn;

(j) One all-round flashing blue light on the top of mast without restriction, indicating the Vessel is a Police Vessel;

(k) Black ball (three numbers);

(l) Black diamond;

(m) Whistle;

(n) Bell; and

(o) Any other navigation lights as required.

8.11.5 Three (3) sets of spare bulbs shall be provided for the navigational and signal lights.

8.12 Searchlight

8.12.1 Three (3) proprietary make 220V AC LED remote controlled power-operated searchlights shall be installed on top of the Wheelhouse.

(a) 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°.

(b) 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 through ±135°.

8.12.2 All searchlights are to be remotely controlled. Searchlights are to be capable of being networked together so that 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.

8.12.3 Searchlight controllers are to be provided at the Launch Commander's console, Wheelhouse Control Station and at the MARSAS/EOSS operator's console.

8.12.4 All searchlights are to be integrated into the radar and directly using inputs from the radar to manoeuvre the searchlight.

8.12.5 High quality covers are to be provided for each searchlight. Suitable fastenings are to be fitted to searchlights/ the Wheelhouse top to facilitate fitting of searchlight covers.

8.12.6 In addition to the three search lights stated in Paragraph 8.12.1 of this Part VII, one (1) 24V DC LED portable searchlight (with luminosity equivalent to not less than 150W conventional type) with a 30 metres waterproof cable reel and plug shall be provided. Portable searchlights are to be stored in the wheelhouse.

8.12.7 The searchlight should be programmable to broadcast International Morse Code light signal of L (. _..). **[D]**

8.13 Floodlight

8.13.1 AC LED floodlights shall be fitted, with remote operation from the Wheelhouse and the operational console shall be confirmed with GNC. All maker's standard fittings and accessories shall be provided.

8.13.2 The floodlights are to be fixed to the Wheelhouse roof and upper deck in order to provide full illumination of the upper deck, main deck (in particulars to working areas and the helicopter winching area) and surrounding water.

8.13.3 The arrangement is to be designed and installed to the satisfaction of GNC and the HKPF.

8.14 Power Receptacles / Sockets

8.14.1 Receptacles/sockets installed in locations likely to be subjected to rain, spray or splashing shall have a minimum protection of IP 56, in accordance with IEC60529 when not in use, e.g. protected by a cover with an effective weatherproof seal. Protection from wave slamming in outdoor open locations shall be provided.

8.14.2 A system of 220V AC 13A and 24V DC 5A socket outlets shall be provided in the Engine Rooms, Bow Thruster Rooms and Jet Rooms.

8.14.3 Sufficient socket outlets for 220V AC and for 24V DC shall be provided in the Wheelhouse and Command and Control Suite to the satisfaction of GNC and the HKPF.

8.14.4 Socket outlets for 220V AC shall be provided throughout the Vessel. The Contractor shall design and install the socket outlets as required and to the satisfaction of GNC and the HKPF.

8.14.5 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.

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

8.14.7 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.

8.14.8 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 at the discretion of GNC.

8.14.9 Only flameproof or intrinsically safe electrical equipment is to be used in these areas.

8.14.10 No electrical wiring is to be fixed directly to the outside of the bulkheads adjacent to these areas/ compartments/ spaces.

8.14.11 Any cabling which is required within spaces 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.

8.14.12 Starters, socket outlets and light switches are not to be installed within hazardous spaces.

8.15 Monitoring and Control System (MCS)

8.15.1 Monitoring and Control System (MCS) shall be provided on board. The information from this MCS system shall be capable of being shown in Integrated Navigation System (INS).

8.15.2 The system shall be capable to monitor and control the following information and function:

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

(b) All the diesel generator alarms and running parameters;

(c) All the water-jet alarms and running parameters;

(d) All the gearbox alarms and running parameters;

(e) AC Electrical system;

(f) Water mist system and alarm;

(g) Fire detection system and alarm;

(h) FM-200 system and alarm;

(i) Fans (under main deck) control;

(j) General engineering system including fire pump control, bilge alarm and pump control, and tank level alarm and gauges (freshwater tank, fuel oil tank, lubricating oil, oily bilge tank, etc.);

(k) Sewage system;

(l) Oily water separator;

(m) Marine growth protection system;

(n) Air conditioning system;

(o) Intercom between Wheelhouse Engine Remote Control Console and Engine Control Console in the Engine Room Control Office;

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

(q) Bow thruster system;

(r) External Fire-Fighting System (including fire-fighting monitor control, fire monitor pumps alarm and monitoring panel);

(s) Other related alarm signals and any other signals (if applicable); and

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

8.15.3 The system shall comprise a central processing unit, signal acquisition module, signal output module, Human-Machine-Interface workstation, extended alarm board and other hardware as necessary. The system shall adopt distributed architecture. In order to meet the requirements for system reliability and redundancy, the CPU redundancy configuration, acquisition module field bus and power redundancy configuration shall be adopted. In the event of the main CPU fails, it shall automatically switch to the redundant processor.

8.15.4 The system hardware shall support the hot swap function and replace the hardware without interrupting the system.

8.15.5 Input channels shall be continuously monitored and when any input of them deviates from the pre-set value, an alarm shall be activated with audible and visual signals generated by the annunciator unit.

8.15.6 The alarm system shall be arranged in separate groups for main engines and its auxiliary machinery.

8.15.7 The instrument gauges and alarms shall be arranged in good order for the safety of operation and ease of maintenance.

8.15.8 An Un-interrupted Power Supply (UPS) shall be provided for the Monitoring and Control System.

8.15.9 The monitoring, control and operation of the engineering systems shall be provided in Engine Room Control Office and 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.

8.15.10 The system shall have at least four (4) 32” or larger multifunction displays, acceptable to the HKPF. Two of them shall be provided for Wheelhouse Remote Engine Control Console as detailed in Paragraph 9.3.2(h) of this Part VII. The other two shall be provided and located in Engine Room Control Office as detailed in Paragraph 9.3.2(q) of this Part VII. All of them shall be provided with independent control and capable to select the control and monitor display of their own. The multifunction displays shall be dedicated for operating and primarily displaying the MCS and shall also be able to switch between MCS and CCTV system. The displays are to be fitted within a console which is to be angled such that the view on the display(s) is not compromise.

8.15.11 System and implementation details of the MCS shall be discussed in the kick off meeting.

8.15.12 The MCS shall be capable to integrate with the IMACS described in paragraphs from Paragraphs 4.17.5 to 4.17.11 of this Part VII.

Chapter 9 Operational Systems

9.1 Overview of Requirements

9.1.1 The Contractor shall supply, deliver, install, commission, conduct trial tests 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 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") specified in Paragraph 9.3 of this Part VII, all Electronic Navigation Equipment ("ENE") listed in Paragraph 9.4 of this Part VII. "Operational System" (singular) means any one of these items. The MRCS radios, CC3 radios, Marine Situational Awareness System ("MARSAS"), HKPF Special Operation Mobile Radio, HKPF Special Operation Radio Repeater and other Police Special IT Equipment will be supplied and installed by the HKPF or HKPF's other contractors, whereas the Contractor shall supply the infrastructure specified in Paragraph 9.32 of this Part VII for these items. All other systems/equipment listed in this Chapter 9 of Part VII shall 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 and construction of the Vessels will take a number of years from proposal until delivery of the Vessels, particularly the later models in the Class, the proposal should contain a plan for ensuring the future proofing of the technology specified in the as 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 SOLAS, 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 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 Operational Systems equipment, which is harmful to human beings under normal operating conditions, in accordance with 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, the Wheelhouse and the Command and Control Suite of the Vessel. All designs and installation/mounting proposals shall be approved by GNC and the HKPF prior to the commencement of any such work.

9.2.6 In addition to the submission of layout plans in accordance to Annex 3 of this Part VII to GNC and the HKPF, to facilitate the optimal design, user-friendliness, effectiveness and easy accessibility for inspection and maintenance of all on-board systems, following Contract award and during the design phase, the Contractor shall construct a full-size wheelhouse mock-up for comment and approval by GNC and the 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 INS listed in Paragraph 9.3 of this Part VII, all other ENE listed in Paragraph 9.4 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 one complete set 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 one (1) set 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 be serviceable and have technical support and maintenance services available locally in HKSAR upon the completion of the Warranty Period.

9.2.9 The power supply for all the equipment of the Operational Systems specified in Chapter 9 of this Part VII shall be from the Vessel's UPS with backup battery support for at least 30 minutes.

9.2.10 The Contractor shall submit design description, schematic diagrams, hardware and software specifications, installation drawings and integration design including but not limited to the Operational Systems specified in this Chapter 9 of Part VII to HKPF for approval within the time specified by the HKPF and prior to the commencement of any such work during design stage.

9.2.11 Upon receipt of a request from the HKPF, the Contractor shall alter or adjust or modify any of the deliverables as specified in Paragraph 9.2.10 of this Part VII to the satisfaction of the HKPF without causing any delay to the Implementation Plan or such other time requirements set out in the Contract, at no additional cost to the Government.

9.2.12 Design Standards

(a) Environmental Conditions:

(1) All Operational Systems shall be capable of operating continuously to the specifications contained in this Part VII, throughout the normal life span of such systems, in the HKSAR climate and environment. The following parameters shall apply unless otherwise stated:

(i) Ambient temperatures between 0 ℃ and 40 ℃ and between -5 ℃ and +50 ℃ if the equipment (including antennae) is exposed to the open air;

(ii) Relative humidity up to 95%, non-condensing;

(iii) Salt and chemical corrosion as found in a tropical coastal atmosphere; and

(iv) Materials that promote mould growth shall not be used.

(2) The Operational Systems shall be rugged and capable of withstanding the knocks and jolts likely to occur during repair work or in operating environment as specified in Paragraph 2.7.4 in the Part VII.

(b) Power Supplies:

(1) The power supply for all Operational Systems shall be protected by appropriate circuit breakers;

(2) 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;

(3) 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;

(4) 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;

(5) 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;

(6) Adequate provision shall be made to protect the Operational Systems from the adverse effects of excessive voltage, current spikes and surges;

(7) Suitable devices shall be incorporated for protecting the Operational Systems and accessories against damage due to lightning and the unregulated DC power supply onboard; and

(8) Selected Operational Systems equipment shall be connected to individual external switches for controlling the power on or off status of the individual Operational Systems equipment and the illumined device on the control panel. The location of external switches shall be easily accessible. The actual devices to be connected to the external switches shall be subject to the approval of the HKPF.

(c) Safety:

(1) All Operational Systems supplied shall be of a safe design and shall be installed in a safe manner as approved by GNC and the HKPF. The standard of installation shall enhance the equipment's safety features and not present any hazard to users;

(2) 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;

(3) Electrical contacts and PCBs shall also be protected in an appropriate manner that does not impair their electrical characteristics;

(4) Lightning protection devices (e.g. lightning surge arrestors/dissipaters as specified in Paragraph 4.33 of this Part VII) are required, particularly for antennae installed outside the protection zone of the Vessel's own lightning protection device;

(5) The lightning surge arrestors/dissipaters of each feeder cable shall be grouped and concentrated in a "lightning arrestor panel" for ease of maintenance; and

(6) 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:

(1) All systems shall be designed for prolonged, continuous and reliable operation, i.e. twenty-four (24) hours per day and 365 days per year;

(2) 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;

(3) The design, construction and installation of the Operational Systems shall be to a standard of engineering acceptable to COMMS;

(4) The display digits in the Operational Systems control panels and displays shall be easily legible;

(5) 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;

(6) 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;

(7) 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);

(8) Adequate testing points and other testing facilities, e.g. extension boards, testing probes, shall be provided to permit ease of maintenance; and

(9) 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.

9.2.13 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; and

(b) Any such protective layer shall be smooth, continuous, and free from blemishes and scratches.

9.2.14 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 followings, for normal operations:

(1) Connectors;

(2) Circuit breakers;

(3) Lightning arrestors/dissipaters;

(4) Power sockets;

(5) Plugs; and

(6) 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), Maritime and Coastguard Agency, 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 whilst in service;

(f) Installation shall be to the highest standard to ensure:

(1) 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;

(2) Satisfactory performance of the Operational Systems;

(3) Protection from mechanical and water damage;

(4) Ease of accessibility for maintenance and repair;

(5) Manufacturers' recommendations are followed strictly;

(6) 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; and

(7) The installation in the environment shall withstand the conditions stated in Paragraph 9.2.12(a)(1) 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, shall be earthed, screened and protected according to the rules, regulations and recommended practices regarding screening of electric wiring.

9.2.15 Cable Laying

(a) General Cable Requirements:

(1) All cables shall be rated and sized properly;

(2) The signal cables shall be screened properly to reduce the cross-talk level as necessary; and

(3) 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 decks unless approved otherwise by GNC and the 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 as 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 metalwork or exposed structures.

(d) The Contractor shall be responsible for the supply, installation and inter-connection of all cables and all related installation materials within the system as well as 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:

(1) To enable parts to be removed and replaced during servicing without disconnecting other parts;

(2) To facilitate field repairs of broken or cut wires; and

(3) 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.

9.2.16 Labelling and Marking:

(a) All Operational Systems supplied shall carry the name, trademark or other means of identifying the manufacturer;

(b) Major Operational System 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 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; and

(e) The DC circuit breakers controlling the Equipment shall be labelled clearly.

9.2.17 Acceptance Test

(a) The acceptance tests for each Operational System shall consist of three (3) parts: bench tests, Factory Acceptance Test (FAT) and on-site commissioning tests as follows:

(1) Upon the request of the Government, 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;

(2) The Contractor shall carry out the FAT in the presence of 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(d) and (f) of this Part VII.

(3) The on-site commissioning tests shall be carried out by the Contractor in the HKSAR, as part of Stage 2 and 3 of the Technical Acceptance, in the presence of 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 9.32 of this Part VII; and

(4) 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 ICNIRP 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 standard; and

(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.

9.2.18 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 USB or equivalent device. 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 as specified in Paragraph 11.2.6 (h) of this Part VII. The manuals shall provide the information listed below:

(1) Description of the principle of operation;

(2) Details of installation and setting up procedures;

(3) Maintenance instructions including mechanical assembling and disassembling procedures;

(4) Schematic diagrams and block diagrams with their respective descriptions; and

(5) 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 GNC and COMMS for approval before installation;

(c) At Delivery Acceptance, the Contractor shall supply:

(1) Operational manuals and maintenance manuals specified in Paragraph 9.2.18(a) above (to have been supplied at least six (6) weeks prior to Delivery Acceptance);

(2) Properly organised individual equipment testing results including details of test and calibration procedures;

(3) On-site commissioning test and sea trial reports of all equipment as witnessed by COMMS;

(4) The initial parameter settings and readings of all equipment at the time of the on-site commissioning test;

(5) "As installed" drawings showing the positions of all individual items of the equipment installed and the routing of the interconnecting cables between equipment;

(6) A block diagram showing the interconnections between all equipment units complete with their technical protocols and the wiring schedule;

(7) "As fitted" diagram showing the locations and positions of all circuit breakers controlling the power to the equipment; and

(8) The completed NIR Report as required by Paragraph 9.2.17(b) of this Part VII.

(d) The documents specified at Paragraphs 9.2.18(a) to (c) of this Part VII shall be supplied in both paper copy and soft copy in USB or equivalent device; and

(e) The Contractor shall not use confidentiality as a reason for withholding the supply of relevant documentation as required by GNC and the HKPF.

9.2.19 Electronic Components/Spares Parts/Spare Units/Maintenance

The Contractor shall commit to provide spare parts for the Operational Systems equipment for a period of not less than five (5) years from the date of the successful commissioning of the last Vessel.

9.2.20 Warranty Services:

(a) The Contractor shall provide a one (1) year free Warranty Period 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 in accordance with the requirements as specified in Annex 1 Paragraph 1.7 of this Part VII. 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;

(c) The Contractor shall keep sufficient spare parts for Operational Systems in the HKSAR with no extra cost to Government for fulfilling the warranty services requirement as specified in Paragraph 9.2.20(b) of this Part VII;

(d) The Contractor shall provide and install sea chart update services when the updated versions of the sea charts are released; and

(e) The Contractor shall indemnify the Government in respect of any damages to all the HKPF equipment as specified in Paragraph 9.32 of this Part VII if the damages were caused by defects or malfunctions of the Vessel or its equipment onboard. Paragraph 1.4 of Annex 1 of this Part VII shall also apply to all HKPF equipment as specified in Paragraph 9.32 of this Part VII.

9.3 Integrated Navigation System

9.3.1 The Contractor shall supply and install an INS to allow the officers in the following locations 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, whilst the conceptual design of Command and Control Suite layout can be referred to Figure 9.2 below):

(a) Forward Ship Navigation Control Station in the Wheelhouse;

(b) Aft Command and Control Station in the Wheelhouse;

(c) Command and Control Suite;

(d) Communication area in the Command and Control Suite;

(e) Command Office in the Command and Control Suite;

(f) Briefing & Standby Area;

(g) Engine Room Control Office; and

(h) Commander's Cabin.

9.3.2 The INS shall provide the Vessel operator(s) with a user interface to be used in normal operations providing access to all data or repeated video images supplied by the Operational Systems, unless otherwise stated. The INS shall consist of the following minimum specifications:

Forward Ship Navigation Control Station in the Wheelhouse

(a) Three (3) 19" or larger multifunction displays, acceptable to the HKPF, are to be located in the Wheelhouse, overhead and in view of the Coxswain ("COX"), Officer On Watch ("OOW") and Launch Commander, dedicated to operate and display CCTV video images of the exterior and interior of the Vessel from the CCTV system 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:

(1)	Native Resolution:	1280 x 1024 pixels or higher
(2)	Contrast ratio standard:	1000:1 (typical)
(3)	Light Intensity Standard:	350cd/m² (typical)
(4)	Viewing Angle Standard:	±85 ° (typical) (up/down/left/right)

(b) Two (2) 26" or larger IMO compliant multifunction displays, acceptable to the HKPF, located in the Wheelhouse Control Station for primarily operating and displaying navigation Electronic Chart Display and Information System (ECDIS #1) and Navigation Radar respectively, forward of the COX and OOW seated positions. 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:

(1)	Native Resolution:	1920 x 1080 (HD) pixels or higher
(2)	Contrast ratio standard:	1500:1 (typical)
(3)	Light Intensity Standard:	300cd/m² (typical)
(4)	Viewing Angle Standard:	±88°(typical) (up/down/left/right)
(5)	Max Colours:	16.7 million
(6)	Multi-touch screen:	Yes

(c) One (1) 26" or larger IMO compliant multifunction display, acceptable to the HKPF, located in the Wheelhouse Control Station for primarily displaying conning information, forward of the COX and OOW seated positions. 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:

(1)	Native Resolution:	1920 x 1080 (HD) pixels or higher
(2)	Contrast ratio standard:	1500:1 (typical)
(3)	Light Intensity Standard:	300cd/m² (typical)
(4)	Viewing Angle Standard:	±88°(typical) (up/down/left/right)
(5)	Max Colours:	16.7 million
(6)	Multi-touch screen:	Yes

This display shall display at least but not limited to the following information:

(1) Vessel speed;

(2) Distance travelled;

(3) Vessel heading;

(4) Waterjet RPM;

(5) Rate of turn indicator;

(6) Waterjet angle;

(7) Fuel consumption; and

(8) Other information deemed necessary by HKPF, GNC or proposed by the Contractor during the kick-off meeting.

(d) One (1) 26" or larger multifunction display, acceptable to the HKPF, is to be located in the Wheelhouse Control Station, forward of the COX and OOW seated position, to display the Alarm and Monitoring System Information from MCS. 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:

(1)	Native Resolution:	1920 x 1080 (HD) pixels or higher
(2)	Contrast ratio standard:	1500:1 (typical)
(3)	Light Intensity Standard:	300cd/m²(typical)
(4)	Viewing Angle Standard:	±88°(typical) (up/down/left/right)
(5)	Max Colours:	16.7 million
(6)	Multi-touch screen:	Yes

Aft Command and Control Station in the Wheelhouse

(e) 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 for operating and primarily displaying the High Performance Radar, but the display shall also be able to switch among all repeated video images from the MARSAS terminal 1, the EOSS, navigation ECDIS (ECDIS #1) and Navigation Radar specified in Paragraph 9.3.2 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(s) is not compromised by glare. The display shall have the following:

(1)	Native Resolution:	3840 x 2160 (UHD, 4K) pixels or higher
(2)	Contrast ratio standard:	1000:1 (typical)
(3)	Light Intensity Standard:	300cd/m²(typical)
(4)	Viewing Angle Standard:	±89° (typical) (up/down/left/right)
(5)	Max Colours:	16.7 million (RGB 8-bit)
(6)	Multi-touch screen:	Yes
(7)	Viewing Angle Standard:	±89° (typical) (up/down/left/right)
(8)	Max Colours:	16.7 million (RGB 8-bit)
(9)	Multi-touch screen:	Yes

(f) Two (2) 32" or larger multifunction displays, acceptable to the HKPF, are located at the MARSAS/EOSS Operator's Consoles. One of the displays shall be dedicated for operating and primarily displaying the MARSAS Terminal 1 and the other display shall be for operating and displaying the EOSS. The displays/monitors shall have the following minimum specifications:

(1) Native Resolution:	3840 x 2160 (UHD, 4K) pixels or higher
(2) Contrast ratio standard:	1000:1 (typical)
(3) Light Intensity Standard:	300cd/m² (typical)
(4) Viewing Angle Standard:	±89°(typical) (up/down/left/right)
(5) Max Colours:	16.7 million (RGB 8-bit)
(6) Multi-touch screen:	Yes
(7) Viewing Angle Standard:	±89°(typical) (up/down/left/right)
(8) Max Colours:	16.7 million (RGB 8-bit)
(9) 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 Console shall provide a dedicated display for operating and primarily displaying the second independent ECDIS (ECDIS#2), but the display shall also be able to switch among all repeated video images from the MARSAS Terminal 1, the Electro Optical Sensor System (EOSS), and High Performance Radar, specified in Paragraph 9.3.2 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(s) is not compromised by glare. The display/monitor shall have the following minimum specifications:

(1) Native Resolution:	3840 x 2160 (UHD, 4K) pixels or higher
(2) Contrast ratio standard:	1000:1 (typical)
(3) Light Intensity Standard:	300cd/m² (typical)
(4) Viewing Angle Standard:	±89°(typical) (up/down/left/right)
(5) Max Colours:	16.7 million (RGB 8-bit)
(6) Multi-touch screen:	Yes

(h) Two (2) 32" multifunction displays are to be located at the Wheelhouse Remote Engine Control Console. The Remote Engine Control Console shall provide a dedicated display for operating and primarily displaying the MCS, but the display shall also be able to switch among all repeated video images from the Conning Display, Alarm and Monitoring System and CCTV system. The display/monitor shall have the following minimum specifications:

(1) Native Resolution:	3840 x 2160 (UHD, 4K) pixels or higher
(2) Contrast ratio standard:	1000:1 (typical)
(3) Light Intensity Standard:	300cd/m² (typical)
(4) Viewing Angle Standard:	±89°(typical) (up/down/left/right)
(5) Max Colours:	16.7 million (RGB 8-bit)
(6) Multi-touch screen:	Yes

(i) One (1) 55" multi-touch multifunction display acceptable to the HKPF, which 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 9.3.2 of this Part VII. The display shall have the following minimum specifications:

(1)	Native Resolution:	3840 x 2160 (UHD, 4K) pixels or higher
(2)	Pixel Pitch (RGB):	0.315 (H) x 0.315 (V) millimetres
(3)	Contrast ratio standard:	4000:1 (typical)
(4)	Light Intensity Standard:	450cd/m²(typical)
(5)	Viewing Angle Standard:	±89 °(typical) (up/down/left/right)
(6)	Max Colours:	16.7 million (RGB 8-bit)
(7)	Multi-touch screen:	Yes

Commander's Cabin

(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 9.3.2 of this Part VII to display repeated images from the MARSAS Terminal 1, navigation ECDIS (ECDIS #1), EOSS, and Navigation Radar. 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:

(1)	Native Resolution:	1920 x 1080 (HD) pixels or higher
(2)	Contrast ratio standard:	1500:1 (typical)
(3)	Light Intensity Standard:	300cd/m²(typical)
(4)	Viewing Angle Standard:	±88 °(typical) (up/down/left/right)
(5)	Max Colours:	16.7 million
(6)	Multi-touch screen:	Yes

Command and Control Suite

(k) Two (2) 32" or larger multifunction displays, acceptable to the HKPF for another set of MARSAS Terminal (MARSAS #2). One (of the displays shall be dedicated for operating and primarily displaying the MARSAS Terminal 2 and the other display shall be for displaying the mirror image of EOSS. The displays/monitors shall have the following minimum specifications:

(1)	Native Resolution:	3840 x 2160 (UHD, 4K) pixels or higher
(2)	Contrast ratio standard:	1000:1 (typical)
(3)	Light Intensity Standard:	300cd/m^2 (typical)
(4)	Viewing Angle Standard:	±89°(typical) (up/down/left/right)
(5)	Max Colours:	16.7 million (RGB 8-bit)
(6)	Multi-touch screen:	Yes

(7)	Viewing Angle Standard:	±89°(typical) (up/down/left/right)
(8)	Max Colours:	16.7 million (RGB 8-bit)
(9)	Multi-touch screen:	Yes

(l) Two (2) 75" or larger multi-touch anti-glare smart board multifunction displays with wireless video projection function, acceptable to the HKPF, is to be located at the Command and Control Suite. As a smart board multifunctional display, the operator shall be able to switch between all multifunction display video feeds as specified in Paragraph 9.3.2 of this Part VII, and to provide interactive whiteboard, pinpoint touch, multi media player and the Office reader applications. The display shall have the following minimum specifications:

(1)	Native Resolution:	3840 x 2160 (UHD, 4K) pixels or higher
(2)	Contrast ratio standard:	1200:1
(3)	Light Intensity Standard:	350cd/m²
(4)	Viewing Angle Standard:	Real 178°
(5)	Aspect Radio:	16:9
(6)	Display Colour:	1.07B (10 bit)
(7)	USB ports:	3
(8)	HDMI In:	3
(9)	HDMI Out:	1
(10)	Audio (3.5mm jack):	1
(11)	RJ 45 Port (10/100mbps):	1

(12) Computer module:

- Android/Microsoft Windows (latest version)
- Intel i7 CPU or above
- 32GB RAM or above
- 512GB SSD hard disk or above
- Built-in 2.4G/5G (Support Wi-Fi and hotspot Sync)

(13)	Touch System:	Support finger, passive infrared pen
(14)	Accessories:	Supply 2 x touch system writing pens

(m) One (1) 75" or larger multi-touch anti-glare smart board multifunction display with wireless video projection function, acceptable to the HKPF, is to be located at the Command and Control Suite. As a smart board multifunctional display, the operator shall be able to display live video and audio from the television receiver, as specified in Paragraph 9.30 of this Part VII, and to provide interactive whiteboard, pinpoint touch, multi media player and the Office reader applications. For this multi-touch multifunction display, the Contractor shall also provide hardware and software to enable the operator to select multiple video sources for displaying in quad-screen and full screen formats. The display shall have the following minimum specifications:

(1)	Native Resolution:	3840 x 2160 (UHD, 4K) pixels or higher
(2)	Contrast ratio standard:	1200:1
(3)	Light Intensity Standard:	350cd/m²
(4)	Viewing Angle Standard:	Real 178°

(5) Aspect Radio: 16:9

(6) Display Colour: 1.07B (10 bit)

(7) USB ports: 3

(8) HDMI In: 3

(9) HDMI Out: 1

(10) Audio (3.5mm jack): 1

(11) RJ 45 Port (10/100mbps): 1

(12) Computer module:

- Android/Microsoft Windows (latest version)
- Intel i7 CPU or above
- 32GB RAM or above
- 512GB SSD hard disk or above
- Built-in 2.4G/5G (Support Wi-Fi and hotspot Sync)

(13) Touch System: Support finger, passive infrared pen

(14) Accessories: supply 2 x touch system writing pens

(n) One (1) 55" or larger multi-touch anti-glare smart board multifunction display with wireless video projection function, acceptable to the HKPF, is to be located at the Command Office of Command and Control Suite. As a smart board multifunctional display, the operator shall be able to display live video and audio from the television receiver as specified in Paragraph 9.30 of this Part VII, switch between all multifunction display video feeds as specified in Paragraph 9.3.2 of this Part VII, integrate with the video conference system as specified in Paragraph 9.29 of this Part VII, and to provide interactive whiteboard, pinpoint touch, multi media player and the Office reader applications. The display shall have the following minimum specifications:

(1) Native Resolution: 3840 x 2160 (UHD, 4K) pixels or higher

(2) Contrast ratio standard: 1200:1

(3) Light Intensity Standard: 350cd/m²

(4) Viewing Angle Standard: Real 178°

(5) Aspect Radio: 16:9

(6) Display Colour: 1.07B (10 bit)

(7) USB ports: 3

(8) HDMI In: 3

(9) HDMI Out: 1

(10) Audio (3.5mm jack): 1

(11) RJ 45 Port (10/100mbps): 1

(12) Computer module:

- Android/Microsoft Windows (latest version)
- Intel i7 CPU or above
- 32GB RAM or above
- 512GB SSD hard disk or above
- Built-in 2.4G/5G (Support Wi-Fi and hotspot Sync)

(13) Touch System:	Support finger, passive infrared pen
(14) Accessories:	supply 2 x touch system writing pens

Briefing and Standby Area

(o) One (1) 75" or larger multi-touch anti-glare smart board multifunction display with wireless video projection function, acceptable to the HKPF, is to be located at the Briefing and Standby Area. As a multifunctional display the operator shall be able to switch between all multifunction display video feeds as specified in Paragraph 9.3.2 of this Part VII, to display live video and audio from the television receiver as specified in Paragraph 9.30 of this Part VII, to provide interactive whiteboard, pinpoint touch, multi media player and the Office reader applications. The display shall have the following minimum specifications:

(1) Native Resolution:	3840 x 2160 (UHD, 4K) pixels or higher
(2) Contrast ratio standard:	1200:1
(3) Light Intensity Standard:	350cd/m^2
(4) Viewing Angle Standard:	Real 178°
(5) Aspect Radio:	16:9
(6) Display Colour:	1.07B (10 bit)
(7) USB ports:	3
(8) HDMI In:	3
(9) HDMI Out:	1
(10) Audio (3.5mm jack):	1
(11) RJ 45 Port (10/100mbps):	1

(12) Computer module:

- Android/Microsoft Windows (latest version)
- Intel i7 CPU or above
- 32GB RAM or above
- 512GB SSD hard disk or above
- Built-in 2.4G/5G (Support Wi-Fi and hotspot Sync)

(13) Touch System:	Support finger, passive infrared pen
(14) Accessories:	Supply 2 x touch system writing pens

Engine Room Control Office

(p) One (1) 32" or larger multifunction display, acceptable to the HKPF, is to be located in the Engine Room Control Office, to display the CCTV system and display video images. 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:

(1) Native Resolution:	1920 x 1080 (HD) pixels or higher
(2) Contrast ratio standard:	1500:1 (typical)

(3)	Light Intensity Standard:	300cd/m² (typical)
(4)	Viewing Angle Standard:	±88° (typical) (up/down/left/right)
(5)	Max Colours:	16.7 million
(6)	Multi-touch screen:	Yes

(q) Two (2) 32" multifunction displays, acceptable to the HKPF, is to be located at the Engine Room Control Office. This multifunction display shall provide a dedicated display for operating and primarily displaying the MCS and integrated with INS for sharing MCS video images to other display units of the INS as specified in Paragraph 9.3.2 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(s) is not compromised by glare. The display/monitor shall have the following minimum specifications:

(1)	Native Resolution:	1920 x 1080 (HD) pixels or higher
(2)	Contrast ratio standard:	1500:1 (typical)
(3)	Light Intensity Standard:	300cd/m² (typical)
(4)	Viewing Angle Standard:	±88° (typical) (up/down/left/right)
(5)	Max Colours:	16.7 million
(6)	Multi-touch screen:	Yes

9.3.3 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 9.3.2 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, CCTV and television etc.

9.3.4 The multifunction display shall be capable of accepting navigational data from a wide selection of equipment including Differential Global Navigation Satellite System ("DGNSS"), Secure Automatic Information System ("S-AIS"), radars and satellite compass, gyro compass and, of providing data on all tracked targets in the form of a track table.

9.3.5 The 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 ECDISs, radars, S-AIS, DGNSS, satellite compass, echo sounder, CCTV, MARSAS, EOSS, television receiver and all others as listed in Paragraph 9.4.1 of this Part VII. The information and images shall be shared and viewed on all designated displays as listed in Paragraphs 9.3.2 (a) to (q) of this 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 requirements. **[E]**

9.3.6 The INS shall have video switching functions so that the video images of all multifunction displays specified in Paragraph 9.3.2 of this Part VII can be selected and displayed on any of the designated multifunction displays in the INS. The Contractor shall provide user friendly hard panels or soft panels so that the operators can select video sources, full screen or quad-split screen formats to any multifunction displays flexibly at the location of the multifunction displays.

9.3.7 All the INS equipment except control panels shall be installed inside the cabinet or console at the installation location and Server Room and be easy to access for maintenance. The cabinet or console shall be supplied and installed by the Contractor.

9.3.8 The video switching capacity 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.

9.3.9 The latency of video switching of the INS for high definition video with 30 frame per seconds shall be less than 10ms.

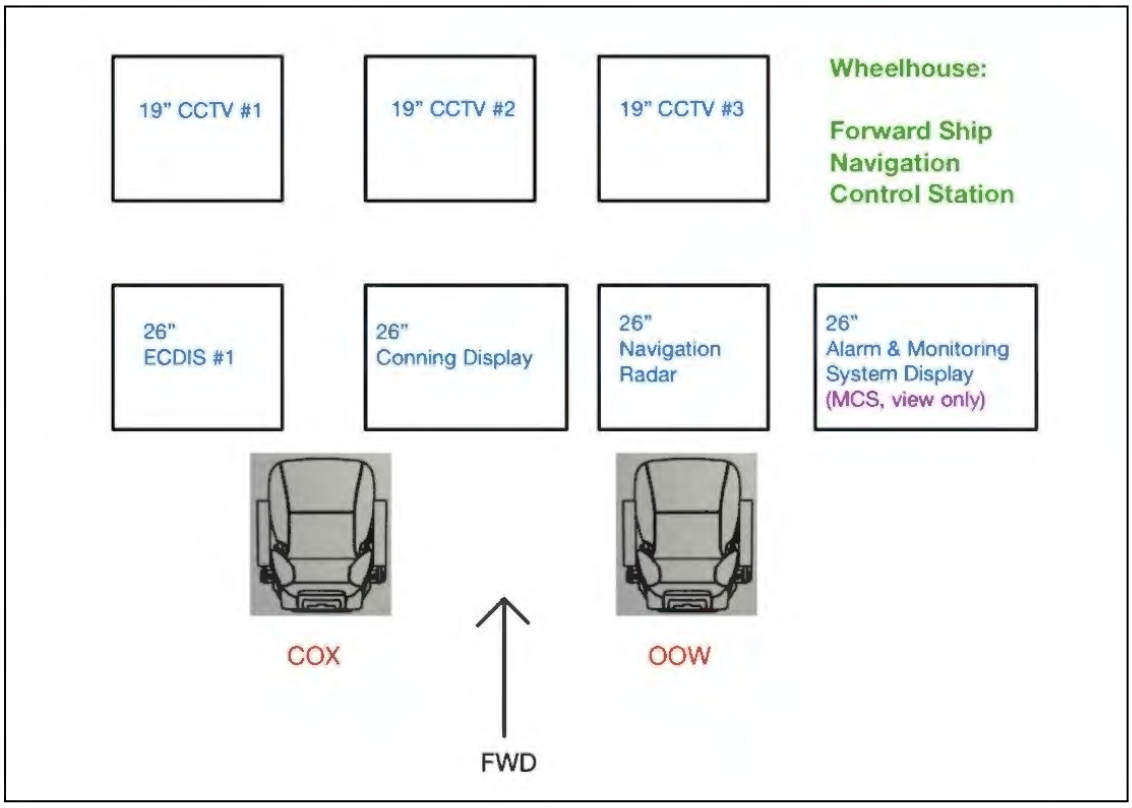
9.3.10 If the Contractor adopts a video over IP solution, the transmission cables shall be Cat6e type and the network routing capacity shall be at least 10 gigabits. The Contractor shall use optical fibre cable and provide all necessary converters if the transmission cable length is over a hundred (100) meters.

9.3.11 It is desirable to adopt power over Ethernet for video switching equipment for the INS to minimizing the scale of cabling.

9.3.12 The INS shall provide at least four (4) video input ports and circuits from the INS for extending two (2) MARSAS Terminal videos to other display units within the Vessel as specified in Paragraph 9.32.3(e)(10) to (12) of this Part VII.

9.3.13 The INS shall provide two (2) additional video input ports and circuits from the INS for the use of other HKPF systems.

9.3.14 All the INS multifunction displays specified in Paragraph 9.3.2 (b), (c), (d), (f), (g), (h), (k) and (q) 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.



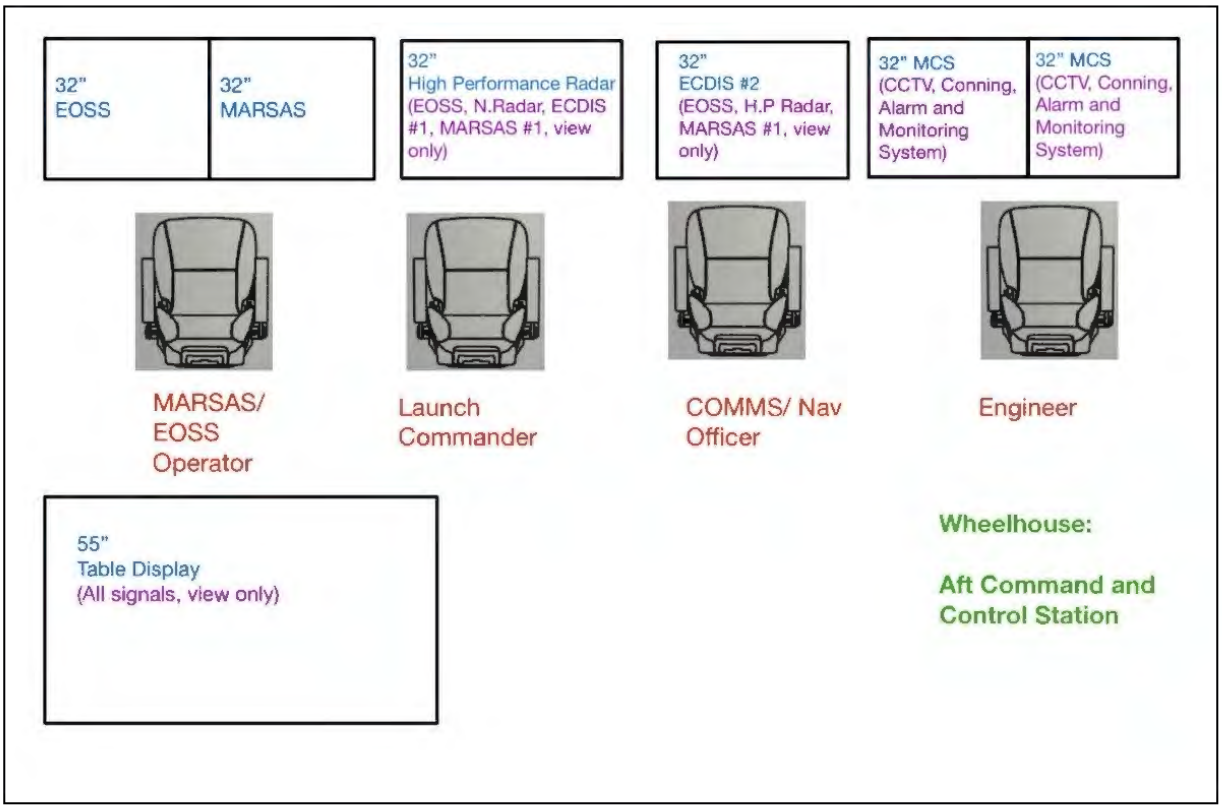


Figure 9.1 – Conceptual Design of Wheelhouse Layout for Reference Only

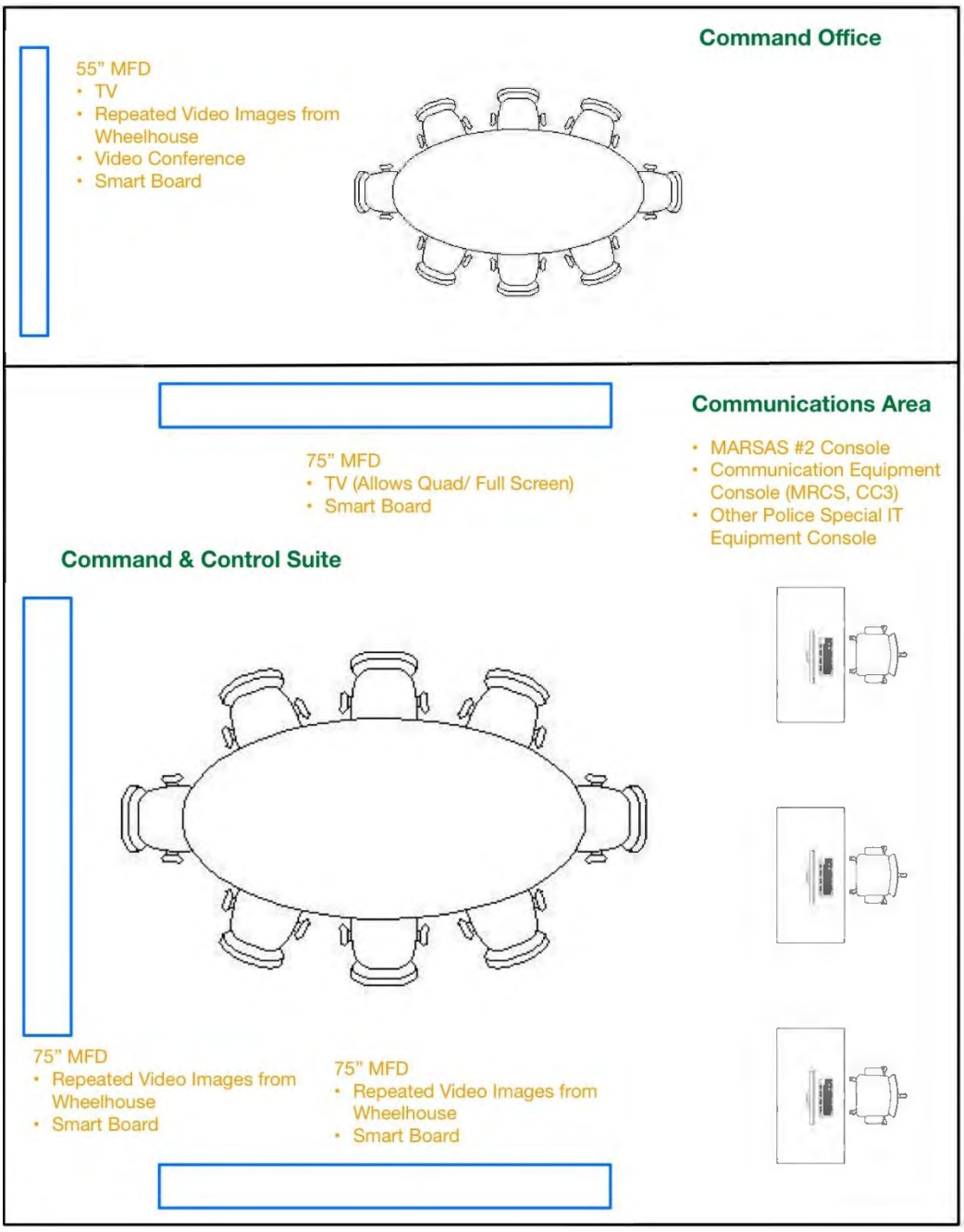


Figure 9.2 – Conceptual Design of Command and Control Suite Layout for Reference Only

9.3.15 The INS shall support and allow the HKPF to substitute any brand and model of Operational Systems equipment in the future.

9.3.16 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.

9.3.17 The Contractor shall submit an INS detailed design proposal that includes schematic diagrams, equipment list, equipment specifications and functional description to the HKPF, for approval within two (2) months after the contract date as stated in Annex 3 of this Part VII. The HKPF

has the right to request the Contractor to provide a 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 manuals and training for the following Electronic Navigation Equipment to be fitted onboard the Vessel and integrated 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 Systems (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 Device;

(o) Sound Reception System;

(p) International Maritime Mobile (IMM) VHF Radios with GMDSS;

(q) Marine Band Hand-held Waterproof Radio Transceivers;

(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;

(y) Television reception system;

(z) Video Conference System;

(aa) Satellite Communications System (SATCOM); and

(bb) Installation/Space/Cabling for the HKPF MRCS, CC3, MARSAS, HKPF Special Operation Mobile Radio, HKPF Special Operation Radio Repeater and other Police Special IT Equipment.

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 9. References to

'Equipment' in this Chapter 9 of Part VII shall mean the above-mentioned Equipment in (a) to (bb). References to "Electronic Navigation Equipment" or "ENE" throughout the Tender Documents or Contract shall mean each set of the abovementioned Equipment in (a) to (bb).

9.4.3 All Equipment offered shall be designed for marine applications and shall operate effectively under adverse conditions, such as 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 onboard.

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 Operational 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. In accordance with Paragraph 4.33 of this Part VII, the lightning arresters/ dissipaters 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 and shall comply with the applicable IMO requirements.

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 in the forward and aft parts of the Vessel;

(b) Shall be capable of generating a 'Yelp' siren and a horn sound signal in manual mode;

(c) It shall also have a selection of at least four (4) warning sound signals in automatic mode, at appropriate selectable time intervals, for general marine navigational use, namely:

(1) Under power, under way and making way;

(2) Under power, under way and not making way;

(3) Towing / restricted manoeuvring;

(4) At anchor; and

(5) Others to be confirmed.

(d) The system shall incorporate at least four (4) police siren sounds 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 sound patterns by updating associated audio files;

(f) There shall be a volume control for the external broadcasting speakers, which shall be adjustable from full power 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:

(1) Power ON/OFF;

(2) Hail volume control; and

(3) 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); and

(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 to provide a one-way internal voice broadcast within the Vessel and to 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 zones 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;

(a) 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 the HKPF during the kick-off meeting;

(b) The outdoor speakers shall be 15 Watt or more and at least IP66 class waterproofing. Indoor speakers shall compliant with the requirements of the IMO 2000 HSC Code. The sound volume of the speaker in crew cabins and control areas shall be adjustable;

(c) The positions of the Public Address System Control Panel as well as the number and position of the speakers shall be proposed by the Contractor during the detailed design stage. The contractor shall seek comment and approval from the HKPF. If this is not possible, additional speakers and associated equipment are to be fitted to the satisfaction of GNC and the HKPF at no extra cost to the Government;

(d) All the indoor areas, rooms and outdoor areas shall be covered by the Public Address System; and

(e) The Public Address System shall be integrated with Talkback System specified in Paragraph 9.26 of this Part VII such that the voice message from the Talkback System can be broadcasted to the selected zones of the Vessel via 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 requirements of any one of the RO listed in Annex 9.

9.6.4 The magnetic compass shall be capable of operating without power supply.

9.6.5 The magnetic compass shall be adjustable and properly calibrated in the HKSAR. 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 any one of the RO listed in Annex 9 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 integrate with 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)	Roll and Pitch accuracy:	0.01° RMS or better
(d)	Angular rate:	>300°/s
(e)	Start-up time:	10 minutes or below
(f)	Deviation Compensation:	Automatic
(g)	Operating Temperatures:	-10℃ to 55℃ or better
(h)	Waterproofing:	IP X5 or higher
(i)	Environmental:	Meets or exceeds IEC 60945
(j)	EMC:	Meets or exceeds IEC 60945
(k)	Interface:	3 x Configurable bi-directional RS-232 / RS-422 or more; 1x Ethernet or more; Status / Alarm relay contacts; NMEA 0183 / NMEA 2000/ IEC61162-1

(including roll and pitch signal).

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 GNC and HKPF, to allow sights to be taken. In addition, two (2) gyro repeaters are to be fitted in the port and starboard Jet Rooms at the emergency steering positions. 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 IP44 or higher.

9.8.2 In order to assist an officer deployed to the emergency steering position, a waterjet angle indicator shall 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 multifunction digital display 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 the HKPF during the kick-off meeting.

9.9.2 The satellite compass sensor unit shall be connected to the radars, ECDIS, MARSAS, gyro compass 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 The satellite compass shall support GPS, GLONASS, BeiDou and Galileo for pinpoint global positing and heading accuracy.

9.9.6 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 the 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 9.3.2 of this Part VII.

9.10.2 General requirements of the navigation radar:

(a) The navigation radar equipment shall include:

(1) One (1) antenna;

(2) Masthead turning unit;

(3) Transceiver;

(4) Sensor interface unit;

(5) Control panel; and

(6) 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 have an interface to incorporate all navigational data such as latitude/longitudinal position of the Vessel given by the DGNSS receiver, satellite compass, S-AIS, gyro compass and other Equipment;

(f) The Contractor shall ensure that the type and provisions of the radar are appropriate to the class of Vessel;

(g) 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;

(h) 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;

(i) Targets shall be capable of being displayed in an intercept mode during pursuits;

(j) The navigation radar shall be capable of displaying up to 200 or above AIS targets with up to 20 or above active AIS targets;

(k) The navigation radar shall be capable of displaying charts without obscuring the radar image;

(l) The radar shall be capable of supporting both automatic and manual tracking;

(m) The navigation radar shall be capable of displaying targets with both True and Relative Motion vectors;

(n) Target information shall be capable of being communicated via NMEA 2000 (Ethernet) or NMEA0183 to the MARSAS, EOSS systems and searchlight;

(o) 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;

(p) The radar scanner unit shall be installed clear of any obstructions to minimize undue interference and Non-Ionizing Radiation (NIR hazards);

(q) 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;

(r) 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;

(s) The proposed navigation radar shall connect to an Ethernet switch and be capable of multicasting the radar video stream;

(t) 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;

(u) The Equipment shall be powered from the 220V AC system of the Vessel;

(v) 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);

(w) The radar shall be displayed on one or more of the INS displays/monitors as specified in Paragraph 9.3.2 of this Part VII. It shall provide a clear and clutter free picture in all weather conditions and be suitable for both bright daylight and night time viewing. It shall clearly indicate important parameters such as radar targets, range marker, bearing line, heading marker, range rings, guard zones, background and other necessary information;

(x) The navigation radar shall have at least the following operational controls/features:

(1) Operator selection of North Up, Head Up, Course Up;

(2) True Motion (TM) and Relative Motion (RM) modes;

(3) At least four (4) different brightness levels;

(4) Information displaying Vessel's own latitude/longitude, position and speed;

(5) Trails;

(6) Range rings;

(7) At least two (2) Variable Range Markers (VRM);

(8) At least two (2) Electronic Range and Bearing Lines (ERBL);

(9) Manual and automatic rain and sea clutter suppression;

(10) Gain control;

(11) Range up and down;

(12) Target and own ship vectors;

(13) Centre picture, offset picture, maximum view ahead;

(14) Acknowledge alarm;

(15) Panel brilliance;

(16) Target intercept – execute intercept manoeuvres between vessels;

(17) Immediate indication of fast-moving targets;

(18) 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 addition external unit;

(19) Helicopter Approach Sector - used as an aid to guide a helicopter on approach to a selected location;

(20) Position Keeping - used to verify that vessels in a convoy are keeping to their correct position with respect to own ship;

(21) 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;

(22) Navigation lines;

(23) Electronic Cursor;

(24) Track management; and

(25) Target identification - enables the desired on-screen target ID to be displayed by selecting the target information.

(y) On the viewing side of the display unit, the following controls shall be provided:

(1) Power ON/OFF;

(2) Standby/Transmit;

(3) Automatic adjustment of gain, sea and rain clutter to tune and clearly display targets;

(4) True Motion display of the Vessel's movements relative to fixed targets;

(5) Bearing cursor rotation;

(6) Electronic Bearing Line (EBL);

(7) Variable Range Marker (VRM);

(8) Range scale selection;

(9) Display brilliance and illumination;

(10) Selection of background colour and target colour;

(11) Tuning; and

(12) Heading marker ON/OFF.

(z) The navigation radar shall fulfil the following minimum performance requirements:

(1)	Reference:	Magnetic and True North
(2)	Warm-up Time:	< 180 seconds
(3)	Distance Accuracy:	<1% of the range scale in use or 25m whichever is the greater
(4)	Bearing Accuracy:	<1°
(5)	Operational Maximum Wind Speed:	At least 100 knots
(6)	Scanner Size:	≥2.4m (8 feet)
(7)	Scanner Rotation:	28 rpm or 45 rpm
(8)	Beam Width H/V:	≤1°/24°

(9)	Transceiver Output Power:	25kW
(10)	Operating Temperatures:	external equipment –25℃ to +55℃, internal equipment: –15℃ to +55℃.
(11)	Waterproofing	antenna/scanner unit: IP65 or higher

(aa) The OOW or other operators shall be capable of selecting the following modes of presentation at the radar display:

(1) Radar image only;

(2) Plotter image only; or

(3) Plotter image overlaid with radar image.

(bb) The navigation radar shall provide visualization and indication of conning data through an always visible section in the display.

9.10.3 The navigation radar shall equip with an Asterix category 240 video output with Ethernet interface. If not possible a Vessel Radar Interface Unit (VRIU) convertor shall be provided to convert the radar output to Asterix category 240 radar video for interfacing with MARSAS.

9.10.4 The VRIU provided under this Contract shall meet the following minimum requirements:

(a) Able to extract the radar video from the radar transceivers, auto-detect the turning rate of radar antenna and the pattern of the radar video by using the radar trigger, azimuth count pulse, azimuth reference pulse or other signals from the radar transceivers;

(b) Handle of tracks from radar with at least one thousand (1000) moving targets and five hundred (500) stationary targets simultaneously;

(c) Able to form tracks within ten (10) radar turns;

(d) Support the selected Navigation Radar; and

(e) Produce an Asterix CAT240 or equivalent radar signal stream for transmission over IP network.

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 9.3.2 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 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 high performance radar should equip with an Asterix category 240 video output with Ethernet interface. If not possible, a Vessel Radar Interface Unit (VRIU) convertor shall be provided to convert the radar output to the Asterix category 240 radar video for interfacing with MARSAS.

9.11.6 The VRIU provided under this Contract shall meet the following minimum requirements:

(a) able to extract the radar video from the radar transceivers, auto-detect the turning rate of radar antenna and the pattern of the radar video by using the radar trigger, azimuth count pulse, azimuth reference pulse or other signals from the radar transceivers;

(b) handle of tracks from radar with at least one thousand (1000) moving targets and five hundred (500) stationary targets simultaneously;

(c) able to form tracks within ten (10) radar turns;

(d) support selected High Performance Radar; and

(e) produce Asterix CAT240 or equivalent radar signal stream for transmission over IP network.

9.11.7 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%; and

(i) The radar must be able to detect the following small targets as a minimum:

(1) RCS of 2.5m^2 / 2-metre high / small 10-metre boat in sea state 5 and 16mm rain. Minimum Pd of 100% at 4 nautical miles or greater.

(2) RCS of 10m^2 / 2-metre high / speedboat at high speed in sea state 2 and clear Minimum Pd of 100% > 6.5 nautical miles.

9.11.8 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:

(1) Radar;

(2) Chart radar;

(3) ECDIS with radar overlay;

(4) Conning display; and

(5) 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:

(1) In radar and Chart radar 8 levels according to the IMO radar performance standard; and

(2) 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 executing 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 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.

9.11.9 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.

9.11.10 The high performance radar antenna/scanner shall be capable of operating when subjected to vibration and relative wind speeds of up to 100 knots.

9.11.11 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.

9.11.12 The high performance radar shall be capable of being aligned with the heading of the Vessel.

9.11.13 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

9.11.14 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.

9.11.15 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.

9.11.16 The high performance radar scanner unit shall be installed to ensure the scanner mounting does not result in excessive shadow sectors for navigational lights.

9.11.17 The high performance radar scanner unit shall be installed clear of any obstructions to minimize undue interference and Non-Ionizing Radiation (NIR hazards).

9.11.18 The high performance 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.

9.11.19 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.

9.11.20 The Contractor shall provide sufficient vertical and horizontal separation between the navigation radar scanner and the high performance radar scanner to facilitate maintenance works.

9.11.21 The high performance 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, S-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.

9.11.22 The high performance radar shall be powered from the 220V AC system of the Vessel.

9.11.23 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 as well as night time 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 an IMO compliant DGNSS, which fulfils the following general requirements:

(a) The DGNSS shall integrate with radars, S-AIS, ECDIS, VDR, MARSAS and others to provide real time Vessel position and clock signal in the NMEA 0183 and NMEA 2000 formats.

(b) The DGNSS shall include the following;

(1) 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;

(2) Touch screen and/or keyboard;

(3) Compatible with GPS, GLONASS and Beidou satellite positioning systems;

(4) Receiver Autonomous Integrity Monitoring (RAIM) functionality to provide an alert when position accuracy falls below the user pre-set limit.

(5) Displays located at the Wheelhouse Control Station and at the Navigation/Communications Console and anywhere else required by the HKPF;

(6) Automatic, manual or remote dimming;

(7) Integration with S-AIS, radars, ECDIS, VDR, MARSAS and others;

(8) Connectivity between DGNSS antenna/receiver and the radar for the provision of DGNSS related data, such as position fix, time, speed over ground and course over ground;

(9) Fully compatible with the radars;

(10) Support Serial NMEA 0183, Serial 26-pin D-sub, Serial 9-wire RS232, Serial 3-wire RS232 and Ethernet (NMEA 2000); and

(11) The DGNSS shall support at least the following data displayed at the DGNSS multi-function LCD display units and through outputs to the INS;

(i) Position (latitude/longitude): to at least four (4) decimal points;

(ii) Horizontal Position accuracy (at speed of 15kt): less than or equal to 10m;

(iii) Course: 1° resolution;

(iv) Speed: 0.1 knot or 0.1 km/hour resolutions with at least three (3) digits;

(v) Date and time: selectable as GMT or local mode; and

(vi) 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:	1575.42 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 Systems (ECDIS)

9.13.1 Two (2) independent ECDIS systems, one each located in the Wheelhouse Control Station called navigation ECDIS (ECDIS #1) and the Communications/Navigation Officer Control Console to be called second independent ECDIS (ECDIS #2) as specified in Paragraph 9.3.2(b) and 9.3.2(g) of this Part VII respectively. The ECDIS shall be compliant with IMO performance standards (IMO MSC.232 (82)) in the version as at the Contract Date unless the standards specify that version of the standards as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein. The ECDIS images shall be capable of being displayed through the INS on other multifunction display units. 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:

(1) Navigational calculation;

(2) Chart updating;

(3) Piloting; and

(4) Voyage monitoring.

(b) The ECDIS shall be equipped with detailed navigational sea charts covering the entire Hong Kong waters and adjacent 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 direct loading and reading IHO S-57 (Version 3.1 or latest) 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 Marine Department with the capability of displaying updates on the ECDIS; and

(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;

(1) Total Waypoints:	2000 or more
(2) Routes:	50 route plans or more
(3) 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 220V AC via an RO type approved UPS of an appropriate size; and

(d) Environmental

(1) Operating Temperature:	-10˚C to +50˚C
(2) Storage Temperature:	-20˚C to +60˚C

9.13.6 The Contractor shall supply the latest version of Hong Kong Electronic Navigational Chart (ENC) in IHO S-57 data format and in CD-ROM which is issued by Hydrographic Office of Marine Department of HKSAR for at least 12-month to the Government and install the ENC and all ENC updates to all ECDISs. Furthermore, the Contractor shall also supply and install the latest version of South China Sea ENC in all the ECDISs.

9.14 Echo Sounder

9.14.1 The Contractor shall supply and install an IMO compliant Echo Sounder with the sonar unit securely installed on the body of the Vessel. The Echo Sounder shall comply with the following requirements:

(a) The equipment shall consist of transducers and, a graphical and digital depth indictor front panel which is flush 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 1600m 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 to indicate when the Vessel is entering an area with a water 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 within 1% of the measurement;

(e) 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 continue to operate and function as in normal working condition; and

(f) The transducer shall not interfere with or be interfered by other equipment on the Vessel;

(g) 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, DGNSS 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 be connected with 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 knots); and

(c) Resolution: 0.01 knots.

9.15.5 The wind direction sensor shall fulfil the following requirements:

(a) Range: 0-359°;

(b) Accuracy: ± 3°; and

(c) Resolution: 0.1°.

9.15.6 The sensor shall fulfil the following requirements:

(a) IP Rating: IP65 or above; and

(b) Input voltage:12V or 24V DC

9.16 Secure Automatic Identification System (S-AIS)

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. The version of the secure AIS shall be allowed to export to Hong Kong with appropriate licence, as needed;

(c) The S-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 S-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;

(e) The S-AIS shall be capable of operating in at least three (3) modes, including but not limited

to:

(1) Normal mode – function as a normal SOLAS Class A AIS broadcasting and receiving without encryption;

(2) Secure mode – only encrypted AIS data will be broadcast, both encrypted and non-encrypted AIS messages will be received; and

(3) 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 another 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); and

(j) Each set of S-AIS shall include:

(1) A display with minimum dimensions of 250mm x 130mm;

(2) An AIS transponder unit;

(3) A VHF antenna;

(4) A GPS antenna; and

(5) Installation/operation handbook.

9.16.2 The S-AIS shall be capable of the following performance requirements:

(a) General Requirements

(1)	Power Supply:	24V DC
(2)	Default Frequencies:	
	AIS1 (CH 87B):	161.975MHz
	AIS2 (CH 88B):	162.025MHz
	DSC (CH70):	156.525MHz
(3)	Frequency Range:	155-163MHz
(4)	Transponder Size/Weight (+2%):	237mm W x 79mm H x 170mm D, 1.7kg

(b) S-AIS Transmitter

(1)	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 56 time limited keys or above;

(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 DGNSS 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 Vessel.

9.16.6 Each S-AIS shall be supplied 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: 0 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 ohms.

9.16.8 The S-AIS shall provide and install a display unit in the Wheelhouse for operational and system administration of the S-AIS equipment.

9.16.9 The Contractor shall provide and install a secure mode switch on the dashboard to enable the officer to change the operational modes, as specified in Paragraph 9.16.1(e) of this Part VII without having a secure AIS display.

9.16.10 The Contractor shall supply and install external AIS encryption unit for integration with other HKPF systems. The external AIS encryption unit shall be connected to the Vessel's power. The external AIS encryption unit shall be a rugged, compact and slim computer that fulfils the following minimum requirements:

(a) CPU: Intel Core i7

(b) Memory: 16GB

(c) I/O interface: 2xRS232/422/485
2xUSB 2.0

(d) Storage: 6Gbps SSD hard disk

(e) Ethernet: 1xGE

(f) Power: 9V to 36V DC, Max 30W

(g) Operating System: Windows 10 / Linux

(h) Operating Temperature: -30C to 70C

(i) Shock: IEC 60068-2-27

(j) Vibration: IEC 60069-2-64

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) Waterjet RPM;

(e) Rate of turn indicator;

(f) Waterjet angle;

(g) Fuel consumption;

(h) CCTV; and

(i) Other information deemed necessary by the HKPF, GNC or proposed by the Contractor.

9.18 Speed and Distance Through Water Device

9.18.1 A device shall be fitted to measure speed and distance through the water and shall 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 any one RO listed in Annex 9 of this Part VII.

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 Global Maritime Distress and Safety System (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 shall be included 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:

(1) Power ON/OFF;

(2) Transmit indicator, volume and squelch controls;

(3) Socket for microphone and external speaker plugs;

(4) Quick selector for Channel 16 and the programmed call channel;

(5) Channel selector and indicator;

(6) Independent dual watch mode selection switch;

(7) Transmission power selector for HIGH and LOW Power (25 W/ 1 W); and

(8) Replay the last 240 seconds or longer of received voice messages.

(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; and

(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

(1) Frequency Range:	156.000MHz to 157.425MHz, or wider
(2) Frequency Deviation:	Frequency modulation with maximum frequency deviation of +5 kHz
(3) Spurious and Harmonics:	-60dB or better
(4) 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

(1) Frequency Range:	156.000 MHz to 163.425 MHz or wider
(2) Sensitivity:	Less than -119dBm for 20 dB SINAD or equivalent
(3) Adjacent Channel Selectivity:	65dB or better
(4) Spurious Image Rejection:	65dB or better
(5) Intermodulation:	65dB or better
(6) Audio Output:	At least 0.2 watt at rated output with less than 10% distortion.

(c) Aerial and Feeder

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

(2) The VSWR of the aerial and cabling as installed shall be less than 1.5:1;

(3) The aerial feeder shall be RG58U type or equivalent; and

(4) 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

(1) 6W or above.

9.21 Marine Band Hand-held Waterproof VHF Radio Transceiver

9.21.1 General Requirements

(a) The Contractor shall provide four (4) GMDSS IMM VHF waterproof handheld transceivers. Their battery chargers shall be installed and connected to the dedicated power sockets in the Control Area of the Wheelhouse. The exact installation locations of the battery chargers are to be discussed and confirmed during the kick-off meeting;

(b) Each portable IMM VHF transceiver shall be of proprietary make and complete with two sets of rechargeable batteries, battery charger, helical antenna with VSWR 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, lightweight 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 a software programmable carrier frequency type. Add-on crystal for carrier frequency will not be acceptable; and

(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:

(1) Power on/off button;

(2) Volume control;

(3) High/low transmitting power switch;

(4) Press to talk switch;

(5) Built-in microphone and loudspeaker;

(6) Channel selector operating channel display; and

(7) Sockets for external microphone, press to talk and loudspeaker.

(b) The transceiver shall comply with the following:

(1) Operating frequency range: International Maritime VHF Band;

(2) No. of Operating Channels: 99 (programmable);

(3) Channel spacing: 25kHz; and

(4) Housing IP Category: IP 57.

9.22 Government Mobile Data Equipment and Antennae

9.22.1 The Contractor shall provide five (5) sets of Government Mobile Data Equipment and Antennae, one (1) each for MARSAS Terminal 1 at the Wheelhouse, MARSAS Terminal 2 at the Command and Control Suite, Video Conferencing at the Command and Control Suite, internet access Wi-Fi service in the Command and Control Suite, and internet access for other HKPF special IT systems.

9.22.2 Each set of Government Mobile Data Equipment and Antennae shall include the following equipment:

(a) Encrypted mobile router;

(b) Antennae; and

(c) Ethernet switch(es).

9.22.3 The encrypted mobile router shall meet the following minimum specifications:

(a) Wide Area Network (WAN) Interface:

(1) 3 x Embedded 5G modems with Multi-input Multi-output (MIMO) antennae. The model of 5G modems shall support

i) 5G Bands: n1, n2, n3, n5, n7, n8, n12, n20, n28, n38, n40, n41, n48, n66, n71, n77, n78, n79 or more bands according to ETSI Technical Specification 38.101-1 version 15.3.0 release 15,

ii) LTE Band: 2, 4, 5, 7,14, 17, 27, 38, 39, 40, 41, and

iii) 3G Band: B1, B2, B4, B5, B6, B8, B9, B19;

(2) 1 x Embedded 4G TD-LTE Modem with MIMO antennae. The 4G modem shall support TD-LTE with operating frequency band between 1.785 GHz to 1.805 GHz;;

(3) 1 x 10/100BaseTX Gigabit Ethernet; and

(4) 1 x 802.11a/b/g/n WAN interface with MIMO antennae.

(b) Ethernet interface:

(1) 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

(2) 1 x 802.11a/b/g/n interface with MIMO antennae.

(c) Requirement:

(1) Load Balancing;

(2) IPv4 and IPv6 support;

(3) USB or equivalent LTE/3G Modem support (3G Band: 1, 2, 4, 5 and 8);

(4) WAN/Mobile Bandwidth Bonding which is compatible with the Multi-Wan Bonding router;

(5) IPsec VPN;

(6) 256-bit AES Encryption;

(7) PPTP VPN Server;

(8) QoS for VoIP; and

(9) Speed Fusion connections to existing HKPF router (Peplink380)

(d) Environmental:

(1) The encrypted mobile router specified at Paragraph 9.22.2(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;

(2) Operation temperature at least between -20℃ and +65℃; and

(3) Humidity: 15% – 95% (non-condensing).

(e) The WAN modules shall be pluggable in encrypted mobile routers. The Government reserve the right to request the Contractor to change or upgrade any WAN models as specified in Paragraph 9.22.3(a) of this Part VII with no extra cost to the Government after contract award.

9.22.4 The Contractor shall provide six (6) pairs of weatherproof MIMO antennae as specified in Paragraphs 9.22.3(a) and 9.22.3(b) of this Part VII for each set of Government Mobile Data Equipment. The MIMO antennae and feeder cables shall also support Hong Kong 5G mobile system frequency bands.

9.22.5 The weatherproof MIMO antennae for the WAN interfaces as specified in Paragraphs 9.22.3(a) of this Part VII shall be installed in/on the mast or rooftop of 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 For the Government Mobile Data Equipment dedicated for MARSAS Terminal in the Wheelhouse, the weatherproof MIMO antennae for Ethernet interface as specified in Paragraphs 9.22.3(b) of this Part VII shall be installed on the ceiling of the Wheelhouse. The installation location of the MIMO antennae shall provide full Wi-Fi coverage in the Wheelhouse. The Contractor shall provide and install cables, as well as connect the cables to the antennae and encrypted mobile router.

9.22.7 For the Government Mobile Data Equipment dedicated for Video Conferencing at Command and Control Suite, and internet access Wi-Fi service in the Command and Control Suite, their individual weatherproof MIMO antennae for Ethernet interface as specified in Paragraphs 9.22.3(b) of this Part VII shall be installed on the ceiling of the Command and Control Suite. The installation location of the MIMO antennae shall provide full Wi-Fi coverage for the dedicated systems in the Command and Control Suite. The Contractor shall provide and install cables, as well as connect the cables to the antennae and encrypted mobile routers.

9.22.8 The Government Mobile Data Equipment dedicated for internet access for other HKPF systems shall be installed in the Server Room and shall provide CAT6e cables to connect to the patch panel(s) as specified in Paragraph 9.22.12 of this Part VII.

9.22.9 The Vessel's electronic equipment including the radars, 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 9.22.2(a) of this Part VII.

9.22.10 The Contractor shall provide additional waterproof Ethernet switches if more Ethernet connection ports are required.

9.22.11 The Contractor shall reserve at least three (3) 10/100BaseTX Fixed ports with Power over Ethernet for future system use.

9.22.12 The Contractor shall supply a 24-port CAT6e rack mounted patch panel including all associated accessories and complete installation in the equipment rack in the Server Room. The Contractor shall supply and install twenty-four (24) CAT6e cables, one end of the cables shall be terminated at the patch panel in the Server Room, the other end of the cables shall be located in the selected connection locations of the Vessel and terminated with CAT6e Ethernet socket wall mounted faceplates. The exact cable termination locations shall be discussed during the kick-off meeting.

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, excluding crew resting areas and the Command and Control Suite.

(a) The locations of the CCTV cameras shall be determined with the HKPF either in the kick-off meeting after the Contract has been awarded or during the design phase of the Vessel; and

(b) Unless otherwise specified, all CCTV cameras shall comply with the following minimum technical requirements:

(1) All cameras shall be IP based, high definition cameras (minimum 1920 x 1080p), waterproof to IP67 or above, vandal-resistant type, Infrared Cut Filter (ICR) day and night dome pan-tilt-zoom cameras. They shall be of a marine type and shall be suitable for operation in a rough sea environment;

(2) All cameras shall have an image stabilization function to accommodate rough sea conditions;

(3) All cameras shall be capable of covering diagonal views using wide angle lenses or standard lenses according to the actual conditions;

(4) All camera images shall be recorded within a Digital Video Recorder (DVR);

(5) 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;

(6) CCTV images shall be displayed on relevant multi-function displays on the Wheelhouse Control Station and the INS. The CCTV system shall allow the operator to select exterior CCTV views of the port/starboard/ aft areas and interior CCTV images to be displayed on the overhead monitors. Interior CCTV images shall also be displayed at the Engineering Officer's Console;

(7) 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;

(8) The CCTV system shall be equipped with a control panels or virtual control panels, installed in the Wheelhouse to allow the operator to select and control the pan-tilt-zoom function of the selected camera. These requirements and number of control panels and location of control panels will be discussed further during the design phase;

(9) The CCTV system shall be capable of providing an instant playback function from the video file recorded in the DVR; and

(10) 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:

(1) At least two (2) cameras on the port side;

(2) At least two (2) cameras on the starboard side;

(3) At least one (1) camera facing aft for navigation purposes;

(4) At least one (1) camera facing the helicopter winching area;

(5) At least one (1) camera facing the Davit LARS system;

(6) At least one (1) camera facing the crane LARS system;

(7) At least one (1) camera facing forward to view operations on the bow;

(8) At least two (2) cameras in the Engine Room;

(9) At least one (1) camera in each of Bow Thruster Room;

(10) At least one (1) camera in each Steering Gear Room;

(11) At least one (1) camera in the Wheelhouse;

(12) At least one (1) camera in the Weapons and Ammunition Storeroom;

(13) At least one (1) camera in the Pyrotechnics Storeroom;

(14) At least one (1) camera facing the entrances to the Weapons and Ammunition Storeroom and the Pyrotechnics Storeroom. In case of one (1) camera cannot cover both entrances, an addition camera shall be used; and

(15) 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 GNC and he HKPF at no extra cost to the Government.

(b) A dedicated CCTV 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 in adverse weather conditions;

(c) Control and monitoring of the CCTV system shall be performed from the Wheelhouse; and

(d) The CCTV system shall integrate with the INS so that all the CCTV cameras can be displayed on any multifunction display units.

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)

(1)	Recording period:	720 hours or better
(2)	Recorded media:	Removable Solid State Drive
(3)	Built in UPS:	Two (2) hours or above
(4)	Number of audio interface inputs:	Ten (10) or above
(5)	Number of serial data inputs:	Twelve (12) or above
(6)	Number of Ethernet data inputs:	Seven (7) or above
(7)	Interface:	Support NMEA 0183 or NMEA 2000 (Ethernet base)
(8)	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 specifies 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 shall include at least the following records:

(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;
(l) Speed log;
(m) Data from Monitoring and Control System (MCS) (details shall be finalised in kick-off meeting);
(n) Fire detection and alarm system;
(o) Water mist firefighting and alarm system;
(p) Watertight door indicator;
(q) Navigation & signal lights panel; and
(r) Bilge alarm system.

9.24.4 The Contractor shall provide and install a VDR alarm unit in the Wheelhouse to alert the crew in the event that the VDR has failed.

9.24.5 The Contractor shall provide a laptop computer with installed playback software for extracting, recognising and playing back the recorded files and data contained therein from the VDR. Extraction of data from the VDR shall be possible via USB or equivalent. The perpetual license shall be provided if a license to use and/or update the playback software, operating system and anti-virus definition update is required. HKPF shall not be required to pay any periodic fees and charges for using the system.

9.25 Electro Optical Sensor System (EOSS)

9.25.1 The Contractor shall provide and install an EOSS System with the following key components:

(a) One (1) daylight camera;
(b) One (1) cooled Thermal Imaging (TI) camera;
(c) Laser range finder (LRF);
(d) Pan-tilt pedestal with stabilization (Pedestal);
(e) On-board control comprising central equipment, uninterrupted power supply and control panel ("On-board Control Unit"); and
(f) Video Player and Recorder.

9.25.2 General requirements:

(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 66 or higher meeting the weather and environmental conditions expected at the operational locations. The EOSS shall be fully capable of operating under WMO Sea State 5 and surviving without damage under WMO Sea State 7, as defined in Annex 8 of this Part VII;

(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 waters. The Contractor shall pay 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 on the roof of the Wheelhouse. The Contractor shall propose appropriate installation locations, either on the mast or on 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 the 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) NMEA 0183 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 or H.265 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 as specified in paragraph 9.3.2 of this Part VII;

(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 normal operating conditions, 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 three (3) seconds;

(m) The EOSS shall have two dedicated power switches extended on the control panel of On-

board Control Unit to perform the functions of (a) power on / off the entire the EOSS and (b) power on / off the cooled TI Camera Unit only. Where the cooled TI Camera Unit is powered off, it shall not affect the power supply to other components of the EOSS;

(n) 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 the use during maintenance of the EOSS equipment or in the event of an emergency;

(o) The 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.

(p) The EOSS shall be capable of powering up for operation within one (1) minute, except the cooled Thermal Imaging (TI) Camera Unit, and show the video on the display unit thereafter;

(q) The Contractor shall design and install the pedestal together with daylight camera, cooled TI and LRF at the best mounting position such that the views from both the daylight camera, cooled TI shall have no blind sector arcs forward of 22.5 degrees abaft the beam within a sector of 225 degrees centred at the bow of the vessel; and

(r) Both daylight camera, cooled TI and any parts of the EOSS mounted outdoor shall be designed as maintenance free without the need for frequent or daily manual cleaning of lenses. In case any such cleaning is required, it shall be carried out mechanically with control activated at the control panel of the EOSS.

9.25.3 Daylight Camera

(a) The daylight camera shall be of colour type, compact, auto-focus, ruggedized and designed for surveillance applications;

(b) The daylight camera shall be able to zoom in or out continuously between the narrow and wide fields of view. The minimum optical field of view, from narrow to wide, shall cover narrow field of view of 1.7 degrees (horizontal) and wide field of view of 60 degrees (horizontal) or wider range;

(c) The daylight camera shall have auto-defogging capability for providing clear video even under foggy or misty environmental conditions;

(d) 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;

(e) 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;

(f) The daylight camera shall switch to black and white mode automatically under low light conditions;

(g) 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;

(h) The daylight camera shall include all necessary optical lenses that form an integral part of the EOSS;

(i) The daylight camera shall provide profiles with adjustable frame rate and resolution or provide multiple video steams for of different frame rate and resolution for display unit locally and remote transmission;

(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; and

(k) The daylight camera shall meet the following technical requirements:

(1)	Image Sensor:	At least 1/1.8", colour operation
(2)	Resolution:	3840 (horizontal) x 2160 (vertical) pixels or more
(3)	White balance:	Fixed or full-time automatic
(4)	Minimum sensitivity:	0.15 lux or lower for colour operation and 0.005 lux or lower for black and white operation
(5)	Aperture ratio:	Cover the range from F1.4 to F5.0 or wider
(6)	Backlight compensation:	Auto adjust, on/off selectable

9.25.4 Cooled Thermal Imaging (TI) Camera Unit

(a) The cooled TI shall be capable of focusing in a range from infinity to thirty (30) metres or closer in the narrow field of view (FOV), and in a range from infinity to two (2) metres or closer in the wide FOV. When focused to the infinity, the combination of lenses and other components of the cooled TI shall compensate possible changes of focus over the operating temperature range;

(b) The cooled TI shall include be of modular construction including optical lenses, cooled type thermal detector, cryocooler, main unit, cast and housing;

(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-five (25) 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 twenty-four (24) hours per day, seven (7) days per week continuously;

(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 time conditions and even under conditions of poor visibility;

(j) The cooled TI camera unit shall incorporate a cryocooler 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 pixels (horizontal) x 480 pixels (vertical), 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 shall equip with appropriate lens to achieve optical zoom in or out continuously between the narrow and wide optical field of view (FOV). The minimum optical FOV, from narrow to wide, shall cover a narrow FOV of 1.8 degrees (horizontal)

and wide FOV of 36 degrees (horizontal);

(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 seven (7) minutes of powering up the cooled TI camera unit; and

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.

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 better than or equal to two (2) m for a target of size 2.3 m x 2.3 m positioned within ten (10) km away;

(c) The LRF shall have a working range of up to twenty (20) kilometres;

(d) The LRF shall be of an eye-safe type and comply with the IEC 60825-1 requirements; and

(e) The LRF shall produce the figures of target distance and location within one (1) second on the display unit when it is triggered by the operator. The target distance shall be presented in nautical miles and metres. The target location shall be presented in degree, minute and second according to its longitude and latitude.

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 three hundred (300) 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 forty (40) degrees up and forty (40) degrees down with stoppers to prevent any limit violations;

(d) The Pedestal shall have an electro-mechanical stabilizer with a line of sight angular stabilization higher than 0.4mRad;

(e) The Pedestal shall achieve pointing accuracy in both azimuth and elevation higher than 0.1mRad.

(f) The Pedestal's free drift shall be less than fifteen (15) degrees per hour;

(g) 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;

(h) 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;

(i) The Pedestal shall have the following modes selectable by the operator:

(1) Manual: Manual control of pan and tilt; and

(2) Stabilised: Stabilised against roll, pitch and yaw of the Vessel.

(j) The Pedestal's current pan and tilt angles shall be shown on the display unit.

9.25.7 Central Equipment, Uninterrupted Power Supply, Control Panel and integration with multifunction displays.

(a) One (1) set of central equipment, including the control panel, shall be located in the EOSS Operator's position at 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 Contractor shall integrate the EOSS with multifunction displays at the EOSS Operator consoles in the Wheelhouse and, Command and Control Suite specified in paragraphs 9.3.2(f) and (k) of this Part VII respectively;

(c) The following functional switches / controls shall be available on the EOSS control panel for the operation of the EOSS:

(1) Power on/off switch for the EOSS with protection cover;

(2) Power on/off for the cooled TI camera unit with protection cover;

(3) Gain control for the cooled TI camera unit;

(4) Offset Control for the cooled TI camera unit;

(5) Video polarity for the cooled TI camera unit;

(6) Focus control for the cooled TI camera unit and daylight camera;

(7) Button control for pan and tilt, in addition to joystick control;

(8) Pan and tilt sensitivity control for the joystick;

(9) Daylight camera mode switch (colour or black/white mode);

(10) Tracking control for video and radar tracking;

(11) Stabilization on or off;

(12) Pedestal 'Stow' control;

(13) Pedestal 'Home' control;

(14) Video recording and playback controls;

(15) Main menu control;

(16) EOSS diagnosis button; and

(17) Joystick.

(d) The following functional switches and controls shall be available on the joystick of the EOSS control panel:

(1) Pan and tilt control;

(2) Zoom control for the cooled TI camera and daylight camera;

(3) Daylight camera or TI camera selector switch; and

(4) Activation for the LRF.

(e) A sample layout of the switches and controls on the control panel has been illustrated on Figure 9.3 below

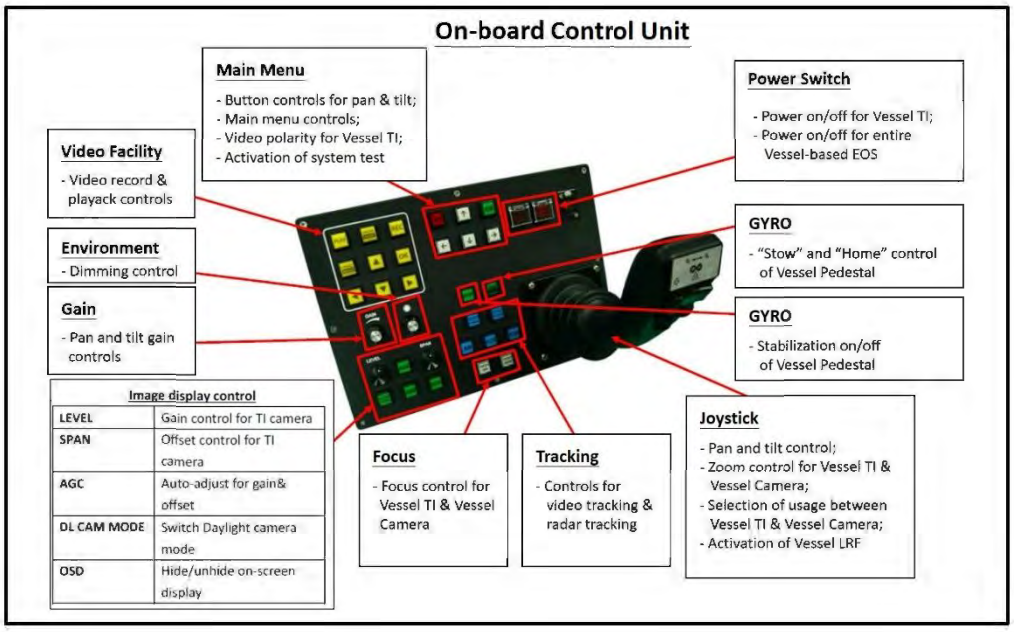


Figure 9.3 – Sample layout of the control panel

(f) The multifunction display 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;

(g) The multifunction display 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 smaller window shall present the daylight and cooled TI camera units respectively or vice-versa;

(h) The multifunction display shall present the following information, inter alia, on the screen:

(1) GPS position (latitude and longitude) of the Vessel;

(2) GPS position (latitude and longitude) of the target when the tracking function is on;

(3) Elevation and zoom level of the TI and daylight cameras;

(4) True bearing of the pedestal / bearing to observed target; and

(5) GPS derived local date and time.

(i) 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 H.264 and H.265 compression suitable for installation onboard the Vessel; and

(b) Performance requirements:

(1) 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 capable of being operated by personnel unskilled in video and audio recording;

(2) 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;

(3) The video player and recorder shall have password protection and watermark data authentication security features;

(4) The video player and recorder shall support resolution of at least 3840 x 2160 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;

(5) The video player and recorder shall both be of a high-speed quick start type so that the hard disk can be ready for recording within one minute after the power is switched on;

(6) The video player and recorder shall support high speed read/write such that backup videos from its internal hard disk to any removable storage, e.g. password protected flash drive with USB 2.0 or later version and SD card up to class UHS-3, and could be carried out according to the maximum transfer speed of the removable storage; and

(7) 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.

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; and

(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

(a) The EOSS shall have a radar tracking function, which enables an operator to select any target from potential targets identified by navigation radar for display 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; and

(c) A 'Radar Track' button on the control panel shall be provided to enable the radar tracking function as specified in paragraph 9.25.10(a). A 'Release' button on 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 directly 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 comply with the following:

(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; and

(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 incoming calls;

(c) Step volume control;

(d) Push-to-talk button; and

(e) Call signal button.

9.26.5 The talkback stations, which is 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 including but not limited to;

(a) Wheelhouse;

(b) Wheelhouse Engine Remote Control Console;

(c) Each of the Crew Cabin;

(d) Commander's Cabin;

(e) Mess Room;

(f) Command and Control Suite;

(g) Weapons and Ammunition Store;

(h) Briefing and Standby Area;

(i) Engine Room Control Office;

(j) Evacuation Zone;

(k) First Aid Room;

(l) Each of the Underdeck Compartments;

(m) A minimum of two (2) stations at the external upper deck; and

(n) A minimum of six (6) stations at the external main deck.

Reference shall also be made to Chapter 4 of this Part VII. Details of the number of talkback stations required, and their installed locations shall be finalised in the kick-off meeting. No additional costs associated with the number of talkback stations required shall be chargeable to the Government

The talkback stations shall include speakers of 10W or more and be associated with Combined Audible devices (Call Alert with Flashing Light & Ringer) and Portable Headsets for the use in noisy 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 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% of the main deck area and within 50m of the Vessel in an unobstructed view.

9.26.10 The Talkback System shall equip with mobile gateway such that the external personnel can make voice telephone calls to the dedicated talkback stations of Talkback System and make public address announcements via the Public Address System over Hong Kong public 4G or above mobile network.

9.26.11 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. The battery chargers shall be fixed and connected to dedicated power sockets at the Wheelhouse.

9.26.12 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.

9.27 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 bands, UHF aviation bands and Cospas-Sarsat frequencies;

(b) Be able to automatically monitor emergency frequencies whilst other frequency bands are being monitored;

(c) Integrated with satellite and DGNSS via NMEA 0183 /2000 providing relative bearing and true bearing;

(d) Provide normal mode and standby mode; and

(e) Be equipped with a display unit having 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 Video Conference System

9.29.1 The Contractor shall provide and install one (1) Video Conferencing End-Point Unit in the Command Office of Command and Control Suite, such that it shall be fully interoperable/compatible with the existing Video Conferencing System of the HKPF. It shall incorporate two network interfaces of 10/1000 Base-T full-duplex (RJ-45) and Multipoint Control Unit (MCU) functionality to enable users to host video conference for remote End-Point Units on private network and public network simultaneously (i.e. multi-parties conference at private networks and public networks). The existing model of Video Conferencing End-Point Units to be used in Video Conferencing System of the HKPF is AVAYA Scopia XT5000.

9.29.2 The Video Conferencing End-Point Unit shall contain licenses required for the MCU implementation that support hosting one multi-party conference with at least 3 remote End-Point Units across the private network and public network simultaneously.

9.29.3 Each Video Conferencing End-Point Unit shall include:

(a) One (1) set of 10 times or more optical zoom HD Pan/Tilt/Zoom Camera;

(b) One (1) set of 3 Way Microphones (360 degree voice pick up);

(c) Support H.323 & SIP protocol;

(d) Support H.460 NAT/Firewall traversal;

(e) Support H.323, SIP and H.320 mixed mode; and

(f) Support AES encryption standards with automatic key generation and exchange.

9.29.4 The Video Conferencing End-Point Unit shall be able to conduct H.323 videoconference sessions for all participants via AES encrypted connection, in both point-to-point calls and videoconferences.

9.29.5 The Video Conferencing End-Point Unit and accessories shall be new and free from all defects and imperfections and shall not have been in prior service.

9.29.6 The Contractor shall provide and install one (1) set of Government Mobile Data Equipment and Antennae as specified in Paragraph 9.22 of this Part VII dedicated for video conference connection between the Video Conferencing End-Point Unit and the Video Conferencing System of the HKPF over 4G mobile networks. The Contractor shall connect the Video Conferencing End-Point Unit to an encryption mobile router through Cat6 network cable.

9.29.7 The Contractor shall integrate the Video Conferencing End-Point Unit to the existing Video Conferencing System of the HKPF and conduct a multi-conference commissioning test, through the 4G mobile network during the on-site commissioning test.

9.29.8 The Contractor shall install the Video Conferencing End-Point Unit and associated equipment, as specified in Paragraph 9.29.4 of this Part VII, securely and integrate both video and audio with a multi-touch multifunction display as specified in Paragraph 9.3.2(n) of this Part VII.

9.30 Television Receivers

9.30.1 The Contractor shall provide a television system, which shall receive Hong Kong television signals and distribute both audio and video to multifunction displays at the Command and Control Suite as specified in Paragraph 9.3.2(m) and (n) of this Part VII and multi-touch multifunction display at the Briefing & Standby Area as specified in Paragraph 9.3.2(o) of this Part VII, and integrate such with the INS. The television system shall allow the crew to switch television channel independently on the above multifunction displays.

9.30.2 The television system shall include antenna, signal amplifier, splitters, lighting arrestor/ dissipater and cables to provide television signal to the locations as specified in Paragraph 9.30.1 of this Part VII.

9.30.3 The Contractor shall provide and install a Digital Multimedia Broadcast - Terrestrial/Handheld (DMB-TH) television tuner to provide signal to the multifunction displays as specified in Paragraph 9.30.1 of this Part VII and the INS.

9.30.4 The television antenna shall be wide band, rigid, non-corrodible maintenance free, and for maritime use. The television antenna shall meet the following requirements:

(a) Frequency range: 40-860 MHz;

(b) Output impedance: 75 ohms; and

(c) Directional: Omni

9.30.5 The television antenna shall be located as high as possible for to optimise the signal reception.

9.31 Satellite Communications System

9.31.1 The Contractor shall supply and install a Satellite Communications System (SATCOM) including all associated equipment and cables, and interface the SATCOM with the encrypted mobile router, as specified in Paragraph 9.22.2(a) of this Part VII as an additional communications bearer for communications from the Vessel to shore.

9.31.2 The SATCOM equipment e.g. routers, shall be installed in an equipment rack in the Server Room specified in Paragraph 4.3 of this Part VII. The SATCOM antenna shall be fitted on board the Vessel, either on the Wheelhouse roof or mast.

9.31.3 The SATCOM equipment shall be powered by 200 to 220V AC or 24V DC vessel power with power rectifier.

9.31.4 The Contractor shall integrate the SATCOM with onboard heading devices e.g. gyro compass system and satellite compass as specified in Paragraph 9.7 and 9.9 of this Part VII respectively for locking onto satellites.

9.31.5 The Contractor shall:

(1) Supply and install the SATCOM equipment specified in Paragraph 9.31 of this Part VII;

(2) Coordinate and finalize the positions of the SATCOM equipment during the detailed system design stage;

(3) Supply sufficient equipment racking, as specified in Paragraph 4.3.6 of this Part VII, for the installation of the SATCOM equipment;

(4) Supply a mounting pedestal of sufficient structural strength to be fitted to the Wheelhouse roof top 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;

(5) Supply and install all power, grounding and cables; and

(6) Submit design description, schematic diagrams, hardware and software specifications, installation drawings and integration design including but not limited to encrypted mobile router and onboard heading devices to the HKPF for approval within the time specified by the HKPF and prior to the commencement of any such work during the design stage.

9.31.6 The SATCOM to be used by HKPF should be operated in Ku-band, L-band or Ka band. The exact brand and model of SATCOM to be finally used by HKPF will be provided during kick-off meeting. The Government shall have the right to change the model of the SATCOM equipment and SATCOM equipment installation requirements as specified in Paragraph 9.31 of this Part VII before the detailed system design is finalised and the change requests shall not incur additional cost to the Government.

9.32 Installation/Space/Cabling for the HKPF MRCS, CC3, MARSAS, HKPF Special Operation Mobile Radio, HKPF Special Operation Radio Repeater and other Police Special IT Equipment

9.32.1 At no extra cost to the Government, the Contractor shall install onto the Vessel with four (4) HKPF Marine Radio Communications Systems (MRCS) radio terminals. Two (2) each to be located at the Communication/Navigation Officer Console in the Wheelhouse and the Communication Area of the Command and Control Suite, in accordance with the following:

(a) The present equipment is TETRA mobile radio with separate control panel and speaker box. The MRCS radio terminal is a wide-band version with a frequency range of 380 MHz to 430 MHz and is powered by a +12V DC nominal supply. The HKPF will provide exact model of the MRCS radio terminal, at least three months in advance of the on-site installation of the MRCS radio terminal. No additional costs associated with the installation of a radio of a different type shall be chargeable to the Government; and

(b) The Contractor shall

(1) Reserve sufficient space for the installation of the MRCS radio terminals by COMMS of the HKPF;

(2) Supply mounting brackets for the MRCS radio installation;

(3) 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;

(4) Supply and install all power converters and power supply terminals necessary for the MRCS radios installation; and

(5) Supply and install four (4) 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.

(c) COMMS shall:

(1) Supply the MRCS radios and accessories;

(2) Connect up the MRCS radios and accessories using the connectors, cables and wires installed by the Contractor;

(3) Test the VSWR of the RF cables and UHF antennae to confirm that neither exceeds 1.5; and

(4) Commission the MRCS radios.

9.32.2 At no extra cost to the Government, the Contractor shall install two (2) HKPF Third Generation Command and Control Communications System (CC3) radios onto the Vessel. One (1) each is to be located in Communication/Navigation Officer console in the Wheelhouse and the Communication Area of Command and Control Suite, in accordance with the following:

(a) The present equipment includes the Motorola TM5000 TETRA two-way mobile radio with separate control panel and speaker box. The MTM5000 mobile radio is a wide-band version with a frequency range of 403 MHz to 430 MHz and is powered by a +12V DC nominal supply. The HKPF reserves the right to use other radios in place of the present MTM5000, provided that the Government notifies the Contractor at least three months in advance of the on-site installation of the CC3 Radio. No additional costs associated with the installation of a radio of a different type shall be chargeable to the Government and

(b) The Contractor shall:

(1) Reserve sufficient space for the installation of the CC3 radios by COMMS of the HKPF;

(2) Supply mounting brackets for the CC3 radio installation;

(3) Supply and install all RF signal, power and grounding cables and wires. COMMS will provide the specifications of all of the RF cables and connectors to the Contractor;

(4) Supply and install all power converters and power supply terminals necessary for the CC3 radios installation; and

(5) Supply and install two (2) UHF antennae for one (1) each of the CC3 radios. The UHF antennae shall have an impedance of 50 ohms, unity gain and a frequency range of 403 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 these UHF antennae to protect the radio equipment from lightning surges.

(c) COMMS shall:

(1) Supply the CC3 radios and accessories;

(2) Connect up the CC3 radios and accessories using the connectors, cables and wires installed by the Contractor;

(3) Test the VSWR of the RF cables and UHF antennae to confirm that neither exceeds 1.5; and

(4) Commission the CC3 radios.

9.32.3 The Contractor shall facilitate the installation by the HKPF Marine Situational Awareness System (MARSAS) Contractor of two (2) on-board MARSAS equipment and two (2) MARSAS Terminals to be interfaced with the INS, where approved and displayed on the multi-function displays in the Wheelhouse and in the Command and Control Suite. MARSAS can be installed later as the installation of MARSAS is under HKPF or HKPF's other contractor scope but the Contractor is required to supply infrastructure for MARSAS as stated in this Paragraph 9.32.3. This same requirement shall apply to any other equipment expressly stated to be provided by HKPF in this Chapter 9. The conceptual system interface diagram between the Vessel and MARSAS (see Figure 9.4 below) illustrates the system integration, comprising the following;

(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 Terminals 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 4.3 of this Part VII. The MARSAS terminals and associated equipment shall be installed in the Wheelhouse and in the Command and Control Suite at the Operations/EOSS Operator's Console;

(c) The on-board MARSAS equipment, including the MARSAS terminals, will be powered by 200 to 240V AC and / or 24V DC;

(d) The MARSAS Terminal shall be installed in console table in the Wheelhouse and the Command and Control Suite;

(e) The Contractor shall:

(1) Coordinate and finalize the positions of the on-board MARSAS equipment and the MARSAS Terminals with HKPF during the detailed system design stage of the Vessel;

(2) Supply at least one (1) equipment rack in the Server Room as specified in Paragraph 4.3.6 of this Part VII for the installation of the MARSAS equipment and reserve sufficient space in the Wheelhouse and in the Command and Control Suite for the installation and integration of the MARSAS terminal;

(3) Supply and install all power, grounding and data cables. COMMS will provide the specifications of all the cables and connectors to the Contractor;

(4) Supply and install all power converters and power supply terminals necessary for the on-board MARSAS equipment and MARSAS Terminals installation;

(5) Ensure that all the cable trunks shall be accessible and allow unimpeded access for the HKPF MARSAS Contractor to install cables as necessary;

(6) Provide an Asterix Category 240 Ethernet interface for the radar as specified in Paragraphs 9.10.3 and 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;

(7) Provide navigational information, including but not limited to DGNSS, satellite compass and AIS in NMEA 0183 and / or NMEA 2000 (Ethernet base) interfaces;

(8) For each MARSAS Terminal, 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 the MARSAS control of the EOSS;

(9) Provide one (1) Ethernet interface from the EOSS for both the daylight camera video and TI camera video;

(10) For each MARSAS Terminal, provide two (2) video input ports from the INS to extend MARSAS Terminal videos to other display units within the Vessel;

(11) For each MARSAS Terminal, provide one (1) video input port in the MARSAS display unit and the EOSS display unit as specified in Paragraphs 9.3.2(f) and 9.3.1(k) of this Part VII for the direct connection of the MARSAS Terminal video to these two (2) display units;

(12) Ensure that the MARSAS display unit and EOSS display unit can be displayed on all multi-function displays in the Wheelhouse via the INS;

(13) Provide one (1) 10/100BaseTX Fixed port from the encrypted mobile routers of the MARSAS Terminal at the Wheelhouse and from the encrypted mobile routers of the MARSAS Terminal at the Command and Control Suite as specified in Paragraph 9.22.2(a) of this Part VII. This Ethernet port shall be located in the MARSAS equipment rack in the Server Room;

(14) For each MARSAS Terminal, other than the mouse and keyboard of the MARSAS Terminal, provide one (1) USB 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;

(15) For each MARSAS Terminal, provide one (1) pair of loud 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;

(16) Provide one (1) Cat6e 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 in the Command and Control Suite; and

(17) All Operational Systems interface ports locations and types for MARSAS Terminals shall be discussed and confirmed during the kick-off meeting. The signals drawn from these interface ports for the MARSAS shall not affect the normal operation of the corresponding Command and Control System.

(f) COMMS shall:

(1) Supply the MARSAS Terminals and accessories;

(2) Install and connect up the MARSAS Terminals and accessories using the connectors, cables and wires installed by the Contractor; and

(3) Commission the MARSAS Terminals with the core MARSAS system.

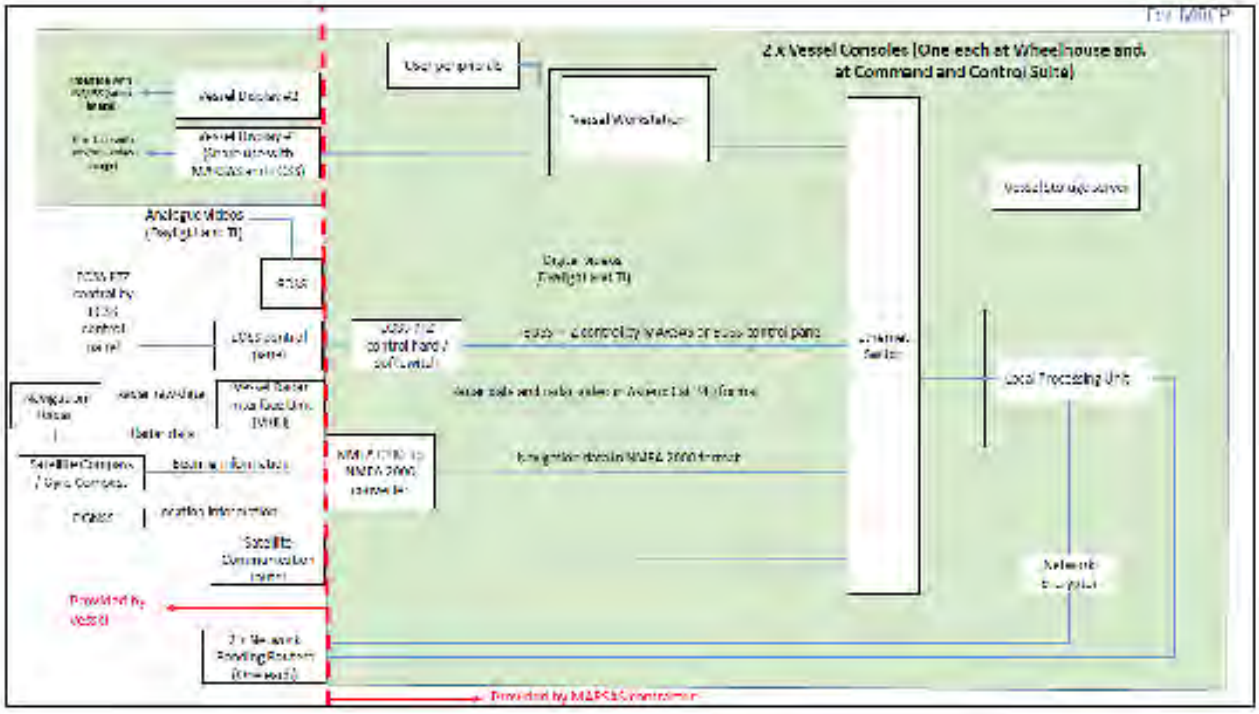


Figure 9.4 - Conceptual system interface diagram between the Vessel and MARSAS

9.32.4 At no extra cost to the Government, the Contractor shall install two (2) HKPF Special Operation Radio Communications System mobile radios including associated accessories. One (1) each is located in Communication/Navigation Officer console in the Wheelhouse and the Communication Area of Command and Control Suite. The exact mobile radio model will be provided to the Contractor during kick-off meeting. The present mobile radio has separate control panel and speaker box. 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 mobile radio model. Provided that the Government notifies the Contractor at least three (3) months in advance of the on-site installation of the two (2) HKPF Special Operation Radio Communications System mobile radios, no additional costs associated with the installation of a radio of a different type shall be chargeable to the Government.

(a) The Contractor shall

(1) Provide sufficient space for the installation of the HKPF Special Operation Radio Communications System mobile radios and accessories by COMMS of the HKPF;

(2) Supply mounting brackets for the mobile radios and accessories installation;

(3) Supply and install all RF signal, power and grounding cables and wires. COMMS will provide the specifications of all of the RF cables and connectors to the Contractor;

(4) Supply and install all power converters and power supply terminals necessary for the mobile radios installation. Dedicated power on/off switches for controlling each mobile radio transmitter power on/off shall be provided and installed near to the display units of the mobile radio;

(5) Supply and install two (2) UHF antennae for one (1) each of the mobile radios. The UHF antennae shall have an impedance of 50 ohms and the VSWR shall be 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;

(6) Design, rig and suitably mount the antennae to ensure EMC and avoid interference;

(7) Provide all necessary cables, materials, labour and transportation for the equipment installation;

(8) Fit and install the mobile radios in the HKSAR in the positions that were finalised during the detailed design stage, subject to any subsequent EMC-necessitated alteration; and Provide all necessary cables, materials, labour and transportation for the equipment installation.

(b) COMMS shall:

(1) Supply the HKPF Special Operation Radio Communications System mobile radios and accessories;

(2) Connect up the HKPF Special Operation Radio Communications System mobile radios and accessories using the connectors, cables and wires installed by the Contractor;

(3) Test the VSWR of the RF cables and UHF antennae to confirm that neither exceeds 1.5; and

(4) Commission the HKPF Special Operation Radio Communications System mobile radios.

9.32.5 At no extra cost to the Government, the Contractor shall supply and install one (1) UHF aerial antenna including RG213 coaxial cable at the mast or roof top of the wheelhouse for signal repeater of HKPF Special Operation Radio Communications System.

(a) The Contractor shall

(1) Provide sufficient space at the Server Room for the installation of the signal repeater of HKPF Special Operation Radio Communications System. The dimensions of the signal repeater will be provided during kick-off meeting;

(2) Supply anchoring points situated at the Server Room for fixing and fastening the signal repeater by the HKPF. The design and quantity of anchoring points shall be discussed during kick-off meeting;

(3) Supply a dedicated 220V AC socket outlet with protection cover and label situated at the Server Room for the signal repeater. The location of the socket outlet shall be next to the signal repeater.

(4) Supply and install a point of interface box with cover situated at the Server Room which is for termination of RG213 coaxial cable from the aerial antenna as specified in Paragraph 9.32.5 of this Part VII. The RG213 coaxial cable shall be terminated by N-female type connector and properly fixed in the point of interface box.

(b) COMMS shall:

(1) Dimension and photos of the signal repeater information exchange to the Contractor;

(2) Test the VSWR of the RF cables, at point of interface and UHF antennae to confirm that neither exceeds 1.5; and

9.32.6 In order to provide an interface with other Special Police IT Equipment, the Contractor shall supply and install an outdoor waterproof cabinet (with size no less than 250mm x 250mm) at the base of mast or at the compass deck, for housing power sources (one 12V DC and one 220V AC), four (4) low loss coaxial cable terminations, and six (6) Cat.6e cable terminations. The contractor shall supply the cables listed above, and the other ends of the cable terminations shall be situated at the Server Room.

Chapter 10 External Fire-Fighting System (EFFS)

10.1 General Requirements

10.1.1 The external fire-fighting system as more particularly described in this Chapter 10 ("EFFS" or "system" shall be designed for fire-fighting at sea.

10.1.2 The performance and functional tests of the EFFS shall be included as part of the Technical Acceptance in Stage 1 of Technical Acceptance - Pre-Shipment Construction and Handling Inspection and Stage 2 of Technical Acceptance in Paragraphs 1.8.1 and 1.8.2, respectively to test each and every single functionality and performance standard of the EFFS as specified in this Chapter.

10.1.3 The system shall be capable of operating in two modes providing both jet and fog patterns.

10.1.4 At the Technical Acceptance, the Contractor shall demonstrate that the design of the fire-fighting system, the arrangements and equipment are suitable for fire-fighting at sea to the satisfaction of GNC and the HKPF.

10.1.5 The external fire-fighting system shall meet the following requirements:

(a) The water shall be piped through the main deck via a deck connection, approved by any one RO specified in Annex 9 of this Part VII, to one (1) fixed remote fire-fighting monitor;

(b) The fire mains 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, as more particularly described in Paragraph 10.8 below, having a minimum capacity to pump water of 360 m^3 per hour at a discharge pressure of 4-16 bar providing both jet and fog patterns, shall be installed as part of the external fire-fighting system on the Vessel. The monitor shall be fitted on the foredeck and be remotely controlled from the Wheelhouse through the control as more particularly described in Paragraph 10.7 below; **[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 the EFFS as more particularly described in paragraph 10.2 below shall be dedicated and independent from other systems; and **[E]**

(f) The fire pump of the EFFS shall be electrically driven whilst complying with the following: **[E]**

(1) avoiding a sudden build-up of water pressure (water hammering); and

(2) avoiding a sudden impact upon the electrical system.

10.2 The Electrical Fire Pump

10.2.1 The fire pump shall have a self-priming function and shall meet the criteria of the fire monitor defined in Paragraph 10.1.5(c) of this Part VII.

10.2.2 The fire pump shall be driven by a Permanent Magnetic Motor (PM Motor) equipped with a variable speed control able to achieve a soft starting. in order to prevent a sudden impact upon the electrical system onboard.

10.2.3 The compartment with the pump shall be adequately ventilated to reduce the heat generated by the components, such as motor, variable frequency drive (VFD), starter panel and other associated parts, so as to ensure the environmental conditions within the compartment remain

similar to the ambient conditions outside the compartment.

10.2.4 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.

10.2.5 The Variable Frequency Drive (VFD) and the system protection shall be the same as Paragraphs 7.9.6 and 7.9.8 of this Part VII.

10.2.6 The fire pump shall be positioned in the hull as low as possible and whenever possible be below the Vessel waterline to ensure positive suction head. If that is impracticable and the pump is located above waterline, the pump shall be provided with an approved self-priming system and shall not be the compressed air self-priming system.

10.2.7 The materials of the pump shall be galvanic and physically and chemically compatible to the hull and any material they are associated with.

10.2.8 Net pump pressure of the pumps at their rated capacity shall be equal to or greater than 10.5 bar or greater.

10.2.9 The pump and its connecting pipes shall be hydrostatically tested according to the RO's rules or tested to gauge pressure of 15.75 bar or at 50% greater pressure than the rated cut-off pressure of the pump, whichever is greater.

10.3 Piping Systems

10.3.1 The piping system shall be protected from over pressure.

10.3.2 All piping shall be suitably protected from corrosion and freezing as well as being capable of being drained.

10.3.3 Where pipes supplying water to the monitor are passing through the propulsion machinery spaces, they shall be led through the Engine Room casings all the way to the monitor. If this requirement is not achievable the complete design shall be thoroughly discussed with GNC and the HKPF before installation. This piping system must be acceptable to GNC and the HKPF in addition to the RO requirements.

10.3.4 Pipes between the pump and a deck or bulkhead shall be full penetration welded. Flange connection is only permitted at the pump or the sea water discharge valve outlet.

10.3.5 All pipes, flanges, valves etc. in the piping system shall be made of a suitable grade of stainless steel and of a sufficient thickness and to prevent corrosion occurring within the expected 20 year life span of the Vessel.

10.3.6 Adequate piping support arrangements shall be decided by GNC and HKPF in addition to the RO requirements.

10.3.7 Where flanges are used to join piping or to facilitate removal of valves for service, a support shall be provided not more than 0.6 m from the joint.

10.3.8 Bracing shall be provided to resist the nozzle reaction of discharge devices.

10.3.9 Provision shall be made for the expansion or contraction of piping and for stresses in the piping due to temperature changes or flexing of the hull, in accordance with the RO requirements.

10.3.10 Drains shall be provided to drain all portions of the discharge and distribution piping.

10.3.11 A small drain line (by a valve) that bypasses the pump check valve shall be provided to permit drainage of the discharge piping.

10.3.12 Fire Pump discharge piping shall be designed to withstand a working pressure not less than the maximum cut-off pressure of the pump fitted.

10.3.13 Piping systems shall be designed to avoid water hammer and similar hydraulic shocks within the system and shall be provided with a means to purge air from the piping system at low flow velocities.

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 a remotely operated type.

10.4.3 The controls for the remote operation shall be located in the Wheelhouse.

10.4.4 In addition, local operation of the monitor and associated valves shall also be provided.

10.4.5 The sea water inlet for the fire-fighting piping shall be equipped with a shut off valve.

10.4.6 The leading edge of the inlet pipe shall be rounded to avoid cavitation being created.

10.5 Sea Connections and Sea Chest

10.5.1 Sea connections and sea chests are to be designed and arranged so as to provide an adequate and uniform supply of water, which shall not be interfered with by movements of the Vessel or water flow set up by water-jet units.

10.5.2 The sea suction inlet shall be arranged as low as practicable in the Vessel in order to have the maximum available 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.

10.5.3 The suction pipeline shall be designed so as to avoid cavitation.

10.5.4 The suction arrangements 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 prevent air locks from forming due to the Vessel's motions at sea. The sea chest opening is to be equipped with strum plates, which are to 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 side of the pump. An air vent is to be fitted at the upmost location of the sea chest casing/cover.

10.5.5 The fire pump suction velocity shall meet the manufacturer's design limit and the requirements of the RO, GNC and the HKPF.

10.5.6 The discharge velocity at the water monitors shall meet the manufacturer's design limit and the requirements of the RO, GNC and the HKPF.

10.5.7 A means and/or facilities shall be provided to enable the gradual filling of the pipeline up to the monitor with water before the full capacity of the pump can be engaged.

10.5.8 The intake to the fire pump shall be fitted with a means for clearing the ingested debris while the Vessel is underway.

10.6 Operation of Pump and Valves

10.6.1 The fire pump, the seawater shut-off valve and the seawater discharge valve, including the water monitor front regulating valve, shall be operated from the same location.

10.6.2 An interlock system or equivalent shall be provided to prevent the fire pump from being started, in the event that a shut off valve is closed, together with audible and visual alarms at the Wheelhouse.

10.6.3 All discharge valves of fire pump shall be of a motor driven screw-down non-return type and the suction valves shall be of a motor driven type.

10.6.4 All motor driven valves shall be capable of being manually 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 for 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 controls;

(c) Speed controls;

(d) Fault indicating alarms;

(e) Protective devices such as motor overload and any others recommended by the manufacturer;

(f) Lamp test button;

(g) Alarm mute push button; and

(h) 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 plate labels and markings 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 the 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 for 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 nozzle, which is 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 discharging at the set angles as required.

Chapter 11 Services Support

11.1 General Requirements

11.1.1 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.

11.1.2 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.

11.1.3 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 2.7.2, Chapter 2 of this Part VII.

11.2 Information to be Provided Prior to and at Delivery Acceptance

11.2.1 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.

11.2.2 In addition, the documents for the Operational Systems shall be provided as described in Paragraph 9.2.18 in this Part VII.

11.2.3 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 shall be for the expected service life of the Vessel and will include, but not be limited to, the following:

(a) A list of recommended spare parts to be stored on the Vessel that may be required for preventive maintenance and consumable replacement;

(b) A list of recommended spare 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) A list of recommended spare 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) A list of recommended spare 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) The RO's design and construction inspection certificates for the waterjet propulsion units shall be submitted to GNC before the Delivery Acceptance; and

(h) Other details the Contractor deems relevant.

11.2.4 "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.

11.2.5 The first draft of the Onboard Operator's Manual (in both English and Traditional Chinese) mentioned in Paragraph 11.2.6(g) of this Part VII shall be submitted to GNC for approval one (1) month before the documentation acceptance.

11.2.6 At Delivery Acceptance, the Contractor shall provide GNC 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:

(1) Description,

(2) Type or model (if applicable);

(3) Makers part number or equivalent (if applicable);

(4) Location;

(5) Quantity;

(6) Supplier or agents name and contact details;

(7) Order lead time;

(8) Shelf life; and

(9) Unit cost.

(e) Four (4) printed copies (at least one (1) original) and two (2) soft copies on USB or equivalent devices of manufacturers' operation, maintenance and workshop manuals in English for all machinery and equipment, including spares and stores, special tools, 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:

(1) Daily user checks and operating procedures;

(2) Operating detail of each system; and

(3) 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 9.2.18 of this Part VII for each individual item of equipment that comprises the 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 9.2.18 of this Part VII.

11.2.7 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.

11.2.8 Tools and Test Equipment for Electronics

(a) All tools and testing equipment for the Vessel's electronic equipment shall be delivered directly to COMMS; and

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

11.2.9 Photographs

The Contractor shall at Delivery Acceptance provide the following:

(a) As-Fitted Photographs

(1) 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

(2) 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

(1) 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;

(2) Four (4) 200 mm x 150 mm colour photographs showing the profile of the Vessel in Hong Kong Waters; and

(3) Four (4) 150 mm x 100 mm colour photographs showing the profile of the Vessel in Hong Kong Waters.

(c) Softcopy of Photographs

(1) 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 GNC on two (2) USB or equivalent devices in RAW and JPEG formats at Delivery Acceptance.

11.2.10 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) Complete record of the commissioning tests;

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

(f) Certificates of light and sound signalling equipment;

(g) Builder certificates;

(h) Certificates of building materials;

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

(j) Hull construction material issued by the RO;

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

(l) Certificate of Class issued by the relevant RO; and

(m) Any other certificates as appropriate to discretion of GNC.

11.2.11 Ship model

(a) The Contractor shall supply two (2) Ship models with the Daughter Boat and Hovercraft on 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 Ship 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 Ship 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, waterjet, 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 12 Training

12.1 General

12.1.1 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. The trainings shall be delivered by qualified Contractor's own experienced trainers.

12.1.2 Each training course is to provide the participants, 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.

12.1.3 'Vessel' for the purposes of the courses mentioned in this Chapter 12 refers to the mother launch only. However, the training shall include operating the Davit and Crane LARSs, stowage and securing of the Daughter Boat and Hovercraft.

12.1.4 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.

12.1.5 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 GNC 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.

12.1.6 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.

12.1.7 The training courses as specified in Paragraph 12.1.1 shall be provided immediately after the Delivery Acceptance of the first (1st) Vessel to the MD. Any engineering/operational systems upgrade that have been implemented during the construction of the second (2nd) Vessel shall be supplemented to and reflected in the training notes/ operator's manual.

12.1.8 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.

12.1.9 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 GNC shall have the right to reproduce all

training documents for internal use.

12.1.10 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.

12.2 Launch Mechanic (Engineering Stream) Operational Crew Training

12.2.1 The purpose of the Launch Mechanic (Engineering Stream) Operational Crew Training Course is to provide each participant, who will already have completed the requisite HKPF training and be an experienced Launch Mechanic (Engineering Stream) operational crew member, 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. On completion of the training course, the participants shall be capable to deliver further training courses to other HKPF officers.

12.2.2 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 multiple classes as required by HKPF and GNC)

12.3 Engineering Maintenance Training

12.3.1 The purpose of the Engineering Maintenance Training Course is to provide the HKPF and GNC 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. 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.

12.3.2 The Contractor shall then deliver this training course to HKPF and Government Dockyard Maintenance and Support Section (GDMSS) technical and maintenance staff as follow:

(a) 20 HKPF and 10 GDMSS staff at the 1st Vessel Delivery (shall be separated into multiple classes as required by HKPF and GNC)

12.4 Deck Operational Crew Training

12.4.1 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 Vessel and 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 position keeping shall be the essential subjects. On completion of the training course, the participants shall be capable to deliver further training courses to other HKPF officers.

12.4.2 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 multiple classes as required by HKPF and GNC)

12.5 Operational Systems Maintenance Training

12.5.1 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.

12.5.2 Upon Delivery Acceptance, the Contractor shall then deliver this training course to HKPF staff as follow:

(a) 20 staff at the 1st Vessel Delivery (shall be separated into multiple classes as required by HKPF and GNC)

Chapter 13 Abbreviations

ABS	American Bureau of Shipping
AC	Alternating Current
AFFF	Aqueous Film-Forming Foam
AIS	Automatic Identification System
AML	Additional Military Layers
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
BS	British Standards
BSB	data encoded in the BSB format
BWA	Biological Warfare Agent
CBRN	Chemical, Biological, Radiological and Nuclear
CCD	Charge-Coupled Device
CCTV	Close Circuit Television
CD	Compact Disc
cd/ m^2	Candela per Square Metre
CD-ROM	Compact Disc Read-Only Memory
CFC	Chlorofluorocarbon
CH	Channel
cm	Centimetre
FM200	heptafluoropropane
COG	Course Over Ground
CPA	Closest Point of Approach
CPU	Central Processing Unit
CRT	Cathode Ray Tube
c/w	Come with
CWA	Chemical Warfare Agent
dB	Decibel
dBi	Decibel Isotropic
dBm	Decibel-milliwatts

DC	Direct Current
DDR	Double Data Rate
deg	Degree
DGPS	Differential Global Positioning System
DISS	DNC Digital Nautical Chart
DPDT	Double-Pole, Double-Throw
DSC	Digital Selective Calling
DTRS	Digital Trunk Radio System
DVD	Digital Versatile Disc
DVI	Digital Video Interface
DVR	Digital Video Recorder
ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
EFFS	External Fire-Fighting System
EFCP	External Fire-Fighting Control Panel
EGNOS	European Geostationary Navigation Overlay Service
ENC	Electronic Navigational Charts
ENE	Electronic Navigational Equipment
FTP	Fire Test Procedures
FO	Fuel oil
FOV	Field of View
g	Gravity
GB	Gigabyte
GeoTIFF	GeoTIFF Format File
GHz	Gigahertz
GM	Metacentric Height
GMDSS	Global Maritime Distress Safety System
GMT	Greenwich Mean Time
GPS	Global Positioning System
GRP	Glass-Reinforced Plastic
GZ	Righting Lever
HazMat	Hazardous Material
HEPA	High-Efficiency Particulate Arrestance
HCFC	Chlorodifluoromethane
HD	Hard Disk
HDD	Hard Disk Drive
HDMI	High Definition Multimedia Interface

HPS	Harbour Patrol Section
HSC	High-speed Craft
HVAC	Heating, Ventilation and Air Conditioning
Hz	Hertz
ICR	Information Collection Request
IHO	International Hydrographic Organization
IMM	International Maritime Mobile
IMO	International Maritime Organisation
IEC	International Electrotechnical Commission
IP	Ingress Protection
IPX	Internetwork Packet Exchange
IR	Infrared
IS	Intact Stability
ISO	International Organization for Standardization
ITU-R	International Telecommunication Union – Radiocommunication Sector
K	Kilo
kΩ	Kilo Ohm
kg	Kilogram
kHz	Kilohertz
km	Kilometre
km/h	Kilometre per hour
kts	Knots
kW	Kilowatt
L/min	Litre per minute
LO	Lube Oil
LCD	Liquid Crystal Display
LCG	Longitudinal Centre of Gravity
LED	Light-Emitting Diode
L/s	Litre per second
LSA	Lifesaving Appliances
m	Metre
m/s	Metre per Second
m^3	Cubic Metre
M/E	Main Engines
MARPA	Mini-Automatic Radar Plotting Aid
MCR	Maximum Continuous Rating
MCS	Monitoring and Control System

MEI	MEI Corporation
MFD	Multi-Function Display
MHz	Megahertz
MJ/ m^2	Megajoule per Square Metre
MKD	Minimum Keyboard Display
mm	Millimetre
MMC	Multi Media Card
MMSI	Maritime Mobile Service Identity
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
NIR	Non-Ionizing Radiation
NFPA	National Fire Protection Association
NMEA	National Marine Electronics Association
ns	Nanosecond
NTRIP	Networked Transport of RTCM via Internet Protocol
NUC	Not Under Command
OBE	On-Board Electronics
OSHA	Occupational Safety and Health Administration
Pa	Pascal
PAL	Phase Alternating Line
p.s.i.	Pounds per square inch
PTO	Power Take Off
PVC	Polyvinyl Chloride
RAM	Random Access Memory
RCA	Radio Corporation of America
RGB	Red Green Blue
RF	Radio Frequency
RG58U	RG58U Type Coaxial Cable
RH	Relative Humidity
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 Systems
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
TCG	Transverse Centre of Gravity
TCPA	Time of Closest Point of Approach
TFT	Thin-Film Transistor
TIFF	Tagged Image File Format
TMR	TOPEX/Poseidon Microwave Radiometer
TS	Technical Specifications
UHF	Ultra High Frequency
UPS	Uninterruptible Power System
USB	Universal Serial Bus
UTC	Universal Time Coordinated
UV	UltraViolet
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
VSWR	Voltage Standing Wave Ratio
VTC	Vessel Traffic Centre
VTS	Vessel Traffic Services
W	Watt
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. It must be emphasized that it is the Contractor's responsibility to ensure the Warranty Services and Guarantee Slipping are performed in full compliance with the terms of the Contract. The Contractor shall arrange their own technical staff with all the necessary skills, qualifications and experiences to conduct the services. Unless the technical staff from local agent meet all these requirements, the technical staff from local agent shall not provide the required Warranty Services. The Contractor shall provide the curriculum vitae of the local agent's engineers involved in providing the Warranty Services. The Government reserve the rights to reject any engineer whose qualification and experience are not acceptable to GNC.

The Warranty Services and Guarantee Slipping for the Daughter Boat and the Hovercraft are not included in this Annex 1. Reference to "Vessel" in this Annex 1 shall exclude the Daughter Boat and the Hovercraft.

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 including this Annex.

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 or any part thereof is handed over for the Warranty Services and/or Guarantee Slipping, the Contractor shall be responsible for the collection and due return of the Vessel in good order (including all freight from and to the Government Dockyard and insurance (as further mentioned below)). 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 the 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 without limitation all major Equipment specified in Schedules 6 and 7 in Part V and all Operational Systems as defined in Chapter 9 of Part VII), fittings and outfit (including spare parts, and documentation) (collectively, "Warranty Items") against defects of design, construction, workmanship or materials and against any non-compliance with any of the Product Warranties. The Warranty Services may be backed up by the Contractor

using individual equipment suppliers/manufacturers' warranties but the Contractor shall remain solely liable to MD as a primary obligor to provide the Warranty Services. Notwithstanding and without prejudice to the Contract on warranty obligations for the total Vessel, any individual equipment supplier/manufacturer's warranty extending beyond the one year total Vessel warranty must be assigned to the Government as appropriate.

In order not to violate the warranty of the main propulsion engine(s), gearbox(es) and diesel generator(s), the Contractor shall also provide the corresponding periodic maintenance services based on the manufacturer(s)' recommendation within the Warranty Period at no extra cost to the Government.

1.6 Procedures for Warranty Claim

Without prejudice to the provisions of the Contract, a detailed procedure for dealing with warranty claims must be proposed by the Contractor and agreed by MD before the issuance of the Acceptance Certificate of the Vessel. This shall be based on the following principles:

1.6.1 Any notification of claimed defect shall be sent from MD to the Contractor through a defined route.

1.6.2 There shall be a joint inspection to examine the defect and the Contractor shall propose the appropriate and necessary remedial action to the satisfaction of MD.

1.6.3 The Contractor shall undertake on-site Warranty Services (including provision of all replacement Warranty Items, spare parts, labour, materials, test equipment, and transportation) wherever, at the option of the Government, the Vessel is berthed in the Government Dockyard or maintenance bases of the user department. Taking the Vessel to the shipyard of the Contractor should be avoided unless absolutely necessary.

1.6.4 Rectification of defects must have a minimum effect on the operation of the Vessel by the provision of on loan equipment if the anticipated repair time exceeds the time frame as specified in Paragraph 1.7.1 below.

1.7 Throughout the Warranty Period, the Contractor shall be responsible for the provision of free of charge corrective maintenance and rectification of all defects in all and any of the Warranty Items including repair and replacement as necessary. This shall, at no cost to the Government, include Warranty Services to be performed by the Contractor described in the following sub-paragraphs:

1.7.1 To attend to the Vessel for inspection and repair within 24 hours (excluding Hong Kong public holidays) of receiving the report of a fault ("fault report") and to take immediate action to rectify the defect after inspection. Unless otherwise agreed by the Government, all corrective maintenance and rectification must be effected within 48 hours after the fault report is first issued. The MD must be informed of what corrective maintenance and rectification actions have been taken within 72 hours of receiving the relevant fault report.

1.7.2 To provide all necessary transport, replacement Equipment, spare parts, labour and materials, tools and testing instruments required for the corrective maintenance and rectification.

1.7.3 Any replacement item or part to be deployed shall originate from the manufacturer of the original Warranty Item to be repaired of the same model and with the same or better specifications 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 replaced during the Warranty Period shall have a new warranty period of one year commencing from the date of replacement.

1.8.3 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.

1.8.4 In relation to a Warranty Item with extended warranty period as mentioned in Paragraph 1.8.1 and/or 1.8.2 and/or 1.8.3 above, depending on whichever is applicable, all references to Warranty Period in the Contract shall be construed to include such extended warranty period.

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 for the same items as listed in Schedules 6 and 7 in Part V and in the same quantity in the shipyard of the Contractor/ or of its local agent, 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 Operational Systems

On top of the Warranty Services described in this Annex 1, there are also service specifications of the Warranty Services set out in Chapter 9 of this Part VII for the Operational Systems. In the event of any inconsistency, the better service specifications shall prevail. Please refer to the Chapter 9 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 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, clean and remove obstructed object in the waterjets.

(d) Water jet tunnel and impeller(s) inspection and cleaning.

(e) 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.

(f) Renew all zinc anodes on hulls and waterjets.

(g) 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)

(h) 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) Navigational equipment, lights and sound signals;

(d) Ahead and astern running and crash stop test;

(e) Steering trial;

(f) Speed Measurement;

(g) Bilge system function (including high level bilge alarm system);

(h) Fire pump(s) function (including fire detection system, alarms, ventilation fans /fuel pump remote shutdown);

(i) 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 handling unit 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 (if applicable)

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

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

(j) Other trials or testing of equipment as required by the Government Representative; and

(k) 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 main engines, waterjet propulsion system 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 Chapter 9 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 not be 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 and a 3D computer model of the Vessel interior for review	
2	Lines Plan	
3	Stability Analysis & Calculations	
4	Daughter Boat and Hovercraft LARSs 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	*All the drawings are required to be submitted in two months after the Contract Date for GNC's approval / reference.*
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	Waterjet and Installation Drawings	
23	Steering Arrangement	
24	Bow Thruster Details	
25	Details of Diesel Generator Arrangement	
26	Control Console Arrangement and Schematic Diagram	
27	Instrumentation and Control System	
28	Calculation of Fuel Capacity	
29	Details of Main Engines	
30	Details of Propulsion System - Main Engines, Reduction Gear Boxes, and the Waterjet Propulsion System	
31	Details of Position Keeping System	
32	Engine Room Piping Diagrams including sea water system, bilge system, fresh water system, black water system, HVAC	

Item No.	Drawings Approval	Completion Date
33	Engine Room Ventilation and Exhaust	
34	Details of the Air-Conditioning System	
35	Details of Electrical and Electronic Equipment	
36	Electrical Load Calculations	
37	Schematic Layout of Electrical Circuits	
38	Lightning Protection Arrangement	
39	Details of Galvanic Corrosion Prevention	
40	Torsional Vibration Calculation	
41	Fire Fighting Arrangement	
42	Lifesaving Arrangement	
43	Safety Plan	
44	Others as required	

Note: All information to be submitted shall show compliance of the relevant Equipment or the Vessel or any part thereof with all requirements of the Contract.

Part VII - Annex 4 – Main Items Inspection Timetable

VESSEL NAME : "Mobile Response and Command Platforms(MRCP) "			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Hull Structure, Layout and Outfitting Inspection			
H-1	Hull Lofting			
H-2	Construction materials – Aluminium plate mark checking for hull			
	a) Aluminium plate mark checking for hull			
	b) Material certification verification			
H-3	Construction materials – aluminium plate mark checking for deckhouse			
	a) Aluminium plate mark checking for deckhouse			
	b) Material certification verification			
H-4	Welding consumables and welders' certificates verification			
H-5	Keel lay inspection			
H-6	Fabrication of hull up to main deck in stages of work including			
	a) Alignment			
	b) Edge preparation			
	c) Welding			
	d) Workmanship			
	e) Compliance with approved plans			
	f) Non-destructive tests NDT (Xrays) of welds			
	g) Hull internal structural 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			
	Oily water tank			
	a) Tank construction (internal/external/fitting)			
	b) Tank seating construction/securing			
	c) Tank pressure test			

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 Cabin			
	d) Crew Shower and Toilet Facilities			
	e) Mess Room			
	f) Galley			
	g) Command and Control Suite and Command Office			
	h) Passenger Cabins			
	i) Passenger Shower and Toilet Facilities			
	j) Standby and Briefing Area (also be another Evacuation Zone)			
	k) Evacuation Zone			

	l) First Aid Room			
	m) Wet Room			
	n) Special Equipment Room			
	o) Engine Control Room			
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			

VESSEL NAME : "Mobile Response and Command Platforms (MRCP)"			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 generator sets			
	c) General inspection of the shafting			
	d) General inspection of waterjet propulsion system			
	e) General inspection of bow thruster			
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 water valve			
EM-4	Inspection of the sea water suction strainers			
EM-5	Fresh water system:			
	a) General inspection and dimension checking of the fresh water system			
	b) Functional test of the Seawater Desalination Unit			
	c) Fresh water tank low level alarm test			
	d) Fresh water tank final cleaning/internal inspection before filling			
	e) Fresh water tank high level alarm test			

	f) Fresh water tank content gauge calibration and test			
	g) Inspection of piping penetration of bulkhead and deck			
	h) Hydraulic test of fresh water system piping			
	i) 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 high level alarm test			
	c) Bilge tank content gauge calibration and test			
	d) Inspection of piping penetration of bulkhead and deck			
	e) Hydraulic test of bilge system piping			
	f) Functional test of bilge system			
EM-8	Black water/sanitary system:			
	a) General inspection and dimension checking of the black water/sanitary system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of black water/sanitary system piping			
	d) Functional test of black water/sanitary system			
EM-9	External 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 and performance test of external firefighting system			
EM-10	Fire extinguishing systems:			
	a) General inspection and dimension checking of the fire extinguishing system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of fire extinguishing system piping			
	d) Functional test of fire extinguishing system			
	e) Test of fixed fire extinguishing alarm system			
	f) Test of fire detection (smoke and heat detection) alarm system			
EM-11	Hydraulic test of sea water 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) Operational test of battery charger			
	e) Test of main engines and generators consecutive starting by each group of battery (start/stop at remote and local control)			
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 remote engine 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-23	Station Keeping Capability Plot			
EM-24	FMEA Report			
EM-25	Electronic Navigational Equipment installation and testing by COMMS			
EM-26	Daughter Craft LARS Davit installation, structural foundation and testing			
EM-27	Fire Monitor and system installation, structural foundation and testing			
EM-28	Water-mist firefighting system			
EM-29	Marine knuckle boom crane installation, structural foundation and testing			
EM-30	Test of window wipers			
EM-31	Test of noise levels throughout the vessel during the sea trial			
EM-32	Inclining Experiment			
	a) Official Speed Trial			
	b) Other Official Sea Trials			
EM -33	Launch and Recovery Systems (LARS)			
	a) General Inspection of Davit LARS			
	b) Function Test of Davit LARS			
	c) General Inspection of Crane LARS			
	d) Functional test of Crane LARS			
EM -34	Stretcher Lift			
	a) General Inspection of Stretcher Lift			
	b) Functional Test of Stretcher Lift			
	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 communication antenna and others.			
OS-4	Function and performance test during Sea Trial			

Part VII - Annex 5 – Vessel Condition During Respective Sea Trial

1) Official Speed Trial

Conditions at Speed-Trial		
1	Person on board	19 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 80% tank capacity
4	Store/Utilities	500 kg
5	Sea Conditions	Sea state 0-2 : wave height 0.1 - 0.5 metres

2) Endurance and Performance Test

Conditions at Endurance and Performance Test		
1	Person on board	19 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 80% tank capacity
4	Store/Utilities	500 kg
5	Sea Conditions	Sea state 0-2 : wave height 0.1 - 0.5 metres

3) Manoeuvrability Test

Conditions at Forward Turning Circle Test		
1	Person on board	19 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 80% tank capacity
4	Store/Utilities	500 kg
5	Sea Conditions	Sea state 0-2 : wave height 0.1 - 0.5 metres

4) Crash Stop Test / Astern Running Test / Emergency Steering Test

Conditions at Crash Stop Test / Astern Running Test / Emergency Steering Test		
1	Person on board	19 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 80% tank capacity
4	Store/Utilities	500 kg
5	Sea Conditions	Sea state 0-2 : wave height 0.1 - 0.5 metres

Note: The Daughter Boat and the Hovercraft shall be installed and included as part of the Vessel and secured and stowed at their normal designed locations. For the pre-shipment tests and trials, if the Daughter Boat and the Hovercraft are not available onboard, the existence of the Daughter boat and Hovercraft on the Vessel shall be represented by equivalent weights at the corresponding equivalent centre of gravity locations.

Part VII - Annex 6 – Endurance Performance – Diesel Main Engine 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**	**Waterjet:**	**Port Side**	**Starboard Side**
Maker			Maker		
Type			Jet Model		
Serial Number			Maximum Power		
Rated Power			Maximum RPM		
Rated Speed					

Engine Load	**Engine Speed (rpm)**	**Vessel Speed (Knots)**	**Time (Start)**	**Time (Finish)**	Fuel Consumption (litres/minutes)	Engine Oil Pressure (Bar)	Engine (in) CW Temp. (°C)	Others	Others
__% of rated Power	At Minimum Cruising Speed		>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 At not less than four (4) weeks before the 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 Midship section plan

1.2.14 Profile and Deck construction plan.

1.2.15 Steering system and steering arrangement diagrams.

1.2.16 Deckhouse and deck structural and construction plan.

1.2.17 Hull watertight bulkheads construction plan.

1.2.18 Deckhouse to deck connection detailed construction plan.

1.2.19 Deck edge details and construction plan, including detailed structural arrangement drawings of hull to deck connection.

1.2.20 Detailed cathodic corrosion prevention and arrangement plans and drawings for the Vessel throughout.

1.2.21 Mast structural and construction plan and mast equipment arrangement plan.

1.2.22 Anchoring arrangement plan.

1.2.23 Piping diagrams for fuel oil, freshwater, lubrication oil, bilge, firefighting, scuppers and drains, sewage system.

1.2.24 Fire prevention, fire control and firefighting system drawings.

1.2.25 External firefighting monitor and the corresponding system details and drawings.

1.2.26 Drawings of the main switchboard and all other switchboards and the electrical system.

1.2.27 Electrical Load Calculation

1.2.28 Electrical installation drawings

1.2.29 Details of the Operational Systems

1.2.30 Operational Systems equipment installation and location drawings, including ENE, communications, radio terminal, MARSAS and satellite communication antenna.

1.2.31 Operational Systems connection drawings

1.2.32 Wheelhouse and cabin sound and heat insulation system diagram.

1.2.33 Main engines and generator sets arrangement and siting plans and drawings of their fuel lines and exhaust gas piping and arrangement.

1.2.34 FMEA and test report.

1.2.35 Shaft line arrangement.

1.2.36 Waterjet details and drawings

1.2.37 Bow thruster details and installation drawings

1.2.38 Position Keeping system details and drawings

1.2.39 Vessel ventilation drawings for the wheelhouse, accommodation and other spaces.

1.2.40 Main fuel oil tank drawing and its associated piping and manifold(s), and filling, overflow and ventilation system.

1.2.41 Freshwater tank and its associated piping arrangement.

1.2.42 Seawater Desalination Plant and its associated piping arrangement.

1.2.43 Fuel oil tank(s) and its associated piping system

1.2.44 Grey water tank and its associated piping system

1.2.45 Drawings for anchor, windlass and the anchoring system.

1.2.46 Lifesaving appliance arrangement plan and fire safety plan.

1.2.47 Distress signals, alarm systems, and internal/external communication arrangement and system plan.

1.2.48 Navigation lights, sound and signal diagrams.

1.2.49 Vessel overall lighting arrangement and light control plan.

1.2.50 Vessel alarm and signals, internal communication systems and public address systems plan.

1.2.51 General layout and arrangement drawing of the air-conditioning system.

1.2.52 Piping layout drawing of the air-conditioning system.

1.2.53 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.

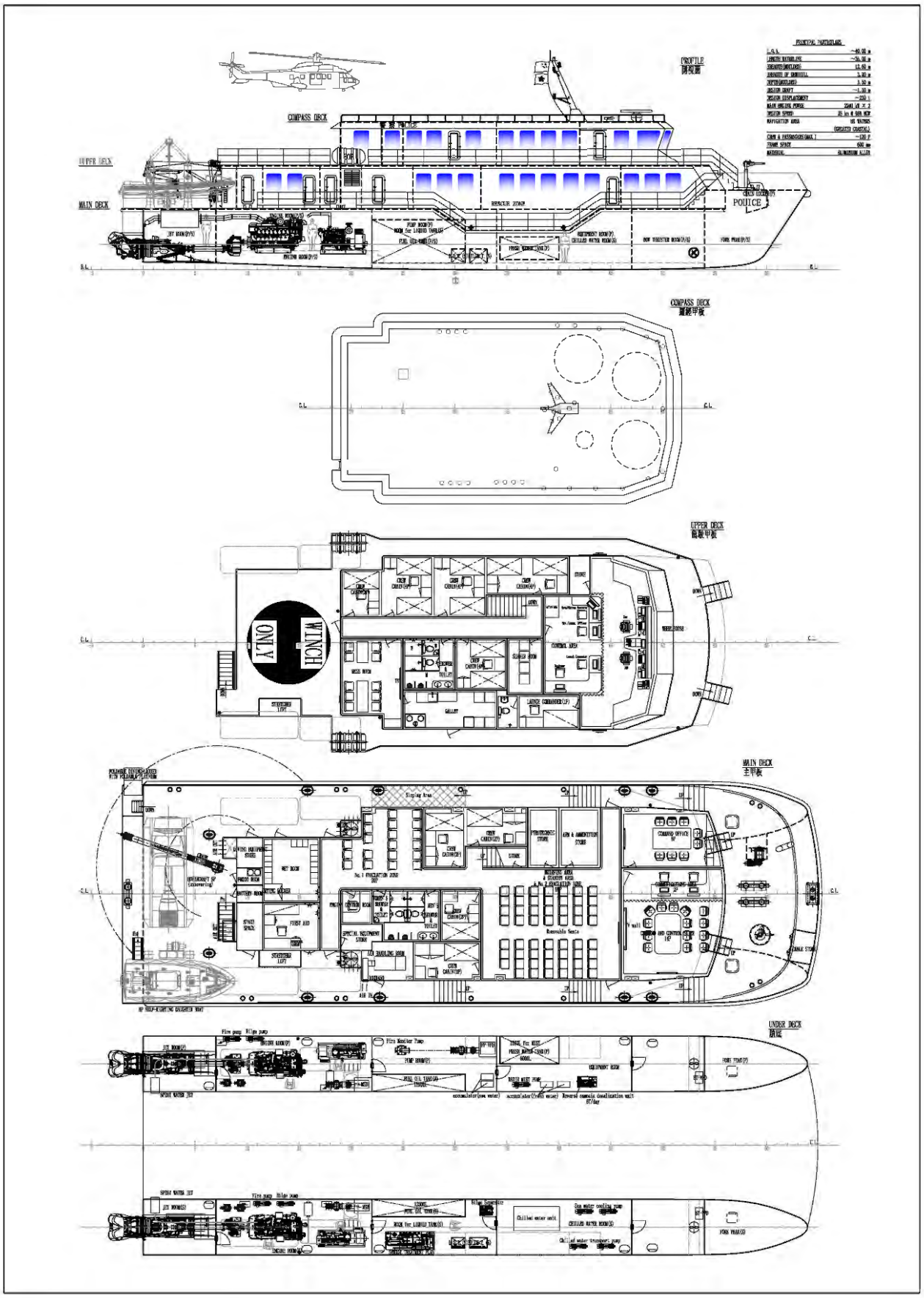
10	Storm, whole gale	89–102 km/h (24.7-28.3 m/s) 55–63 mph 48–55 knot 24.5–28.4 m/s	9–12.5 m 29–41 ft	Very high waves with overhanging crests. Large patches of foam from wave crests give the sea a white appearance. Considerable tumbling of waves with heavy impact. Large amounts of airborne spray reduce 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.

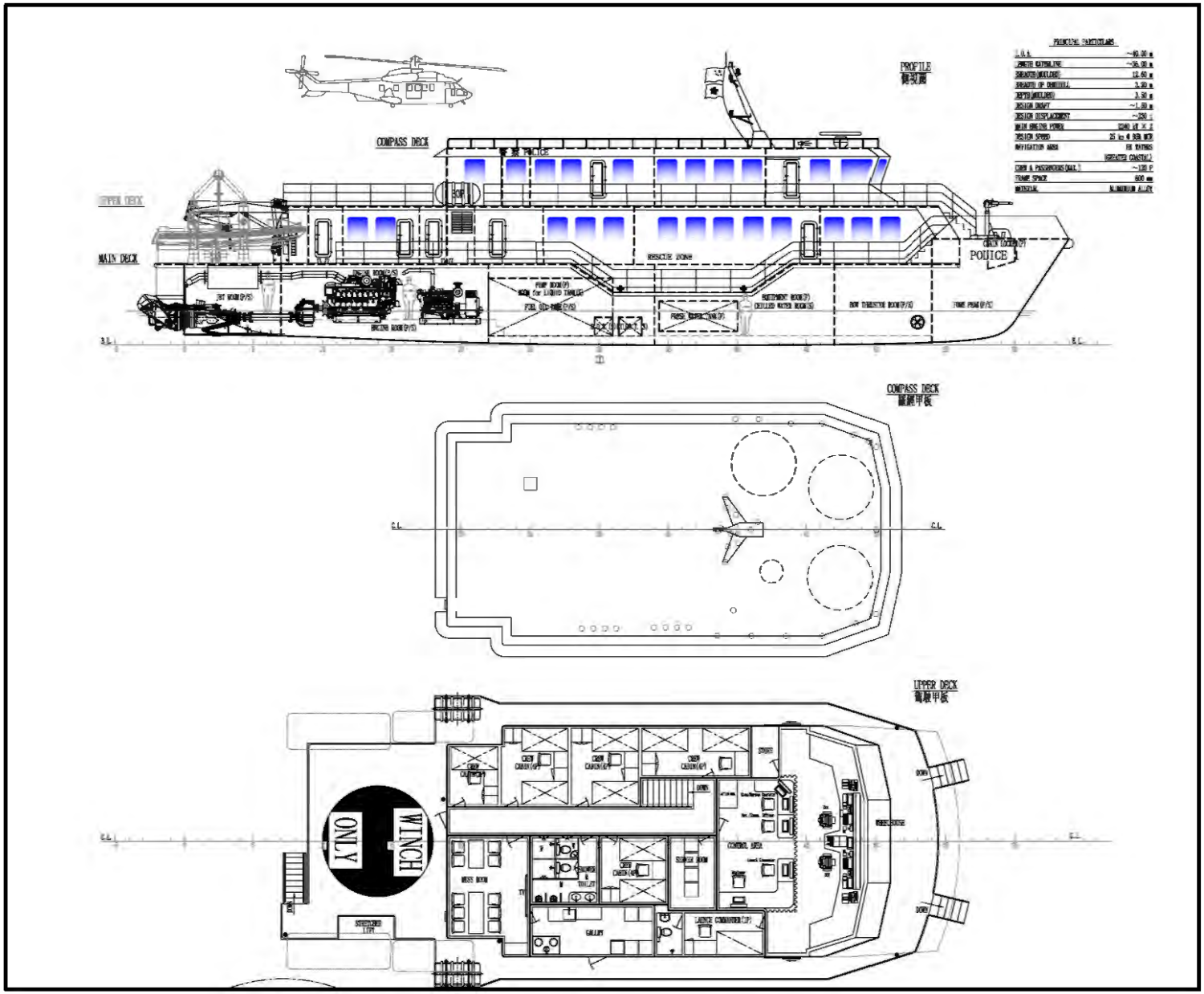
World Meteorological Organization (WMO) Sea State Code		
Sea State Code	Wave Height (meters)	Characteristics
0	0	Calm (glassy)
1	0 to 0.1	Calm (rippled)
2	0.1 to 0.5	Smooth (wavelets)
3	0.5 to 1.25	Slight
4	1.25 to 2.5	Moderate
5	2.5 to 4	Rough
6	4 to 6	Very rough
7	6 to 9	High
8	9 to 14	Very high
9	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	

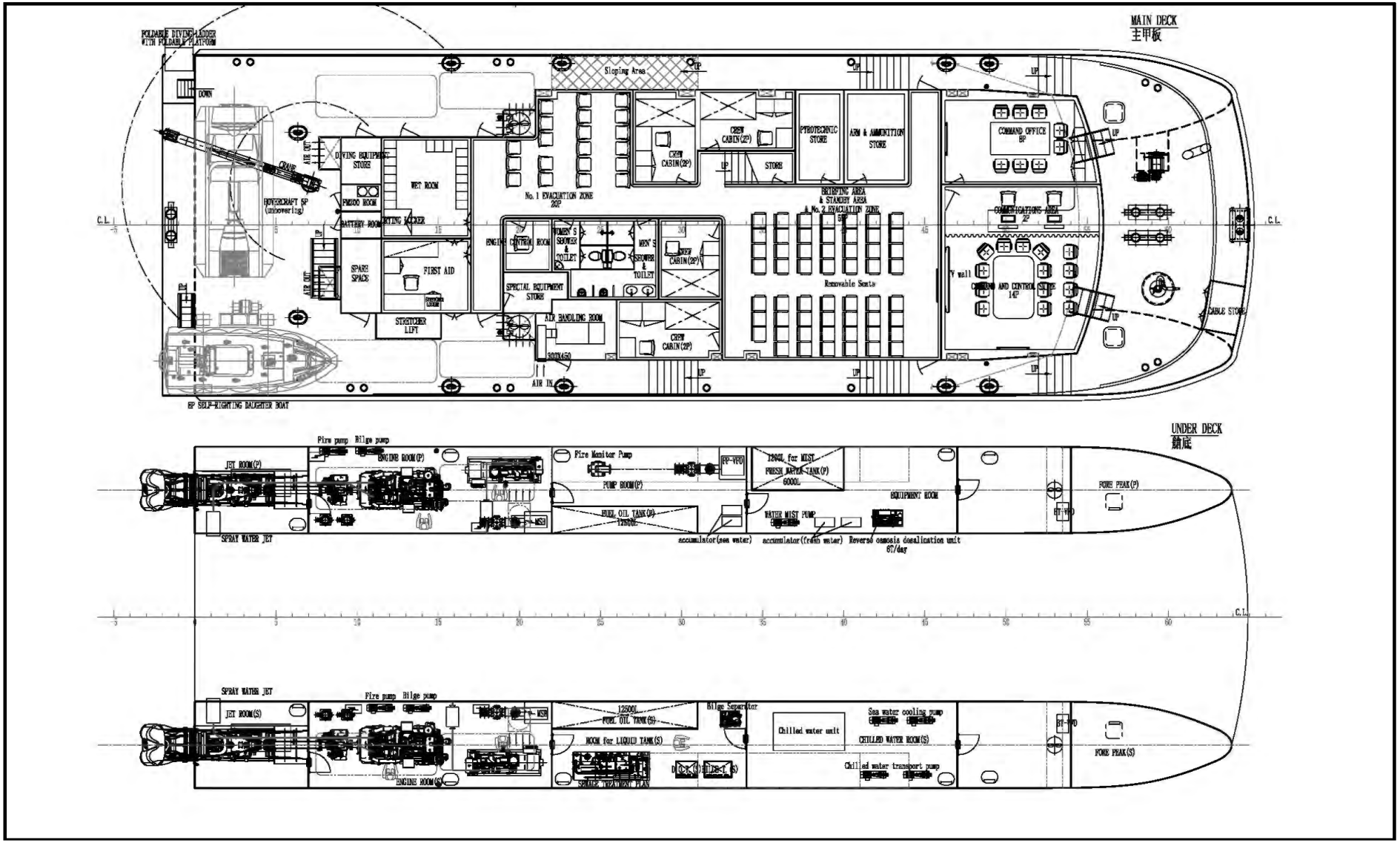
Part VII - Annex 9 – List of Recognized Organisations

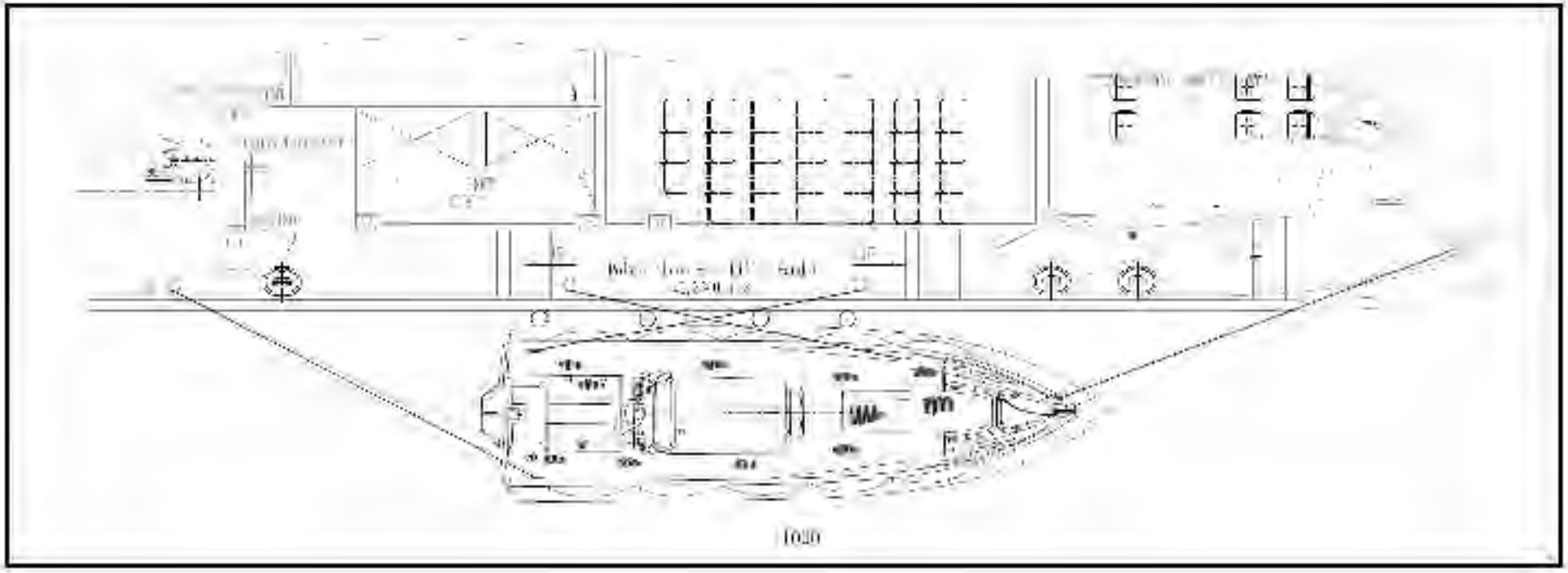
Acronym	Name
ABS	American Bureau of Shipping
BV	Bureau Veritas SA
CCS	China Classification Society
DNV AS	DNV AS
KRS	Korean Register
LR	Lloyd's Register Group Limited
NK	Nippon Kaiji Kyokai
RINA	RINA Services S.p.A.
RS	Russian Maritime Register of Shipping

Part VII - Annex 10 – Conceptual General Arrangement Plan

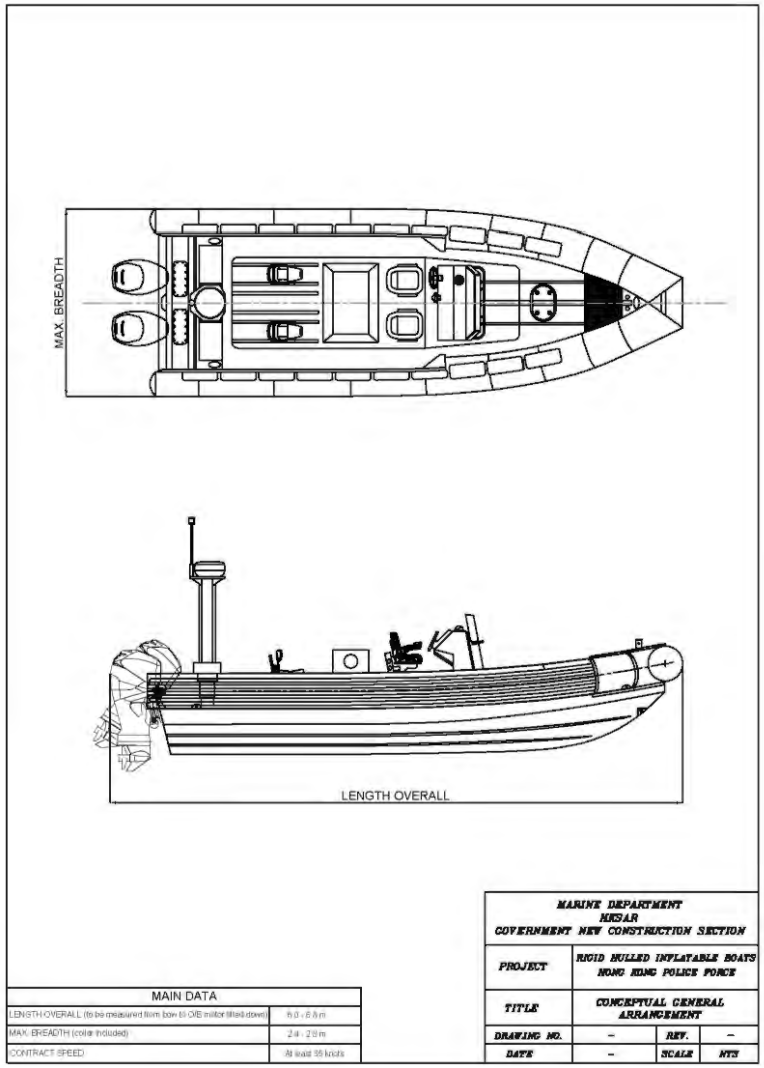



PROFILE
COMPASS DECK
UPPER DECK
MAIN DECK
POLICE
COMPASS DECK
UPPER DECK
ONLY
WINCH

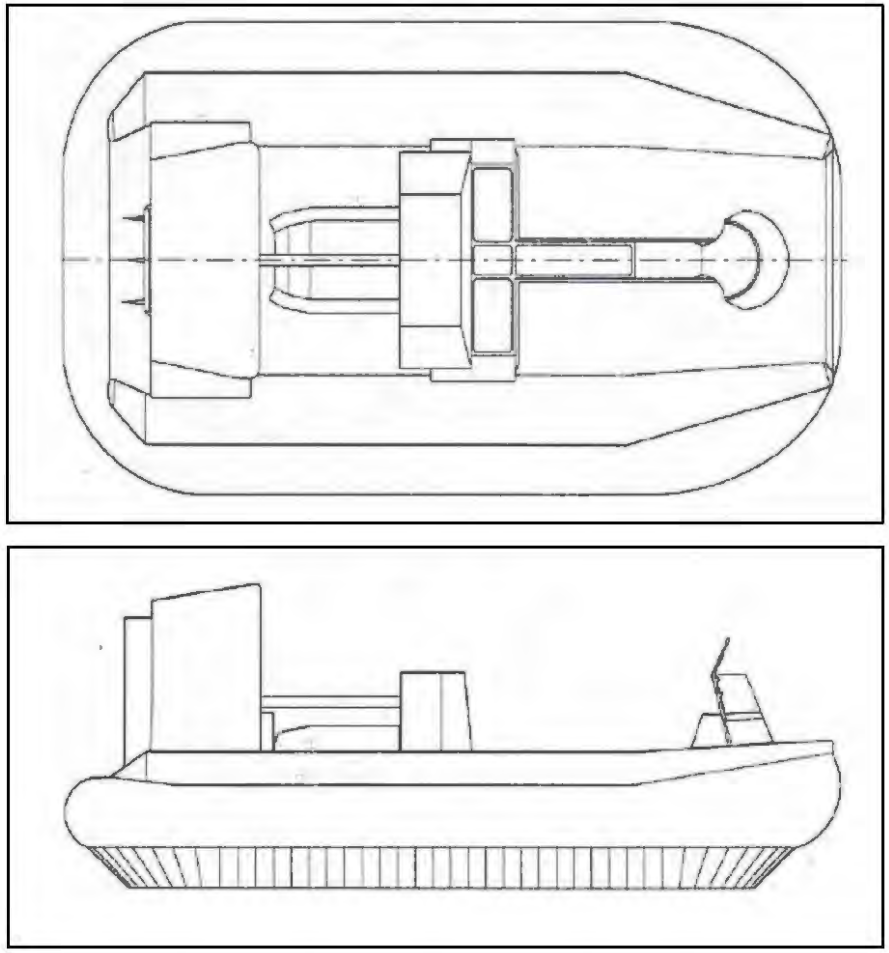

MAIN DECK
主甲板
FOLDABLE DIVING LADDER WITH FOLDABLE PLATFORM
Sloping Area
DOWN
CRANE
AIR OUT
DIVING EQUIPMENT STORE
HOVERCRAFT SP (undocking)
PADDO ROOM
WET ROOM
BATTERY ROOM
LIFTING ROCKER
No. 1 EVACUATION ZONE 20P
CREW CABIN(2P)
CREW CABIN(2P)
STORE
PYROTECHNIC STORE
ARM & AMMUNITION STORE
COMMAND OFFICE 8P
BRIEFING AREA & STANDBY AREA & No. 2 EVACUATION ZONE 58P
COMMUNICATIONS AREA 2P
C.L.
SPARE SPACE
FIRST AID
STRETCHER LIFT
ENGINE CONTROL ROOM
WOMEN'S SHOWER & TOILET
MEN'S SHOWER & TOILET
CREW CABIN(2P)
SPECIAL EQUIPMENT STORE
AIR HANDLING ROOM
CREW CABIN(2P)
Removable Seats
Y wall
CABLE STORE
AIR IN
SP SELF-RIGHTING DAUGHTER BOAT
UNDER DECK
舱底
Fire pump
Bilge pump
JET ROOM(P)
ENGINE ROOM(P)
Fire Monitor Pump
PUMP ROOM(P)
FUEL OIL TANK(P) 12500L
FP-VPD
12500L for MIST
FRESH WATER TANK(P) 6000L
EQUIPMENT ROOM
FORE PEAK(P)
SPRAY WATER JET
accumulator(sea water)
accumulator(fresh water)
Reverse osmosis desalination unit 6T/day
WATER MIST PUMP
SPRAY WATER JET
JET ROOM(S)
Fire pump
Bilge pump
ENGINE ROOM(S)
12500L FUEL OIL TANK(S)
ROOM for LIQUID TANK(S)
Bilge Separator
Chilled water unit
Sea water cooling pump
CHILLED WATER ROOM(S)
Chilled water transport pump
FORE PEAK(S)



Note: The above Conceptual General Arrangement Plans are for reference only. It is by no means a suggested or preferred layout of the vessel. The Contractor is encouraged to produce their own design which meets the requirements of Technical Specifications in this Part VII.



Conceptual General Arrangement Plan of the Daughter Boat

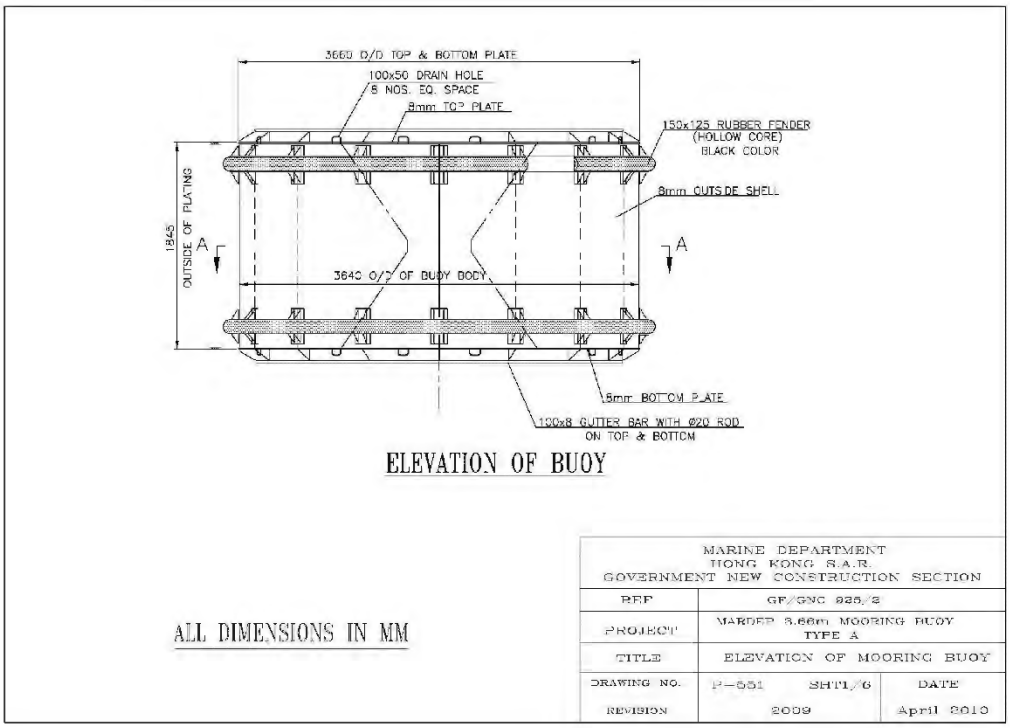


Conceptual General Arrangement Plan of the Hovercraft

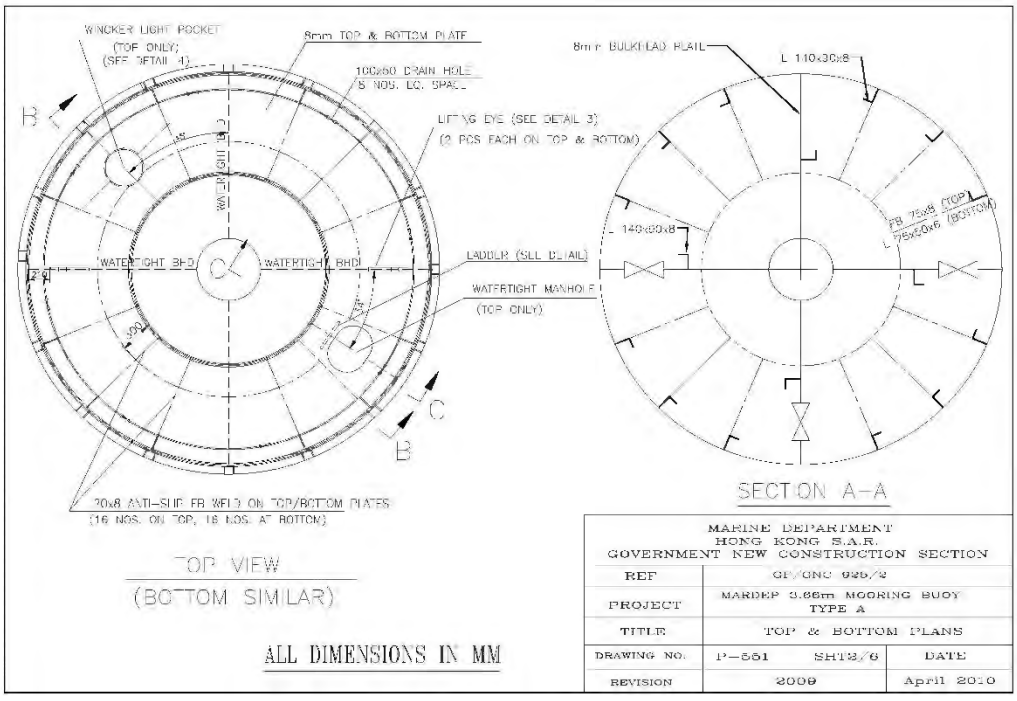
Part VII - Annex 11 – Typhoon Mooring Arrangement

Operating on a MARDEP 3.66m Mooring Buoy

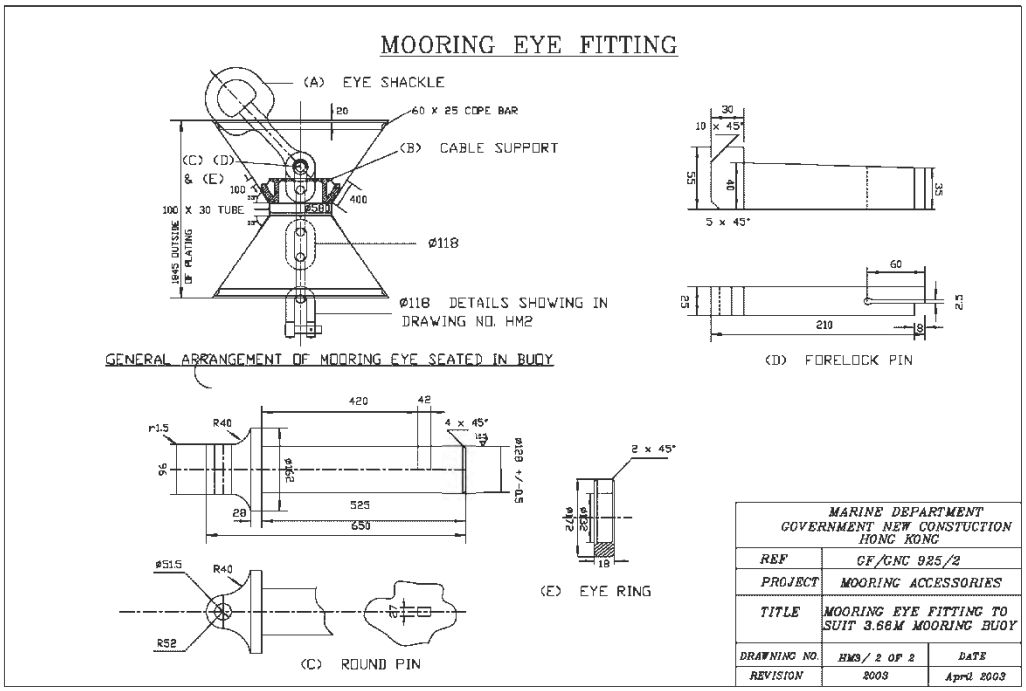
MARDEP 3.66m Mooring Buoy

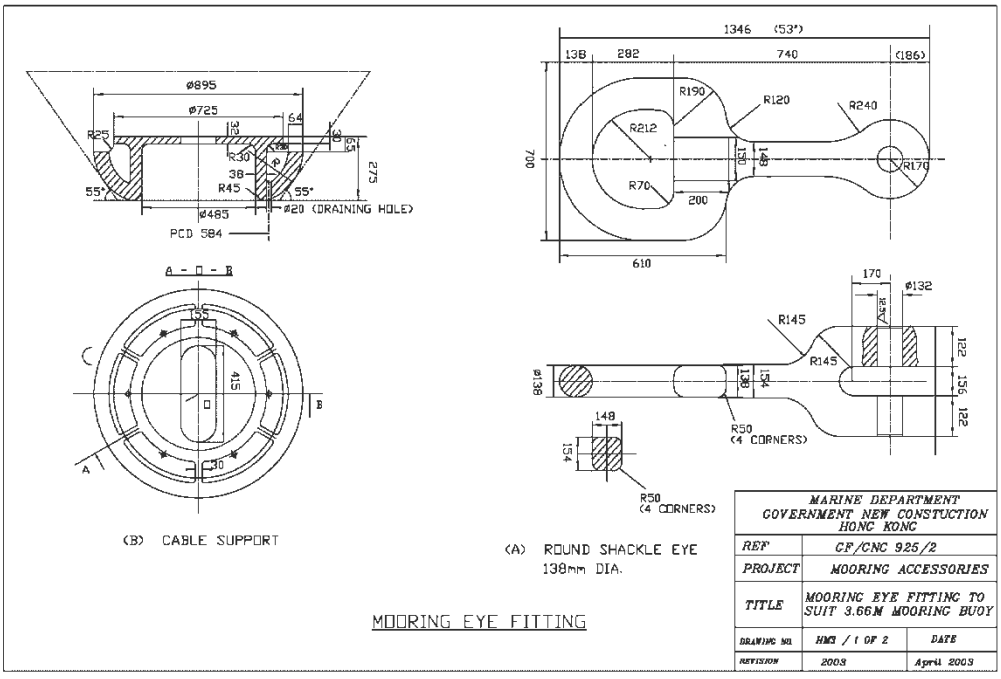


MARINE DEPARTMENT HONG KONG S.A.R. GOVERNMENT NEW CONSTRUCTION SECTION		
REF	GF/GNC 925/3	
PROJECT	MARDEP 3.66m MOORING BUOY TYPE A	
TITLE	ELEVATION OF MOORING BUOY	
DRAWING NO.	P-551 SHT1/6	DATE
REVISION	2009	April 2010



MARINE DEPARTMENT HONG KONG S.A.R. GOVERNMENT NEW CONSTRUCTION SECTION		
REF	GF/GNC 925/2	
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
60 x 25 COPE BAR
(B) CABLE SUPPORT
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 CF/GNC 925/2
PROJECT MOORING ACCESSORIES
TITLE MOORING EYE FITTING TO SUIT 3.66M MOORING BUOY
DRAWING NO. HM3/ 2 OF 2
REVISION 2003
DATE April 2003


(B) CABLE SUPPORT
(A) ROUND SHACKLE EYE
138mm DIA.
MOORING EYE FITTING
MARINE DEPARTMENT
GOVERNMENT NEW CONSTUCTION
HONG KONG
REF CF/CNC 925/2
PROJECT MOORING ACCESSORIES
TITLE MOORING EYE FITTING TO SUIT 3.66M MOORING BUOY
DRAWING NO. HM3 / 1 OF 2
REVISION 2003
DATE 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 香港近海平面風勢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 香港近海平面風勢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

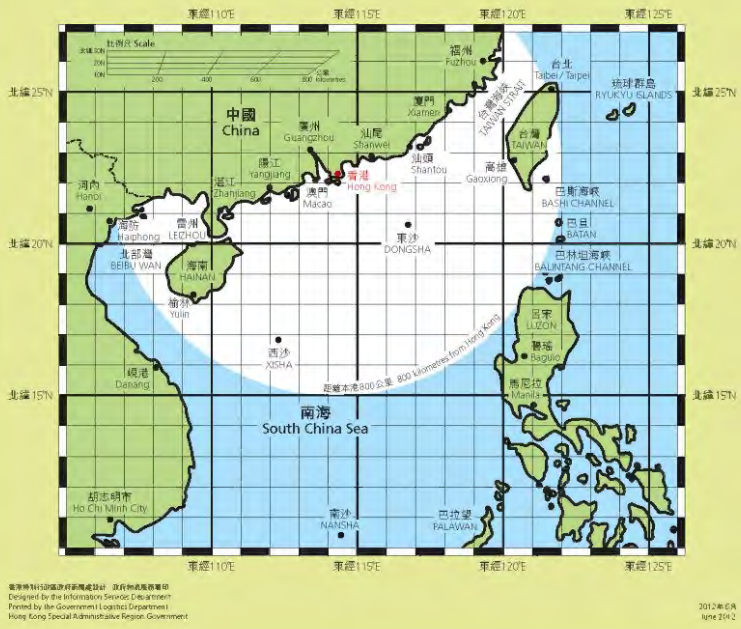
- 香港不同地區的天氣情況不能簡單憑發出的信號推斷。只知道發出了什麼信號並不足夠，你應該留意電台、電視台及天文台網頁（網址為 http://www.hko.gov.hk 和 http://www.weather.gov.hk）及「打電話問天氣」系統（電話號碼：1878 200）所提供的熱帶氣旋最新消息及有關報告，然後就發出的信號決定採取適當的相應行動。
- 發出熱帶氣旋警告信號，是為了警告市民熱帶氣旋帶來的風力威脅。
- 受地形或鄰近建築物影響，你所在區域的風力與香港普遍風勢可能有顯著差異。臨岸海域及高地風力通常較強，不當風的地區風力較弱。
- 天文台透過多種途徑，特別是互聯網，向公眾提供各區風力及雨量的詳細資料。市民應按個人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，並注意臨岸海域可能有強風。
- 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、廣告和臨時建築物亦應重固。發出3號信號後，通常在12小時之內香港會普遍吹強風，在臨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小時之內香港會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。避時切勿外出，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

熱帶氣旋途徑繪畫圖
Tropical Cyclone Plotting Map



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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
強烈颱風 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逾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"途徑之間可能相差逾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.

Part VII - Annex 12 – Tenderer's Presentation

1. General

1.1 Those Tenderers, who passed the Stage 1 and 2 of the Tender Evaluation Procedures, are required, at the discretion of the Government and 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) Command and Control Suite and Command Office

(5) Fire Safety Equipment

(6) Lifesaving Appliances and Arrangements

(7) Machinery

(8) Electrical System

(9) Operational Systems

(10) External Fire-Fighting System

(11) Waterjet System

(12) Davit and Crane LAR Systems

(13) Innovation Suggestions