Supply of Two (2) Daughter Boats for the Fire Services Department

Part VII – Technical Specifications

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Chapter 1 General Provisions

1.1 Introduction

1.1.1 This document or "Technical Specifications" (TS) sets out the requirements of the Government of the Hong Kong Special Administrative Region of the People's Republic of China ("Government") in relation to in relation to **two (2) Daughter Boats** ("Vessels") for use by the Fire Services Department ("FSD" or the "user department").

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

(a) Essential Requirements [E]; and

(b) Those specifications that are not labelled with [E] or [D] shall equally form part of the Contract like the specifications labelled as [E] ("Specifications without Label"), and

(c) Desirable Specifications [D].

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

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

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

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

1.1.7 Unless otherwise expressly defined in the Contract, all technical terms and expressions used in this Part VII shall be interpreted in accordance with the professional or common usage in naval architecture, marine engineering, nautical navigation and the shipbuilding industry.

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

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

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

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

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

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

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

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

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

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

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

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

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

(j) a sub-Section of this Part (at whichever sub-level and regardless of the numbering system adopted) may begin in upper or lower case and may be ended

with semi-colon or full stop; these differences do not have any interpretation significance on their own;

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

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

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

1.2 Statement of Purposes of the Vessels

1.2.1 The Vessels shall be used by FSD mainly (i) to perform search and rescue operations; (ii) to serve as daughter boat for coordinating search and rescue operations; and (iii) to serve as independent firefighting units.

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

1.3 Authorities

1.3.1 The Government New Construction Section ("GNC") of the Marine Department ("MD") is the section responsible for the procurement of the Vessels for the Government.

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

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

1.4 Shipyard

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

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

1.5 Design and Construction Responsibility

1.5.1 The Vessels shall be designed and constructed for a service life of not less than fifteen (15) years under reasonable maintenance.

1.5.2 It is the SOLE responsibility of the Contractor to supply Vessels which are safe, fit and suitable for the operation of the of the FSD as set out in Paragraph 1.2.1 above and which meet all the relevant regulations and the specifications in this Part VII, which include without limitation requirements for safety, health, environmental protection, hull form design features, structure, method and materials for construction and outfittings, stability, sub-division and operational efficiency.

1.5.3 The proposed Vessels shall be issued with a Classification Certificate, or Type Approval Certificate or equivalent certificate by the Recognised Organisation (RO) as specified in Schedule 9 of Part V.

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

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

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

1.6 Survey and Inspection

1.6.1 Tenderers shall note that the unit price per Vessel quoted in Schedule 1 – Price Schedule in Part V shall be deemed to have included the cost of surveys to be carried out by the relevant RO in respect of that Vessel.

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

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

1.6.4 The Contactor shall provide

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

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

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

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

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

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

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

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

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

1.6.9 The Contractor shall provide a site office for GNC's consultant's supervisor(s) during building of the Vessels at the shipyard of contractor or sub-contractor where the Vessels are constructed. The office space shall include, but not be limited to, two (2) desks, six (6) chairs, one (1) telephone, one (1) conference table for 10 persons, drinking facilities, power supply and one (1) cupboard for storage of documents and working clothes. The space provided by the Contractor shall also be fitted with air conditioning, have Internet access, a copying and a printer machine. Cleaning of the space shall be carried out in each working day.

1.6.10 The hours of work of GNC's consultant's site supervisor(s) will be arranged to coincide with those of the shipyard, in so far as it is practicable to do so. It is intended that all

reasonable steps be taken so that the duties of the consultants can be carried out with a maximum of efficiency and a minimum of interference with the Contractor's work.

1.7 Official Sea Trial and Speed Requirements

1.7.1 The Contractor shall submit for MD approval, an Official Sea Trial programme 14 working days in advance of the Official Sea Trial, which shall include details of proposed procedures for carrying out the Official Speed Trial, endurance test, ship handling at sea and performance tests, manoeuvring test, crash stop test, astern running test, emergency steering test, anchoring tests and other tests as stated in this paragraph. The notification for Official Sea Trial shall be included evidence that the Vessels are safe to go to sea for the intended tests and trials specified in the Contract.

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

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

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

1.7.5 Official Speed Trial

(a) The Official Speed Trial shall be carried out in Hong Kong Waters.

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

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

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

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

(f) The Contract Speed to be achieved by each Vessel in the Official Speed Trial shall be the minimum highest achievable speed of 35 knots for the principal dimensions A of the Vessel and 40 knots for the principal dimensions B of the Vessel as specified in Paragraph 2.5.1 of this Part VII, with the engine power at declared maximum rated power and the Vessel under Official Speed Trial Conditions as stated in Annex 5 to this Part. If the Vessel fails to achieve the minimum highest achievable speed under the aforesaid conditions, the Government will deem that the Vessel has failed to pass the Official Speed Trial and therefore Technical Acceptance.

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

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

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

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

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

(j) The speed, time of the day, engine running conditions, sea condition, etc., shall be properly recorded by the Contractor, and signed as witnessed by GNC surveyor (or GNC representatives) during the Official Sea Trial. A copy of the Official Sea Trial Report as required in Paragraph 1.7.6 below shall be given to GNC before Delivery Acceptance.

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

1.7.6 The following tests, for each Vessel, shall be conducted by the Contractor as part of the Technical Acceptance and the testing results shall be recorded and form part of the Official Sea Trial Report:

(a) Endurance Test

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

(b) Manoeuvrability Test

Forward turning circle tests to port and starboard sides shall be carried out with: (i) both engines running; (ii) port engine running; and (iii) starboard engine running. The minimum time for turning to both sides at 15°, 90°, 180°, 270° and 360°shall be recorded.

(c) Crash Stop Test

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

(d) Astern Running Test

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

(e) Emergency Steering Test

An emergency steering test shall be carried out to ascertain that the Vessel shall be steered satisfactorily when the hydraulic power supply to the steering system has been disabled.

1.8 Acceptance and Delivery

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

(a) Technical Acceptance

(b) Delivery Acceptance

1.8.2 Technical Acceptance comprising all of the following tests and trials specified in sub-paragraphs (a) to (f) below:

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

(b) This includes all the hull construction, mechanical and electrical tests and trials as required in this part and those considered necessary by the Government, including equipment tests, anchoring tests, inclining experiment and bottom survey on the slipway in Hong Kong, the Official Speed Trial as mentioned in Paragraph 1.7.5 of this Chapter shall be conducted in Hong Kong Waters, the Endurance Test, Manoeuvrability Test, Crash Stop Test and Astern Running Test as mentioned in the Paragraphs 1.7.6 of this Part, the bench acceptance test and on-site commissioning test for ENE and on-site commissioning test for as mentioned in Chapter 8 of this Part and all other verification tests to determine whether or not the Vessel including the Equipment has been supplied in accordance with all the specifications set out in these Technical Specifications.

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

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

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

(f) If the Vessel cannot pass all of the tests comprised in the Technical Acceptance

by the Delivery Date specified in the Contract, the options available to the Government are set out in Clause 12 of the Conditions of Contract and other applicable provisions of the Contract.

1.8.3 Delivery Acceptance

(a) The Vessel, after its successful completion of Technical Acceptance, and the Spare Parts as specified in Schedule 1 of Part V, shall be delivered at the Contractor's expense to the Government Dockyard. In accordance with the applicable Delivery Date specified in Schedule 2 of Part V.

(b) Type Approval Certificate for the Vessel shall be issued by the relevant RO as specified in Paragraph 2.3.3 of this Part VII before the Acceptance Certificate is issued by the Government.

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

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

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

(f) The items specified in Paragraph 8.1 of Chapter 8 of this Part VII, and all items set out in the Inventory List in the form as approved or stipulated by the Government shall be delivered to MD at the Delivery Acceptance of the Vessel. The Contractor must provide 14 days advance notice in writing for Vessel delivery when the Vessel is considered to be completed in accordance with the Contract and Ready for Use and to be delivered for the Delivery Acceptance. The Government will not accept delivery if after undergoing the tests and trials in the Technical Acceptance, the Government does not consider that the Vessel is in Ready to Use condition.

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

(h) Launching and Recovery test for the Vessels with the mother boat shall be carried out to the satisfaction of the MD and the user.

1.9 Warranty Services During the Warranty Period

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

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

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

1.10 Support Services

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

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

1.11 Asbestos Free

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

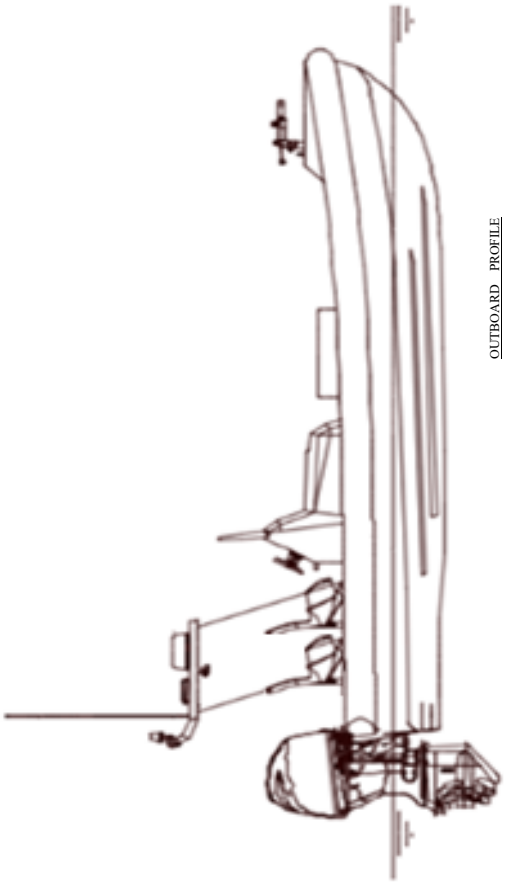
Chapter 2 General Technical Requirements

2.1 Conceptual General Arrangement Plan

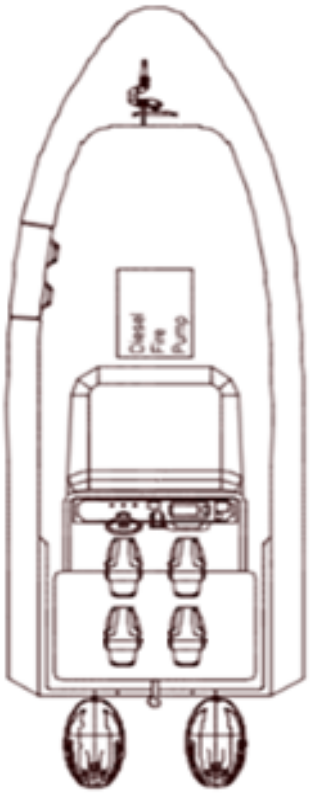
CONCEPTUAL GENERAL ARRANGEMENT PLAN

The Principle Dimensions A of the Vessel Shall be:

Length Overall:	6.5 m to 7.5 m
Extreme Breath:	Design to suit
Maximum Weight of the Vessel:	Not greater than 2,500 kg
Speed:	At least 35 knots
Material of Construction:	Aluminum

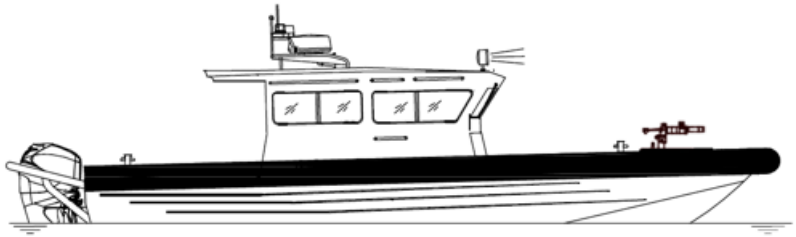


OUTBOARD PROFILE



PLAN (MAIN DECK)

CONCEPTUAL GENERAL ARRANGEMENT PLAN



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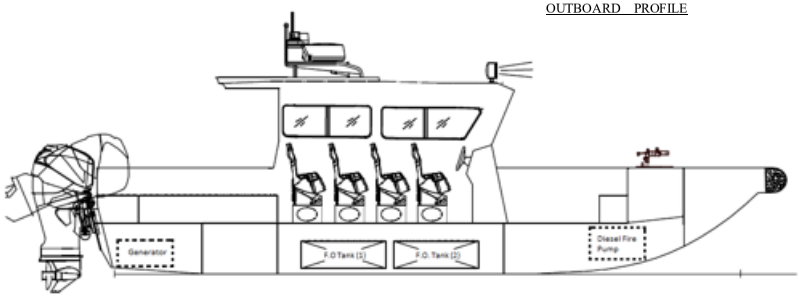

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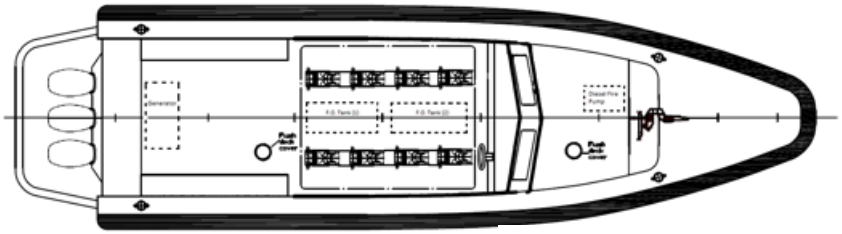
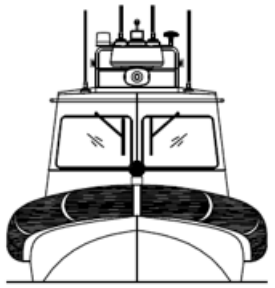


PLAN (MAIN DECK)

The Principal Dimensions B of the Vessel Shall be:

Length Overall:	9.5 m to 11.5 m
Extreme Breath:	Design to suit
Maximum Weight of the Vessel:	Design to suit
Speed:	At least 40 knots
Material of Construction:	Aluminum



FRONT VIEW

2.2 General Provisions

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

2.2.2 The work to be done under this contract consists of the design, construction, outfit, testing and delivery of **Two (2) Daughter Boats for the Fire Services Department**. Workmanship, functions, characteristics and performance shall be in accordance with this Part VII, best marine construction practices, and the regulatory standards herein specified or otherwise applicable.

2.2.3 Whilst the Contractor is required to exercise its professional expertise and knowledge to come up with appropriate designs for the Vessels which can comply with all requirements of the Contract. The Conceptual General Arrangement Plan shown above only serves as guidance and a reference drawing to help to explain the tender requirements stated in this Part VII.

2.2.4 During the design and construction of each Vessel, the Contractor is required to submit a detailed General Arrangement Plan ("GA Plan") and all relevant construction drawings for GNC's approval and acceptance.

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

2.3 Rules and Regulations

2.3.1 Each Vessel shall be issued with a Type Approval Certificate recognised by GNC.

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

2.3.3 Without prejudice to the general requirements that the Contractor shall perform all Work in full compliance with all applicable laws and regulations, and in full compliance with the requirements of the Contract including this Part VII, the construction of the Vessels must comply with the requirements of the RO specified in Schedule 9 or the requirements of any of the RO listed below (where it is expressly specified in this Part VII in relation to a particular requirement, another RO which is any one of the ROs listed in sub-paragraphs (a) to (i) below may be designated for compliance with the relevant requirement), and also the requirements further specified in sub-paragraphs (j) to (m) below:

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

(f)	Lloyd's Register of Shipping	LR
(g)	Nippon Kaiji Kyokai	NK
(h)	Registro Italiano Navale	RINA
(i)	Russian Maritime Register of Shipping	RS

and other entities as specified below:

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

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

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

(m) ISO 12215-4 "Small craft – Hull construction and scantlings – Part 4 Workshop and manufacturing".

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

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

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

2.4 Principal Dimensions

2.4.1 The Vessels of Principal Dimensions A and B are the daughter boats of the Fire Services Department. The Vessels to be built are monohull. Details of Principal Dimensions A and B as follows:

The Principal Dimensions A of the Vessel shall be:

Length Overall:	6.5 m to 7.5 m	
Extreme Breadth:	Design to suit	
Maximum weight of the Vessel	Not greater than 2,500 kg	[E]

The Principal Dimensions B of the Vessel shall be:

Length Overall:	9.5 m to 11.5 m	[E]
Extreme Breadth:	Design to suit	
Maximum weight of the Vessel	Design to suit	

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

2.5 Contract Speed

2.5.1 When all of the engines are running at their declared 100% maximum rated power, the guaranteed minimum highest achievable speed shall be at least 35 knots for the Vessel of Principal Dimension A and at least 40 knots for the Vessel of Principal Dimensions B in WMO Sea States 0 to 2 under Operational Load Condition specified in Paragraph 2.5.2 of Part VII. [E]

2.5.2 Operation Load Conditions

	Operational Loading Condition of Daughter Boat with	
	Principal Dimensions A	Principal Dimensions B
Fuel	90% of full	90% of full
No. of Persons	2 Crew + 4 Persons	2 Crew + 6 Persons
Equipment	200 kg	250 kg

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

2.6 Material of the Construction

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

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

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

2.6.4 All other materials used shall be specifically selected for marine use.

2.7 Propulsion system

2.7.1 The Vessels shall be propelled by twin outboard engines for the Principal Dimensions A and by triple engines for the Principal Dimensions B. The power rating of each outboard engine shall be at least 70 horse power for the Principal Dimensions A of the Vessels and at least 300 horse power for the Principal Dimensions B of the Vessels.

Both of the engines shall be of the same specifications produced by the same manufacturer. [E]

2.8 Vessel Operating Profile and Environment

2.8.1 The Vessels with Principal Dimensions A shall be designed to provide sufficient space for carrying at least six (6) seated persons, i.e. independent suspension seats for two (2) crew shall be provided and open jockey seats for four (4) persons shall be provided. The Vessels with Principal Dimensions B shall be designed to provide sufficient space for carrying at least eight (8) seated persons, i.e. independent suspension seats for two (2) crew shall be provided and open jockey seats for six (6) persons shall be provided. Detailed provisions regarding the mounting of shock mitigation seats are specified in Paragraphs 3.6 and 3.7 of this Part VII.

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

Operational Hours/Range of the Vessels shall be:

Number of hours/day	:	4 hours/day
Number of days/year	:	300 days/year
Endurance for fuel capacity over ground and sea	:	Sufficient fuel for 4 hours full speed operation at 35 knots for the Vessel of Principal Dimensions A and 40 knots for the Vessels of Principal Dimensions B [E]

2.8.3 The Vessels shall be able to operate safely and have good seakeeping performance within the Hong Kong Waters in rough sea conditions up to and including WMO Sea State 5 and Beaufort Scale 6 set out in Annex 8 of this Part VII.

2.8.4 The Vessels shall have good manoeuvrability and quick response throughout its speed range and capable to operate in open water and shallow water.

2.9 Markings and Colour Scheme

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

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

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

2.9.4 The Vessels' names shall be marked permanently on both sides and console of the Vessels. The details of size and calligraphy shall be directed and agreed by the MD and FSD.

2.9.5 Draught marks shall be provided permanently at the port and starboard of stem and stern. Draught marks shall be in Arabic numerals 100 mm high and shall be measured from the underside of the keel to the underside of the number markings. A draught

mark plan shall be produced by the Contractor and agreed by GNC before the draught marks are marked permanently onto the hull surface.

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

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

2.10 Tally Plates

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

(a) Builder's name;

(b) Vessel's name;

(c) Year of build;

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

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

(a) Equipment in the console;

(b) Electrical and communication equipment;

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

(d) All valves and equipment on deck;

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

(f) Any other equipment and fitting as required.

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

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

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

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

2.11 Other Design Features

2.11.1 The berthing requirements of Vessels shall match both with the cradle at their corresponding mother boats and the designated point of berth at Government Dockyard.

2.11.2 Due to the safe working load of the cranes of the mother boat, the Vessel' displacement of Principal Dimensions A, with all equipment and fuel on board, and with the crew excluded, shall be not more than 2.5 tonnes. [E]

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

(a) chine walking;

(b) porpoising;

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

(d) loss of directional control;

(e) permanent list; and

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

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

Chapter 3 Hull

3.1 Structures of the Hull and Scantlings

3.1.1 The vessel design stresses and load (wave height versus speed), maximum acceleration considered and scantlings calculation including internal structural members shall be designed according to the rules as stipulated in Paragraph 2.3.3 of this Part VII. It shall be capable of withstanding stress coming from wave impact and operation environment conditions. All material and build processes for aluminium construction shall comply with an approved standard. Their selection shall recognise the craft through life cycle and service conditions for ease of repair in the event of hull damage.

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

3.1.3 The hull design shall incorporate a self-bailing deck with scuppers capable of draining the cockpit in accordance with the ISO 11812:2001 Small Craft – Watertight Cockpits and Quick-Draining Cockpits requirements.

3.1.4 The Vessels shall be constructed with internal buoyance tanks. Removal hatches shall be provided for ease of inspection.

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

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

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

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

3.2 Weld and Fabrication

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

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

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

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

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

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

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

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

(f) Finish surfaces and bolting;

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

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

3.3 Stability

3.3.1 The offered Vessels shall meet the Stability Criteria specified in Paragraphs 3.3.4 to 3.3.7 of Part VII. [E]

3.3.2 The lines plan with offset table and the preliminary stability information of the Vessels shall be submitted with the tender before the Tender Closing Date. All calculations and drawings must be in metric units.

3.3.3 A final stability assessment of the sea trial loading condition using final lightship data shall be delivered to MD prior to the Official Speed Trial mentioned in Paragraph 1.7.6 of this Part VII. Any compartment to be fully filled up with foam or other alternative to obtain 100% permeability shall not be allowed.

3.3.4 Stability Criteria

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

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

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

(c) As per stability requirements of the RO.

3.3.5 Inclining Experiment

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

(b) At least 7 working days in advance of the inclining experiment specified at Paragraph 3.3.5 (a), the "Scheme of Inclining Experiment" ("Scheme") shall be approved by the RO and submit to MD for reference. The Scheme shall include:

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

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

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

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

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

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

(c) The inclining experiment shall only be conducted:

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

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

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

3.3.6 The inclining experiment report shall be produced and has obtained the RO's approval before submitting to MD for further comments. The report shall include a statement from the Contractor stating that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract. The Vessel must not carry any operational limitations with respect to its stability capability within the operational requirements stipulated in this Part VII. No Official Speed Trials shall be conducted until MD, based on the information given in the inclining experiment report, agrees it is safe to carry out such tests and trials.Stability Assessment Booklet

(a) The Contractor shall supply to MD three (3) copies of the Stability Assessment Booklet. The Stability Assessment Booklet must be given to MD at the time of Delivery Acceptance.

(b) The Stability Assessment Booklet in its final version shall include:

(i) The Vessel's particulars, sketch of general arrangement drawing showing different compartment and tank positions, hydrostatic curves, cross curves, vessel displacement, drafts, trim, VCG, TCG, LCG, GM, down-flooding angle(s) and other information where necessary;

(ii) Tank calibration/sounding tables, which shall consist of the locations of tanks (in terms of frame numbers), levels from tank bottom, capacity, and free surface moments, and the locations of the sounding points;

(iii) The Vessels fulfilling the Stability Criteria as stipulated in Paragraph 3.3.3; and

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

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

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

Vessel with Principal Dimension A				
Loading Conditions		Fuel oil	Equipment	Persons
1	Full Load Departure Condition	98%	200 kg	450 kg (6 persons)
2	Full Load Arrival Condition	10%	200 kg	450 kg (6 persons)
3	Light Load Departure Condition	98%	20 kg	150 kg (2 crew)
4	Light Load Arrival Condition	10%	20 kg	150 kg (2 crew)

Vessel with Principal Dimension B				
Loading Conditions		Fuel oil	Equipment	Persons
1	Full Load Departure Condition	98%	250 kg	600 kg (8 persons)
2	Full Load Arrival Condition	10%	250 kg	600 kg (8 persons)
3	Light Load Departure Condition	98%	20 kg	150 kg (2 crew)
4	Light Load Arrival Condition	10%	20 kg	150 kg (2 crew)

(i) The weight of each person shall be assumed to be 75 kg.

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

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

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

(v) The vessel shall be capable of operating safely at WMO Sea State 6.

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

3.3.7 Damaged Stability Criteria

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

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

3.4 Painting

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

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

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

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

3.4.5 A Tributyltin (TBT) free foul release/anti-fouling paint shall be applied on the following areas below the water line to provide at least two years protection against the marine growth. The anti-fouling systems shall not contain toxic substance called cybutryne.

(a) Exterior of the hull; and

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

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

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

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

3.4.9 Surfaces that require painting shall be fully prepared prior to painting. Exposed aluminium parts are coated with at least three layers of two component coating.

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

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

3.5 Steering Console

3.5.1 The steering console shall be integrated with the engine compartment casing. It shall be constructed with either marine grade aluminium alloy or Composite Material.

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

3.5.3 Steering Console

(a) The layout of the console shall be submitted for MD's approval before any construction work on the consoles commences. The final design of the console shall be manufactured for inspection, modification (if necessary) and confirmation by MD and the FSD. The console of an existing craft may be used as the basis for initial discussions.

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

(c) The console's design shall be optimised ergonomically so that a coxswain of an Asian stature (approximately 1.64 metres in height) can operate the controls and displays for extended periods from both the seated and standing positions without incurring unnecessary physical strain.

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

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

(i) Helm;

(ii) Engine throttle control head;

(iii) Engine monitoring display panel;

(iv) Engine start control;

(v) Loudhailer control unit and microphone;

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

(vii) Electric horn;

(viii) Siren and flashing beacon control panel;

(ix) Navigation lights and search lights switch panel;

(x) GPS receiver;

(xi) Start and priming control of fire pump;

(xii) Fuel tanks level gauge (Fuel for both outboard engines and fire pump); and

(xiii) Display screen of at least 9 inches showing all necessary ENE information as stipulated in Chapter 8.

(f) The Controls, Displays and Equipment

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

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

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

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

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

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

3.6 T-top/ Awning (Vessel with Principal Dimension A)

3.6.1 No hard top is required, merely T-top/ Awning and a support structure for essential navigation, communication and signalling devices shall be provided.

3.6.2 The T-top shall be made of aluminium with enhance visibility. It shall be strong and rigid but designed to minimise wind resistance and visual obstruction to crew members seated or standing at the Steering Consoles. The designs of the fixtures, fittings and finishing specified shall be discussed during the kick-off meeting and drawings shall be submitted to GNC and FSD within one month from the date of the kick-off meeting for approval.

3.6.3 Independent suspension seats with horizontal and vertical adjustment for two (2) crew and open jockey seats with handles for four (4) persons shall be provided.

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

3.7 Wheelhouse (Vessel with Principal Dimension B)

3.7.1 Wheelhouse includes console, seating and space. Wheelhouse design shall ensure the Vessel to have an air draught to be agreed by the MD and FSD.

3.7.2 Independent suspension seats with horizontal and vertical adjustment for two (2) crew and open jockey seats with handles for six (6) persons shall be provided.

3.7.3 The entrance door shall be a watertight construction and placed in center aft.

3.7.4 Wheelhouse shall be capable of carrying two (2) persons lying on two (2) stretchers respectively.

3.7.5 All Wheelhouse windows shall be made of safety glass. The windows shall be provided with sunscreens of the readily adjustable type. Forward facing windows shall be inclined forward and provide visibility free of any glare under all operating condition. The Wheelhouse front windows shall be inclined from a vertical plane topside out to reduce unwanted reflection, at an angle of not less than 10° and not more than 25°. All side windows shall be openable for the sake of ventilation.

3.7.6 An air conditioner (A/C) shall be installed for cabin, and proper thermal insulation layer shall be installed inside the cabin for minimizing the transmission of heat.

3.7.7 Hand holds and grab rails shall be fitted in cabin.

Marine heavy duty straight-line type wipers with water spray shall be provided for all front windows.

3.8 Lockers/Void Spaces

3.8.1 Lockers/Void Spaces

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

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

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

3.8.2 The design of lockers or other storage acceptable to the FSD, or void spaces and their mounting facilities, shall be subject to the prior approval by MD and FSD. Upon request, the Contractor shall change and modify the design to the satisfaction of MD and FSD.

3.9 Deck, Seating and Attachment Systems

3.9.1 High quality overall boat deck covering shall be provided. The seats shall be designed to prevent occupants from falling or being thrown onto the deck or overboard, to optimise body posture thereby minimising the potential for spinal or other injuries and to mitigate the potentially harmful forces to which the Vessel and crew conducting the type of operations specified in Paragraph 1.2.1 according to the operational profile specified in Paragraph 2.8.2 of this Part VII may be subjected.

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

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

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

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

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

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

3.9.4 Suitable handrails and grips, coated with appropriate anti-slip material, shall be provided at the console and at other locations around the Vessel to enable operators to move safely around the Vessel at all times. The locations of handrails shall be discussed at the kick-off meeting.

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

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

3.10 Fender System

3.10.1 Fixed rubber fender shall be fitted to cover the full length of the port and the starboard sides for hull protection purposes.

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

3.10.3 The fender shall be resistant to impact, abrasion, outdoor temperature extremes, degradation caused by ultraviolet radiation, ozone and contact with seawater, oil,

petrol, diesel, lubricating oil or chemicals. Heavy duty abrasion resistant D-shape collar foam fendering system with nose cone fender is preferred.

3.11 Bow

3.11.1 All gunwale fittings such as cleats and bollards shall be designed to minimise the risks of line tangling or snagging. All deck level tie-down points shall be flush fitting or removable to minimise trip hazards. The structure of bow shall be adequately strengthened with optimal fendering for protection from slamming.

3.11.2 The detachable fire-fighting monitor shall be installed at the bow of the Vessels as specified in Paragraph 5.4 of this Part VII.

3.12 Survivor Recovery Door (Diving door)

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

3.12.2 The door shall be constructed with a diving door for opening and locking in position. The sealing of diving door shall be such that water shall not ingress from the gaps whilst sailing. Handrail/handgrip and ladder shall be provided in way of the survivor recovery door. The design shall be appropriate for its function and discussed at the kick-off meeting.

3.13 Transom and Stern Area

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

3.13.2 Sufficient protection shall be designed and fitted for safety of prevention of man overboard incidents.

3.13.3 The outboard engines shall be protected by a suitable stern guard. Details of the design shall be discussed at the kick-off meeting and submitted to the MD for approval before the completion date stipulated in Annex 2 to this Part VII.

3.13.4 A radar bar, which is installed at transom, shall be equipped with navigation lights, beacons, remote LED search lights, waterproof loudhailer, GPS transceiver and radar antenna in concealed wiring system.

3.13.5 Radar bar shall be collapsible arch type and retrieved when the vessel is being hoisted.

3.14 Anchor, Chains and Strong Points

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

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

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

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

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

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

(d) Mounting the survivor recovery system or rescue frame

3.15 Devices for lifting the Vessels

3.15.1 The Vessels shall be provided with following means of lifting for docking, storage, inspection and maintenance purposes, designed for use with fixed jib cranes, davit cranes, telescopic cranes and truck mounted cranes:

(i) 4-Points Lifting Method

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

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

3.15.3 All devices and accessories shall be in accordance with the laws of Hong Kong prior to delivery. The 4-point lifting arrangement shall be discussed at the kick-off meeting and agreed by MD and the FSD. To avoid the need for costly and unnecessary alteration or modification of existing equipment, the Contractor shall, prior to any construction, submit detailed drawings of both methods so that the FSD can check dimensional compatibility with its existing lifting facilities.

3.16 Cathodic Protection

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

Chapter 4 Machinery

4.1 Main Propulsion Engines

4.1.1 The Vessels shall be powered by the engines which shall be four stroke outboard petrol spark ignition engines of adequate power to achieve the Contract Speed. The engines shall drive stainless steel fixed pitch propellers through the integral gearboxes.

4.1.2 The Contractor shall be responsible for ensuring the correct installation and setting up of the engines including the choice of propellers so as to avoid ventilation and cavitation.

4.1.3 The declared (rated) power of an engine model or propulsion system shall be the full throttle power at the declared (rated) speed at the final output shaft of the engine or propulsion system as offered for sale by the manufacturer. The power measurements and declarations for the engines and the propulsion system shall comply with the requirements in accordance with International Council of Marine Industry Associations (ICOMIA) 28/83.

4.1.4 The emission of the main propulsion engines shall comply with 3 Stars (Ultra-Low Emission) or higher required by California Air Research Board (CARB) star system that describes exhaust emissions of four-stroke outboard engines or equivalent.

[E]

4.1.5 Each engine shall be controlled by one set of throttle/forward/reverse lever. The two levers will be conveniently placed for one handed simultaneous operation by the coxswain.

4.1.6 The engine throttle control head shall be provided on the right hand side of the steering wheel.

4.1.7 The engines shall be equipped with power trim and a switch at the helm that enables the operator to adjust the trim angle on the fly. The engines shall be designed to trim fully in to start, and trim out as the boat gains momentum, until it reaches the point just before ventilation begins.

4.1.8 The engine located at the transom shall be easily accessed for maintenance and routine checking even underway. Working platform(s) for engine maintenance purpose shall be fitted at the stern area.

4.1.9 The electrical cables, pipings for fuel and hydraulic oil run between the console/fuel tanks and the stern shall be suitably designed to ease the maintenance. They shall be properly supported to prevent chafing and unnecessary tension.

4.1.10 Each engine system shall include the following accessories:

4.1.11 24V or 12V electrical system c/w alternator and remote starting control;

(a) Dead-man switch/emergency cut-off;

(b) Power trim and tilt system with trim gauge at console;

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

(d) Each engine shall incorporate one alternator for battery charging to support electrical consumption onboard; and

(e) Engine tie bar with each pair of engines.

4.2 Engine Installation

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

4.3 Propellers

4.3.1 All propellers shall be of stainless steel with fixed pitch that is able to minimize vibration to the hull. Removable propeller guard shall be provided for the Vessels but shall not be fitted during the Official Speed Trial.

4.4 Steering System

4.4.1 The Vessel shall be fitted with a hydraulic steering system approved by the engine's manufacturer as evidenced by a confirmation issued by the engine's manufacturer.

4.4.2 The hydraulic steering system shall be designed with two hydraulic cylinders operating in parallel. The steering capability shall be maintained with one cylinder malfunctioned.

4.4.3 The hydraulic oil tank shall be located that ready access is available for level checking.

4.4.4 Outboard engines shall be designed so that, with any combination of engine turn and tilt, there shall be no damaging interference between the motor, its accessories, and both the craft-mounted and the engine-mounted system.

4.4.5 Connections, fittings, oil fill openings and air bleeders shall be accessible.

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

4.4.7 Hydraulic systems shall be capable of operation throughout an ambient temperature range of -10 ºC to +60 ºC and be capable of withstanding storage at -30 ºC to +60 ºC.

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

4.4.9 The type of hydraulic fluid to be used in a hydraulic steering system shall be specified by the manufacturer of the steering system and shall be stated in the owner's manual. The hydraulic fluid shall be non-flammable or have a flash point of 157 ºC or over.

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

4.4.11 A flexible section shall be installed between rigid piping and cylinder(s).

4.4.12 The steering wheel shall be fitted with an anti-slip covering.

4.4.13 The piping shall comply with one of the international standards as stated in Clause 2.3.3 to this Part.

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

4.5 Generating Set (Vessel with Principal Dimension B)

4.5.1 One 220 Voltage (V) Alternating Current (AC) single phase marine diesel driven generating set of proprietary make with sound shield shall be installed. The location of Generator Set shall be discussed at the kick-off meeting and submitted to GNC for approval before installation. Detection system for fire or gas in generator compartment shall be provided.

4.5.2 The output power of the generator set shall be sufficient to meet ship's loading requirement for air-conditioning system and electrical bilge pump plus 20% reserve margin.

4.5.3 The generating set shall be DC battery started, attenuator to be drip-proof construction, and its starting/stopping and on-loading shall be by manual means.

4.5.4 One 220V single phase power supply to the electric equipment from the distribution board shall be through circuit breakers. The distribution system for 220V AC shall be insulated with two wires.

4.6 Air-conditioning system (Vessel with Principal Dimension B)

4.6.1 Air-conditioning with adequate back up ventilation shall be driven by diesel generator and provided for the wheelhouse compartment to maintain comfort when operating in heavy spray and in a high temperature, high humidity summer.

4.6.2 The air-conditioned space temperature shall be 24°C (dry bulb) for 50% relative humidity when the ambient air temperature is 33°C (dry bulb) at 85% relative humidity with full complement onboard.

4.6.3 The interval time for first operating to low the space temperature from initial temperature to 24°C (dry bulb) for 50% relative humidity shall be within 20 minutes.

4.6.4 The air-conditioner shall be of a proprietary make with local control in wheelhouse.

4.6.5 The heat exchange fins shall be provided with anti-corrosion treatment.

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

4.6.7 Remote emergency stop buttons in the wheelhouse shall be provided to stop the air-conditioning units in an emergency.

4.7 Bilge System

4.7.1 A drainage system, including an electrical bilge pump (for Vessel with principal dimension B) and a manually pump, shall be constructed and arranged to discharge the bilge of every non-watertight compartment by the Contractor. The electrical bilge pump if fitted shall be connected to the main source through fuse and started by automatic switch. An external high level bilge alarm (i.e. audio and visual) is provided at mast with on /off switch at console. Details of the design shall be discussed at the kick-off meeting and submitted to the MD for approval before the completion date stipulated in Annex 2 to this Part VII.

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

4.8 Petrol Tank

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

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

4.8.3 A tank content gauge and low level alarm shall be fitted in the console. A level gauge in litres shall be provided for each tank.

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

4.8.5 An inspection hole and air vent with flame trap on deck shall be provided. Fuel tank inspection hatch shall be sized to allow proper inspection of the entire tank interior. The inspection hatch shall have gasket covers secured by stainless steel bolts and self-locking nuts.

4.8.6 Suitable provision such as drip trap shall be made for collecting the oil discharge.

4.9 Diesel Oil Tank

4.9.1 One marine grade stainless steel 316 diesel tanks shall be mounted at under deck position. The tanks shall not be integral with the hull and shall be installed so that the loads due to the mass of the full tank are safely induced into the structure, with due consideration given to upward and downward acceleration due to the Vessel's movements at maximum speed in the sea. In this respect, continuous flexible supports spreading loads are preferable to rigid ones. The design and tests shall comply with the requirements of Recognised Organisation or other international standards acceptable to MD.

4.9.2 A tank content gauge and low level alarm shall be fitted in the console. A level gauge in litres shall be provided for each tank

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

4.9.4 The capacity shall be sufficient for 4 hours continuous operation of the air-conditioning system. The design and tests shall comply with the rules and regulations of RO.

4.9.5 All seals such as gaskets, O-rings and joint-rings shall be of non-wicking, i.e. non-fuel absorbent, material. All materials used shall be resistant to deterioration by the fuel for which the system is designed and to other liquids or compounds with which the material can come in contact as installed under normal operating conditions, e.g. grease, lubricating oil, bilge solvents and sea water.

Internal surfaces of the diesel tank shall be left unpainted and the diesel tank internal shall be cleaned thoroughly to the satisfaction of MD.

Chapter 5 External Fire-fighting System (EFFS)

5.1 General Requirements

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

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

5.1.3 The EFFS shall meet the following requirements:

(a) One electric-priming diesel engine driven fire pump rated flow of at least 1000L/min at discharge pressure of not less than seven (7) bar shall be mounted securely on deck connecting with steel suction pipe from bottom sea chest. [E]

(b) The water shall be discharged to an underdeck fixed piping and connected to a total of two (2) connections, one detachable fire-fighting monitor and an additional light alloy instantaneous 70 mm female coupling at bow.

(i) The detachable fire-fighting monitor with independent shut-off valve shall be fitted at the bow of the Vessel capable of achieving (1) at least 135° vertical travel (-45° to +90°) and (2) not less than 240° horizontal movement.

(ii) The light alloy instantaneous 70 mm female coupling shall be comprised of an independent shut-off valve at the bow. The specification of couplings shall be complying with British Standard BS 336.

(c) The underdeck fixed piping shall be provided at or near the fire pump outlet. The design and piping arrangement of the EFFS shall be discussed at the kick-off meeting and submitted to GNC for approval before installation.

(d) The fire main pipes shall be constructed with marine grade stainless steel (316) or marine grade aluminium alloy.

5.2 Fire Pump

5.2.1 The Principal Dimensions A of the Vessels shall be provided with one electric-priming diesel engine driven fire pump and the Principal Dimensions B of the Vessels shall be provided with one electric-priming diesel engine driven fire pump for external fire-fighting practice. The fire pumps shall be mounted securely with an independent underdeck fuel tank. The fire pumps shall be operated by centrifugal impeller(s), which is designed for marine and open boat use.

5.2.2 The fire pump shall be fitted and connected to an independent sea suction. Suction and discharge pressure gauges, safety valves, tachometer and any other gauges and fittings fitted shall be provided and fitted intact with the fire pump before delivery.

5.2.3 The minimum water pumping capacity of the pump shall be at least 1000 litres per minute at a discharge pressure of not less than seven (7) bar.

5.2.4 The fire pump shall be controlled manually by the integrated control panel at steering console.

5.2.5 The fire pump shall be equipped with an emergency shutdown function. The design and piping arrangement of the fire pump shall be discussed at the kick-off meeting and submitted to GNC for approval before installation.

5.3 Water Suction, Discharge and Sea Chest

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

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

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

5.3.4 The suction arrangement for the fire pump shall include a sea chest with screened inlet, a valve at the sea chest outlet and a valve vent to atmosphere.

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

5.3.6 The sea water inlet at sea chest shall be fitted with strainer plates at the Vessel's shell. The strainer plates shall possess a clear area at least twice that of the sea valves. The edges of strainer plate slots or holes shall be rounded to prevent the cavitation. The strainer plates shall also be effectively kept away from biofouling.

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

5.4 Fire-fighting Monitor

5.4.1 The detachable fire-fighting monitor shall be installed at the bow of the Vessel so as to allow an unobstructed range of operation in preventing monitor jets from impinging on Vessel structures and equipment. Designated space shall be arranged to store the fire-fighting monitor when it is not in use.

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

5.4.3 The monitor shall be constructed with corrosion- resistant material. It shall be capable of achieving (i) at least 135° vertical travel (-45° to +90°) controlled by lever and twist lock mechanisms and (ii) not less than 240° horizontal rotation.

5.4.4 The monitor shall be fitted with waterjet spray nozzle.

Chapter 6 Electrical System

6.1 General Requirements

6.1.1 Engine alternators, at idle conditions, shall provide sufficient power to maintain the battery charged.

6.1.2 Generating set (Vessel with principal dimension B) shall have the following features:

One 220V AC single phase marine diesel driven generating set of proprietary make with sound shield shall be installed. The location of generating set shall be discussed at the kick-off meeting and submitted to GNC for approval before installation. Detection system for fire or gas in generator compartment shall be provided. The output power of the generating set shall be sufficient to meet ship's loading requirement for air-conditioning and electric bilge pump plus 20%reserve margin. The generator set shall be DC battery started, attenuator to be drip-proof construction, and its starting/stopping and on-loading shall be by manual means. One 220V single phase power supply to the electric equipment from the distribution board shall be through circuit breakers. The distribution system for 220VAC shall be 2 wires insulated. The cabin area requires 220V AC power sockets only for the portable apparatus and the domestic equipment, etc. Each socket outlet shall be integrated with an 'On/Off' switch to facilitate local switching of the electrical equipment. The 220V AC socket outlets shall be supplied with 13A 3-square-pin fused plugs

6.1.3 All electrical equipment, fittings, instruments, switches, cables, insulation, sheathing, circuit breakers, rating standards and their installations shall comply with the latest Regulations of the International Electro-technical Commission (hereinafter referred to as IEC), Electrical Installations in Ships. The electrical system shall be an insulated two-wire Direct Current (DC) system. The hull shall not be used as a current-carrying conductor.

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

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

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

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

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

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

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

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

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

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

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

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

6.1.14 The Equipment's installation standards shall serve to enhance safety and not present hazards to the operators, e.g. all metal panels exposed to the operator shall be grounded properly. Warnings of any potential hazards shall be displayed in both English and traditional Chinese, or with universally recognisable labels.

6.2 Batteries

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

6.2.2 The capacities of each group of batteries specified in Paragraph 6.2.1 above shall be sufficient to provide at least six (6) consecutive starts of the engine from cold without recharging and maintain an uninterrupted power supply to the shipboard services (e.g. navigation lights, general lights alarm).

6.2.3 A separate group of batteries dedicated to the shipboard services and emergency services (e.g. radio communications and signalling, emergency and navigation lights) shall be supplied by the Contractor and conform to the RO Requirements.

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

6.2.5 Batteries shall be permanently installed in a dry, ventilated location.

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

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

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

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

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

6.2.11 All circuits (with the exception of those required for starting the engines and powering navigation lighting, electronic devices with protected memory and protective devices, which shall be protected individually with a circuit breaker or fuse as close as practical to the battery terminal) will be connected to the supply system voltage in a readily accessible location through a master battery disconnection switch, installed at or as close as possible to the positive conductor from the battery, or group of batteries.

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

6.3 Distribution Network

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

(a) Navigation light control panel and navigation lights;

(b) Horn;

(c) General lighting;

(d) Compass light;

(e) Instrument panel in the consoles;

(f) Content gauges for the fuel oil tanks;

(g) Hand-held searchlight;

(h) Siren;

(i) Red flashing light; and

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

6.3.2 For Vessel with principal dimension B, 220V AC services shall be supplied from the switchboard in the console to the following items:

(k) Air-conditioning system; and

(l) Electric bilge pump;

6.4 Cables

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

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

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

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

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

6.4.6 Wiring shall run along conduits with watertight openings and be secured in such a manner as to allow easy maintenance. Type approved cable penetrations shall be provided at the openings of watertight compartments or deck penetrations.

6.5 Overcurrent Protection

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

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

6.6 Switchboard (Panel Board)

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

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

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

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

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

6.7 Receptacles/Sockets

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

6.8 Lighting

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

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

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

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

6.9 Navigational and Signalling Equipment

6.9.1 Navigation Lights

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

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

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

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

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

(i) Port side light;

(ii) Starboard side light;

(iii) Stern light; and

(iv) Masthead light.

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

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

(a) One all-round red flashing light;

(b) One siren; and

(c) One horn.

6.9.4 For the Principal Dimensions B of the Vessels, a foldable navigation mast shall be provided on the wheelhouse top deck

6.10 Lightning Protection

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

6.11 Searchlight

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

Chapter 7 Life-Saving Appliance (LSA) Arrangements

7.1 General Requirements

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

(a) Two (2) life ring buoy with marker light and a rescue quoit with line attached shall be provided. The name of the Vessel shall be painted on both life ring buoy and rescue quoit.

(b) The no. of self-inflatable life jackets to be provided in each Vessel shall be six (6) for Vessel with principal dimension A and eight (8) for Vessel with principal dimension B respectively. The lifejacket shall comply ISO 12402-3:2006 (Personal floatation devices – Part 3 :Lifejackets, performance level 150 – Safety requirements) issued by the ISO. In addition to the other lifejacket requirements in the International Life-Saving Appliance Code (LSA Code), the name of the Vessel shall be painted on each side of the lifejackets on board. The size of the name painted shall be decided by GNC. The material of paint shall not cause any damage to the lifejacket surface.

(c) One (1) 2.5-kg dry powder fire extinguishers shall be provided with holding rack.

(d) A survivor recovery door shall be installed at the starboard side of the Vessel to facilitate rescue of victim at sea. The size and arrangement shall be discussed at the kick-off meeting.

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

Chapter 8 Electronic Navigation Equipment

8.1 Description of Electronic Navigation Equipment System

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

(a) Loudhailer/Siren and External Broadcasting System;

(b) 3D Compressed High Intensity Radar Pulse (CHIRP) Sonar System;

(c) Marine Doppler Radar;

(d) GPS/DGPS Receiver (with GPS Chart Plotter);

(e) Automatic Identification System (AIS);

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

(g) Magnetic Compass; and

(h) Electronic Chart System (ECS).

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

8.1.3 An integrated system is preferred, so that information and the display monitor of different systems, such as ECS, Doppler radar system, AIS transceiver, GPS chart plotter and 3D CHIRP sonar system, can be shared in order to utilise the limited space available in coxswain operation area and to provide users a better displaying interface.

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

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

8.1.6 The Contractor shall pay attention to the compass safe distance of the Equipment and the radiation hazard zone of the radar scanner in the Vessel design. All radar and radio equipment shall be of a type approved by the Office of the Communications Authority of Hong Kong.

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

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

8.1.9 When the generation/use of calendars are employed for logging of reports, activation of equipment, or as any essential part of logic for the proper functioning of the system,

then the calendar generation shall function without any error or manual intervention for all leap years.

8.1.10 The circuit-breaker for the electronic equipment shall equip with lockout device so that the breaker can be locked during the equipment maintenance.

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

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

8.2 Loudhailer/Siren and External Broadcasting System

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

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

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

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

(a) Power ON/OFF;

(b) Hail volume control; and

(c) Function control.

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

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

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

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

8.3 3D Compressed High Intensity Radar Pulse (CHIRP) Sonar System

8.3.1 The equipment shall consist of transducers, a processor unit and an interconnection display unit which is recessed mounted at the steering console and capable of providing readout of sea depth in feet, fathoms and meters.

8.3.2 The transducer shall be installed at the hull of the Vessel.

8.3.3 The interconnection display unit shall comprise of a flush-mounted LCD colour display of a type suitable for use on an open deck vessel. The display unit shall provide a

clear and clutter free picture in all weather conditions and be suitable for viewing in direct sunlight without the need for a viewing hood or the like.

8.3.4 The interconnection display unit shall be interconnected with the Radar, ECDIS and other navigational equipment.

8.3.5 The equipment shall provide radar pulse in multiple frequencies to build 3D high resolution sonar images.

8.3.6 The measuring depth shall provide at least 600 feet of down vision and 300 feet of side vision.

8.3.7 The waterproof rating of the equipment shall meet IPX6 or IPX7 standard.

8.3.8 The maximum power consumption shall be 12.4 W.

8.3.9 The power of the equipment shall be supplied from the 12 or 24 V DC system of the Vessel.

8.4 Marine Doppler Radar

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

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

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

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

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

8.4.6 The radar shall have standard NMEA 0183 or NMEA 2000 interface ports, i.e. National Marine Electronics Association (NMEA) Standard, capable of accepting navigational data from a wide selection of GPS/DGPS Receivers, Electronic Compasses, and to output comprehensive data on all tracked targets in the form of a track table to a wide selection of electronic chart plotters. However, connection of the radar system to the other systems supplied under this Contract via other standard interface types equivalent to NMEA 0183 is acceptable.

8.4.7 The power of the equipment shall be supplied from the 12 or 24 V DC system of the Vessel.

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

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

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

8.4.11 The radar display unit shall comprise a flush-mounted LCD colour display of a type suitable for use on an open deck vessel. The display unit shall provide a clear and clutter free picture in all weather conditions and be suitable for viewing in direct sunlight without the need for a viewing hood or the like. The display shall indicate clearly the important parameters such as radar targets, range marker, bearing line, heading marker and range rings, guard zone and background etc.

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

(a) Power ON/OFF;

(b) Standby/Transmit;

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

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

(e) Bearing cursor rotation;

(f) Variable range marker;

(g) Range scale selection;

(h) Display brilliance & illumination;

(i) Selection of background colour and target colour;

(j) Tuning; and

(k) Heading marker ON/OFF.

8.4.13 Performance Requirements

The marine radar shall perform at least the following requirements.

(a) Display Unit

Display:	LCD
Screen size:	9 inch or larger
Resolution:	800 x 480 pixels or better
Display mode:	Head up, Course up, North up and True Bearing Modes (with inputs of compass and speed data)
Range scale:	0.125 nm to 36 nm
Range units:	Selectable from nautical miles, kilometres, and kilo yards
Minimum range:	30 m or better

Range ring accuracy:	1.5% or better of the maximum range of the scale in use; or 30 m, whichever is the greater
Radar bearing accuracy:	1.5 degree or better
Display language:	English and desirably with Chinese
Others:	With Adjustable electronic bearing lines and variable range markers features
Operating temperature:	-10℃ to +55℃ or better
Waterproofing:	IPX6 or better

(b) Transceiver

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

(c) Antenna

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

8.4.14 Heading Marker, Bearing Measurement and Display

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

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

8.5 Global Positioning System (GPS) / Differential Global Positioning System (DPGS) Receiver (with GPS Chart Plotter)

8.5.1 The information received by the GPS/DGPS receiver shall be input to the marine radar and display on the marine radar and the screen of the Electronic Chart System (ECS). The output of the receiver shall give the vessel position in a format compatible to marine radar in the NMEA 0183 or NMEA 2000 format. However, connection of the

radar system to the other systems supplied under this Contract via other standard interface types equivalent to NMEA 0183 or NMEA 2000 is acceptable.

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

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

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

8.5.5 Performance requirements

(a) Display

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

(b) GPS Receiver

GPS Receiver Type:	Equipped with 8 channel parallel receiver or better
Frequency Range:	1575.42± 1MHz (C/A code), L1
Sensitivity:	-130 dBm or better
Dynamic Range:	25 dB or better
Warm start fix time:	Less than 30 seconds
Cold start fix time:	Less than 3 minutes
Position Accuracy:	15 m or better
Tracking Velocity:	999 kt or better

(c) Differential Beacon Receiver

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

(d) Environmental Requirements

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

8.6 Automatic Identification System (AIS)

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

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

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

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

8.6.5 Each set of AIS shall include:

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

(b) AIS Transponder Unit;

(c) VHF antenna;

(d) GPS antenna; and

(e) Installation / operation handbook

8.6.6 Performance Requirements

(a) General

Power supply:	12 – 24 V D.C.
Default Frequencies:	AIS1 (CH 87B) : 161.975 MHz
	AIS2 (CH 88B) : 162.025 MHz
Frequency range:	156.025 ~ 162.025 MHz
Transponder size/weight (+ 2%):	221 x 165 x 95 mm, 1.5 kg
GPS size/weight (+ 2%)	90 x Ø65 mm (+140 mm mounting bar), 0.2 kg

(b) Transmitter Characteristic

Power output:	12.5W or 1.0W (41 dBm ±1.5 dB or 30 dBm ±1.5dB)
Antenna impedance:	50 ohms (SO-239)
Channel spacing:	25 kHz

(c) AIS Receiver

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

(d) GPS Antenna & Receiver

Antenna:	PATCH ANTENNA /TNC (RG58U)

Receiver Type:	16 channel, L1 frequency, C/A code
Accuracy:	Acquisition -140dBm / Tracking -150dBm

(e) Environment

Operating temperature:	-15℃ to +55℃
Storage temperature:	-25℃ to +75℃
Vibration:	IEC 60945

(f) Aerial and Feeder

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

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

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

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

8.7 International Maritime Mobile (IMM) Very High Frequency (VHF) Radio with VHF Digital Selective Calling (DSC) of Global Maritime Distress Safety System (GMDSS)

8.7.1 The IMM VHF radio shall conform to the performance requirements and standards adopted by the International Maritime Organization (IMO) and meet the licensing requirements of the Office of Communication Authority of Hong Kong.

8.7.2 The Radio shall be fully compatible to GMDSS and equipped with a lithium battery of lifetime at least 5 years.

8.7.3 The Radio shall be integrated with a Class A Digital Selective Calling (DSC) transceiver fully compatible with the IMO GMDSS carriage requirements.

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

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

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

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

(a) Power ON/OFF;

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

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

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

(e) Channel selection and indicator;

(f) Dual watch mode selection; and

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

8.7.8 Performance Requirements

(a) Transmitter Characteristics

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

(b) Receiver Characteristics

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

(c) Aerial and Feeder

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

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

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

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

8.8 Magnetic Compass

8.8.1 The Contractor shall provide one magnetic compass.

8.8.2 The magnetic compass shall have a direct-read dial with dial size of at least $2\frac{3}{4}$ inch.

8.8.3 The magnetic compass shall have a green night lighting function.

8.8.4 The magnetic compass shall have a built-in compensator to adjust for deviation.

8.8.5 The power of the equipment shall be supplied from the 12 or 24 V DC system of the Vessel.

8.8.6 The compass dome shall be constructed of heavy duty, optically clear polymer, and shall provide clear and accurate magnification of the dial.

8.8.7 Performance requirements of magnetic compass:

(i)	Resolution:	5° or better
(ii)	Mounting option:	Binnacle or flush or bulkhead mount
(iii)	Waterproofing:	IPX5 or better

8.9 Electronic Chart System (ECS)

8.9.1 The ECS shall be able to show the radar, AIS, depth of water by echo sounder and Electronic Navigational Charts (ENC) information. The aforementioned functions shall be integrated into one multi-function system and present to the display.

8.9.2 General Requirements

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

(i) Navigational calculation;

(ii) Chart updating;

(iii) Piloting; and

(iv) Voyage monitoring.

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

(i) Working with GPS/DGPS receiver (connected via NMEA 0183 or NMEA 2000 bus);

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

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

8.9.3 Performance Requirements

(a) Navigational Features

Total Waypoints:	2000 or more
Routes:	50 route plans or more
Alarms:	Including but not limited to, proximity alert, cross-track error and arrival/anchor watch

(b) Electrical and Physical

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

(c) Environment

Operating Temperature: -10℃ to +50℃ or better

Storage Temperature: -20℃ to +60℃ or better

8.10 Installation Requirements

8.10.1 General

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

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

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

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

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

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

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

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

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

(iv) Lightning protection devices shall be fitted.

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

(i) Satisfactory performance of the Equipment;

(ii) Protection from mechanical and water damages;

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

(iv) Manufacturers' recommendations shall be strictly observed.

(h) The power, signal and control cables connecting to the flush-mounted equipment

shall be long enough to let the equipment wholly place on a safe place like on the panel, table, etc. with valid cable connections for fault finding and equipment testing. These extended cables shall be properly managed and resided inside the console.

(i) Induced mutual interference should be within an appropriate level which would not affect normal operation. [D]

(j) Installation location

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

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

(k) Material and Workmanship

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

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

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

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

(l) Equipment Fixing and Interconnection

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

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

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

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

(m) Electricity

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

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

(n) Cable

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

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

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

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

(o) Labelling and Marking

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

(ii) Polarity of power cables shall be labelled.

8.11 Acceptance Test

8.11.1 The acceptance tests shall comprise the following:

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

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

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

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

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

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

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

8.12 Documentation for the Proposed Equipment

8.12.1 The Contractor shall supply with the tenders the following documentation:

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

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

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

(a) Operations and working principals;

(b) Equipment functional description;

(c) Equipment specifications;

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

(e) Calibration procedures;

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

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

(h) Maintenance and troubleshooting instructions;

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

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

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

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

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

Chapter 9 Services Support

9.1 General Requirements

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

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

(b) Initial cost;

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

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

(e) Time between maintenance periods;

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

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

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

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

(b) easy access to in-situ service and maintenance in Hong Kong.

9.2 Information to be Provided Prior to and at Delivery Acceptance

9.2.1 Information provided prior to Delivery Acceptance:

(a) Detailed Inventory List for the whole Vessel to be submitted to the MD and FSD for approval.

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

(c) Full details of each item includes:

(i) Item number;

(ii) Description;

(iii) Type/model;

(iv) Quantity;

(v) Manufacturer;

(vi) Manufacturer’s reference number;

(vii) Location in Vessel; and

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

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

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

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

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

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

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

(i) Description;

(ii) Type/model;

(iii) Makers part no. or equivalent;

(iv) Location;

(v) Quantity; and

(vi) Supplier or agents name and contact address.

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

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

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

(i) Daily user check and operation procedure;

(ii) Operating detail of each system; and

(iii) Emergency operation procedure.

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

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

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

9.2.3 Tools & Test Equipment for Electronics

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

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

9.2.4 Photographs

For each Vessel, the Contractor shall at Delivery Acceptance provide the following:

(a) As-Fitted Photographs

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

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

(b) Official Photographs

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

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

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

(c) Softcopy of Photographs

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

9.2.5 Certificates and Reports

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

(a) Associated test certificates;

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

(e) Main engines and Generator performance test certificates;

(f) Complete record of the trial commissioning tests;

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

(h) Certificates of light and sound signalling equipment;

(i) Builder certificates;

(j) Certificates of building material;

(k) Deviation card for compass (after adjustment in Hong Kong);

(l) Type Approval certificate of each Vessel issued by RO;

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

(n) Any other certificates as appropriate.

Chapter 10 Training

10.1 Training on Electronic Navigational Equipment (ENE)

10.1.1 General requirements

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

(b) The Contractor shall provide appropriate classroom as well as on board training to the operational and technical staff to familiarise officers with the operation and maintenance of the Equipment being supplied and installed. The trainer shall be able to communicate with the local trainees effectively.

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

(d) Operator Training

(e) Equipment Maintenance Training

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

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

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

10.1.2 Operator Training Course

(a) This course shall provide training for trainers.

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

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

(d) A total of up to 20 trainees will attend the course. The training course shall accommodate the specified number of trainees.

10.1.3 Equipment Maintenance Training Course

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

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

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

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

(i) Introduction of the Equipment locations;

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

(iii) Equipment block and schematic functional descriptions;

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

(v) Equipment construction and mounting;

(vi) Equipment interfacing and signal interfacing; and

(vii) Preventive maintenance and trouble-shooting.

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

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

(e) A total of up to 30 trainees will attend the course. The training course shall accommodate the specified number of trainees.

10.2 Training on Operation and Maintenance of the Vessel

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

10.2.2 In order to ensure the navigational work-up team of the MD acquires full knowledge and appreciation of all aspects of the manoeuvrability, vessel handling, turning characteristics, engines, etc., the Contractor shall provide an appropriate training course for 20 officers of the MD in Hong Kong upon the Delivery Acceptance of the Vessel. An operation training programme shall be proposed for consideration by GNC which shall include details of depth and duration of the training course. The training instructors must possess suitable qualifications acceptable to MD. A certificate shall also be issued to the trainees by the training instructor or his organisation upon completion of the training course for proof of competence and satisfactory completion of the course.

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

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

Chapter 11 Abbreviations

ABS	American Bureau of Shipping
AIS	Automatic Identification System
AWS	American Welding Society
BS	British Standards
CD	compact disc
CD-ROM	Compact Disc Read-Only Memory
CH	Channel
COG	course over ground
dB	Decibel
dBi	decibel isotropic
dBm	Decibel-milliwatts
DC	Direct Current
DGPS	Differential Global Positioning System
DSC	Digital Selective Calling
ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
ENC	Electronic Navigational Charts
ENE	Electronic Navigational Equipment
GB	Gigabyte
GM	Metacentric Height
GMDSS	Global Maritime Distress Safety System
GPS	Global Positioning System
GZ	Righting Lever
Hz	Hertz
IMM	International Maritime Mobile
IMO	International Maritime Organization
IEC	International Electro-technical Commission

IP	Ingress Protection
IPX	Internetwork Packet Exchange
ISO	International Organization for Standardization
ITU-R	International Telecommunication Union – Radio communication Sector
K	Kilo
kg	Kilogram
kHz	Kilohertz
km	Kilometer
LCD	Liquid Crystal Display
LCG	Longitudinal Centre of Gravity
LED	Light-emitting Diode
LSA	Life-Saving Appliance
LSA Code	International Life-Saving Appliance Code
m/s	Metre per Second
MHz	Megahertz
mm	Millimetre
MMSI	maritime mobile service identity
NIR	Non-Ionizing Radiation
Nm	Nanometre
NMEA	National Marine Electronics Association
PVC	Polyvinyl Chloride
RF	Radio Frequency
RG58U	RG58U Type Coaxial Cable
ROT	rate of turn
rpm	revolutions per minute
RT	Radioactive Test
SINAD	Signal-to-noise and Distortion Ratio
SOG	speed over ground

TCG	Transverse Centre of Gravity
TS	Technical Specifications
UTC	coordinated universal time
uV	nano voltage
VCG	Vertical Centre of Gravity
VDC	Voltage of Direct Current
VHF	Very High Frequency
V.S.W.R.	Voltage Standing Wave Ratio
W	Watt
WVGA	Wide Video Graphics Array

Part VII - Annex 1 - Warranty Services and Guarantee Slipping

1. Warranty Services

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

1.2 The Government reserves all rights and claims against the Contractor in the event that any warranty claim has not been handled in accordance with the terms of the Contract.

1.3 For the Equipment in respect of which the manufacturer/supplier does not offer a one-year free warranty on such equipment, the Contractor shall provide the Warranty Services throughout the Warranty Period at the Contractor's own cost. For other loose equipment and installations, such as life-saving and firefighting equipment, etc., which are required to be serviced, inspected or renewed annually, the Contractor shall provide the servicing, inspection and renewal as per the manufacturer's requirements of that equipment or installation in the Warranty Period applicable to such items.

1.4 During the Warranty Period, when the Vessel is handed over for the Warranty Services and/or Guarantee Slipping, the Contractor shall be responsible for the due return of the Vessel in good order. Should there be any loss or damage of the Vessel or any Warranty Item (as defined in Paragraph 1.5 below) caused by any reason whatsoever while the Vessel is in the possession or control of the Contractor (including even when the Vessel is at the Government Dockyard or a maintenance base of the user department) or at the shipyard of the Contractor or an authorised agent appointed by it, the Contractor shall pay for the cost for the loss or damage plus 20% as and for liquidated damages but not as a penalty. Throughout the Warranty Period, notwithstanding anything to the contrary in the Contract, the Vessel and all Warranty Items are deemed to be at the Contractor's risks, and the Contractor shall insure and keep insured, at his own expense, a property insurance with the Government to be named as the sole payee, for an indemnity amount of not less than the purchase price of the Vessel plus 20% to protect the Government property against all risks. The Certificate of Insurance and evidence showing that the premium has been paid shall be available for inspection in advance. The Contractor shall provide this insurance policy before the commencement of the Warranty Services and/or Guarantee Slipping. Any excess payable under the insurance policy shall be borne by the Contractor.

1.5 Total Vessel Warranty

It is required that the Vessel is covered by free of charge Warranty Services for one year after the date of the issue of the Acceptance Certificate in respect of the Vessel. The Warranty Services shall cover the entire Vessel and all its Equipment (including all major Equipment specified in Schedules 6 and 7 in Part V and electronic navigational equipment), fittings and outfit (including spare parts, and documentation) (collectively, "Warranty Items") against defects of design, construction, workmanship or materials and against any non-compliance with any of the Product Warranties. The Warranty Services may be backed up by the Contractor using individual equipment suppliers/manufacturers' warranties but the Contractor shall remain solely liable to MD as a primary obligor to provide the Warranty Services. Notwithstanding and without prejudice to the Contract on warranty obligations for the total Vessel, any individual equipment supplier/manufacturer's warranty extending beyond the one year total Vessel warranty must be assigned to the Government as appropriate.

In order not to violate the warranty of main propulsion engine(s), gearbox(es), diesel generator(s) and fire pump petrol engine(s) of External Fire-fighting System, the Contractor shall also provide the corresponding periodic maintenance services based on the manufacturer(s)' recommendations within the Warranty Period at no extra cost to the Government.

1.6 Procedures for Warranty Claim

Without prejudice to the provisions of the Contract, a detailed procedure for dealing with warranty claims must be proposed by the Contractor and agreed by MD before the issuance of the Acceptance Certificate of the Vessel. This shall be based on the following principles:

1.6.1 Any notification of claimed defect shall be sent from MD to the Contractor through a defined route.

1.6.2 There shall be a joint inspection to examine the defect and the Contractor shall propose the appropriate and necessary remedial action to the satisfaction of MD.

1.6.3 The Contractor shall undertake on-site Warranty Services (including provision of all replacement Warranty Items, spare parts, labour, materials, test equipment, and transportation) wherever, at the option of the Government, the Vessel is berthed in the Government Dockyard or maintenance bases of the user department. Taking the Vessel to the shipyard of the Contractor should be avoided unless absolutely necessary.

1.6.4 Rectification of defects must have a minimum effect on the operation of the Vessel by the provision of on loan equipment if the anticipated repair time exceeds the time frame as specified in Paragraph 1.7.1 below.

1.7 Throughout the Warranty Period, the Contractor shall be responsible for the provision of free of charge corrective maintenance and rectification of all defects in all and any of the Warranty Items including repair and replacement as necessary. This shall, at no cost to the Government, include Warranty Services to be performed by the Contractor described in the following sub-paragraphs:

1.7.1 To attend to the Vessel for inspection and repair within 24 hours (excluding Hong Kong public holidays) of receiving the report of a fault ("fault report") and to take immediate action to rectify the defect after inspection. Unless otherwise agreed by the Government, all corrective maintenance and rectification must be effected within 48 hours after the fault report is first issued. The MD must be informed of what corrective maintenance and rectification actions have been taken within 72 hours of receiving the relevant fault report.

1.7.2 To provide all necessary transport, replacement Equipment, spare parts, labour and materials, tools and testing instruments required for the corrective maintenance and rectification.

1.7.3 Any replacement item or part to be used shall originate from the manufacturer of the original Warranty Item to be repaired and must be able to be found in the latest spare parts list issued by such manufacturer. Alternative components shall not be used without the prior approval in writing of the MD.

If the Contractor fails to respond to any reported warranty claims within 48 hours, the MD may arrange corrective maintenance and rectification of the defect either on its own or by deploying a third party contractor as deemed appropriate with a view to minimising any downtime incurred. In such case, the Contractor shall compensate the Government for the full cost of such repairs plus 10% as and for liquidated damages but not as a penalty no later than 10 working days after a written demand has been served on the Contractor by MD.

1.8 Extension of Warranty

1.8.1 The Warranty Period for any Warranty Item shall be suspended whilst and if the Contractor fails to repair and correct satisfactorily the defects in such Warranty Item within seven working days counting from the date when the relevant fault report was first issued.

1.8.2 Warranty Items which are electronic equipment sub-assemblies, modules or components and which are replaced during the Warranty Period shall have a new warranty period of one year commencing from the date of replacement.

1.8.3 In relation to a Warranty Item, references to Warranty Period shall be construed to include such extended warranty period as mentioned in Paragraph 1.8.1 and/or 1.8.2 above, depending on whichever is applicable.

1.8.4 Equipment which is found to be defective during the trials at the Guarantee Slipping as mentioned in Paragraph 2.2.5 below shall have an extension of warranty of one year.

1.8.5 The Warranty Period of the Vessel shall be suspended due to operational downtime caused by any confirmed failure in any Warranty Item counting from the date when the relevant fault report was first issued.

1.9 Recurrent Defects

During the Warranty Period, should a second and similar defect arise in relation to a Warranty Item, this shall be construed as conclusive evidence of the Warranty Item's unsuitability for the purpose intended, and the Contractor shall take immediate steps to conduct a thorough investigation jointly with MD at the Contractor's expense, to ascertain the reasons for any such defect and shall forthwith at the MD's option and the Contractor's expense, procure and deliver another replacement Warranty Item with a new design suitable for the purpose intended to replace the original defective Warranty Item.

1.10 In the event that the Contractor proposes to modify any Warranty Item or any part of the Vessel in order to repair or replace the same or another Warranty Item, the Contractor shall obtain the Government's advance written consent to the proposed modification.

1.11 Throughout the Warranty Period, the Contractor shall maintain an inventory of spare parts, which shall be the same items as listed in Schedules 6 and 7 in Part V and in the same quantity in the shipyard of the Contractor which the Contractor shall use for performing the Warranty Services. The Government will not provide its own inventory of the Spare Parts to the Contractor for the provision of the Warranty Services.

1.12 Updated/Upgraded Information

It is expected that during the Warranty Period certain Warranty Items may be modified or changed. All documentation affected by this change must be updated to reflect the new situation. All the support documentation such as the Vessel inventory list, job information and maintenance scheduling in relation to these modifications and changes shall be provided at the expiry of the Warranty Period.

1.13 Warranty of Electronic Navigational Equipment

Please refer to the Chapter 8 of 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 Gearboxes

(a) Renew the lubricating oil and replace the filters for the main engines and gearboxes and top up the engine coolant as per the manufacturer's recommendations;

(b) Clean all the engine air filters and change the filter elements;

(c) Change all fuel/water separators elements and fuel filters for all engines;

(d) Clean the coolers of the engines and gearboxes and renew all zinc anodes if provided;

(e) Check all the engines' belts and adjust or renew if necessary;

(f) Check tappet clearances for the inlet and exhaust valves, ignition timing and idle speed and adjust if necessary;

(g) Conduct function tests for the engines' protection system and their associated sensors, gauges and other measuring devices;

(h) Disconnect and remove all engines and gearboxes sea water pipes (suction & discharge)

for inspection, and clear off marine growth and obstructive materials in all pipes and fittings;

(i) Repair all damages and leakages in the metal and fibreglass pipelines; and

(j) Any other work required or recommended by the engine manufacturer.

All of the work listed at Paragraphs 2.2.2(a) to (j) of this Part VII shall be carried out by the manufacturer's authorised agent/dealer. All the work procedures and the spare parts used shall comply with the manufacturer's specifications and requirements.

2.2.3 Hull and Deck Items (where applicable)

(a) Paint Under the Water Line

(i) Paint under the water line shall be checked by the paint manufacturer's representative for the effectiveness of one year's protection against marine growth;

(ii) The hull shall be cleaned and readily for inspection of paint damage;

(iii) Damaged paint shall be repaired according to the paint manufacturer's procedures;

(iv) After the repair of the damaged paint as specified at Paragraph 2.2.3(a)(iii) of this Part VII, two coats of touch up primer and one coat of touch up shall be applied; and

(v) One touch up anti-fouling paint of finishing coat shall be applied to the damaged paint as specified at Paragraph 2.2.3(a)(iii) of this Part VII.

(b) Paint Above the Water Line

(i) Damaged paint on the hull above the water line and deckhouse shall be repaired properly. After repair, two coats of touch up primer and one coat of touch up (finishing) shall be applied;

(ii) Two coats of paint shall be applied on the Vessel's name, draft marks and insignia; and

(iii) One full coat of anti-slip paint shall be applied to the open and side deck.

(c) Inspect and clean and polish propellers.

(d) Inspect, clean and remove obstructed object on the propeller shaft.

(e) Water jet tunnel and impeller(s) inspection and cleaning (if applicable).

(f) Free, clean, grease and recondition all moving parts of the deck fittings, i.e. water tight ("WT") hatches, vent covers, rollers and fairleads and anchor chain stoppers, etc.

(g) Renew all zinc anodes on hull, rudder(s) and tail shaft(s).

(h) Life-saving appliances ("LSA") and Fire-fighting appliances ("FFA") must be serviced and re-certified as required. (Free, clean, grease and recondition all fire control valves, hydrants and bilge suction and control valves).

(i) Free, clean and repaint the anchor chain and swivel set.

2.2.4 Mechanical, Electrical & Air-conditioning

(a) Dismantle all overboard valves for inspection and renew the defective parts;

(b) Check and clean the sea water system (including the grating, sea chest internal, sea suction and strainers) complete with renew their zinc anodes;

(c) Each of the compartment bilge suction to be checked and free of rubbish;

(d) Generator megger test and electrical circuit earth leak test; and

(e) Batteries condition check and switch over test.

2.2.5 The following shall be tested at the dock trial / sea trials as part of the Guarantee Slipping:

(a) Engine control and steering system including emergency/alternative method;

(b) Engine alarm and shut down function (including emergency stopping of engines at wheelhouse);

(c) Hybrid System;
(d) Battery Generator;
(e) Navigational equipment, lights and sound signals;
(f) Ahead and astern running and crash stop test;
(g) Steering trial;
(h) Speed Measurement;
(i) Bilge system function (including high level bilge alarm system);
(j) Fire pump(s) function (including fire detection system, alarms, ventilation fans /fuel pump remote shutdown);
(k) The Dock Trial and Sea Trial Safety Checklist items, as listed below;

Dock Trial Check List

General items will be checked during dock trial	
1.	Engines start and stop testing
2.	Engines emergency stop check
3.	Engines speed and clutch unit testing
4.	Engines speed high and low idle speed testing
5.	Engines gauges and alarm check
6.	Propulsion system testing
7.	Anchor windlass testing
8.	Navigation lights testing
9.	Wheelhouse horn and windows screen wipers testing
10.	Fire protection system alarm check
11.	Portable fire extinguishers inspection
12.	Life-saving equipment inspection
13.	Engine room ventilation fans testing
14.	Air compressor and air conditioning system testing
15.	Cabin lights testing
16.	Bilge system in each compartment testing.
17.	Floor plate inspection
18.	Fuel tanks quick closing valves testing
19.	G.S. pumps testing
20.	Bilge pumps testing
21.	A/C cooling water pumps testing
22.	Tailshaft cooling water pumps testing
23.	Fire pumps testing
24.	Fuel oil pumps testing
25.	Sanitary pumps testing

26.	Sewage pumps testing
27.	Fresh water pumps testing
28.	Waste water pumps testing
29.	Steering system power assisted and manual operation testing
30.	Emergency rudder operation check
31.	Rudder indicator check

Sea Trial Safety Check List

General items will be checked during sea trial	
1.	Engines start and stop testing
2.	Engines emergency stop check
3.	Engines speed and clutch unit testing
4.	Wheelhouse horn and windows screen wipers testing
5.	Portable fire extinguishers are in place
6.	Life jackets and life buoys are in place
7.	Sea trial navigation flag hoisted
8.	Telecommunication system function check
9.	Approved coxswains are in control
10.	Sufficient fuel oil to perform the full course of sea trial
11.	Water tank is full

(l) Other trials or testing of equipment as required by the Government Representative; and

(m) Any item or component found defective shall be repaired or replaced.

2.3 After Guarantee Slipping, the Contractor shall submit the above works completion report (including engines trial/testing report completed with engines parameters) to the Government Representative.

Part VII - Annex 2 - Implementation Timetable

Milestones		Completion Dates
1	Issuance of "Notification of Conditional Acceptance"	To be advised after Tender Evaluation.
2	Contract Date (the date of the last party signing the Articles of Agreement)	The date when the last party signs the Articles of Agreement. The Government will not sign the Articles of Agreement until and unless the Contractor fulfils all of the conditions precedent as specified in Clause 25.2 of Part II - Conditions of Tender (save to the extent waived by the Government, if any).
3	Kick-Off Meeting	To be held within two (2) months after the Contract Date at the Government Dockyard or the Contractor's Shipyard.
4	Completion of hull and superstructure of the Vessel	The Contractor shall propose the completion dates of Milestones 4-8 for GNC's approval within two (2) months after the Contract Date.
5	Completion of installation of engine propulsion system, propellers and steering system	
6	Completion of design with GNC approval and installation of ENE Systems	
7	Launching of the Vessel	
8	Conduct of all tests, inspections and trials as part of the Technical Acceptance including the Yard Trial	
9	Shipment to Hong Kong	
10	Delivery Date	The Delivery Date for the Vessel shall be no later than the date set out in Schedule 2 (Delivery Schedule) of Part V.

Part VII - Annex 3 - Drawing Submission Timetable

Item No.	Drawings Approval	Completion Date
1	General Arrangement Plan	*All the drawings shall be submitted in two months after Signing of Articles of Agreement for GNC's approval / reference.*
2	Lines Plan	
3	Stability Information	
4	Inclining Experiment Report	
5	Midship Section	
6	Stern Construction	
7	Frames and Bulkhead Sections	
8	Construction Profile and Deck Plan	
9	Shell Expansion Plan	
10	Bow Construction & Bow ramp Details	
11	Deckhouse Construction Plan	
12	Fuel Oil tank Construction	
13	Paint Schedule	
14	Tank Capacity Plan	
15	Main Engine & Gearbox Mounting Arrangement	
16	Power / Speed Estimation and Curve	
17	Deck Cabin Arrangement & Details	
18	Crew Cabin Arrangement & Details	
19	Engine Room Arrangement	
20	Shafting Arrangement	
21	Propeller Drawing	
22	Steering Arrangement & Rudders & Rudder Stock	
23	Mast Structure	
24	Details of Diesel Generator Arrangement	
25	Details of ENE Equipment System	
26	Control Console Arrangement and Schematic Diagram	
27	Instrumentation and Control System	
28	Calculation of Fuel Oil Capacity	
29	Details of Main Engines /Generators Alarms & Sensors	
30	Engine Room Piping Diagrams including sea water system, bilge system, fresh water system, black water system, HVAC	
31	Engine Room Ventilation and Exhaust & Calculation	
32	Details of the Air-Conditioning System & Calculation	
33	Ship's Ventilation Arrangement & Details	
34	Fire Detection System	

Item No.	Drawings Approval	Completion Date
35	Details of Electrical Equipment	
36	Electrical Load Calculations	
37	Schematic Layout of Electrical Circuits	
38	Lighting Arrangement	
39	Battery Arrangement & Details	
40	Navigation Light Arrangement	
41	Search Lights & Flood Lights Arrangement	
42	Lightning Protection Arrangement	
43	Solar Panel Arrangement	
44	Details of Galvanic Corrosion Prevention	
45	Torsional Vibration Calculation	
46	Fire Fighting Arrangement	
47	Lifesaving Arrangement	
48	Tonnage Measurement Calculation	
49	Freeboard Calculation	
50	Anchoring & Mooring Arrangement	
51	Hatches & Manholes Arrangement & Details	
52	Ship's Railing Arrangement & Details	
53	Wheelhouse Windows & Visibility Diagram	
54	Windows Arrangement & Details	
55	Insulation & Lining Arrangement & Details	
56	Fender Arrangement & Details	
57	Cathodic Protection Arrangement & Details	
58	Ship's Name & other Tally Plates Details	
59	Safety Plan	
60	Others as required	

Part VII - Annex 4 – Main Items Inspection Timetable

VESSEL NAME : (Principal Dimensions B) & (Principal Dimensions A)			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Hull Structure, Layout and Outfitting Inspection			
H-1	Hull Lofting			
H-2	Construction materials –Aluminium plate mark checking for hull			
	a) Aluminium plate mark checking for hull			
	b) Material certification verification			
H-3	Construction materials – aluminium plate mark checking for deckhouse			
	a) Aluminium plate mark checking for deckhouse			
	b) Material certification verification			
H-4	Welding consumables and welders' certificates verification			
H-5	Keel lay inspection			
H-6	Fabrication of hull up to main deck in stages of work including			
	a) Alignment			
	b) Edge preparation			
	c) Welding			
	d) Workmanship			
	e) Compliance with approved plans			
	f) Non-destructive tests NDT (X rays) of welds			
	g) Hull internal work inspection			
	h) Plating thickness gauging			
H-7	Engine girder fabrication and welding			
H-8	Deckhouse scantling and welding check			
H-9	Inspection and weld check of connection between deckhouse and main deck			
H-10	Welding construction and pressure test of tanks			
	Fuel oil tank(s)			
	a) Tank construction (internal/external/fitting)			
	b) Tank pressure test			
	Fresh water tank(s)			
	a) Tank construction (internal/external/fitting)			
	b) Tank pressure test			

VESSEL NAME : (Principal Dimensions B) & (Principal Dimensions A)			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Hull Structure, Layout and Outfitting Inspection			
H-11	Hose test for hull and deckhouse			
H-12	Mock-up inspection for the wheelhouse			
H-13	Deckhouse console mock up			
H-14	Installation of the various outfitting items			
	a) Anchor and chain			
	b) Windlass			
	c) Hand pump			
	d) Hatches			
	e) Doors			
	f) Windows			
	g) Ventilators			
	h) Seating of heavy equipment and mast			
H-15	Function test of various outfitting items			
H-16	Water-tightness or weathertightness of openings			
	a) Manholes			
	b) Hatches			
	c) Doors			
	d) Windows			
	e) Ventilators and Air pipes			
	f) Cable glands			
H-17	Painting inspection of different layers			
H-18	Zinc anodes and lightning protection			
	a) Installation of zinc anodes			
H-19	Vessel dimension verification			
H-20	Draught marks verification			
H-21	Hull completion survey			
H-22	Arrangement of deckhouse, wheelhouse and accommodation			
H-23	Inspection of fire, heat and sound insulation			
	a) Fire Insulation			
	b) Heat Insulation			
	c) Sound Insulation			
	Cabin			

VESSEL NAME : (Principal Dimensions B) & (Principal Dimensions A)			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Hull Structure, Layout and Outfitting Inspection			
H-24	Lifesaving appliances and firefighting appliances			
	a) Lifesaving appliances			
	b) Firefighting appliances			
H-25	Inspection of sea chest and grating			
	a) Sea chest			
	b) Grating			
H-26	Inclining experiment			
H-27	Sea Trials including operation of outfitting			
H-28	Trial of anchor & mooring arrangement			
H-29	Cleanliness inspection before acceptance			
H-30	Inventory check in HKSAR			
H-31	Acceptance and delivery			
H-32	Acceptance of As-Fitted drawings and Engine/Equipment manuals and Documentation			

VESSEL NAME : (Principal Dimensions B) & (Principal Dimensions A)			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-1	General inspection and function tests on installation of machinery:			
	a) General inspection of the main propulsion engine			
	b) General inspection of the generator set			
	c) General inspection of the shafting			
	i. Propeller taper bedding test			
	ii. Coupling taper bedding test			
	iii. Coupling and rudder bolts fitting			
	d) General inspection of propeller			
EM-2	Main Engine:			
	a) Test of engine safety devices and alarms			
	b) Test of emergency stop			
	c) Inspection of exhaust pipe before lagging			
EM-3	Hydraulic test of sea valve			
EM-4	Inspection of the sea water suction strainers			

VESSEL NAME : (Principal Dimensions B) & (Principal Dimensions A)			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-5	Fresh water system:			
	a) General inspection and dimension checking of the fresh water system			
	b) Fresh water tank low level alarm test			
	c) Fresh water tank final cleaning/internal inspection before filling			
	d) Fresh water tank high level alarm test			
	e) Fresh water tank content gauge calibration and test			
	f) Inspection of piping penetration of bulkhead and deck			
	g) Hydraulic test of fresh water system piping			
	h) Functional test of fresh water system			
EM-6	Fuel oil system:			
	a) General inspection and dimension checking of the fuel oil system			
	b) Fuel oil tank(s) low level alarm test			
	c) Fuel oil tank(s) final cleaning/internal inspection before filling			
	d) Fuel oil tank(s) high level alarm test			
	e) Fuel oil tank(s) content gauge calibration and test			
	f) Inspection of piping penetration of bulkhead and deck			
	g) Hydraulic test of oil fuel system piping			
	h) Functional test of oil fuel system			
EM-7	Bilge system:			
	a) General inspection and dimension checking of the bilge system			
	b) Bilge tank low level alarm test			
	c) Bilge tank high level alarm test			
	d) Bilge tank content gauge calibration and test			
	e) Inspection of piping penetration of bulkhead and deck			
	f) Hydraulic test of bilge system piping			
	g) Functional test of bilge system			
EM-8	a) Inspection of piping penetration of bulkhead and deck			
	b) Hydraulic test of black water/sanitary system piping			
	c) Functional test of black water/sanitary system			

VESSEL NAME : (Principal Dimensions B) & (Principal Dimensions A)			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-9	Firefighting system:			
	a) General inspection and dimension checking of the firefighting system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of firefighting system piping			
	d) Functional test of firefighting system			
EM-10	Fire extinguishing systems:			
	a) General inspection and dimension checking of the fire extinguishing system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of fire extinguishing system piping			
	d) Functional test of fire extinguishing system			
	e) Test of fixed fire extinguishing alarm system			
	f) Test of fire detection (smoke and heat detection) alarm system			
EM-11	Hydraulic test of sea valve			
EM-12	Hydraulic system:			
	a) General inspection and dimension checking of the hydraulic system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of hydraulic system piping			
	d) Functional test of hydraulic system			
EM-13	Engine room ventilation:			
	a) Inspection of E/R ventilation fan installation			
	b) Function test of start/stop at remote and local control for E/R ventilation fans			
EM-14	Air conditioning system:			
	a) General inspection and dimension checking of the air conditioning system			
	b) Inspection and hydraulic test of cooling water system(if applicable)			
	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)			

VESSEL NAME : (Principal Dimensions B) & (Principal Dimensions A)			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-16	Electrical installation:			
	a) Inspection of lightening conductor			
	b) General inspection of cable layout and checking of cable sizes			
	c) Inspection of cable penetration of bulkhead and deck			
	d) Inspection of transformers			
	e) Inspection of tally plates			
EM-17	Main and emergency switchboard and panels:			
	a) Main switchboard and panels – high voltage primary injection test			
	b) Cable size checking of electrical switchboard installations			
	c) Inspection of AC distribution panel			
	d) Inspection of DC distribution panel			
	e) Megger test of the electrical system			
	f) Earth test of the electrical system			
EM-18	Control console(s):			
	a) Inspection of control console			
	b) Functional test of console controls			
	c) Inspection of navigation equipment control panel			
EM-19	Lighting:			
	a) Inspection and functional test of general lighting			
	b) Inspection and functional test of emergency lighting			
	c) Inspection and functional test of floodlight installation			
	d) Inspection and functional test of searchlight installation			
EM-20	Navigation Lights and Signals:			
	a) Inspection and functional test of navigation lights			
	b) Test of horn /whistle			
EM-21	Shafting (tailshaft and coupling) system:			
	a) Marking/Stamping and material check			
	b) Dimension check and taper bedding test			
	c) Shaft line checking of stern tube/shaft bracket and alignment of main engines and tail shaft			
EM-22	Steering system installation and testing:			
	a) Inspection and dimensional check of rudders			
	b) Inspection and dimensional check of steering gear system			
	c) Steering system functional test			

VESSEL NAME : (Principal Dimensions B) & (Principal Dimensions A)			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-23	Electronic Navigational Equipment installation and testing by EMSD			
EM-24	Test of window wipers			
EM-25	Test of noise levels throughout the vessel during the sea trial			
	Operational System			
OS-1	Installation inspection and functional test for ENE Systems			
OS-2	Inspection of tally plate and cable label			
OS-3	Inspection of main engine/genset safety alarms on W/H console table			
OS-4	Function and performance test during Sea Trial			

Note:

The inspection items are preliminary and not exhaustive, any items found necessary to be included at a later stage will be added to this list.

Part VII - Annex 5 – Vessel Condition During Respective Sea Trial

1. Sea trial for vessel with LOA 6.5 m to 7.5m (Principal Dimensions A)

1) Official Speed Trial

Conditions at Speed-Trial		
1	Person on board	6 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 90% fuel tank capacity
3	Store/Utilities	200 kg
4	Sea Conditions	Sea state 2 : wave height 0.2 - 0.5 metres

2) Endurance and Performance Test

Conditions at Endurance and Performance Test		
1	Person on board	6 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 85% fuel tank capacity
3	Store/Utilities	200 kg
4	Sea Conditions	Sea state 2 : wave height 0.2 - 0.5 metres

3) Manoeuvrability Test

Conditions at Forward Turning Circle Test		
1	Person on board	6 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Store/Utilities	200 kg
4	Sea Conditions	Sea state 2 : wave height 0.2 - 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	6 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Store/Utilities	200 kg
4	Sea Conditions	Sea state 2 : wave height 0.2 - 0.5 metres

2. Sea trial for vessel with LOA 9.5 m to 11.5m (Principal Dimensions B)

1) Official Speed Trial

Conditions at Speed-Trial		
1	Person on board	8 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 90% fuel tank capacity
3	Store/Utilities	250 kg
4	Sea Conditions	Sea state 2 : wave height 0.2 - 0.5 metres

2) Endurance and Performance Test

Conditions at Endurance and Performance Test		
1	Person on board	8 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 85% fuel tank capacity
3	Store/Utilities	250 kg
4	Sea Conditions	Sea state 2 : wave height 0.2 - 0.5 metres

3) Manoeuvrability Test

Conditions at Forward Turning Circle Test		
1	Person on board	8 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Store/Utilities	250 kg
4	Sea Conditions	Sea state 2 : wave height 0.2 - 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	8 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Store/Utilities	250 kg
4	Sea Conditions	Sea state 2 : wave height 0.2 - 0.5 metres

Part VII - Annex 6 – Endurance and Performance Test

For vessel with LOA 6.5m – 7.5m (Principal Dimensions A)

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

Conditions at Endurance and Performance Test

Person On board	**2 crews + 4 other persons**	Dummy Weight	**75 kg per person**
Fuel	**Refer to Annex 5**	Other Equipment	**Refer to Annex 5**
Sea Conditions	**WMO Sea State 2** wave height ≤ 0.5 metres and water depth ≥5 metres		

Engines:	**Port Side**	**Starboard Side**	**Propellers:**	**Port Side**	**Starboard Side**
Maker			Maker		
Type			Type		
Serial Number			Diameter		
Rated Power			Pitch		
Rated Speed			Direction of Rotation		

Engine Load	**Engine Speed (rpm)**	**Vessel Speed (Knots)**	**Time (Start)**	**Time (Finish)**	**Fuel Consumption (litres/minutes)**	**Engine Oil Pressure (Bar)**	**Engine (in) CW Temp. (ºC)**	**Others**	**Others**
__% of rated Power	At Minimum Crushing Speed		>15 min						
50% of Rated Power/rpm			>15 min						
60% of Rated Power/rpm			>15 min						
70% of Rated Power/rpm			>15 min						
80% of Rated Power/rpm			>30 min						
90% of Rated Power/rpm			>30 min						
100% of Rated Power (Endurance Test)			>90 min						

Remarks:

Witness by:	MD Representative	Shipyard Representative

For vessel with LOA 9.5m – 11.5m (Principal Dimensions B)

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

Conditions at Endurance and Performance Test			
Person On board	**2 crews + 6 other persons**	Dummy Weight	**75 kg per person**
Fuel (diesel oil)	**Refer to Annex 5**	Other Equipment	**Refer to Annex 5**
Sea Conditions	**WMO Sea State 2** wave height ≤ 0.5 metres and water depth ≥5 metres		

Engines:	**Port Side**	**Starboard Side**	**Propellers:**	**Port Side**	**Starboard Side**
Maker			Maker		
Type			Type		
Serial Number			Diameter		
Rated Power			Pitch		
Rated Speed			Direction of Rotation		

Engine Load	**Engine Speed (rpm)**	**Vessel Speed (Knots)**	**Time (Start)**	**Time (Finish)**	**Fuel Consumption (litres/minutes)**	**Engine Oil Pressure (Bar)**	**Engine (in) CW Temp. (ºC)**	**Others**	**Others**
__% of rated Power	At Minimum Crushing Speed		>15 min						
50% of Rated Power/rpm			>15 min						
60% of Rated Power/rpm			>15 min						
70% of Rated Power/rpm			>15 min						
80% of Rated Power/rpm			>30 min						
90% of Rated Power/rpm			>30 min						
100% of Rated Power (Endurance Test)			>90 min						
Remarks:									

Witness by:	MD Representative	Shipyard Representative

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 upon Delivery Acceptance

1. As-Fitted Drawings

1.1 Upon delivery of the Vessel, the Contractor shall deliver to the Government four (4) hard copies and two (2) soft-copies in .pdf and .dwg (where applicable) files of the following plans and drawings that contain the technical information of the Vessel and its machinery and equipment as they are when the Vessel is on the day accepted by GNC/MD. These are termed the final version of the "As-Fitted" Plans and Drawings, and they must consist of the following ones as well as any other additional ones that may be required by GNC/MD during the design and construction of the Vessel and before the Vessel is accepted by the Government.

1.2 The As–Fitted Plans and Drawings shall be prepared by professional ship draughtsmen and they shall be prepared in a professional manner, scale, size and style normally required of in the ship design and construction business sector. All plans and drawings shall show and be clearly marked for the profile, plan, and section views of the layout, arrangement details, and construction details in a manner required by GNC officer.

1.2.1 General Arrangement Plan.

1.2.2 Lines plan and offsets data and table.

1.2.3 Final stability information booklet and the final inclining experiment report.

1.2.4 Hydrostatics, cross curves and intact and damage stability calculations for all ship loading conditions specified in the Technical Specifications.

1.2.5 Vessel subdivision drawings and stability calculations.

1.2.6 Painting scheme of the whole Vessel.

1.2.7 Vessel draught marking diagram.

1.2.8 Detailed arrangement and layout plan of the deckhouse, accommodation, decks showing the disposition of all main equipment, fittings and fixtures, furniture, doors, windows, hatches, manholes and access openings. The down-flooding openings (points) shall be clearing indicated on the drawings.

1.2.9 Equipment layout diagram.

1.2.10 Hull structural construction and hull scantlings drawings.

1.2.11 Hull shell and frames and the framings arrangement and construction plan.

1.2.12 Hull shell expansion plan.

1.2.13 Bow construction plan.

1.2.14 Steering gear system and steering arrangement diagrams.

1.2.15 Deckhouse and deck structural and construction plan.

1.2.16 Hull watertight bulkheads construction plan.

1.2.17 Deckhouse to deck connection detailed construction plan.

1.2.18 Deck edge details and construction plan, including detailed structural arrangement drawings of hull to deck connection.

1.2.19 Detailed cathodic corrosion prevention and arrangement plans and drawings for the Vessel throughout.

1.2.20 Mast structural and construction plan and mast equipment arrangement plan.

1.2.21 Anchoring & mooring arrangement plan.

1.2.22 Piping diagrams for fuel oil, freshwater, lubrication oil, bilge, firefighting, scuppers and drains, sewage system.

1.2.23 Fire firefighting system drawings.

1.2.24 Drawings of the main switchboard and all other switchboards and the electrical system.

1.2.25 Electrical Load Calculation.

1.2.26 Electrical installation drawings.

1.2.27 Details of the Operational Systems.

1.2.28 Operational Systems equipment installation and location drawings, including ENE, communications, radio terminal, and CCTV system.

1.2.29 Operational Systems connection drawings.

1.2.30 Engine Room arrangement.

1.2.31 Shaft line arrangement.

1.2.32 Propeller details and drawings.

1.2.33 Main fuel oil tank drawing and its associated piping and manifold(s), and filling, overflow and ventilation system.

1.2.34 Freshwater tank construction plan and its associated piping arrangement.

1.2.35 Fuel oil tank(s) construction plan and its associated piping system.

1.2.36 Black water tank construction plan and its associated piping system.

1.2.37 Grey water tank construction plan and its associated piping system.

1.2.38 Drawings for anchor, windlass and the anchoring system.

1.2.39 Lifesaving appliance arrangement plan and fire safety plan.

1.2.40 Navigation lights, sound and signal diagrams.

1.2.41 Vessel overall lighting arrangement and light control plan.

1.2.42 Vessel alarm and signals, internal communication systems and public address systems plan.

1.2.43 General layout and arrangement drawing of the air-conditioning system.

1.2.44 Piping layout drawing of the air-conditioning system (if any).

1.2.45 Air-conditioning load calculation.

1.2.46 CCTV system arrangement.

1.2.47 Solar panel system.

The lists are not exhaustive, additional as fitted drawings may be added if required.

1.3 Documents shall be provided by the Contractor:

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

1.3.2 When the Vessel is delivered to the Government Dockyard, the Contractor shall deliver to the Government all of the documents as listed above and those specified in Chapter 14 of this Part VII which required to be delivered upon delivery acceptance and all other technical information, leaflets, literature, manuals and booklets etc. and whatsoever items that are necessary for the operation, handling, services, maintenance, spare parts, repairs and the technical understanding of any one of all the engines, machinery, motors, pumps, equipment, fittings and outfitting items of the Vessel.

Part VII - Annex 8 – Definition of Waves and Sea

Beaufort scale number	Description	Wind speed	Wave height	Sea conditions	Land conditions
0	Calm	< 1 km/h (< 0.3 m/s) < 1 mph < 1 knot < 0.3 m/s	0 m 0 ft	Flat.	Calm. Smoke rises vertically.
1	Light air	1.1–5.5 km/h (0.3–2 m/s) 1–3 mph 1–3 knot 0.3–1.5 m/s	0–0.2 m 0–1 ft	Ripples without crests.	Smoke drift indicates wind direction. Leaves and wind vanes are stationary.
2	Light breeze	5.6–11 km/h (2–3 m/s) 4–7 mph 4–6 knot 1.6–3.4 m/s	0.2–0.5 m 1–2 ft	Small wavelets. Crests of glassy appearance, not breaking	Wind felt on exposed skin. Leaves rustle. Wind vanes begin to move.
3	Gentle breeze	12–19 km/h (3–5 m/s) 8–12 mph 7–10 knot 3.5–5.4 m/s	0.5–1 m 2–3.5 ft	Large wavelets. Crests begin to break; scattered whitecaps	Leaves and small twigs constantly moving, light flags extended.
4	Moderate breeze	20–28 km/h (6–8 m/s) 13–17 mph 11–16 knot 5.5–7.9 m/s	1–2 m 3.5–6 ft	Small waves with breaking crests. Fairly frequent whitecaps.	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	29–38 km/h (8.1-10.6 m/s) 18–24 mph 17–21 knot 8.0–10.7 m/s	2–3 m 6–9 ft	Moderate waves of some length. Many whitecaps. Small amounts of spray.	Branches of a moderate size move. Small trees in leaf begin to sway.
6	Strong breeze	39–49 km/h (10.8-13.6 m/s) 25–30 mph 22–27 knot 10.8–13.8 m/s	3–4 m 9–13 ft	Long waves begin to form. White foam crests are very frequent. Some airborne spray is present.	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic bins tip over.
7	High wind, moderate gale, near gale	50–61 km/h (13.9-16.9 m/s) 31–38 mph 28–33 knot 13.9–17.1 m/s	4–5.5 m 13–19 ft	Sea heaps up. Some foam from breaking waves is blown into streaks along wind direction. Moderate amounts of airborne spray.	Whole trees in motion. Effort needed to walk against the wind.
8	Gale, fresh gale	62–74 km/h (17.2-20.6 m/s) 39–46 mph 34–40 knot 17.2–20.7 m/s	5.5–7.5 m 18–25 ft	Moderately high waves with breaking crests forming spindrift. Well-marked streaks of foam are blown along wind direction. Considerable airborne spray.	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.
9	Strong gale	75–88 km/h (20.8-24.4 m/s) 47–54 mph 41–47 knot 20.8–24.4 m/s	7–10 m 23–32 ft	High waves whose crests sometimes roll over. Dense foam is blown along wind direction. Large amounts of airborne spray may begin to reduce visibility.	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over.

10	Storm, whole gale	89–102 km/h (24.7-28.3 m/s)	9–12.5 m	Very high waves with overhanging crests. Large patches of foam from wave crests give the sea a white appearance. Considerable tumbling of waves with heavy impact. Large amounts of airborne spray reduce visibility.	Trees are broken off or uprooted, saplings bent and deformed. Poorly attached asphalt shingles and shingles in poor condition peel off roofs.
		55–63 mph			
		48–55 knot	29–41 ft		
		24.5–28.4 m/s			
11	Violent storm	103–117 km/h (28.6-32.5 m/s)	11.5–16 m	Exceptionally high waves. Very large patches of foam, driven before the wind, cover much of the sea surface. Very large amounts of airborne spray severely reduce visibility.	Widespread damage to vegetation. Many roofing surfaces are damaged; asphalt tiles that have curled up and/or fractured due to age may break away completely.
		64–73 mph			
		56–63 knot	37–52 ft		
		28.5–32.6 m/s			
12	Hurricane	≥ 118 km/h (≥ 32.8 m/s)	≥ 14 m	Huge waves. Sea is completely white with foam and spray. Air is filled with driving spray, greatly reducing visibility.	Very widespread damage to vegetation. Some windows may break; mobile homes and poorly constructed sheds and barns are damaged. Debris and unsecured objects are hurled about.
		≥ 74 mph			
		≥ 64 knot	≥ 46 ft		
		≥ 32.7 m/s			

World Meteorological Organization (WMO) Sea State Code		
Sea State Code	Wave Height (meters)	Characteristics
0	0	Calm (glassy)
1	0 to 0.1	Calm (rippled)
2	0.1 to 0.5	Smooth (wavelets)
3	0.5 to 1.25	Slight
4	1.25 to 2.5	Moderate
5	2.5 to 4	Rough
6	4 to 6	Very rough
7	6 to 9	High
8	9 to 14	Very high
9	Over 14	Phenomenal
Character of the Sea Swell		
	0. None	
Low	1. Short or average 2. Long	
Moderate	3. Short 4. Average 5. Long	
Heavy	6. Short 7. Average 8. Long	
	9. Confused	