

Mid-Shore Patrol Vessel (MSPV)

Technical Statement of Operational Requirements (TSOR)

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Table of Contents

Table of Contents	iii
Acronyms	vii
1 INTRODUCTION	1
1.1 INTRODUCTION	1
2 GENERAL REQUIREMENTS.....	3
2.1 REFERENCE DOCUMENTS.....	3
2.2 REGULATIONS AND STANDARDS.....	3
2.3 REGISTRATION AND CLASSIFICATION	3
3 GENERAL TECHNICAL REQUIREMENTS.....	5
3.1 DESIGN CONSTRAINTS	5
3.2 SPEED	6
3.3 RANGE.....	7
3.4 HIGH SPEED ENDURANCE.....	7
3.5 LOW SPEED ENDURANCE.....	8
3.6 SERVICE LIFE	8
3.7 OPERATING ENVIRONMENTS	8
3.8 OPERABILITY	9
3.9 HULL DESIGN	10
3.10 PROPULSION AND CONTROL SYSTEMS	10
3.11 GENERAL ARRANGEMENT (GA).....	10
3.12 ENVIRONMENTAL PROTECTION	12
3.13 STABILITY AND SUBDIVISION.....	12
3.14 ELECTROMAGNETIC INTERFERENCE (EMI) AND ELECTROMAGNETIC COMPATIBILITY (EMC)	13
4 HULL STRUCTURES	14
4.1 GENERAL.....	14
4.2 MATERIALS.....	14
4.3 SHELL AND SUPPORTING FRAMING	15
4.4 PILLARS AND STANCHIONS	15
4.5 INNER BOTTOM AND FOUNDATIONS	15
4.6 WEATHER DECK AND INTERNAL DECKS	15
4.7 MINOR BULKHEADS	15
4.8 SUPERSTRUCTURE.....	16
4.9 STRUCTURAL CASTINGS, FORGINGS.....	16
4.10 DRAIN PLUGS	16
4.11 MAST	16
4.12 RUDDERS.....	17
4.13 CHAIN LOCKER(S).....	17
4.14 RUBBING STRIPS	17
5 HULL OUTFITTING.....	20
5.1 MOORING AND TOWING SYSTEMS	20
5.2 ANCHOR HANDLING AND STOWING SYSTEM.....	20

5.3	DECK CRANE.....	21
5.4	CRAB AND GILL NET HAULER.....	21
5.5	HYDRAULIC OIL SYSTEMS	22
5.6	RIGID HULL INFLATABLE BOATS (RHIBS).....	22
5.7	RIGID HULL INFLATABLE BOATS (RHIBS) FUELLING	23
5.8	LAUNCH AND RECOVERY SYSTEMS FOR THE RHIBS	24
5.9	DECK TIE DOWNS.....	24
5.10	LIFTING STRONG POINTS	24
5.11	EMERGENCY RESPONSE GEAR.....	25
5.12	SIGNAL FLAG LOCKER	25
5.13	JACK AND ENSIGN STAFFS	25
5.14	GANGWAY	25
5.15	PORTLIGHTS AND WINDOWS.....	25
5.16	BLACKOUT AND PRIVACY CURTAINS	26
5.17	PROTECTIVE COVERS	26
5.18	LIFE LINES AND STANCHIONS.....	27
5.19	DECK PLATES AND GRATINGS	27
5.20	STRUCTURAL BULKHEADS, DOORS AND PARTITIONS	27
5.21	NAME PLATES, NOTICES AND MARKINGS	28
5.22	IMMERSION SUITS STORAGE	28
5.23	LIFE PRESERVERS	28
5.24	JACOB’S LADDERS.....	28
5.25	PAINTING AND PRESERVATION	28
5.26	DECK COVERINGS.....	28
5.27	FIREARMS AND AMMUNITION	29
6	PROPULSION	32
6.1	GENERAL.....	32
6.2	MAIN ENGINES.....	32
6.3	GEARING, SHAFTING, BEARINGS.....	32
7	AUXILIARY SYSTEMS.....	34
7.1	PUMPS	34
7.2	PIPING SYSTEMS.....	34
7.3	FUEL OIL SYSTEM	35
7.4	LUBRICATING OIL SYSTEM.....	35
7.5	DIESEL ENGINE COMBUSTION AIR INTAKES AND EXHAUSTS.....	36
7.6	COMPRESSED AIR SYSTEM.....	37
7.7	FIREMAIN SYSTEM	37
7.8	SEA CHESTS AND SEA BAYS	38
7.9	STEERING SYSTEM	38
7.10	REFRIGERATION SYSTEMS.....	38
7.11	HEATING VENTILATION AND AIR CONDITIONING (HVAC).....	39
7.12	POTABLE WATER SYSTEM	41
7.13	BLACK, GREY WATER AND SANITARY FLUSHING SYSTEMS	43
7.14	FIRE DETECTION, EXTINGUISHING AND FIREFIGHTING SYSTEMS.....	43
7.15	PORTABLE FIREFIGHTING EQUIPMENT	44
8	ELECTRICAL	46

8.1	POWER SUPPLIES	46
8.2	GENERATORS	46
8.3	SHORE CONNECTIONS	47
8.4	SWITCHBOARDS	47
8.5	DISTRIBUTION PANELS	48
8.6	ELECTRICAL CABLES.....	48
8.7	MOTORS AND CONTROLLERS	49
8.8	POWER CONVERSION EQUIPMENT.....	49
8.9	115 V AND 230 V RECEPTACLES	50
8.10	LIGHTING	51
8.11	24 V DC DISTRIBUTION AND 12 V DC DISTRIBUTION.....	54
9	NAVIGATIONAL, COMMUNICATION & MACHINERY CONTROL SYSTEMS....	56
9.1	GENERAL.....	56
9.2	BRIDGE LAYOUT	56
9.3	SHIP'S INFORMATION SYSTEMS	56
9.4	RADIO FREQUENCY (RF) EXPOSURE SURVEY.....	57
9.5	INTERFACING REQUIREMENTS	57
9.6	HARDWARE STANDARDS	57
9.7	SOFTWARE STANDARDS.....	57
9.8	NAVIGATING APPLIANCES AND EQUIPMENT	57
9.9	GYRO COMPASS	58
9.10	NAVIGATIONAL RADARS.....	58
9.11	DIFFERENTIAL GLOBAL POSITIONING SYSTEM.....	59
9.12	AUTOMATIC IDENTIFICATION SYSTEM (AIS).....	59
9.13	ELECTRONIC CHART SYSTEM (ECS)	59
9.14	AUTOPILOT	60
9.15	ECHO SOUNDER AND SONAR.....	60
9.16	SPEED AND DISTANCE LOG.....	61
9.17	VHF DIRECTION FINDER	61
9.18	NAVIGATIONAL AND SIGNALLING EQUIPMENT, NON-ELECTRICAL NAVIGATION AIDS.....	61
9.19	METEOROLOGICAL SYSTEM.....	62
9.20	EXTERNAL DATA TRANSMISSION.....	62
9.21	SATELLITE TERMINAL.....	62
9.22	SECURE COMMUNICATIONS SATELLITE TERMINAL	62
9.23	EMAIL-AT-SEA	63
9.24	HF COMMUNICATIONS	63
9.25	VHF COMMUNICATIONS	64
9.26	AIR/GROUND TRANSCEIVER.....	65
9.27	WIDEBAND ENCRYPTION TRANSCEIVER.....	65
9.28	PORTABLES.....	65
9.29	GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM STATION.....	66
9.30	UHF COMMUNICATIONS	66
9.31	LOUDHAILERS	67
9.32	RACK(S) OR SHELVE(S).....	67
9.33	CELLULAR PHONE	68

9.34	NAVTEX RECEIVER.....	68
9.35	EMERGENCY POSITION INDICATING RADIO BEACON (EPIRB).....	68
9.36	RCMP TRANSCEIVERS.....	68
9.37	OTHER GOVERNMENT AGENCIES	69
9.38	CLOSED CIRCUIT TELEVISION SYSTEM (CCTV)	69
9.39	INTERIOR DATA TRANSMISSION	69
9.40	NAVIGATION AND COMMUNICATION SYSTEMS.....	69
9.41	LOCAL AREA NETWORKS (LAN)	69
9.42	TELEPHONE AND INTERCOM SYSTEMS.....	70
9.43	AUTOMATIC TELEPHONES	72
9.44	TALKBACK COMPONENT.....	72
9.45	INTERCOM COMPONENT.....	73
9.46	PUBLIC ADDRESS COMPONENT	73
9.47	SOUND POWERED TELEPHONES	74
9.48	SHIP’S ENTERTAINMENT SYSTEMS EQUIPMENT	74
9.49	TELEVISION AND BROADCAST SYSTEMS	74
9.50	ELECTRONIC EQUIPMENT ROOM.....	75
9.51	CENTRALIZED CONTROL, ALARM AND MONITORING SYSTEM (CCAMS)....	76
10	ACCOMMODATION OUTFITTING	79
10.1	PLUMBING FIXTURES AND ACCESSORIES	79
10.2	LOCKS, KEYS, KEYBOARDS AND KEY CABINETS	80
10.3	HABITABILITY	80
10.4	STOREROOMS AND STOWAGE SPACES.....	91
A.1	RIGID HULL INFLATABLE BOAT (RHIB) MARINE SECURITY VARIANT.....	1
A.2	MISSION PERCENTAGES, PROFILES AND VESSEL UTILISATION.....	1
A.3	SEA STATE TABLE.....	1
A.4	MESS ITEMS	1
A.5	GALLEY ITEMS.....	1
A.6	CENTRAL STOREROOM	1
A.7	LINEN LOCKER.....	1
A.8	CLEANING GEAR AND STEWARD’S LOCKER(S).....	1
List of Tables	TABLE 1 - ENVIRONMENTAL CONDITIONS	9
	TABLE 2 - DECK COVERINGS	29
	TABLE 3 - AIR CHANGES	40
	TABLE 4 - ESTIMATED WASTE PRODUCTION	95

Acronyms

AC	Alternating Current
AIS	Automatic Identification System
AM	Amplitude Modulation
AMR	Auxiliary Machinery Room
ARPA	Automatic Radar Plotting (or piloting) Aids
ATU	Automatic Tuner Unit
AVOS	Automatic Voluntary Observation Ship’s
BCS	Bridge Control Station
C&P	Conservation and Protection
CCAMS	Centralized Control, Alarm and Monitor System
CCG	Canadian Coast Guard
CCS	Centralized Control Station
CCTV	Closed Circuit Television System
CD	Compact Disc
CLASS	Classification Society
cm	centimetre
COTS	Commercial Off the Shelf
CSA	Canadian Shipping Act 2001
DC	Direct Current
DGPS	Differential Global Positioning System
DND	Department of National Defence
DSC	Digital Selective Calling
DVD	Digital Video Device
ECS	Electronic Chart System
EEBD	Emergency Escape Breathing Device
EER	Electronic Equipment Room
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EP	Environmental Protection
EPIRB	Emergency Position Indicating Radio Beacon
FM	Frequency Modulation
G4	Service Group 4
GA	General Arrangement
GFE	Government Furnished Equipment
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
HAZMAT	Hazardous Material
HD	High Definition
HP	Horsepower
HSC	High Speed Craft
HVAC	Heating, Ventilation, and Air Conditioning
ICC	Integrated Computer Control

IEC	International Electrotechnical Commission
IICS	Integrated Internal Communications System
IMO	International Maritime Organization
ISO	International Organization for Standardization
ITU	International Telecommunications Union
kg	Kilogram
kts	Knots
l	litres
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LR	Lloyd’s Register
m	metre
m/s	Metres per second
MCR	Machinery Control Room
MCS	Machinery Control Station
MF/HF	Medium Frequency/High Frequency
mm	millimetre
MMR	Main Machinery Room
MOSH	Marine Occupational Safety and Health
MS	Maritime Security
MSPV	Mid Shore Patrol Vessel
nm	Nautical Miles
NMEA	National Marine Electronics Association
OEM	Original Equipment Manufacturer
OPI	Office of Primary Interest
PA	Public Address
PSMR	Propulsion Steering Machinery Redundancy
RCMP	Royal Canadian Mounted Police
RF	Radio Frequency
RHIB	Rigid Hull Inflatable Boat
SART	Search and Rescue Radar Transponders
SCIP	Secure Communications Interoperability Protocol
SCN	S (Service Power), C (Continuous Power), N (Brake Power) with only the essential dependent auxiliaries, at the declared engine speed
SCST	Secure Communications Satellite Terminal
SI	International System of Units
SSC	Special Service Craft
STA	Standard Technical Architecture
STP	Sewage Treatment Plant
SWL	Safe Working Load
TA	Technical Authority
TCMS	Transport Canada Marine Safety
UHF	Ultra High Frequency

UMS	Unattended Machinery Space
UPS	Uninterruptible Power Supply
VCG	Vertical Centre of Gravity
VCR	Video Cassette Recorder
VHF	Very High Frequency
VSCS	Vessel Satellite Communication System
WHMIS	Workplace Hazardous Materials Information System

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1 INTRODUCTION

1.1 INTRODUCTION

1.1.1 This is the Technical Statement of Requirements (TSOR) for the Mid-Shore Patrol Vessel (MSPV) that is to be capable of sustained operations out to 120 nautical miles (nm) offshore at high speeds. These vessels will be designed and built in a manner that meets each of the requirements set out in this TSOR.

1.1.2 The MSPV will be required to conduct patrols on Canada's sea coasts and on the Great Lakes and St. Lawrence Seaway System. The operational area extends from Canada's southern borders to approximately 55° North Latitude.

1.1.3 The MSPV shall meet all standards and references as detailed herein and shall be a steel mono-hull based on an existing proven parent design, as defined herein. There shall be no change to the underwater portion of the MSPV hull form as compared to that same portion of the proven parent design, except in way of appendages. The proven parent design shall have been used in the construction of a steel mono-hull vessel that has been in service for a minimum of two (2) years, and a minimum of 1000 hours in-service operation.

1.1.4 The MSPV shall be built and delivered in two variants. The first variant is the MSPV Maritime Security (MS) variant configured to accommodate two (2) Rigid Hull Inflatable Boats (RHIB). The second variant is the MSPV Conservation and Protection (C&P) variant configured to accommodate the port RHIB normally embarked and fitted for but not with either the starboard RHIB or the necessary system(s) and equipment to accommodate the starboard RHIB. Both MSPV variants are detailed herein.

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2 GENERAL REQUIREMENTS

2.1 REFERENCE DOCUMENTS

2.1.1 The MSPV shall be designed and built in accordance with the references and standards stated herein.

2.1.2 Except where otherwise noted, the latest official version at time of bid closing of the listed references shall be used.

2.2 REGULATIONS AND STANDARDS

2.2.1 In addition to the specifications described herein, the MSPV shall be designed, built, and outfitted in accordance with:

a. Classification rules of a single approved Classification Society (Class) as listed in TP 13585 - Marine Safety Management System; and

b. All national statutory and regulatory requirements for certification as required by the *Canada Shipping Act 2001* (CSA) for a cargo vessel on Near Coastal Voyage, Class I, wholly between Canadian ports.

2.2.2 The Contractor shall be responsible to ensure that all the MSPVs are certified in accordance with CSA, including all related regulations and Class. Any TCMS or Class conflict must be resolved by the Contractor to the satisfaction of Canada.

2.3 REGISTRATION AND CLASSIFICATION

2.3.1 The MSPV shall be designed, built and outfitted to receive a Certificate of Class equivalent to a Lloyd's Register (LR) ✕100A1, Special Service Craft (SSC), High Speed Craft (HSC), Patrol Vessel (Patrol), Service Group 4 (G4), Unattended Machinery Space (UMS), Environmental Protection (EP), Propulsion Steering Machinery Redundancy (PSMR), Centralized Control Station (CCS), Integrated Computer Control (ICC).

2.3.2 Notwithstanding the MSPV's gross tonnage, the MSPV shall comply with Lloyd's Register HSC Code or equivalent.

2.3.3 The UMS Notation shall not include any automatic fuel transfer system. The size of any service tank(s) shall be in accordance with the fuel system requirements described herein.

2.3.4 The Contractor shall be responsible to demonstrate all Class equivalencies to Canada's satisfaction.

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3 GENERAL TECHNICAL REQUIREMENTS

3.1 DESIGN CONSTRAINTS

- 3.1.1 The general MSPV configuration shall meet all requirements identified herein.
- 3.1.2 Length Overall, the distance, in metres, measured parallel to the static load waterline from the foreside of the stem to the after side of the stern or transom, excluding rubbing strakes and other projections of the MSPV shall be between 37.0 metres and 43.0 metres (m).
- 3.1.3 Extreme appendage draft of the MSPV MS variant shall not exceed 3.0 m in the port departure condition as defined in TSOR paragraph 3.2.1.b in fresh water, with allowance for the 2.0 tonnes Contract Modification Margin applied at 0.3m above the MSPV design lightship VCG and Construction Margin of ½% of the MSPV design lightship displacement applied at 0.3m above the MSPV design lightship VCG. The Contract Modification Margin is to allow for any weight increases as a result of GFE being installed and to allow for approved design changes that may result in a Contract Amendment. Only Canada has the right to use this Contract Modification Margin for modifications.
- 3.1.4 Air draft of the MSPV C&P variant shall be less than 35.5 m in salt water in the arrival condition defined as one (1) RHIB embarked, 13% of the total installed diesel fuel tank capacity, 10% of the total installed potable water tank capacity, 90% of the total installed black and grey tank capacity and 10% of the total installed upper deck RHIB gasoline fuel tank capacity.
- 3.1.5 There shall be an enclosed Bridge with a Command Centre immediately aft of it on the upper level of the deckhouse. Port and Starboard Bridge Wing control stations shall be supplied and installed.
- 3.1.6 There shall be a clear view of the aft work deck such that deck operations can be visually monitored from the Bridge machinery control station (MCS) or the Bridge Wing control stations.
- 3.1.7 The aft deck of the MSPV MS variant shall be configured to accommodate two (2) RHIBs as detailed at Appendix 1 of the TSOR complete with suitable launching and recovery system(s).
- 3.1.8 On the MSPV C&P variant, only the port RHIB will normally be embarked on the aft deck. When only the port RHIB is embarked, the aft deck unoccupied space shall be at least 30.0m² of continuous deck space and shall have a minimum deck loading capacity of five (5) tonnes spread over the 30.0m² deck.
- 3.1.9 A liquid ballast system shall be supplied and installed to enable the crew to trim and heel the MSPV to design trim and within a 0.5° list to port or starboard when, respectively, only the port or starboard RHIB is embarked.
- 3.1.10 Provisions stowage shall be for a fourteen (14) day operational period for a complement of fourteen (14) personnel.

3.1.11 Potable water tank capacity of the MSPV, based on a daily allowance of 150.0 litres per person and a complement of fourteen (14) personnel, shall be for a three (3) day period as a minimum and shall not include any potable water production.

3.1.12 The solid waste handling system shall be capable of handling waste for a complement of fourteen (14) personnel for a fourteen (14) day operational period in accordance with Table 4 as a minimum.

3.1.13 Black and grey water systems of the MSPV shall be designed and built to have a combined tank holding capacity for two days, 150.0 litres per day per person for fourteen (14) persons, and a sewage treatment facility designed for a complement of eight (8) to fourteen (14) personnel.

3.1.14 The MSPV shall be designed and built to be fitted-for-but-not-with two (2) 0.50 calibre heavy machine guns port and starboard side forward.

3.1.15 The MSPV shall have cabin accommodation for fourteen (14) personnel in either single or double cabins as described herein.

3.2 SPEED

3.2.1 The maximum speed of the MSPV shall not be less than 25.0 knots (kts) under the following conditions:

- a. At a maximum propulsive power not exceeding a SCN with only the essential dependent auxiliaries of 5000.0 kW at the declared engine speed as defined in ISO 3046-1: 2002 (E) and ISO 15550: 2002(E). "Propulsive power" means the power in kilowatts that is specified in a vessel's certificate of registry or the total installed power in kilowatts that can be directed to propel the vessel, whichever is greater; and
- b. In the port departure condition which is defined as fully crewed with fourteen (14) persons, fully provisioned, spared, ready for sea with diesel fuel at 95% of the total installed diesel fuel tank capacity including all fitted day and service diesel tank(s), if any, upper deck RHIB gasoline tank(s) at 95% of the total installed gasoline fuel tank capacity, potable water tank(s) at 100% full, black and grey water tanks empty, lube oil storage tank(s) at 100% full, and working deck fully outfitted in the MSPV MS variant with both RHIBs embarked with 100% of their total internal gasoline tank capacity in each as detailed at Appendix A1 of the TSOR; and
- c. In Sea State 2 as detailed at Appendix 3 of the TSOR, or calculated equivalent; and
- d. In salt water or calculated equivalent; and
- e. Construction Margin and Contract Modification Margin as defined in TSOR paragraph 3.1.3 added.

3.3 RANGE

3.3.1 The range of the MSPV shall not be less than 2000.0 nm under the following conditions:

- a. At a constant cruising speed of 14.0 kts; and
- b. Not trailing or locking any shaft; and
- c. Commencing in the port departure condition, as per paragraph 3.2.1.b above; and
- d. For range calculation purposes, the total available diesel fuel shall be 82% of the total installed diesel fuel tank capacity including all fitted day and service diesel tank(s), if any, less the ship service generators' fuel consumption of the period traveled based on a preliminary electrical load analysis provided by the Bidder (Contractor). The 82% available diesel fuel is derived from:
 - i) A maximum diesel fuel tank capacity of the total installed diesel tank capacity at 95%; and
 - ii) A 3% deduction from the total installed diesel fuel tank capacity including all fitted day and service diesel tank(s), if any, to account for unusable diesel fuel; and
 - iii) A further 10% deduction from the total installed diesel fuel tank capacity including all fitted day and service diesel tank(s), if any, to allow for reserve diesel fuel; and
- e. In Sea State 2 as detailed at Appendix 3 of the TSOR, or calculated equivalent; and
- f. In salt water or calculated equivalent; and
- g. Construction Margin and Contract Modification Margin as defined in TSOR paragraph 3.1.3 added.

3.4 HIGH SPEED ENDURANCE

3.4.1 For the MSPV, a sustained speed of no less than 25.0 kts shall be maintained for 24 continuous hours, as detailed at Appendix 2 of the TSOR Mission Profiles, under the following conditions:

- a. At a maximum propulsive power, as per paragraph 3.2.1.a above, not exceeding a SCN of 5000.0 kW at the declared engine speed; and
- b. Commencing in the port departure condition; as per paragraph 3.2.1.b above; and
- c. For endurance calculation purposes, the total available diesel fuel shall be 82% of the total installed diesel fuel tank capacity including all fitted day and service diesel tank(s), if any, less the ship's service generators' fuel consumption for the

period traveled based on a preliminary electrical load analysis provided by the Bidder (Contractor). The 82% available diesel fuel is derived from:

- i) A maximum diesel fuel tank capacity of this total installed tank capacity at 95%; and
 - ii) A 3% deduction from the total installed diesel fuel tank capacity including any fitted day and service diesel tank(s) to account for unusable diesel fuel; and
 - iii) A further 10% deduction from the total installed diesel fuel tank capacity including all fitted day and service diesel tank(s), if any, to allow for reserve diesel fuel; and
- d. In Sea State 2 as detailed at Appendix 3 of the TSOR, or calculated equivalent; and
- e. In salt water or calculated equivalent; and
- f. Construction Margin and Contract Modification Margin as defined in TSOR paragraph 3.1.3 added.

3.5 LOW SPEED ENDURANCE

3.5.1 The MSPV shall be capable of continuous slow speed operation, at 2.0 kts ahead for a minimum of eight (8) continuous hours as detailed at Appendix 2 of the TSOR Mission Profiles, in Sea State 1 as detailed at Appendix 3 of the TSOR, or calculated equivalent. The MSPV shall operate in all air and water environmental conditions listed at Table 1 - Environmental Conditions. If low speed endurance for the MSPV is achieved by not running all main engines, the MSPV propulsion system shall incorporate a method to trail a shaft(s) such that the non-running main propulsion engine(s) and shaft(s) shall be brought on line for propulsion in less than one (1) minute.

3.6 SERVICE LIFE

3.6.1 The MSPV shall be designed and built to meet a 25 year service life based upon the Mission Profiles as detailed at Appendix 2 of the TSOR.

3.6.2 All equipment utilized in the MSPV shall be of a commercial marine standard; durable and reliable enough to withstand the rigors of the intended service.

3.7 OPERATING ENVIRONMENTS

3.7.1 The MSPV shall be able to operate year round, day and night, in freezing rain, spray and icing conditions and, will occasionally transit through loose ice (less than 8/10 coverage). No icebreaking capabilities are required.

3.7.2 The MSPV, its propulsion and auxiliary equipment, and the associated fluid systems shall be designed and built to conduct operations, as per Mission Profiles as detailed at Appendix 2 of the TSOR, in up to and including Sea State 6 as detailed at Appendix 3 of the TSOR.

3.7.3 The MSPV and its systems shall be able to conduct operations as per Mission Profiles as detailed at Appendix 2 of the TSOR, in the environmental conditions listed in Table 1 below:

Air Temperature & Humidity	Minimum -20.0°C, 30% RH (fall and winter) Maximum 35.0°C, 95% RH (summer)
Water Temperature Range	Minimum -1.8°C to Maximum 30.0°C
Water Types	Fresh and Salt water
Sea Conditions	Primary Missions – Up to and including Sea State 5 (as detailed at TSOR Appendix 3) Secondary Missions – Up to and including Sea State 6 (as detailed at TSOR Appendix 3)

TABLE 1 - ENVIRONMENTAL CONDITIONS

3.7.4 The exterior equipment and machinery, excluding RHIB stowing and securing arrangements, shall be protected with secured waterproof covers. All machinery, structure, and outfit shall be designed and built to withstand the resultant loads from the ship and sea interactions and the environmental conditions.

3.8 OPERABILITY

3.8.1 Operability is defined as the sea keeping characteristics of the MSPV and the ability to put to sea and safely maintain program activities and tasks in the specified areas of operation and environmental conditions.

3.8.2 Any appendage based stabilizing systems shall be designed and built to shed, and prevent entanglement by, ropes and nets.

3.8.3 All horizontal surfaces, except the aft working deck, exposed to wind-driven spray on the MSPV shall be angled or cambered to minimize build-up of ice.

3.8.4 The MSPV shall be capable of holding station relative to a fixed or moored object to within ten (10) metres (m) in all conditions up to and including Sea State 5 as detailed at Appendix 3 of the TSOR.

3.8.5 The MSPV shall be capable of station keeping relative to a free floating object to within ten (10) m in all conditions up to and including Sea State 6 as detailed at Appendix 3 of the TSOR.

3.8.6 Safe access to all areas of the MSPV's open decks shall be maintained at speeds up to 5.0 kts in Sea State 6 as detailed at Appendix 3 of the TSOR.

3.8.7 The MSPV shall be capable of maintaining a course within 1.0° of desired heading in all conditions, with wind and seas from any direction relative to the MSPV's heading, within three (3) minutes at a speed of 14.0 kts.

3.8.8 The MSPV shall be capable of turning 180.0° to port or starboard at zero speed within its own length in up to and including Sea State 2 as detailed at Appendix 3 of the TSOR.

3.8.9 The MSPV shall be capable of turning to port or starboard under power from a full stop, safely in all conditions up to and including Sea State 6, as detailed at Appendix 3 of the TSOR, with wind and seas from any direction relative to MSPV heading.

3.8.10 The MSPV shall be capable of steering effectively in all conditions up to and including Sea State 5 as detailed at Appendix 3 of the TSOR, while towing a vessel of similar displacement.

3.9 HULL DESIGN

3.9.1 There shall be no modification of the proven parent design except as set forth in paragraph 1.1.3 of the TSOR.

3.10 PROPULSION AND AUTOMATIC MACHINERY CONTROL SYSTEMS

3.10.1 The MSPV's propulsion and automatic machinery control systems shall be of a proven marine design configuration. The MSPV shall not have a propulsive power greater than a SCN of 5000.0 kW at the declared engine speed.

3.10.2 The main propulsion system and control equipment shall be selected from current models supported in Canada.

3.10.3 The MSPV's main propulsion system shall not be a water jet.

3.11 GENERAL ARRANGEMENT (GA)

3.11.1 The MSPV shall be designed and built with, as a minimum, the following separate spaces:

- a. Fore Peak, Chain Locker and store for anchor, chain and rope storage; and
- b. Cabins to accommodate fourteen (14) persons. There shall be two (2) adjacent single cabins, for the Captain and Chief Engineer, one (1) single cabin for the Program/Incident Commander and one (1) additional single cabin for a minimum of four (4) single cabins, and a maximum of five (5) double cabins; and
- c. Galley and associated cold and cool rooms; and
- d. Mess to seat at least ten (10) in one sitting; and
- e. Four (4) washrooms; and

- f. Command Centre; and
 - g. Electronic Equipment Room (EER); and
 - h. Wet Gear Locker; and
 - i. Bridge; and
 - j. Central Storeroom as detailed in Appendix 6 of the TSOR; and
 - k. Machinery Control Room (MCR); and
 - l. Main Machinery space(s) for propulsion machinery and electrical generators; and
 - m. Auxiliary Machinery Room(s) (AMR), if fitted; and
 - n. Steering Gear Compartment; and
 - o. Emergency Generator Compartment; and
 - p. Storerooms for provisions and equipment spares; and
 - q. Deck Workshop (does not need to be a separate space but facility needs to be provided); and
 - r. Garbage Handling Room; and
 - s. Sewage Treatment Room; and
 - t. Lockers as required for linen, tools, cleaning gear, spill control and disposal kits, Medical/SAR equipment and small arms.
- 3.11.2 The superstructure shall have safe exterior walkways on both port and starboard sides of the weather deck.
- 3.11.3 The open deck areas shall be designed and built for:
- a. Anchor handling; and
 - b. Mooring; and
 - c. Equipment stowage; and
 - d. Ship to shore safe access; and
 - e. Transfer on and off MSPV when docked; and
 - f. Medical evacuation via helicopter off forecastle deck; and

- g. Crab Trap and Gill Net Hauler handling and operations; and
- h. RHIB and rescue boat operations; and
- i. Crane operations; and
- j. Towing; and
- k. Search and rescue; and
- l. Mast signalling; and
- m. Use of the fitted for but-not-with two (2) 0.50 calibre heavy machine gun mounts.

3.12 ENVIRONMENTAL PROTECTION

3.12.1 The MSPV shall meet all Canadian Federal Environmental Legislation, as well as the provincial environmental Acts of all provinces adjacent to waters in the patrol areas described in paragraph 1.1.2. A system engineering approach shall be used to consider all applicable environmental aspects associated with the particular MSPV system(s). All ways in which the MSPV will interact with its surroundings shall be considered.

3.13 STABILITY AND SUBDIVISION

3.13.1 The MSPV shall not have a static list greater than 0.5° from upright in all loaded conditions as defined in TP 7301- Stability, Subdivision and Load Line Standards STAB7, excluding crane and RHIB operations. The MSPV shall not be trimmed by the bow in any loading condition.

3.13.2 The MSPV in all loaded conditions shall meet the requirements of TP 7301 - Stability, Subdivision and Load Line Standards STAB7 without the use of permanent water or solid ballast. Crane and RHIB operations are excluded.

3.13.3 When launching and recovering the RHIB over the side and in all crane operations, the MSPV shall not heel more than 7.0° and the freeboard shall not be reduced by more than 50%. In no case shall the freeboard be reduced to less than 0.30 m at any point along the MSPV.

3.13.4 The MSPV shall meet the damaged stability requirements of TP10943 (Part II) – Passenger Vessel Operations and Damaged Stability Standards for two-compartment flooding at the end of life, i.e. incorporating a growth margin defined as 2% of the MSPV design lightship displacement applied at 0.3m above the MSPV lightship VCG.

3.14 ELECTROMAGNETIC INTERFERENCE (EMI) AND ELECTROMAGNETIC COMPATIBILITY (EMC)

3.14.1 The MSPV shall be constructed such that all electric and electronic equipment is electromagnetically compatible in accordance with IEEE 45-2002 Section 4.5 and 4.6 and CCG 70-000-000-EU-JA-001 - Chapter 6 that sets limits for Electromagnetic Interference (EMI).

4 HULL STRUCTURES

4.1 GENERAL

4.1.1 The hull construction of the MSPV shall be designed, built and outfitted to withstand loads up to and including Sea State 6 as detailed at Appendix 3 of the TSOR for all environmental conditions noted in Table 1.

4.1.2 All hull structure shall be of welded design.

4.2 MATERIALS

4.2.1 The superstructure of the MSPV shall be of marine quality aluminum alloy.

4.2.2 Inter-connections between steel structures and the aluminum superstructure shall be made by using explosive-bonded bi-metal strips.

4.2.3 Subject to Class approval, the certified marine grade aluminum alloys shall be 5083/5086-H32/H116 for plates, and 5083/5086-H111 or 6061-T6 or 6082-T6 for extrusions and shapes. 6061 alloys shall not be used in critical high stress areas.

4.2.4 There shall not be any direct contact of electrolytically dissimilar metals except as described in paragraph 4.2.2.

4.2.5 Paint, insulation, adhesives, or other items containing materials or components that emit noxious or toxic fumes at temperatures below 94.0°C shall not be installed or applied on hull structural material and superstructure. For paints and adhesives, this requirement applies after drying or curing is complete. Chromate based paints shall not be used.

4.2.6 Aluminum structural components shall not be threaded or tapped. Helical coil or pressed-in galvanically compatible threaded inserts shall be used when directed threading is required.

4.2.7 Nuts which are inaccessible shall be captured to allow reassembly and prevent backing off. Unless otherwise specified, self-locking nuts of plastic insert type or all-metal self-locking nuts of distorted type shall be supplied and installed to prevent bolt loosening caused by shock or vibration. Fasteners on walking areas of the upper deck shall be flush mounted to eliminate tripping hazards.

4.2.8 In the assembly of machinery units subjected to large reversing stresses such as screw gear and hydraulic steering cylinders, the forces tending to shift the unit on its foundation shall be countered by the use of fitted bolts, keys and dowel pins or other OEM approved methods. Propulsion machinery shall be secured by means of fitted bolts or other OEM approved methods. Bolts shall be inserted from the bottom of the foundation with the nut on top.

4.3 SHELL AND SUPPORTING FRAMING

4.3.1 To avoid propeller induced vibration, the lowest natural frequency of stiffened bottom shell plating in the after quarter of the MSPV shall not lie within a band of $\pm 20\%$ of an excitation frequency throughout the range of operating speeds of the MSPV and shall be subject to Class approval.

4.3.2 There shall be a minimum of 75 mm clearance between structural members and parallel plate butts and seams. Longitudinals shall be made continuous with butt welds, with those welds at least 75 mm from all shell butts. Frames shall be butt welded, with those welds at least 75 mm from any shell seam.

4.4 PILLARS AND STANCHIONS

4.4.1 Pillars and stanchions shall be landed on structural framing members and aligned with the webs of the supporting structure in the longitudinal and transverse planes.

4.5 INNER BOTTOM AND FOUNDATIONS

4.5.1 Wells constructed in a double bottom for the purpose of drainage shall all be capable of being emptied by mechanical pumping other than a hand pump.

4.5.2 Foundations shall be arranged in such a way to provide adequate clearance for servicing and disassembling modules or parts such as pumps, filters, valves and pistons without dismantling other machinery, structure or piping.

4.6 WEATHER DECK AND INTERNAL DECKS

4.6.1 Deck longitudinals shall be butt-welded throughout with those welds separated from all deck butts by at least 75 mm.

4.6.2 Openings shall be kept to a minimum in particular in the strength decks within the 3/5 length amidships.

4.6.3 All exposed decks shall have a camber set at 2% of beam, except for the aft working deck. A camber of 2% of beam or less is permissible on the aft working deck providing no deck equipment overhangs the deck-edge.

4.7 MINOR BULKHEADS

4.7.1 Outside corners of interior steel bulkheads in way of living and working spaces shall be rounded to prevent hazard to personnel.

4.7.2 The periphery of minor bulkheads shall not allow dust, sound and light to penetrate.

4.7.3 Non-structural steel or joiner bulkheads surrounding wet spaces shall have all-welded coaming extending a minimum of 10 cm above the deck covering.

4.8 SUPERSTRUCTURE

4.8.1 The boundaries of all superstructures shall be of weather tight construction. Casings, houses, bulkheads, and other surfaces shall be fair, without buckles, kinks, or other similar surface irregularities. Where trunks penetrate decks, the deck cuts shall have rounded corners.

4.9 STRUCTURAL CASTINGS, FORGINGS

4.9.1 All finished forgings and castings shall have Original Equipment Manufacturer (OEM) or serial numbered identification markings.

4.10 DRAIN PLUGS

4.10.1 Docking drain plugs, minimum diameter 38 mm, fitted to heavy steel weld-in spigot insert plates, shall be fitted in all bottom compartments, skeg(s) and tanks to permit complete drainage of the MSPV when in drydock. Plugs shall be flush with the outside of the shell when installed. Plugs shall be identified by two (2) shapes of key recesses, one (1) for oil fuel tanks and lube oil tanks, and a different shape for other spaces. Two (2) stainless steel keys for each shape shall be supplied and stowed aboard in the Chief Engineer's Cabin, clearly marked as to purpose.

4.10.2 The position and key recess shape of each drain plug shall be specified on the as-fitted docking plan.

4.11 MAST

4.11.1 The mast structure and the associated platforms and overhangs shall be designed and built to provide rigid foundations to support the electronic navigation equipment such as radar and antennae. The magnitudes of vibration shall be designed so that the maximum vibration does not exceed the manufacturer's limitations for all pieces of equipment mounted on the mast or, if not stated by the manufacturer, that the vibration level in all operating condition does not adversely affect the performance of each piece of equipment.

4.11.2 A mast shall be fitted to carry radars, antennae, navigating lights, navigational aids, yard-arms with signal flag hoisting attachment, signals and sirens. The mast and supporting structure shall be designed and built to withstand wind loads up to and including eighty (80) kts, the weights of the structure and equipment and, the dynamic inertia loads due to ship motion.

4.11.3 The mast's first fundamental frequency shall not lie within a band of $\pm 20\%$ of an excitation frequency throughout the complete range of operating speeds of the MSPV and shall be subject to Class approval.

4.11.4 Cleats for signal halyards including masthead flag and gaff shall be supplied and installed. Standing rigging shall be reduced to a minimum.

4.11.5 The mast shall be fitted with anchor points for fall protection and ladder rungs as required by MOSH regulations.

4.12 RUDDERS

4.12.1 The rudders shall be streamlined in horizontal section and be of the type, area and contour suitable for the intended service. The rudders shall be double plated with internal horizontal plate stiffeners and round bar leading edge and shall be made watertight by welding, and then tested via an upper and lower plugs made of stainless steel. The internal surfaces shall be treated to prevent corrosion.

4.13 CHAIN LOCKER(S)

4.13.1 The chain locker(s), designed and built so that the chain(s) will be self-stowing, shall be sized to accommodate the chain(s) and to give at least 60 cm headroom when cable(s) is stowed.

4.13.2 The chain locker(s) shall be fitted with perforated removable floor plates suitably stiffened at a height of 150 mm above the bottom of the locker(s). Access to the chain locker(s) shall be within the MSPV fore peak by means of a hinged manhole(s). If a single chain locker is intended to house two chains, it shall be divided with a non-watertight centreline bulkhead. The bulkhead shall have semi-circular holes in line with access manhole(s) to act as toe and hand holes when inspecting the locker. Otherwise, alternate arrangements shall be installed to allow access to the locker bottom.

4.13.3 The bitter end connection(s) shall be located at the top of the locker(s), in protected but accessible locations to permit emergency release of the chain(s). The bitter end connection(s) shall be designed for shear failure under a runaway chain load equal to the breaking strength of the anchor chain.

4.14 RUBBING STRIPS

4.14.1 Deck edges shall be protected with smooth, steel, Schedule 80, half-round pipe moulding, welded to the hull and deck and fitted in way of, and for a minimum length of 0.5 m, each side of all mooring fittings.

4.14.2 A continuous, shock-absorbing rubbing strip shall be mounted on the MSPV's hull, approximately 800 mm below the deck edge, from the aft edge of the house on the port side, around the bow to the aft edge of the house on the starboard side. This rubbing strip shall be constructed using lengths of hollow, rubber, D-section fendering which shall be held between steel channel sections by vertical steel pins. The steel pins shall be welded to the channels at both ends of each pin. The steel channels shall be continuously welded to the MSPV's hull, be waterproof and shall be the only connection to the hull. Rubbing strips shall be sized appropriately for the MSPV, considering the hull thickness and local strengthening.

4.14.3 A smooth, steel, Schedule 80, half-round pipe moulding shall be continuously welded to the deck edge and hull aft of the shock-absorbing rubbing strip, butted to that strip with an aft-angled lap joint, to continue the rubbing strip protection along both sides of the working deck.

4.14.4 On the areas of the ship's side where launching and recovering of RHIBs and lifting of seized nets, traps and anchors could damage the hull, steel half-round pipe protection shall be

welded to the hull. These hull protection strips shall extend downward, butted at their top ends to the horizontal, half-round pipe, rubbing strip mentioned above, down to the deepest operating waterline. They shall be continuously welded on an angled pattern, be waterproof and be one (1) metre apart, with the lower ends diagonally aft of the upper ends, so as to deflect spray outward and cause the smallest possible reduction to speed. The lower ends of these half-round protection strips shall be tapered down to the hull over a 25 cm length and all rubbing strips shall be welded watertight.

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5 HULL OUTFITTING

5.1 MOORING AND TOWING SYSTEMS

5.1.1 A set of six (6) appropriately sized synthetic mooring lines shall be supplied with a one (1) m eye splice at each end. Stowage for the mooring lines shall be supplied and installed in the fore peak and aft peak.

5.1.2 Cleats and fairleads shall be arranged to support RHIB operations on the port and starboard side.

5.1.3 Arrangements shall be made for being towed and for towing another vessel of similar displacement in head seas, up to and including Sea State 5 as detailed at Appendix 3 of the TSOR. One (1) cruciform bollard and bow fairlead shall be supplied and installed for the lead of the towing gear when the MSPV is being towed. One (1) cruciform bollard and stern fairlead shall be supplied and installed on the centreline for use when towing another vessel.

5.1.4 The towline reel shall be installed in close proximity to the aft towing arrangement. The reel shall accommodate the towing line and shall have a reserve capacity equal to one layer warp of line to compensate for imperfect warping of the line during retrieval operations.

5.1.5 The towline reel shall be electrically or hydraulically driven and shall be designed to minimize its deck footprint. The reel shall be located so as to provide unobstructed access to the aft work deck and towing area. Local control shall be supplied and installed to pay in and pay out the rope. The control shall be of the safety type which, when released by the operator, will return to the off position. The reel shall be fitted with a mechanical release arrangement to allow emergency retrieval or release in the event of loss of power.

5.1.6 One (1) electrically or hydraulically driven capstan with local control and overload protection shall be installed on the aft work deck to provide hauling capability to either side of the MSPV. It shall have a minimum pull of 1,000.0 kg.

5.2 ANCHOR HANDLING AND STOWING SYSTEM

5.2.1 The MSPV shall be designed, built and outfitted with at least one working anchor and eight (8) shots of chain. A second anchor is required only as a spare and shall be stored onboard. The storage location shall be approved by the Technical Authority (TA) during the design review process. However, if the second anchor is intended to be fitted as a working anchor, it too shall be supplied and installed with eight (8) shots of chain. Two (2) of the eight (8) shots of each fitted chain shall be galvanized - one (1) fitted at the bitter end, and one (1) fitted at the anchor's end. The forecastle deck shall have a working area available for the operation of the anchor windlass and for normal deck operations.

5.2.2 Facilities and wash down points shall be fitted for washing the anchor(s) and chain(s).

5.2.3 A common anchor windlass and capstan shall be supplied and installed for anchor handling and warping operations. The windlass and capstan shall be electrically or hydraulically driven and shall be capable of hoisting home the anchor and fully extended chain.

5.2.4 Anchor chain stoppers shall be designed and installed and aligned in the path of the anchor chain(s). An arrangement shall be supplied and installed to ensure that the anchor(s) consistently trip and seat home firmly.

5.2.5 The design of the anchoring system shall be such that there is positive starting of the anchor(s) and the chain(s) upon release under all conditions of intact stability.

5.2.6 Arrangements shall be supplied and installed to stop water on the deck from flooding the chain locker(s). The chain locker(s) shall be designed and built such that the chain(s) is self-stowing. The chain locker(s) shall incorporate a non-manual pumping arrangement or drainage arrangement for the removal of water.

5.3 DECK CRANE

5.3.1 The MSPV shall have an articulated, marine, knuckle-boom hydraulic crane capable of lifting a minimum of 1.5 tonnes at a minimum distance of 2.5 m over both the port and starboard side of the MSPV in a minimum of Sea State 4 as detailed at Appendix 3 of the TSOR. The deck crane may form part of the specified launch and recovery system for the RHIBs, see Section 5.8. The crane shall be capable of rotating 360.0° and shall be installed on the aft work deck of the MSPV. The safe working loads (SWL) of the crane up to and including the maximum design sea state shall be indicated on the crane.

5.3.2 The crane shall be designed, built and certified in accordance with the Lloyd's Register Code for Lifting Appliances in the Marine Environment, or equivalent.

5.4 CRAB AND GILL NET HAULER

5.4.1 A removable, hydraulically driven, Marco Pot Line Hauler, J0117, Crab Trap Hauler shall be supplied and installed on the starboard side of the aft work deck area on the MSPV C&P variant. The Crab Trap Hauler shall be fitted to the deck crane or another suitable removable appliance capable of withstanding the vertical and side loads associated with retrieving 2.4 m conical crab traps requiring a maximum pull capacity of 800-kg in Sea States up to and including Sea State 4 as detailed at Appendix 3 of the TSOR. Hydraulic power shall be supplied and installed to the Crab Trap Hauler's hydraulic motor for operation.

5.4.2 A removable, hydraulically driven, Rapp Marine Power Block Type KB-08, Gill Net Hauler shall be supplied and installed on the starboard side of the aft work deck area on the MSPV C&P variant. The Gill Net Hauler shall be fitted to the deck crane or the same removable appliance used to mount the Crab Trap Hauler. Hydraulic power shall be supplied and installed to the Gill Net Hauler's hydraulic motor for operation.

5.4.3 The location of the Crab Trap Hauler, Gill Net Hauler, and removable appliance shall not interfere with the operation of the MSPV's fitted towing equipment.

5.4.4 Any fittings or mountings associated with the Crab Trap Hauler, Gill Net Hauler, and removable appliance shall not interfere with the MSPV's ability to embark and deploy a starboard RHIB.

5.5 HYDRAULIC OIL SYSTEMS

5.5.1 Hydraulic power unit(s) shall be supplied and installed to provide hydraulic fluid to permanent and removable equipment fitted in and on the MSPV as required. Stainless steel quick-connections shall be supplied and installed on the aft working deck to provide fluid to removable equipment.

5.5.2 Deck hydraulic systems shall be equipped with heaters to prevent condensation and excess pressures on start up. The same type of hydraulic fluid shall be used for all the machinery, if approved by the OEM.

5.6 RIGID HULL INFLATABLE BOATS (RHIBS)

5.6.1 The aft working deck shall have work area available for the launch and recovery system(s) of Zodiac-Hurricane (SAR configuration) H753 RHIBs, embarkation and disembarkation of personnel, stowage of the RHIBs, transfer of stores and equipment and, the conduct of RHIB refuelling, troubleshooting and maintenance.

5.6.2 The MSPV MS variant shall be supplied and installed with two (2) RHIBs as detailed at Appendix 1 of the TSOR.

5.6.3 The MSPV MS variant shall be supplied and fitted with one (1) common system or with two (2) identical systems and equipment to launch, recover and stow one (1) port side RHIB and one (1) starboard side RHIB.

5.6.4 The MSPV C&P variant shall be outfitted with the necessary system(s) and equipment to launch, recover and stow one (1) RHIB on the port side using the identical system(s) and equipment as the MSPV MS variant. The MSPV C&P variant RHIB is an additional item listed in Schedule A and is described in the SOW Appendix 2.5.

5.6.5 The MSPV C&P variant shall be configured to accommodate the port RHIB and fitted for but not with either the starboard RHIB or the necessary system(s) and equipment to launch, recover, and stow the starboard RHIB.

5.6.6 If the MSPV C&P starboard RHIB has its own dedicated launch and recovery system, the launch and recovery system, equipment and the starboard RHIB stowage arrangement shall be removable such that the MSPV C&P variant has at least thirty (30) m² of continuous open deck space and is able to carry and operate the Crab Trap Hauler, Gill Net Hauler, and removable appliances as noted in paragraphs 5.4.1 above and 5.4.2 above.

5.6.7 One (1) Zodiac RIBO 420, or equivalent, SOLAS rigid hull inflatable rescue boat, shall be supplied and installed on each MSPV. Each rescue boat shall be supplied and equipped with one (1) 4-stroke gasoline outboard engine of 25 Horsepower (HP).

5.6.8 Chocks, cradles, gunwale guards and all necessary fittings and support for the stowage of the rescue boat shall be supplied and installed.

5.7 RIGID HULL INFLATABLE BOATS (RHIBS) FUELLING

5.7.1 Twenty five hundred (2500.0) litres of gasoline for refuelling the RHIBs and rescue boat shall be stored on the aft working deck. The gasoline may be stored in one or more baffled tanks. Each tank shall be constructed of non-ferrous metal and shall be equipped with:

- a. an automatic pressure and vacuum vent complete with flame arrestor; and
- b. a low level, lockable drain valve; and
- c. top-mounted, filling and pumping connections complete with lockable isolation valves; and
- d. a tank level indicating system; and
- e. a top-mounted, removable tank inspection plate; and
- f. a save all under the tank; and
- g. a lockable, quick release mechanism to jettison the fuel tank(s) overboard in an emergency; and
- h. connections to a RHIB and rescue boat refuelling system.

5.7.2 The RHIB and rescue boat refuelling system shall have the following features:

- a. be constructed of non-ferrous materials; and
- b. be contained within a storage cabinet with lockable doors; and
- c. be equipped with a hand operated or pneumatic pump; and
- d. be equipped with a grounded flexible hose of an approved rubber material and length to reach the embarked RHIBs' onboard tank filling arrangements; and be equipped with a hand gun on the end of the flexible hose to allow control of the refuelling operation onboard the RHIBs; and
- e. be fitted with a means to ensure there is no build up or dangerous discharge of static electricity during the refuelling operation; and
- f. be designed to allow transfer of gasoline from ashore into the onboard RHIB gasoline storage tank(s).

5.8 LAUNCH AND RECOVERY SYSTEMS FOR THE RHIBS

5.8.1 The H753 SAR version RHIB launch and recovery system(s) shall be capable of launching and recovering two (2) fully loaded RHIBs containing four (4) occupants per RHIB (weighing a maximum total of 500.0 kg), each fully fuelled, at a speed of 5.0 knots and up to and including Sea State 5 as detailed at Appendix 3 of the TSOR.

5.8.2 The H753 SAR version RHIB launch and recovery system(s) shall be capable of stowing two (2) fully loaded, fully fuelled RHIBs in all conditions in which the MSPV will operate.

5.8.3 For each of the two (2) H753 SAR version RHIBs onboard the MSPV MS variant and the one (1) H753 SAR version RHIB onboard the MSPV C&P variant and the associated fittings, including shackles, webbing, quick release device(s), such as Cranston Eagle Hook, shall be supplied and installed to facilitate the safe launch and recovery of the RHIBs with four (4) personnel embarked. Handling lines, cleats and or stoppers shall be supplied and installed as necessary for RHIB launching, recovery and handling alongside port and starboard. A 6-inch snatch block shall be secured to the head of the launch and recovery system(s) and another 6-inch snatch block shall be secured to an eye on the deck to provide a lead for a diver recovery line.

5.8.4 The launch and recovery systems and stowing arrangements shall not interfere with towing operations.

5.8.5 The launch and recovery systems, stowing and securing arrangements, control stations and power packs and sub-assemblies shall be secured to seating arrangements that are flush-fitted to the deck plate structure. All securing arrangements and bolt patterns required to secure the launch and recovery systems, control stations, power packs and sub-assemblies shall be fitted with stainless steel socket head screws which shall also be flush with the deck plate.

5.8.6 The launch and recovery system controls shall be fitted such that the operator can clearly view the RHIB(s) and rescue boat at all times during the launch, recovery and stowage operations.

5.8.7 The rescue boat shall be able to be manually launched, recovered and stowed in the event of a MSPV power failure.

5.9 DECK TIE DOWNS

5.9.1 Flush mounted deck tie downs, each with a 0.5 tonne (SWL), shall be spaced approximately 1.5 m apart along the entire aft working deck area. The tie downs shall have rolled edges to prevent chaffing of lines.

5.10 LIFTING STRONG POINTS

5.10.1 Lifting strong points shall be designed and installed to facilitate machinery and equipment maintenance, repair and removal.

5.11 EMERGENCY RESPONSE GEAR

5.11.1 Pallets with Emergency Response Gear for both variants may be loaded on the aft deck. The pallets will be loaded using the deck crane and secured using deck tie-downs. The total weight of all pallets will not exceed three (3) tonnes.

5.12 SIGNAL FLAG LOCKER

5.12.1 A signal flag locker shall be supplied and installed in the Bridge. The signal flag locker shall be sized appropriately to house a complete set of signal flags in individual compartments.

5.13 JACK AND ENSIGN STAFFS

5.13.1 The staffs shall be 1.8 m high and constructed of 50 mm diameter galvanized steel or aluminum pipe.

5.13.2 The jack staff shall be permanently fitted vertically at the stem. The ensign staff shall be removable and raked to 10.0° aft from the vertical on the main deck at the stern. Each staff shall be fitted with two halyard sheaves and cleats.

5.14 GANGWAY

5.14.1 A gangway with a minimum length of 6.5 m shall be supplied. The gangway shall have a clear width of at least 760 mm with an anti-slip serrated tread walking surface to prevent snow and ice accumulation. It shall have permanently fitted rollers at one end and removable railings to facilitate onboard stowage. Eye plates and fittings shall be fitted on the MSPV and to the gangway to secure the safety net beneath the gangway.

5.14.2 Gangway access areas shall be supplied on both port and starboard sides of the main deck of the MSPV.

5.15 PORTLIGHTS AND WINDOWS

5.15.1 Windows and portlights shall be constructed and installed to preserve the watertight and fire-rated integrity of bulkheads and the structure in which they are fitted. All glass shall be heat-treated safety glass.

5.15.2 All portlights shall be at least 450 mm in diameter with deadlights hinged up and the means of retaining deadlights in the "up" position shall be rigid and secure.

5.15.3 Each cabin on or above the main deck shall be supplied and installed with an opening type portlight. Each cabin below the main deck shall be supplied and installed with a non-opening type portlight.

5.15.4 All fixed Bridge windows shall be electrically heated using a vinyl film design for defrosting and de-icing.

5.15.5 The Bridge front windows, non-drop type, shall be fitted with straight-line wipers and a system to permit de-icing and potable water wash-down. A locally mounted wiper speed controller and ON/OFF switch shall be fitted to each front window.

5.15.6 See-through window films that roll up shall be supplied and installed to reduce sun glare and interior heating while still preserving full visibility.

5.15.7 A minimum of two (2) Bridge front windows shall be weather tight and drop-type opening or raised-type opening. Two (2) side windows, one (1) each port and starboard, shall also be weather tight and drop-type opening.

5.15.8 To reduce reflections from internal lighting, all Bridge windows are to be inclined from the vertical plane top out, at an angle of not less than 10.0° and not more than 35.0°.

5.16 BLACKOUT AND PRIVACY CURTAINS

5.16.1 Blackout curtains shall be impervious to the transmission of any light and shall be installed around all access doors leading to the weather decks. Blackout curtains shall be laced to overhead curtain rails that are fixed stationary to overhead curtain plates. The curtains shall be overlapping and doors shall be fitted with the necessary rods and magnets or Velcro® fasteners to ensure complete blackout conditions when the curtains are closed. Provisions shall be made to secure curtains in the fully opened and fully closed positions.

5.16.2 Blackout curtains shall be supplied and installed at the navigation display, chart table and all entrances to the Bridge. Blackout curtains shall be fitted in the Command Centre to completely exclude light transmission via portlights and windows.

5.16.3 Where deadlights are not installed, black-out curtains with tie backs shall be fitted to completely exclude light transmission from all windows and portlights in cabins, in the mess and in the galley. All house front curtains shall have Velcro® fasteners to hold the curtain against the window.

5.16.4 All cabin doors shall be fitted with privacy curtains so that when the cabin door is secured open with a hook, the curtain may be closed across the door way.

5.16.5 All curtains shall be lined and weighted and shall have top hems of 50 mm and bottom hems of 100 mm. All tops of curtains shall be pleated and shall be at least 150% of the width of the track. All curtains shall extend beyond the deadlight or window or door trim and overlap by 50 mm.

5.17 PROTECTIVE COVERS

5.17.1 Protective covers shall be supplied and installed for the anchor windlass, RHIBs, searchlights, signal lights, floodlights, wire rope and tow rope reels, and other upper deck equipment or lockers requiring protection from the weather. All protective covers shall be made of commercial, marine grade, waterproof coated nylon cloth with stainless steel lacing grommets.

Velcro® fastenings and chafing pieces of leather are to be fitted where there are pressure points on the cover.

5.18 LIFE LINES AND STANCHIONS

5.18.1 In order to facilitate the use of the 0.50 cal heavy machine guns, the main deck forward shall be fitted with removable, coated wire life lines and galvanized steel stanchions. The life lines shall be made taut by means of turnbuckles.

5.18.2 Closed link chain and removable stanchions shall be supplied and installed around all low coamings and flush hatches, and where ever necessary for the protection of personnel. The stanchion supports shall be pocketed.

5.19 DECK PLATES AND GRATINGS

5.19.1 Deck plates shall be aluminum chequered plates, 4.5 mm thick with a raised 4-bar pattern non-skid type surface. Individual deck plates shall not be greater than one (1) m² for ease of lifting and removal. Deck plates shall be constructed in accordance with Class.

5.19.2 Deck plates shall be firmly secured to steel angle bar ledges with counter sunk and stainless steel threaded socket head screws. Securing arrangements shall not extend above the surface of the grating and deck plating.

5.19.3 Piano hinged sections of deck plates or gratings shall be fitted in areas where access is required below them to carry out operation and periodic inspection, maintenance and cleaning of equipment.

5.19.4 All grating panels shall be secured to the supporting framework by clips or bolts to ensure positive locking and ready disassembly. Clips and J-bolts shall not extend above the surface of the grating.

5.20 STRUCTURAL BULKHEADS, DOORS AND PARTITIONS

5.20.1 All fire doors shall be fitted with magnetic hold backs. All non-fire doors shall be fitted with suitable non-rattling holdbacks.

5.20.2 All watertight doors and hatches shall have open and closed indicators located on the Bridge.

5.20.3 All accommodation doors shall be supplied and installed with kick-out panels.

5.20.4 Exterior access to the Bridge shall be by means of supplied and installed port and starboard weather tight doors. The door windows shall be fixed and the doors shall be supplied and installed with a four (4) point single lever dogging arrangement. The Bridge doors shall have keyed dead bolt locks and shall be keyed-to-like.

5.21 NAME PLATES, NOTICES AND MARKINGS

5.21.1 Bilingual label plates for compartments, warnings, ventilation, lifting appliances, exits, means of escape, life saving appliances, fire-fighting, damage control, and safety related items and equipment shall be made using an aluminum metal photo process.

5.21.2 Self-adhesive safety labels and markings within compartments, warning signs, exits, life-saving appliances, fire-fighting, damage control, and other safety related items and equipment shall be in accordance with International Maritime Organization (IMO) A 603(15) 7 Standard Symbols.

5.22 IMMERSION SUITS STORAGE

5.22.1 Allocated lockers with storage space for eighteen (18) Transport Canada Marine Safety (TCMS) approved immersion suits shall be provided as follows: one (1) immersion suit in each cabin for each occupant and two (2) immersion suits in both the Bridge and in the MCR.

5.23 LIFE PRESERVERS

5.23.1 Eighteen (18) TCMS approved life preservers shall be supplied and installed. Allocated storage space shall be supplied and installed as follows: one (1) life preserver in each cabin for each occupant and two (2) life preservers in both the Bridge and in the MCR.

5.24 JACOB’S LADDERS

5.24.1 Two (2) Jacob’s ladders shall be supplied and installed on each MSPV. The Jacob’s ladders shall reach the waterline with at least two rungs submerged when secured on either side of the vessel from the highest point of the main deck edge at the MSPV’s arrival condition in salt water.

5.25 PAINTING AND PRESERVATION

5.25.1 The exterior hull and deckhouse plating of the MSPV shall be painted in accordance with standard Canadian Coast Guard colours as detailed in Fleet Circular - Canadian Coast Guard Identity Colour Standard –CF-08-2007 and Canadian Coast Guard Identity Program TP-4011.

5.25.2 The MSPV shall be fitted for, but not with, removable markings to be provided by Canada as required by CCG and the RCMP for identifying the MSPV MS variant.

5.26 DECK COVERINGS

5.26.1 Deck coverings shall be installed as shown in Table 2 – Deck Coverings.

AREA	FINISH
Bridge and Command Centre	shock absorbing rubber
Cabins and Mess	vinyl flooring or tiles on underlay
Galley	3 inch x 3 inch or metric equivalent non-slip type ceramic tiles on underlay

Washrooms, Wet Gear Locker & Laundry	“Terrazzo Reversa Tile” or similar quality slip resistant tile on underlay
Switchboards, UPS, control consoles	Switchboard Mat; ASTM 30,000 Volt Dielectric Rated Standard in accordance with IEEE 45-2002, Standard Specification for Rubber Insulating Matting.
Exterior Deck	non-slip high performance paints
Passageways	12 inch x 12 inch or metric equivalent non-slip asbestos-free vinyl tile on underlay
Tank top if used for working area	perforated rubber matting

TABLE 2 - DECK COVERINGS

5.26.2 Deck coverings fitted in galley, showers and laundry areas shall be contoured to ensure proper drainage to scuppers.

5.27 FIREARMS AND AMMUNITION

5.27.1 The MSPV shall be designed and built to be fitted-for-but-not-with two (2) 0.50 calibre heavy machine guns. The main forward deck in way of the port and starboard mount locations for the two (2) 0.50 calibre heavy machine guns shall be strengthened for the firing loads.

5.27.2 The firearms locker shall be designed and built so that the following firearms can be stored. The stowage arrangement shall be designed and built to meet the requirement of Canadian Coast Guard National Firearms Policy (Doc #817221v5).

- a. Three (3) – Long Rifles; and
- b. Three (3) – Long Rifle Scopes; and
- c. Three (3) - Shot Guns; and
- d. Two (2) – 0.50 cal heavy machine guns without barrels; and
- e. Three (3) – 0.50 cal heavy machine gun barrels.

5.27.3 The firearms locker shall be fitted with two (2) independent locking devices.

5.27.4 The MSPV’s firearms locker shall be located inside on the main deck level.

5.27.5 A secure locker shall be supplied and installed in the Captain’s Cabin for stowage of all the breech blocks for all the firearms noted above.

5.27.6 RCMP and C&P personal firearms shall be secured in lockers located in each cabin as specified in the cabin outfit.

5.27.7 Two (2) lockable watertight ammunition lockers shall be supplied and installed on the main deck, one (1) port and one (1) starboard, with appropriate capacity for each to hold 1000 rounds for the 0.50 cal heavy machine guns.

5.27.8 One (1) lockable ammunition locker, separate and apart from the 0.50 cal heavy machine gun ammunition stowage lockers, shall be supplied and installed inside on the main deck level so that the following ammunition can be stored:

f.a. Long Rifle: TBD (200 rounds); and

g.b. 9mm pistol: 9mm (2000 rounds); and

h.c. Shot Gun: TBD (250 rounds).

5.27.9 All ammunition lockers shall be fitted with a fixed fire-fighting system.

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6 PROPULSION

6.1 GENERAL

6.1.1 All controls for operating the machinery, equipment, instruments, pumping systems, cocks, air pipes, inlets, sounding pipes, switches and associated items shall be permanently marked with bilingual, mechanically-fastened, engraved plates of plastic or corrosion resistant metal, clearly showing their purpose. All hand-wheels shall be marked to show the direction of closure. Valves shall have brass label plates securely attached to them in accordance with ASTM F99-86(2006) Standard Specification for Valve Label Plates.

6.1.2 All portions of exhaust pipe surfaces and other hot surfaces which could be a hazard to personnel shall be properly insulated so that the surface temperature does not exceed 60.0°C or otherwise shall be protected to prevent accidents or burns.

6.1.3 All fuel discharge lines shall be double-walled.

6.2 MAIN ENGINES

6.2.1 All main engines shall be supplied and installed. Every engine shall be a non-reversible, self contained, turbo-charged, after-cooled, four cycle marine diesel engine. Every main engine shall meet the requirements as stated in CSA 2001 -Main Machinery Regulations Schedule IV Part II Plans Division I Internal Combustion Oil Engines.

6.2.2 The main engines shall be capable of operation on high output diesel single-or multi-grade commercially available (API/SAE graded) lubricating oil. Each diesel engine shall have its own OEM supplied pre-heater and pre-lube pump and its own lube oil, fresh water-cooling and raw water system. There shall be no interconnection between the engines' lube oil, fresh water and raw water systems although the raw water systems may be connected to a common sea chest.

6.2.3 Each engine shall be supplied and installed with all accessories recommended by the OEM for continuous service at sea.

6.3 GEARING, SHAFTING, BEARINGS

6.3.1 Each main engine shall be connected to a separate gearbox in accordance with the OEMs recommended method. Coupling bolts shall be supplied and installed with locking devices. The gearboxes shall be identical except that they shall be configured such that the propellers have opposite rotation. Propellers shall have rotation such that the propeller blades will rotate outboard over the top for ahead propulsion.

6.3.2 Stern tube bearings shall be water cooled. To permit operation in shallow waters, a filtration device shall be supplied and installed on the water supply to the bearings.

6.3.3 The stern tube mechanical watertight seal shall be readily accessible to allow for checking and replacement of wearing elements without shaft disassembly and with the MSPV afloat.

6.3.4 Means shall be supplied and installed to prevent propellers from being fouled by ropes up to and including 2.0 cm in diameter.

7 AUXILIARY SYSTEMS

7.1 PUMPS

7.1.1 All pumps shall be supplied, installed and fitted with mechanical seals. The pump casings and impellers shall be stainless steel or naval bronze, and all shafting shall be constructed of stainless steel. Pumps handling black and grey water, fuel, and lubricating oils shall have drip trays or save-alls installed to contain possible leakage. All pump configurations shall be standardized where pumping requirements are the same or similar.

7.1.2 All instrumentation for machinery, pumps, piping and mechanical systems shall display readings in the international system of units (SI). Instrumentation shall be installed to ensure the safe and proper operation of equipment and systems.

7.2 PIPING SYSTEMS

7.2.1 Piping systems shall be designed and installed to afford access to valves, manifolds, strainers, filters and other items incorporated in the systems requiring periodic servicing. Duplex filters with changeovers shall be fitted in critical systems for the purpose of enabling cleaning without disturbing the normal functioning of the systems. Where piping is attached to resiliently mounted machinery, rotating flange expansion joints or 321 stainless steel braided flexible hoses with ridged male and swivel female couplings shall be used.

7.2.2 Mechanical joints shall be avoided and only used where absolutely necessary to allow for maintenance. Pipe runs shall be engineered to ensure no interference with equipment access for maintenance and operation. All piping carrying potable water and raw water shall be supplied and installed with drain plugs to allow complete drainage by gravity for maintenance. All piping arrangements shall be designed and installed to avoid air pockets. Where piping systems are inherently prone to air pockets by design, piping shall be fitted with threaded spigots or vent plugs. All joints shall be either welded or brazed sleeved. All pipe sections shall be thoroughly cleaned and be free from oil, dirt, rust, weld splatter and all other foreign matter prior to installation. After installation, all piping systems shall be flushed and blown clear, to be proven free of oil, dirt, rust, weld splatter and all other foreign matter or contaminant prior to putting into service.

7.2.3 Valves shall be suitable for the intended application and shall be readily accessible for inspection, operation, maintenance and removal. Sandwich-type, butterfly valves shall not be used to provide watertight integrity between any system and the ship's hull. Where possible, all valves shall be grouped in a manifold. Valves that are not readily accessible shall be fitted with fixed extension spindles upon approval by Canada.

7.2.4 Piping systems shall be identified in accordance with the Colour Coding Standard for Piping Systems CCGS 30-000-000-ES-TE-001.

7.2.5 Valves shall have bilingual brass label plates securely attached to them in accordance with ASTM F99-86(2006) Standard Specification for Valve Label Plates.

7.2.6 All potable water (hot and cold), raw water, ballast water, black and grey water, sanitary water and refrigerant piping throughout the MSPV shall be insulated, however, the raw water, ballast water and black and grey water piping and potable water filling pipes in the machinery space(s) shall not be insulated. Where piping passes through a tank, a void, or a cofferdam there is no requirement to insulate the pipe. Insulation on valves shall be arranged to permit easy removal and replacement of insulation without disturbing pipe insulation.

7.2.7 All deck-filling and pump-out connections shall be lockable and located to permit use when the MSPV is moored both port and starboard side to. All fuel oil, waste oil, lubrication oil, and black water connections shall be fitted with a save-all.

7.3 FUEL OIL SYSTEM

7.3.1 Notwithstanding the overall intent to design, build, outfit and certify to Lloyd's Register Rules and Regulations for the Classification of Special Service Craft, or equivalent, the MSPV shall be designed, built and outfitted with a fuel oil system allowing storage, transfer, treatment, cleaning, supply, use and discharge of the appropriate fuel in accordance with OEM requirements and in accordance with Lloyd's Register Rules and Regulations for the Classification of Ships Chapter 14 Section 2, 3, and 4, or equivalent.

7.3.2 The transfer pump(s) shall be supplied and installed to allow transfer of diesel fuel to, or from, or between, any of the diesel fuel oil storage tanks via duplex filter(s) and water separator(s) to all of the day and service tank(s), or directly to a deck connection(s) to de-fuel.

7.3.3 The following requirements shall apply to the fuel system:

- a. two (2) diesel filling stations shall be located on the main deck one (1) starboard and one (1) port. Alternatively, one (1) central filling station that is accessible from both sides of the MSPV is acceptable; and
- b. one (1) simplex coarse strainer shall be supplied and installed in the main fuel line at each filling station; and
- c. bronze lockable closing caps and connections shall be supplied and installed on each filling connection; and
- d. each fuelling station shall be supplied and installed with a means of communication with the Bridge, Main Machinery Room (MMR) and MCR.

7.3.4 All fuel tanks shall have access for internal examination and cleaning and shall be fitted with sounding tubes on the main deck level.

7.4 LUBRICATING OIL SYSTEM

7.4.1 All lubricating oils shall be the same for similar equipment, subject to the approval of the OEM.

7.4.2 The lubricating oil transfer system shall allow transfer of oil from storage tank(s) to the diesel sumps. If the same grade of lubricating oil is approved for main engines, gear boxes and generator engines, the minimum capacity of the storage tank(s) shall include one (1) complete oil change of one (1) main engine, one (1) gear box and one (1) generator engine and all bearing(s), plus 20%. If more than one lubricating oil type is used, the capacity of the tanks shall be as follows:

- a. 1.2 times the quantity required for one main engine; and
- b. 1.2 times the quantity required for one gear box; and
- c. 1.5 times the quantity required for one generator engine.

7.4.3 The dirty oil tank(s) shall be capable of holding all the oil removed during one complete oil change. A complete oil change comprises one main engine, one gear box, one generator engine and all bearing(s) plus 20%. The dirty oil tank(s) contents shall be capable of being discharged to shore through a deck connection(s) by means of an electrically driven pump.

7.4.4 Tank(s) that supply make-up oils for engines shall be of the type, capacity and general location as recommended by the OEM. Tank(s) in the system shall be built and installed with approved oil level indicators, sounding tubes, filling pipes, vent pipes, manholes, cleanout holes, and all necessary connections and fittings. The storage tank(s) shall have a lockable drain valve(s) and suitable save-all(s).

7.4.5 At the lube oil filling station(s) on the main deck there shall be sufficient deck area to store a standard forty-five (45) gallon drum or metric equivalent. The filling line(s) to the storage tank(s) shall be fitted with a fine mesh strainer with removable element and drain.

7.4.6 The lubricating oil storage tank(s) shall have a rundown valve and distribution line terminating at a stop valve convenient to each main propulsion engine, generator engine and each gearbox. A length of quick connecting flexible hose terminating in a spring-loaded cock or nozzle shall be used to introduce oil into the engine sump. An electric pump, with a hand pump in parallel, shall be supplied and installed for supplying oil(s) to diesel sumps and gearboxes.

7.4.7 The transfer system for diesel engine and gearbox clean lubricating oil(s) shall be segregated from the dirty oil system.

7.5 DIESEL ENGINE COMBUSTION AIR INTAKES AND EXHAUSTS

7.5.1 Combustion air shall be conditioned to supply air in accordance with the OEM's recommendations in all environmental conditions noted in Table 1 of the TSOR.

7.5.2 The installation of the diesel exhaust system(s) shall comply with both the OEM's recommendations and the Class acoustic requirements for maximum noise reduction. Each engine outlet shall be supplied and installed with a stainless steel expansion bellows which shall be installed as recommended by the OEM. Piping and silencers shall be secured to accommodate thermal expansion and motion of the engines. The exhaust systems shall be installed with supports

to minimize loading of the flexible connections and expansion joints, and be effectively isolated from the ship's structure. Flexible sections shall be installed at the engine exhaust outlets to facilitate engine maintenance including engine mounts and vibration isolators.

7.5.3 The exhaust gases from each engine shall exit through a spark-arresting exhaust silencer, complete with clean-out ports, drain pot, drain line and valve.

7.5.4 The exhaust system shall not run through habitable spaces and shall be designed and built such that it does not interfere with the aft working deck area, specifically the boat launching and recovery operations, and be streamlined to reduce air drag. Arrangements shall be supplied and installed to prevent spray and all water ingress into the exhaust system.

7.6 COMPRESSED AIR SYSTEM

7.6.1 A compressed air system shall be used for engine starting. The compressors shall be supplied and installed with provision for making one compressor as lead and another compressor as lag. Drains shall be led to an outlet near deck plate level and piped via a "Pig's Ear" back to the oily bilge water tank, if fitted.

7.6.2 A compressed air system shall be fitted to provide a compressed air supply for power hand tools. The system shall provide a minimum of 140.0 l/m @ 6.2 bar from a self contained compressor and air receiver. Air outlets shall be fitted with shutoff ball valves and spring-loaded quick-connect female couplings. A quick connect air hose of 15 m minimum length complete with one (1) male and one (1) female quick connect coupling shall be supplied and installed at the following locations:

- a. MMR; and
- b. Main deck at forward and aft ends of main deckhouse; and
- c. Deck workshop; and
- d. Steering Gear compartment; and
- e. If fitted, Auxiliary Machinery Room (AMR).

7.7 FIREMAIN SYSTEM

7.7.1 The firemain system shall be normally dry. The firemain shall be supplied and installed with drains at suitable points to ensure that the system can be completely drained.

7.7.2 An international shore connection shall be supplied and installed.

7.7.3 Cooling of auxiliary systems using firemain water shall not be permitted under any circumstances.

7.7.4 The firemain shall be used to provide a wash-down for the anchor and anchor chain. A means of draining the firemain directly overboard after the wash-down shall be included.

7.7.5 Fire pumps shall have the capability of being operated both locally and remotely.

7.8 SEA CHESTS AND SEA BAYS

7.8.1 To avoid ice accumulation in sea chests and sea bays Transport Canada Ship Safety Bulletin No.08/1989 shall be adhered to.

7.9 STEERING SYSTEM

7.9.1 The rudder bearings must be of the self-lubricating type.

7.9.2 The rudders shall be capable of being individually locked in the mid-ship position. Each rudder shall be capable of being worked from each of the steering operating stations over the full range of 35.0° port and starboard while the other rudder is locked mid-ships

7.9.3 A hand-operated emergency steering gear pump and associated piping and valves shall be supplied and installed in the Steering Gear compartment. This pump shall be operable by one (1) person and capable of moving both rudders to any desired position within the working range without disconnecting any part of the steering gear.

7.9.4 The MCS in the Bridge shall be fitted with a steering wheel. The other control stations should utilize steering wheels or joysticks. Each control station shall have a take-over switch and rudder angle indicators which shall be back-lit with dimmers.

7.9.5 It shall be possible to steer the MSPV from each control positions using a follow-up and a non-follow-up system.

7.10 REFRIGERATION SYSTEMS

7.10.1 All refrigerants that are currently scheduled to be phased out of use within the design life of the MSPV shall not be used in MSPV refrigeration systems. The refrigeration systems shall utilize an approved refrigerant and shall be fitted with all components necessary for successful and safe operation of the system when utilizing that refrigerant.

7.10.2 Two (2) identical co-located refrigeration units shall be supplied and installed. The units shall be raw water cooled and shall have identical but separate control and auxiliary systems. Each unit and its associated system components shall be sized so that they are individually capable of initially achieving and then maintaining the required temperatures simultaneously in the refrigerated rooms. The temperatures of the refrigerated rooms shall be monitored locally and through the Centralized Control, Alarm and Monitoring System (CCAMS) which shall be set to alarm when the temperature is +/- 2.0° C outside the required range.

7.10.3 The required temperature ranges are:

- a. Freezer (cold) Room: -18.0°C to -15.0°C; and
- b. Refrigeration (cool) Room: 3.0°C to 5.0°C.

7.11 HEATING VENTILATION AND AIR CONDITIONING (HVAC)

7.11.1 Accommodation spaces, including the Bridge, Command Centre, MCR, Galley and common areas, shall be supplied and installed with heating, ventilation and air conditioning (HVAC). The HVAC system(s) shall provide the following:

- a. Heating (not less than 19.0°C under winter conditions listed in Table 1); and
- b. Cooling (not more than 22.0°C under summer conditions listed in Table 1); and
- c. humidification; and
- d. dehumidification; and
- e. required number of air changes.

7.11.2 Air-conditioning fans shall be capable of being used as ventilation fans when spaces are not being heated or cooled.

7.11.3 The HVAC system shall be designed and built with a 20% makeup fresh air supply.

7.11.4 The HVAC system shall meet the following requirements:

- a. upper deck louvered openings should be directed aft and protected from the weather; and
- b. non-return dampers shall be mounted in the discharge ducting of each exhaust fan; and
- c. HVAC intakes shall be located to prevent short-circuiting of all exhaust gases.

7.11.5 Manual dampers shall be supplied and installed in HVAC trunking to isolate ventilation in case of fire and in suitable locations to permit system balancing.

7.11.6 Dampers in the HVAC trunking at watertight boundaries shall be supplied and installed with fusible links to isolate the HVAC system in case of fire.

7.11.7 Primary heating shall be by means of electric heating elements in the HVAC system augmented by local, individual, fixed electric space heaters.

7.11.8 Non air-conditioned spaces, such as workshops and storage spaces, shall be locally heated, cooled and ventilated with local temperature controls. Minimum temperatures shall be 10.0°C in storage spaces and 19.0°C in workshops.

7.11.9 Air vents shall be placed such that they do not blow directly on workstations or berths. Air vent exit air velocity shall as a minimum meet the specified air change rate, Table 3, and shall not exceed 2.5 m/s. The 2.5 m/s air velocity maximum does not apply to unattended machinery spaces. Ventilation trunking shall be accessible and designed and built for efficient cleaning.

7.11.10 Machinery spaces shall be independently heated, cooled, and ventilated. Local controls for each of the spaces shall be supplied and installed.

7.11.11 All fans and air-conditioning units shall be resiliently mounted.

7.11.12 No part of the ship’s structure shall be used as air ducting for the HVAC system.

7.11.13 Intake fans shall be fitted with silencers to minimize noise transmission to the machinery space and to the working deck area.

7.11.14 The required air changes shall be as listed below in Table 3 – Air Changes.

SPACE	# of air changes/hour
MMR	20 (minimum)
Auxiliary Machinery Room(s), if fitted (AMR)	20 (minimum)
Garbage Handling Room	30
Sewage Treatment Room	30
Toilets and Washrooms	30
Wet Gear Locker	20
Paint locker and other storage spaces	10
Accommodation spaces	20
Galley	20

TABLE 3 - AIR CHANGES

7.11.15 The temperature in machinery spaces shall not exceed 50.0°C with all the machinery operated at full power or full load nor fall below 10.0°C in all machinery states.

7.11.16 There shall be a minimum of two (2) air changes per hour when the vessel is in hot lay-up.

7.11.17 Washrooms, including toilets, and the galley shall have separate exhaust systems from those used for accommodation spaces. The galley exhaust system trunking shall be designed, built and installed with access ports to facilitate in-situ internal cleaning.

7.11.18 The following compartments shall have natural supply and mechanical exhaust:

- a. central store; and
- b. washrooms; and
- c. laundry; and
- d. workshops; and
- e. garbage handling room; and
- f. sewage treatment room; and

- g. paint locker; and
- h. Wet Gear locker.

7.11.19 Ventilation shall be supplied and installed for the fore peak compartment.

7.11.20 The main and auxiliary machinery spaces shall be served by variable speed supply and exhaust fans.

7.11.21 Insulation and vapour barrier shall be applied to the ducting and equipment to ensure minimum acceptable heat loss or gain and to prevent condensation. Metal sheathing shall be supplied and installed in areas where insulation may be subject to damage.

7.12 POTABLE WATER SYSTEM

7.12.1 The potable water system comprises the equipment used for embarking, producing, testing and treating, heating, cooling, storing and distributing potable water. The potable water system shall be fitted with two (2) reverse-osmosis type potable water makers each capable of producing a no less than 150.0 litres (l)/hour (hr) of potable water, from sea water and fresh water at a minimum temperature of 5.0°C. The system shall be fitted with a minimum of two (2) stainless steel storage tanks capable of storing a no less than the total volume of 6,300.0 l of potable water, based on a consumption rate of 150.0 l/day/person x 3 days x 14 persons.

7.12.2 The potable water system shall be designed and built to comply with:

- a. Guidelines for Canadian Drinking Water Quality and the Guideline Technical Documents, as published by Health Canada; and
- b. Canadian Coast Guard (CCG) Fleet Safety and Security Manual Section 7 – Potable Water Quality; and
- c. Potable Water Regulations for Common Carriers, C.R.C., c. 1105, as published by Health Canada.

7.12.3 The potable water system shall be designed, built and installed to comply with NSF/ANSI Standard 61 Drinking Water System Components – Health Effects.

7.12.4 Each potable water storage tank shall be fitted with: a vent, a drain, a salinity monitor, a connection to each of the reverse-osmosis type potable water makers, a connection to a common upper deck filling station, a connection to the potable water distribution system, a tank inspection access opening and, connections for sampling, and treating tank contents. Each tank shall have tank level sensor alarms integrated into the CCAMS. The alarms shall also be displayed on a local control panel. The potable water makers shall be able to be started and stopped manually from a local control panel and remotely from the MCS. Each water maker shall be fitted with a salinity monitor and an automatic dump valve or shut down control.

7.12.5 The cap on the fill connection shall be padlocked and a bilingual label plate stating "Potable Water Only" shall be installed at the fill valve and connection. Every outlet used for

drinking and culinary purposes shall be supplied and installed with a filter(s) capable of removing suspended solids down to one (1.0) micron and shall have a bilingual plate affixed stating the water is safe for drinking and culinary purposes.

7.12.6 Potable water shall be distributed to the:

- a. cabin sinks; and
- b. lavatory sinks; and
- c. showers; and
- d. galley; and
- e. mess; and
- f. chilled-water drinking fountains; and
- g. laundry; and
- h. sanitary flushing system; and
- i. MCR; and
- j. MMR; and
- k. Bridge; and
- l. Command Centre; and
- m. Bridge window wash-down system; and
- n. wet gear locker; and
- o. garbage handling room; and
- p. deck workshop; and
- q. all other systems or locations that require potable water.

7.12.7 Water heaters shall be equipped with temperature regulating devices to maintain the hot water temperature at 60.0°C. Temperature and pressure sensors shall be integrated into the alarm and monitoring system and shall be displayed on a local control panel as well as the CCAMS. Should the internal tank temperature reach 66.0°C or the tank pressure exceed the OEM's recommended pressure setting, power to the water heater shall be cut off and an alarm shall be activated.

7.12.8 All hot water piping and flanges shall be insulated to minimize heat losses and ensure personnel safety. All cold water lines and flanges shall be insulated to minimize heat gain and to

prevent condensation. Hot and cold water piping in shower enclosures shall be installed behind the paneling to ensure personnel safety. Isolating valves shall be fitted at each hot and cold branch from the main system and at each fixture.

7.13 BLACK, GREY WATER AND SANITARY FLUSHING SYSTEMS

7.13.1 The MSPVs shall be fitted with marine-type sanitary flushing and vacuum collection systems capable of collecting black water in a collection tank(s). Grey water shall be handled and collected separately from the black water system using a gravity-type system capable of collecting grey water in a collection tank(s). The black water tank(s) shall be sized to store a no less than 420 l of black water. The grey water tank(s) shall be sized to store a no less than of 3,780 l of grey water.

7.13.2 The grey water system shall be designed and built to transfer grey water collected in the grey water collection tank(s) either directly overboard or to the black water collection tank(s). The grey water system shall be designed to prevent black water from contaminating the grey water system.

7.13.3 The black water system shall be designed and built to transfer black water collected in the black water collection tank(s) to an IMO MEPC.159(55) certified sewage treatment plant (STP) for discharge of the treated effluent overboard or, additionally, to transfer untreated black water to a standard IMO MARPOL deck shore connection.

7.13.4 The STP shall be capable of treating influent streams containing black water only and black and grey water combined containing fresh water and salt water. The STP shall be capable of providing continuous operation for complement of between eight (8) and fourteen (14) persons while meeting the treated effluent discharge requirements specified in IMO MEPC.159(55). The grey and black water tank level indicators and, high and low sensor alarms shall be integrated into the CCAMS and shall be displayed on a local control panel. The influent piping immediately prior to the STP and the outlet piping immediately prior to the overboard discharge shall each contain a sampling valve to allow for the collection of influent and effluent samples, respectively.

7.13.5 The black water and grey water collection, discharge, and treatment system(s) shall be capable of full automation with the ability to be operated locally and remotely from the MCS.

7.13.6 Hydrogen sulphide (H₂S) sensors shall be supplied and installed in the black and grey water tank spaces as well as the STP space. The sensor shall monitor the level of H₂S in the spaces and provide an audible alarm in the space as well as providing an alarm to the CCAMS when a H₂S level exceeds set limits.

7.14 FIRE DETECTION, EXTINGUISHING AND FIREFIGHTING SYSTEMS

7.14.1 Each MSPV shall be equipped with fire detection system(s), fire-extinguishing systems, and a fire plan.

7.14.2 The MMR and, if fitted, the AMR fixed fire-extinguishing systems' extinguishing agent shall be located outside of the protected space with direct access to an open deck and shall be capable of local actuation.

7.14.3 The galley exhaust hood, trunking, and cooking appliances requiring automatic protection shall be fitted with approved fire-extinguishing systems which shall also be capable of manual activation from outside the galley. The system shall meet the requirements of the Underwriters Lab ULC / ORD-1254.6-1995 Fire Testing of Restaurant Cooking Area Fire Extinguishing System Units.

7.15 PORTABLE FIREFIGHTING EQUIPMENT

7.15.1 Portable fire fighting equipment shall be supplied and installed.

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8 ELECTRICAL

8.1 POWER SUPPLIES

8.1.1 The MSPV shall be supplied and installed with the following:

- a. Primary power shall be 600 volts AC, 3-phase, 3-wire insulated, 60 Hz, ungrounded delta connected; (this does not exclude the option of a high resistance ground to limit available fault current if required); and
- b. All Alternating Current (AC) voltages for power distribution shall be 60 Hz frequency; and
- c. The emergency source of electrical power shall be a diesel driven generator. It shall be capable of automatically assuming the emergency switchboard load within 45 seconds after failure of the normal electrical power source; and
- d. Backup power shall be supplied and installed to power computer systems and peripherals, machinery control, alarm and monitoring and other vital systems as required. There shall be an automatic, no-break battery back up. Where an Uninterruptible Power Supply (UPS) is selected, refer to paragraph 8.8.3 below.

8.1.2 Apparatus containing transistors, diodes and other solid-state devices shall be internally or externally supplied with protection against voltage transients or surges caused by load switching, fault or failures of the MSPV power systems.

8.2 GENERATORS

8.2.1 The MSPV shall have normal electrical power supplied by at least two identical, independent, diesel engine driven ship service generating sets, rated 600 volts AC, 3-phase, 3-wire insulated, 60 Hz at 0.8 PF at a 50.0°C ambient temperature, and arranged for continuous parallel operation of the units when required.

8.2.2 The generators shall be rated such that either one can continuously supply the peak cruising load at sea plus transient loads, with an allowance for 20% future growth. The ship's service standby generator set shall be capable of automatically assuming the ship's service electrical load within thirty (30) seconds after the failure of the on-line generator.

8.2.3 Each engine shall be a non-reversible, self contained, turbo-charged, after-cooled, four cycle marine diesel engine and shall have a normal continuous capacity at its marine rating and shall be capable of meeting the rating of its generator.

8.2.4 All fuel discharge lines shall be double-walled.

8.2.5 Diesel engines shall be capable of operation on a high output diesel single or multi-grade commercially available (API/SAE graded) lubricating oil. Each diesel engine shall have its own

OEM supplied pre-heater and pre-lube pump and its own lube oil, fresh water-cooling and raw water system. There shall be no interconnection between the engines' lube oil, fresh water and raw water systems although the raw water systems may be connected to a common sea chest.

8.2.6 Each generator-engine set shall be supplied and installed with all accessories recommended by the OEM for service at sea in all conditions specified in Table 1 and shall be installed complete with all attached and unattached auxiliaries.

8.2.7 Each generator and its engine shall be installed on a common rigid frame that is suitable for resilient mounting.

8.2.8 Each ship service generator and the emergency generator shall be supplied and installed with a minimum of one imbedded temperature detector per phase to allow the monitoring of the winding temperatures at the appropriate switchboard section and also by the CCAMS. In addition, an automatic insulation resistance monitor shall continuously monitor each ship service generator's and the emergency generator's stator insulation leakage to ground and shall initiate an alarm at the CCAMS at values of one (1) megohm or less.

8.3 SHORE CONNECTIONS

8.3.1 The shore power isolation transformer shall be one (1) – 3 phase, 600 V: 600 V, dry type transformer. The transformer shall incorporate an electrostatic shield. Taps shall be supplied and installed on the primary side of the transformer as follows:

- a. Two (2) capable of increasing voltage 2.5% above normal full capacity; and
- b. Two (2) taps capable of decreasing voltage 2.5% below normal full capacity.

8.3.2 A 30 m interconnecting 3 phase 4 wire cable suitable for 600 V 200 amp service fitted with two male plugs at each end of the cable with either CROUSE-HINDS AR2042 or APPLETON ADR20034 plugs for the shore-to-ship connection, shall be supplied and installed. A stowage reel, weatherproof caps for the plugs and weatherproof covering for the cable and reel shall be supplied and installed for onboard storage.

8.3.3 Watertight shore connection capability, located on the weather deck and readily accessible to shore power from both sides, shall be supplied and installed. The shore connection box(es) shall be at least 0.5 m above the deck and shall be located in weather protected area(s) to ensure the portable supply cable does not impede weather deck walkways or interfere with deck activities on both the port and starboard sides. Nameplate(s) shall be supplied and installed to clearly identify the connection box(es). A warning plate instructing personnel to isolate all supplies prior to working within the enclosure shall also be supplied and installed on every connection box.

8.4 SWITCHBOARDS

8.4.1 The generator and distribution switchboards shall be arranged for operation of generator circuit breakers and for distribution of power throughout the MSPV.

8.4.2 Bus bars shall be marked A, B, C to identify each of the three phases.

8.4.3 All switchboards shall be supplied and installed with fluorescent canopy lighting under the front, and back if access is required, drip-shields. Front and rear lighting shall be individually switched.

8.4.4 Two (2) of each distribution breaker frame size shall be supplied and installed within each switchboard and shall act as spares.

8.4.5 Each switchboard circuit breaker shall be of the draw-out type. Lifting and handling equipment shall be supplied for the removal of the circuit breakers from the switchboards.

8.4.6 In addition to manual paralleling capability, all generator combinations shall be supplied and installed with automatic paralleling capabilities.

8.5 DISTRIBUTION PANELS

8.5.1 All distribution panel bus-bars and connectors shall be made of copper. Distribution panels shall be from the same manufacturer and shall be supplied and installed with lockable doors. All locks shall be keyed alike and the quantity of keys to be supplied shall be equal to the number of locks supplied and installed.

8.5.2 Each distribution panel shall also be supplied and installed with four (4) blanked, double-pole circuit breaker spaces, to allow for future growth as well as four (4) spare circuit breakers that are representative in amperage of what is installed in the panel.

8.6 ELECTRICAL CABLES

8.6.1 All cable shall be low smoke, zero halogen and, unless otherwise required, unarmoured. All cables shall have an insulation rating of at least 85.0°C.

8.6.2 All cables shall be designated by an identification number that shall be permanently marked on non-ferrous metal tags, securely affixed to each end of the cable run in each main compartment and subdivision and, on both sides where passing through decks and watertight bulkheads.

8.6.3 Cableways and cables shall be installed clear of machinery access routes and maintenance envelopes. The strength and watertight integrity of the decks and bulkheads shall not be affected by the installation of the cable penetrations. Upon MSPV delivery, a minimum of 10% spare space shall be available in all cableways and deck and bulkhead multi-cable penetrations.

8.6.4 All cables supplying power to equipment, fixtures and electrical apparatus exposed to the weather shall be run internal to the ship's hull and superstructure as much as practicable. Where unavoidable, or where the length of the cables exposed to the weather exceeds one (1) metre, the cable selected shall be of a type that includes basket weave bronze braid armour covered with an external impervious non-metallic jacket.

8.6.5 To minimize EMI, spacing between cables shall conform to CCG Standard 70-000-000-EU-JA-001, or where this is not practical, additional approved shielding shall be supplied and installed, except where entering associated equipment, or where cables cross at a 90° angle.

8.7 MOTORS AND CONTROLLERS

8.7.1 All motors shall be totally enclosed fan cooled while those installed on deck exposed to weather shall be watertight to NEMA 4X.

8.7.2 All motors greater than one (1) HP shall be suitable for 575 volt, 3-phase, 60 Hz operation, and rated for continuous duty, with Class F insulation, and equipped with anti-friction, factory sealed pre-lubricated ball bearings.

8.7.3 Grouping of motor controls in Motor Control Centres (MCC) centralized in proximity to the source of supply, the main or emergency switchboards, is a requirement and shall be maximized. MCC bus bars and connectors shall be made of copper. Starter units shall be draw-out type, and shall include an incoming circuit breaker. Reduced voltage starters, where required, shall be solid state type. Starter front covers shall include shrouded start and stop pushbuttons and run and stop indicating lights.

8.7.4 Individual motor starters and controllers shall be mounted within line of sight of the auxiliary they serve. They shall be supplied and installed with local control and indicating lights. Local control shall be mounted in drip proof enclosures. An overload/reset button shall be supplied and installed on the enclosure door of each motor controller unless the operation of the auxiliary necessitates remote reset. Indicating lights mounted in the enclosure door shall notify the operator of equipment status. A complete wiring diagram of each controller shall be permanently attached, with a transparent, oil resistant protective covering, to the inside surface of the control cabinet door.

8.7.5 Auxiliaries with remote control positions shall be supplied and installed with a "Remote/Local" control switch in its motor starter/controller enclosure. In addition to the remote push button start and stop controls, remote motor running status indicators shall be supplied and installed. When the "Remote/Local" switch is in the "Local" position, it shall not inhibit the remote "Stop" function.

8.7.6 All motors connected to power feeds from static power converters shall be rated for inverter use.

8.8 POWER CONVERSION EQUIPMENT

8.8.1 All transformers shall be dry type, single phase and, with the exception of the shore power isolation transformer, rated at least Class F. Transformer ratings shall be standardized wherever possible.

8.8.2 Where an UPS is required by an individual system it shall be approved for marine use, shall have input and output isolation transformers, and, if hard-wired, an external manual bypass capability.

8.8.3 UPSs shall have an input voltage of 115 volts, 60 Hz. Batteries shall be sealed, suitable for deep discharge cycling and shall have as a minimum the capacity to provide the rated output for no less than 15 minutes.

8.9 115 V AND 230 V RECEPTACLES

8.9.1 All receptacles shall be "Specification Grade" duplex U-ground and, where used for general-purpose, rated for 15 amp, 115 volt, single phase, 60 Hz. Receptacles shall be installed in each compartment, except hazardous areas in which outlets are prohibited, and there shall be at least one receptacle installed for every eight (8) m² of deck area, defined by the compartment boundaries.

8.9.2 Passageways, washrooms, laundry area and other spaces not specifically listed shall have at least one (1) receptacle installed. For every three (3) metres of passageway, or fraction thereof, regardless of the presence of equipment, there shall be at least one (1) receptacle installed.

8.9.3 Cabins shall be supplied and installed with a minimum of three (3) receptacles regardless of the presence of furniture. In addition, the mirror/medicine cabinet in each cabin shall be supplied and installed with a shaver outlet, separate from the cabinet's fluorescent lighting and integral switch.

8.9.4 Sufficient receptacles shall be installed to provide power for all specified equipment in the Command Centre plus an equal number of spare receptacles.

8.9.5 Additional, non-duplex receptacles on dedicated circuits shall be installed in the galley and mess for all countertop equipment and audio visual equipment.

8.9.6 Additional, non-duplex receptacles shall be installed elsewhere for all test equipment, portable tools, communication equipment, computers and other electrical equipment and appliances not specifically listed herein.

8.9.7 Internal work stations shall have at least one (1) non-duplex receptacle installed.

8.9.8 There shall not be more than eight (8) outlets per circuit for general purpose branch circuits.

8.9.9 Single (non-duplex) watertight 115V receptacles shall be installed for each radar antenna, in the steering gear compartment, in the MMR, in the fore peak, in all machinery spaces and other areas and compartments exposed to raw water. Six (6) exterior receptacles, three (3) each side port and starboard located at the forward, the middle and the aft end of the superstructure on the main deck, shall be installed for general utilities purposes. Each exterior receptacle shall be on a separate branch circuit.

8.9.10 As a minimum, four (4) exterior single watertight receptacles shall be installed on the Bridge top, each supplied from a separate branch circuit.

8.9.11 230V / 20 amp receptacles shall be installed to supply portable galley equipment requiring that service.

8.9.12 230 V / 30 amp receptacles shall be installed to supply laundry equipment requiring that service.

8.9.13 One (1) 230 V / 20 amp and one (1) 230 V / 30 amp three phase watertight receptacles shall be installed on each side of the external working decks for auxiliary machinery and equipment, such as winches, portable pumps or other specialized equipments. At each end of the MMR, there shall be one (1) water tight receptacle of 230 V / 30 amp single phase.

8.10 LIGHTING

8.10.1 Interior lighting fixtures shall be installed and shall be of the fluorescent or compact fluorescent type wherever possible. The number of different fixture types shall be minimized in order to reduce the quantity and type of spare parts and lamps to be carried on board. Fixtures shall be constructed of corrosion resistant materials. Fixtures shall be suitable for direct mounting to bulkheads or decks, without the need for vibration isolation mounts. Fixtures shall use 115 volts, single phase, 60 hertz, and shall have solid state high efficiency ballasts.

8.10.2 Lamps shall be standard North American types, to fit common, commercially available sockets.

8.10.3 Lighting shall be controlled locally by specification grade switches installed at the entrance to each space. Where spaces have two (2) or more entrances, switches shall be located at each entrance. Passageway lighting shall be switched from the distribution panel. Specific task lights shall have integral switches. All lighting switches shall be double-pole to ensure complete isolation of the lamps when switched off.

8.10.4 Where emergency lighting cannot be supplied and installed integral with the normal lighting, separate non-rechargeable, battery-powered fixtures providing a minimum of two (2) hours of lighting shall be installed. These fixtures shall be automatically energized upon power interruption.

8.10.5 Switches to control lighting at hatches and doors shall not restrict neither the size of the hatchway and door opening nor the clear operation of the hatchway and door.

8.10.6 Watertight fixtures installed in outside spaces shall be constructed of corrosion-resistant material and have a corrosion resistant finish. Lamps shall be capable of being replaced without the use of special tools.

8.10.7 Levels of illumination in specific compartments and areas shall be as follows:

- a. 55.0 lux for storerooms, fan compartments and Bridge; and
- b. 110.0 lux for machinery space(s), emergency switchboard compartment, passageways, and steering gear compartment; and
- c. 220.0 lux for toilets, washrooms and showers, cabins, Mess and wet gear locker; and
- d. 300.0 lux for galley.

8.10.8 The levels of illumination shall vary within the Command Centre: 110.0 lux for the area in general, 500.0 lux at the program staff's work surface, and 220.0 lux at the Program/Incident Commander's workstation. The Command Centre shall have a variable light control for the room and at specific zones so that illumination within the room is capable of being dimmed individually or globally. Primary light controls shall be labelled and located at the Program/Incident Commander's station. A light control at the door is required to facilitate a safe passage to the Program/Incident Commander's station.

8.10.9 Illumination levels in other areas of the MSPV shall meet the Marine Occupational Safety and Health Regulations for vessels that are five hundred (500) tons or greater registered tonnage.

8.10.10 Illumination for the Bridge Control Station (BCS) shall be the minimum level necessary to maintain a visual gradient with the alarm, signal and indicating lights, and to readily recognize all information cues from the BCS. Glare reducing features such as anti-glare coatings and individual dimmable light switches shall be installed on all displays.

8.10.11 All space illumination in the Bridge shall be capable of being dimmed as a group in addition to the standard fluorescent fixtures. The Bridge shall be equipped with red illumination for use at night.

8.10.12 The chart table shall be supplied and installed with supplementary dimmable red and white lighting to produce from zero up to 220.0 lux at the chart table.

8.10.13 Dimming capability for indicator lights in the Bridge shall be supplied and installed, except that no dimming is permissible for warning and alarm indicating lights.

8.10.14 All principal illumination fixtures shall be flush mounted with the deckhead, false deckhead and bulkhead, unless otherwise specified.

8.10.15 Each cabin shall be supplied and installed with a minimum of one fluorescent type overhead fixture for general illumination, controlled by a switch at the entrance. A desk light in way of each desk with an integral switch, a mirror light over each mirror and a berth light at the head of each bunk, each with an integral switch, shall also be supplied and installed.

8.10.16 All passageways shall be equipped with red illumination for use at night in addition to the standard fluorescent fixtures.

8.10.17 Drip proof fluorescent light fixtures shall be installed in all machinery spaces. Machinery space lighting shall not be switched.

8.10.18 Lights illuminating store and locker spaces shall be housed in drip proof guarded fixtures. Switches adjacent to access entry shall control the lighting.

8.10.19 Workbench general lighting shall be fluorescent.

8.10.20 Fixtures shall be placed to illuminate ladders, walkways, obstructions, abrupt changes in deck level and other hazards to personnel safety.

8.10.21 Exterior lighting shall be switch controlled from the Bridge.

8.10.22 Deck lighting and exterior lights shall be watertight types with guards. Fixtures shall be connected to the ship's service power via through-bulkhead fittings, so that the cabling runs internal to the hull.

8.10.23 Portable fixtures shall be supplied and installed to illuminate the gangway areas, along with dedicated switched receptacles.

8.10.24 Four (4) portable floodlights, watertight, corrosion resistant, and at least 200 Watts (quartz halogen) types shall be supplied and installed for the rescue boat and life raft areas, shore transfer and connection station(s), embarkation and disembarkation station(s), and mooring areas.

8.10.25 Two (2) floodlights of at least 1000 Watts each shall be permanently mounted on brackets facing aft on port and starboard sides to illuminate the aft working deck.

8.10.26 One (1) additional floodlight of at least 500 Watts shall be mounted on a portable arm, with fittings located at various locations around the working deck. The locations of these fittings will enable the floodlight to illuminate the port and starboard sides and the stern. The floodlight on the portable arm shall be supplied by a three (3) m power cord and watertight plug, and shall not interfere with deck equipment operation.

8.10.27 One (1) floodlight of at least 500 Watts shall be supplied and positioned to illuminate the forecabin. The fixture shall be hooded to help prevent light spill over into the Bridge.

8.10.28 Stowage for the portable floodlights and portable arm shall be supplied and installed onboard. Protective covers shall be supplied and installed as per paragraph 5.17.1 above. Watertight receptacles shall be arranged for the floodlight supplies and control shall be from the Bridge.

8.10.29 Two (2) searchlights shall be fitted on the Bridge top, forward near each side. The searchlights shall have a minimum output of ten (10) million candelas each, and shall be complete with anti-icing heaters and remote control of slew, tilt and focus. All searchlight functions shall be controlled electrically from a remote panel mounted on the BCS. The searchlights shall be capable of moving through a minimum of 360.0° horizontal sweep and a minimum of 35.0° vertical sweep both above and below the horizontal plane of the light. The searchlights shall be mounted as high as practical. Search beam blockage from other mounted equipment or superstructure shall be minimized as much as practical. The searchlights shall not weigh more than 30 kg each. At least one (1) searchlight shall be supplied from the emergency bus. Each searchlight shall be installed with vibration isolation mountings.

8.10.30 A central navigation light control panel for all navigation lights shall be fitted at the BCS. The vessel's blue flashing warning light shall also be controlled from the central navigation light control panel.

8.11 24 V DC DISTRIBUTION AND 12 V DC DISTRIBUTION

8.11.1 24V and 12V Direct Current (DC) systems, where required for engine starting, or other systems not listed in this Section, shall be supplied and installed.

8.11.2 Batteries and charging systems shall be designed and installed for the following purposes:

- a. Group 1 Generator set engine starting (if electric start selected); and
- b. Group 2 Emergency generator set engine starting (if electric start selected); and
- c. Group 3 Battery backup systems, including UPS.

8.11.3 Group 1 and 2 batteries shall be located as close as practicable to the engines concerned. Each set of Group 1 and Group 2 batteries shall be sized to have as a minimum the capacity to meet IEEE Std. 45 requirements for engine starting.

8.11.4 Battery chargers, certified for marine application, shall be of constant voltage type, fully automatic, featuring float or boost charge arrangements and be selected and sized to suit the application. The battery chargers shall be equipped with, as a minimum, "on/off" switch, power "on" indicating light, voltmeter, ammeter, boost operation indicator, manual boost override, protection against overload and overcharging. Printed circuit boards in chargers shall have conformal coating.

8.11.5 Each set of Group 1 and 2 batteries shall have no other connected loads and shall be supplied and installed with a dedicated battery charger.

8.11.6 One (1) portable battery charger shall be supplied for charging spare batteries of all sizes fitted in the MSPV.

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9 NAVIGATIONAL, COMMUNICATION & MACHINERY CONTROL SYSTEMS

9.1 GENERAL

9.1.1 The MSPVs shall be supplied and installed with navigation equipment, communication equipment, collision avoidance signals, and all miscellaneous equipment needed for the safe handling of the MSPVs. Additionally, the MSPVs are to be in compliance with the Navigation Safety Regulations under Arctic Waters Pollution Prevention Act and the Standards for Navigating Appliances and Equipment (1983) – TP 3668.

9.1.2 All equipment shall be capable of withstanding momentary loss of power as described by the OEM for that particular piece of equipment without damage.

9.2 BRIDGE LAYOUT

9.2.1 The Bridge shall incorporate the radar, electronic chart system (ECS), and all other navigation aids necessary to:

- a. determine and plot the ship's position, course, track and speed; and
- b. analyze the traffic situation; and
- c. decide on collision avoidance manoeuvres; and
- d. effect internal and external communications related to navigation and manoeuvring, radio communication on the Very High Frequency (VHF); and
- e. give sound signals and hear sound signals; and
- f. monitor course, speed, track, and depth of water; and
- g. record navigational data.

9.2.2 It shall incorporate all gauges, instrumentation, and alarms required to fully monitor the ship's propulsion system and auxiliaries as well as permit the helmsman to control rudder, MSPV speed and propulsion both ahead and astern.

9.2.3 A chart table shall be supplied and installed on the Bridge and should face forward. The chart table shall not face aft.

9.3 SHIP'S INFORMATION SYSTEMS

9.3.1 All internal communications, external communications, navigation equipment and materials shall be supplied and installed.

- 9.3.2 All cables shall be protected against mechanical damage, water ingress and EMI.
- 9.3.3 All coaxial cables for radio transceivers shall be RG-214, unless otherwise specified herein.
- 9.3.4 Cable runs shall be segregated and grouped in accordance with CCGS 70-000-000-EU-JA-001.

9.4 RADIO FREQUENCY (RF) EXPOSURE SURVEY

- 9.4.1 A survey to determine radio frequency radiation shall be conducted on all parts of all upper decks.
- 9.4.2 To ensure that personnel shall not be exposed to harmful radio frequency radiation while conducting training and working on deck, each radar shall be fitted with RF emission keys or fuses that shall be capable of ceasing RF transmission and antenna rotation.

9.5 INTERFACING REQUIREMENTS

- 9.5.1 All navigational equipment and applicable communication equipment shall be interfaced utilizing the National Marine Electronics Association (NMEA) 0183 Industrial Standard for Communication between Marine Electronics Devices.

9.6 HARDWARE STANDARDS

- 9.6.1 All radio transmitting equipment installed on the MSPVs shall be type approved by Industry Canada.
- 9.6.2 All navigating appliances and equipment shall be supplied and installed. They shall comply with the International Electrotechnical Commission (IEC) and International Organization for Standardization (ISO) technical standards, where applicable.
- 9.6.3 An Administrative Local Area Network (LAN) shall be supplied and installed and shall comply with the Standard Technical Architecture (STA) for Shipboard Computer Systems 46-000-000-ES-TE-001.

9.7 SOFTWARE STANDARDS

- 9.7.1 All software for the Administrative LAN shall be supplied and installed and shall comply with the STA for Shipboard Computer Systems 46-000-000-ES-TE-001.

9.8 NAVIGATING APPLIANCES AND EQUIPMENT

- 9.8.1 All the equipment specified and the associated hardware, such as antennae, shall be supplied, installed, integrated and commissioned in accordance with the recommendation and guidance of the respective OEMs. Electrical and electronic equipment shall be arranged and

installed so that EMI does not affect the proper function of navigational or other systems and equipment.

9.9 GYRO COMPASS

9.9.1 One (1) C Plath 2100 fibre optic gyro compass shall be supplied and installed in the EER. Bearing repeaters with pelorus capability shall be supplied and installed on each of Bridge Wings. Bearing repeaters are to be mounted on longitudinal slide rails to enable the user to relocate the repeater fore and aft.

9.9.2 A steering repeater shall also be supplied and installed at the BCS and at the emergency steering location. A numeric repeater shall be installed on the forward Bridge bulkhead at deckhead level. The fibre optic gyro system shall be supplied and installed to provide a digital heading data in NMEA 0183 format (HDT) to the radars, ECS, Autopilot, Automatic Identification System (AIS) and the E-mail-at-sea system.

9.10 NAVIGATIONAL RADARS

9.10.1 Two (2) navigation radar systems shall be supplied and installed complete with collision avoidance display, Automatic Radar Plotting Aid (ARPA) and alarm system. The radar system shall provide ARPA information to the ship's ECS and the Trackplot computer in the Command Centre.

9.10.2 The radars shall be Sperry Marine VisionMaster FT X-Band and S-Band inter-switched radars (bulkhead transceiver). The system shall consist of the following units:

- a. VisionMaster FT Radar CAT2 252/6/BT/VM2 complete with buffered video output, Interface unit required for AIS input, Keyboard and Joystick Human Machine Interfaces and performance monitor; and
- b. VisionMaster FT Radar CAT2 253/12/BT/VM2 complete with buffered video input, Interface unit required for AIS input, Keyboard and Joystick Human Machine Interfaces; and
- c. Interswitch unit.

9.10.3 In addition, both radars shall be supplied and installed complete with bi-directional couplers having a 20dB forward and reverse coupling and a directivity of 40dB. The X-Band radar shall be supplied and installed with a rigid waveguide (RG51). Along with the bi-directional coupler, the waveguide shall be supplied and installed complete with a pressure gauge and pressure windows. The S-Band waveguide shall be LDF5-50A.

9.10.4 A remote radar display shall be supplied and installed in the Command Centre. This remote display shall be capable of being switched to either radar.

9.10.5 The radar antennas shall have a minimum vertical separation of one (1) m. The antennae shall be located so that any radar blind arcs which may occur as a result of masts or funnel casings

are not dead ahead or dead astern. All attempts shall be made to minimise blind arcs by rounding the mast surfaces and by not fitting items such as lights, and ladders at the antenna radiation level on the mast. A bilingual cautionary notice shall be placed at each entrance to the radar platforms warning of dangers associated with rotating and radiating antennae.

9.10.6 Each antenna shall be supplied with a safety switch, located at the entry point or at the base of the respective mast to stop the antenna rotation.

9.10.7 Each radar shall be connected to the differential global positioning system (DGPS) receiver, the (AIS), the ECS Trackplot computer, fibre optic gyro and speed log.

9.11 DIFFERENTIAL GLOBAL POSITIONING SYSTEM

9.11.1 The MSPV shall be fitted with a Saab R4 Differential Global Positioning System (DGPS) Nav Sensor, Saab R4 Control and Display unit and associated J4N junction box. The DGPS system output shall be connected via a two position data selection switch to a data buffer unit. A second input to the two position data selection switch will be from the DGPS to the AIS. The Data Buffer unit will provide NMEA 0183 connectivity to the radars, AIS, Autopilot, echo sounder, ECS, and the Trackplot computer in the Command Centre

9.11.2 A combined Global Positioning System (GPS) beacon and antenna shall be supplied and installed on the mast.

9.12 AUTOMATIC IDENTIFICATION SYSTEM (AIS)

9.12.1 An automatic identification system (AIS) shall be supplied and installed to automatically provide MSPV position and vessel information to systems ashore and to other vessels.

9.12.2 The AIS shall provide AIS information to the ship's ECS and radars.

9.12.3 The AIS system is to include the Saab R4 transponder, Saab R4 DGPS Nav Sensor, Saab R4 Control and Display unit and associated J4 and J4N junction boxes. DGPS output shall be connected to the two position data collection switch noted in the DGPS paragraph 9.11.1.

9.12.4 The AIS Nav Sensor shall connect to both ECSs, Trackplot computer and DGPS for bi-directional waypoint transfer.

9.12.5 The antenna for the AIS transceiver shall be supplied and installed in accordance with the accepted antenna arrangement.

9.13 ELECTRONIC CHART SYSTEM (ECS)

9.13.1 Two (2) computers capable of running GFE software, ICAN ALDEBARAN CCG Version application shall be supplied and installed on the MSPV.

9.13.2 The first system shall be supplied and installed in the Bridge. A 19" viewing area flat panel design chart display shall be located at the BCS with a 19" viewing area flat panel design

remote display at the chart table in the Bridge. Each Bridge Wing shall have a remote display that shall be at least a 14" viewing area flat panel design. All monitors shall be complete with dimming capability to one candela per square metre for night operation.

9.13.3 A separate 19" viewing area flat panel display area ECS shall be supplied and installed in the Command Centre.

9.13.4 Inputs from the speed log, navigational radars, fibre optic gyro, DGPS, echo sounder, AIS and anemometer shall be supplied to the ECS.

9.13.5 The ECSs shall be capable of displaying ARPA targets, AIS targets, depth soundings, wind speed and direction information, and electronic chart data in the selected area.

9.14 AUTOPILOT

9.14.1 An autopilot system shall be provided and installed.

9.14.2 The autopilot shall be interconnected to the fibre optic gyro and DGPS.

9.14.3 The autopilot shall employ adaptive steering technology.

9.15 ECHO SOUNDER AND SONAR

9.15.1 One (1) dual frequency recording type echo sounder with display shall be supplied and installed in the Bridge at the chart table with a remote display at the BCS. The echo sounder shall be capable of providing accurate depth indication in feet, fathoms and metres from zero (0) to a maximum depth of at least 200 m with a high contrast Liquid Crystal Display (LCD) display. The echo sounder system shall have an adjustable shallow depth alert and shall be capable of paper recording, electronic recording and storage of data for the depth(s) and the associated time for 12 hours. In addition, the system supplied by the Contractor shall provide a means to retrieve the recorded information. The echo sounder shall be a Simrad ES60 38/200 KHz.

9.15.2 The recorder shall be console supplied and installed at the chart table with digital indicators supplied and installed at the Bridge Wings.

9.15.3 The Simard ES60 illuminated display shall be supplied and installed in the vicinity of the chart table and shall have the capability of being dimmed. The echo sounder shall interface to the DGPS Receiver and ECS.

9.15.4 The transducer shall be supplied and installed in the hull in a location recommended by the OEM. Upon completion of installation, the hull surface in the vicinity of the transducer shall be smoothed and all holes or gaps filled with a suitable marine compound and smoothed.

9.15.5 Space shall be supplied to install an optional sonar with display in the Bridge. The footprint shall be based on a Wesmar HD800. Space shall also be supplied to install its associated transducer and electrical connections. Its location shall be in accordance with the OEM's installation instructions.

9.16 SPEED AND DISTANCE LOG

9.16.1 A speed and distance log shall be supplied and installed to conform to HSC Code rules. It shall supply the ship's velocities in digital format and direction (fore and aft), with respect to the water, at low ship's speed in relatively shallow water and with high resolution. The speed and distance log shall provide the MSPV speed information to the ship's radars and ECSs.

9.17 VHF DIRECTION FINDER

9.17.1 One (1) automatic VHF direction finder shall be supplied and installed.

9.17.2 The receiver indicator shall be supplied and installed in the Bridge and the antenna shall be supplied and installed at the top of the main mast.

9.17.3 The VHF direction finder shall be a Cubic OAR4400.

9.18 NAVIGATIONAL AND SIGNALLING EQUIPMENT, NON-ELECTRICAL NAVIGATION AIDS

9.18.1 The Bridge shall be supplied and installed with lockers for miscellaneous navigational aids such as chart folios, publications, documents, signalling lamps, three (3) binoculars, two (2) night vision goggles, and other required items.

9.18.2 A control panel integrated with only the ship's whistle system shall be supplied and installed to automatically sound the ship's whistle in fog conditions.

9.18.3 The ship's fitted loudhailer system shall be interfaced to the CCAMS and shall provide an audible indication for set abnormal conditions onboard when the MSPV is unoccupied. An external yellow flashing 200 Watt light interfaced to the CCAMS shall also be supplied and installed to similarly indicate abnormal conditions.

9.18.4 One (1) 300 mm high by 320 mm diameter brass ship's bell complete with mounting brackets, clapper, striking lanyard shall be supplied and installed at a location to be designated by the TA. The MSPV's name shall be engraved on the bell. The bell engraving shall be as follows:

- a. Canadian Coast Guard – 29 mm;
- b. Ship name – 38 mm; and
- c. Date of completion in full (day/month/year) – 12 mm.

9.18.5 The proposed font shall be approved by the TA prior to engraving the bell.

9.18.6 Hoisting arrangements shall be supplied and installed for displaying the day shapes and international code flags.

9.19 METEOROLOGICAL SYSTEM

9.19.1 The MSPV shall be supplied and installed with a meteorological system as follows:

- a. A wind speed and direction indicator with an indicating instrumentation system, installed in the Bridge; and
- b. Exterior air temperature unit capable of displaying in the range of -50.0°C to 50.0°C with an accuracy of $\pm 1.0^{\circ}\text{C}$, installed in the Bridge; and
- c. A recording barometer, installed in the Bridge; and
- d. A non-recording barometer, installed in the Captain's Cabin; and
- e. An atmospheric Environmental Services of Canada compliant automatic voluntary observation ship's (AVOS) system, supplied as government furnished equipment (GFE) shall be installed. Location to be designated by the TA.

9.19.2 The ship's anemometer shall provide the wind speed and direction data to the ship's ECSs.

9.20 EXTERNAL DATA TRANSMISSION

9.20.1 All components installed in areas exposed to the weather shall be fully protected by waterproof enclosures or shall be watertight to NEMA 4X.

9.21 SATELLITE TERMINAL

9.21.1 An INMARSAT FleetBroadband 250 terminal shall be supplied and installed in the vicinity of the chart table.

9.21.2 Connection shall be made to the Telephone System to allow for voice communications.

9.21.3 Connection shall be made to the Telephone System to allow for facsimile communications.

9.22 SECURE COMMUNICATIONS SATELLITE TERMINAL

9.22.1 The Secure Communications Satellite Terminal (SCST) system shall consist of a Sailor SC4000 Iridium satellite phone with encryption devices. One (1) Iridium Satellite phone shall be supplied and installed in the Command Centre. The SCST shall be compatible with the Secure Communications Interoperability Protocol (SCIP). Space for one (1) SCIP unit, a General Dynamics BDI Sectera encryption device, shall be allocated in the Command Centre. The SCIP unit will be supplied by the Canadian Security Establishment after delivery of each MSPV.

9.22.2 One (1) remote handset for the Iridium satellite phone shall be supplied and installed in the Bridge at the BCS. The unit shall be interfaced to the telephone system to allow authorized telephones access to this system. One (1) antenna shall be supplied and installed in accordance with the accepted antenna arrangement.

9.22.3 For clarity and to summarize, the SCST system shall include one of each of the following specific components:

- a. transceiver; and
- b. multifunctional handset; and
- c. hands free microphone; and
- d. antenna electronics unit; and
- e. security device (GFE); and
- f. remote handset.

9.23 EMAIL-AT-SEA

9.23.1 A Vessel Satellite Communication System (VSCS) for E-mail-at-sea system, supplied as GFE, shall be installed as follows:

- a. One (1) SeaTel antenna model 4006 for the VSCS system shall be mounted in accordance with the accepted antenna arrangement; and
- b. Equipment rack with shelve(s) shall be installed in the Electronic Equipment Room (EER) to house the VSCS equipment. The equipment shall be installed in a standard 19" 40 RU rack which provides a minimum of 77.5 cm useable depth. The rack shall be of welded steel construction as per "Specification for the Installation of Shipboard Electronic Equipment (70-000-000-EU-JA-001 July 2003); and
- c. All power, interconnect and antenna cables are not GFE and shall be supplied, installed, terminated and set-to-work.

9.24 HF COMMUNICATIONS

9.24.1 One (1) Medium Frequency/High Frequency (MF/HF) radio telephone shall be supplied and installed in the Bridge. The antenna shall be installed in accordance with the accepted antenna arrangement. Units shall be Motorola Model Micom 2 complete with F2260 Antenna Tuner.

9.24.2 The radio-telephone shall have the following features:

- a. R.F. power output of 125 Watts P.E.P.; and
- b. fully synthesized and capable of 120 channel selection over 1.6 MHz to 30 MHz range; and
- c. fully automatic tuning, within 15 seconds of channel selection; and
- d. channels shall be field programmable; and

e. incorporates a two-tone distress generator.

9.24.3 The radio-telephone shall be supplied complete with:

- a. electronic noise blanker; and
- b. interconnecting cabling; and
- c. power supply.

9.25 VHF COMMUNICATIONS

9.25.1 Marine Transceivers: These units are in addition to the Global Maritime Distress and Safety System (GMDSS) Digital Selective Calling (DSC) unit required as part of the GMDSS station.

9.25.2 Two (2) VHF/FM Marine radio transceivers shall be supplied and installed in the EER, each having associated remote units supplied and installed in the Bridge, and the Command Centre. One (1) VHF/FM Marine transceiver and associated antenna shall be supplied and installed, at a location aft on the MSPV. The antennae shall be the Coast Guard version of Sinclair Model 225M, centre cut to 156.8 MHz.

9.25.3 All transceivers shall have as a minimum the following features:

- a. fully synthesized operation, covering all US and International private and weather channels which are used in the VHF band; and
- b. programmed for all fifty-five (55) international maritime VHF channels with an additional capability to program a further twenty (20) private channels; and
- c. sea watch operation with at least two (2) channels and including priority operation on Ch 16; and
- d. One (1) button selection for Ch 16; and
- e. One (1) Watt and twenty-five (25) Watt power output; and
- f. Full function remote operation, with lock-out of remote at master control; and
- g. Capable of transmitting in the frequency range of 155.4 MHz to 158 MHz, at channel separations of 25 kHz; and
- h. Capable of receiving in the same frequency range and 160.0 MHz - 162.6 MHz; and
- i. A sensitivity of 0.3 micro-volts for 12 db sinad, single channel operation.

9.26 AIR/GROUND TRANSCEIVER

9.26.1 One (1) VHF/AM radiotelephone shall be supplied and installed in the Bridge. The antenna shall be a Sinclair SRL-238M.

9.26.2 Features shall include:

- a. 760 channel selection at 25 kHz spacing between 118 MHz and 136 MHz; and
- b. 16 Watts nominal RF power output; and
- c. side tone capability, adjustable up to 100 mW into 500 ohms; and
- d. single channel store and recall memory; and
- e. speaker and headphone outputs.

9.27 WIDEBAND ENCRYPTION TRANSCEIVER

9.27.1 One (1) Mobile VHF-FM Wideband Radiotelephone complete with dual remote control heads, dual speakers, antenna and power supply shall be supplied and installed. The transceiver shall operate in a frequency range from 136 MHz to 174 MHz at a RF power level of 10 to 50 watts. Channel spacing shall be variable/programmable and Primary Operation and System Type shall be programmable. Feature Level shall be the Standard Package. The Transceiver unit shall be supplied and installed in the EER.

9.27.2 One (1) remote unit complete with limited keypad and display shall be supplied and installed in the Bridge and a second shall be supplied and installed in the Command Centre. Both units shall be supplied with encryption modules and all software required for programming of the transceiver and the encryption modules.

9.27.3 The antenna shall be Sinclair SRL-233 centre cut to 156.8 MHz. The antenna shall be supplied and installed in accordance with the accepted antenna arrangement. Each remote unit shall be equipped with an external speaker.

9.27.4 The Radiotelephone shall be a Motorola Astro XTL 5000 Digital Mobile Radio.

9.28 PORTABLES

9.28.1 Five (5) VHF/FM portable radio telephones, each fitted with a battery charger shall be supplied and installed in the Bridge. Three (3) of these shall be GMDSS TCMS approved units, Skanti VHF 9110, and two (2) shall be Icom M72 with Built-in UT112 voice scrambler. Units shall be supplied with carrying case and strap.

9.28.2 Two (2) Ultra High Frequency (UHF) FM portable radio telephones, each fitted with a battery charger shall be supplied and installed in the Bridge. Units shall be intrinsically safe Motorola MT1500 units capable of operating on 467 MHz. Units shall be supplied with intrinsically safe remote microphones, carrying case and strap.

9.29 GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM STATION

9.29.1 One (1) Global Maritime Distress and Safety System (GMDSS) station meeting Canadian domestic carriage requirements shall be supplied and installed in the Bridge at a location agreed to by Canada. All operator interface components of the GMDSS station, with the exception of VHF Digital Selective Calling (DSC) radios, GMDSS portables, Emergency Position Indicating Radio Beacon (EPIRB), and Search and Rescue Radar Transponders (SART), shall be physically located in a deck standing console. The console shall meet the requirements of the Canadian Radio Inspection Certificate for A3 configuration. The station shall be supplied and installed complete with cables, batteries, connectors, antenna, display terminals, printers and all other items required for equipment set-to-work in conformance with the above requirements. The equipment shall be type-approved to IMO and IEC GMDSS performance standards.

9.29.2 Reserve battery or batteries shall be supplied and installed and all shall have as a minimum the capacity to power necessary equipment to satisfy the regulatory requirements. A battery-charging unit shall be supplied and installed.

9.29.3 The INMARSAT Standard C terminal, with Enhanced Group Call shall comply with the latest of INMARSAT performance standards. It shall also comply with the latest IEC regulations. The Standard C terminal shall be comprised of an integrated transceiver with monitor display and disc drive. A keyboard, printer, and remote distress control unit are also required. The Standard C terminal shall have a built-in GPS receiver that will allow automatic updating of the ship position every five (5) minutes in the event of a distress. The GPS antenna supplied shall be integral to the Standard C antenna radome.

9.29.4 The Medium Frequency / High Frequency Digital Selective Calling (MF/HF DSC) shall be a solid-state MF/HF DSC transceiver which shall have a power output of not less than 200 Watts PEP. The transceiver shall have a tuning range covering from 1.7 MHz to 28 MHz. The transceiver shall be tuneable on all International Telecommunication Union (ITU) marine channels, ITU Radio Regulations Appendix 18 refers, plus shall be capable of providing one hundred (100) programmable channels. The transceiver shall consist of three separate units – controller/remote, transceiver and automatic tuner unit (ATU). These three (3) units shall be capable of functioning with connecting cables. The controller shall include a NMEA 0183 interface for navigational devices such as a GPS receiver.

9.29.5 The Narrow Band Direct Printing Equipment, and the Search and Rescue Radar Transponder (SART) shall be compliant with the latest IEC requirements.

9.30 UHF COMMUNICATIONS

9.30.1 Space for one (1) multi-band transceiver (115 MHz -138 MHz, 136 MHz-174 MHz and 225 MHz -400 MHz bands) with scanning and fixed frequency operation in both AM and FM capability to communicate with Department of National Defence (DND) UHF/VHF AM/FM multi-band transceivers and ancillaries shall be allocated. This space shall be 5RU and allocated in the communications rack in the Command Centre to temporarily mount this transceiver.

9.30.2 A means to securely fasten this equipment shall be supplied. Antenna(e) to support this transceiver shall be supplied and permanently installed on the Bridge top or mast.

9.31 LOUDHAILERS

9.31.1 Two (2) weatherproof horn type loudhailers shall be supplied and installed on the searchlights.

9.31.2 The loudhailers shall be controlled from the BCS.

9.31.3 The loudhailers are part of the internal communication system and shall be integrated with the Talkback and Public Address (PA) systems.

9.32 RACK(S) OR SHELVE(S)

9.32.1 19" Communications Rack(s) of welded steel construction as per 70-000-000-EU-JA-001, with a minimum of 65.4 cm useable depth and shelves shall be supplied and installed in the Command Centre to house radio transceivers that will be required by other Government Agencies during joint operations. If one (1) rack cannot accommodate all of the equipments listed below, a second rack with shelves shall be supplied and installed.

9.32.2 The rack(s) and shelves shall be designed, built and installed to allow quick and easy installation of the required radio transceivers. All power, interconnect and antenna cables shall allow for quick connect and disconnect.

9.32.3 A secure means of temporarily mounting the equipment shall be supplied and installed.

9.32.4 Antennae supporting the equipment noted below in 9.31.5 shall be supplied and permanently installed in accordance with the accepted antenna arrangement.

9.32.5 The rack(s) with shelves and 1RU vent panels separating each equipment shall have as a minimum the space to allow for the following equipment to be installed:

- a. Motorola PDR 3500; and
- b. VHF/UHF Transceiver; and
- c. Motorola UHF Quantar Station/Repeater with duplexer; and
- d. Motorola VHF Quantar Station/Repeater with duplexer; and
- e. Ontario Provincial Police Transceiver – approximately 21 cm L x 8 cm D x 8 cm H;
and
- f. Quebec Provincial Police Transceiver – approximately 21 cm L x 8 cm D x 8 cm H;
and
- g. Kenwood TK980 Trunk Radio Transceiver; and

h. Motorola Astro XTL 5000.

9.33 CELLULAR PHONE

9.33.1 One (1) digital cellular phone capable of transmitting at a minimum power of three (3) Watts shall be supplied and installed in the Command Centre.

9.33.2 The antenna shall be supplied and installed in accordance with the accepted antenna arrangement.

9.33.3 The cellular phone shall be connected to the Integrated Internal Communications System (IICS) to allow authorized telephone access to this system.

9.34 NAVTEX RECEIVER

9.34.1 One (1) Navtex receiver system shall be supplied and installed in the Command Centre and shall be connected to its antenna.

9.34.2 The antenna shall be located in accordance with the accepted antenna arrangement.

9.35 EMERGENCY POSITION INDICATING RADIO BEACON (EPIRB)

9.35.1 One (1) Class I TCMS approved EPIRB shall be supplied and installed on the Bridge top, clear of masts and antennae and mounted in a float free bracket.

9.36 RCMP TRANSCEIVERS

9.36.1 Space for one (1) Royal Canadian Mounted Police (RCMP) transceiver, a Motorola PDR 3500, TransPortable Digital Repeater (PDR)/TransPortable Base Station, one (1) Motorola Quantar (UHF) Station/Repeater and, associated duplexers shall be allocated in the communications rack(s) in the Command Centre to temporarily mount these units.

9.36.2 A means to securely fasten this equipment when installed shall be supplied.

9.36.3 The antennae to support these transceivers shall be supplied and permanently mounted in accordance with the accepted antenna arrangement.

9.36.4 Two (2) Sinclair SC320 collinear omni antennae shall be fitted in accordance with the accepted antenna arrangement and connected to the above transceivers utilizing LMR 600 FR coaxial cables.

9.36.5 The transmit frequency for the Motorola PDR unit shall be 426 MHz and the receive frequency shall be 421 MHz. The frequencies for the Motorola Quantar will be provided later.

9.37 OTHER GOVERNMENT AGENCIES

9.37.1 Two (2) spare runs of RG-214 coaxial cable and two (2) spare runs of LMR 600 FR coaxial cable shall be run from the communication rack(s) in the Command Centre to the Bridge Top to facilitate the installation of associated antennae for these transceivers in accordance with the accepted antenna arrangement.

9.38 CLOSED CIRCUIT TELEVISION SYSTEM (CCTV)

9.38.1 A CCTV system with a digital recording capability shall be supplied and installed on the MSPV and distributed over the administrative LAN.

9.38.2 The master monitor shall be supplied and installed in the Bridge.

9.38.3 Fixed cameras shall be supplied and installed throughout the MSPV in such a manner so as to allow complete monitoring of the entire upper deck area, all working deck areas, the gangway, and all machinery spaces.

9.39 INTERIOR DATA TRANSMISSION

9.39.1 An internal data transmission system shall be supplied and installed. It shall be comprised of the following networks:

- a. NMEA 0183 data network for Navigational and Communication Equipments; and
- b. Ethernet 1 Gigabit per second (Gbps) for the administrative and operational LANs; and
- c. International Processing Standards for Computers Communications Link for the Machinery Control Link.

9.39.2 The routing of cables and the grounding and bonding of electronic equipment shall meet the requirements of CCGS 70-000-000-EU-JA-001, General Specification for the Shipboard Installation of Electronic Equipment.

9.40 NAVIGATION AND COMMUNICATION SYSTEMS

9.40.1 Navigation and selected communication equipment shall be interfaced utilizing the NMEA 0183 data bus. This is also referred to as the IEC61162 standard.

9.41 LOCAL AREA NETWORKS (LAN)

9.41.1 Two (2) separate fibre-optic Ethernet-based Computer LANs shall be supplied as per STA 46-000-000-ES-TE-001. One (1) network will be used for operational purposes and the other will be used for administrative purposes. Each drop shall be fed by three (3) fibre optic pairs in a single tube. Each end of the fibres should be terminated by ST type connectors. The third fibre optic pair shall be connected to a fibre optic to Ethernet (RJ-45) converter. Converters shall be supplied and installed in the bulkhead and shall be powered. A maintenance access shall be supplied.

9.41.2 Computer connection capability shall be supplied to the administrative LAN, to allow information access and a means to communicate to all areas of the MSPV specified herein.

9.41.3 Operational LAN drops shall be supplied and installed in the following areas:

- a. Three (3) in the Command Centre; and
- b. One (1) in the Program Officer's/Incident Commander's cabin.

9.41.4 Administrative LAN drops shall be supplied and installed in the following areas:

- a. Four (4) in the Command Centre (for a total of 7 LAN drops: 3 operational, 4 administrative); and
- b. Three (3) on the Bridge; and
- c. One (1) in the MCR; and
- d. One (1) per single cabin; and
- e. Two (2) per double cabin; and
- f. One (1) in the mess.

9.41.5 A 2.4 GHz 9db Omni antenna shall be supplied and installed. The antenna shall be routed to the LAN equipment rack in the EER by LMR600FR cable. An additional 2 m of cable is to be left coiled in base of rack to allow for future connectivity anywhere in the rack.

9.41.6 19" 40 RU rack of welded steel construction as per 70-000-000-EU-JA-001, with a minimum of 77.5 cm useable depth shall be provided in the EER to house the LAN equipment. Fibre optic cabling shall be terminated in patch panel(s) at the top section of this rack. Remaining vacant space shall be reserved for LAN hardware.

9.41.7 The MSPV shall be fitted-for-but-not-with computer workstations in the following locations:

- a. The Bridge; and
- b. MCR; and
- c. Commanding Officer's Cabin; and
- d. Chief Engineer's Cabin; and
- e. The Mess.

9.42 TELEPHONE AND INTERCOM SYSTEMS

9.42.1 One (1) IICS shall be supplied and installed. It shall consist of:

- a. telephone system with telephones in all cabins, workspaces, mess and workshops; and
- b. talk-back system; and
- c. PA system; and
- d. shoreline connections; and
- e. ship's recreational equipment; and
- f. loudhailers.

9.42.2 The IICS shall be a Hose McCann (United Marine) Integrated Communication Platform product. System design shall dictate if more than one node (Equipment Cabinet) is required for all endpoint connectivity. One node shall be fitted in the EER and include the UPS, Power Supplies, EPIC, PBX, Main and Standby PA controllers. Cabinet fittings including shock mounts, thermostatically controlled cooling fan to provide positive air pressure, General Alarm override relay and, locking cabinet door shall be supplied and installed. Field wiring termination points shall be supplied directly in the rear of the cabinet, eliminating the need for additional cross-connect or junction panel hardware. Also incorporated within this cabinet shall be the control circuitry for the automatic fog signalling electric whistle system. All Fog Tone generators shall be monitored for failure.

9.42.3 All IICS speaker runs shall be monitored and controlled in such a way that if an open circuit, short circuit or a ground were to occur on either side of the speaker run, then a trouble indication appears on the Control Head, and the speaker run is automatically disconnected.

9.42.4 Functional integration in the Bridge and MCR shall be through the use a Control Head device incorporating access to all PA, Talkback/intercom, loudhailer, system alarm and key telephone system functions. The Control Head device is a single, flush-mount unit, providing distributed single-keystroke access to key IC functions at strategic locations throughout the Bridge and MCR consoles. By means of connections to the IICS, direct access to resources such as cellular and satellite phones shall be supplied through use of pre-programmed codes.

9.42.5 The PBX shall be able to handle voice and data transmissions simultaneously in all configuration of trunks, telephone and data devices. For this application, the exchange shall have a minimum of thirty (30) lines and twelve (12) analog trunks. This PBX shall be fully compatible with shore Central Office equipment.

9.42.6 The Talkback portion of the IICS shall use a telephone circuit for the call-back portion of all Talkback stations allowing Dual Telephone access to the PBX or Talkback function and giving private telephone communication along with the Talkback speaker.

9.42.7 The IICS shall be interfaced to the satellite transceivers and cell phones.

9.42.8 Four (4) analog trunk lines with lightning protection shall be supplied from the ship's IICS to shore.

9.43 AUTOMATIC TELEPHONES

9.43.1 Telephone stations shall be supplied and installed in all work areas and cabins. Each telephone shall be able to dial all other telephones onboard and access the shore trunks and communication systems if so programmed. Push-button dial telephone stations shall be equipped with special marine handset retainers, suitable for bulkhead or desk mount, and be either of regular inside, drip-proof or waterproof type depending on location. In machinery spaces auxiliary visual signalling strobe blue lens lights shall be supplied and installed to indicate an incoming call.

9.43.2 The Captain's Cabin and Bridge telephones shall be supplied with override and all-call paging facilities.

9.44 TALKBACK COMPONENT

9.44.1 The Bridge Talkback system shall be supplied and installed to provide point-to-point voice communication between the BCS and the following outlying stations:

- a. Captain's Cabin; and
- b. Lifeboat Station; and
- c. RHIB Stations; and
- d. Aft Line Handling Position; and
- e. Fwd Line Handling Position; and
- f. Fuelling Station(s); and
- g. Fuel Transfer Pumps;
- h. MMR; and
- i. If fitted, AMR; and
- j. MCR; and
- k. Loudhailers; and
- l. Steering Gear Compartment.

9.44.2 The MCR Talkback system shall be supplied and installed to provide point-to-point voice communications between the MCR and the following outlying stations:

- a. Bridge; and
- b. Fuelling Station(s); and

- c. Fuel Transfer Pumps; and
- d. Steering Gear Compartment; and
- e. MMR; and
- f. If fitted, AMR; and
- g. Sewage Treatment Room; and
- h. Emergency Diesel Generator Compartment.

9.44.3 Communications between the Control Head and the outlying stations shall be by the use of the Control Head handset and dedicated station selection push-buttons. Reply from the outlying stations shall be hands free via the Talk-back loudspeaker, environmental and noise conditions permitting and all fixed and portable telephone headset and handset stations.

9.44.4 All Talkback locations shall be equipped with individual call-in push-button to signal the group Control Heads. The talkback loudspeaker units shall also be connected to the PA system.

9.45 INTERCOM COMPONENT

9.45.1 An intercom system shall be supplied and installed to provide point-to-point voice communications between the Command Centre and the following stations:

- a. Bridge; and
- b. Captain's Cabin; and
- c. Program Officer/Incident Commander's Cabin; and
- d. Mess; and
- e. Aft working deck.

9.46 PUBLIC ADDRESS COMPONENT

9.46.1 A PA component shall be supplied and installed to provide routine or emergency broadcast PA facilities to select or all areas of the ship via strategically located loudspeaker units throughout the MSPV. The PA system master control shall be located in the Bridge in a dedicated panel. The Bridge shall have priority over the communication system. Activation of this function shall override the general alarm signal.

9.46.2 Initiation of a PA message shall be from the Control Head station by use of the handset and dedicated selection push-buttons or by specifically programmed telephone stations (all-call only). The PA system shall be consolidated into selectable loudspeaker groups as follows:

- a. Group 1 "work stations group"; and

- b. Group 2 "common areas group"; and
- c. Group 3 "cabin group"; and
- d. Group 4 "machinery spaces group"; and
- e. Group 5 "exterior deck group"; and
- f. All-call (Groups 1, 2, 3, 4 and 5).

9.46.3 PA loudspeaker units shall also have dual functions: operating as public address/loudhail and Talk-back loudspeakers. However, there shall not be any switching devices located in the loudhailers and loudspeaker units to accomplish the additional functions described.

9.46.4 Loudhailers shall be supplied and installed and interconnected as detailed in Section 9.31 of the TSOR.

9.47 SOUND POWERED TELEPHONES

9.47.1 A sound powered telephone system shall be supplied and installed as a backup for emergency communications between operational stations as follows:

- a. Bridge; and
- b. MMR; and
- c. If fitted, AMR; and
- d. Steering Gear Compartment; and
- e. MCR; and
- f. Aft working deck; and
- g. Fuelling station(s).

9.48 SHIP'S ENTERTAINMENT SYSTEMS EQUIPMENT

9.48.1 The ships' entertainment systems equipment shall be fed from the communal entertainment antenna/distribution system.

9.49 TELEVISION AND BROADCAST SYSTEMS

9.49.1 A communal entertainment antenna/distribution system, including all cabling and fittings, shall be supplied and installed. An input for an external cable television shore connection shall be supplied. The shore connection shall be located adjacent to the shore power and shore telephone connections.

- 9.49.2 The system shall distribute high definition TV and AM/FM radio broadcasts.
- 9.49.3 The system shall utilize low-loss coaxial distribution cable and separate outlets in each space, where installed.
- 9.49.4 The TV and AM/FM distribution system shall be designed in such a manner as to provide a nominal level of 0 dbmv +/- 2 db on CATV channel 13 at each cabin outlet. Independent automatic gain control shall be supplied for each channel of the system.
- 9.49.5 Each antenna outlet shall be connected directly to a trunk-line directional tap-off. Isolation between outlets shall be not less than 25 db on VHF and 18 db on UHF. Trunk line directional tap-offs shall be easily accessible and preferably installed in Store Rooms or Locker Rooms. Where tap-offs are mounted behind bulkhead or deckhead linings, access shall be supplied by a dedicated removable access panel, labelled with appropriate identification.
- 9.49.6 An antenna system shall be supplied and installed and be comprised of a single omni-directional wide band antenna. Antenna shall be equipped with a preamplifier and shall be connected using low-loss coaxial cable. An antenna control position shall be supplied and installed in the EER. Antenna amplifier shall be supplied and installed near this control station.
- 9.49.7 The signal distribution system shall distribute TV and AM/FM radio signals to bulkhead-mounted outlets in:
- a. the Bridge; and
 - b. all cabins; and
 - c. the Command Centre; and
 - d. the Mess.

9.50 ELECTRONIC EQUIPMENT ROOM

- 9.50.1 A dedicated EER shall be designed, built and installed in the MSPV, preferably on the main deck. This room shall contain the following equipment:
- a. telephone/Talkback equipment; and
 - b. television and AM/FM radio distribution system, antenna control position and associated amplifiers; and
 - c. LAN equipment rack including fibre-optic cable termination patch panel(s); and
 - d. fitted-for-but-not-with two (2) Computer servers; and
 - e. communications equipment (e.g. FM wideband radio-telephone) with remotes in the Bridge and Command Centre; and

- f. fibre optic gyro compass; and
- g. E-mail-at-sea equipment rack.

9.50.2 Space shall be allocated in the EER for the installation of one (1) Motorola Quantar VHF repeater and duplexer, and the installation of a second transceiver of similar size. Spare coaxial cables shall be supplied and run from this location to locations in accordance with the accepted antenna arrangement.

9.50.3 Depending on the location of the EER, it may also house the radar transceiver units, which could be bulkhead mounted. A sufficient number of approximately 48.3 cm equipment racks, with adequate space in front of them, shall be supplied and installed so that the equipment can be installed or removed. There shall be approximately 45 cm clear space behind the racks. The racks shall be supplied and installed with removable doors at both the front and the back. The preferred location is near the Bridge and Command Centre.

9.51 CENTRALIZED CONTROL, ALARM AND MONITORING SYSTEM (CCAMS)

9.51.1 The MSPV CCAMS, employing commercial-off-the-shelf (COTS) hardware and software, shall be supplied and installed.

9.51.2 The CCAMS shall have the main MCS located in the MCR. The MCS shall have remote and automatic machinery control to meet Class UMS requirements and other requirements as stated elsewhere in this document. The CCAMS shall provide an automatic data logging function. CCAMS shall log all alarms and shall have the capability to be configured to log user defined events. A log viewer shall be supplied to review the captured data complete with applicable units of measurement. A dedicated colour printer shall be supplied and installed at the MCS to print logs, active alarm lists and machinery control mimic pages.

9.51.3 The CCAMS shall have a BCS located on the Bridge. The BCS shall have two functions. First, the BCS shall have remote and automatic machinery control to meet Class UMS requirements and other requirements as stated elsewhere in this document. Second, the BCS shall be the human machine interface to provide operator control of propulsion and steering at the BCS over the complete range of vessel operation.

9.51.4 The CCAMS shall have permanent Bridge wing consoles. The wing consoles shall be capable of controlling steering and propulsion. The wing consoles shall be watertight to NEMA 4X, if exposed to environmental elements.

9.51.5 There shall be a CCAMS remote display unit in the Chief Engineer's cabin and in the 2nd engineer's cabin capable of displaying logs, active alarm lists and machinery control mimic pages. The remote display unit in both cabins shall also provide audible and visual alerts for all CCAMS alarms. These shall be able to be acknowledged without removing the alarm condition from the remote display units, the MCS and the BCS.

9.51.6 A ship alert system as per Marine Transportation Security Regulations shall be supplied and installed onboard.

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10 ACCOMMODATION OUTFITTING

10.1 PLUMBING FIXTURES AND ACCESSORIES

10.1.1 All trim pieces for fixtures and all accessories shall be chrome plated cast, forged brass or stainless steel and shall be of matching design for uniformity.

10.1.2 Grab rods shall be supplied and installed at all showers and toilets.

10.1.3 Isolation valves shall be supplied and installed as described at paragraph 7.12.8.

WASHBASINS

10.1.4 Washbasins, showers and service sinks shall be supplied and installed with hot and cold potable water.

10.1.5 Washbasins shall be stainless steel and shall be supplied and installed with self-closing and washerless faucets.

10.1.6 Washbasins, unless otherwise specified, shall be supplied and installed with the following accessories:

- a. toiletries cabinet; and
- b. soap dish; and
- c. soap dispenser; and
- d. towel hook/bar/ring.

SHOWERS

10.1.7 The showers shall be supplied and installed with:

- a. a low-flow shower head (max 9.0 l/min); and
- b. a non-scald mixing valve; and
- c. a push button or level-operated control valve; and
- d. the following shower accessories: soap dish, shower curtain and grab rail.

DEEP SERVICE SINKS

10.1.8 Each sink or set of double sinks shall be stainless steel and shall be supplied and installed with self-closing and washerless faucets and a soap dish.

10.1.9 A service sink shall be supplied and installed in cleaning gear lockers if such facilities are not readily available in adjacent sanitary spaces.

TOILETS

10.1.10 Vitreous china toilets (vacuum type) shall be supplied and installed.

10.1.11 A toilet paper holder and grab rail shall be supplied and installed in each toilet enclosure.

10.1.12 A toilet seat, open front type, shall be supplied and installed for each toilet.

10.2 LOCKS, KEYS, KEYBOARDS AND KEY CABINETS

10.2.1 Locks shall be supplied and installed for all doors, hatches, manholes and scuttles. Cabin doors shall be able to be opened from the inside without a key. Identical keys shall be used for all furniture in cabins, different keys shall be used for furniture assigned to each person and four (4) key sets plus one (1) blank shall be furnished. Locks for desks, key cabinets and bookcases in cabins shall be the same as locks for the furniture in the corresponding cabins.

10.2.2 A lockable Key Cabinet shall be supplied and permanently mounted on the Bridge and shall contain one copy of all keys, complete with labels, supplied with the MSPV.

10.2.3 All locks on the MSPV, including locks for access doors, storerooms and lockers, shall be supplied and installed. They are to be keyed alike and shall be capable of being opened by a master key as well as their specific key. The only exceptions to this are the keys and locks for the firearms lockers which shall each be unique.

10.2.4 A lockable Duplicate Key Cabinet shall be supplied and permanently mounted in the Captain's Cabin. It shall contain three (3) labelled copies plus one (1) blank of all keys supplied with the MSPV.

10.3 HABITABILITY

FURNISHINGS

10.3.1 Bulkhead linings and false deckheads shall be supplied and installed in all cabins, Command Centre, mess, accommodation passageways, and Bridge. Bulkhead linings and false deckheads shall be supplied and installed in the galley and sanitary spaces. The outer face of joiner bulkhead panels fitted in the galley shall be stainless steel satin finish. Where necessary for frequent access, inspection, or troubleshooting, deckheads and linings shall be supplied and installed with portable or hinged access panels with easily removable fastenings.

10.3.2 All furniture supplied shall be of commercial design and modular construction, suited for the marine environment shipboard use. All furniture shall be free of sharp edges and burrs. Large articles of furniture shall be mounted on sub-bases and secured at the top and sides. Furniture shall not be rigidly attached to non-structural or joiner bulkheads. Maximum use of durable, low

maintenance, lightweight materials and finishes for ease of cleaning shall be incorporated into all accommodation furnishings.

10.3.3 All berths, drawer units, lockers, sideboards and dining table supports shall be constructed from TCMS approved fire retardant materials with standard marine fit and finish. Accommodation upholstery shall have a woven fabric and shall be fire retardant, washable and fastened to the frame with non-corrosive attachments. Vinyl upholstery shall not be used.

BERTHS

10.3.4 Berths shall be single- or double-tier and shall be installed in the fore and aft plane with the head position forward. Each berth shall accommodate a mattress having dimensions of at least 1980 mm long, 800 mm wide and 150 mm thick. The underside of the bottom tier pan shall be a minimum of 300 mm above the deck. The vertical clearance above the top of each mattress shall not be less than 910 mm.

10.3.5 Each berth shall be supplied and installed with:

- a. one (1) reading light; and
- b. one (1) stowage space for an Emergency Escape Breathing Device (EEBD) (approx 130 mm x 260 mm x 270 mm); and
- c. one (1) a stowage space for reading material (approx 300 mm L x 75 mm D x 300 mm H); and
- d. one (1) 150 mm thick spring filled mattress with latex coated spring coils, boxed border, cotton tufting, corded handles and vents and zipped cotton duck covering.

10.3.6 Double-tier berths shall be fitted with separate opaque privacy curtains with tie-backs.

KIT LOCKERS

10.3.7 One (1) kit locker per occupant shall be supplied and installed within each cabin as a minimum. The kit lockers shall be, approximately 500 mm L x 530 mm D x 1830 mm H. The lockers shall provide the following types of stowage:

- a. minimum of three (3) drawers; and
- b. minimum of five (5) shelves; and
- c. one (1) cap stowage (for one RCMP or C&P Officer's Forage Cap); and
- d. one (1) boot and shoe stowage; and
- e. one (1) hanging bar for uniforms and civilian clothes; and
- f. one (1) outside towel rail; and

g. two (2) clothes hooks; and

h. Drawers and lockers shall be supplied and installed with cylinder locks keyed alike. Four (4) sets of keys per locker shall be supplied. Lockers shall be designed, built and installed so that they permit free air circulation within the locker and free unobstructed access within the compartments that they are situated in. Drawers and lockers shall not freely open due to the MSPV's motion.

DESKS, WRITING TABLES

10.3.8 Desks of a single pedestal type and appropriately surfaced to reduce husbandry shall be supplied and installed.

CHAIRS

10.3.9 Cabin chairs of a lightweight design with an upholstered seat on a light metal frame shall be supplied and installed.

TOILETRY CABINETS

10.3.10 Cabinets of metal construction and equipped with stainless steel shelves with edge rails and a mirror on doors shall be supplied and installed above each washbasin. Doors shall have secure catches. Cabinets shall be installed so that the centre of the mirror is approximately 1.6 m above the deck.

SINGLE CABINS

10.3.11 Single berths shall be supplied and installed in all single cabins. Each cabin shall be supplied and fitted with a desk with drawers and desk light, combination safe, desk chair, at least one (1) but up to two (2) kit lockers, a stainless steel washbasin complete with a compact mixer faucet and hot and cold shut-off valves, a toiletry cabinet, a single shelf bookshelf storage (1.5 m L and a minimum of 25 cm D), two (2) clothes hooks, waste bin, internal communications station, one (1) administrative LAN outlet, one (1) telephone outlet and, two (2) television and radio reception outlets fed from the communal entertainment antenna distribution system.

10.3.12 One (1) small-arms secure storage locker for a 9 mm individual pistol shall be supplied and installed in the Program Officer/Incident Commander's cabin. The designated cabin shall be determined by Canada during the outfitting design of the cabins.

10.3.13 One (1) small refrigerator (approximately 0.12 m³) shall be supplied and installed in both the Captain's and Chief Engineer's Cabins.

10.3.14 The Commanding Officer's, Chief Engineer's and Program Officer/Incident Commander's cabins shall be each be supplied and installed with one (1) 40 watt stereo with two (2) speakers, one (1) CD player, one (1) twenty (20) inch flat screen HD LCD television and one (1) Blu-ray/DVD player.

10.3.15 Allocated storage shall be supplied and installed for one (1) immersion suit and one (1) lifejacket.

DOUBLE CABINS

10.3.16 A double-tier berth, with a Pullman berth (or equivalent) as the top tier, shall be supplied and installed in each double cabin. Each double cabin shall also be supplied and fitted with a single pedestal desk with drawers, desk light, desk chair and at least two (2) but up to four (4) kit lockers. Each cabin shall be supplied and fitted with a stainless steel wash hand basin complete with a compact mixer faucet and hot and cold shut-off valves, a toiletry cabinet, a single bookshelf (1.5 m L and a minimum of 25 cm D), four (4) clothes hooks, waste bin, internal communications station, two (2) administrative LAN outlets, one (1) telephone outlet, and two (2) television and radio reception outlets fed from the communal entertainment antenna distribution system.

10.3.17 Two (2) separate, secure storage lockers each accommodating a 9 mm individual pistol, or equivalent, and one (1) long rifle shall be fitted in each double cabin.

10.3.18 Allocated storage shall be supplied and installed for two (2) immersion suits and two (2) lifejackets.

WASHROOMS

10.3.19 Four (4) washroom facilities shall be supplied and installed. One (1), located on the main deck in proximity to the Command Centre, shall be fitted with one (1) toilet and one (1) wash basin with all necessary fittings including hot and cold water, water isolating valves, self-closing and washerless faucets, toilet roll holder, grab rails, paper towel dispenser/disposal unit and coat hook. Three (3) washroom facilities shall be fitted with one (1) toilet enclosure with door, one (1) wash hand basin in a vanity type installation with toiletry cabinet and one (1) shower enclosure with curtain. The washroom shall be outfitted with all necessary fittings including hot and cold water, water isolating valves, self-closing and washerless faucets, toilet roll holder, towel rail, grab rails, paper towel dispenser/disposal unit, and coat hook. All facilities shall be supplied and fitted with a sanitary napkin depository and dispenser.

10.3.20 One (1) of the four (4) washroom facilities, complete with shower, shall be supplied and installed adjacent to the Captain's and Chief Engineer's Cabins for their shared use.

MESS

10.3.21 A large mess shall be supplied and built for the crew. The mess shall be cafeteria style with a service opening adjacent to the galley. The mess area shall be adaptable such that it will accommodate ten (10) persons for briefings and interviews.

10.3.22 The mess shall be fitted with moveable chairs and tables having a seating capacity for ten (10). The seating arrangement in the mess shall be configured so that each person has access to his or her place without disturbing another crewmember when everyone is seated. Individuals shall also be able to leave their seat without having to ask someone to move. For this seating arrangement, the tables shall be equipped with a mechanism that will allow them to be temporarily

secured to the deck. Furthermore, the furniture in the mess shall have the capability of being struck down and stowed in the mess in order to leave a large, clear deck-space, which may be used for temporary (overnight) accommodations.

10.3.23 The mess shall be fitted with a pass-through so that the crew can receive their meals and return their dirty dishes to the galley.

10.3.24 The mess shall have a counter with cupboards beneath supplied and installed close to the pass-through. The following items shall be supplied and installed:

a. a stainless steel counter that shall be outfitted with a bar style sink complete with a compact mixer faucet, hot and cold shut-off valves and with space for:

- i) one (1) industrial stainless steel four (4) slice toaster to accept regular and oversize items (bagels); and
- ii) one (1) electric coffee maker, maximum power of 1200 Watts, water tank size of not less than 2.0 l; and.
- iii) one (1) electric soup and food warmer heater with 120 V / 800 Watts, non-stick surface and not less than 12.0 l capacity; and
- iv) one (1) microwave oven in stainless steel with inverter turbo defrosts, 34.0 litre minimum capacity and 1200.0 Watts.

b. one (1) cabinet, counter-depth stainless steel refrigerator and freezer with a minimum combined capacity of approximately 563 litres and complete with French doors, glide-out freezer drawer, through the door ice and water dispenser, an easily accessible isolation valve on the refrigerator potable water supply; and

c. one (1) water dispenser column model, approximately 32 cm L x 30 cm D x 102 cm H. It shall be secured to the bulkhead and shall be compatible with approximately 18.5 l bottled water containers. A means of securing the water containers to the bulkhead shall be supplied and installed. Dispensed cold water temperature shall be between 4.0° and 10.0°C; and

d. food preparation area; and

e. one (1) garbage container in plastic complete with a hinged lid. It shall have a minimum capacity of 49.0 l; and

f. stainless steel cupboards to store dry food such as cereal and bread plus cupboards to store glasses, coffee mugs, plates and bowls as detailed at Appendix 4 of the TSOR; and

g. a stainless steel drawer for the stowage of cutlery, utensils and linen as detailed at Appendix 4 of the TSOR.

10.3.25 The mess shall also serve as the crew's recreation space. It shall be designed and built with an area for lounging and shall be supplied and installed with a comfortable upholstered sofa made of leather or other durable material. This area shall also be supplied and installed with an entertainment system cabinet outfitted with:

- a. a forty (40) watt AM/FM stereo; and
- b. a multiple disc Compact Disc (CD) player; and
- c. a forty (40) inch flat screen Liquid Crystal Display (LCD) High Definition (HD) television, with provision to provide suitable viewing for the whole mess area; and
- d. a Blu-ray/Digital Video Device (DVD) player; and
- e. eight (8) speakers, including two extension speakers to the galley.

10.3.26 The mess area shall contain:

- a. a computer workstation space; and
- b. an administrative LAN drop; and
- c. a cork notice board (1.5 m L x 1.0 m H); and
- d. a bookcase, two (2) linear metres of shelving at least 25 cm D; and
- e. a clock; and
- f. curtains made of opaque materials so as not to pass light, complete with tie backs; and
- g. dimmable lighting; and
- h. television and radio reception points fed from the communal entertainment antenna distribution system.

GALLEY

10.3.27 The galley shall be designed, built and equipped to allow for a single cook to prepare meals, generally composed of two choices of entrée, for a complement of fourteen (14) personnel when the MSPV is operating in conditions as described in Table 1 – Environmental Conditions. Ergonomics, efficiency and galley lay-out shall be optimized when planning the galley design. The galley should be free of overhead trunking and obstructions. Deck areas shall be designed to eliminate cross traffic and bottlenecks, yet retain specific areas designated for specific tasks. The galley shall provide storage spaces for a food locker and for items as detailed at Appendix 5 of the TSOR, meat and vegetable preparation spaces, a pastry and bread making section, cooking spaces, dishwashing spaces and garbage stowage space. The galley shall be supplied and outfitted with the following:

- a. one (1) flash-steam combination oven and steamer, including operational modes for steam, convection and a combination of steam and convection heat. Features shall include automatic steam venting and a self-adjusting, flush-mounted rotary door handle with a steam venting safety stop. Controls shall include a 2-speed fan and a cool-down function. The oven shall be constructed of 18 gauge stainless steel, include an attached spray hose with backflow preventer, and an automatic cleaning function. The oven cavity is to accommodate up to six (6) half-size sheet pans, include a removable door gasket for easy replacement, appropriate door hinging, removable quick-connect internal product temperature probe in the oven interior, programming capability and cold water inlet(s); and
- b. one (1) stainless steel range exhaust hood shall be fitted above the induction ranges. It shall be fitted with a grease trap, removable and cleanable filters and lights. The range hood shall be connected to the galley exhaust system; and
- c. one (1) vertical, upright, stainless steel, marine type refrigerator of 595 l minimum capacity. It shall be fitted with five (5) adjustable shelves, a door latch and interior lighting; and
- d. one (1) commercial, stainless steel exterior, combination convection and microwave oven of 34.0 litre capacity minimum. It shall provide up to and including 246.1°C (475°F) of convection cooking with 1400 Watts minimum of microwave heating and shall have an easy to clean interior; and
- e. one (1) industrial dishwasher with a heat booster, which shall wash at a temperature of not less than 66.0°C and rinse at a temperature of not less than 82.0°C. The dishwasher shall have two (2) extra racks for cutlery and glasses and top and side panels; and
- f. two (2) heavy-duty, stainless steel, commercial, dual hob, vitro ceramic countertop induction ranges with at least 2.5 kW per hob. The ranges shall accommodate two (2) pans each with a maximum diameter of 30.5 cm. The ranges shall be easy to clean; and
- g. one (1) stainless steel, industrial, counter electric griddle at least 38 cm x 61 cm x 35 cm. The deep grease drawer shall be concealed behind a front cover door. The griddle shall be easy to clean and have safety features to prevent grease spills; and
- h. one (1) stainless steel exterior industrial four (4) slice toaster to accept regular and oversize items (bagels); and
- i. one (1) bulkhead-mounted, heavy-duty manual can opener capable of opening a 35 cm diameter can; and
- j. one (1) garbage container in plastic with a minimum capacity of 80.0 l with a snap-fit or swinging lid; and
- k. one (1) preparation table with a stainless steel base and a wooden "butcher block" counter top, located near the cooking section; and

- l. one (1) stainless steel counter beneath the pass-through; and
- m. one (1) plate dispenser fitted to one side of the stainless steel counter beneath the pass-through; and
- n. the pass-through shall be large enough to allow the crew to be served from the galley and to allow crew members to return dirty dishes to the galley concurrently; and
- o. one (1) three (3) sink unit, with a single lever mixing valve faucet and spray nozzle attachment on a flexible hose; and
- p. one (1) separate sink for hand washing fitted close to the preparation table, with a fixed soap and paper towel dispenser; and
- q. one (1) food processor (KitchenAid TM 16 cup food processor KFPF850PM or equivalent); and
- r. one (1) scale - portion (Bakers) 1-10 lb (Electronic scale); and
- s. one (1) mixer (Hobart N50 Mixer or equivalent); and
- t. galley items storage as detailed at Appendix 5 of the TSOR.

10.3.28 The main cooking section shall be close to the point of service.

10.3.29 The sink counter shall be of all stainless steel construction with 150mm backsplash. A three (3) compartment sink unit shall be made of stainless steel with radius corners throughout. Each side sink shall be approximately 50 cm L x 50 cm D x 50 cm H with 60 cm L x 50 cm D drain boards. Two (2) sinks shall each be fitted with a spin waste strainer. The rinsing sink shall be fitted with one (1) industrial-grade garborator of at least 0.75 kW. The garborator shall be totally enclosed to protect against ingress of outside moisture, it shall have a built-in thermal overload protection and it shall be designed for reverse action grinding. The garborator shall be all stainless steel and shall discharge all galley wastes that may contain grease through grease traps to a retaining box prior to discharge into the grey water system. A standard single lever, mixing valve faucet and spray nozzle attachment on a flexible hose shall serve the sink unit.

10.3.30 Equipment abutting other pieces of equipment or furnishings such as table tops, countertops and bulkheads shall have seals installed to avoid grease or soil catching crevices. Panels of quilted stainless steel shall only cover bulkheads behind heat producing equipment. Other bulkheads shall be made of fire retardant material other than stainless steel. The space between the heat producing equipment and the bulkhead shall be sealed against the entry of vermin, cooking ingredients or other extraneous matter.

10.3.31 All sinks, countertops and cupboards shall be constructed of stainless steel. Stainless steel cupboards and tables shall be reinforced, if required, to prevent warping or buckling of surfaces. Unless otherwise specified, they shall be of welded construction. All welds shall be sound, non-

porous and free from imperfections. The deposited colour metal shall be corrosion resistant and matched to parent materials. All welds shall be ground and polished to a smooth finish.

10.3.32 Deck coverings shall be evenly laid and well sealed to prevent lifting through continuous use of water and they shall be made of durable and easy to clean material.

10.3.33 Tables, counters and cupboards shall be supplied and installed to the maximum practical extent. Normal depth of counters accessible from one side shall be approximately 50 cm. Cupboards shall be of stainless steel construction, bulkhead mounted with adjustable shelving, and shall have hinged doors with latches and locking arrangements. Cupboards above the dishwashing area counter shall have dividers sized for dishes. Stowage for pots and pans shall be deep cupboards and drawers with spaces sized for utensils, located as near as possible to the oven and under the stainless steel counter beneath the pass through.

10.3.34 To accommodate the operational and stowage realities of the shipboard environment, the following are required:

- a. counter tops and sink units shall be supplied and installed with inverted "V" edges; and
- b. splash backs shall be supplied and installed for sinks and counters when sinks are installed against a bulkhead; and
- c. all shelving shall be supplied and installed with raised edges; and
- d. the front lip of refrigeration racks shall be raised; and
- e. large overhead cupboards shall be supplied and installed with retaining bars; and
- f. shelves shall be supplied and installed with lips for packaged and canned supplies; and
- g. racks shall be supplied and installed for pot lids; and
- h. drawers shall be supplied and installed with stainless steel bin inserts for sugar, flour, bread, etc.; and
- i. cutlery and tool drawers shall be supplied and installed with internal sectioning and shall be fitted with latches; and
- j. shelves and drawers shall be supplied and installed to be removable for easy cleaning. Drawers shall be supplied and installed with stops and latches; and
- k. drainage shall be supplied and installed under all plumbed equipment; and
- l. electrical outlets shall be installed and installed with waterproof covers. Wiring shall be sealed and encased in waterproof jackets; and
- m. light fixtures shall be supplied and installed complete with waterproof seals and safety glass; and

- n. grease trays shall be supplied and installed on main cooking equipment; and
- o. all doors shall be supplied and installed with strong hooks to secure them when they are open; and
- p. cupboards and drawers shall be supplied and installed with storage for all the items as detailed at Appendix 5 of the TSOR.

10.3.35 The galley shall be fitted with a small ready use storage space for brooms, mops, buckets and cleaning materials.

COMMAND CENTRE

10.3.36 The Command Centre shall consist of stationary material storage spaces, Program/Incident presentation space, three Program/Incident staff working, writing and operational & administrative LAN spaces, spaces for communications and other electronics equipment and, a briefing area for seven personnel. Its furnishing shall consist of desks and shelving. The Command Control Centre shall be located aft of the Bridge and shall be supplied and installed with the following:

- a. a working surface with a minimum size of 1270 mm L x 890 mm D and 910 mm above the deck; and
- b. seating for four (4); and
- c. one (1) whiteboard cabinet of minimum size 1200 mm W x 900 mm H, mounted 910 mm above the deck; and
- d. inside cabinet features with hinged doors and cork bulletin board on the inside of each hinged door; and
- e. a space for Program/Incident Commander's workstation with a desktop computer integrated with a supplied and installed digital projector; and
- f. two (2), thirty-two (32) inch flat screen HD LCD televisions, two (2) Video Cassette Recorders (VCRs), and one (1) Blu-Ray/DVD players. Remote operation is required for all listed electronic devices; and
- g. operational and administrative LANs; and
- h. one (1) water dispenser column model, approximately 32 cm L x 30 cm D x 102 cm H. It shall be secured to the bulkhead and shall be compatible with approximately 18.5 litre bottled water containers. A means of securing the water containers to the bulkhead shall be supplied and installed. Dispensed cold water temperature shall be between 4.0°C and 10.0°C; and
- i. one (1), four (4) drawer, lockable, heavy duty filing cabinet to hold up to and including SECRET documents as per Government Security Policy; and

- j. door access to the Bridge with lock; and
- k. a second door, with a thumb-turn lock and a non-opening window, giving access to the outside deck area. Fixed windows shall be supplied and installed to view port, starboard and astern, and shall be arranged so there is sufficient bulkhead space for the whiteboard, workstations and storage. Black out curtains on all Command Centre windows shall be supplied and installed.

BRIDGE

10.3.37 The size and layout of the Bridge shall accommodate both normal operations and Incident/Program Commander operations.

10.3.38 The Bridge shall be supplied and outfitted with navigational aids, communications and electronic equipment as per Section 9 and the following:

- a. one (1) chart table with the top at least 1270 mm L x 890 mm D, 910 mm above the deck and with drawers and lockers underneath the table top; and
- b. one (1) chart table lamp secured to bulkhead; and
- c. three (3) administrative LAN connections not co-located; and
- d. one (1) Flag locker; and
- e. one (1) bookshelf, at least two (2) m L and 25 cm D; and
- f. one (1) BCS to accommodate steering, navigation, communication, alarm, machinery controls and indicators, and auxiliary machinery monitors and controls; and
- g. chairs for all consoles. They shall be Admiral Helm, or equivalent, adjustable type seats and a minimum of two (2) in total shall be supplied and installed. A fixed Captain's chair of the same type shall be supplied and installed for the master, positioned on the starboard side, as far forward as possible. It should be of a height to permit the master to see the upper edge of the bow while seated; and
- h. one (1) each clock, barometer and barograph; and
- i. one (1) inclinometer, the Chaney Instrument Co. Model MK IV or equivalent, shall be supplied and installed; and
- j. one (1) magnetic compass shall be supplied and installed on the centreline; and
- k. one (1) medical cabinet, including first aid kit shall be supplied and installed; and
- l. stowage spaces for sextant, shapes, binocular boxes and lead lines shall be supplied and installed adjacent to the Helmsman's position; and

m. stowage space for binoculars shall be supplied and installed adjacent to the Captain's chair; and

n. allocated storage space shall be supplied and installed for two (2) immersion suits and two (2) lifejackets; and

o. storm rails under all windows and at all consoles and control positions.

10.3.39 All navigational and electronic components shall be positioned so that they are readily visible from the BCS and do not obstruct general visibility from any other control position within the space. All navigation equipment and communication equipment that calls for continued use, such as gyro read-out, auto pilot, electronic charts, radar(s), echo sounder, etc., shall be favourably orientated for Bridge operations, and shall have dimmers.

10.3.40 Consoles shall be ergonomically designed and located for efficient and convenient visibility of, and access to, all equipment. Components on the display area of the console shall be logically grouped according to function and operational priorities.

10.3.41 The Bridge Wings shall extend to the ship's sides.

RAT PROOFING

10.3.42 Subject to the configuration of the bulwarks at the fairleads, rat proofing shall be accomplished by the nature of the construction rather than the use of additional fittings, plates and screens. In addition, enclosed inaccessible spaces shall be protected by permanent means. Inaccessible void spaces shall be rat proofed.

10.3.43 Circular openings shall not exceed 25 mm diameter and the side dimensions of square openings shall not exceed 25 mm. Openings in louvers and parallel-sided openings such as around doors and expanded metal bulkheads shall not exceed 10 mm in width. Deck gratings and portable flats in storerooms shall be constructed and fitted so that no openings are wider than 10 mm. Ventilation openings requiring rat proofing shall be fitted with rat proof screens.

10.4 STOREROOMS AND STOWAGE SPACES

GENERAL STORAGE SPACES OUTFIT

10.4.1 Storerooms and stowage spaces including lockers, cupboards and drawers shall be supplied and installed to provide stowage facilities for the ship's provisions, equipment or gear associated with the MSPV's functions. Lockers may be arranged in a common stowage space to afford convenience and economy of space. All storerooms and stowage spaces shall be fitted with locking arrangements. Shelving and stowage bins shall be supplied and installed in the stowage spaces. Stowage spaces shall be supplied and allocated for:

a. two (2) type B First Aid Kits, as per the Canadian Coast Guard Fleet Logistics Standard 400.00.07, metal construction and bulkhead mounted. The first kit shall be installed next

to the medical equipment & SAR locker and the other shall be installed as designated by the TA; and

b. a medical equipment & SAR locker at least 1.5 m L, 1.5 m D and 2.0 m H with shelves and a door shall be fitted; and

c. a Hazardous Medical Waste Receptacle, approximately 80 l, shall be stored in the medical equipment & SAR locker until proper disposal is later possible; and

d. a main Refrigerator (cool room) for provisions for 14 people for 14 days with adjustable shelves and interior lighting, easy to clean and situated on the same deck as the galley; and

e. a main Freezer (cold room) for provisions for 14 people for 14 days with adjustable shelves and interior lighting and easy to clean and situated on the same deck as the galley; and

f. a Dry Food Store sized to hold dry provisions for 14 people for 14 days situated on the same deck as the galley; and

g. a Central Storeroom sized to hold all items as detailed at Appendix 6 of the TSOR; and

h. a Linen Locker sized to hold all items as detailed at Appendix 7 of the TSOR; and

i. the laundry area shall be supplied and installed with the following:

i) two (2) sets of commercial quality, stackable front-loaded washer and dryers in stainless steel of at least 0.25 m³ each, with extra-large doors and drum openings and with no requirement to use money or debit card to operate. The dryer units shall be vented through a dedicated exhaust system to the MSPV exterior with suitable standpipe and weather tight closure; and

ii) one (1) single, stainless steel compartment sink mounted to the wall, with approximate dimensions 60 cm L x 36 D cm x 60 H cm. It shall drain to the grey water system; and

iii) one (1) heavy duty stainless steel faucet with at least two (2) m stainless steel hose and spray head, to reach and fill buckets on deck; and

iv) one (1) soap and one (1) paper towel dispenser; and

v) stainless steel cupboards and shelves for the stowage of soap, detergent, etc.; and

vi) one (1) folding ironing board fixed to the bulkhead for ironing and folding clothes; and

vii) one (1) closet rod 60 cm L for hanging clothes.

- j. Cleaning Gear and Steward's Locker(s) sized to hold all items as detailed at Appendix 8 of the TSOR; and
- k. one (1) separate lockable Scientific Evidence Freezer (0.8 m³) with tamper-proof hinges, located inside away from the elements; and
- l. an Engineer's Spare Part Store approximately 10.0m³ for the storage of maintenance gear, rag bins, small parts, fasteners and special instruments and tools; and
- m. a minimum of three (3), approximately equally sized, lockers for Deck Stores (a minimum of 7.0 m³ total) with stowage racks for the stowage of mooring and towing hawsers and other ropes, spare mooring gear, reels, fenders, scramble net, Jacob's Ladders, and two (2) long handled boat hooks and the SAR Equipment as required by Annex E of CCG Fleet Order 207.00 and identified for storage in this space by the CCG Fleet Order; and
- n. a small after deck store approximately 1.0 m³ for towing equipment as required in CCG Fleet Order 207.00 Annex E; and
- o. a Paint Locker on the main deck with a separate ventilation system with the appropriate shelving and cabinets for ten (10) x 4.4 litre cans of paint and supplies; and
- p. a Wet Gear Storeroom approximately 6.0 m³ shall be located for direct access from the weather deck. It shall be vented to the outside, in accordance with paragraph 7.11.18, and heated, in accordance with paragraph 7.11.7, and shall be designed and built for direct access from the exposed main deck. It shall drain to the main deck. Racks shall be installed to facilitate the hanging-to-dry of fourteen (14) sets of wet weather gear in a manner that will allow easy potable water wash-down in accordance with paragraph 7.12.6n and drain off. The wet gear will consist of the following:
 - i) cold weather suit (floater) and work vests; and
 - ii) rain gear and work vests; and
 - iii) boots.
- q. a Fire Fighting Equipment approximately 2.5 m³ locker that opens to the weather deck for the firefighting equipment required by the regulations plus the firefighting equipment required by Annex E of CCG Fleet Order 207.00; and
- r. a Fuel Oil Spill Control Locker approximately 1.5m³ for oil-absorbent materials shall be located for direct access from the weather deck; and
- s. a Hazardous Material (HAZMAT) locker approximately 1 m³ accessible from the weather deck; and
- t. a small locker approximately 1m x 0.7m x 0.7m on the Bridge for the miscellaneous equipment identified for storage in this space and required by Annex E of CCG Fleet

Order 207.00 and pyrotechnics and other Bridge equipment required by Transport Canada;
and

u. Solid Waste Storage in the Garbage Handling Room, capable of storing four (4) 240 litre wheeled cart containers, and ventilated with weather deck access.

10.4.2 The Steering Gear Compartment may also be used as stowage spaces. All loose material stowed in the Steering Gear Compartment shall be contained in bins or lockers and properly secured to prevent it fouling the steering equipment. Passage between the stowage bins, lockers and steering equipment shall be no less than 610 mm wide and provide adequate maintenance envelope for the equipment installed in the compartment.

FENDERS

10.4.3 Six (6) portable fenders with suitable storage shall be supplied and installed onboard. The fenders supplied shall be approximately 66 cm in diameter and 100 cm H and therefore hold the MSPV approximately 50 cm off of the wharf in up to and including Sea State 2 as detailed at Appendix 3 of the TSOR.

WORKSHOP AND WORK AREA

10.4.4 A deck workshop and work area shall be supplied and installed and furnished with a workbench with the top work area approximately 1200 mm L x 760 mm D, approximately 940 mm above the deck.

10.4.5 One (1) washbasin shall be located close to the workbench.

GARBAGE AND TRASH STOWAGE

10.4.6 The MSPV shall have a well ventilated Garbage Handling Room as defined in TSOR paragraph 7.11.18, with weather deck access, for containers and bins to collect sorted garbage, recyclable material and regular waste, in accordance with CSA Garbage Pollution Prevention Regulations. All garbage stowage areas shall meet the requirements of the Canadian Labour Code Marine Occupational Safety and Health Regulations.

10.4.7 The Garbage Handling Room and trash compactor shall not be located adjacent to or within any messing area. Ventilation shall be fitted to the Garbage Handling Room to prevent accelerated decomposition of stored solid waste and exhaust ventilation shall be located to prevent short-circuiting into the MSPV's air intakes.

10.4.8 Space for four (4) waste containers, each having an internal volume of approximately 227 litres, shall be provided as follows:

- a. food waste;
- b. paper, books, fine cardboard, newspapers, magazine, corrugated cardboard;

- c. metal cans and glass; and
- d. plastic.

10.4.9 Provisions shall be made on the MSPV to store sorted garbage for the maximum continuous duration of fourteen (14) days for fourteen (14) personnel based on the solid waste generation rate shown in Table 4 below.

Solid Waste Category	Generation Rate by Weight (kg/person-day)	Generation Rate Volume (litres/person-day)
Food	0.55	0.85
Paper and Cardboard	0.50	5.38
Metal and Glass	0.25	1.42
Plastic	0.10	4.25
Textiles	0.06	0.28
Daily Totals	1.46	12.48

TABLE 4 - ESTIMATED WASTE PRODUCTION

MAIN MACHINERY ROOM

10.4.10 A workbench shall be supplied and installed in the MMR with tool cabinet and tool box, with storage supplied and installed for special tools.

10.4.11 The MCR shall be located adjacent to the MMR and shall accommodate the CCAMS MCS. A chair and a steel desk with a durable marine grade laminate top shall be supplied and fitted. The desk dimensions shall be no less than 1.5 m L, 0.6m D, and 0.7 m H. The desk shall be supplied and installed with three (3) full depth drawers located at one end, one drawer shall be able to hang legal size folders. The desk shall be supplied and installed with an under mount, adjustable, retractable computer keyboard tray. The desk shall be well lit, with two (2) spare 115 V power outlets over and above the power supplies for necessary equipment.

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A.1 RIGID HULL INFLATABLE BOAT (RHIB) MARINE SECURITY VARIANT

The following are the required additional features to the base model of the Zodiac Hurricane H753 SAR Version.

ITEM	DESCRIPTION
Environmental Conditions	<ul style="list-style-type: none"> • Shall be capable of day and night operations in the following conditions: <ul style="list-style-type: none"> ○ Ambient air temperature range: -20.0°C to 35.0°C ○ Ambient water temperature range: -1.8°C to 30.0°C ○ Sea State 6 as detailed at Appendix 3 of the TSOR ○ Freezing spray or freezing rain with accumulations of up to 6.0mm while maintaining stability to allow for safe transit in Sea State 4 as detailed at Appendix 3 of the TSOR
Performance	<ul style="list-style-type: none"> • When fully loaded, range shall be at least 100.0 nm at 25.0 kts with 10% fuel reserve remaining • Shall be capable of maintaining maximum speed for up to and including 2 hours
Hull	<ul style="list-style-type: none"> • Shall be grey in colour • Deck covering shall be SKYDEX • The Kevlar© fibreglass beaching shoe that comes as standard equipment shall be grey in colour
Collar	<ul style="list-style-type: none"> • Shall be grey in colour • Shall be the foam-filled Durarib upgrade option • Shall have full-length anti-abrasion rubber strips fitted to both sides • The bottom of the collar and all wetted surfaces of the tube shall be fitted with a protective layer of material (EPDM or equivalent)
Seating	<ul style="list-style-type: none"> • Seating shall be in a 2 X 2 layout, 2 forward of the lifting arch, 2 aft • On the starboard side, a jockey style shock-absorbing type helm seat with control console shall be fitted side-by-side with another jockey style shock-absorbing seat with a combined Communications/Navigation console • The forward set of seats and consoles shall be a sufficient distance forward of the lifting arch and quick-release apparatus such that operators do not impact that arch while seated and underway in any sea conditions • The aft set of non-folding, jockey style shock-absorbing type seats with enclosed, lockable storage shall be fitted side by side immediately behind the forward set of seats and shall be similarly distanced from the lifting arch and quick-release apparatus such that the riders are not in danger of impacting those items in any sea conditions • Each seat shall have foldable foot rests • Hand bar(s) shall be fitted for each rider • Each seat shall have waterproof ballistic nylon seat covering or material of equivalent durability and waterproofing
Consoles	<ul style="list-style-type: none"> • Each console face shall be at an angle that maximizes console control operability, comfort and visibility when rider is in both a standing or sitting position

	<ul style="list-style-type: none"> • Communication and navigational equipment shall be flush mounted into the consoles whenever possible, shall be weatherproof and, shall be supplied with protective coverings that are easily removable and lockable • Shall be manufactured from marine grade aluminum or fibreglass • One (1) additional accessory plug with screw on watertight cap shall be installed in the Helm console
Engines, Propellers & Steering Rams	<ul style="list-style-type: none"> • Each RHIB shall be fitted with twin 200 HP 4-stroke gasoline outboard engines of a type currently supported within Canada • Each outboard engine shall meet US EPA regulations for the control of emissions for marine spark ignition engines • There shall be an engine shut down, kill switch, mounted on the helm console • The propellers shall be stainless steel and of a pitch and diameter sufficient to achieve a speed of at least 45 kts in calm salt water, zero wind, when fully fuelled and, when carrying maximum payload of 500.0 kg including four (4) personnel and equipment • If not already supplied as standard equipment, there shall be individual propulsion leg trim controls and a SYNCRO trim switch to integrate the two (2) drive leg trim controls on one (1) switch • If not already supplied as standard equipment, the following instrumentation shall be supplied and installed on the driver’s console: <ul style="list-style-type: none"> ○ Tachometer for each engine ○ Water pressure gauge for each engine ○ Hour meter for each engine ○ Ignition harness (mounted so that the ignition system cannot collect water) ○ Trim gauge ○ Fuel tank gauge(s) • RHIB draft with engines lowered shall be a maximum of one (1) metre • RHIB draft with engines raised shall be a maximum of 0.6 metres • Steering system rams shall have replaceable seals on the rams
Fasteners	<ul style="list-style-type: none"> • All fasteners shall be metric
Launch & Recovery Arrangements	<ul style="list-style-type: none"> • When fully fuelled (504 litres) and carrying maximum payload of 500.0 kg including four (4) personnel and equipment, the RHIB itself and all its launch/recovery arrangements and components shall be structurally capable of safely launching and recovering RHIBs in up to and including Sea State 5 at a vessel speed of up to five (5.0) kts • Shall be fully compatible with the MSPV’s RHIB launch & recovery system • Shall be fully compatible with the MSPV’s RHIB stowage arrangement
Antennas	<ul style="list-style-type: none"> • Three (3) shall be supplied and fitted to the righting arch <ul style="list-style-type: none"> ○ VHF for marine radio to comply with TCMS ○ UHF for RCMP radio ○ UHF for local law enforcement agency radio • Contractor shall supply and install all cabling and connectors from righting arch to communications console
Communications	<ul style="list-style-type: none"> • Contractor shall supply and install one (1) RayMarine model 215 DSC Marine

	<p>VHF radio, or equivalent</p> <ul style="list-style-type: none"> • Contractor shall supply and install one (1) RayMarine model 430 Loud Hailer, or equivalent • Contractor shall supply and install one (1) DSM300 Digital Sound Module, or equivalent that interfaces with a Garmin integrated navigation package • Contractor will be later advised with respect to dimensional and power requirements for Contractor installation in the communications console of two (2) Government UHF radios
Navigation	<ul style="list-style-type: none"> • Contractor shall supply and install a four (4) kW Garmin radar and enclosed dome mounted on or above the righting arch • Contractor shall supply and install the Garmin radar display in the Navigation console and it shall be fully integrated to the radar, chart plotter and sonar through a Garmin integrated navigation package • Contractor shall supply and install a GPS antenna and receiver that is interfaced with the Garmin navigation package
Operations	<ul style="list-style-type: none"> • Contractor shall supply and install one (1) AIS 250 automatic identifier receiver • Contractor shall supply and install on the righting arch one (1) additional blue law enforcement high intensity strobe light • Contractor shall ensure that the supplied searchlight fitted to the righting arm is at least 1,000,000 candela and that the searchlight is remotely controllable • The remote control(s) for the searchlight shall be positioned such that the searchlight is operable by both the driver and the navigator from their seated positions • The two (2) Contractor-supplied handheld searchlights shall be 12V and at least 1,000,000 candela each • Additional deck floodlights shall be supplied and installed such that there are two (2) each for forward, aft, port & starboard for eight (8) in total
Miscellaneous	<ul style="list-style-type: none"> • The fuel filling inlets shall be fitted at the bow locker location onboard and shall be lockable • Fuel shutoff valves shall be installed at fuel tank outlets and must be readily accessible by vessel operators • The Contractor shall ensure the electromagnetic compatibility of all fitted navigation, communication, operations equipment and associated components • Retro-reflective tape shall not be affixed to any part of the RHIB • All electrical wiring shall be protected and all connections shall be waterproof • The Contractor-supplied electric bilge pumps shall be capable of pumping at least 4500 litres per hour and shall be installed one (1) per hull compartment • The electric bilge pump control switch shall be fitted to the driver’s console with settings for ‘on’, ‘off’ and ‘automatic operation’. There shall be an automatic float switch control fitted such that the electric bilge pump operates whenever the pump control switch is set to auto and there is water in the bilge • There shall be means fitted such that it is possible to drain both the forward and after hull compartments when the RHIB is out of the water • The RHIB shall be supplied and fitted with one (1) 2.5 m retractable type boat hook and two (2) paddles with securing holders

	<ul style="list-style-type: none">• In addition to the supplied fire extinguisher, two (2) Class 1 BC, marine type fire extinguishers and two (2) associated stowage holders shall be supplied and installed
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A.2 MISSION PERCENTAGES, PROFILES AND VESSEL UTILISATION

Primary Mission 75%: Fisheries Conservation and Protection Duties

Profile 1 – Day operation (a single 24 hour operation and return to port)	Duration hrs	Speed kts
Transit from Port to operating area	6	20.0
Loiter in operating area	8	2.0
Inter-area transit (economical speed)	4	14.0
Transit to Port from operating area	6	20.0

Profile 2 – Week operation (7 days away from port)	Duration hrs	Speed kts
Transit from Port to operating area	6	20.0
Inter-area transit (economical speed)	34	14.0
Loiter in operating area	24	2.0
Anchor in operating area	72	0
Berthed in port (away from home port)	24	0
Transit to Port from operating area	8	20.0

Profile 3 – 14 day operation	Duration hrs	Speed kts
Transit from Port to operating area	6	20.0
Inter-area transit (economical speed)	72	14.0
Loiter in operating area	94	2.0
Anchor in operating area	84	0
Berthed in port (away from home port)	72	0
Transit to Port from operating area	8	20.0

Secondary Mission 25%: Search and Rescue

Profile 4 – 4 day operation from home port	Duration hrs	Speed kts
Transit from Port to Rescue area	24	25.0
Rescue area search	62	4.0
Transit to nearest Port from rescue area	10	14.0

Vessel Utilisation

At Sea:

Profile	Missions	Total days/ year
1	25	25
2	12	84
3	10	140
4	10	40
Other (same as profile 1)	20	20
Totals	77	309

Out of service:

Maintenance/refit: 35 days per year

Out of Service means that the vessel is not available for sea service and the vessel can be docked. Major equipment can be overhauled without expecting recall to service within the advised notice for service.

In Harbour:

Holidays, crew change, training, etc.: 21 days per year

It is considered that when the vessel is in harbour, it is available for sea service on not more than 60 minutes notice for departure. This means that the vessel is fully fuelled and stocked with provisions and mechanically available.

A.3 SEA STATE TABLE

From "Sea Loads on Ships and Offshore Structures"
O.M. Faltinsen – Professor, Department of Marine Technology
Norwegian Institute of Technology

Table 2.3. Annual sea state occurrences in the North Atlantic and North Pacific (Lee et al., 1985)

Sea state no.	Significant wave height (m)		Sustained wind speed (knots) ^a		North Atlantic			North Pacific		
	Range	Mean	Range	Mean	Percentage probability of sea state	Modal wave period (s)		Percentage probability of sea state	Modal wave period (s)	
						Range ^b	Most probable ^c		Range ^b	Most probable ^c
0-1	0-0.1	0.05	0-6	3	0.70	—	—	1.30	—	—
2	0.1-0.5	0.3	7-10	8.5	6.80	3.3-12.8	7.5	6.40	5.1-14.9	6.3
3	0.5-1.25	0.88	11-16	13.5	23.70	5.0-14.8	7.5	15.50	5.3-16.1	7.5
4	1.25-2.5	1.88	17-21	19	27.80	6.1-15.2	8.8	31.60	6.1-17.2	8.8
5	2.5-4	3.25	22-27	24.5	20.64	8.3-15.5	9.7	20.94	7.7-17.8	9.7
6	4-6	5	28-47	37.5	13.15	9.8-16.2	12.4	15.03	10.0-18.7	12.4
7	6-9	7.5	48-55	51.5	6.05	11.8-18.5	15.0	7.00	11.7-19.8	15.0
8	9-14	11.5	56-63	59.5	1.11	14.2-18.6	16.4	1.56	14.5-21.5	16.4
>8	>14	>14	>63	>63	0.05	18.0-23.7	20.0	0.07	16.4-22.5	20.0

^a Ambient wind sustained at 19.5 m above surface to generate fully-developed seas. To convert to another altitude, H_2 , apply $V_2 = V_1(H_2/19.5)^{1/2}$.

^b Minimum is 5 percentile and maximum is 95 percentile for periods given wave height range.

^c Based on periods associated with central frequencies included in Hindcast Climatology.

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A.4 MESS ITEMS

DRAWERS shall be supplied and installed in the Mess pantry for all listed items of cutlery, utensils and linen.		CUPBOARDS shall be supplied and installed in the Mess pantry for ready-use dry food such as cereal, bread, peanut butter/jam, snacks and all listed items of crockery & glassware.	
Item	Quantity	Item	Quantity
Salad forks	36	Soup/stew bowls	18
Table forks	36	Cereal bowls	18
Steak knives	24	Salad bowls	18
Table knives	36	Breadbaskets 26.4 cm x 21 cm x 8.5 cm	4
Dessert spoons	36	Egg cups	28
Table spoons	36	Coffee cups	28
Dish towels 41 cm x 71 cm	12	Sundae dishes	18
Dish cloths 30 cm x 29 cm	12	Dessert dishes	8
Utility drawer insert	1	Sugar dispensers	3
		Glass goblet 10 oz	24
		Glass goblet 12 oz	24
		Dessert plates	24
		Dinner plates	36
		Salt shakers	4
		Pepper shakers	4
		Stainless steel salt shakers	2
		Stainless steel pepper shakers	2
		Plastic butter servers	4

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A.5 GALLEY ITEMS

Cupboards and drawers shall be supplied and installed in the Galley to provide stowage for all listed items of equipment and utensils.

Item	Quantity	Item	Quantity
Decorative icing bag		sauce 10 qt with SS	2
Canvas 12” bag	1	sauce 1qt with SS lid	2
Canvas 18” bag	1	sauté 12 “	1
Bag Icing – Tips (set) Sizes 1-8	1 kit	Potato Paring knife/Peeler	2
Melon ball cutter	1	Can piercer / bottle opener	2
Cutting board (Plastic boards) - 1 Large : 18’’x12’’x1’’ and 1 Small : 14’’x11’’x1’’	2	Rolling pin 15”	2
Bowl-Stainless Steel (SS)		Pitcher	
Mixing SS 1½ qt.	2	SS 2 qt open lip	6
Mixing SS 3 qt.	2	Plate	
Mixing SS 4 qt.	2	Pie SS1 10”	6
Mixing SS 8 qt.	2	Pie pizza 14”	6
Mixing SS 13 qt.	2	Pot	
Brush - Pastry	2	Cooking 9 qt SS	1
Brush-Nail and Hand	2	Cooking 12 qt SS with cover	1
Colander		Press – Garlic SS	1
SS 4w Base 13 quarts	1	Ladle	
SS Small	1	SS 1 oz.	1
Corer - Apple	1	SS 2 oz.	2
Corkscrew	1	SS 4 oz.	1
Cup		SS 6 oz	1
Measuring Alum. 8 oz.	1	Rack – Cake – Mesh 16 ¼ x 10 ¼	2
Measuring SS 16 oz.	1	Scale - Portion (Bakers) 1-10 lb (Electronic scale)	1
Measuring 4L	1	Scissors – 12”	2
Cutter	1	Scoop	
Cookie (Set)	1	Ice Cream 2 ¼ »	1
Doughnut	1	(Pan) Grocers Alum. 4”	1
Dredge		Grocers SS 6”	1
Flour	1	Scraper	
Food processor (KitchenAid™ 16 cup food processor KPFP850PM or equivalent)	1	Grill top	1
Mixer for soup (commercial model)	1	Bakers-SS	3
Shaker (commercial model)	1	Bowl-plastic	2
Funnel (medium, 13 oz)	1	Sieve-Flour	1
Grater / Shredder SS (4 sided)	1	Skewer (poultry) - 12/set	2
Juicer – Lemon	1	Skimmer-SS 6 ½”	1

Appendix 5 to
Annex "B" to F7045-060001//002/NQ

Knife		Slicer-Egg	1
Boning 6"	1	Spatula	
Bread 8"	2	Large Rubber	1
Chef-French 12"	1	Small Rubber	2
Chinese 8"	1	Bakers – SS 10 " x 1-5/8"	2
Cleaver 7"	1	Food Turner – SS 3" x 8"	1
Ham Slicing 12"	1	Off Set 3" x 8"	1
Paring 4"	2	Spoon	
Pie	2	Wooden 12 "	2
Pizza Wheel	1	Wooden 15"	2
Spreader 3 1/2 "	2	Wooden 18 "	2
Mixer (Hobart N50 Mixer or equivalent)	1	Serving Slotted SS 13"	2
Oven Mitts (commercial)	4 pairs	Serving Perforated SS 13"	2
Opener		Serving Solid 13"	2
Can (heavy blade)	2	Butchers 14"	1
Pan		Stone-Oil	1
Angel Food 9"	2	Strainer	
Bread: (2lb. loaf)- (4 pans per unit)	1	China-Cap-Large	1
Bun steel clad aluminum 18" x 26" x 1"	1	Thin Sieve	1
Bun steel clad aluminum 12" x 18" x 1"	2	Wire-Heavy Duty 10 1/2"	1
Pan		Thermometer-Meat (Dial Type)	1
Cake rectangular 15" x 10" x 2"	2	Timer-Minute "Lux"	2
Cake round 10" x 2"	2	Tongs-Flat Spring	
Frying non stick steel clad aluminum omelet 7"	1	Steel 9"	2
Frying- cast iron 13"	1	Steel 12"	2
Frying- non stick steel clad aluminum 15"	1	Tongs-Spaghetti	1
Jelly roll 15" x 10" x 1/2"	1	Tray-SS 16" x 20" Medium Gauge	4
Muffin 13" x 10"	2	Whip	
Roasting 11 1/8" x 20"	2	French SS 12"	1
sauce 2 qt with SS lid	2	French SS 14"	1
		Piano SS 12"	1
		Potato hand whipper	1
sauce 5 qt with SS lid	2	Mandoline metal vegetable slicer	1

A.6 CENTRAL STOREROOM

Central Storeroom space, complete with supplied and installed lockers, storage racks and shelves, shall be allocated within the MSPV to provide stowage for all listed items of protective clothing.

Protective Clothing Description	Quantity
Aprons - Food Handlers, White	6
Boots - Safety, Rubber, Hip	6
- Safety, Rubber, Knee	6
Cap - Food Handler	1 box of paper hats
Coveralls – Blue: 2 of each size (36 reg, 36 long, 40 short, 40 reg, 40 long, 44 short, 44 reg, 44 long, 48 short, 48 reg, 48 long)	22
Gloves:	
Cloth, Work	12
Leather, Work	12
Rubber, Small	3
Rubber, Medium	3
Rubber, Large	3
Helmet:	
Safety, White	3
Safety, Yellow	3
Strap - Chin, Safety Helmet	6
Liner - Safety Helmet	6
Overalls - Wet Weather: 1 of each size (36 reg, 36 long, 40 short, 40 reg, 40 long, 44 short, 44 reg, 44 long, 48 short, 48 reg, 48 long)	11
Jacket Rain: 1 of each size (36 reg, 36 long, 40 short, 40 reg, 40 long, 44 short, 44 reg, 44 long, 48 short, 48 reg, 48 long)	11
Vest - Work , Flootation: (2 x size 36, 5 x size 40, 5 x size 44, 2 x size 48)	14
Cold Weather Suit (Floater): (2 x size 36, 5 x size 40, 5 x size 44, 2 x size 48)	14
Potable water bottles for water coolers (18.5 litres/bottle)	11

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A.7 LINEN LOCKER

Linen Locker shall be supplied and installed, complete with storage racks and shelves, to provide stowage for all listed items. The preferred locker location is in the vicinity of the Accommodation areas.

Description	Quantity
Heavy Quilted Bedspreads	16
Mattress covers	16
3 types of contour sheets: 22 cotton, 10 flannel, 10 micro fibre	42
3 types of flat sheets: 22 cotton, 10 flannel, 10 micro fibre	42
2 types of blankets: 6 wool and 8 polar	14
Pillows	4
Pillow covers	16
Pillow cases	16
Bath towels	32
Hand Towels	16
Face cloths	16
Bath mats	4
Laundry bags	16
Shower curtains	2
Shower curtain rings	20
Curtains for windows and portlights	4 spare curtains for windows and portlights
Curtains for the cabin doors	2 spare door curtains

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A.8 CLEANING GEAR AND STEWARD’S LOCKER(S)

CLEANING SUPPLIES and STEWARD’S LOCKER(S)

Locker(s), complete with racks and shelves, shall be supplied and installed to provide stowage for all listed items. The preferred locker location(s) is in the vicinity of the Galley or the Accommodation area.

Cleaning Supplies	Quantity	Steward's Stores	Quantity
Bag – Garbage, green	150	Batteries Flashlight, D cell	12
Bleach – Javex™, 3.0 l, bottles	10	Flashlights (1 per berth)	14
Cleaning Compound		Broom	
Oven (liquid foam), cans	7	Corn, Whisk	2
Glass, Liquid, 1.0 l, bottles	7	Corn	2
Detergent		Push 14”	3
General purpose, liquid, 1.0 l, bottles	14	Push Broom	3
Laundry, powder, kgs	8	Brush	
Dishwashing Compound		Bannister	2
Liquid, 1.0 l, bottles	10	Toilet brush c/w holder	1 per washroom
Machine, powder, kgs	4	Scrub 6 “	6
Disinfectant		Scrub 10”	4
Germicidal and Fungicidal	1 gallon	Turkshead 5” c/w handle	6
Hand Cleaner		Bucket	
Abrasive, 1.0 l, bottles	6	Oval Mop c/w wheels	3
Waterless, 1.0 l, bottles	6	Wringer for Oval Bucket	1
Napkins, Paper	1 case	Mop	
Paper		Wet Spring Type	2
Toilet, 2-ply	72 rolls	Wet, Head Cotton	4
Wax, HD 18“ x 100“	1 roll	Dry, Dust 14 “	2
Towel - Paper	1 case	Yacht, Cotton	4
Polish		Padlocks	6
Metal , Brass, 0.5 l, cans	2	Pail - Plastic , 8-10 qt.	6
Metal , Silver, 0.5 l, cans	2	Pans - Dust	4
Stainless Steel (Aerosol)	1 litre	Plunger, Toilet	4
Soap		Rags, Wiping	1 case
Toilet, White, bars	72	Scissors, 12”	1 per desk
Wrap		Scrubber - Deck c/w Rubber Squeeze and Handle.	4
Aluminum Foil, 18“ x 450“	1 roll	J-cloths	24 packs
Cellophane, 18” x 1000“	1 roll	Sponge, synthetic	12
		Pot Scrubbers, Metal Brass	12

Cleaning Supplies	Quantity	Steward's Stores	Quantity
		Squeegee - Glass 10 " c/w handle	2
		Vacuum Cleaner - Wet/ Dry type c/w attachments	2 (one 5 and one 8 gallons)