



DEPARTMENT OF FISHERIES AND OCEANS

ANNEX A

Technical Statement of Requirements Requisition number F7047-150004, provision of Quantity seven (7), 9.1 to 9.2 m Aluminum Self-Propelled Barges

Revision 2, May 25, 2015

**TRANSPORT CANADA MARINE SAFETY BRANCH (TCMSB)
TP1332 APPROVED CONSTRUCTION**



Document Control

Record of Amendments

#	Date	Description	Initials
0	April 20, 2015	Original Issue	KA
1	April 30, 2015	Minor modifications	KA
2	May 25, 2015	Modifications for questions	KA

TABLE OF CONTENTS

1.0 OVERVIEW	1
1.1 GENERAL	1
1.2 REQUIREMENT	1
1.3 INFORMATION REQUIRED FOR TENDERING	1
2.0 DESIGN AND CONSTRUCTION REQUIREMENTS	1
2.1 GENERAL	1
2.2 ERGONOMIC DESIGN	2
2.3 VIBRATION	2
2.4 EQUIPMENT PROTECTION	2
2.5 SITE CLEANLINESS	2
2.7 STRUCTURAL STRENGTH	3
2.8 LAUNCHING	3
2.9 HULL	3
2.10 DECK	4
2.11 TIE DOWNS	4
2.12 STOWAGE	4
2.13 STANDARDS, CLASSIFICATION AND REGULATIONS	4
2.15 MATERIALS	5
2.16 FASTENERS	5
2.17 FACILITIES	6
3.0 OPERATIONAL REQUIREMENTS	6
3.1 GENERAL	6
3.2 STEERING	6
3.3 ENVIRONMENTAL CONDITIONS	6
4.0 PHYSICAL CHARACTERISTICS	6
4.1 BARGE PARTICULARS	6
As per Drawings identified in Appendix A.	6
5.0 BARGE CONFIGURATION	6
5.1 STRUCTURE	6
5.2 GENERAL	7
5.3 WELDING	7
5.4 IDENTIFICATION LABELS	7
6.0 BARGE OUTFIT	8
6.1 BUOY TENDING OPERATION REQUIREMENTS	8
6.2 STERN ROLLER	8
6.3 WOODEN DECKING	8
6.4 HATCH OVER ENGINE ROOM	9
6.5 ACCESS HATCHES TO COMPARTMENTS	9
6.6 BOLLARDS	9
6.7 RAILINGS	10
6.8 BOW RAMP	10
6.9 TOWING POST	10
6.10 FREEING PORTS	11
6.11 MOORING EYES	11
6.12 PIPE GUARDS AROUND THRUSTER	11
6.13 LIFTING LUGS	11
6.14 FENDERS	11

6.15 FUEL TANK	12
6.16 HYDRAULIC TANK	12
6.17 DECK STORAGE CONTAINER	12
7.0 DECKHOUSE	12
7.1 GENERAL	12
7.2 NAVIGATION EQUIPMENT.....	13
7.3 MACHINERY INSTALLATION	13
7.4 ELECTRICAL	16
7.5 LIFE SAVING AND SAFETY EQUIPMENT	19
7.6 ENGINE ROOM FIRE SUPPRESSION	20
7.7 FIRE EXTINGUISHERS	20
8.0 TESTS & TRIALS	20
8.1 TESTS - GENERAL	20
8.2 SEA TRIALS - GENERAL	21
9.0 DOCUMENTATION	22
9.1 GENERAL	22
9.2 NATIONAL ASSET CODE	22
9.3 BUILDER'S PLATE	23
9.4 TECHNICAL PUBLICATIONS	23
9.5 ADDITIONAL DELIVERABLE DOCUMENTATION	25
10.0 SHIPPING AND DELIVERY	25
10.1 GENERAL	25
APPENDIX A	26
APPENDIX B	29

1.0 OVERVIEW

1.1 GENERAL

- 1.1.1 The Department of Fisheries and Oceans (DFO) buys, manages and operates numerous small craft in support of its Departmental programs and other missions.

1.2 REQUIREMENT

- 1.2.1 The Contractor must fabricate and supply quantity one (1) Aluminum Self-Propelled Barge based the requirements of this TSOR and utilizing the supplied fifteen (15) drawings to outline the construction, outfit and machinery systems for construction of the barge. Construction will be completed based on the current Transport Canada Marine Safety Branch (TCMSB) Marine Safety Publication TP 1332 "Construction Standards for Small Vessels" (hereinafter referred to as TCMSB TP 1332).
- 1.2.2 The primary role of this barge will be Canadian Coast Guard Buoy tending operations in the Atlantic region.
- 1.2.3 This barge will be shore-based and ship based, launched and recovered by crane and Davit respectively.

1.3 INFORMATION REQUIRED FOR TENDERING

The following information must be provided for the tendering stage:

- 1.3.1 A description of how the bidder will meet each of the requirements of this Technical Statement of Requirements (TSOR).
- 1.3.2 The lightship weight.
- 1.3.3 The proposal must demonstrate the craft will be fully seaworthy, operable and fit in all regards for the purposes intended.
- 1.3.4 The proposal must demonstrate the firm has the facilities, management, technical expertise, welding certification (construction to TP-1332, welding to CSA W47.2, CWB certified shop div. 2.1).and the resources to deliver the craft with the contracted quality and performance.
- 1.3.5 The contractor must also provide documentary evidence of its capability in the construction of this size of craft.

2.0 DESIGN AND CONSTRUCTION REQUIREMENTS

2.1 GENERAL

- 2.1.1 Unless stated otherwise all components, equipment and material must be Contractor supplied.

2.1.2 CHOICE OF EQUIPMENT

- 2.1.2.1 The selection of all items not fully specified must be approved by the Technical Authority before any orders are placed and the Technical Authority reserves the right to substitute items which may be considered more suitable for the service.
- 2.1.2.2 Reference to trade names and catalogue numbers are indicative of the quality and performance of the article. Substitutions may be made with Technical Authority's written approval provided they are

equivalent and do not impact hull construction or other installed equipment or system.

2.2 ERGONOMIC DESIGN

2.2.1 Hazardous operating conditions must be prevented by arranging machinery and equipment in a safe manner; providing guards for all electrical, mechanical and thermal hazards to personnel; and providing guards or covers for any controls that might accidentally be activated by contact of personnel.

2.2.2 The barges must be designed and constructed to accommodate both male and female crew from approx. 5' to 6' 4" in height, wearing cold weather clothing and equipment in accordance with ASTM F1166-07 Standard Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities.

2.2.3 Human engineering factors considered in design must include accessibility, visibility, readability, crew efficiency and comfort. All equipment must be accessible for use, inspection, cleaning and maintenance.

2.2.4 Equipment must be accessible for use, inspection, cleaning and maintenance as per ASTM F1166-07.

2.3 VIBRATION

2.3.1 The barge and all components must be free of local vibration that could endanger barge personnel, damage barge structure, machinery or systems, or interfere with the operation or maintenance of barge machinery or systems.

2.3.2 Mounts for movable components, including items moved for stowage, towing or transport must be provided with resilient material as necessary to prevent rattling.

2.3.3 Loosening of fasteners under vibration must be prevented by the use of self-locking fasteners.

2.4 EQUIPMENT PROTECTION

2.4.1 The Contractor is responsible for the care of all equipment. All parts, especially those having working surfaces or passages intended for lubricating oil, must be kept clean and protected during manufacture, storage, assembly and after installation. Equipment must at all times be protected against dust, moisture or foreign matter and must not be subject to rapid temperature changes or extremes in temperature.

2.5 SITE CLEANLINESS

2.5.1 During construction, all chips, shavings, refuse, dirt and water must be removed at the completion of the work shift or sooner. The Contractor must ensure measures are taken to avoid wear and damage incident to construction, and to prevent corrosion or other deterioration. Equipment subject to freezing must be kept drained, except during test and trials. Equipment must be kept clean and protected from the environment prior to installation.

2.6 QUALITY CONTROL DURING CONSTRUCTION

The contractor is required to demonstrate that the company has in place a system that incorporates a formal mechanism to deal with Quality Control practices and

procedures. The contractor is required to provide the following information with the bid.

2.6.1 Control of Suppliers: The contractor shall provide a description of the system that will be used to coordinate the sourcing, ordering, delivery and receipt of the various components required for the fabrication of the complete barge. This would include a list of the various components and items and show suppliers and delivery times for each component.

2.6.2 Production Schedule: The contractor shall supply a production schedule for the construction, testing and delivery of the barge.

2.6.3 Inspection: The contractor shall outline the inspection and testing plan that the contractor will use to verify, test and inspect all the various components, systems and the complete barge.

2.6.4 Problem Solving: The contractor shall outline the process that will be used to address problems or delays with the fabrication, component installation, testing and delivery of the barge.

2.6.5 Project Management: The contractor shall outline the general plan for construction of the barge including; how and where the major components will be assembled; how moving of the barge will be performed; where and how sea trials will be performed; how many employees will be used during the various stages; how the aluminum components will be shaped and cut; and where the finished components will be stored.

2.6.6 Workforce: The Contractor shall provide a list of the following individuals and a short listing of the individual's qualifications and experience.

2.6.6.1 Welding Supervisor

2.6.6.2 Logistical Supervisor

2.6.6.3 Mechanical Supervisor

2.6.6.4 Electrical Supervisor

2.6.6.5 Drawing Supervisor

2.6.6.6 Inspection and Testing Supervisor

2.6.6.7 Overall Project Manager

2.6.7 Subcontractors: The Contractor shall supply a list of any subcontractors that will be used and a description of the scope of work required from each contractor.

2.7 STRUCTURAL STRENGTH

2.7.1 All structures and components (hull, deck, seating, etc.) must be of sufficient strength to withstand when in the Fully Loaded Condition, the lateral and vertical impact-loading that equates to the conditions of the operational requirements.

2.8 LAUNCHING

2.8.1 The barge must be capable of being launched, recovered shore based crane or by ship based davit as identified herein.

2.9 HULL

2.9.1 Hull Form, Single Chine.

2.9.2 Construction, Transverse webs and longitudinal frames.

2.9.3 Material, Welded aluminum hull, decks, ramps and deckhouse.

2.9.4 The deck must have a suitable non-skid surface.

2.10 DECK

- 2.10.1** Decks must be self-draining, by means of non-return freeing ports or similar. The deck above the watertight compartments must be bolted for easy removal to allow access for repair of buoyancy compartments beneath.

2.11 TIE DOWNS

Flush mounted deck tie downs will be fitted on the deck area for the securing of deck cargo.

2.12 STOWAGE

- 2.12.1** The Contractor must provide a watertight compartment for safe stowage of equipment and accessories. Arrangements must be provided for safe, secure and accessible stowage of an anchor and cable, paddles, and other equipment.

2.13 STANDARDS, CLASSIFICATION AND REGULATIONS

- 2.13.1** Barges constructed under this TSOR must be fabricated in accordance with the current TCMSB TP 1332 "Construction Standards for Small Vessels" An electronic version is available at:
<http://www.tc.gc.ca/marinesafety/tp/TP1332/menu.htm> and where applicable the American Barge & Yacht Council (ABYC).
- 2.13.2** Transport Canada's Ship Electrical Standards - 2008 (TP 127E). An electronic version is available at:
<http://www.tc.gc.ca/marinesafety/tp/tp127/menu.htm>
- 2.13.3** The Contractor must construct each barge as per this TSOR and where this TSOR interferes or contravenes the above standard; the above TCMSB TP 1332 standard will take precedence
- 2.13.4** The Contractor must arrange for Technical/Contracting Authority site visits, during all phases of each barge's construction. The site visits are required to insure that all barges constructed under this TSOR comply with each standard addressed in this TSOR. The Contractor must supply an electronic copy and two (2) hard copies of all as-fitted drawings for the barge design to the Technical Authority.
- 2.13.5** The Contractor must supply a signed letter insuring the barge complies with TCMSB TP 1332 and a completed Small vessel Compliance Form (available from the TCMSB web site), to ensure compliance with the current TCMSB requirements.
- 2.13.6** To facilitate proper inspection of material and workmanship, the Technical Authority / Inspection Authority must be permitted access, to the Contractor's facility at any time during construction.
- 2.13.7** The construction, outfit, machinery, equipment, fittings, systems, testing and trials must be to the satisfaction and approval of the Technical Authority / Inspection Authority.

2.14 ALUMINUM WELDING CERTIFICATION AND DOCUMENTATION

- 2.14.1** This construction contract requires that the primary Contractor be currently certified by the Canadian Welding Bureau (CWB) to standard CSA

W47.2M, Division I and II - Certification of Companies for Fusion Welding of Aluminum.

2.14.2 The Contractor must provide a current letter of validation from the CWB indicating compliance with standard CSA W47.2M 1987, Division I, II.

2.14.3 The Contractor will be required to provide approved procedure data sheets for each type of joint and welding position that will be involved in this construction.

2.14.4 The Contractor will be required to supply a current Welders Ticket for each individual welder that will be involved in this construction.

2.15 MATERIALS

2.15.1 All materials must be corrosion resistant and suitable for use in a salt water environment as detailed in the Operational Requirements. All materials normally subjected to sunlight must resist degradation caused by ultraviolet radiation. Galvanized materials are unacceptable.

2.15.2 Dissimilar Metals: Direct contact of electrolytically dissimilar metals is not allowed. Electrolytic corrosion must be prevented by insulating dissimilar materials from each other with gaskets, washers, sleeves, or bushings of suitable insulating material.

2.15.3 Aluminium: Aluminium alloy types 5086/ 5083-H321/H116 must be used for plate; aluminium alloy 6061-T6 (anodized grade), suitable for type 5356 filler alloy, must be used for extruded shapes and welded tubing and pipe. Non-structural items of trim and outfit such as hatch frames, castings, consoles, and hardware items may be of other aluminium alloys suitable for commercial saltwater marine use such as dual rated 5083 / 86 or 5052 or 6063-T54.

2.15.4 Stainless Steel: Stainless steel type 316L or 316 must be used for all stainless steel applications except as noted. Alloy 316L must be used in any welded underwater components.

2.15.5 Fittings and clamps must be stainless steel. Bolts used in all fittings must be Type 316 stainless steel.

2.15.6 Where flexible connections are required for steering and fuel systems, suitable hose with permanently crimped, detachable reusable type fittings must be used.

2.15.7 All materials and equipment must be stored installed and tested in accordance with the manufacturer's guidelines, recommendations and requirements.

2.16 FASTENERS

2.16.1 All fasteners must be of corrosion resistant materials.

2.16.2 Cadmium plated parts and fasteners, including washers, must not be used.

2.16.3 Direct attachment of alloys containing copper to aluminium is not permitted except for an electrical bonding strap.

2.16.4 Aluminium or Stainless steel washers or backing plates must be used as appropriate.

2.16.5 Where nuts will become inaccessible after assembly of the barge, nuts must be captured or anchored to allow reassembly and prevent backing off. Unless otherwise specified, self-locking nuts must be installed to

prevent loosening of fasteners due to shock and vibration.

2.16.6 Fasteners in deck traffic areas must be flush-mounted to eliminate tripping and snagging hazards.

2.17 FACILITIES

2.17.1 The Contractor must have a shop capable of maintaining temperature and humidity. It must be capable of maintaining temperature between 16°C and 25°C. It must be capable of maintaining relative humidity below 70%.

3.0 OPERATIONAL REQUIREMENTS

3.1 GENERAL

Requirements have been identified in section 8.0, Test and trials.

3.2 STEERING

3.2.1 Capable of steering 15° from heading, in Sea State 6, with seas from any direction.

3.2.2 Steer and manoeuvre effectively at 3 knots in Sea State 6.

3.2.3 Maintain course, made good over ground, when proceeding at 3 knots with relative crosswind of 35 knots.

3.2.4 Capable of turning in its own length in Sea State 6.

3.2.5 Capable of steering effectively in Sea State 6 with winds of 30 knots while towing a 15 ton (displacement) barge at 5 knots

3.3 ENVIRONMENTAL CONDITIONS

3.3.1 Capable of operating day or night in the following conditions:

3.3.1.1 Average ambient air temperature range: -15° C to + 30° C

3.3.1.2 Average water temperature: 0° C to +20° C.

3.3.1.3 Wave heights of 4 meters to 6 meters (WMO Sea-State 6).

3.3.1.4 Wind speeds of 30 knots minimum.

3.3.1.5 Required to operate safely in ice infested waters, (some minor damage to the barge, not affecting stability or buoyancy is acceptable).

3.3.1.6 Barge operates in freezing spray or freezing rain with accumulations of up to 6.0 mm while maintaining stability while allowing for safe transit in Beaufort force 7.

4.0 PHYSICAL CHARACTERISTICS

4.1 BARGE PARTICULARS

As per Drawings identified in Appendix A and the requirements identified in this TSOR.

5.0 BARGE CONFIGURATION

5.1 STRUCTURE

The Contractor shall supply certificates / mil test reports for the aluminum used in the construction of the barge.

All aluminum plate shall be new 5086 H116 or 5083 H116/H321 plate, Extrusions and shapes and checkered plates shall be new 6061 Aluminum.

The main deck shall have a non-skid surface - aluminum checkered deck plating. The plate thickness, excluding raised material, shall be as per structural requirements.

All bare aluminum surfaces on the exterior of the vessel shall have a M32, medium satin finish, in accordance with the Aluminum Anodizers Council. The Contractor shall ensure that the two towing posts, fwd bollards and mooring eyes are excluded from this surface finish and left with a smooth mill finish. The Contractor shall ensure that all aluminum surfaces which are to be left bare are kept as clean as practical during construction and welding.

Grinding, blasting, and any other process that might cosmetically alter the aluminum's natural finish shall be kept to a minimum.

Aluminum surfaces which might be used for hand holds, footings, handrails, and deck areas not covered with checker plate shall have an AA-M44, coarse matte finish, in accordance with Aluminum Association Inc., Publication #45, Table 1.

5.2 GENERAL

All lugs or brackets welded to the hull for construction purposes shall be cut-off proud of the plate surface and the stub shall be ground flush when the work is complete. Every effort shall be made to avoid surface damage to the plating. If such damage should occur, the area in question shall be replaced with new material.

Fairness of hull, deck and cabin plating shall be maintained. Bulkheads, deck plates, bottom plates and side plating shall be fair and flat without buckling (tolerance \pm three millimeters).

All deck attachments such as the life raft, deck storage container and deck winches shall not be mounted directly to the deck. The mountings shall comprise of a raised aluminum channel or structure, which is welded to the deck. The equipment shall then be attached to the channel or structure using stainless steel nuts and bolts.

5.3 WELDING

All hull, deck and bulkhead welding shall be continuous welding. All primary structure, web frames, girders and additional engine skid support structure shall be double continuous fillet welding. Secondary stiffening shall be welded with four inch eight staggered intermittent welds. All other welding shall be continuous.

The Contractor shall arrange a welding inspection from an organization currently certified to the latest CSA Standard W178.1. The Contractor shall be required to obtain up to 20 radiographs per barge. The location of radiographs shall be determined by the Technical Authority. Radiography shall meet the requirements of the ASTM Standard E142, with acceptance criteria as per the CSA W59 Welding Standard.

The cost of radiographs (x-rays) and all other cost associated with the inspection organization shall be included in the Contractor's bid.

5.4 IDENTIFICATION LABELS

All compartment vents, fuel and hydraulic fill and vents, lubrication and grease points, Compartment access hatches, winch control handles, electrical switches, Engine and thruster controls and bilge piping discharges shall be clearly

identified with a permanently attached label or sign located adjacent to the item. The label shall be engraved or stamped and fabricated of non-corroding material.

6.0 BARGE OUTFIT

6.1 BUOY TENDING OPERATION REQUIREMENTS

The deck shall accommodate a minimum of two 2500-pound concrete stones, two 6-foot spar buoys and associated moorings. The details of the Contractor supplied and installed equipment to support buoy tending is outlined as follows:

- 6.1.1** The Contractor shall supply and install all the necessary equipment for the complete hydraulic system.
- 6.1.2** The barge shall be outfitted with two hydraulic winches, stern roller and deck pad-eyes to facilitate buoy and stone deployment, stowage and recovery.
- 6.1.3** Two Pull Master PL5 winches with 50 feet of stainless steel wire. Termination ends of the stainless steel wire shall be mechanically spliced or mechanically swaged complete with stainless steel thimbles. Bulldog type clamp clips are not acceptable.
- 6.1.4** A lug shall be installed on the deck, on the centerline of the barge, in front of the engine room hatch, which will allow for the use of a shackle and pulley so that the wire can feed directly down the centerline and over the mid point of the roller. The two winches shall be mounted so that the wire feeds towards this lug. The lug and support structure must have the capacity to support 6000 lbs must be Certified and tested to 150% of this load by the contractor.
- 6.1.5** Each winch shall be fitted with 1-inch solid round aluminum guards. All hydraulic lines shall be routed under deck except for exposed lines in way of each winch. All wire for the winches shall be supplied by the Contractor and shall be certified for the maximum pull of the winches.
- 6.1.6** The barge shall be fitted with lugs for the attachment of lashings and tackle for buoy tending. Two $\frac{3}{4}$ inch plate lugs shall be fitted at the stern near the roller pocket suitable for a 6000-pound S.W.L., must be Certified and tested to 150% of this load by the contractor.

6.2 STERN ROLLER

- 6.2.1** The barge shall be fitted with a removable steel stern roller.
- 6.2.2** The steel roller shall have a working drum length of approximately 3 ft 10 inches, a drum diameter of 20 inches and be supported by a C1045 Shaft and a bronze bushing bearing.
- 6.2.3** The Stern roller S.W.L. (safe working load) shall be 5000 pounds, must be Certified and tested to 150% of this load by the contractor.
- 6.2.4** The roller shall be fitted with faring plates to stop wire and cable from passing between the sides of the roller and the hull and also between the drum and deck.
- 6.2.5** The height of the roller drum shall be at least 3 inches but not exceed 6 inches above the top surface of the wooden decking.
- 6.2.6** The drum shaft shall be fitted with grease nipples for the roller bushings and these shall be fitted to allow easy greasing from the deck level.

6.3 WOODEN DECKING

The center of the barge deck from the stern roller to the bow ramp shall be fitted with two-inch thick X 6 inch wide wooden planks of Juniper or equivalent running in an awthartships direction. The planks shall be held in place with an angle retainer at the outboard edge. The angle retainer shall have six 10-inch long openings to facilitate installation and removal of the decking. These openings shall be at approximately Frame #2.5, #5.5 and #8.5.. A bolted section shall fit into the openings to secure the decking in place.

6.4 HATCH OVER ENGINE ROOM

6.4.1 The contractor shall supply and install one removable "soft patch" fitted in the main deck over the main engine. The hatch shall be of watertight construction and installed in such a way as to allow shall be easily removed to facilitate main engine removal as a package.

6.4.2 The hatch shall provide strength equivalent to the main deck structure, and be secured by bolts and gasket.

6.4.3 A rubber neoprene gasket shall be incorporated to provide the water tightness.

6.5 ACCESS HATCHES TO COMPARTMENTS

6.5.1 The Contractor shall supply and install flush-mounted, Cast Aluminum Watertight Hatches for access to the compartments: The hatches shall have an aluminum-mounting ring, which is welded to the deck or bulkhead as follows:

6.5.1.1 Fwd Void Space: One 15" X 24" BOMAR model C41524-H (hinged) shall be installed in the fwd bulkhead # 8 - stbd side which allows access to the void space from the Engine room.

6.5.1.2 Engine room: Two 15" X 24" BOMAR model C41524 (Non-hinged) shall be installed in the deck, Port and Stbd at the fwd end of the engine room. (An access ladder shall be installed below each hatch.)

6.5.1.3 Aft Void Space: One 15" X 24" BOMAR model C41524 (non-hinged) shall be installed in the deck, on the Port side at the fwd end of the space. (An access ladder shall be installed below the hatch.)

6.5.1.4 Thruster Compartment: The Contractor shall fabricate an opening and access panel of approximately One 24" x 24" BOMAR C42424 (non-Hinged) OR EQUIVALENT shall be installed in the deck directly over the thruster unit. In addition two 15" X 24" BOMAR model C41524-H (hinged) shall be installed in the aft bulkhead # 3.

6.5.1.5 Each compartment shall be fitted with a deck vent complete with down flooding protection.

6.5.1.6 The Engine room Compartment shall be fitted with two supply air vents for the engine. These vents shall be of sufficient size to allow for the full air requirements of the engine. These vents shall be fitted with a positive method of closure complete with gasket.

6.6 BOLLARDS

The contractor shall supply and install two fabricated aluminum bollards (tie up bitts) at the bow port and starboard. The base of the bollards shall be sufficient to support each post and in turn be welded to the main deck. All welds shall be ground smooth and caps shall be rounded so as not to cut mooring ropes. The bollards and support

structure must have the capacity to support 6000 lbs, must be Certified and tested to 150% of this load by the contractor.

6.7 RAILINGS

6.7.1 Pipe stanchions shall be fitted around the bulwarks at each of the port and starboard sides of the barge. Stanchions shall be of 1½-inch diameter aluminum pipe recessed in the bulwark. The Stanchions shall be removable. Two courses of stainless steel wire lifeline shall be fitted over length of stanchions and secured in place at each of the forward and after ends, and to the fixed railing adjacent to the deckhouse with stainless steel turnbuckle fittings. Termination ends of the stainless steel wire shall be mechanically spliced or mechanically swaged complete with stainless steel thimbles. Bulldog type clamp clips are not acceptable. All shackles and turnbuckles shall be stainless steel.

6.7.2 The railings shall provide a minimum height of 34 inches (864 mm) above the deck.

6.8 BOW RAMP

6.8.1 The ramp shall be designed and fabricated to safely carry a 1500-pound load, must be Certified and tested to 150% of this load by the contractor when the ramp is horizontal and supported by the outboard end. In addition the ramp must be capable of withstanding all sea loads when located in the stowed position.

6.8.2 Hinges shall be fitted in a recess at the bow to so that provide the ramp top is inline parallel with the main deck when in the horizontal position. Ramp lugs and hinge plates shall have stainless steel grommets in way of the stainless steel hinge pins. Lugs and hinges shall be robust and connected by full penetration welding. A grease fitting shall be fitted at each lug.

6.8.3 Raising and lowering of the aluminum bow ramp shall be completed using two hand operated cable winches mounted at the bulwarks adjacent the ramp. Pulleys and sheaves to route the cable for raising and lowering shall be supplied and installed as required. The winches shall be fitted with stainless steel wire. Termination ends of the stainless steel wire shall be mechanically spliced or mechanically swaged complete with stainless steel thimbles. Bulldog type clamp clips are not acceptable.

6.8.4 The bow ramp shall be fitted with a watertight gasket, which seals the door against the hull when the door is fully closed. Locking pins shall be supplied and installed port and starboard to positively lock the ramp in its closed position.

6.9 TOWING POST

6.9.1 The Contractor shall supply and install a towing post of heavy duty six-inch Schedule 80 aluminum pipe mounted at each of the port and starboard sides at the forward end of the roller as shown on the General Arrangement drawing.

6.9.2 A 1½-inch solid round crossbar shall be fitted at mid height of each tow post. Towing posts and substructure shall be designed for 6000 lb towing capacity, must be Certified and tested to 150% of this load by the contractor.

6.10 FREEING PORTS

6.10.1 Freeing ports shall be cut in the bulwarks immediately above the main deck to provide deck drainage as indicated on the General Arrangement drawing.

6.10.2 Eight freeing ports shall be installed, approximate size of three inches high by 10 inches long each. Each Freeing port shall be fitted with a hinged flapper plate complete with stainless steel hinge pins and hardware.

6.11 MOORING EYES

6.11.1 Two mooring eyes shall be fitted in the fwd bulwark plating on the (Port and Starboard) as indicated on the General Arrangement sides of the barge.

6.11.2 Mooring eyes shall be approximately 12 inches long by six inches high and fitted with a one-inch diameter solid round.

6.11.3 All welding shall be ground smooth to prevent cutting or chafing of mooring lines.

6.12 PIPE GUARDS AROUND THRUSTER

6.12.1 The contractor shall supply and install a four-inch diameter Schedule 80 pipe guard around the hydraulic thruster unit.

6.12.2 The pipe guard shall be generally fitted as indicated in the Fendering plan and the construction sections.

6.12.3 Where pipes join on to the hull plates, a six-inch diameter welded pad shall be incorporated.

6.12.4 The pipe Pipe guard shall be sufficient in strength to take the full grounding weight of barge in either of the forward or reverse directions and also to support the weight of the barge when placed on a dock or onboard a ship..

6.12.5 The thruster shall have pipe guards installed to prevent damage from items lifted over the stern roller.

6.12.6 The pipe guards shall have six 3/8" diameter holes drilled into the underside of each pipe to allow water drainage.

6.13 LIFTING LUGS

6.13.1 Lifting lugs shall be incorporated in the deck and hull structure so as to safely support the maximum barge weight whilst raising / lowering with either of the following methods:

6.13.1.1 Davit operation on a large ship (four points) (Distance between lifting points is 23 ft.)

6.13.1.2 Crane operation for ship or shore (four points)

6.13.2 The lifting lugs shall be fitted with stainless Steel grommets.

6.13.3 The Contractor shall supply certified lifting slings (3/4" diameter wire rope) and shackles for each barge. Three separate certified lifting slings will be required complete with necessary shackles and rings at a safe working load rating to suit the barge. 1) A two-point sling for the fwd davit lift points, 9' long. 2) A two-point sling for the aft davit points, 9' long and 3) A four-point sling for the crane lift points, two lengths 10'6" and two at 7'4". Each lifting sling shall be clearly labeled. The Contractor shall provide test certificates for each sling.

6.14 FENDERS

6.14.1 The Contractor shall supply and install rubber fenders over the full length of the port and starboard sides: Vertically on the Port Side of the barge at the bow and stern: and horizontally on the upper and lower edges of the bow door.

6.14.2 The rubber fenders shall not be through-bolted through the hull but should be fitted to a continuous rail or bracket welded on the exterior of the hull. The rubber fenders shall be fitted with continuous aluminum flat bar on the interior of the fender to provide support.

6.15 FUEL TANK

6.15.1 The engine room shall be fitted with one non-integral 50 gal fuel tank located on the Port side of the engine room. The tank shall have a separate fill line fitted with a camloc fitting and a vent line of 1½ inch to the deck. The tank shall be fitted with shut off valve and a bolted clean-out access of 12-inch diameter. The tank shall also be fitted with a remote sensing level indicator with display in deckhouse.

6.15.2 The fuel oil piping supply to the engine shall be fitted with a Racor fuel / water separator with clear bowl and drain cock in addition to the engine mounted fuel filter.

6.15.3 The fuel and vent line shall be installed in a save-all located to provide maximum protection from damage. The save-all shall be fitted with a removable drain plug.

6.16 HYDRAULIC TANK

6.16.1 The barge shall be fitted with one 50 gal hydraulic storage tank located on the Port side. The tank shall be fitted with a 12-inch access/clean-out, filling pipe and vent. The tank shall be fitted with a sight glass and temperature Indicator which are located on the same side of the tank as the access hatch to the compartment and be easily visible from that side.

6.17 DECK STORAGE CONTAINER

6.17.1 An aluminum storage locker shall be fabricated and installed by the contractor on the stbd deck, in front of the pilothouse and behind the stbd engine room watertight deck hatch. The locker shall be approximately 3'x 2'x 3' and shall have a positive closing hinged cover or door(s) with gasket and shall be fitted with a removable drain plug. The contractor may combine this locker with the mounting of the life raft.

7.0 DECKHOUSE

7.1 GENERAL

7.1.1 The Contractor shall supply and install one aluminum deckhouse on the vessel's starboard side as shown in the General Arrangement Drawing.

7.1.2 The pilot house shall provide a minimum of 6' 8" head room between the deck and the lowest point on the roof stiffeners.

7.1.3 The Pilot house shall be fitted with sliding Marine Grade safety glass, minimum ¼" laminated clear glass windows as indicated on the Deckhouse Structure Drawing. The forward and aft windows shall be non-sliding and fitted with a marine windshield wiper and window wash system.

- 7.1.4** The sliding windows shall have positive latches to secure the windows in both the open and closed position
- 7.1.5** The pilothouse shall be fitted with a sliding door c/w window, which shall have positive acting latches to secure the door fully open and also fully closed. These positive acting latches will stop the door sliding and effectively latch the door should it either slide open or closed. The door shall be capable of being locked from the outside.
- 7.1.6** The cabin shall be fitted with a fwd console for the engine controls, steering etc.
- 7.1.7** The controls for the hydraulic deck winches shall be mounted outside the cabin, on the aft end of the pilot house, immediately aft of the sliding door opening and shall be fitted with a guard to protect the controls.
- 7.1.8** The interior of the cabin shall be insulated and the insulation shall be covered with expanded steel mesh to protect the insulation.
- 7.1.9** The cabin shall be fitted with a 120VAC 500 watt electric heater.
- 7.1.10** The cabin shall be fitted with a ladder on the exterior to allow access to the cabin roof.

7.2 NAVIGATION EQUIPMENT

The Contractor shall supply and install following navigation equipment:

- 7.2.1** Depth Sounder: Lowrance HDS-7 Gen2 complete with through-hull transducer.
- 7.2.2** VHF Radio: Motorola CDM 1250 complete with roof mounted antenna on ratchet mount.
- 7.2.3** DGPS: SIMRAD NSE12 complete with proper roof mounted combo antenna on ratchet mount.
- 7.2.4** Compass: Ritchie Explorer complete with separate dimmer control and non-white light illumination

Note: Location of electronic components shall be identified during construction by the Technical Authority.

7.3 MACHINERY INSTALLATION

7.3.1 ENGINE

The contractor shall supply and install a John Deere Marine Diesel Engine model 4045AFM85 (160 Hp @ 2300rpm). The Contractor shall supply and install all the components required for a complete system including:

- 7.3.1.1** Engine mounting pads for elastic suspension consisting of ant vibration pads with adjustable anchorage plates for dampening of sound and vibration and collision chocks.
- 7.3.1.2** Oil cooler.
- 7.3.1.3** 120 V AC thermostatically controlled Jacket water heater, which is permanently wired into a breaker on the 120 VAC Distribution Panel.
- 7.3.1.4** Engine panel for console mounting which includes start/stop switch; engine oil temperature and pressure; Jacket water temperature and Pressure; Engine tachometer and hour meter; instrument lights.
- 7.3.1.5** Fernstrum Keel Cooler suitable for Salt-water application and installation on un-painted Aluminum hulls. (Model CA1642U or equivalent)

- 7.3.1.6 14V / 80A marine alternator.
- 7.3.1.7 Charging regulator with battery sensor.
- 7.3.1.8 Volt Electric Starting motor.
- 7.3.1.9 Manual pump for changing oil.
- 7.3.1.10 The engine, thruster, steering and hydraulic systems shall be capable of operation for a minimum of 15 minutes (minimal loading) while the barge is out of the water and shall not be fitted with any fittings or systems that require raw water supply for cooling or lubrication.
- 7.3.1.11 The Contractor shall include in the bid price the cost of a visit from an authorized engine representative who is to view the installation and provide a written certificate that the engine is installed in accordance with the manufacturer's instructions and is operating correctly.

7.3.2 TRANSMISSION

- 7.3.2.1 The transmission shall be a Borg Warner Velvet Drive Model 72CR (1:1 ratio). The transmission shall be supplied and installed by the Contractor and shall consist of all components required for a complete system.
- 7.3.2.2 A transmission oil pressure and temperature gauge shall be installed in the pilothouse.

7.3.3 DRIVE TRAIN

- 7.3.3.1 The barge shall be fitted with a drive train that connects the transmission to the steerable thruster. The drive train shall comprise of drive shafts, universal joints and watertight bulkhead bearings, which allow the drive shaft to pass through two watertight bulkheads at frame #3 and #8. All universal joints and watertight bulkhead bearings shall have grease nipples.
- 7.3.3.2 The drive shafts in the engine room and aft void space shall be fitted with removal guards to protect personnel from the rotating shafts and to ensure the shafts cannot be fouled by ropes.

7.3.4 STEERABLE THRUSTER

- 7.3.4.1 The Contractor shall supply and install an Olympic 360 degree Steerable Thruster - model SD-1. The thruster shall be supplied and installed as per the thruster manufacturer's installation instructions.
Supplier:
Olympic Drives & Equipment Ltd.
#120 - 6751 Graybar Road
Richmond BC, Canada V6W-1H3
Telephone: 604-207-8444
Fax: 604-207-8441
- 7.3.4.2 The Thruster shall be fitted with an Osborne 24 X 14 Right Hand Propeller.
- 7.3.4.3 The thruster shall be fitted with Ti360 Olympic Thrust Indicator System and is comprised of:

- 7.3.4.3.1 LCD display dimensions in a waterproof housing, mounted at the operator's console, overall Dimensions: 9 1/8"L x 4 1/2"W x 3"H. 12 to 24 VDC with a 270 mA power consumption and 25 feet of cable.
- 7.3.4.3.2 Encoder mounted in a waterproof housing, overall Dimensions: 4 3/4" diameter x 6"H. 12 to 24 VDC with a 18 mA power consumption with a 7/8" shaft with a 1/4" key
- 7.3.4.4 The thruster shall be steered using a hydraulic system which provides smooth steering operation at slow increments of the wheel or jog lever. See drawing 14460-10 of Appendix A.
- 7.3.4.5 The engine-driven pump and clutch shall be rated for the full load engine rpm of the engine (2600rpm).
- 7.3.4.6 There must be a mechanism for disengaging the hydraulic drive for the thruster and placing the thruster in a neutral position. The selector switch or control shall be located at the operators position.
- 7.3.4.7 The thruster hydraulic header tank shall be fitted with a dipstick. The hydraulic reservoir shall be fitted with a combined sight glass/thermometer located on the side of tank closest to the hatch to the compartment, and be easily visible for that side.

7.3.5 DECK HYDRAULICS

- 7.3.5.1 The deck hydraulic system shall be comprised of two Pullmaster PL5 deck winches and an engine driven hydraulic pump (Parker PAVC 33 – Variable Volume Piston Pump or Equivalent). The pump shall be engaged using an electro-mechanical clutch (Ogura Electric Clutch 8030212 or Equivalent), operated by a switch in the pilothouse.
- 7.3.5.2 The engine-driven pump and clutch shall be rated for the full load engine rpm of the engine (2600rpm).
- 7.3.5.3 Hydraulic filters shall be contractor supplied and installed as per manufacturer's requirements.
- 7.3.5.4 All fittings and connections shall be stainless steel.
- 7.3.5.5 A hydraulic system pressure gauge shall be installed in the pilothouse.

7.3.6 EXHAUST SYSTEM

- 7.3.6.1 All exhaust piping shall be stainless steel.
- 7.3.6.2 The engine shall be fitted with a dry exhaust, complete with expansion bellows, silencer and exhaust pipe as per the manufacturer's recommendations.
- 7.3.6.3 The exhaust pipe shall be routed aft and up through the deck aft of the pilothouse. Height shall be sufficient to clear smoke above deckhouse level.
- 7.3.6.4 Exhaust pipe shall be insulated and lagged over its length.
- 7.3.6.5 A protective perforated stainless steel guard shall be fitted around exhaust pipe between the main deck and deckhouse top.
- 7.3.6.6 The uppermost section of the exhaust which is above the roof of the pilot house shall have a bolted and flanged joint to allow for the removal of this section during transportation of the barge.

7.3.6.7 The exhaust shall be fitted in such a manner to prevent rain and or snow from entering the exhaust piping.

7.3.7 COOLING SYSTEM

7.3.7.1 The engine shall be supplied and installed with keel cooling. The keel cooler shall be a Fernstrum grid cooler Model CA1642U-S2 for installation on unpainted aluminum hulls. The keel cooler shall be installed on the sloping area of the hull, fwd of the thruster between Frames #3 and #4.

7.3.7.2 The engine, thruster, steering and hydraulic systems shall be capable of operation for a minimum of 15 minutes while the barge is out of the water and shall not be fitted with any fittings or systems that require raw water supply for cooling or lubrication.

7.3.8 PROPULSION CONTROLS

7.3.8.1 One Morse or equivalent engine speed control shall be supplied and installed in the deckhouse console, complete with one control cable to the main engine speed control and a control for the operation of the hydraulic drive for the thruster.

7.3.8.2 One "Thruster Angle" indicator shall be provided in the deckhouse to show rotation and location of the steerable thruster unit.

7.3.8.3 There must be a mechanism for disengaging the hydraulic drive for the thruster and placing the thruster in a neutral position. The selector switch or control shall be located at the operator's position.

7.3.8.4 The controls shall be fitted with a Neutral Safety Switch so that the engine cannot be started with the transmission/thruster engaged. The control shall have positive indication of the neutral position.

7.4 ELECTRICAL

7.4.1 GENERAL

7.4.1.1 The S.P. Barge shall be fitted with a 12 volt DC electrical system to suit shipboard operations and a 120 V AC shore power supply to suit shipboard requirement when secured alongside, or when stored onboard a larger vessel in its davits.

7.4.1.2 Cables that exit or enter exposed surfaces shall be fitted with an approved marine watertight gland. All cables shall be secured with cable straps or run in cableways. All cables shall be protected from chaffing on any plate edges.

7.4.2 ALTERNATOR

7.4.2.1 The DC alternator shall be supplied with the main engine package suitable for an output to 14V and a rating of 80 amps. The alternator shall be suitable for charging shipboard batteries (starting and ship service) and running all electrical components.

7.4.2.2 Noise suppression shall be incorporated to prevent interference with shipboard electronics.

7.4.2.3 Alternator shall be easily removable to facilitate renewal of belts and for maintenance purposes.

7.4.3 BATTERIES

7.4.3.1 The barge shall be fitted with a dual battery / dual battery Isolation selector switch configuration. One battery shall be for engine starting and the other shall be for operating auxiliary equipment. The battery selector / isolation switch shall allow for either battery to perform either operation.

7.4.3.2 The batteries shall be Marine Grade, Deep Cycle with a minimum of 850 cold cranking amps such as the Excidie Model EXI 31NG-24 or Equivalent.

7.4.3.3 An ammeter shall be installed in the deckhouse.

7.4.3.4 Battery condition gauge(s) shall be fitted in the deckhouse.

7.4.4 AC SHORE POWER

7.4.4.1 The shore power cable shall not be permanently connected to the AC shore supply panel. The system shall comprise of a Marine Grade 30A watertight male connector receptacle (Marinco Easy Lock 301EL-8 or equivalent) mounted in a location easily accessible with all doors and covers in a closed position. Doors and/or covers shall be of watertight construction. The Contractor shall supply 50 feet of shore power cable complete with a corresponding female connector to match the shore power receptacle.

7.4.5 AC DISTRIBUTION PANEL

7.4.5.1 The Contractor shall supply and install one 120-volt AC distribution panel to provide the following 120 VAC services: Each circuit shall be provided with a breaker to suit the required current rating and the panel shall be fitted with a main breaker.

Circuits:

1. Engine room receptacle
2. Jacket water heater
3. Battery charger
4. Pilot House Heater

7.4.5.2 The Contractor shall supply and install all the wiring and fittings for each circuit. Electrical components shall be robust and have recognized marine standard and supply. Deck, bulkhead and deck head penetrations and cable transits shall be via watertight glands.

7.4.6 BATTERY CHARGER

7.4.6.1 The contractor shall supply and install a 120 v AC Marine Grade Electronic Controlled Battery Charger such as the Guest 2630 Charge Pro or Equivalent. The Charger shall have fully automatic operation (float / trickle), has the ability to charge multiple batteries, automatic reset overload protection and shall have an indicator of charging function.

7.4.7 DC DISTRIBUTION PANEL

7.4.7.1 The Contractor shall supply and install one 12 VDC distribution panel to provide the following 12 VDC services: Each circuit shall be

provided with a breaker to suit the required current rating plus the panel shall have a main breaker.

Circuits:

1. Two window wipers and windshield wash systems (fwd and aft windows), Two fan/heater units.
2. Two outside deck lights.
3. Electric bilge pump No. 1 and Electric bilge pump No. 2
4. Navigation lights - One interior deckhouse light, one compass light, Port Navigation Light, Starboard Navigation Light, Masthead Light, Stern Light. One searchlight.
5. Navigational equipment: One VHF radio, One depth sounder, One differential GPS, One horn
6. Two lights in engine room
7. One 12 VDC Auxiliary socket - mounted in deckhouse.
8. Electro-mechanical clutch for deck winches.
9. One spare circuit.
10. One spare circuit.

7.4.7.2 The Contractor shall supply and install all the wiring and fittings for each circuit. Electrical components shall be robust and have recognized marine standard and supply. Deck, bulkhead and deck head penetrations and cable transits shall be via watertight glands.

7.4.8 SEARCH LIGHT

7.4.8.1 The Contractor shall supply and install a 12v DC searchlight on the deckhouse top. The searchlight shall be a minimum 100,000 candlepower, 12V 50W (Rayline 135 RL Remote Control Search Light or equivalent.) and shall be electronically controlled with a remote control panel located inside the deckhouse.

7.4.9 WINDSHIELD WIPERS

7.4.9.1 The Contractor shall supply and install one 12-v DC marine windshield wiper on the deckhouse front window and aft window. Each shall be complete with heavy-duty stainless steel motor arm, and wiper blade.

7.4.9.2 Each windshield wiper shall be fitted with a wash system complete with storage bottle and 12 volt electric pump.

7.4.10 FAN/HEATER

7.4.10.1 The Contractor shall supply and install two 12 v DC marine fan / heater units in the deckhouse for de-misting and de-frosting of windows. Units shall have built-in heater coil and be capable of turning in all directions. Units shall be mounted overhead and positioned to blow air onto each window.

7.4.11 HORN

7.4.11.1 The contractor shall supply and install one single tone 12 v DC marine horn on the deckhouse top, which shall be operated by a button/switch mounted on the console in the deckhouse.

7.4.12 BILGE PUMPS

- 7.4.12.1 The Contractor shall supply and install all components for the bilge pumping system including:
- 7.4.12.1.1 One electric Rule 2000 bilge pump (or equivalent) installed in the engine room
 - 7.4.12.1.2 One electric Rule 2000 bilge pump (or equivalent) installed in the aft void space below the deckhouse.
 - 7.4.12.1.3 One emergency hand operated bilge pump shall be mounted at the bulwark rail for direct engine room suction. The pump shall be supplied complete with handle and means to secure in place.
 - 7.4.12.1.4 Each electric pump shall be controlled by a float switch and shall be operated from a Rule 3 Way bilge pump panel (or equivalent) located in the deckhouse which allows for manual and automatic operation and shall be fitted with a spring return "off" from the manual position and the panel shall have indicator light and fuse holder.
 - 7.4.12.1.5 Each overboard discharge shall be fitted with a non-return or check valve to prevent back flooding through the discharge line.
 - 7.4.12.1.6 The bilge pumping arrangement shall allow for the bilge pumps to discharge to a fitting so that the bilge contents can be pumped either directly overboard or to a shore or ship based external recovery tank via a separate connected hose.
- 7.4.12.2 DECK LIGHTS
- 7.4.12.2.1 The Contractor shall supply and install two 12V, 55W Halogen deck spotlights, complete with adjustable mounts fitted at the exterior of the deckhouse, each on its own switch. One light shall be mounted at the forward inboard side and one shall be mounted at the after inboard side.
- 7.4.12.3 NAVIGATION LIGHTS
- 7.4.12.3.1 The Contractor shall supply and install navigation lights and the installation shall comply with the Collision Regulations.
 - 7.4.12.3.2 Lights shall be installed on cabin roof. Masthead light and stern light can be combined into a single light mounted on a pole complete with ratchet mount.
- 7.4.12.4 SYSTEM GROUNDING
- 7.4.12.4.1 The entire DC system including main and auxiliary engine components shall not be grounded to the vessel hull. The 12v DC distribution system shall be a complete two-wire system with the negative wires returning to a common "negative bus" which is completely isolated from the vessel hull.
 - 7.4.12.4.2 The barge shall be fitted with a battery isolator such as the Guest model 1-130-2 or equivalent and shall be fitted with a galvanic isolator such as the Guest model 2433.

7.5 LIFE SAVING AND SAFETY EQUIPMENT

7.5.1 LIFE RAFT

7.5.1.1 The Contractor shall supply and install a Zodiac SY-4 (four-person) life raft complete with cradle, lashings and hydrostatic release. The life raft shall have an inspection date that will not expire before six months after delivery of the barges.

7.5.2 LIFE RINGS

7.5.2.1 The Contractor shall supply and install one life ring with 15-meter line. This life ring shall be installed on the inboard side of the cab complete with support cradle. Life rings shall be Transport Canada, Marine Safety approved in size and type for this class of vessel.

7.6 ENGINE ROOM FIRE SUPPRESSION

7.6.1 The Contractor shall supply and install a fixed fire suppression system for engine room fire protection. The system shall be automatically triggered if an abnormal rise of heat occurs.

7.6.2 The system shall be capable of being discharged manually from the deckhouse and shall have an indication in the deckhouse of the operational status of the system.

7.7 FIRE EXTINGUISHERS

7.7.1 The Contractor shall supply three 10-pound dry chemical fire extinguishers - two for the engine room and one for the cab. The fire extinguishers shall be serviceable by a local company in Dartmouth, Nova Scotia and shall be of an approved size and type for this class of vessel.

7.8 PAINTING AND CORROSION PROTECTION

7.8.1 GENERAL

7.8.1.1 The standard color of the deck, under the wood, inside of wheelhouse and console of the barge must be DFO Slate Grey (RAL7042).

7.8.1.2 Underwater hull must be covered with an anti-fouling paint system, approved for use in Canada and applied to a thickness as recommended by the paint manufacturer.

7.8.1.3 Prior to delivery the Contractor must ensure that all non-painted exposed aluminium is free of cosmetic blemishes, including all construction marks, scratches, gouges and stains.

8.0 TESTS & TRIALS

The Contract Authority and Technical Authority must be notified no less than 2 weeks prior to sea trials. The Technical Authority will witness and attend the sea trials. Sea trial results must be forwarded to the Technical Authority prior to delivery of the barge. For the purpose of the trials, Normal Loaded Condition must be considered to be the basic barge, fitted with all normal equipment, full fuel, with complement and loads per Barge Particulars.

8.1 TESTS - GENERAL

8.1.1 The Contractor must inspect and test the following items, as a minimum, for adherence to the contract requirements and proper operation (proper operation means that the equipment can be started, operated, connected together and demonstrated to function in a normal fashion, as applicable). All discrepancies must be corrected prior to delivery. The required inspections and tests are minimums and are not intended to supplant any

controls, examinations, inspections or tests normally employed by the Contractor to assure the quality of the barge:

- 8.1.1.1 Weight
- 8.1.1.2 Construction Quality
- 8.1.1.3 Lifting Gear, if applicable
- 8.1.1.4 Propulsion Engines, including starting and ancillary systems
- 8.1.1.5 Propulsion Controls
- 8.1.1.6 Steering System
- 8.1.1.7 Fuel System
- 8.1.1.8 Electrical System
- 8.1.1.9 Electronics

8.2 SEA TRIALS - GENERAL

8.2.1 Sea trials must be conducted by the Contractor to demonstrate the barge machinery and its equipment conform to the requirements as stated in the Contract. All expenses incident to the trials must be borne by the Contractor, including fuel unless otherwise specified. A crew provided by the Contractor must operate the barge during sea trials. Upon completion of sea trials fuel tanks must be pressed full prior to delivery of the barge.

8.2.2 All Sea Trial instrumentation and equipment must be furnished and operated by the Contractor. Trial instrumentation, where applicable, must not replace the barge's instruments (e.g., engine tachometer, pressure gauges, and thermometers). The Contractor must furnish all necessary hardware and fittings and must install the measuring devices. After satisfactory completion of the trials, all instrumentation must be removed and all systems restored to their original condition. The Contractor must provide two (2) copies of the calibration data certifying the accuracy of the instrumentation for the tests and include it in the technical publications

8.2.3 The Contractor must submit a Test & Trials Plan, including a description of all of the acceptance trials to be performed. As a baseline, Using Appendix B, with modifications to suit this particular barge. The following trials must be conducted: (the barge must operate in the Normal Load Condition.)

8.2.3.1 Speed Trials - The speed trials must be done over a course at least one (1) nautical mile in length. Two (2) runs must be made over the course, one (1) in each direction with the speeds for the two (2) runs averaged. The use of GPS data (averaged) is acceptable.

8.2.3.2 Endurance Trial - The barge must operate at maximum speed for a minimum of ten (10) minute intervals in the Fully Loaded Condition over one (1) hour period considering the break in procedures of the equipment. During the endurance trials, it must be demonstrated that all parts of the propulsion system are in full operation. All systems must be operated to check for proper lubrication, control and alignment. Fuel consumption must be recorded for the one-hour trial

8.2.3.3 Astern Propulsion - The barge must be operated and manoeuvred using astern propulsion to establish the astern performance. During the backing performance tests the throttles must be set to provide 1/3

of the rated engine horsepower. In order to demonstrate astern performance of the engines in an emergency stop and to test the strength of the foundations, the engine must be subjected to two stops from full power ahead at maximum speed to dead in the water using reverse thrust. Time required to perform this trial must be recorded.

- 8.2.3.4 Steering Gear - Tests must be conducted on the steering gear to demonstrate the adequacy of the steering system under all operations. Manoeuvring tests must be performed to ensure that the barge meets the stated requirements. Manoeuvring trials must be conducted in the Normal Load Condition and repeated in the Full Load Condition.
- 8.2.3.5 The engine, transmission and thruster shall be operated at various speeds including full engine rpm for a period of 30 minutes to ensure that all components are operating within their parameters.
- 8.2.3.6 The sea trial shall include five lifts over the stern roller and onto the deck using a Contractor supplied 2500-pound buoy anchor and five deployments of a 2500-pound buoy stone.
- 8.2.3.7 The completed barge shall have sufficient aft buoyancy so that the stern doesn't submerge when lifting the 2500 pound anchor. There shall be a minimum of 12 inches between the water level and the upper surface of the wooden deck when lifting the load over the stern roller.
- 8.2.3.8 When the barge is in the unloaded condition, the barge must float such that the propeller is fully submerged and the barge shall float upright with no Port or Stbd List.

8.2.4 Final Inspection and Acceptance (PWGSC Acceptance Document) for delivery Final Inspection must not be performed until all tests have been satisfactorily completed with data available for review. The barge must be ready for delivery in all respects, except for final preparation for shipment. The Contractor must provide personnel, as required, to resolve questions and to demonstrate equipment operation maintenance accessibility, removal and installation. The Contractor must document the results of the Final inspection and provide these results to the Technical Authority.

- 8.2.4.1 Final Acceptance upon delivery, the Technical Authority, or a representative of the Technical Authority will conduct the final delivery inspection. The Contractor must repair any damage to the barge or ancillary equipment resulting from shipping, to the satisfaction of the Technical Authority.

9.0 DOCUMENTATION

9.1 GENERAL

- 9.1.1 All documentation must be provided in both official languages (French and English)

9.2 NATIONAL ASSET CODE

9.2.1 The National Asset Code for this BARGE is VYA61. The contractor must add this 5 character code to the builder's plate of each barge with the prefix "National Asset Code".

9.3 BUILDER'S PLATE

9.3.1 A Builder's Plate must be affixed to each asset in a readily visible location, e.g. for a barge, in way of the helm position, for a trailer on the left side of the tongue.

9.3.2 The plate must be made of a weather resistant material compatible with that to which it is affixed.

9.3.3 The dimensions of the plate must be not less than 200mm x 125mm

9.3.4 The plate must contain the following information, permanently etched:

9.3.4.1 National Asset Code;

9.3.4.2 Naval Architect/Designer;

9.3.4.3 Builder;

9.3.4.4 Hull Number;

9.3.4.5 Year of Construction;

9.3.4.6 Call Sign (if applicable); and

9.3.4.7 Lightship Weight in kilograms.

9.4 TECHNICAL PUBLICATIONS

9.4.1 Contractor must provide, upon delivery of the barge, complete sets of technical publications of a comprehensive owner/operator manual that provides a physical and functional description of the barge, it's machinery and equipment, as well as delivery testing and sea trial result documentation. The cost of these manuals must be included in the Contractor's bid. The manuals must include but not be limited to sections: **General Information, Technical Information, Spare Parts List, Shop and Sea trial Data, Stability Booklet and Acceptance Certificates.**

9.4.2 The contractor is to provide copies of the technical publications as follows:

9.4.2.1 one (1) complete hard copy and one (1) complete CD electronic copy set of technical publications per barge produced for the operator of the barge, to be delivered with the barge.

9.4.2.2 one (1) complete hard copy and one (1) complete CD electronic copy set of technical publications per barge produced for the Technical Authority, to be delivered to the same address identified for invoices.

9.4.3 GENERAL INFORMATION SECTION

9.4.3.1 The General Information Section must include a description of the arrangement and function of all structures, systems, fittings and accessories that comprise the barge, with illustrations as appropriate:

9.4.3.1.1 Operating procedures;

9.4.3.1.2 Basic operating characteristics (such as temperatures, pressures, flow rates)

9.4.3.1.3 Installation criteria and drawings, assembly and disassembly instructions with comprehensive illustrations showing each step;

9.4.3.1.4 Recommended planned maintenance; and

9.4.3.1.5 Complete troubleshooting procedures.

9.4.4 TECHNICAL INFORMATION SECTION

9.4.4.1 The Contractor must supply three copies each of the following

documents for the barge to the Technical Authority. The cost of these manuals must be included in the Contractor's bid.

- 9.4.4.1.1 Engine Instruction Manual
- 9.4.4.1.2 Transmission Instruction Manual
- 9.4.4.1.3 Thruster Instruction Manual
- 9.4.4.1.4 Hydraulic Winch Instruction Manual
- 9.4.4.1.5 Navigation Equipment Manuals
- 9.4.4.1.6 Electrical system Manuals
- 9.4.4.1.7 Engine room Fire suppression System Manual.
- 9.4.4.2 These manuals must be the original manufacturer's manuals and must be contained in a binder. Each binder must contain a data page which lists all the pertinent data for the barge and components including but not limited to: Barge serial number: Barge particulars such as length, breadth: Engine model and serial number: Thruster model and serial number: Transmission model and serial number: Hydraulic pumps and clutches: Hydraulic Winch models and serial numbers: Navigation Equipment models and serial numbers (depth sounder, VHF radio, DGPS): Battery types; Battery charger model and serial number: Propeller model and serial number: Deck hatch models: Engine room fire suppression system.
- 9.4.4.3 The binder must include a written description of the operation of the main systems such as: Engine operation (starting, stopping): Engine alarm signals: Hydraulic system operation including operation of any clutches, PTO's and alarms: Electrical system operation including description of shore power charging, single and dual battery operation and position of battery switches: Thruster Operation including a description of the steering system mechanism and controls. Stern Roller operation, maintenance and removal procedure: Procedure for removal of engine room hatch: Procedure for removal of wooden decking: Engine room fire system description and operation: Bilge pumping system description and operation.

9.4.5 SPARE PARTS LIST

- 9.4.5.1 The list must include the name, part number and serial number if applicable of the parts, items or components and must indicate the supplier (name, address, phone number, email address) of this part, equipment or component and in which part of the specification the item appears.

9.4.6 SHOP AND SEA TRIAL DATA

- 9.4.6.1 Pre-trial shop Testing Check Sheets.
- 9.4.6.2 Completed Sea Trial results as per Appendix B.

9.4.7 STABILITY BOOKLET

- 9.4.7.1 The contractor must produce a stability booklet for the completed barge. The stability booklet must comply with the requirements described in Transport Canada publication TP 7301 Stability, Subdivision and Load Line Standards and indicate the Intact and Damages Stability for the constructed barge.

9.4.8 ACCEPTANCE CERTIFICATES

9.4.8.1 Compliance sheets or certificates distributed with equipment i.e. life-saving appliances, lifting appliances, engine test reports, calibration certificates, Navigation light certificates, Fire suppression material certificates, flotation foam rating sheets.

9.5 ADDITIONAL DELIVERABLE DOCUMENTATION

9.5.1 The following additional documentation must be delivered with each barge:

9.5.1.1 Tonnage Registration Certificate in accordance with TP 13430 -

<http://www.tc.gc.ca/eng/marinesafety/svcp-gt-3948.htm>

9.5.1.2 Contractor must complete the applicable portion of the Small Vessel Compliance Program (SVCP) spreadsheet as per the SVCP Website: <http://www.tc.gc.ca/eng/marinesafety/svcp-menu-3633.htm>
Sign the form and provide a pdf copy with the original spreadsheet for the operator of the Barge.

9.5.1.3 A Bill of Sale for the Barge.

10.0 SHIPPING AND DELIVERY

10.1 GENERAL

Prior to shipping, the barge is to be cleaned, appropriately protected and covered in accordance with the instructions specified in this section.

10.1.1 Compartments, bilges, decks and machinery spaces throughout the barge must be thoroughly cleaned of all dirt and residue prior to the acceptance of barge.

10.1.2 The barge must be delivered address with all fuel, hydraulic oil, lube oil, and systems full and in operating order.

10.1.3 Prior to or at the time of acceptance of the barge, the Contractor must supply the Technical Authority with all documents, drawings, manuals, certification and papers pertaining to the barge as required in this specification.

10.1.4 Delivery of the barge is FOB to the Canadian Coast Guard Base in Dartmouth, Nova Scotia. The Contractor's bid must include all the costs for transport, and unloading at destination.

APPENDIX A

List of Drawings

DRAWINGS for Bidders

The following list of drawings is supplied in a pdf file (F7047-150004 Drawings) and are to be utilized in conjunction with the TSOR here in for bid purposes.

- 1 General Arrangement
- 2 Console Gauges
- 3 Lines plan and Offsets
- 4 Structural Arrangement @ Deck & Bottom
- 5 Structural Details – Side Profile Details
- 6 Structural Details – Sections & Details
- 7 Structural Details – Sections & Details
- 8 Bottom Fender
- 9 Deckhouse Structure
- 10 Hydraulic Arrangement
- 11 Electrical Arrangement
- 12 Stern Roller Detail Drawing
- 13 Bow Ramp Detail Drawing
- 14 Engine Seating Arrangement Drawing
- 15 Z-Drive Thruster Mounting Drawing

Upon completion of construction of this barge, the Contractor shall provide the following as-fitted drawings to reflect the updated changes. The contractor must supply two hard copies and one electronic copy to the Technical Authority prior to delivery of the barge, as follows:

- 1 General Arrangement
- 2 Console Gauges
- 3 Lines plan and Offsets
- 4 Structural Arrangement @ Deck & Bottom
- 5 Structural Details – Side Profile Details
- 6 Structural Details – Sections & Details
- 7 Structural Details – Sections & Details
- 8 Bottom Fender
- 9 Deckhouse Structure
- 10 Hydraulic Arrangement
- 11 Electrical Arrangement
- 12 Stern Roller Detail Drawing

- 13 Bow Ramp Detail Drawing
- 14 Engine Seating Arrangement Drawing
- 15 Z-Drive Thruster Mounting Drawing

As Fitted Drawing Format:

The contractor shall supply the identified drawings using the Canadian Coast Guard Drafting Standard which identifies items such as: Annotation style, Pen and Color Standard, Dimension Details, Line types, symbols, layer system, Drawing numbers, project numbers, typical title block etc. The successful contractor will be provided with a CG supplied AutoCAD template for the drawings. The cost of providing the “As Fitted” drawings as electronic copies shall be included in the Contractor’s bid price. The drawings shall become the property of the Canadian Coast Guard.

APPENDIX B

Tests and Trials Sheet

APPENDIX B

SMALL CRAFT / VESSEL TESTS & TRIALS SHEET

CONTRACT # F7047-150004

Small Craft / Vessel Builder:			
Small Craft / Vessel Description:			
Hull Identification Number:			
National Asset Code:			
Date of Trials:			
Personnel in Attendance:			
Builder			
PWGSC			
DFO			
DFO			
Time: _____ hrs Departing from _____			
Small Craft / Vessel Weights:	Dry Weight of Hull with cabin:		_____ lbs/ _____ kg
	Furnishings & Fittings:		_____ lbs/ _____ kg
	Engines & Equipment:		_____ lbs/ _____ kg
	Fuel:	Fuel:	_____ lbs/ _____ kg
	_____ Imp gal	_____ Litres	
	Total Weight of Small Craft/Vessel:		_____ lbs/ _____ kg
	Number of Crew _____ and operating equipment:		_____ lbs/ _____ kg
	Test Total Laden Weight:		_____ lbs/ _____ kg
	Trailer weight:		_____ lbs/ _____ kg
Boat & Trailer weight:		_____ lbs/ _____ kg	
Motors: Starting -		Port	<input type="radio"/> Immediate, Yes / No

Operation "IDENTIFY INBOARD/OUTBOARDS"		Starboard	<input type="radio"/> Immediate, Yes / No
Propellers/Impellers	Pitch		_____
	Diameter		_____
	No. of Blades		_____
	Stainless Steel or Aluminum		<input type="radio"/> S/S <input type="radio"/> AL
Static Attitude & Trim:			
Weather Conditions: Refer to attached Beaufort Wind Scale. BWS No. _____			
Speed Trials	Speed Required _____ - _____ knots		
	Cruising Speed: measured mile 1 way		_____ kts @ _____ rpm
	Cruising Speed: measured mile return		_____ kts @ _____ rpm
	Averaged Cruising Speed:		_____ kts @ _____ rpm
	Maximum Speed: measured mile 1 way		_____ kts @ _____ rpm
	Maximum Speed: measured mile return		_____ kts @ _____ rpm
	Average Maximum Speed _____ kts @ _____ rpm		
Full Throttle	From dead stop to plane		_____ seconds
	From dead stop to 30 knots		_____ seconds
Astern Propulsion:	Straight line to 2000 rpm		<input type="radio"/> Issues, Yes / No
	Hard a-port		<input type="radio"/> Issues, Yes / No
	Hard a-starboard		<input type="radio"/> Issues, Yes / No
	Emergency stop		_____ seconds
Tubes (if applicable)	No. of Chambers		_____

	Semi-auto fill system	<input type="radio"/> Yes / No
	Time to fill all chambers	_____ seconds
Endurance Trials: X = gallons or Litres	Fuel consumption	
	Port & Starboard Motor: at cruise:	_____X/hr @ _____rpm
	Port & Starboard Motor: at full throttle:	_____X/hr @ _____rpm
Steering: Acceptable Y /N	Straight line	<input type="radio"/> Yes / No
	Hard-Port radius of turn. Full Throttle	_____ feet
	Hard-Stbd radius of turn. Full Throttle	_____ feet
	Lock to lock = 35 degrees pt. & stbd	<input type="radio"/> Yes / No
	Effective steering 0-5 knots	<input type="radio"/> Yes / No
	5-10 knots	<input type="radio"/> Yes / No
	20-30 knots	<input type="radio"/> Yes / No
	Full speed	<input type="radio"/> Yes / No
Outboard/Inboard Leg Trim Control:	From fully raised to fully lowered.	<input type="radio"/> Acceptable Yes / No
Trim Tab Operation:	Fully raised, fully lowered.	<input type="radio"/> Acceptable Yes / No
Engine Controls:	Start	<input type="radio"/> Issues, Yes / No
	Shift	<input type="radio"/> Issues, Yes / No
	Throttle	<input type="radio"/> Acceptable Yes / No
Engine Gauges:	Tachometer	<input type="radio"/> Acceptable Yes / No
	Fuel gauges	<input type="radio"/> Acceptable Yes / No
	Trim gauges	<input type="radio"/> Acceptable Yes / No
	Oil pressure	<input type="radio"/> Acceptable Yes / No
Engine Gauges:	Voltmeter	_____ volts

Cabin Sound Levels:	Cruising speed- door & windows closed	_____dbA @ _____rpm
	Cruising speed- door & windows open	_____dbA @ _____rpm
	Full speed- door & windows closed	_____dbA @ _____rpm
	Full speed- door and windows open	_____dbA @ _____rpm
Outboard/Inboard engine operation:	Starting	<input type="radio"/> Acceptable Yes / No
	Shifting	<input type="radio"/> Acceptable Yes / No
	Throttle	<input type="radio"/> Acceptable Yes / No
	Raise	<input type="radio"/> Acceptable Yes / No
	Lower	<input type="radio"/> Acceptable Yes / No
Loaded Vessel Drop Test:	If applicable	<input type="radio"/> Acceptable Yes / No
Lifting Bridle Certified:	If applicable	<input type="radio"/> Acceptable Yes / No
Rollover test	If applicable	<input type="radio"/> Acceptable Yes / No
<u>NOTES</u>		

Beaufort Wind Scale Identifier

Force	Wind Speed		Descriptive Term	Effects Observed at Sea	Effects Observed on Land
	Km/h	Knots			
0	Less than 1	Less than 1	Calm	Sea surface like a mirror, but not necessarily flat.	Smoke rises vertically.
1	1 - 5	1 - 3	Light air	Ripples with the appearance of scales are formed, but without foam crests.	Direction of wind shown by smoke drift, but not wind vanes.
2	6 - 11	4 - 6	Light breeze	Small wavelets, still short but more pronounced. Crests do not break. When visibility good, horizon line always very clear.	Wind felt on face. Leaves rustle. Ordinary vane moved by wind.
3	12 - 19	7 - 10	Gentle breeze	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered whitecaps.	Leaves and small twigs in constant motion. Wind extends light flag.
4	20 - 28	11 - 16	Moderate breeze	Small waves, becoming longer. Fairly frequent whitecaps.	Raises dust and loose paper. Small branches are moved.
5	29 - 38	17 - 21	Fresh breeze	Moderate waves, taking a more pronounced long form. Many whitecaps are formed. Chance of some spray.	Small trees with leaves begin to sway. Crested wavelets form on inland waters.
6	39 - 49	22 - 27	Strong breeze	Large waves begin to form. The white foam crests are more extensive everywhere. Probably some spray.	Large branches in motion. Whistling heard in telephone wires. Umbrellas used with difficulty.
7	50 - 61	28 - 33	Near gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.	Whole trees in motion. Inconvenience felt in walking against wind.
8	62 - 74	34 - 40	Gale	Moderately high waves of greater length. Edges of crests begin to break into the spindrift. The foam is blown in well-marked streaks along the direction of the wind.	Breaks twigs off trees. Generally impedes progress. Walking into wind almost impossible.
9	75 - 88	41 - 47	Strong gale	High waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility.	Slight structural damage occurs, e.g. roofing shingles may become loose or blow off.
10	89 - 102	48 - 55	Storm	Very high waves with long overhanging crests. Dense white streaks of foam. Surface of the sea takes a white appearance. The tumbling of the sea becomes heavy and shock-like. Visibility affected.	Trees uprooted. Considerable structural damage occurs.
11	103 - 117	56 - 63	Violent storm	Exceptionally high waves. Sea completely covered with long white patches of foam. Visibility affected.	Widespread damage.
12	118 - 133	64 - 71	Hurricane	Air filled with foam and spray. Sea entirely white with foam. Visibility seriously impaired.	Rare. Severe widespread damage to vegetation and significant structural damage possible.



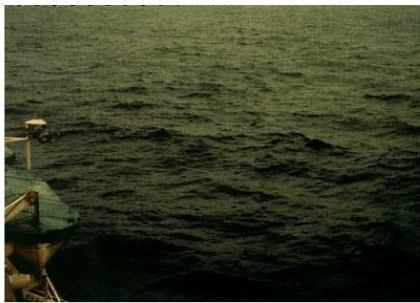
BEAUFORT FORCE 0
WIND SPEED: LESS THAN 1 KNOT
SEA: SEA LIKE A MIRROR



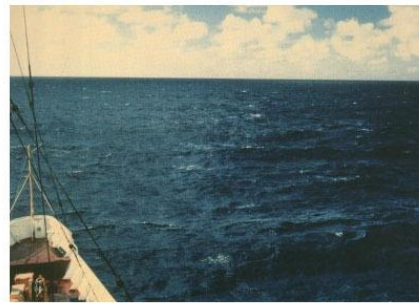
BEAUFORT FORCE 1
WIND SPEED: 1-3 KNOTS
SEA: WAVE HEIGHT 1M (25FT), RIPPLES WITH THE APPEARANCE OF SCALES, BUT WITHOUT FOAM CRESTS



BEAUFORT FORCE 2
WIND SPEED: 4-6 KNOTS
SEA: WAVE HEIGHT 2-3M (5-10FT), SMALL WAVELETS, CRESTS HAVE A GLASSY APPEARANCE AND DO NOT BREAK



BEAUFORT FORCE 4
WIND SPEED: 11-16 KNOTS
SEA: WAVE HEIGHT 1-1.5M (3.5-5FT), SMALL WAVES BECOMING LONGER, FAIRLY FREQUENT WHITE HORSES



BEAUFORT FORCE 5
WIND SPEED: 17-21 KNOTS
SEA: WAVE HEIGHT 2-2.5M (6-8FT), MODERATE WAVES TAKING MORE PRONOUNCED LONG FORM, MANY WHITE HORSES, CHANCE OF SOME SPRAY



BEAUFORT FORCE 6
WIND SPEED: 22-27 KNOTS
SEA: WAVE HEIGHT 3-4M (9.5-13 FT), LARGER WAVES BEGIN TO FORM, SPRAY IS PRESENT, WHITE FOAM CRESTS ARE EVERYWHERE



BEAUFORT FORCE 7
WIND SPEED: 28-33 KNOTS
SEA: WAVE HEIGHT 4-5.5M (13.5-19 FT), SEA HEAPS UP, WHITE FOAM FROM BREAKING WAVES BEGINS TO BE BLOWN IN STREAKS ALONG THE WIND DIRECTION



BEAUFORT FORCE 8
WIND SPEED: 34-40 KNOTS
SEA: WAVE HEIGHT 5.5-7.5M (18-25FT), MODERATELY HIGH WAVES OF GREATER LENGTH, EDGES OF CREST BEGIN TO BREAK INTO THE SPINDRIFT, FOAM BLOWN IN WELL MARKED STREAKS ALONG WIND DIRECTION.



BEAUFORT FORCE 9
WIND SPEED: 41-47 KNOTS
SEA: WAVE HEIGHT 7-10M (23-32FT), HIGH WAVES, DENSE STREAKS OF FOAM ALONG DIRECTION OF THE WIND, WAVE CRESTS BEGIN TO TOPPLE, TUMBLE, AND ROLL OVER. SPRAY MAY AFFECT VISIBILITY.



BEAUFORT FORCE 10
WIND SPEED: 48-55 KNOTS
SEA: WAVE HEIGHT 9-12.5M (29-41FT), VERY HIGH WAVES WITH LONG OVERHANGING CRESTS, THE RESULTING FOAM, IN GREAT PATCHES, IS BLOWN IN DENSE WHITE STREAKS ALONG WIND DIRECTION. ON THE WHOLE, SEA SURFACE TAKES A WHITE APPEARANCE, TUMBLING OF THE SEA IS HEAVY AND SHOCK-LIKE, VISIBILITY AFFECTED.



BEAUFORT FORCE 11
WIND SPEED: 56-63 KNOTS
SEA: WAVE HEIGHT 11.5-16M (37-52FT), EXCEPTIONALLY HIGH WAVES, SMALL-MEDIUM SIZED SHIPS MAY BE LOST TO VIEW BEHIND THE WAVES. SEA COMPLETELY COVERED WITH LONG WHITE PATCHES OF FOAM LYING ALONG WIND DIRECTION. EVERYWHERE, THE EDGES OF WAVE CRESTS ARE BLOWN INTO FROTH.



BEAUFORT FORCE 12
WIND SPEED: 64 KNOTS
SEA: SEA COMPLETELY WHITE WITH DRIVING SPRAY, VISIBILITY VERY SERIOUSLY AFFECTED. THE AIR IS FILLED WITH FOAM AND SPRAY