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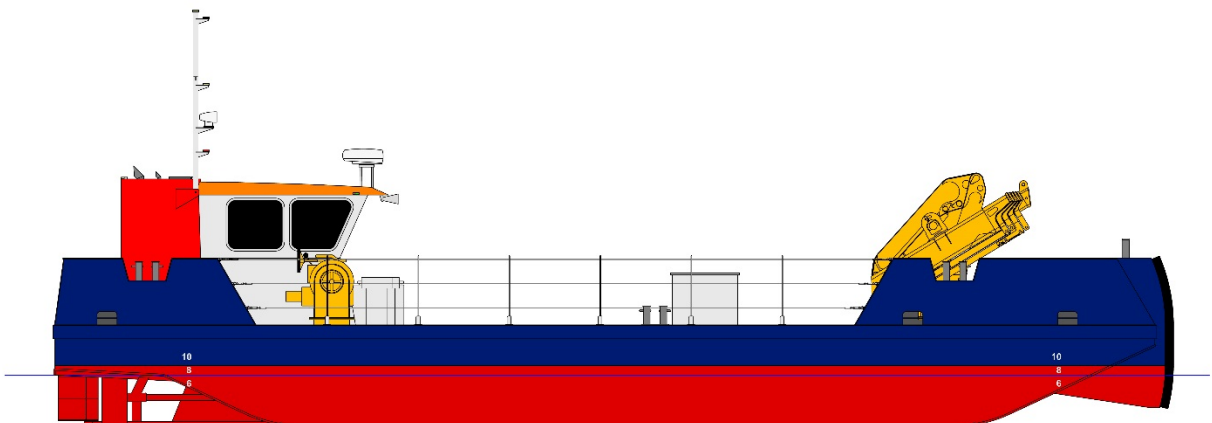
SPECIFICATION

for

Ebbsfleet 1- SPLIT-HULL

MULTI-PURPOSE WORK VESSEL BY

EBBSFLEET MARINE LTD.



GENERAL PARTICULARS

Length Overall	16.85 Metres
Moulded Hull Length	16.50 Metres
Maximum Beam	7.07 Metres
Breadth Moulded (each hull)	3.43 Metres
Breadth Moulded (hull connected)	7.00 Metres
Depth Moulded	1.50 Metres
Load Line Draught	1.10 Metres
Nominal Draught	0.75 Metres
Maximum Displacement	107.00 Tonnes
Deadweight	50.00 Tonnes
Main Engines	Twin Doosan model L136TI turbocharged and intercooled marine diesels each developing 169 kW (230 bhp) at 2200 rpm, fitted with a DI model DMT110A reverse reduction gearbox with a reduction ratio of 2.82:1.
Maximum Speed at Full Load (about)	8 Knots
Bollard Pull (about)	5 Tonnes
Classification	UK Workboat Code, Category 2, 60 NM from a safe haven.
Scantlings	Lloyd's Special Service Craft, G2A, Workboat.
Builder	Ebbsfleet Marine Ltd., Berth 5, Gillingham Gate, Chatham Docks, Chatham, Kent, ME4 4SW.

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Section 1

NOTES

1.1 Introduction

This specification describes a Cladar 1607S, 16.5 Metre multi-purpose work vessel, herein after referred to as *'The Craft'*. It is designed by *Ian Darley.*, herein after referred to as *'The Designer'* and is to be built by *Ebbsfleet Marine Ltd*, herein after referred to as *'The Builder'*.

Both this specification and design to which it refers are confidential and protected by copyright; they shall not be reproduced or used for manufacture without the express permission, in writing, of the Designer.

1.2 Drawings and Information

The Builder has appointed the Designer for the preparation of the working plans, oversee construction and final acceptance trials.

1.3 Precedence and Amendments

Where information contained in this specification may differ from that contained in the design drawings the specification shall be deemed correct. Specification amendments may be produced from time to time; these will only be issued after full agreement has been obtained from all parties they may affect, once circulated the amendments will supersede any previous description.

Section 1

1.4 Stability

The intact stability of the craft will comply with the UK Code of Practice for the Safe Operation of Small Workboats and Pilot Boats 1998, as revised 2013, (Brown Code Revision).

The Designer will prepare a stability information booklet after completion of satisfactory sea trials and the inclining experiment, which will be carried out at the Builder's shipyard.

After approval of the stability data by the Certifying Authority two stamped and approved copies of the full stability information booklet will be supplied, by the Designer; of which one copy will be placed on board the craft.

1.5 Dock Trial

Dock trials will be undertaken at the Builder's shipyard, to ensure correct performance of all machinery. During this trial the propulsion, auxiliary and deck machinery will be thoroughly tested.

All pumps and pipeline systems and associated valves and cocks, and ventilation systems will be fully tested. The bilge and fire pumps will be tested on their respective systems and satisfactory operation demonstrated in all modes of operation. Suction lift of all pumps will be proven.

Ventilation and exhaust systems, all water systems, with all pipes and fittings, will be demonstrated to operate satisfactorily.

All control systems; electrical circuits and equipment will be fully tested. All safety devices will be shown to operate satisfactorily.

All data and records obtained during trials will be carefully analysed, properly tabulated and incorporated in a Trials Record Book to be prepared by the Designer.

Section 1

1.6 Sea Trials

Sea trials will be carried out in accordance with the programme prepared by the Builder, at a suitable location and in favourable weather conditions adjacent to the Builder's shipyard.

During sea trials the following tests will be undertaken with the vessel fully equipped: -

Speed trial – One double run, over a measured distance and at an agreed water depth, at 75% maximum main engine rating and two double runs at 100% maximum engine rating. For each power rating the trail speed will be the 'mean of means' of the recorded speed in each direction.

Endurance trial – The endurance trial will be about one hour duration with the main engines at maximum power.

Reversing trial – With the propulsion system in the reverse position the craft is to be run astern for about 200 Metres.

Steering trial – The rudders will be turned fully to port and held for so long as it takes the craft to make one complete circle, the time for this manoeuvre will be recorded. The test will then be repeated to starboard.

Bilges – The contents of the bilges will be checked at the end of the sea trial.

1.7 Classification

Scantlings and construction of the craft will be generally in accordance with Lloyd's Register of Shipping 'Rules and Regulations for the Classification of Special Service Craft'. The craft will not, however, be classed.

1.8 Certifying Authority

On completion the craft is to be issued with a UK Workboat Code certificate, for operation as a Category 2 vessel allowing operations up to 60 NM from a safe haven. The Certifying Authority is Mecal Ltd. and they will approve all design drawings, supervise construction and attend trials, as they deem necessary.

Section 2

HULL, DECKS AND SUPERSTRUCTURES

2.1 Hull Form

The vessel is of split-hull design with the connection on the centerline; it is of flat bottom single chine configuration with swim ends forward and aft incorporating a shallow 'V' counter and transom stern with rounded quarters. Hull connectors are from Ravestein and are of the swallow tail pattern. Pushing logs are arranged port and starboard forward. Propulsion is by twin propellers with a single rudder, aft of each. Chine reinforcement is by solid round bar. The sheer is straight, there is no camber to the decks and internally the hull is divided into five watertight compartments by four transverse watertight bulkheads.

Scantlings and construction will generally be in accordance with Lloyd's Register Rules and Regulations for the Classification of Special Service Craft. *See item 1.7*

2.2 Construction

The hull is of welded steel construction throughout. All steel conforms to BS EN 10025 S275, or equivalent, having a tensile strength of 410-560 N/mm².

2.3 Hull Plating

The bottom, inner and outer sides and transom plating is 8 mm. All seams and connections are full penetration welds.

2.4 Longitudinal Bottom Stringers and Girders

Longitudinal bottom strength is provided by fore and aft stringers from 80 x 8 flat bar at about 575 mm centres. Engine girders are from 8 mm plate with a 120 x 20 top plate. Welding of the stringers is staggered intermittent and the engine girders double continuous.

Section 2

2.5 Transverse Bottom Frames

Bottom transverse frames consist of a fabricated 'T' section having a 250 x 8 web with 80 x 8 face flat on 1500 mm centres. The weld connection to the bottom plating is double continuous and the face flat connection staggered intermittent.

2.6 Transverse Bulkheads

The port hull is divided into six compartments by five watertight structural bulkheads and the starboard hull into seven compartments with six bulkheads. All are 6 mm plate with 60 x 8 toe welded flat bar horizontal stiffeners on about 375 mm centres. Bulkheads are double continuous welded to the shell and decks; frames are staggered intermittent.

2.7 Side Framing

The side framing consists of fabricated 'T' section transverse frames and a horizontal flat bar longitudinal stringers. Transverse frames have a 250 x 8 web with 80 x 8 face flat; stringers are 80 x 8 toe welded flat bar on about 375 mm centres. All welding to be staggered intermittent.

2.8 Deck Plating

Deck plating is 10 mm throughout. All seams are full penetration welds.

2.9 Transverse and Longitudinal Deck Structure

Transverse deck beams are fabricated 'T' section on 1500 mm centres with a 250 x 8 web with 80 x 8 face flat and longitudinal stringers are 100 x 65 x 8 toe welded angle on about 430 mm centres aft and 100 x 75 x 10 forward. All welding is staggered intermittent.

Using the pressure exerted by the cargo according to Lloyd's Special Service Craft Regulations (WCDP) of 5 T/M² the design pressure will be about 16 T/M² at 14 Metres forward of the transom.

Section 2

2.10 Pillars

A single row of pillars is installed on the centreline at every frame; they comprise 73 mm OD x 7 mm wall tube, welded at head and foot.

2.11 Letters and Numerals

Draught marks are placed both forward and aft, to port and starboard, indicating draughts between 0.6 and 1.2 Metre complying with MCA requirements. The name is to port and starboard on the bow and at the centreline on the transom with the port of registry beneath, all in letters 100 mm high. A plimsoll mark, according to MCA rules, is positioned port and starboard amidships. All letters and numerals are profile cut from 8 mm plate and continuously welded to the plating.

2.12 Fendering

A solid steel sheerstrake from 200 x 20 flat bar is arranged at the sheer. All seams are full penetration welds.

2.13 Engine Removal Hatches

Two bolted flush hatches are fitted in the main deck above the main engines for their removal. They are about 1750 mm long and 900 mm wide. Plating is 10 mm as the deck, framing on the underside 100 x 10 toe welded flat bar. A neoprene gasket with urethane sealant provides the water and gas tight seal and securing is by M12 countersunk machine screws tapped into the bolting plate.

2.14 Chine Bars

The chine is reinforced by a 30 mm solid round bar. All welding is double continuous.

2.15 Hull Connections

The two sections of the split-hull are joined at the centreline using Ravestein connectors of 35 Tonne SWL each, there are a total of 8 pairs arranged at the top and bottom of the inner sides. The hull can be connected with the vessel afloat.

Section 2

2.16 Lifting Eyes

Each hull has four lifting eyes recessed into the main deck, they are port and starboard at frames 3 and 7 and are suitable for forged shackles with a SWL of 8.5 Tonnes.

2.17 Spud Leg Tubes

There are two spud leg tubes, at frame 4 in the port hull and frame 8 in the starboard hull. Tubes are 508 OD x 15 mm wall. Drop in 10 mm thick covers are provided to blank the tubes when not in use. All welding connected with the spud leg tubes in double continuous or full penetration.

2.18 Wheelhouse, General Description

The superstructure comprise a wheelhouse mounted to port at aft, extending from about 0.6 Metre forward of the transom to frame 3 with a width of approximately 3 Metres. Aft to starboard is the uptake with engine exhausts and engine room vents. The mast is mounted on the deckhead outboard of the uptake. Windows are fitted all round for good visibility with a weathertight door on the inboard side.

2.19 Wheelhouse Construction

The deck structure is of welded steel construction throughout. All steel conforms to BS EN 10025 S275, or equivalent, having a tensile strength of 410-560 N/mm².

2.20 Wheelhouse Plating

Plating is 5 mm throughout; seams will be full penetration and 'T' connections double continuous welds.

2.21 Wheelhouse Framing and Beams

Vertical frames will be spaced to suit the windows comprising 50 x 50 x 6 toe welded 'T' section; beams are 5 mm flat plate with 50 x 5 face flat. All welding is staggered intermittent to the plating.

2.22 Door

A hinged steel access door, with window, is arranged at mid length on the inboard side of the wheelhouse.

Section 2

2.23 Hatches

Fitted on 600 mm steel coamings are the hold and engine room access hatches. Construction is from 8 mm plate, the hold hatch is 1000 x 1000 and the engine room hatches 650 x 650. The forward water ballast tanks, voids and aft ballast tank access hatches are Seatite watertight aluminium alloy flush hatches; clear opening 540 x 540, operable from above and below with a steel deck ring welded into the structure.

2.24 Windows

A total of 10 windows are installed in the wheelhouse. All are toughened glass, to BS6206, in grade HE9 marine grade aluminium alloy, clamp in pattern frames by Houdini. Forward facing windows are 10 mm and the remainder 6 mm.

Two windows of the above specification with 6 mm glass are installed in the outboard wheelhouse side to provide daylight to the accommodation spaces.

2.25 Mast

The hinged mast is of tubular construction from 89 OD x 3 mm wall grade 316 stainless steel tube supported in a tabernacle that is welded to the wheelhouse roof structure aft. Spreaders are fitted for the signal flag halyards and platforms for the navigation lights. All cabling for electrical and electronic equipment is internal. On completion weld discolouration is removed and the stainless steel cleaned but not painted.

2.26 Bulwarks

Fabricated from 8 mm plate with a 75 x 12 top plate bulwarks are fitted to port and starboard forward incorporating double pin bollards to port and starboard.

2.27 Guard rails

Guard rails with stanchions and top rail from 89 OD x 5.5 mm wall tube with intermediate rails from 33 OD x 4.5 mm wall tube are arranged port and starboard aft.

Section 2

2.28 Engine Compartment Vents

There are three mushroom pattern ventilators, one for the port engine room and two for the starboard, all are constructed in 6 mm plate. Coamings are 750 mm high. The screw down covers are 250 mm high and mounted on an M20 vertical screw.

A single 250 x 250 vent with hinged weathertight door is fitted aft in the uptake for exhaust air from the port engine room.

Section 3

TANKS

3.1 Fuel Tanks

There are two diesel fuel tanks integral with the hull structure; each of 1800 Litres capacity, located against the inboard side of each hull in the engine rooms between frames 2 and 3.

Generally of 6 mm plate with 60 x 8 toe welded stiffeners, each with a single bolted access manhole.

3.2 Potable Fresh Water Tank

The fresh water tank of 76 Litres capacity is located in the W.C. compartment.

3.3 Waste Water Tank

The waste water tank of 76 Litres capacity is located in the W.C. compartment.

3.4 Water Ballast Tanks

There are three water ballast tanks integral with the hull structure; generally 6 mm plate with 60 x 8 toe welded stiffeners, each with a single bolted access manhole. Two tanks are located forward, frame 10 to the bow in both sections of the hull, each with a capacity of about 3.3 Tonnes and aft is a single tank in the starboard hull, transom to frame 1 with a capacity of about 4.2 Tonnes.

3.5 Hydraulic Tank

A fabricated steel tank of 125 Litre capacity is arranged in the port engine room as a hydraulic reservoir.

3.6 Cargo Diesel Fuel

There are two cargo diesel fuel tanks integral with the hull structure having 6 mm bulkhead plating and 60 x 8 horizontal bulkhead stiffeners. They are full width and depth of each hull, between frames 5 and 6 to port and frames 4 and 5 to starboard, each with a capacity of 7300 Litres.

Section 3

3.7 Cargo Fresh Water

There are two cargo fresh water tanks integral with the hull structure having 6 mm bulkhead plating and 60 x 8 horizontal bulkhead stiffeners. They are full width and depth of each hull, between frames 9 and 10 to port, capacity 5500 Litres, and frames 7 to 9 to starboard, capacity 14,600 Litres.

Section 4

DECK FITINGS AND EQUIPMENT

4.1 Bollards

Six double post bollards are fitted, three to port and three to starboard, the forward bollards are in the bulwarks, the amidships and aft bollards are on the main deck. Welding is double continuous or full penetration.

4.2 Hydraulic Knuckle Boom Crane

The crane comprises an HS Marine model AK34 15.8 HE4 marine hydraulic knuckle boom crane which is mounted on the main deck forward to port at frame 9. The crane is fitted with an integrated control seat mounted on the left hand side of the crane. The seat rotates with the crane. It is accessed by a retractable ladder that, when retracted, serves as a barrier preventing the operator from falling off the seat. From the seat, the operator can operate the crane's manual control valve.

Dynamic moment on crane base is 34000 kgm, maximum hydraulic outreach is 15.8 Metres, minimum 3.2 Metres and maximum height above the main deck 17.00 Metres.

Outreach - lifting capacity:-

3.20 Metres	6930 kg
5.82 Metres	3760 kg
8.28 Metres	2350 kg
10.71 Metres	1650 kg
13.25 Metres	1250 kg
15.80 Metres	1000 kg

Maximum oil pressure 280 bar and slewing angle 3850.

Section 4

4.3 Winch

Mounted aft on the centerline is a Spencer Carter single barrel hydraulic winch, capacity up to 60 Metres of 16 mm wire rope. Capacity on 1st layer 3.0 Tonnes and on top layer 1.7 Tonnes. Winch speed is 24 rpm, wire speed 16 M/min and torque 2650 NM.

4.4 Anchor and Cable

The main anchor is a 34 kg CQR pattern and the kedge a 27.2 kg. The main cable has a length of 50 Metres and comprises 12 mm galvanised short link chain which is permanently attached to the bower anchor and stowed in a deck bin adjacent to the crane, all to comply with the Workboat Code. The anchors are stowed on chocks on the main deck, the bower by the crane and the kedge aft to starboard. The kedge warp/tow line is a 100 Metres 20 mm diameter 3 strand nylon line with a breaking load of 8300 kg which is stowed in the hold.

4.5 Guard Wires and Stanchions

Removable stanchions to port and starboard are constructed from 50 x 12 flat bar. Guard wires are stainless steel 8 mm diameter flexible wire rope each complete with captive shackle and Tallurit splice on one end and open body stainless steel tensioner on the other.

4.6 Bow Roller

A 1500 mm long, 324 mm diameter roller is arranged at the bow of the starboard hull. SWL is 10 Tonnes. The axle is 80 mm diameter solid round supported in Delrin bearings at each end.

Section 5

STERN GEAR

5.1 Propeller Shafts

The propeller shafts are grade F.51 duplex (1.4462) stainless steel with a tensile strength of about 600 N/mm², the port shaft has a length about 4.28 Metres and the starboard approximately 3.28 Metres, diameter of both is 60 mm. Both ends are tapered and keywayed to suit the propeller and half coupling; the shaft is reversible.

5.2 Stern Tubes

The stern tubes are approximately 2.1 Metres long; they are of mild steel construction from tube machined at each end for composite shelled nitrile-lined water lubricated bearings. Bearing lubrication is by sea water from the main engine cooling system.

To prevent distortion during construction the tubes are fitted within sleeve tubes; after alignment the inner and outer tubes are permanently located with Chockfast Orange, PR-610TCF pourable epoxy based chocking compound, or equivalent.

5.3 Propellers

Of five bladed pattern manufactured in high tensile nickel aluminium bronze they are outward turning with a diameter of 700 mm, 100% DAR and having bronze cone nuts. They are designed for maximum thrust and will be fully machined to suit the shafts, balanced, smooth disc finish.

5.4 'Y' Bracket Assembly

A fabricated mild steel 'Y' bracket assembly, with profiled struts, has the upper arms welded into the hull structure and the lower arm to the skeg bar. The bracket boss is part of the stern tube assembly.

Section 5

5.5 Rudders

A single rudder is fitted aft of each propeller, they are of single plate construction with a fish tail trailing edge, height is approximately 720 mm and width 670 mm including a balance of 150 mm, plating is 10 mm and the main piece 60 mm diameter. The pintles are fixed, the gudgeons are bolted to skeg base and the rudder head includes a flange for bolting to the stock.

5.6 Rudder Stocks

Rudder stocks are 60 mm diameter machined from grade 316 stainless steel having a tensile strength of not less than 501 N/mm²; the bottom has a welded flange for connection to the rudder head plate. Stocks will be 655 mm long. The tiller is machined and keywayed to fit the stock and forms the rudder carrier; above the tiller the stock is threaded to accept a nut and lock nut to prevent vertical movement of the tiller. The starboard stock is squared off for the attachment of the emergency tiller.

5.7 Skegs

Twin skegs are fitted to protect and support the stern gear. The base is from 100 x 40 solid rectangular bar, it extends from frame 3 aft to the rudder stock; welding is either double continuous or full penetration, as applicable. Vertical 10 mm plate skegs are incorporated forward between the base, the stern tube sleeve tube and the shell plating.

5.8 Steering Gear

The steering gear is of the hand hydraulic type with a single helm position in the wheelhouse. Rudder angle is 350 – 0 – 350 and number of turns for the steering wheel hard over to hard over is 5.6. A single ram is fitted to the port stock with a link bar connecting to the starboard; the rudder actuator and link bar are located in a recess in the aft deck for easy access. The recess has fibreglass gratings over.

5.9 Emergency Steering

A fabricated steel tiller, about 2 Metre long is arranged to fit on the squared starboard stock by passing through the screwed deck plate. A stowage for the tiller will be arranged on the aft side of the deckhouse.

Section 5

6.14 Cathodic Protection

A cathodic protection system will be especially designed for the craft by M G Duff Marine using weld on pattern aluminium alloy anodes, estimated life span to be two years in sea or brackish waters. Anodes will be attached port and starboard on the hulls and on the rudders. The scheme comprises 10 type AD72 anodes on the hulls and nozzles and 4 type AD77, 2 on each rudder.

Section 6

MACHINERY

6.1 Main Engines

The main engines comprise a pair of Doosan model L136TI, 8 Litre, 6 cylinder, 4 cycle, turbocharged and intercooled marine diesel engines each having an output of 169 Kw (230 bhp) at 2200 rpm, arranged for heat exchanger cooling. Each engine is fitted with a DI model DMT110A reverse reduction gearbox having a reduction ratio of 2.82:1.

Engine starting is 24v DC; each is fitted with a 50 amp battery charging alternator and start/stop controls are at the helm in the wheelhouse. Instruments in the panel will be: tachometer, coolant temperature, oil pressure and voltmeter. Both audible and visual alarms are fitted in the wheelhouse for coolant temperature, low oil pressure and battery charge.

Speed control and gear change is by a twin single lever control at the helm.

Engines are mounted on Chockfast directly bolted to the engine girders. Cooling is by closed circuit fresh water and raw water heat exchangers. The exhaust systems are dry; they terminate to the atmosphere at the top of the uptake.

Duplex fuel filter and water trap systems with change over valves are installed in the main suction line from the fuel tanks in each engine room.

Section 6

6.2 Main Engine Exhausts

The turbocharger outlet on each engine is 75 mm diameter from which the exhaust line is taken to the silencer that comprises a Doosan unit with inlet and outlet of 75 mm diameter; all exhausts terminate at the top of the uptake. Pipework within the engine rooms and uptake is mild steel and externally stainless steel, grade 316; all is schedule 10S with flanged connections. All pipework in the engine room and uptake is lagged with 25 mm thick Rockwool type HD wired matt mineral wool insulation with a sewn material covering.

The starboard exhaust is connected by a Straub Grip-L coupling where it passes from the starboard into the port hull; this is located in a well in the main deck, forward of frame 1 along with the electrical connections and the generator exhaust. The well has a fibreglass grating over.

6.3 Hydraulic Pump

A hydraulic pump is coupled to the front end of the port main engine via a flexible coupling to power both the knuckle boom crane and winch. No clutch is fitted.

Section 6

6.4 Generator

The generator is located in the starboard engine room and comprises a Betaset 33 powered by a Beta Marine model BV 3300 marine diesel engine at 1500 rpm, arranged for heat exchanger cooling. The alternator is a Mecc Alte brushless, four pole, revolving field type with an output of 32 kW at 230/1/50.

Engine starting is 12v DC; it is fitted with a 50 amp battery charging alternator and start/stop controls are at the helm in the wheelhouse and locally on the set, with both audible and visual alarms fitted in the wheelhouse for coolant temperature, low oil pressure and battery charge.

Cooling is by closed circuit fresh water and raw water heat exchangers. The exhaust system is dry; it terminates to the atmosphere above the uptake. See also item number 6.2 for the connection where it passes into the port hull.

Duplex fuel filter and water trap system with change over valves is installed in the main suction line from the fuel tanks in the engine room.

6.5 Generator Exhaust

The exhaust outlet on the engine is 40 mm diameter to which will be mounted a flexible bellows, the 40 mm exhaust line is taken to the silencer. Pipework within the engine room and uptakes is mild steel and externally stainless steel, grade 316; all is to be schedule 10S with screwed connections. All pipework in the engine room and uptake is lagged with 25 mm thick Rockwool type HD wired matt mineral wool insulation with a sewn material covering.

6.6 Water Pressure Set

The domestic water pressure set is installed in the W.C. compartment adjacent to the fresh water tank and comprises a Jabsco Par Max 2.9 system with an output of up to 11 lpm (open flow).

Connections are 13 mm NB, the motor 24v DC, fuse size 10 amp. The unit will cut in at 1.4 bar and out at 2.7 bar.

Section 6

6.7 Waste Water Discharge Pump

A Jabsco model 18590-2094 macerator pump powered by a 24v DC, fuse size 15 amp, electric motor is installed in the W.C. compartment adjacent to the waste water tank with local control.

Output is up to 43 lpm at 3 Metre head. Connections are 38 mm inlet and 25 mm outlet.

6.8 Battery Boxes

In the port engine room is a steel gas tight battery box containing the port main engine start and ship service batteries with suitable venting arrangements to the atmosphere; a similar box in the starboard engine room contains the starboard main engine start and generator start batteries.

6.9 Fuel Filtration System

Two duplex diesel fuel filters and water separators are installed in the engine room. They have metal bowls and 60 micron stainless steel elements.

6.10 Calorifier

A C-Warm model CWB29-V3 calorifier is installed in the W.C. compartment; it is fitted with a 230/1/50 immersion heater and has a capacity of 29 Litres.

6.11 Raw Water Inlet

An 80 NB raw water inlet is arranged low down in the topside plating outboard in each engine room. On each inlet is an Aquafax model 2-70780H water strainer with gunmetal body, stainless steel filter element and bolted lid. A wafer type butterfly valve is fitted on both inlet and outlet of the strainers; valve body cast iron, liner EPDM, disc, shaft and pin aluminium bronze, a swing type full bore bronze check valve is fitted on all suctions.

Section 6

6.12 Bilge Pumps

Bilge pumps are fitted in each of the following compartments; port engine room, starboard engine room, hold and starboard void space. Each is a Rule model 4000 submersible bilge pump having a thermoplastic body with a 50 mm discharge port. It is powered by a 24v motor, fuse size 15 amps.

Maximum capacity is 252 lpm. In the forward starboard void is a Rule model 1500 submersible bilge pump having a thermoplastic body with a 28 mm discharge port. It is powered by a 24v motor, fuse size 4 amps. Maximum capacity is 95 lpm. The port aft peak is fitted with a spring loaded valve to drain into the port engine room.

6.13 Ballast/Fire Pump

A Jabsco self-priming bronze flexible impeller magnetic clutch pump is belt driven from the front end of both main engines. Ports are 2" flanged and maximum output 300 lpm; maximum power absorbed 1800 w at 1500 rpm.

6.14 Emergency Bilge and Fire Pump

An Ocean Master portable double-diaphragm hand pump is stowed in the hold for emergency bilge and firefighting duties. It has a 6 Metre flexible 38 mm bore reinforced PVC hose complete with a bronze strum box and a 6 Metre PVC lay flat discharge hose with closely woven yarn reinforcement. There shall be a removable light alloy branch pipe providing variable spray, jet and shutoff for firefighting. Maximum output is 136 lpm.

Section 7

VENTILATION AND HEATING

7.1 Engine Room Ventilation

Ventilation of the engine rooms is natural supply and exhaust and comprises three mushroom ventilators and a louvre in the uptake. Details are given in item 2.28.

7.2 Accommodation and Wheelhouse Heating

An Eberspacher Airtronic D2 is installed in the wheelhouse with ducting to heat both the wheelhouse and accommodation spaces, with branches for demisting the forward wheelhouse windows. Low output is 850 w and maximum 2,200 w with air flow between 40 and 105 kg/hr.

Maximum electrical consumption is 34 w at 24v DC.

7.3 Battery Box Ventilation

On each battery box a steel pipe vent of 40 mm NB is led to the atmosphere on the main deck where a weathertight air pipe head, complete with flash gauze, is mounted on a 750 mm stand pipe.

7.4 Diesel Fuel Tank Ventilation

A steel pipe vent of 50 mm NB is led to the atmosphere adjacent to the inboard side of the wheelhouse from port tank and adjacent to the winch from the starboard tank, where a weathertight air pipe head, complete with flash gauze, is mounted on a 750 mm stand pipe.

7.5 Fresh and Waste Water Tank Ventilation

Flexible plastic vents are led to the atmosphere in the wheelhouse side from both the fresh water and waste water tanks.

7.6 Hydraulic Oil Tank Ventilation

A steel pipe vent of 25 mm NB is led to the atmosphere on the main deck, inboard of the wheelhouse, where a weathertight air pipe head, complete with flash gauze, is mounted on a 750 mm stand pipe.

Section 7

7.7 Ballast Tank Ventilation

Each ballast tank has a 50 mm NB vent led to the atmosphere, forward tanks are inboard of the bulwarks and the aft tank inboard of the guardrails; where a weathertight air pipe head is mounted on a 750 mm stand pipe.

7.8 Cargo Diesel Fuel Tanks

Each tank has a 65 mm NB steel tube ventilator led to the atmosphere, the port tank is forward of the wheelhouse and the starboard tank adjacent to the winch where a weathertight air pipe head is mounted on a 750 mm stand pipe.

7.9 Cargo Fresh Water Tanks

Each tank has a 65 mm NB steel tube ventilator led to the atmosphere inboard of the forward bulwarks where a weathertight air pipe head is mounted on a 750 mm stand pipe.

7.10 Aft Peak, Void Spaces and Hold Ventilation

Each space has a steel pipe vent of 50 mm NB is led to the atmosphere where a weathertight air pipe head is mounted on a 750 mm stand pipe. The port aft peak is aft of the wheelhouse, the hold is adjacent to the crane, the starboard void spaces are both inboard of the starboard forward bulwarks.

Section 8

PIPE WORK

8.1 Diesel Fuel Filling

Each diesel fuel tank is filled from a single 50 mm NB stand pipe on the main deck, the port is inboard of the wheelhouse and the starboard adjacent to the winch; height is 750 mm with the top threaded 2" BSP and fitted with a brass cap and keep chain. All pipe work will be black to BS1387 with screwed connections apart from where passing through bulkheads, or into the tank, these connections to be double continuous welded.

8.2 Fuel Supply and Return

The fuel suction pipe on both tanks is about 100 mm above the bottom plating in the inboard tank bulkhead and two spigots are fitted in the tank top for the fuel return. Within the engine compartment will be a 20 mm NB spigot threaded ¾" BSP for the main engine fuel suction and two similar spigots towards the top of the bulkhead for the fuel returns. On each spigot will be fitted a full flow stainless steel monobloc design, AISI316 ball valve with PTFE seals. An emergency shut off system will be connected to each valve with actuation from the wheelhouse, this will comprise a pull cable with a 'T' handle for actuation; these are clearly marked 'Emergency machinery fuel shut off, pull closed in event of fire'.

Two duplex water separator/fuel filters are mounted on the inboard tank bulkhead above the sole plating. Pipe work before the filters is 20 mm NB steel, between the filters and main engines it is copper. The fuel return to the tank will be from 20 mm NB pipe having two ¾" brass swing type check valves attached.

All fuel supply and return piping within the engine compartment will be 15 mm copper; it is well supported from the structure with the minimum of bends and easily visible, accessible and protected from damage.

A flexible section of fuel pipework is attached to the main engines and wheelhouse heater; it will have a length of 300 mm and comply with MCA Operations Advice Note number OAN52, revision 02.

Section 8

8.3 Bilge Pipe Work

Bilge pumps are as detailed in item number 6.12. Apart from the forward starboard void a short length of 50 mm ID medium duty flexible PVC hose with a rigid PVC spiral is attached to the pump for easy removal and cleaning.

The discharge to the side plating is 50 mm NB galvanised pipe to BS1387, at the pump end of the pipe will be an 2" BSP brass swing type check valve, the pipe will rise to the underside of deck and drop down to about 250 mm above the load waterline to discharge overboard, at the hull is a 2" BSP lever operated ball valve with hot forged nickel plated brass body and hard chrome plated ball. The starboard forward void has a similar arrangement but the pipework is 28 mm.

8.4 Hydraulic Pipework

All hydraulic pipework is within the port hull. Pipe work is steel with safe working pressure to suit the equipment; flexible hoses are fitted at the pump, machinery and cylinder connections. BSPP fittings are used on the steel and swaged end fittings on the flexible hoses, steel bulkhead fittings are used in bulkheads and decks, all pipe work is well supported from the structure with the minimum of bends, easily visible, accessible and protected from damage.

A suction line filter is fitted between the tank and pump and comprises and the return line filters will have 10 micron elements.

8.5 Raw Water Inlet Pipe Work

The raw water hull inlet spigots are 80 NB x 10 mm wall steel tube full penetration welded to the shell plating with a PN16 flange for the strainer valve on the inboard end.

Section 8

8.6 Main Engine Cooling Water Pipe Work

The pipe work between the raw water strainers and the main engines will be 50 NB galvanised steel to BS1387 with flexible connections to the engines. The sea water discharge is overboard with branches to the stern tubes, all connections will be screwed BSP.

8.7 Fire, Deck Wash and Ballast Pipe Work

Pipework is arranged for the pumps to draw raw water from the raw water inlets or the ballast tanks. Discharge is to the fire hydrant, the ballast tanks, or overboard.

The pipe work between the sea inlet, deck suction, water ballast tank and the pump will be 50 NB galvanised steel to BS1387. The deck discharge is 50 NB galvanised steel to BS1387 and terminates in a 750 mm high deck standpipe with its outlet horizontal located inboard of the wheelhouse; it is fitted with a 50 NB lever operated ball valve with hot forged nickel plated brass body and hard chrome plated ball and an instantaneous outlet with a cap and keep chain and clearly labelled 'Fire Hydrant'.

8.7 Fire, Deck Wash and Ballast Pipe Work

Two 6 Metre lengths of 50 mm bore PVC lay flat discharge hose are stowed in the wheelhouse complete with removable light alloy branch pipe providing variable spray, jet and shut-off; they are fitted with instantaneous couplings.

Section 9

Electrical Systems and Equipment

9.1 Overview

The craft has two power supplies, 230/1/50 AC and 24v DC, each is distributed on separate systems through switch panels in the wheelhouse. 230/1/50 is generated by the generator and distributed through the consumer unit having RCD protection and circuit breakers for each on-board circuit.

The batteries are charged from the main engines and generators, supply 24v DC. Distribution is through a mimic panel in the wheelhouse fitted with circuit breakers and indicator lights.

The installation will be generally in accordance with the requirements of Lloyd's Rules and Regulations for Classification of Ships.

9.2 Cabling

Electric cables comply with IEC Publication 332-1 and are of the flame retardant type. Where cables are installed in the engine room, or exposed to the atmosphere they are enclosed in an impervious sheath of material appropriate to the expected ambient conditions. All cables are tagged for easy identification.

Generally cable runs will be on galvanised cable tray and secured by cable ties. No circuits will be left unsupported, installed near sources of heat or mounted where they are likely to sustain mechanical damage.

Where electric cables pass through structural bulkheads, or decks, they are installed in cable glands, or transits, to A30 standard. All exposed cables on the weather deck will be installed in stainless steel conduit with watertight connections.

9.3 Consumer Unit, 230/1/50

An MK Sentry, surface mounted, insulated type, single phase consumer unit is fitted in the wheelhouse for single phase services and has a Sentry 2 pole fault current sensitive RCD having a tripping current of 30 mA. Outgoing devices are MCB's to suit the circuit load.

Section 9

9.4 DC Distribution Board

The 24v DC distribution board is fitted in the wheelhouse at the helm; it incorporates a mimic diagram of the vessel to indicate the navigation lights and bilge alarms. Push button circuit breakers, of capacity to suit the load and protect each circuit, which include: -

- Ø Bilge Alarms,
- Ø Fire alarm,
- Ø Navigation lamps,
- Ø Horn,
- Ø Searchlight,
- Ø Interior lights,
- Ø Window wiper,
- Ø Compass,
- Ø VHF radio.

9.5 Batteries

Four banks of batteries are installed, main engine starting, generator starting and ship's services; all are stowed in the battery boxes. In the port engine room will be the port main engine start and the ship service batteries; in the starboard engine room are the starboard main engine and generator start batteries. All batteries are charged from the main engine mounted alternators. Each bank will provide an output of 24v DC (generator start is 12v DC); all are of the lead acid pattern. Each bank will be fitted with an isolating switch.

Section 9

9.6 Battery Isolating Switches

Each bank of batteries will have an ETA model 922 B33, or equivalent, double pole isolating switch, with IP54 enclosure including external operating knob, mounted externally on the battery box. Maximum continuous rating is 120 amps and 1500 amps intermittent.

9.7 Bilge Alarms

A total of five Johnson 24v DC electronic float switches are fitted, one in each of the following compartments, engine rooms, hold, and void spaces, they are connected to the bilge alarm section of the DC distribution panel.

9.8 Fire Alarm

An Electronic Devices four zone fire detection system is installed with detectors in the accommodation, engine rooms and hold. A single smoke detector is fitted in each of the following spaces, accommodation and hold; a heat and smoke detector is fitted in each engine room. The control panel is mounted in the wheelhouse with audible and visual alarm; power supply is 24v DC.

9.9 Interior Lighting

All interior lighting is 24 v DC fluorescent type, with heavy duty weather tight pattern in the engine room. Generally each fitting has 2 x 18w lamps and is of polycarbonate construction; there are four in the engine room, four in the hold and two in the wheelhouse.

9.10 Exterior Lighting

Two floodlights are mounted on the wheelhouse; of fluorescent butyl rubber type fitted with a 200w tungsten halogen lamp.

9.11 Searchlight

A Jabsco model 225 SL searchlight is mounted forward on the wheelhouse. Of 24v DC operation with remote control at the helm; output is 10 lux at 100 Metres and fuse size 5 amp.

Section 9

9.12 Navigation Lights

Navigation lights comply with the Merchant Shipping (Distress Signals and Prevention of Collisions) Regulations 1996 and M.1642/COLREG 1, as amended. Visibility is 2.5 nautical miles.

They are Lopolight, or equivalent, lights of 24v DC operation with LED lamps. Lights fitted are: -

Ø Port and starboard, mounted in light boxes on the wheelhouse.

Ø Steaming, mounted on the mast.

Ø Stern, mounted on the uptake.

Ø Anchor mounted on top of the mast.

Ø All round NUC on the mast.

Operation of individual lamps is from the DC distribution board that incorporates a mimic diagram showing which lamps are illuminated.

9.13 Horn

A single trumpet marine air horn is mounted on the mast, complete with 24v DC air compressor and push at the helm.

9.14 Window Wiper

A Vetus heavy duty 24v DC window wiper is fitted on the window forward of the helm.

9.15 Outlets

A double 230/1/50 outlet is installed in the wheelhouse, crew accommodation and a weather tight pattern single outlet in the engine room.

A single weathertight 230/1/50 outlet is fitted on the inboard side of the wheelhouse on the main deck.

Section 10

ELECTRONICS AND NAVIGATION EQUIPMENT

10.1 Compass

A Raymarine type i60 electronic compass system is installed; display is at the helm. Power supply is 24v DC.

10.2 Rudder Angle Indicator

A Raymarine type i60 rudder indicator system is installed. Display at the helm. Power supply is 24v DC.

10.3 Combined Echo Sounder and Log

A Raymarine type a65 multifunction display at the helm displays the echo sounder and log. Power supply is 24v DC.

10.4 Radar

A Raymarine type RD418D radome is mounted on a folding platform forward on the wheelhouse with display at the helm on the 'a' series multifunction display. Power supply is 24v DC.

10.5 Chart Plotter

TBD.

Section 10

10.6 VHF Radios

Two Raymarine VHF radios are installed. At the wheelhouse console is a model Ray49E VHF marine transceiver with built in Class D DSC, programmable with tri-watch functions, internal speaker and hand microphone. Power supply is 24v DC. A Pacific Seamaster Pro VHF Heliflex 0.3 Metre antenna mounted on the wheelhouse.

10.7 Clock and Barometer

A matching pair of 75 mm diameter polished brass case marine clock and aneroid barometer are mounted on the aft wheelhouse bulkhead.

10.8 Clinometer

A 45-0-45 pendulum type clinometer is mounted forward in the wheelhouse.

Section 11

ACCOMODATION AND FIT OUT

11.1 Arrangement

The wheelhouse has a console across the forward end with the helm to starboard; to port is a large chart table with a companionway to the lower deck accommodation aft. The companionway has a double hinged hatch and door. Aft is settee recessed into the deck head of the lower deck sleeping area.

Forward in the lower deck accommodation is the toilet compartment with a W.C. and was basin. At the bottom of the companionway is the galley with the cooker and sink with lockers under.

Athwartships aft are two bunks with foam mattresses.

11.2 Linings and Deckhead

The wheelhouse will be lined on the bulkheads below window level and on the deckhead with marine grade plywood faced with melamine laminate, the accommodation spaces will be fully lined in the same manner. Cable and pipe runs will be kept to a minimum behind linings.

11.3 Insulation

Wheelhouse and accommodation – Behind the linings will be Rockwool RWA45 mineral wool insulation with an aluminium foil vapour barrier fitted on the 'warm' side. The insulation will be 40 mm thick and attached by self-adhesive pins to the structure. Bulkheads, deck structure sides and deck heads are to be insulated for both thermal insulation and to prevent condensation. Engine rooms - The space is insulated to A30 standards using Rockwool Firebatt 2000 mineral wool insulation, 40 mm thick, fitted on the deck head. All insulation is sheathed with 1 mm thick electro-zinc plated perforated steel sheet.

11.4 Cabinet Work

Cabinetwork in the wheelhouse and accommodation will be melamine faced marine grade plywood with varnished hardwood trim. Fastenings to be exposed stainless steel in screw cups.

Section 11

11.5 Sole Coverings

Sole covering in the wheelhouse and accommodation will be studded rubber floor tiles, glued directly to the sole using epoxy based resin.

11.6 Toilet

In the W.C. compartment is a Jabsco model 29090-3000 manual marine toilet, flushing is by sea water with discharge to the waste tank. A 20 NB ball valve is fitted at the sea suction on the side plating. Pipe work is generally spiral reinforced PVC.

11.7 Sink and Wash Basin

A stainless steel sink is installed in the galley and wash basin in the W.C. compartment, both are fitted with chrome brass screw down taps and both discharge to the waste tank.

11.8 Cooker

A Duronic model HPS2 2500w two solid ring plate hob is installed in the accommodation space. Power supply 230/1/50.

Section 12

LIFE SAVING AND EMERGENCY EQUIPMENT

12.1 Lifebuoys

Two in number Cosalt 725 mm diameter, 2.5 Kg weight MCA approved lifebuoys in high visibility orange are to be supplied, one lifebuoy has a 30 Metre x 8 mm buoyant heaving line attached and the other an automatic light. One lifebuoy is stowed forward in a suitable rack inboard of the port bulwarks, the other is aft on the wheelhouse.

12.2 Liferafts

An RFD Surviva 4 person inflatable liferaft is supplied and stowed aft of the wheelhouse; in a flat pattern GRP container with type 'B' emergency pack.

12.3 Engine Compartment Full Flood Fire Extinguishing System

An MCA approved fixed fire suppression system is installed in both engine rooms; they are manual operation with activation from the wheelhouse with two control panels fitted adjacent to the helm. Within each space are the extinguisher canisters; other equipment includes sounder beacons and heat sensors. Power supply 24v DC.

12.4 Fire Extinguishers

The following portable fire extinguishers, conforming to BS EN3, are supplied and suitably mounted: -

Ø Two in number 6 kg. ABC powder type in the wheelhouse.

Ø Two in number 6 kg. ABC powder type in each engine room.

Section 13

PAINTING

13.1 Overview

This paint specification has been prepared in conjunction with International Marine Coatings; it provides a general description only, for the requisite number of coats, application procedures and other technical information refer to their relevant paint manuals.

13.2 Steel Hulls External, Topsides

Steel work is blasted to Swedish Standard 2.5 prior to application of paint coatings.

Ø Primer, Intergard 5000, TFT dry 250 microns,

Ø Finish, Interthane 990, TFT dry 50 microns.

13.3 Steel Hulls External, Underwater

Steel work is blasted to Swedish Standard 2.5 prior to application of paint coatings.

Ø Primer, Intergard 5000, TFT dry 250 microns,

Ø Intermediate, Intergard 263, TFT 50 microns,

Ø Finish, Interspeed 6200, TFT dry 200 microns.

13.4 Internal Steel Structure

Steel work is blasted to Swedish Standard 2.5 prior to application of paint coatings.

Ø Primer, Interprime 198, TFT dry 75 microns,

Ø Finish, Intercare 332, primer/finish, TFT dry 100 microns.

Section 13

13.5 Deck Structures External

Steel work is blasted to Swedish Standard 2.5 prior to application of paint coatings.

Ø Primer, Intergard 5000, TFT dry 250 microns,

Ø Finish, Interthane 990, TFT dry 50 microns.

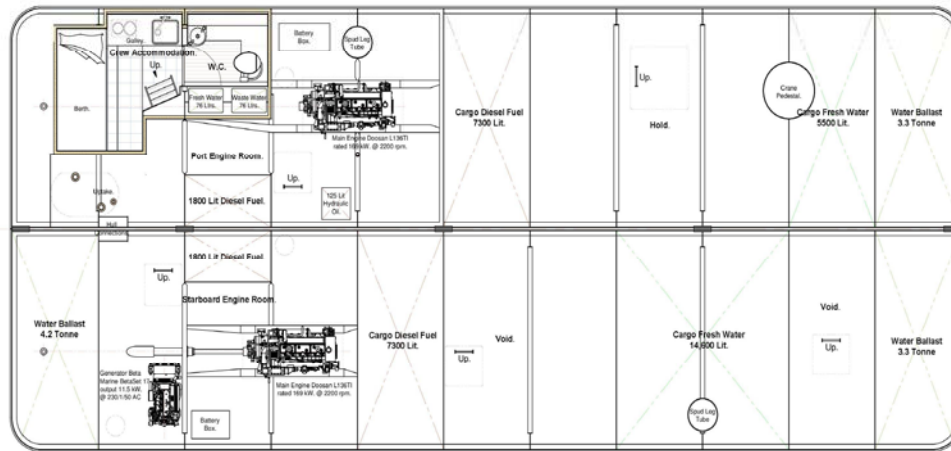
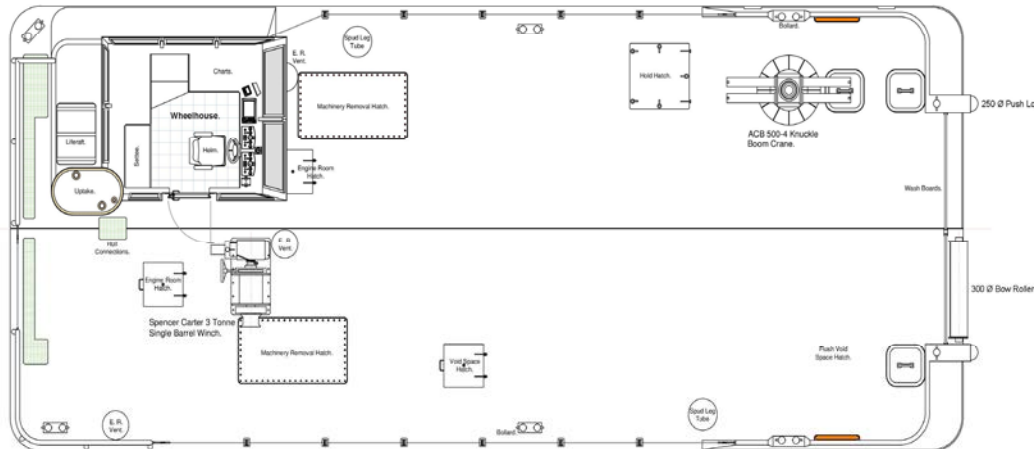
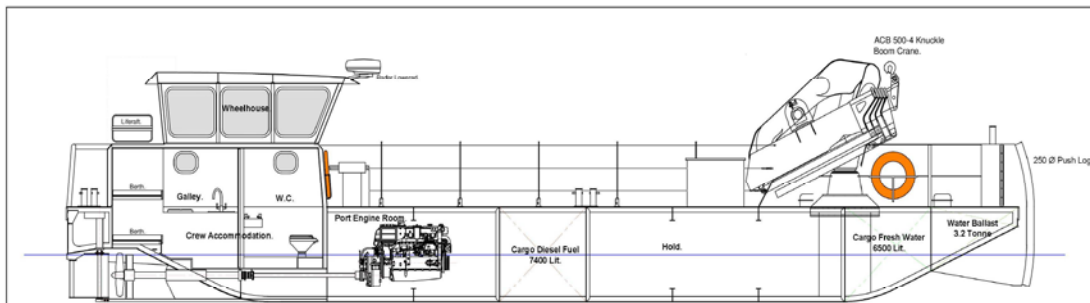
13.6 Main Deck

Steel work is blasted to Swedish Standard 2.5 prior to application of paint coatings.

Ø Primer, Intergard 5000, TFT dry 100 microns,

Ø Intermediate, Intershield 852, TFT 200 microns,

Ø Finish, Interthane 990, TFT dry 50 microns, plus non-slip additive.



CLADAR 1607S
Split-Hull Multi-Purpose Work Vessel

Hull length	16.50 Metres
Overall length	16.85 Metres
Breadth moulded (each hull)	3.43 Metres
Breadth moulded (hulls connected)	7.00 Metres
Beam overall	7.07 Metres
Depth moulded	1.50 Metres
Load line draught	1.10 Metres
Nominal draught	0.75 Metres
Maximum displacement	107 Tonnes
Deadweight	50 Tonnes
Total installed power	Two 150 kW
Bollard Pull	5 Tonnes
Classification	UK Workboat Code, Category 2, 60 NM from a Safe Haven
Scantlings	Lloyd's Special Service Craft, G2A, Workboat

Issued	Date	Modifications
E	23-10-13	Propeller nutties deleted and shaft line raised accordingly. Layout revised to add issue 'C' of the fabrication drawings. Engine room layout modified as issue 'F' of the engine room arrangement.
D	19-04-13	Diesel fuel tank capacity increased. Propeller shafts & machinery removed heeled moved outboard, port engine room access moved inboard. Lower outboard side of wheel-houset raised to full accommodation. Centre aft bollard deleted and port aft winchway added. Update height increased to obscure outboard outlets.
C	11-04-13	Refer to drawing issue for details of modifications.
B	05-04-13	Refer to drawing issue for details of modifications.
A	23-04-12	First issue

DO NOT SCALE
IF IN DOUBT ASK

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Project: S.H Welding Services.
Cladar 1607S - Split-Hull M-PWV
Title: General Arrangement.

Scale: 1 to 25
Date: 03-04-13
Drawn: I.C.D.
Dir. No.: 357/003