

CREWTENDER.com



Preliminary Building Specification for the **Crewtender 18m**

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1. GENERAL

This preliminary building specification is intended to inform clients and/or rescue, salvage or pilot organisations interested in building the new type Crewtender.

The design, the data and specifications, and the branch name Crewtender 18m are the legal property of Habbeke Shipyard, KRVE and De Vries Lentsch, Yacht Designers & Naval Architects, and are not transferable to others without written authorisation.

1.1 Type

aluminium crewtender, with deep V hull and reinforced rubber tube, closed main deck and closed wheelhouse. Propulsion by water jets and main engines

1.3 Main dimensions and Data (Dimensions can be different)

Length o.a.	18,80	m
Length aluminium hull incl. platform	18,00	m
Length cwl.	14,50	m
Beam o.a. incl. tube	6,10	m
Beam Hull	5,04	m
Draft at cwl	1,00	m
Draft fully loaded	1,07	m
Weight fully loaded (4 crew) approx.	29000	kg
Displacement fully loaded approx	28	m ³
Speed trial condition	35	knots
Range at full power	16	hrs
Max. possible Nr.of rescued persons	120	pers.
Crew	4	pers.
Fuel Tank volume	6200	ltr.
Fresh water (option)	100	ltr.

1.4 Propulsion

Main engines proposal:
Caterpillar C32 ACERT
MAN V12 -1100

with 2x Reintjes WLS 334 KA reduction gearboxes ratio 1,645:1 allowing the engines to be declutched from the waterjets.

ZF 3050 / 3055 reductie 1.8-1

Waterjets and gearboxes are connected by horizontal carbonfibre driving shafts.

Waterjets: Proposal,
2x Hamilton 521 B / or 571 with control system.
2x Rolls-Royce KaMeWa FF450s or FF500
2 x Ultrajet 525 or 575

MAIN ENGINES & Waterjets TO CHOOSE OWNERS.

1.5 Tube

Custom designed for this boat by Marant and Poly-Marine services, polymer outside with foam core, outside diameter 600mm

1.6 Electric system

24V / 12V DC system and 230V AC system, with 3ph. The 230 V system is supplied by a 10Kva hydraulic generator. A. de Keizer, Zaandam

Other types of generators are a option, to choice owner

2. CONSTRUCTION

2.1 General

The construction will be all aluminium, according a transverse framing system (framing distance 400 mm) with longitudinal stiffening. The construction will be executed by the yard according to approved plans. Experienced certified welders execute all the welding. All welds to be smooth grinded on all outside surfaces. All welding stresses to be avoided, and/or eliminated. All not accessible area's where stress can be expected are dye penetrant tested in accordance with classification society's survey. Fairing of the aluminium plating (hull, deck and superstructure) to be within the standard limits (50% of plate thickness over 1 m).

2.2 Materials

Aluminium plating, built sections and flat bar:	AlMg4,5Mn (5083-0 H321)	
	min. tensile strength unwelded	275 N/mm ²
	min. yield strength unwelded	125 N/mm ²
	min. tensile strength welded	275 N/mm ²
	min. yield strength welded	125 N/mm ²
Aluminium extrusions:	AlMgSi1 (6082 T6)	
	min. tensile strength unwelded	275 N/mm ²
	min. yield strength unwelded	200 N/mm ²
	min. tensile strength welded	160 N/mm ²
	min. yield strength welded	135 N/mm ²
Stainless steel:	AISI 316L	
Fastenings :	st. st. grade A4 and Sopral P60	

2.3 Scantlings

- skeg/ski-sole 10 mm
- hull 8 mm and 10 mm
- hull i.w.o. waterjets 12 mm
- transom..... 6 mm and 10 mm
- tube support..... 4 mm
- weather deck 4 mm
- wheelhouse deck..... 4 mm
- raised deck near bow 4 mm
- superstructure plating 4 mm
-
- floors outside engine room 5 mm with face flat 60x5
- floors in engine room 6 mm with face flat 60x5
- hull frames web 70x5, face flat 40x5

- w.t. bulkheads..... 5 mm, 6 mm and 8 mm
- w.t. bulkhead stiffeners T 45x30x4,5, T 65x32x5 and T 75x32x6
- deck beams web 100x5, face flat 40x5 and T 45x30x4,5
- superstructure stiffeners T 45x30x4,5 and T 65x32x5
- superstructure beams..... T 45x30x4,5
-
- stem bar..... 100x12
- longitudinal bottom stiffeners T 45x30x4,5
- tanktops 5 mm
- manhole covers 5 mm
- deck girders web 80/100x5, face flat 80x6
- wheelhouse roof girders web 100x5, face flat 80x6
- longitudinal stiffeners decks..... 40x5
- longitudinal stiffeners superstructure 30x4

Pillars, webframes, bottom girders, stringers etc. according to construction plan

2.4 Construction parts

- Ski-sole
- Sprayrails built onto the hull according to plans.
- 2x Stern extensions to add buoyancy and support aft deck.
- 2x Exhaust tail pipe through transom with flange at forward end to fit aluminium butterfly valve and room to attach rubber hose at the aft end with st.st. clamps.
- Heavy insert plating in bottom and stern in way of the waterjets, outside flush with surrounding plates
- Seatings for mounting of sensors of navigation instruments like speed, log and echosounder.
- Special care for mounting of flush anodes, according to specification of specialist and yard standard.
- Fittings to attach trim flaps at the transom.
- Trim flaps at the transom (optional)
-
- Centre girder with face flat and stem bar.
- Engine seatings with heavy flat bar on top.
- Floors with face flat and lightening holes.
- Frames and deck beams with welded flange and supporting brackets according to plans.
- Webframes with face flat according to approved plans.
- Superstructure side extended downwards under the weather deck onto the bottom plating as a longitudinal w.t. bulkhead with large manholes with 4 mm covers under the weather deck according to plan.
- Longitudinal girders and stringers according to approved plan.
- Tube support.
-
- 3x W.t. bulkheads with (sniped) stiffeners including w.t. bulkhead penetrations. W.t bulkhead at frames 9, 24 and 31. **EXPORT VERSION: POSITION Bulkheads according Leak Calculations**
- W.t longitudinal bulkhead with (sniped) stiffeners including w.t. bulkhead penetrations between PS and SB engine rooms from frame 9-24.
- 4x Integrated fuel tanks with:
 - swashplates
 - margin plates
 - manholes
 - sockets etc. for filling, suction and ventilation and level indication systems.
 - drainplug at lowest point.
-
- W.T. Hatches and doors:

- 2x flush (with the deck) hatch ($\pm 600 \times 600$ mm) over the waterjet compartment with drains to the transom. Can be opened from inside and outside.
- 1x entrance door ($\pm 2000 \times 700$ mm) to wheelhouse on c.l
- **EXPORT VERSION.** 1 outside door at the Toiletroom
- 2x entrance doors/hatches ($\pm 880 \times 550$ mm) to engine rooms, to be opened from inside and outside.
- **EXPORT VERSION (1) LARGE HATCH OVER THE TWO MAIN ENGINES.**
- 1 x entrance hatch ($\pm 600 \times 600$ mm) to the engine room, in large hatch over main engines (see above). Can be opened from inside and outside.
- 1x entrance door/hatch ($\pm 900 \times 600$ mm) to auxiliary compartment at the forward side of the superstructure. Can be opened from inside and outside.
- 1x flush hatch ($\pm 770 \times 600$ mm) in foredeck above the forepeak. Can be opened from inside and outside.
- The above aluminium hatches with adjustable st.st. or aluminium hinges, rounded corners and gutters, flush st.st. toggles which can be opened from inside and outside and st.st. gas springs, unless stated otherwise.
- Engine room air inlet ducting (PS+SB) with:
 - 2x aluminium grills in superstructure side (PS+SB) forward of engine room.
 - 2x aluminium fire/capsized flaps, with lever for hydraulic cylinder
 - 2x w.t. ducting inside auxiliary compartment
 - 2x mist eliminator in bulkhead at frame 24.
- Rescue platform which can be lowered at the stern with:
 - aluminium gratings to be provided with rubber flaps to prevent flooding of aft deck when manoeuvring backwards
- Aft deck railing with side bollards, liferaft holder (PS) and provision to store drogue's (SB) (see Ch. 3.3)
- Aluminium box on the aft deck for storage of jerricans with petrol.
- Double towing pole on the aft deck, $\varnothing 230 \times 10 / \varnothing 180 \times 10$ with $\varnothing 100 \times 10$

- Anchor chain and line locker on foredeck .
- Rope holders
-
- Aluminium handrails all along the superstructure, the wheelhouse roof, on the raised fore deck and at the aft side of the raised fore deck. Part of these handrails is also pressure line for the prewetting-system. (option)
- Recesses in superstructure for:
 - 2x Filling stations for fuel each with 2x filling and 2x ventilation line caps.
- 7x Self closing ventilation opening in superstructure.
-
- Aluminium canting and removable navigation mast on heavy foundation plate. Mast with branches to support all navigational equipment and lights etc.
- 2x Foundations for navigation side lights.

- Dashboard construction, arrangement to be made after try-out with mock-up (by yard).
- Seats (make: Ullman, Shockwave, Nor-Sap) on console
- Bench foundations (PS+SB) with storage inside.
- Supports for piping, tools and equipment to be fitted where needed and to be provided with suitable anti vibration and insulation materials.
- Aluminium protection plates to be fitted over all (dangerously) moving parts.
- Extra fresh watertank with pipelines , waterpressure system, and boiler.

3. EXTERIOR

3.1 General

All equipment to be installed according to the recommendations of the relevant subcontractors/suppliers.

3.2 Aluminium fittings

On all positions where equipment will be installed, extra aluminum support to be constructed, and where needed eyes for mounting and swingplates for small parts to be fitted.

3.3 Anchor, mooring and towing equipment

- Fortress anchor, type FX85 21.4 KG , , equipped with "mudguard", 6 m Ø 12 mm st.st. anchor chain and 70 m Ø 32 mm anchor line.
- Boathook
- 4x 15 m Mooring ropes

Option:

- Towing line on rope holder aft. Towing line: 220m Ø 32 mm Tipto Twelve

3.4 Tube

D shape tube, made according to the specification of the supplier Marant Poly-Marine. Outside diameter 600 mm. Fastening to the aluminium hull by Habbeke / KRVE patent. Colour to choice owner.

3.5 Windows

Construction and lay-out according to plans and instructions of the supplier
Windows (3x in wheelhouse front) to be made according to opening in plate dimensions of architects.
Windows can be heated, 230V or 24V (option)

3.6 Pipelines and fittings on deck

- All fastening of pipelines to be of stainless steel, Poly-Propylene (PP) or aluminium, and to be carefully insulated to prevent galvanic corrosion.
- There will be a connection of the reservoir to the wipers on the front windows.
- Window reservoir with inspection opening, to be positioned in engine room.
- Tank caps (filling stations) with st. st. padlocks. The filling pipe with extra ventilation opening
- Handrails of small aluminium pipe along the superstructure also used for serving the pre-wetting system. At relevant positions nylon spray nozzles to be fitted. (approx 20) **(OPTION)**

3.7 Electrical deck equipment and lighting

- Window screen wipers with st.st. wiper arms and blades. Make: Exalto 2355 KK-HD
- Camera, looking aft and front from the mast, display on dashboard.
- Horn, mounted to prevent the ingress of water. (type Marco, compressor BOF)
- Navigation lights

- NUC and restricted manoeuvrability lights
- Orange flash light
- Deck Lights
- Search lights which can be operated from the wheelhouse
- Deck / Capsize lights
- Intercom connections (Option)

3.8 Various deck equipment

- Liferaft for 6 / 8 / 10 persons (choice owner)
- Epirb (to be mounted without hydrostatic release)
- Sart
- 2x Diving knives
- Flaglines
- 4x Locking key for hatches.

4. INTERIOR

4.1 General (See interior plan Wheelhouse)

- All joinery and equipment crack and rattle free secured
- Ceiling panels and side panels to be removable in order to get access to cables, piping etc.
- Dashboard and seating arrangement to be executed according the drawings architect. Exact position of steering position, engine and waterjet controls to be finalised with a mock up (yard supply).

4.2 Interior lay-out

- 3 Special high speed craft spring mounted seats with safety belts, make Ullman or similar, on aluminium foundation.
- Other seating by choice owner
- Brackets for stretchers over benches (option)
- Rubber floor covering

4.3 Equipment and inventory

- Hand compass.
- 2x Binocular
- Infra red binocular for night vision, in box (option)
- 2x Throw-lines, 25 m long, one with ring
- Bucket with line
- 2x Diving knives with sheaths
- Loudhailer
- 2x 24V Hand searchlights.
- 2x Hand-torches, to be rechargable on board.
- First aid box
- Hypothermal rescue stretcher (option)
- Foldable stretcher, make: Datema
- 5x Lifejackets for rescued persons
- Rescue ramp (option)
- 8x White parachute flares, make Pains Wessex, stored in wheelhouse
- 2x Red parachute flares, make Pains Wessex, stored in wheelhouse
- 2x 18 ltr. Jerricans engine lubrication oil, one stored in each engine room.
- 1x 10 ltr. Jerrican engine coolant
- 1x 10 ltr. Hydraulic oil
- 1x 5 ltr. Gearbox lubrication oil
- Tool kit in suitable heavy duty plastic case
- Grease gun.
- Multimeter
- Set spare lights for all lights, including navigation lights.
- Set of st.st. hose clamps

- **Options, salvage and firefighting equipment:**
- Submersible bilge pump to put onboard other vessels
- Honda or Hatz salvage pump
- Suction hose 3,5 m with plastic foot valve and Storz coupling.
- Suction hose 3,5 m with 2x Storz coupling
- Pressure hose 10 m with 2x Storz coupling
- 2x Spray nozzle, pistol type
- 15 m, Ø ½" hose and nozzle to supply fuel to other vessel

5. Engineering and engine room

5.1 General

All equipment to be installed according to regulations of manufacturers, suppliers, subcontractors and ABS.

5.2 Construction

- foundations for engine room equipment
- support for pipelines
- bulkhead penetrations

5.3 Propulsion and steering

Main engines

- 2x Alternator (capacity 120 A), one on each engine.

Installation of engines

- Main engines and built on gearboxes have specially designed engine brackets and are rigidly mounted on engine foundation. Installation strictly according to instructions and guarantee of the suppliers/manufacturers.

Shafts

- Straight carbon fibre shaft with flexible couplings at both ends and steel spacer at gearbox side to be designed by Centa (type: CL-65-FF2-60500).
- Watertight bulkhead seals for these shafts.
- Shaftline is straight and horizontal positioned at the boat. (sb and ps)

Exhausts Main Engines

- 2x Water-cooled exhaust lines each comprising of
 - 2x2 st.st. compensators at exhausts of each engine
 - st.st. exhaust piping
 - st.st. waterinjection bend
 - Rubber hose
 - aluminium w.t. bulkhead penetration
 - aluminium butterfly valve
 - aluminium exhaust tail pipe passing through transom
 - hose (thin material) mounted with st.st. clamps on aft end of tail pipe to prevent water running back into the exhaust.
- Connection for pressure gauge.

- Connection for temperature sensor
- Dry part of exhaust to be well insulated.
- Exhaust line to be flexibly supported.
- To reduce the noise level, the installation of small mufflers is an option.

Controls

- Engine and bucket controls will be integrated. The smaller inside handles are for engine speed (PS+SB). The larger outer handles will control the buckets (PS+SB). Option, all electronic
- Gearboxes are controlled electronically from the wheelhouse. Each gearbox control panel consists of 3 lighted push buttons for the 3 modes: clutch in, clutch out and back flush.

Steering system

- According waterjet supplier, electronically by joystick or hydraulic with steeringwheel
- emergency steering system

Option:

- *1x Firefighting pump driven by SB main engine. Pump is driven by driving belts and can be clutched/declutched by means of a magnetic clutch operated from the auxiliary compartment.*

Bow thruster

Hydraulic bow thrusters, choice owner

Controlled by vectorstick steering (in docking mode)

5.4 Piping systems

General

- Pipelines according to KRVE / Hydromarine / Habbeke Shipyard approved diagrams and data.
- All piping to be adequately flexibly mounted.
- Pipelines, strainers, valves, pumps etc, all clearly labelled with plastic (preferable screwed on) nameplates.
- On all pipelines stickers according to international colour code showing content and direction of flow inside pipeline.
- All hose connections by fitted 2 stainless steel clamps.
- All materials of pipe systems and appendages to be approved by classification society especially non metallic piping (e.g. polypropene piping) ,non metallic appendages and hose materials.
- Provisions to prevent levelling between bottom tanks.

Bilge system

- Pipelines and closing valves outside the engine room to be made of aluminium.
- Pipelines and closing valves inside the engine room to be made of stainless steel.
- Overboard valves to be made of aluminium.
- Every compartment has his own submersible 24V bilge pump with automatic and manual switch. Bilge pumps are normally manually operated but can be switched to automatic when in harbour.
- Every compartment has a bilge alarm with a visual and audible alarm on the dashboard.
- There are 3 overboard pipelines; 1 for waterjet compartment, 1 for PS engine room, auxiliary compartment and fore peak, 1 for SB engine room.
- There will be a emergency submersible bilge pump on board (cap. 60 ltr./min.) which can be used in every compartment.

Fuel system

- Fuel system: daytank will always be filled up by one of the feeding pumps which will run continuously. Overflow from daytank back to bottom tank. This system will keep fuel temperature in daytank low.
- System has 4 bottom tanks and a daytank in the auxiliary compartment.
- Fuel tanks according specification owner, example:

- tank 1 (forward) 1810 ltr.
- tank 2 1370 ltr.
- tank 3 1530 ltr.
- tank 4 (aft) 1490 ltr.

- The 2 filling stations are on SB, 1 for tank 1 and tank 2, 1 for tank 3 and tank 4.
- Filling stations each with 2x filling pipe and 2x tank ventilation pipe. Next to each filling pipe is a large ventilation pipe to the same tank only to be opened during filling.
- Filling capacity of 130 ltr/min.

- Filling and ventilation lines to be made of aluminium
- Feeding and return lines between engine and daytank are stainless steel.
- Suction and return lines to bottom tanks are of aluminium and/or stainless steel.
- Short lengths of approved marine fuel hose between engines and piping
- Flame arrester in the permanent combined tank ventilation line.
- Non return valves in permanent combined tank to prevent fuel oil leaking when capsizing.

- Emergency manual fuel feeding pump in wheelhouse.
- Emergency fuel manifold in waterjet compartment.
- Suction and return manifolds to bottom tanks with electric valves (make: Asco, 3/4") which can also be manually operated. When the voltage drops to low they will close automatically.

- All tanks with level indicator with display on dashboard.
- All tanks with low level alarm on dashboard.
- 4x Coarse filter, make: Hollex, 1 in each suction line to the pumps.
- 1x Duplex filter, fuel/water separator, make Racor in combined suction line to pumps. This filter can be cleaned during at sea.
- 2x Magnetic filter, make: Debug, 1 in each feeding to engines. This to prevent possible bacteria in fuel to reach the engine filters.
- Possibility to supply fuel to other vessels at sea, with hose and nozzle.

Seawater system

- Cooling (sea)water is taken from specially designed streamlined seachests (PS+SB).
- Cooling water passes 4" Hollex strainer (PS+SB) on its way to engine.
- Alternatively cooling water is taken from deeper inlets further aft (PS+SB) and passes 3" Hollex strainer (PS+SB) on its way to engine.
- Cooling water will be injected in the exhaust line after leaving the heat exchangers of the main engines.
- The seawater lines will be polypropene pipes and short lengths of hose.

Fresh Water System:

Complete freshwater pressure system for cold/hot water to be installed.

Option:

Firefighting and pre-wetting system

- *Firefighting pump (make: Desmi S80-70-275/D09) mounted at frontside of SB main engine.*
- *Firefighting pump is driven by SB engine with a magnetic clutch in between. Clutch can be operated from the auxiliary compartment.*
- *Sea inlet for firefighting pump situated in auxiliary compartment.*
- *A firefighting pressure manifold with connections to the pre-wetting system or to Storz couplings on deck.*
- *Fire hose with nozzle can be coupled to Storz couplings on deck.*
- *Pre-wetting system consists of approx. 20 small nozzles around the superstructure. By putting pressure on the pre-wetting lines the superstructure and the tube will be wetted which allow better assistance to other burning vessels.*

5.5 Fixed firefighting system

Fire and temperature detection in engine rooms

- 2x Smoke and temperature detectors in engine room.

Fixed fire fighting system in engine room

- 2 Fixed fire fighting systems in engine room, make: StatX 1500
- StatX fixed fire fighting system can be operated from the wheelhouse.
- StatX fixed fire fighting system will be activated automatically when temperature in engine room rises to more than 175 °C.
- Before StatX is released a audible alarm and a flashlight will be activated.

5.6 Hydraulics

Functions

- Hydraulic installation to serve te following:
 - steering
 - bucket control
 - *lowering and rising of rescue platform (option)*
- System to be in accordance with ABS regulations.

Option:

Capsize flaps

- *Fire/capsize flaps will close automatically when ship heels over 90°.*
- *Flaps are closed hydraulically.*
- *As engines are not running at 90° hydraulic pumps driven by the engines are not running either.*
- *Therefore a nitrogen accumulator has been installed with sufficient power to open en close the flaps 3x.*
- *2x pressure switches installed to keep pressure in accumulator constant.*
- *Pressure gauges near accumulator to check the pressure inside the accumulator.*
- *This automatic system is controlled by electric capsize switches.*
- *The accumulator will be loaded as soon as main engines and hydraulic pumps are running again after righting.*
- *System must also work with only one engine running.*
- *Bypass valves must be installed to make it possible to operate the system manually.*
- *4x switches on main switchboard in wheelhouse to open/close the flaps.*

Steering

- Steering with 1x Orbitrol unit (
- Steering cylinder, one at each waterjet.

Option:

Rescue platform

- *One double acting st.st. cylinder, lowering and rising speed ca. 3 s.*
- *Rubber protection of st.st. cylinder rod.*
- *Sandwich valve protects system against hose damage and oil leakage.*

System components

- tank
- pumps
- piping and hoses

Hydraulic oil tank

- Tank (with capacity of approx. 80 ltr.) will be positioned in waterjet compartment.
- Tank with filling cap, (bleeding) air filter, level switch and return filter (10 micron)
- Tank with level indicating glass
- Oil level alarm
- At the bottom 2x suction lines with ball valves
- Tank will be connected with separate suction lines to hydraulic pumps, one on each engine

Pumps

- Each engine has a hydraulic pump with a variable flow regulator which delivers constant capacity independent of the rpm. of the main engine.
- Pump pressure lines join en lead to manifold with connections for steering and other tasks.

Piping and hoses

- Fittings, pipes, connections, valves etc. all of st.st. 316.
- Whole system to be cleaned and rinsed according the instructions before starting up.

6. Electric system

6.1 General

- The design and lay-out in accordance with requirements of, and approved by classification society, to be supplied by subcontractor. Cables of the halogen free type like "Husk, Huso, Hucom, TP" or equal. Electronic equipment, like navigation equipment etc, to be connected with protected (screened) cabling, and to be installed with the approval of the supplier of the equipment and the subcontractor. (Pay attention to the risk of fire,).
- The system is special designed for aluminum boats, with double wiring and no mass connection to the aluminium. Wiring to be laid in pipes and ducts with watertight bulkhead penetrations.
- The system will be mainly 24V DC and partly 230V AC.
- **Generator according choice owner**

6.2 AC system

- The 230 V AC system is fed from the shorebased shore connection (3 ph. +N+E 32A) by a 15m cable, connected with plug-in on board.
- Crewtender 18m can have a approx 20KW Generatorset on board.

6.3 DC system

- The 24V DC System is 2-wire and mass free. The 24V DC will be delivered by 1 starting battery and 1 service battery. These batteries will be loaded by the battery charger, in the PS engine room, and when the engines are running, by the 2 alternators on the main engines.

6.4 Batteries

- Make: Optima Yellow Top 12V 100 Ah. They will be placed in groups to form 2 sets, 1 for starting, 1 for service.
 - starting battery: 24V 300 Ah, positioned in auxiliary compartment
 - service battery: 24V 300 Ah, positioned in auxiliary compartment
- Switching from start batteries to service batteries for starting and vice versa can be done at the switchboard in the PS engine room
-

6.5 Distribution panels and groups

- In the wheelhouse 2 panels to be installed, 1x on PS, 1x on SB, The panels to be in aluminium boxes with a closed front.

PS wheelhouse panel

- Voltmeter PS start battery
- Amperemeter for charging current PS start battery
- Voltmeter service battery
- Amperemeter charging/discharging service battery
- Voltmeter SB start battery
- Amperemeter for charging current SB start battery
- Earth error indication lights
- 24x Automatic double pole circuitbreakers for the following groups:
 - 11x lighting
 - 3x window screen heating
 - 1x ventilation wheelhouse
 - 5x bilge pumps

- 2x fire/capsize flaps, one for each e.r.
- spare
- navigation lights
- Switches for:
 - switching on/off of rescue platform controls
 - lighting
 - bilge pumps
 - navigation lights
 - NUC lights (red-red)
 - restricted in manoeuvrability lights (red-white-red)
 - towing lights
 - deck/capsize lights
 - wheelhouse night lighting
 - ventilation wheelhouse
 - screen heating
 - navigation lights control lights with buzzer, lamp test and reset button
 - dimmer voor lights in switches
 - airco system

SB wheelhouse panel

- 32x Automatic double pole circuitbreakers for the following groups:
 - 15x electronic equipment
 - 2x screen wipers and spray
 - ship alarm system
 - fire alarm system
 - electrical operated searchlights
 - hand searchlights
 - hydraulic system
 - exhaust temperature measurement system
 - capsizeswitches, engine stop system main engines
 - tank level indication
 - fuel feeding pumps
 - microwave
 - intercom system
 - rear view mirror heating
 - gps/ais
 - GALLEY AND TOILET 24/220 V SUPPLY

Ship alarm system

- In each compartment, except the forepeak, cabling available for 2 extra alarms
- Ship alarm system consists of 2x Signum 10 item alarm panels with the following alarms:
 - bilge alarm fore peak
 - bilge alarm auxiliary room
 - bilge alarm PS engine room
 - bilge alarm SB engine room
 - bilge alarm waterjet compartment
 - hydraulic oil tank low level alarm
 - fuel daytank low level alarm
 - accumulator low pressure alarm
 - water in fuel filter alarm
 - PS main engine exhaust temperature
 - SB main engine exhaust temperature

- power Fire Pro alarm
- waterjet alarm PS
- waterjet alarm SB
- power fire alarm panel
- power alarm panel
- 2x spare

Main engine alarms

- each main engine has his own brand of engine monitoring unit with the following alarms:
 - overspeed
 - low oil pressure engine
 - coolant temperature
 - coolant level
 - combustion air temperature
 - charging/speed of alternator
 - low oil pressure gearbox
 - oil temperature gearbox

Fire alarms

- Fire alarm system consists of a Signum alarm panels in the wheelhouse with the following smoke and heat alarms:
 - auxiliary compartment
 - engine room
 - waterjet compartment
- Fire alarm sound signal (horn) in wheelhouse and auxiliary compartment

6.6 Electric consumers

Lighting and sockets

- All inside and outside lighting is 24V DC and operated from the wheelhouse
- Control panel navigation lights, with lamp test, will be built in PS switchboard. This panel will have switches for:
 - navigation lights
 - towing lights
 - NUC lights
 - restricted manoeuvrability lights

Position of lighting and sockets

- Forepeak
 - 2x bulleye 40W22
- Auxiliary compartment
 - 2x bulleye 40W22
 - 1x 24V socket for submersible bilge pump
 - 2x 230V socket
 - intercom socket (option)
- Engine room

- 8x bulleye 40W22
- 1x 230V socket
- converter for searchlight
- intercom socket (option)
- smoke/heat detector
- intercom socket (option)

- Waterjet compartment
 - 4x bulleye 40W22
 - 1x 230V socket
 - intercom socket (option)

- Wheelhouse
 - 8x ceiling lights
 - 2x 230V socket
 - 1x 230V socket with 5A fuse for ambulance
 - 2x chart light, 1x PS and 1x SB with dimmers
 - engine instruments (PS+SB) with dimmers
 - escape hatch (SB) lighting, make: Flex-a-light, connected to deck/capsize lights.
 - 2x small red floor lights, 1x PS and 1xSB in seats
 - intercom sockets at all seats (6x ?)

- Deck
 - 9x deck/capsize lights (2x at front superstructure, 1x at aftside superstructure, 3x at PS and 3x at SB side superstructure.

- Wheelhouse roof
 - 2x LED floodlight mounted on aft side wheelhouse roof, lighting the aft deck.
 - 2x LED floodlight mounted forward on wheelhouse roof, lighting the foredeck.
 - 2x sockets for hand search lights (option)
 - 1x remote controlled search light, make: ACR, type RCL-300

- Mast
 - top light
 - second top light for towing
 - stern light
 - yellow towing light
 - white light (restricted manoeuvrability)
 - pilot light
 - 2x red light (NUC)
 - orange flashlight
 - camera looking aft and front
 - infrared camera, make: Flir (Option)

Screen wipers

- 3x screen wipers, with each with its own controls for:
 - interval
 - slow speed
 - high speed
 - spray

Tank level indication

- 4 fuel tanks have Wema, or similar, level indication system with displays on the dashboard.
- Fuel feeding pump switch with 3 positions; pump1, pump 2, pumps 1+2

Exhaust temperature measurement

- Each exhaust line with 2 temperature sensors with display on dashboard.

Bilge pump system

- Each bilge suction point provided with:
 - bilge alarm
 - bilge pump, make: Rule 3700
 - bilge pump switch
- Bilge pumps are manually operated unless the ship is in harbour and connected to shorepower. In that case the pumps will be switched on automatically by the bilge pump switches nearby.

Microwave

- 24V Microwave, make: Moulinex Nautic, installed in recess between the engine room entrances in wheelhouse.

Option:

Capsize switches

- *1 Capsize switch will be installed to:*
 - *stop the main engines*
 - *switch on the escape hatch lighting*
 - *switch on the deck/capsize lights*
 - *close the fire/capsize flaps*

7. Ventilation, heating and air drying system

Engine room ventilation

- Combustion and ventilation air inlet grills are in the superstructure side (PS+SB) forward of the engine room. The combustion and ventilation air passes through a watertrap into the air ducts (PS+SB) and through 3-stage mist eliminators into the engine room. PS air inlet grill is connected to PS engine room. SB air inlet grill to SB engine room.
- Air inlet grills will be $\pm 1100 \times 560$ mm with free opening of $\pm 0,47$ m².
- In the air ducts are fire/capsizes flaps which will close automatically at heeling angles $\geq 90^\circ$, by using hydraulic cylinders activated by electric magnetic capsizes switches (see Ch. 6.7).

Wheelhouse ventilation and heating

- 2x heater (heat exchanger) with fan, make: Boomsma, type Delanair C14, positioned in engine room.
- Heat supply to heaters from cooling water of main engines; PS engine cooling water to PS heater, SB engine cooling water to SB heater.
- Heated air from one heater is blown directly into the wheelhouse through a w.t. duct.
- Heated air from the other heater is blown onto the front windows through a w.t. duct.
- Fresh air from outside will come into the wheelhouse through self closing valve (in case of a capsizes $\geq 90^\circ$) and will be blown down (3 openings) above the seats by Jabsco fan (type: 35770)
- *Electrically heated front windows (option)*
- Electric heater (shore power)

EXPORT VERSION: (ONE) AIRCO-UNIT WILL BE INSTALLED IN THE WHEELHOUSE FOR HEATING AND COOLING OF THIS SPACE.

Waterjet compartment

- Air dryer, make: Munters, type MG50, 230V
- Air dryer positioned in wheelhouse with supply and return piping with isolation valves to waterjet compartment and outside.
- Valves en piping in PP

Auxiliary compartment

- Air dryer, make: Munters, type MG50, 230V
- Air dryer positioned in auxiliary with supply and return piping with self closing valves through superstructure sides.
- Valves en piping in plastic.

8. Insulation

- To be according the advice of a specialist.
- Insulation has to be very light weight.

- Underside of wheelhouse floor, engine room bulkhead and longitudinal bulkhead between engine rooms sprayed with anti drumming compound Terophon 112 DB
 - layer thickness : 3,2 mm (dry)
 - weight : 4,8 kg/m²
- Underside of wheelhouse floor, engine room bulkhead, longitudinal bulkhead (on both sides) and engine room side walls lined with fire resistant, heat resistant and sound absorbing foam plastic Flamex GW65N. This material has an oil resistant cloth finish and can be glued onto the Terophon 112 DB with a MS polymer like Sikaflex or Helmitin STP 400.
 - plate dimensions : 200x600 mm
 - thickness : 65 mm
- Top of wheelhouse floor with floating covering. The sound and vibration absorbing polyurethane foam Agglomer D140/30 will be glued onto aluminium deck on top of which there will be a ± 15 mm plywood floor.
 - plate dimensions : 1000x1000 mm
 - thickness : 30 mm
 - weight : 4,2 kg/m²

9. Painting

- To be according the specification of paint manufacturer and sub-contractor. Letters and striping according to owner specification are glued on the aluminium.
- Painting according specification and demand of the client.

10. Navigation and communication equipment Proposal

- Radar, make: Furuno FR-8062 with 4' antenna
 - Radar, make: Furuno Navnet 1734C with Ø 60 cm radome
 - VHF-DSC, make: Sailor RT 5022, provided with interface for intercom
 - VHF, make: Sailor RT 2048
 - Direction finder, make Rhotheta RT-300 with external speaker
 - PC Navigis on computer with 2x TFT monitors with video input.
 - echosounder, make: Humminbird type Matrix 17, ,
 - Depthsonder , make: Furuno FCV 600L with special transducer for shallow water
 - SSB, make: Sailor HC-4610 (150 W). Audio output led to external speaker and intercom system by special amplifier.
 - GPS, make: Furuno GP150
 - AIS, make: Furuno FA150
 - DGPS, make: JRC, JLN-212
 - The NMEA signals from the 2 GPS's to be led via switch to computer with PC Navigis
 - PA system, make Hapé AF12 Mk2
 - Epirb, make Jotron Tron 40S
 - Sart, Jotron, Tron Sart
 - Electronic GPS compass, make: Simrad / furuno
 - Magnetic compass
 - Navtex, make: Furuno NX300
 - GSM cell phone, make Nokia 850
 - GSM telephone dial system make: MCS type ALG 20xx
 - VHF handheld, make: Simrad HT53
- ***Other brands according specification and demand of the client.***

11.Remaining Fire Fight-Equipment

Portable fire extinguishers

- 1x 6,8 kg CO2 extinguishers in the wheelhouse.
 - 1x 6 ltr. AFFF foam extinguisher, class AB in wheelhouse.
 - 1x 6 ltr. AFFF foam extinguisher, class AB in engine room.
 - 1x 6 ltr. AFFF foam extinguisher, class AB in auxiliary compartment.
 -
- Fire Fight Sensors at Eng.Room, Auxiliary Room, Jet Room., with notice to the wheel house panel.

12. Intercom system Option:

- *Intercom system is of make: David Clark with master station type U3800 and the following connections:*
 - *1x intercom socket, type U3801 in the anchor chain and line locker*
 - *1x intercom socket, type U3801 in the auxiliary compartment*
 - *1x intercom socket, type U3802 in engine room*
 - *1x intercom socket, type U3802 in waterjet compartment*
 - *1x intercom socket, type U3801 near rescue platform*
 - *2x intercom socket in masterstation in ceiling over both middle seats*
 - *1x intercom socket , type U3811, for VHF, over PS front seat*
 - *1x intercom socket , type U3811, for VHF, over SB front seat*
 - *1x intercom socket , type U3811, for cell phone, in ceiling between PS and middle seat*
 - *1x intercom socket, type U3811, connected to audio scanner for SB aft seat*
 - *1x intercom socket, type U3802, for PS aft seat*
 - *2x double intercom socket, type U3806, for PS aft bench*
 - *2x double intercom socket, type U3806, for SB aft bench*
- *For communication between doctor and patient a U3800 masterstation with double intercom socket is built in near the SB brancard position and a U3806 double socket near the PS brancard position.*
- *The headsets (8x) are type H3432*
- *The audio scanner detects incoming audio signals from all connected communication equipment and indicates the origin. All incoming signals can be blocked except the VHF signals. The following communication equipment is connected to the audio scanner:*
 - *2x VHF*
 - *SSB*
 - *direction finder*
 - *mobilophone*
 - *cell phone*
 - *aviation transceiver*
 - *lpd*
- *Apart from the above David Clark system there is a **wireless intercom system**, make: Peltor dect. system linked to the David Clark system. This Peltor system consists of a base station, 2x belt stations and 2x Gecko MK10 helmets with a Peltor headset.*

13. Documentation Option:

- *The following documentation to be included into a dvd / book by the yard:*
 - *relevant plans and diagrams.*
 - *part lists*
 - *all manuals of installed equipment*
 - *all installation manuals of installed equipment*

Documentation According choice Client.