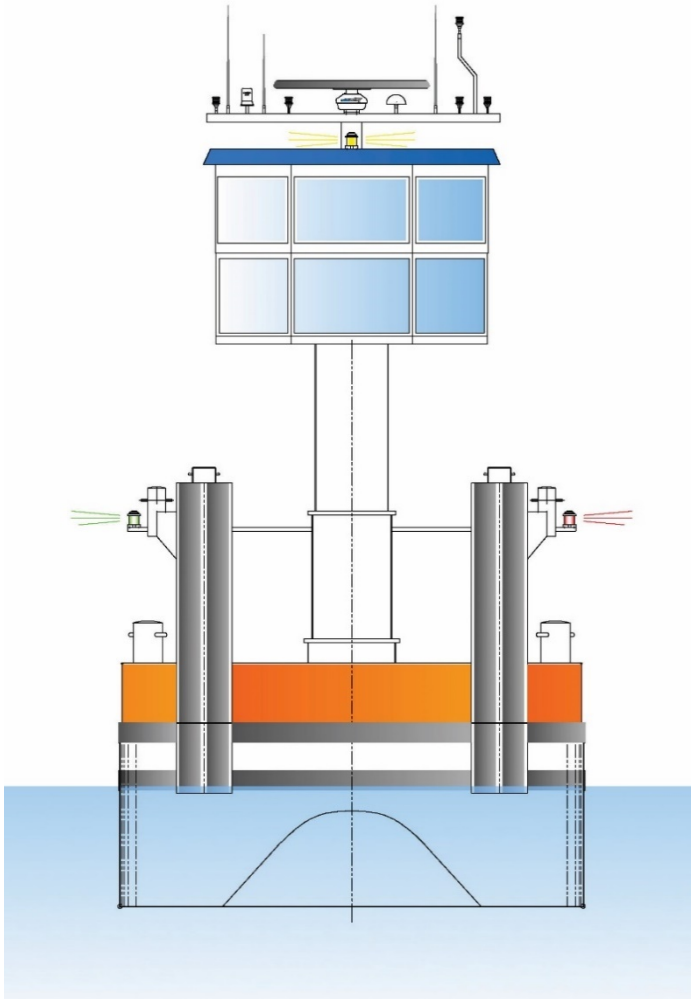
BUILD SPECIFICATION

For the

Watertruck+ Small CEMT I pushers



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DEFINITIONS & ABBREVIATIONS

Definitions

Vessel	An inland waterway vessel or sea-going ship, The pushers developed shall be pushers conform the EU Directive definitions capable of pushing of barges and lighters.
Pushed convoy	A rigid assembly of craft of which at least one is positioned in front of the craft providing the power for propelling the convoy, known as the 'pusher(s)'; a convoy composed of a pusher and a pushed craft coupled so as to permit guided articulation is also considered as rigid. *[EU-Directive 2006/87/ec Art. 1.01]*
Pusher	a vessel specially built to propel a pushed convoy
Flag	Body, National Authority, where the vessel is registered
Class	Classification Society
Design	Basic design covers ´class construction package´.
Owner	Watertruck+ BVBA or its representative
Operator	Barge operator or its representative
Shipyard	Main contractor of the barge / builder (could be hull/casco and/or completion yard)
Hull / Casco	Casco steel work could be including some outfitting equipment
Completion	Outfitting work, could be on different location than hull/casco yard
BENELUX	Belgium, The Netherlands, Luxemburg
Owner	Watertruck+ BVBA or its representative
Operator	Pusher operator or its representative
Shipyard	Main contractor of the pusher / builder (could be hull/casco and/or completion yard)
Hull / Casco	Casco steel work could be including some outfitting equipment
Completion	Outfitting work, could be on different location than hull/casco yard
BENELUX	Belgium, The Netherlands, Luxemburg

Abbreviations

Loa	Length over all
Boa	Breadth over all
LD	Lightship Draft
IACS	International Association of Classification Societies

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0000 - GENERAL

0001 Design Philosophy

The push boats in the Watertruck+ project are to be modern, high performance pusher(s) especially designed for the operation on small inland waterways. The function of the pushers within the Watertruck+ concept is twofold:

- In combination with un-propelled barges: to push single or multiple barges from their origins or towards their destinations along Europe's small inland waterways (CEMT classes I-IV)
- In combination with un-propelled or self-propelled barges: to push convoys of Watertruck+ barges along the TEN-T core network, establishing the link between the TEN-T corridors and the peripheral network of smaller waterways

Two types of pusher are described in this specification, herewith described as small CEMT I or CEMT II pusher, where the applicable dimensions are given in item 0002.

Environment:
The emission values are to be as low as possible. In order to achieve these values the design shall be optimized in terms of weight, hull shape, energy consumption and propulsion system.

Where there is a choice between different systems, materials or parts in terms of environmental impact and which are equal in other respects, in principle the most environmentally friendly solution must be offered.

Building and operational cost:
The build of the pusher is to be developed cost conscious without harming the functionality.

General design description:
The pusher(s) are to be of a mono hull type with a collision bulkhead positioned according to the requirements of the Class Society and National Authorities. The shape on deck level will be basically rectangular with well rounded edges. The shape of the underwater body shall be optimized for its service. The fore part will have 2 vertical fenders especially designed for its push function. The propulsion consists of one integrated 360 degree propulsion thruster with fixed pitch propeller in a nozzle. This thruster will be driven by an electrical power plant.

Below decks the vessel is divided in a 3 watertight compartments with the following functions.

- Forepeak (pending on the design and Operator's preference) suitable for ballast purposes.
- Engine room for the main propulsion plant, with some storage facilities.
- Storage tanks.
- Aft peak cq thruster room.

In general, all compartments are to be easy accessible. The thruster room, engine room, and superstructure shall have adequate means of (emergency) escape to the deck, all in accordance with the applicable Rules and Regulations. The superstructure/accommodation will have an open galley and mess, wet cell(s) with shower and toilet, and sleeping accommodation for min. 3 crew members.

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The wheelhouse shall be of a telescopic, in height adjustable type, with a possibility to lower its upper part, to meet the visibility requirements and specified airdraft.
Furthermore, the wheelhouse is to be equipped with the required Nav-Com equipment.

The deck equipment at least consists of the following:

- 4 hydraulic/electrical winches, positioned on fwd. deck under the wheelhouse, with a holding force of min 25 tons.
- 1 anchors and 1 electrical anchor winch.
- 2 combined double bollards / wire rollers with pins positioned forward, PS and SB.
- single bollards on aftdeck, PS and SB.
- Wire rollers/bollards SWL 40 ton.
- 2 wire rope rollers alongside the accommodation PS and SB.
- 1 bating positioned fwd between the pushing posts.

The propulsion drive and power plant is designed taking the following into account:

- An integrated drive/thruster is used, driven by a compact permanent magnetic motor, system suitable to fit in the thruster room.
- The thruster nozzle shall not extend below the baseline.

0002 Main particulars

Main dimensions of the pusher(s) are the following:

		CEMT I Pusher
Length o.a.	[m]	12,00
Beam o.a.	[m]	5,05
Draught max.	[m]	1,60
Air draft (With retracted wheelhouse)	[m]	3,70
Wheelhouse Elevated Height	[m]	6,00
Pushing Capacity	[t]	1200

Minimum Tank Capacities

		CEMT I Pusher
MDO Fuel tanks (1 PS, 1 SB)	[m^3]	2 x 5,0 m3
Potable water tank	[m^3]	2 x 1 m3
Sewage (black) water tank	[m^3]	1 x 0,5 m3
Dirty oil	[m^3]	1 x 0,25 m3

0003 Scope of supply

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This specification describes the design and build of 2 different types of pusher(s) including their equipment. Any supply which is not mentioned in the paragraph “The supply excludes” or in the paragraph “Owners Supply” or “Operator Supply” is considered “Included” in the services to be delivered.

The supply includes notably but not exclusively:

1. The design works necessary for the shipyard to prepare and organize production (work shop documentation, work shop drawings, bending files, cutting files, nesting, welding procedures, testing procedures, etc.).
2. The construction of the vessel in compliance with the approved drawings.
3. The building survey costs by the Classification Society.
4. The cathodic protection of the hull with zinc anodes.
5. The supply, installation, connection and commissioning of the equipment supplied by the shipyard.
6. The installation, connection and assistance for commissioning of the equipment supplied by subcontractors or Owner/Operator.
7. The handling and storage, in the appropriate conditions, of all the equipment supplied by the Owner/Operator. And his suppliers and/or subcontractors.
8. The installation, connection and commissioning assistance for the equipment supplied by the Owner/Operator.
9. The surface preparation, the supply of the different paints, the application of the painting system and the survey costs by the paint supplier’s approved representative in order to obtain the paintwork warranty.
10. The cleaning products for the paint application tools and materials.
11. The disposal of all residues in respect to surface preparation and paint application.
12. The protection of all equipment, either supplied by shipyard or the Owner/Operator or their subcontractors, damage and/or soiling throughout the construction period.
13. The availability of competent personnel, tools, measuring equipment and safety materials fulfilling the local regulations.
14. The procurement and utilization of all required consumables up to completion.
15. All tests required by Classification Society and Operator, e.g. scantling tests, tightness test, welding tests (radio graphical, ultrasonic, etc.).
16. All the sea trials (with Operator’s crew, yard remains responsible for sea trials).
17. The embarking of the spare parts supplied by the Operator, their storage, stowage or securing on shelves in the different locations.
18. The complete cleaning of the machinery space bottoms, bilges and other spaces and decks before delivery.
19. When applicable, the sea fastening and/or the protections necessary for and during the transport to the destination port.
20. If (ocean) transport is needed, the complete transport of the hull respectively or the complete pusher shall be CIF (cost, insurance, freight) BENELUX.
21. Observing and fulfilling the guidelines IMO RESOLUTION A 765(18) and IMO-MSC-CIRC 884-19981221 Safe ocean towing.

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22. If (ocean) transport is needed, installation and removal of the sea fastening and/or the protections required during transportation after arrival at the destination port in the BENELUX.
23. Ensuring availability of an office for the Owners/Operators representatives or his subcontractors throughout the construction and trial period of the pusher up to delivery.
24. Ensuring free access for Owners/Operators representatives or his subcontractors or surveyors of the Classification Society throughout the complete building process, starting with prefabrication and ending with delivery.
25. The drawings and documents to be supplied by the shipyard and its subcontractors, i.e. as build drawings, installation drawings, diagrams and schematic.

The supply excludes:

1. The equipment supplied by the Owner/Operator if applicable.
2. The costs of the Owners/Operators personnel or that of his suppliers and/or subcontractors for the survey of the construction and assistance with the trials at the shipyard or at sea.
3. The costs of the flag state Authority for the survey of the pusher if not covered by the Classification Society.

Owners supply:

1. The (class approved) drawings and documents in accordance with the lists in the APPENDICES.
2. The equipment and services provided by the owner and his suppliers and/or subcontractors if applicable.

Operators supply:

1. All consumables for the first filling (fuel oil, lube oil, hydraulic oil, potable water).
2. Crew and assistance for the sea trials, assistance for all final trials at the shipyard.
3. The equipment and services provided by the Operator and his suppliers and/or subcontractors if applicable.

0004 Pusher(s) and equipment guarantee

All the material and equipment is guaranteed for at least 1 year for parts and labor from the delivery date of the pusher by the shipyard to the operator after commissioning and satisfactory tests and trials. Tests and trials are to be to the satisfaction of Classification Society as well as to the satisfaction of the operator. The paintwork is to be guaranteed for at least 5 years by the paint supplier covering both surface preparation and application of the paint.

0005 Quality policy

All involved yards and subcontractors must have installed effective systems concerning QHSE (quality, health, safety, and environment) to satisfy both the owner and or its operator/client.

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0006 Workmanship

The workmanship of the hull and all equipment and fittings shall be of high marine standard. Care shall be taken to ensure fair lines, smooth surfaces and neat welding. All materials and equipment installed in, or delivered with the pusher shall be new and of good marine quality.
During the outfitting, high standards are kept regarding clean-keeping, safety and environmental protection.
Trade names and names of specific manufacturers mentioned in the specification are intended to describe the desired quality and/or construction of the equipment and materials and not to exclude any other makes of equal quality or construction.
All bolts, chains, fittings and other small equipment exposed are, where possible, of stainless steel and at least of galvanized steel.

0007 Delivery

The pusher(s) are to be delivered completely with all equipment installed, tested and accepted by class society and the owner/operator or their representatives. Delivery will take place by means of a final delivery protocol signed and accepted by the shipbuilder and owner. All bilges, and other spaces throughout the pusher are thoroughly cleaned and painted surfaces are touched up or repaired where necessary. All stores, inventories and spare parts shall be on-board and shall be properly stored.
The final acceptance and delivery are to be in an agreed location within the BENELUX.

0008 Planning

A building schedule shall be issued shortly after the contract date, at least not more than two weeks after. The planning / building schedule is to be supplied electronically, preferably in PDF format.

The planning shall show the different phases from the completion of the contract and all the main intermediate milestones for each phase:

- Manufacturing / hull production documentation
- Procurement
- Construction
- Outfitting
- Testing schedule of all necessary trials and tests before delivery
- A progress report is to be delivered every month. As far practicable, pictures should be included in these reports.

0009 Design temperatures

All machinery and electrical equipment are to be designed for following conditions;

- River water temperature: +1°C to +30°C maximum
- Ambient air temperature: -15°C (-20°C max.) to +35°C (+ 45 °C max.)
- Relative humidity: 90% maximum

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0010 Shipping routes

The pusher has to be able to operate also in complete inland range according to 2006/87/EC in any case, but not limited to, operational zone 2,3 and 4 of the community.

0011 Optional customizations

The pusher is to be designed to add following customizations in an easy manner, concerning following items:

- None applicable.

0012 Extra works

Extra works and its associated costs not covered in this specification are to be agreed between the Shipyard and Owner or Operator before starting the works. Such agreement is only valid in case properly documented and approved by the owner or operator.

0013 Insurance

The shipyard will bear all risks connected with the hull construction and outfitting until its delivery to the owner in the BENELUX.

0014 Performance and Speed

The pusher(s) need to perform well at all loading conditions of the pusher and its pushed convoy.
The CEMT I pusher will have pushing capacity certificate of 1200 tons and sufficient power installed.
The CEMT II pusher will have pushing capacity certificate of 1500 tons and sufficient power installed.

Passing locks, bridges etc. as well as maneuvering in harbor areas should be possible and safe.
The shipyard will be responsible for the speed and performance of the pusher(s).

The installed engines need to comply with the following emission limits:
The emission values for at least NOx and PM need to comply with the current EURO VI standard for road transportation, or equivalent.

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0100 CLASSIFICATION

The propulsion system including the engine(s) and thrusters systems are to be in accordance with the applicable Class and Authority Regulations.

0101 Classification Society

The pusher(s) are to be designed and built under supervision of and in accordance with the Rules and Regulations for the Classification of Inland Waterway Ships from Lloyds Register.

All drawings and documents are to be in accordance with the Rules and Regulations applicable for the following class notation: **+ A1 IWW Pusher tug**

0102 Flag State Authority

The design and build should meet and reflect the applicable requirements of the Belgium Authority.

At least the following rules and regulations (latest versions) apply:

- European Directive 2006/87/EC.
- ADN concerning pushed convoys and side-by-side convoy formations carrying ADN cargoes.

0103 Test and Trials

The acceptance trials take place in the presence of the Owners and Operators representative(s) and the Classification Society. They will include at least but not exclusively the following:

- Regulatory trials in accordance with the applicable regulations which are at least based on applicable European Directive 2006/87/EC, ADN and the Classification Society Rules and Regulations.
- Especially extensive testing of the welding's in accordance to the NDT plan to be approved by Classification Society. Also the films of the radiographic tests of the welding are to satisfaction of Classification Society and the Owners / Operators representative.
- Pressure test of all hydraulic circuits.
- Pressure test of all tank and compartments.
- Individual testing of each electrical, combustible, air, fresh water, fire, ballasting, etc. circuit respectively system.
- Recording of the insulating measurements of the different electrical circuits.
- Load trials of the propulsion units.
- Measurements, at 100% MCR, of the sound levels in engine rooms and/or wheelhouse during the endurance test. The radiated noise during this test is also to be measured.
- Speed and power runs are also to be carried out in relatively shallow water and at the maximum power.
- Anchor tests.
- Tests of deck equipment.

All tests are subject to a procedure drawn up by the Builder. A test report in which the values measured and the contractual values are mentioned, together with the remarks, is to be provided to the owner and/or operator.

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0200 DOCUMENTS

0201 Design Documents and Drawings

All drawings, calculations and documents are to be in the English language. Documents related to the operation of the pusher are, additionally, to be provided in a language as specified by the operator.

All class approved hull construction drawings and preliminary stability file will be delivered by Watertruck+ BVBA. The shipyard is responsible for the detailed engineering, i.e. work shop documentation and nesting files.

The approved hull construction documents delivered do not alter in any way the responsibility of the shipyard with regard to applicable regulations.

At least the following design drawings are required:

- General Arrangement (as built)
- Engine Room Arrangement (as built)
- Fire control and Safety Plan
- ADN plan of conformity (distances/ventilation etc.)
- Equipment and machinery drawings
- Final stability documentation as input for the pusher's designer
- Machinery diagrams as fuel and cooling cooling water systems, Bilge / fi-fi diagram, Exhaust system diagram including back-pressure calculations.
- Approved TVC report if applicable
- Electrical and control schematics and diagrams

Upon delivery a construction file shall be delivered, containing all material certificates, compliance certificates, drawings and documents approved by the Classification Society. A single hard copy and a PDF version are required.

0202 Manuals / documentation

Instruction and installation manuals are to be delivered in hardcopy and PDF, either in the English or Dutch language, containing at least a description, references, instructions for use, instructions for maintenance and a list of spare parts. All as-built electric diagrams are to be inserted in the corresponding cabinets.

0207 Certificates

At its delivery the pusher shall have all relevant certificates according to Class Rules and Regulations, the European Directive 2006/87/EC and the ADN. At least the following certificates have to be available and delivered with the pusher:

- Flag State Registration Certificate
- Certificate of Class with hull and machinery appendix

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- Certificate of fitness (EU Directive Community Certificaat van Onderzoek, including a note for the required pushing capacity, continuous operation B and one-man navigation notation)
- Attestation of conformity to Rhine rules (ROSR)
- Certificate of Approval (ADN Certificaat van goedkeuring)
- Vessel gauge certificate and table (NL Meetbrief)
- Tank gauging tables of al storage tanks and auxiliary tanks.
- Approved stability booklets

All certificates shall be free of any restriction. The owner will initiate the administrative procedure in Belgium for Authority documents. The shipyard shall undertake appropriate actions in order to provide all necessary documents, certificates and/or attestations to the owner.

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1000 HULL STRUCTURE AND HULL OUTFITTINGS

1001 General

This specification describes the requirements for a steel hull and steel hull outfitting.

The hull is made of steel plates and profiles (grade A or equivalent), certified by one of the major Classification Societies.
The hull is of an entirely welded construction in accordance with the rules of the Classification Society. All welds are double continuous unless otherwise stated in the drawings or welding table. If drain holes or cut-outs ensuring the drainage of the bottoms or the degassing of the ceilings are present in profiles, floors, frames, etc. the welding has to circumvent those holes or cut-outs. All unacceptable faults are repaired according to good shipbuilding practice and to class requirements. Hull, decks and bulkheads are adjusted wherever necessary in order to eliminate local warping; the decks in particular do not develop puddles of stagnant water when in operation. With respect to these quality items, the IACS No. 47 Shipbuilding Quality standard needs to be complied with. The sharp angles of drainage holes or plate cut-outs have to be ground and rounded in order to ensure the paintwork guarantee. Even if tanks are not painted, all such drainage holes and cut-outs are to be well rounded and grinded smoothly.

1002 Hull quality control

The shipyard building the hull is obliged to carry out hull construction tightness tests and obtain Classification Society acceptance of works. All QC operations will be carried out in accordance with Classification Society regulations.

1003 Structural and tightness testing of tanks or compartments

Technical presentation of all tanks, cofferdams and/or void spaces, by shipyards QA in presence of Classification Society and operators representative, before painting and launching of the hull.

Leak air testing:
This shall be carried out prior to the protective coating being applied to the welds. Shop primer may be applied to welds. An efficient indicating liquid shall be applied, when air is used as the test medium. The air pressure shall be kept at a maximum pressure of 20 kPa for minimal 1 hour. In addition to an effective means of reading the air pressure, a safety valve, or a reliable equivalent alternative, shall be connected to the compartment being tested.
Test pressure shall be verified by means of one master pressure gauge. Small repairs / leakages will be repaired/welded after release of pressure, a renewed leak pressure test to be carried out.
All testing of tanks will be reported, reports to be signed by Classification Society.

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Structural testing:

All tanks shall be tested with a hydrostatic test, which may be carried out after a protective coating has been applied, provided a leak test is carried out before application of the protective coating. All pipe connections to tanks shall be fitted before structural testing. When structural testing at the building berth is undesirable or impossible, structural testing afloat may be accepted. The structural testing shall be carried out by filling each tank separately to the test head. Normally equal to the height of the overflow or 1.0 m above the top of the tank, whichever the greatest.

1004 Steel structure materials

All construction elements as well as welding works shall comply with requirements of the Classification Society. Thickness and scantlings shown in drawings approved by the Classification Society will be considered as final and valid. All welded joints shall be of perfect quality, tight and smooth. Special attention should be paid to avoid shell plating dents between frames.
In general a system of plates and profiles will be applied. The length and width are to be as large as practical for the surfaces to be built respecting the available sizes in the market. Size and tolerance of steel profiles and flat bars are to be in accordance to the appropriate DIN Standard.
All steel plates and profiles should be cleaned by sand-blasting or grit-blasting and protected with a shop-primer, minimum thickness 20mu, suitable for 2-compenent conservations.

Steel plates with thicknesses of half millimeters shall be avoided as much as possible. The maximum tolerance in the thickness of the steel plates shall be in according with the DIN Standards, and in smaller than +/- 0,3mm. Due to the fact that corrosion margins are applicable it should be avoided that plates are thinner than nominal.

The plates and profiles are procured from reputed manufacturers and the different batches are identified and delivered with the material certificates 3.2 (chemical analyses, heat treatment and mechanical characteristics). The traceability of the plates and the certificates must be ensured (casting number or equivalent). The costs for the material certificates of steel plates, profiles, pipes, etc. are for the shipyard.
In principle all construction works are to be in accordance with the IACS No. 47 Shipbuilding Quality standard.

Maximum tolerances of plating

Shell plating above water line:	Max 4 mm of frame length
Shell plating below water line:	Max 5 mm of frame length
Bottom:	1% of frame length
Superstructures:	2-3 mm of frame length
Length:	1 mm per meter length, max 50 mm
Breadth overall:	1 mm per meter width
Bulkheads:	5 mm deviation Longitudinal/Transverse/Swash
Shear stroke:	3 mm of frame length

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Notes:

In certain circumstances, deviations from the recommended tolerances may be accepted after written agreement between Owner and/or Operator, Shipyard and Classification Society.
In case the deviation doesn't meet these above mentioned requirements, it should be stretched or reconstructed according operator's satisfaction.

1005 Piping materials

Piping materials applied in the hull construction are equivalent to those determined in the German DIN 2448 Standard and are to be of seamless type.

- Piping wall thickness: According to Classification Society regulations (pipeline fittings shall have wall thicknesses at least the same as the respective pipeline).
- All pipes located in double bottom or double hull shall be reinforced type (AINSI schedule 40, or higher schedule 80 or XS) and galvanized.
- Piping is fully welded and shall be made of standard elbows, tees and flanges or fittings.
- All piping shall be carefully cleaned after manufacturing, pressure tested at 1.5x nominal working pressure and tightness tested after installation on board before connecting to equipment.
- All open ends of pipes outside tanks or compartments to be blinded with blind flanges or closing caps. All pipelines should be fitted "stress free" and sufficiently vibration free clamped.
- Pipe penetrations through watertight bulkheads will be continuously welded on both sides.
- In case construction elements are pierced with holes for the passage of piping, electric cables, etc. the inertia of the section is restored in accordance with Class Rules. All penetrations to enable pipes or cables to pass steel plates are designed in accordance to the rules (water tightness and fire resistance).
- All piping's except for fuel and lube oils are galvanized.

Galvanization

Care should be taken by the design and preparation of items which needs to be galvanized in order to guarantee good distribution and penetration of the galvanization, especially in hollow bodies. In the exceptional case where a galvanized item must be welded or cut for assembly on site, or for a local modification or repair of galvanization this must be carried out by cold galvanization. Hot galvanization has to take place after forming, assembly and welding. Use of hot-galvanized screws, bolts, washers and nuts for assembly is mandatory. The minimum galvanization thickness is 80µm.

Piping joints

Pipe sections should be connected with flat flanges or welding neck flanges complying with requirements of the DIN 2576 Standard, PN10 or as per respective drawing Pipelines to be in accordance with Classification Society requirements.

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1006 welding standards

Welding procedures and welders are to be qualified in accordance with the procedures of the Classification Society.

- Welding operations including welding preparations are to be carried out under proper supervision by the Shipyards Quality Control.
- Abrupt change of sections and plate thicknesses are to be avoided. When the difference in plate thickness exceeds 3 mm a beveled edge to be made (tapering 1:3 standard or as specified in the drawings).
- It is in no circumstance acceptable to fill a gap between joined components with electrode wires, steel round bars or scrap etc.
- Welding operations are to be carried out sheltered free from rain, snow and wind.
- Storage tanks, ballast tanks, chain lockers, sea chests and all outside structures are to be welded double continuous.
- A good quality standard of visual appearance of welds is to be maintained.
- All welds on outside corners of the hull construction outside, including superstructures, hatch coamings, cornered plate or profile connections, must be grind smoothly. No grooves and/or sharp edges may be seen / occur.
- All welding slags and spatters are to be removed.
- Preparation of welding seems and execution of welding is to be in accordance with the approved welding tables, as per relevant constructions plans and according to Class Rules and Regulations.

1007 NDT non-destructive testing

Weld control is carried out by radiographic and ultrasonic control in accordance with the class requirements and those of the operator's representative. In addition to the NDT plan the pusher-owner reserves the right to determine 20 welding locations to be tested by radiographic or ultrasonic control for costs of the contractor.
Where defects are observed at or near the ends of the radiographs additional radiography is to be carried out to determine the full extent next to the defect. Unacceptable defects should be repaired and a second non-destructive examination is to be carried out. Companies performing non-destructive examinations are to be qualified in accordance with Classification Society rules

1008 Space for survey

All distances, sectional areas and spaces required by class and/or authorities have to be respected in order to be able to fully inspect the hull. There is no place and/or closed space in the hull which cannot be visually inspected except for the double bottom under cargo hold, for this technical openings are to be made in case there is a need to inspect.

1009 Hull structure building

The contracted shipyard (being the Shipyard contracted by the Owner) may decide to build the hull structure in a country outside of Belgium or the Netherlands. If transport is needed, the sea fastening and sea protection for towage are installed before leaving the hull construction yard. The contracting shipyard will dry-dock the pusher(s) after such a transport for inspection by owner and or operator or its representative, shipyard and the Classification Society. An inspection report needs to be signed by the parties concerned. Issuance of a transport and/or dry docking attestation by the Classification

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Society is arranged by the shipyard. The hull shall be cleaned properly and paintworks shall be well dried before transport is applied.

1010 Survey and classification survey

The Owner and/or Operator or its representative will have a right to carry out an inspection in all building phases within normal working hours of the Shipyard. The supervision of the Classification Society during the hull building phase of the pusher(s) will be arranged by the shipyard.

1011 Certificates / reports and documents hull structure

The following reports / documents and certificates by the hull structure yard QA will be issued and attached to the final acceptation delivery protocol of each of the pushers:

- NDT test Reports
- WPS welding procedure specifications
- Welder qualifications for used welders
- Structural tightness test Reports (signed by the Classification Society)
- Hull main dimensions measurement
- Class approved material certificates of used plates, profiles and piping.
- Paint Inspection Report (signed by the paint company or representative)
- Paint applied thickness report (signed by the paint company or its representative)

1100 HULL STRUCTURE

1101 Hull Scantlings

The hull is designed as light as practical possible in order to reduce the building cost and to allow for low resistance. Hull structure is to be built according to approved class drawings.

1102 Hull Inlet Chest

Inlet chests are to be integrated in the bottom construction large enough to accommodate the box coolers for the internal cooling systems.

- Each chest is to be provided with sleeves, flush with the bottom and sides.
  Upper sleeves are to be placed close to the sea chests cover, so the sea chest can de-aerate in all circumstances, otherwise a de-aeration pipe and valve to be installed.
- Grating sleeves to be grinded smoothly with R=2mm, so paint application is well adhesive.
- Box coolers of engines are to be installed in this sea chest.
- Suction pipe ends of possible auxiliary pumps (fire, ballast, etc.) are to be made in this sea chest.
- Sea chests to be fitted with removable grids, so they can be inspected from outside.

1103 Engine seating`s

Machinery seatings are sufficiently stiffened to minimize hull vibrations exerted by the engine(s). The engine(s) are to be properly secured/fastened to the top plates of the seatings.

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1104 Shell insert and/or fender plates

Thicker insert plates or double plates in/on the shell are to be designed in order to avoid excessive wastage of the side shell. They are to be mounted in such way that it's guaranteed that the vessels width over all is not exceeded.

1105 Scuppers

A sufficient number of deck drains or scuppers are to be provided in order to avoid water on the decks. Scuppers made of galvanized pipes, ending just above the applicable deck below.

1106 Ballast / Ballast tanks

Depending the design ballast tanks can be fitted. If applicable, ballast tanks are to be connected to a service pump for filling and draining the tank. Suitable sized air-pipes are to be fitted ending min. 600 mm above main deck in a gooseneck. The ballast tanks are designed to enable the crew to minimize the pusher(s) trim in all loading conditions.

1107 Fuel tanks

Two fuel tanks with a minimum capacity as specified in 0002 are to be installed for fuel oil or any other carburant depending on the propulsion type. The tank has to be integrated in the structure between cofferdams. All fuel tanks are to be fitted and equipped according to the applicable rules and regulations at least with:

- 1 ND65 vent pipe with spark/flame arrestor, ending in a gooseneck, lowest point min. > 600mm above main deck.
- 1 ND50 filling inlet pipe equipped with a standardized cap (TW coupling). The tank inlet is to be mounted in such way that spraying/splashing of fuel is avoided.
- 1 fuel return inlet.
- 1 low level alarm at 30% of its tank level.
- 1 high level alarm sensor which triggers the bunkering safety loop.
- 1 gauge glass with graduated scale including the necessary valves.
- 1 manhole for cleaning and inspection.
- 1 quick closing valve outlet with regulatory remote closure control from outside this space.
- 1 purge drain tap placed at the lowest point.
- 1 drainage box suitable for 3 oil filters, with perforated grating above the bottoms box, and a drain connection with ball valve.
- The interior work (cut-outs, welds, grinding of sharp edges, etc.) is of particularly high quality in order to allow thorough cleaning.
- Between the fuel tanks a crossover is installed, min diameter ND65 , connected between the quick closing valves. On the lowest point an accessible drainage tap is fitted.
- The consumer outlets are connected to this crossover by sufficient sized globe valves.

1108 Lube oil tanks

- Not applicable

1109 Hydraulic oil tank

- Not applicable

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1110 Potable water tank

Two potable water tanks with a capacity as specified in 0002 is to be integrated in the hull structure and has to be provided with:

- 1 ND65 vent pipe with spark/flame arrestor, ending in a gooseneck, lowest point min. > 600mm above main deck.
- 1 ND50 filling inlet pipe equipped with a standardized cap (TW coupling).
- 1 manhole for cleaning and inspection.
- 1 purge drain tap placed at the lowest point to drain the tank if it needs to be cleaned.
- 1 output valve, placed low in the tank connected to a crossover pipe, min. diameter ND50, Which is connected to the other potable water tank.
- The fresh, potable water tank shall be specially cleaned before usage.
  All rust and drop of weld shall be completely removed by grinding. Sharp edges are rounded to preserve conservation or resin. After complete cleaning two layers of food compatible conservation/resin are to be applied.
- The food compatibility certificate of the resin and gasket shall be provided. The manhole cover needs also to be treated with the resin.
- The consumer outlets are connected to the crossover by a ball valve.

1111 Sewage water tank

- One sewage tank with a capacity with a capacity as specified in 0002 is to be installed for sewage reception. The tank is integrated in the hull structure.
- Feed of the dirty water tank via fire resistant pipes or galvanised / stainless steel pipe (in no case the use of plastic pipes is accepted).
- The internal faces are covered by suitable conservation in order to avoid corrosion.
- Fitting of necessary sensor sockets (e.g. level indicators to trigger the sewage pump).
- Internal suction pipe-end ND50, with a coupling flange outside the tank, connection to the sewage pumps suction side.
- One manhole enabling full inspection possibilities.
- Equipped with a weathertight vent pipe ND65 which ends in a gooseneck at a location not conflicting with crew's personal safety and comfort.
- Bulkhead flange ND50 with a socket serving high level alarm triggering the sewage pump mounted on the top.

1112 Dirty oil tank

A dirty oil tank is installed and its capacity has to be in accordance with 2006/87/EC and at least as specified in 0002. The tank is to be integrated in the hull structure.

To be equipped with:

- Local de-aeration with spark/flame arrestor.
- Manhole allowing inspecting the inside of the tanks.
- Filler plug enabling to fill in dirty oil with an oilcan. (min ND150mm)
- 1 ND40 suction pipe equipped with a standardized cap (TW coupling), ending on main deck.

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1113 Forepeak – ballast tank

The forepeak is constructed as a ballast tank and will be accessible via a manhole and a ladder below to the bottom. The internal structure shall be welded double continuously.

1114 Engine room

The engine room will be accessible via a steel weather tight hatch and ladder below. An easy accessible emergency exit is to be arranged on the opposite side of the entrance leading to the main deck. A workbench and some storage facilities room are to be located in the engine room.

The engine room will have structural integrated seating's for the main power plant, according to the approved drawings.

The exhaust funnel/box is fitted at the aft deck and contains the exhaust piping of the diesel engines and act as an engine room ventilation outlet.

In the double bottom one echo sounder base pipe DN125x12.5mm is to be fitted with flange and blind flange. The height of the pipe is 150mm above empty waterline, so an echo sounder sensor can be installed or replaced afloat in the light ship service draft.

1115 Aft peak / thruster room

The aft peak contains the propulsion thruster and is well integrated in the ships structure and well aligned according to the rules and rudder manufacturer's arrangements and recommendations.
The aft peak will also house the anchor pocket and its hawse pipe for the stern anchor.

1116 Deckhouse

The pusher will have a superstructure (deckhouse) to accommodate the crew. It will be an all welded aluminum construction mounted on the hull. To minimize tension in the plates due to welding, the construction elements inside will be chain welded where possible.
It will have entrance door(s), window frames, ventilation casings for engine room machinery integrated in the deckhouse and sufficient drainage scuppers.

- The window and door frames to be properly adjusted and welded not twisted or bended with inherent flatness (of plane surface) deviation, max 2 mm. of crossing centers of diagonals.
- Entrance door(s) will be designed according rules, for the accommodation.
- Ventilation casings integrated in the deckhouse act as ventilation inlets
- The accommodation deck can be reached by an aluminium ladder mounted on the deckhouses aft wall.
- Deckhouse deck to be designed/fitted with removable/collapsible railing surrounding this deck. Height min 900mm. (note required airdraft)
- Drainage of the accommodation deck is arranged by means of aluminum pipes 48.3 x 4.0 mm fitted in the deckhouse walls, ending 50mm above main deck.

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1117 Deckhouse flexible mounting.

The deckhouse is flexible mounted on/in the hull structure. This to enable the removal of the main engines and other large machinery from the engine room. It also serves as resilient sound barrier against generated hull vibrations.

Shock absorbers will be installed to ensure flexible mounting of the deckhouse. Yard will mount the deckhouse on these shock absorbers, free of tension, no contact between deckhouse and hull construction.

Sealing rubber profile will be mounted surrounding the complete deckhouse ensuring a watertight sealing between deckhouse and lower connecting compartments.

1200 HULL STRUCTURE OUTFITTING

1201 Bollards – mooring equipment

The following fixed mooring equipment shall be fitted on the hull, at all times suitable for the designed ropes breaking loads and coupling forces needed to couple the convoys.

- In total 6 bollards, fabricated of thick-walled pipe having each two pins, diameter 40mm.
- 2 double bollards / coupling roller combinations on forward main deck on each side.
- 2 coupling rollers fitted amidships on each side on the main deck.
- 1 bating fitted at fore ship near center line.
- 2 single bollards are fitted on the aft deck, on each side.

1202 Pushing post and fendering

The pushing posts is designed such that the pusher is suitable for pushing different and multiple barges of different sizes. The height of the pushing bow fenders is designed for all the pushed barges or convoys loading conditions, and related to fit under the pushers required airdraft. Under main deck the fender is lengthened close to the waterline with structural foundation towards and integrated in the forepeak construction. Fenders fitted with rubber sheeting/plates which have been vulcanised onto steel double plates. These plates are welded to the bow pushing fenders.

Each pushing bow fender is provided with:

- Steel steps on each inner side of the pushing post to the top.
- Wire hooks/cleats on the pushing post outer side.
- One bollard on top, with 40mm pin.
- A jib for hose/cable handling to the pushers.
- Double power socket connection for convoy or pushers shipboard consumers.
- Power socket 400V connection for convoy or pusher consumers (1 fender only)
- A socket connection for work air with camlock. (1 fender only)
- Sockets for power/air fitted in a steel housing build in each fender, closed with an aluminium hinged door and closure toggle.

Between the pushing posts and on the hull corners rubber fendering is installed on the sheerstrake, according the applicable drawing.

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1203 Pushing fender platforms

The pushing posts are connected by an access platform from the accommodation deck to the SB pushing bow fender. Platforms are fitted with fibreglass reinforced plastic gratings and a railing as per rules. Stanchions are removable due air draft matters.

1204 Doors and Hatches

All external doors and hatches on deck shall be made from carbon steel with watertight sealed gaskets. All hinges are adjustable and provided with grease nipples. All hinges / eye bolts and pins are of stainless steel material 316. Doors are fitted with central closing system served by minimal 4 cleats with class type approval for weather tightness. Accommodation doors will have a brass bullseye and the inside of these doors will be insulated so the closure mechanism is not visible. (Alternatively, a certified watertight aluminum door could be installed according to operator's request)

The minimum required opening size, the number of toggles and the resistance of the locking device of the doors and hatches shall be in accordance with the applicable regulations. All main external doors are fitted with barrel safety locks and euro profile key cylinders. The doors and hatches are to be identified with name tags. All hatches on deck are equipped with a sea water resistant padlock closing provisions. Provisions for securing hatch covers in open position are to be provided.

Three copies of the keys are supplied and are equipped with a tag identifying the doors respectively hatches. Exemptions for emergency exits are to be discussed with the Authorities and Class Society in order to avoid conflicts between personnel safety and applicable rules.

1205 Manholes

The access to all other compartments without hatches or entrance doors is made via bolted manholes which are inserted in the top or on the side of the tanks / compartments. The minimum clear size of a manhole opening is 600x400mm. The area directly behind the opening should be free of construction members and pipes in order to allow easy access to the compartment. The manholes are closed by watertight plate covers, secured by bolts. In exposed areas the bolts are of stainless steel. The manholes are fitted with a tight rubber gasket. The covers are to be foreseen with two welded handles. For storage tanks the tank number and its content being either (FW/FO/DO/SW/LO/HO/TW/BW) are marked on the manhole, in written welding letters of 100mm. Also handles of round bar (16mm minimum) are placed judiciously in order to facilitate capacity entry and exit during inspection visits.
The following compartments are accessible via bolted manholes:

- Fuel tanks.
- Forepeak ballast tank
- Closed void spaces.
- Sewage tank.
- Fresh water tanks

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1206 Railings

Railings are to be installed as per applicable Rules and Regulations.
The accommodation deck will be fitted with removable or collapsible railings concerning airdraft requirement.

1207 Ladders

The ladders are to be removable if necessary for access reasons. Ladders giving access e.g. to the aft and fore peak, engine room, voids, other compartments, etc. are installed directly below the access openings and consist in general of 2 vertical strips made of flat bar 80x8mm spaced at least 400mm apart. The strips are connected by square bars 22x22mm positioned inclined at a 45° angle. The square bars are fitted in the openings provided in the strips and welded around.

The following ladders to be installed in the pusher as per drawing.

- Aft peak/thruster room
- Engine room and its emergency exit(s)
- Tanks will be fitted with steps for easy entrance/exit via manholes.

1208 Draft marks

Regulatory water draught scales are placed at the bow and stern, on both sides PS and SB. Scales start below the light service draft and goes up to the maximum draft. The draft marks consist of digits, flat bars of steel plates showing each 10cm of draft and being protected on each side by flat bars. The draft marks must not increase the pusher's breadth over all. Maximum draft for optional operation zones is marked separately by additional flat bars.

1209 Bulwark / Name / ENI number

On the fore and aft decks a railing or bulwark has to be fitted as per drawings. According requirements specified in the EU-Directive 2006/87/EG. Stanchions or stiffeners per max 1500mm.
On both sides of the pusher the pushers name is to be welded. The letters, having a height of approximately 400 mm are to be fabricated from 6 mm steel plates. On the transom the pusher's name letters are be to weld. The name is to be positioned in the middle (CL). In addition, with a smaller letter type port of registry and country of registry are to be welded.
A regulatory registration number and ENI number (European Number Identification) of the pusher are fitted at the stern and on the both sides of the pusher.
All digits and letters are to be painted in a sufficiently contrasting color.

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1210 Anti-skid arrangement

Non-slip studs (stainless steel spot welds) are welded on the deck and on bollards tops to make it non-slip in the walking areas. The density of the Non-slip studs (spot weld) is doubled in working areas surrounding deck equipment for mooring the pusher or convoy, and top of the bollards. The bollards tops are painted in a light contrasting color.

1211 Outboard pipe system connections

In the bottom of the engine room the following outboard connections are to be installed from reinforced carbon steel pipe according to the applicable regulations, fitted with flange and blind flange. The height of pipe is at least 150mm above light service draft, so optional outboard valve and connecting piping systems can be installed or replaced afloat.

- Firefighting / ballast inlet, suction end mounted in sea chest, in ND100x8.
- Sewage outlet, suction end mounted in shell plate, in ND80x8.

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2000 CONSERVATION / CORROSION PROTECTION

2001 Anodes

A passive cathodic protection system via zinc/aluminium sacrificial anodes is to be installed. The quality and quantity of the anodes have to be calculated for five (5) years protection for operation on inland waters. No anode shall be located under the flat bottom of the pusher.

The following items are to be protected by these anodes including the estimated quantity:

- Propulsion nozzles — min. 4 per nozzle
- Tunnel — min. 4
- Inner side of sea chests — min. 4

2002 Paint Preparations

The paintwork is to be guaranteed for at least 5 years in accordance with standard 7 Re 3 of the European scale of degree of rusting for anti-corrosion paints of the European Commission of applicators and paint manufacturers. All compartments of the pusher including the shell, (bow) thruster casings, sea chests and all surfaces on deck have to be painted according to the painting scheme.
The preparation of the surface to be painted, including the zones deteriorated by drainage holes, cut-outs or welding works according the paint supplier's representative. Scaffolding for access and all the necessary ventilation, heating, security and safety means are included in the service amount.

The parts and sections forming part of the construction are sand blasted SA2.5 ISO 8501-1 or SSPC SP10 and primed with an epoxy shop primer. This shop primer for the steel plates and profiles is compatible to the proposed paints in the several compartments. The condition of this shop primer has to be the full satisfaction of the paint supplier's representative in the moment painting starts. Non-painted parts may not be mounted.

2003 Paint Works

The surface preparation is to be according to the paint specification and the conditions of applying the paint meet the requirements of paint supplier. Where necessary remove all weld splatter, smooth weld seams and sharp edges. Fresh water wash to remove all dirt and contamination, if necessary. Degrease according to SSPC-SP1 solvent cleaning. Ensure area is clean and dry prior to application of paint. Clean welds, damaged and corroded shop primer by blasting to near white metal SSPC-SP10 or Sa21/2 ISO 8501-1 or by power tooling to Pt3 JSRA SPSS- 1984. For optimised mechanical properties on typical zinc and iron oxide epoxy shop primers, grit sweep intact areas to AS.2. All parameters like ambient temperature, steel temperature, air humidity, etc. have to be recorded for each painting work in a report. Continuously survey during hull construction and outfitting processes concerning painting is included. An appendix (paint specification) from paint manufacturer to be supplied in accordance to the Operator.

Pusher to be painted by layers of 2-component paint, according to paint specification of paint supplier, following minimum dry thicknesses to be applied.

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Area	*Surface preparation*	*Product*	*Shade*	*Dry thickness in µm.*
Flat bottom , vertical sides Incl. sea chests Incl. anchor pocket(s) Incl. nozzles	HPFW washing , min 220bar and PST3	TBN	TBN	300
Decks	HPFW washing , min 220bar and PST3	TBN	TBN	250
Top structures, Bulwarks , wheelhouse , hatches	HPFW washing , min 220bar and PST3	TBN	TBN	250
Ballast tanks	HPFW washing , min 220bar and PST3	TBN	TBN	300
voids , dry parts	HPFW washing , min 220bar and PST3	TBN	TBN	200
Engine rooms	PST3	TBN	TBN	150
Bilge areas	PST3	TBN	TBN	150
Fore and aft peak	PST3	TBN	TBN	200
Behind insulation, wheelhouse	ST2	TBN	Grey	100
Sewage tank	HPFW washing , min 220bar and PST3	TBN	Grey	300
Fresh water tank	HPFW washing , SA2.5	TBN	White	300

TBN = to be nominated

<u>The following applies as subject of paint program:</u>

- The paint application should not take place when the steel temp is less than 3°C (5F) above the dew point, relative humidity may never be higher than 85%.
- Application of paint in tanks or closed spaces may only be done after tanks pressure testing and technical acceptation of construction by class society.
- Painting bottom, shell and under the water/light ship draft line may only be applied before launching. After launching of the pusher, painting of the inside part under the water line is only to be applied in special condition (heating, ventilation etc.), to prevent condense drops appearance.
- All sharp edges will be grinded smoothly with a radius of minimum 2mm, so cohesion of paint is granted.
- Before painting the welding joints, they will be cleaned; rust and sandblasting materials will be removed. Rough welding's, tack welding, welding spots, etc. will be grinded smoothly and the welding-slag shall be removed carefully before paintworks commence.
- After cleaning and surface preparation, all welding joints, edges, angled parts have to be painted with protective primer before painting.
- Any zone damaged during construction or outfitting deteriorated by burning or welding during the work is repaired as soon as possible after deterioration.
- Special attention is to be made for painting the fresh water tanks, cleaning and painting according to Paint Company specifications.
- Fuel tanks need to be mechanical cleaned inside, however not painted internally, also no shop-primer to be applied.
- It is prohibited to have paint spray on electric cables.
- Paint supplier and paint system to be proposed by Shipyard.

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2004 Piping Conservation

All piping, not galvanized, shall be painted. Galvanized pipes are not painted.
Pipes are applied with shop primer before pipe manufacturing and touched up after manufacturing.
Final paint is to be at least two layers of paint.

Paint color is according to circuits:
Fire lines: red
Cooling lines of diesel engines: violet
Fuel pipes lines: brown
Fresh water lines: green
Ballast lines: blue
Other lines: grey
All paint preparation shall be performed as per normal shipbuilding practice

Alternative all pipes painted white, and tagged with IMO colored nametags indicating its systems contents.

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3000 DECK EQUIPMENT

3100 ANCHOR EQUIPMENT

3101 General

The anchor, mooring and coupling equipment and its installation is to be in accordance with the applicable Rules and Regulations. The anchors shall suitable to fit properly in its designed anchor pockets. The anchor wires are guided from the drum(s) through hawse pipes to the anchors at the stern.

3102 Anchor equipment

According to the pusher(s) dimensions and convoy sizes, anchor equipment should be installed as following:

- Anchor winch installed on the aft main deck.
- 1 high holding power anchors, pool type, balanced, inclusively crown-shackle. Swivel and D-shackle connection.
- Steel wire, (diameter and break load according rules), swivel and D-shackle are to be connected to the anchor.
- Certificates of winch, wires and anchors in compliance with class rules.

3103 Anchor winch

On the aft deck an anchor winch with wire drum(s) are fitted.

- Winch will be driven by a heated electrical motor with sufficient power for establishing a winch wire hauling speed of 10 meter per minute.
- Local winch control is to be supplied, near the winch on the deck, serving start/stop/ up/down control. (To be fitted in an IP65 control box, protected housing), alternative a remote control with cable dry stored in a protective area.
- The electric control box is installed in the thruster room.
- Brake with sufficient holding power shall be installed.
- Suitable winch support foundations shall be integrated in the hull structure.

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3200 COUPLING EQUIPMENT

3201 Coupling winches

- Hydraulic/Electric operated coupling winches are to be fitted on the fore deck. Left and right model types to be installed.
- The winches are bolted on welding brackets in order to allow easy replacement.
- Suitable winch support foundations shall be integrated in the hull structure.

	CEMT I Pusher	CEMT II Pusher
Hydraulic/Electric operated coupling winches	4 x 25T	4 x 25T
Max static load per winch	250kN	250kN
Nominal pull manual drive	25kN	25kN

Coupling winches shall have a manual brake, and a wire eye on the front of the winch to guide the wire onto the drum.
The hydraulic winches are remote controlled from the wheelhouse serving start/stop of hydraulic power pack, and functions for hauling and slacking of the 4 coupling winches.

3202 Coupling wires

Sufficient sized (kN according rules), coupling wires, min. length 25m, are stored on each coupling winch. (Lengths as per operator's request)

3203 Coupling bollards

Different types of convoys are investigated during the coupling plan development. Deck coupling bollards are to be fitted as required for pushing convoys determined and indicated in the coupling plan.

3204 Coupling rollers

2 deck coupling rollers are mounted midships main deck PS and SB:
2 deck coupling rollers / bollard combinations are mounted on fore main deck PS and SB:

- fabricated from pipe 323,9 x 20mm, total height approximately 130mm
- rolling mechanism is established by a roller made of pipe 355.6 x 14.2mm

fitted with a lube channel to grease the roller, rollers are to be well-greased upon delivery
The position shall be according the coupling plans.

3300 MOORING EQUIPMENT

3301 General

Coupling winches and bollards are also to be used for mooring purposes. Mooring equipment to be on board is to be in accordance with the applicable rules and regulations.

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3302 Mooring lines

The pushers equipped with customizations concerning propulsion, are fitted with 3 mooring cables or Polypropylene ropes according the applicable Rules and Regulations:

1 mooring line, length 60m, tensile strength according rules.
1 mooring line, length 40m, tensile strength according rules.
1 mooring line, length 20m, tensile strength according rules.
All cables and/or ropes are to be supplied with a certificate in accordance with European standard EN 10 204:1991. Each line is provided with an eye.

3400 WHEELHOUSE

3401 General

The wheelhouse will be installed on an elevating column, creating a suitable viewing height for the master above the water line (see table below). From the navigation desks standard conning position, the regulatory visibility lines are to be met. When the wheelhouse is lowered into its lowest position, the required airdraft is achieved by lowering the navigation mast and wheelhouse upper part.

Table 3401	CEMT I pusher	CEMT II Pusher
Viewing height above water line for the master	6 meters	6 meters

3402 Wheelhouse base construction

The wheelhouse base is completely fabricated of carbon steel. There's a movable upper part necessary to reduce the airdraft height. The steel substructure has rectangular model. This forefront base has 1 or 2 windows starting from the wheelhouse floor up. Dimensions as per pusher design. Walls of 6mm plate, with reinforcement profiles on the inside and on top around, which serves as foundation for the superstructure. In the bottom an opening enabling access into the column.
In the bottom 2 small lighting boxes for deck-lighting, closed by a transparent plate.
On the aft side a small platform with anti-skid drops as item 1210, just behind the entrance door, which serves also as fixation point of the elevating stairs. Platform fitted with railings according regulations in aluminum enabling safety for the crew.

3403 Wheelhouse upper part

A fixed aluminum superstructure composed of heavy anodized and polished profiles, with rounded outer corners, angled front ca.15 °, with 1 front windows. Straight aft side with 1 window(s) and a door consisting of 2 separated parts, due the movable upper part. Doors fitted with closable air-grill, locking pin for connecting upper and lower part, door lock and key serving an installed euro profile cylinder. Door opening height min 1900mm from main fore deck. Sill height min 200mm. Sides are straight and with fitted with 1 or 2 windows each.
The roof composed of insulated or aluminum plates, with insulated sliding escape hatch on top, circa 800x800mm, placed above the masters conning position. Roof edges surrounding made of aluminum profiles decently mounted and sealed. All windows are made of double glass and fixed, fitted with round glass bars on the inside. Windows shall be type approved according to regulations and class requirements.

3404 Wheelhouse elevating column

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The wheelhouse columns are made of steel plates and its base outer column will be installed in a reinforced area of the hull, structurally connected and welded continuous to the surrounding girders and frames. A wheelhouse and its column hull integration drawing will be made and approved by class, together with the concerning scantling calculations.
The column consists of an outer column and elevating inner columns. Columns scantlings are according the rules. The corner profiles are continuous welded and have no visible greased profiles.

Inner column fitted with guidance blocks or equivalent, which are adjustable preventing vibrations of the columns by adjusting it. The columns are sealed with rubber closures surrounding the top flange of each column preventing water ingress into the columns. The wheelhouse installed on the smallest inner column is made by a continuously welded connection.

Inside the column a cable support and the telescopic hydraulic piston which can lift the column to the required viewing height above the waterline. The piston is connected into the hydraulic circuit of the concerning power pack.

In the outer column a watertight manhole enabling the crew access for maintenance is installed. It has a signal alarm to the wheelhouse if it is opened also preventing control of the elevating column if opened. The outer column will have minimal 2 manual security pins just above main deck so the columns can be fixed in a way maintenance and access by the crew is safe. Cable access into the column by a watertight sealed transit.

3405 Hydraulic Power pack 1

This hydraulic power pack serves the wheelhouse elevating column which is moved by a piston installed in its hydraulic circuit.
The power pack consists of a hydraulic tank with 400VAC electro motor serving a submerged hydraulic pump. Power pack is equipped with a level glass, filling filter and cap, a suction strainer on the pump and a 5µm filter on the oil circuit. A low level alarm has to be fitted in the hydraulic tank and reported to the wheelhouse alarm panel. The control valves are proportional in 24 VDC. Emergency lowering must be possible. Installation of the hydraulic power pack near the wheelhouse column.

This power pack will also serve the hydraulic coupling winches, its design in flow and pressure is engineered to handle the wheelhouse column, or 2 coupling winches working simultaneously. The control valves are proportional so the elevating column and winches will operate without shocking.

3406 Hydraulic Power pack 2

This smaller hydraulic power pack serves the wheelhouse upper part elevating system which is moved by a piston installed in a hydraulic circuit. The elevating radar mast is also connected to this hydraulic circuit/unit.
The power pack consists of a hydraulic tank with 400VAC electro motor serving a submerged hydraulic pump. Power pack is equipped with a level glass, filling filter and cap, a suction strainer on the pump and a 5µm filter on the oil circuit. A low level alarm has to be fitted in the hydraulic tank and reported to the wheelhouse alarm panel. The up/down control valves are 24 VDC.

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Emergency lowering must be possible for both systems. Installation of the hydraulic power pack inside the wheelhouse column.

3407 Navigation Mast

One elevating mast on the aft side of the wheelhouse roof, also able to be lowered due to airdraft, containing the main nautical equipment. Mast is equipped with supports for a radar antenna, communication antenna(s), navigation lights, flood lights, flags and signaling balls and cones.

A radar mast aside the wheelhouse is equipped with a support for the radar antenna, GPS, AIS antenna, and signal horn. This masts elevation is hydraulically operated from power pack 2.
All electrical cables strands for the connection to the navigation mast(s) will have large loops to avoid any stress and abnormal wear in electric cables.

3408 Wheelhouse stairs

Installation of aluminum stairs with self-leveling steps connected to the wheelhouse base platform behind the entrance door, fitted with fixed railings (dismountable if required for airdraft purpose). On the bottom 2 nylon height adjustable bearing roller wheels enabling easy rolling on the deckhouse while elevating the wheelhouse.

3409 Wheelhouse equipment

- One double parallel wiper, placed to cover the view from the conning position, Controlled by a button in the navigation desk including interval control.
- Polished stainless steel cable pipe in the wheelhouse, on PS side, serving cables from base to roof and navigation mast.
- Installation of an aluminum blue flag, operated by its elevating cylinder, on the wheelhouse roof, its lowered position suited for the pushers air-draft. Fitted with regulatory flash light.
- A headlight box in the wheelhouses upper part front on center line.
- 2 drainage pipes on the wheelhouses upper part aft side.
- The windows of the wheelhouse are fitted with manual controlled sun blinds, with transparent view foil, on all windows and fulfill the regulation requirements.

3600 OTHER DECK ITEMS

3601 Stern equipment wing

Aluminum foundation for 3 stern navigation lights, intercom and optional satellite dish, fitted with a foundation serving a flag pole.

3602 Sidelights foundations

2 aluminum side light boxes, suitable for side navigation lights, deck lights and side cameras, adjustable in width with hinged 2 arms. The inside of the box is coated black.

3603 Accommodation windows

Windows installed in the deckhouse window frames are of cold bridge type or equivalent, thermally separated. All windows including the wheelhouse are made of hard glass, fitted in aluminum frames.

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Glass thickness is according to class rules. Windows which can be opened have hinges at the top side and locked from the inside.
Some windows serve as emergency exits, as per class requirement, according the safety plan.

3604 SOS boxes

Integrated in the deckhouse sidewall a steel box, closed with an aluminum or stainless steel hinged door and closure toggle.
This SOS box contains the activation control box from the fixed fire extinguishing system, remote controls of the fuel tanks quick closing valves, and the emergency stops of engine room ventilators, fuel pumps etc.

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3605 Small works

- Bolts and nuts outside used for outfitting works, are made of stainless steel A4 type.
- Fender eyes or clamps made of 20mm massive stainless steel rods mounted per operator's request, serving fender tires or other fenders on the shoulders of the pusher.
- 4 welded eyes on deck for fixation of a life boat.
- Eyes or clamps for cables or wires fitted on the push fenders made of 20mm massive stainless steel rods mounted per operator's request.
- Rope guidance fenders mounted to all 4 corners of the deckhouse, made of 20mm massive stainless steel rods.

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4000 POWER SYSTEM

4001 Propulsion general

The propulsion consists of one 360 degree thruster with integrated permanent magnetic motor, fitted with a fixed pitch propeller in a nozzle. The thrusters drive is powered electrically, supplied by the pushers electric power plant.

4100 AZIMUTH THRUSTER

4101 General

The propulsion consists of 1 azimuth thruster driven by a permanent magnet motor, which is very compact and suits the design. The power of this motor is minimal 400kW for the pusher of type CEMT I and 500 kW for the pusher op type CEMT II. The complete unit shall be suitable for continuous operation usage. The thruster has a steering grid serving endless 360° degrees rotation of thrusted water flow out of the unit. Steering grid drive is electric.

	CEMT I Pusher	CEMT II Pusher
Azimuth thruster	400kW output	500kW output

4102 Thruster drive

The drive consists of an azimuthing thruster in a L-drive configuration in combination with an integrated high frequency permanent magnet motor. Due to the L-drive configuration the electrical part of the thruster is being positioned inside the vessel which makes is easy to access and no concessions have to be made on the hydrodynamic design of the underwater gearbox. The integrated L-drive configuration is to be a combination of proven mechanical parts and a high efficiency electric motor. The integrated L-drive is requires no aligning between the electric motor and the thruster. The underwater gearbox is being designed for optimum hydrodynamics. The gears are spirally cut bevel gears, which secure a quiet operation. All rotating parts are fitted with heavy duty ball and/or roller bearings. The thruster is unlimited revolvable 360 degrees by means of a slewing ring.

The integrated electric motor is a high frequency permanent magnet motor and suitable for heavy duty applications. The design of this motor is smaller, lighter and have a better efficiency than a standard E-motor. This motor has high torque capability at low speed. The motor has a compact design which suits in the construction of the thruster. The motor is a sealed water cooled motor and therefor internal parts are not exposed to outside air conditions. Motor fitted with heating elements, temperature sensors and alarms.

The motors cooling system to be integrated in a propulsion system cooling loop, serving the heat rejection of the motor.

Electrical power supply to the thruster motor via a water cooled frequency drive connected to the main propulsion switchboard. The frequency drive is a marine type, wall mounted , and water cooled and suitable for driving the thrusters PM motor in continuous operation . The drive has

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sufficient extra preserved I/O cards serving data and control connections. The LCD panel shows status and alarms. Build-in AC choke / EMC filtering to limit power mains distortion. Thermistor connection for the E-motors temperature supervision. Delivered with marine type approval.

The frequency drives cooling system to be integrated in a propulsion system cooling loop, serving the heat rejection of this frequency drives.

4103 Thruster Propeller

The drive will be fitted with one main propeller with following characteristics:
- Diameter of circa 1100-1200 mm
- Scantlings for the drives max power output, adjusted to the designed optimal power output
- Material NiAl.
- Direction of rotation 1x right.
- Workmanship and surface roughness according to ISO 484-1981, class 2.

The number of blades and reduction ratio are carefully chosen, to avoid vibrations.

4104 Thruster nozzle

The thruster will be fitted with a nozzle according:
- Type high performance and characteristics suitable for pushers.
- Nozzle bottom may not extend below the baseline
- Diameter according propeller's sizing.
- Inside plating of propeller's working area in marine type stainless steel.

4105 Electric steering system

Steering is done electrically and includes a frequency converter for the steering motor.

4106 Lubrication System

Gears and bearings will be oil bath lubricated. An expansion tank is to be installed.
Oil cooler to be integrated in a propulsion system cooling loop, serving the heat rejection of the lube oil cooler.

4107 Drive construction

A round hull foundation box (the part between the PM motor and thruster tail section) around the unit with upper mounting flange for bolted mounting of the unit in the hull of the ship is to be installed. Watertight sealing of this flange by O-ring sealing fixed with bolts and nuts.

4108 Drive paint system

Lower gearbox and thruster foundation 300mu DFT. (As per standard paint specification under 2002). Machinery components, where applicable are to be painted with 1 or 2 component paint, minimal 100mu DFT.

4109 Commissioning thruster drive

Commissioning of thruster drive unit, controls, other applicable components, and a trial with 100% load test during minimal 2 hours are to be included. Commissioning and test reports are to be delivered.

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4200 THRUSTER ELECTRIC CONTROL SYSTEM

4201 Local control box

The control box contains relays and other electronic devices for the control and monitoring of the thruster. The main functionalities are proportional azimuth and thrust control. The control box has connections for a redundant power supply. In case of failure on the main power supply, it will switch over automatically to the backup power supply (24V). All alarms are collected and given out by the potential free contact “Common alarm”, which will re-trigged in case of any new alarm. Beside the ‘common alarm’, the separate alarms can be read out on the display on the door of the control cabinet. The alarm for ‘Handle not zero’ is presented as a separate alarm.
All internal components and terminals are numbered. The control cabinet has two doors. One of the doors contains a Local Control Panel (LCP) with a display and with push buttons. The local azimuth control has push buttons for ‘CW’ and ‘CCW’. The local thrust control has push buttons thrust ‘up’ and ‘down’.

The local control panel has the following buttons and indications:
- Bridge in control (indication)
- Local (push button with indication)
- Zero thrust (push button with indication)
- Reset alarm (push button with indication)
- Lamp test (push button)
- System off (push button)
- Give (push button with indication)
- System on (push button with indication)
- Thrust stop (push button with indication)

The monitoring display shows a.o.:
- RPM pick up failure (alarm)
- Gearbox temperature high (alarm)
- Gearbox oil pressure low (alarm)
- Gearbox oil level low (alarm)
- Clutch pressure low (alarm)
- Wire break feedback potentiometer (alarm)
- Wire break thrust command (alarm)

4202 Operation panel wheelhouse

The drives operation system is to be mounted in the wheelhouse dashboard and Includes the following panels:

One panel provided with a combined handle for Follow-Up thrust and azimuth.

One control panel provided with:
- System on/off
- Selection give/take/pilot. (if applicable)
- Indication pilot on

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- Indication local control
- Alarm 'Handles thrust not zero' (if applicable)
- Alarm 'Handles azimuth not zero' (if applicable)
- Dimmer
- Alarm reset

One Display panel provided with analogue gauges for monitoring the thrusters rpm in percentage and azimuth indication. Both gauges are illuminated.

4300 ELECTRICAL POWER PLANT

The main electric power plant will supply power to the propulsion thruster via a frequency drive and also supply the barges board net via a microgrid converter. It consist of one diesel generator set mounted on a machinery skid.

The final determination of the generator set is made according to the final electrical load balance calculation to be made by the shipyard. The installation shall have sufficient power installed for a safe operation. As the power plant drives the propulsion thruster, it is to be classified for essential service.

4301 Engine drive

The power is generated by a diesel engine. The motor is installed above a drip pan plate in a machinery frame.

The following engines characteristics are to be observed:

- Marine diesel engines, power plant in propulsion application
- Continuous rating (B)
- Ratings according to DIN 6271, ISO 3046/1 and J 1349
- Suitable for diesel according to DIN 51601, DIN EN 590 and ISO 8217 DMA
- Engine is mounted flexible to avoid transmitting vibration into the hull
- Control unit is mounted near the engine but not directly on the engine (maintenance, vibration)
- Tool to create oil pressure before starting the engine
- Tool to pre-heat continuously the cool water upon +40°C
- Each engine is equipped with an oil filter system
- Each engine is equipped with double fuel filter (with clogging alarm), mounted above a drip tray box.
- The motor start-up is 24 VDC electric and may be executed on the controller cabinet or from the remote control panel. A key switch allows prohibition of remote control panel start-up.
- The (+) and (–) of any electric equipment (starter, generator, pressure & temperature probe, etc.) installed on the engine shall be fully isolated from the body of the engine and from the skid frame.
- All batteries shall be 12VDC or 24VDC, maintenance free and gel & airtight type, installed in a ventilated battery box. Batteries are fixed for pusher movements. Sticker prohibited open fire is fitted on the cover.

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- Power capacity of batteries for the diesel engine shall allow as a minimum, 3 starts in 3 minutes and 6 starts in 30 minutes.
- The 24VDC power feeding of each engine will be fitted with a two (2) poles (+ / -) battery switch in order to isolate completely the engine of any 24VDC connection.
- System is equipped with a set of 24 volt batteries and a charging system served by the diesels alternator and a separate charging system.
- The battery charger is a floating type with failure alarm.
- Installation of the batteries as close as possible to user's equipment to minimise the cable size. Voltage drop should be less of 15% in any case.
- The diesel engines control and all the accessories linked to operation and cooling equipment, tachometer, alternator, the starter, etc. are installed in the controller cabinet preferable near the engine, not directly mounted on the engine (vibrations etc.)
- Water intakes and outlets on each engine cooler are equipped with suitable flexible couplings.
- Engine driven water circulation pump(s)
- Fuel supplies and returns are equipped with type approved hoses.
- Fuel return line of the diesel engine is equipped with a fuel cooler, so the fuel tank will not heat up the fuel tank during continuous operation. Alternative arrangements may be proposed.
- Engine exhaust is equipped with an expansion bellow, exhaust is dry and insulated.
- Engine to be delivered with type approval certificates and pollution certificates according to the regulations.
- Radiated noise in the engine room and outside the pusher shall meet the regulations requirements.

4302 Generator

The generator is sized larger than the diesel drive so it can handle the engines max. outlet power. Generator and diesel engine are sufficiently coupled and mounted on a skid frame. The generator shall be mounted on silent-blocks to avoid transmitting vibrations into the barges hull.

- The generators are minimal IP 23. They are of the reinforced type (declassified higher size generator) to cater for peak intensity on starting the large electrical motors without collapse and breaking off the electrical circuit. They withstand continuous operation of supplying power to the thruster's frequency drives. Minimal temperature rise class F.
- Anti-condensation heating.
- Temperature measurement of windings in the generator.
- Alarms and indicators installed for 24/7 continuous propulsion mode.
- The generator sets are designed to be coupled on the bus bar of the main electrical switchboard. The coupling/uncoupling should be automatic and remote from wheelhouse when remote start of generator sets is "on". This automatic coupling shall allow variation +/- 7,5% of frequency.
- Local coupling could be made on the main switchboard when remote control is "off".
- Generator to be delivered with a Type Approval certificate
- Generator suitable for continuous B operation mode, in propulsion mode supplying a frequency converter drive.

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4303 Commissioning power plant

The commissioning of the power plant, controls, and other applicable components including a trial with a 100% load test of min 2 hours are to be included. Commissioning and test report are to be delivered.

4304 Power plant controls

A remote control and instrument panel is installed in the wheelhouse dashboard. This control panel will also serve visual and acoustic alarms.

The panel is made out of black aluminum with engraved text and/or symbols, which are grouped together to one dashboard for engine control, start/stop buttons, emergency stop, visual and acoustic alarms, meters and switches.
Analogue indicators or are provided for:

- Main engine lubrication oil pressure
- Cooling water temperature
- Fuel consumption

Alternative a digital (touch) screen visualizing alarms, meters and serving control buttons could be installed.

4305 Alarms power plant control box

The alarms and engine control box for the power plant diesel is installed in the engine room. The alarms are also presented on one of the wheelhouse dashboard(s).
The following alarms are installed:

Engine alarms

-	Cooling water temperature	high
-	Lubrication oil pressure	low
-	Cooling water level	low
-	Fuel oil water separator	high

Generator alarms

-	Temperature windings	high
-	Voltage drop	high

Note: According to requirements of the engine manufacturer the amount of alarms may be changed.

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4400 AUXILIARY GENERATORS

4401 General

The final determination of the auxiliary generator is made according to the final electrical load balance calculation. This generator set is installed in the engine room. Set is able to supply the board net. Following auxiliary kWe is estimated:

1x Auxiliary generator of circa 20kWe at 1.500rpm.

- Suitable for diesel according to DIN EN 590 and ISO 8217 DMA
- Rotation direction: left (CCW), seen on the flywheel
- Control unit is mounted near the engine but not directly on the engine (maintenance, vibration)
- Generator 400V at 50Hz, IP23, brushless
- Generator and diesel engine are sufficiently coupled and mounted on a skid frame
- Diesel engine is air-cooled, via a radiator.

4402 Diesel Engine

The power is generated by a diesel engine with sufficient power. The engine has to be in accordance with DIN 6271, ISO 3046/1 and J 1349.The motor is installed above a drip pan plate.

- The motor start-up is 24 VDC electric and may be executed on the controller cabinet or from the control panel. A key switch allows prohibition of remote control panel start-up.
- The (+) and (–) of any electric equipment (starter, generator, pressure & temperature probe, etc.) installed on the engine shall be fully isolated from the body of the engine and from the skid frame.
- All batteries shall be 12VDC or 24VDC, maintenance free and gel & airtight type, installed in a ventilated battery box. Batteries are fixed for pusher movements. Sticker prohibited open fire is fitted on the cover.
- Power capacity of batteries for the diesel engine shall allow as a minimum, 3 starts in 3 minutes and 6 starts in 30 minutes.
- The 24VDC power feeding of each engine will be fit with a two (2) poles (+ / -) battery switch in order to isolate completely the engine of any 24VDC connection.
- System is equipped with a set of 24 volt batteries and a charging system served by the diesels alternator and a separate charging system.
- The battery charger is a floating type with failure alarm.
- Installation of the batteries as close as possible of user's equipment to minimise size of cable. Voltage drop should be less than 15% in any case.
- The diesel engines control and all the accessories linked to operation and refrigeration, tachometer, alternator, the starter, etc. are installed in the controller cabinet preferable near the engine, not directly mounted on the engine (vibrations etc.)
- Water intakes and outlets on each engine cooler are equipped with suitable flexible couplings.
- Engine driven water circulation pump(s)
- Fuel supplies and returns are equipped with type approved hoses.
- Engine is equipped with an oil filter.
- Engine is equipped with water separating fuel filter, mounted above a drip tray box.

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- Engine exhaust is equipped with an expansion bellow, exhaust is dry and insulated.
- Air intake is from the engine room.
- Air supply filter of the motor is equipped with a flexible coupling.
- Engine to be delivered with type approval certificates and pollution certificates according to the regulations.
- Radiated noise in the engine room and outside the pusher shall meet the regulations requirements.

4403 Generators

The generator is sized larger than the diesel drive so it can handle the engines maximum outlet power.

- The generator shall be mounted on silent-blocks to avoid transmitting vibration to the pusher's hull.
- The generators are minimal IP 23. They are of the reinforced type (declassified higher size generator) to cater for peak intensity on starting the large electrical motors without collapse and breaking off the electrical circuit. They withstand continuous operation of supplying power to the thruster's frequency drives. Minimal temperature rise class F.
- Anti-condensation heating
- The generator sets are designed to be coupled on the bus bar of the main electrical switchboard. The coupling/uncoupling should be automatic and remote from wheelhouse when remote start of generator sets is "on". This automatic coupling shall allow variation +/- 7,5% of frequency.
- Local coupling could be made on the main switchboard when remote control "off".
- Generator to be delivered with a Type Approval certificate

4504 Commissioning

The commissioning of the auxiliaries, controls, and other applicable components are to be included. Commissioning and test report are to be delivered.

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5000 MACHINERY SYSTEMS

5000 PRIMARY MACHINERY SYSTEMS

5001 General piping systems

The piping material, operating temperature, operating and test pressure of the various circuits are specified in the drawings and diagrams for each circuit. All steel or other material piping and fittings are made from off-the-shelf parts (pipes, elbows, reductions, flanges, etc.) and according to Class Rules and Regulations. The material and the type of join must be suitable for the nature and temperature of the fluid transported in the particular circuit. Piping is made from seamless pipes, cold or hot bent whenever possible, except for hydraulic pipes which are always cold bent. The form of piping and the support structure takes account of the stresses and distortion of the pusher caused by navigation and the loading status and the expansion stresses caused by variations in the temperature of each circuit. Expansion joints are located at appropriate locations. The piping is inspected and air blown before final assembly. The piping and cable paths which are installed in the ceiling or the bilge of the engine room avoid crossing the zones of ongoing maintenance and possible dismantling hatches.

5002 Exhaust systems

The exhaust is fitted with a high efficiency silencer type, attenuation of 45dB as a minimum. The exhaust piping wall thickness is according Class Rules and Regulations. Pipes are mounted on silent-blocks which serve as shock absorbers and limit noise transmission. Directly behind each engine the exhaust pipe is equipped with a 1” socket to be able to measure the exhaust counter pressure. When engines are cold no stress or pipe deviation between flanges is allowed when flanges are disconnected. Special care to be made to parallelism of flanges. Expansion bellows are inserted where necessary for thermal expansion.

At the top side exhaust pipes are equipped with a pipe bow of at least 90° or equivalent to avoid that water can reach the exhaust system. If necessary due to airdraft restrictions the exhaust pipes are removable or foldaway. Above deck all exhaust pipes material is stainless steel, type 1.4571. To avoid contact of the crew members with hot parts of the exhaust pipes above deck they are protected by perforated plate, material 1.4571.

Inside compartments all exhaust pipes are sufficiently insulated all along its length. The heat-insulating material is enveloped in aluminium sheet fixed by screws. The heat insulators situated in proximity to the engine can be easily dismantled for maintenance operations. They are fixed by “toggle” type systems. The insulation material is of good quality, possible to remove and remount the existing insulation after 5 years of operation.

5003 Fuel systems

The Diesel engine is connected to the fuel tanks (item 1107) outlet by a remote controlled quick closing valve, by sufficient dimensioned piping, according to the approved fuel system diagram. The engines return lines flows back into the tank. Return lines into the fuel tank shall be mounted in such a way that spraying/splashing is avoided.

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All the fuel piping are to be in seamless pipe, carbon steel for diameters greater than or equal to ¾" and in copper tubing for all others. The valves are in steel or nodular cast iron for diameters greater than or equal to ¾" and in steel or brass for the others. For carbon steel, cleaning, passivation and rinsing are carried out after manufacturing.

Fuel transfer pump:

Installation of a ND25 electric fuel transfer pump used for trimming the pusher using the fuel tanks level. Suction and press connections from the pump to the fuel tanks connections. Per fuel tank a high level alarm triggering the fuel transfer pumps emergency stop.

5004 Lube oil systems

Lube oil tank is not installed, standard drum\cans are used.
One drainage box suitable for 3 oil filters, with perforated grating above the bottoms box, and a drain connection with ball valve to be installed.

5005 Cooling systems

Refrigeration of the power plants diesel engine , and electric propulsion drive system is made by box cooler(s) installed in a sea chest.

- Capacity of the boxed coolers has to be at least 25% in addition to the minimum requirements.
- Pipes of the coolers shall be covered or coated for possible use on salt water.
- Removal/replacing the boxed coolers afloat if preferable in the pushers light service draft.

A propulsion equipment cooling system loop is installed, serving the propulsion thrusters drive, the thrusters lube oil coolers, the propulsions frequency drive and the microgrid converter. Cooling of this loop via a boxed cooler, sufficiently sized, installed in a seachest. A circulation pump serves this cooling system generating enough flow. Diagram including heat rejection calculations, flow etc to be engineered. Circuit to be fitted with an electric heating element preventing low temperatures and condense in the drives.
Temperature, flow, and pressure indicators and alarms to be fitted, with local and external read-outs in the wheelhouse. In addition an expansion barrel pre-pressurizing the circuit. Circulation pump functionality to be indicated locally and in the wheelhouse dashboard.

The piping connecting the different cooling circuits are to be in seamless pipes made of carbon steel. The layout and form of piping takes into account warping linked to temperature differences. Fuel coolers or hydraulic oil coolers from the gearbox or gearboxes are mounted in the engines cooling water supply system, a bypass with valves over this oil cooler is installed to control its flow.

Cooling water pipes whose temperature exceeds 45°C are insulated or equipped with sufficient protections for the personnel. Each different pipe is equipped with 1 thermometer (1/2" socket), 1 manometer (1/2" socket) and 1 device (1" socket) for de-aeration. Separation, filling, purging and drainage of the circuits have to be possible.

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The particular circuits are fitted with expansion tanks installed to the engine room's ceiling or wall. The expansion tanks are fitted with low and high level alarm, in addition with visual level indicator. The expansion tanks can be easily filled with coolant. The expansion tanks are fitted with bottom connection to inlet of engine water circulation pump and drainage tap, and top connections for engine degassing. The valves are in steel or nodular cast iron for diameters greater than or equal to ¾" and in steel or brass for the others.

5006 Bilge/ firefighting system

One combined firefighting (fi-fi) / bilge system is to be designed and installed serving the firefighting lines and bilge lines and strainers in the pusher. Bilge/ firefighting system and capacities according the rules and a class approved system diagrams. It serves also the ballast tanks.

- The suction of the pump is made through the sea chests.
- Suction inlet by class approved gate-valve, and a suction strainer.
- The pumps should be chosen and located in order to have a high efficient suction and low required NPSH.
- Sufficient space around the pump(s) should enable easy maintenance
- The fire pump should be able to deliver at least 25m3 @ 3 bar at the discharge flange. The size of the pump(s) are to be according to Class and Rules and Regulations.
- The bilge-fire pumps are installed in the engine room or machinery space.
- The pumps are self-priming pump and driven by a 400VAC electric motor.
- Between pump and piping systems, bellows are installed, covered with insulation.
- The pump is installed above a drip tray.
- Emergency suction and rinse connection to the sewage tank.
- A bilge system in the pusher is fitted according the regulations,
- Each bilge connection is fitted with a strainer closed to the bottom.
- Bilge connection to aft peak and fore peak via a regulatory valve mounted directly on the watertight bulkhead.
- One hydrant connection in engine room.
- One hydrant on foredeck, which serves also as shore connection.
- The pumps are equipped with suction pressure manometer 0 - -1 bar (close to the suction flange) and with discharge pressure manometer 0-10 bar (close to discharge flange). All manometers shall be diameter 100mm minimum and glycerine type to avoid oscillation of the needle. An isolating valve allows replacing of the manometer when the installation operational.

5007 Ballast system

The ballast tank is to be connected to the service pump system.

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5100 SECONDARY MACHINERY SYSTEMS

5101 Compressed air system

One compressor delivering minimal 10 bar combined with an air dryer, mounted on air barrel of min. 200L. Automatic start and stop system. Air flow suitable for supplying an air-horn and general work air for power tools. Compressor is IP55, driven by a 400VAC E-motor. The barrels safety valve is fitted outside if the space is protected by a fixed fire extinguishing system.

Connected to the air system by sseamless steel precision pipes installed between the air consumers and compressor unit. High pressure hoses are to be applied where necessary.

- Quick connection in engine room serving air tools.
- Air horn connection wheelhouse. (reducer valve and filter installed inline)
- Remote controlled aft anchor release valve.
- Quick connection in push bow fender, pipe access to main deck by anti-return valve.

5102 Fresh water system

Fresh water system consists of copper pipes, hoses or polyethylene pipe between the tank and the pressurized water system and its consumer outlets. Hoses and PE pipes are only used in the wheelhouse and accommodation.

- The pressurized water system is fed by one 400VAC constant pressurising pump which will distribute water to the consumers in the wheelhouse and accommodation.
- 1x 50L boiler serving hot water system of accommodation.
- Water filter and UV cleaning system.
- Sink for the washing of hands will be installed in the engine room. This sink will be equipped with cold and hot water taps and an eyes washing device. The sink will be installed with soap support and cleaning paper support.

5103 Sewage system

Sewage system is based on gravity flow, from the sewage points, combined and connected, flowing into the sewage water holding tank. The piping in the engine room is made in stainless steel or PE material, piping in the wheelhouse and accommodation is made in PE material. Bulkhead and floor crossing are made through steel pipe sealed with fire resistant sealant, or type approved.

A sewage pump is installed to empty the sewage tank automatically if a high alarm is triggered. Sewage pump suction from sewage tank to the hull outlet by a reinforced carbon steel pipe and fitted with a regulatory valve. The pipe from the sewage pump to outboard valve is connected by a loop routing above the deepest water line fitted with an automatic breather on the top.

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5104 Fixed fire extinguishing system

Engine rooms will be protected by a fixed fire extinguishing system, type FM200 or equivalent (no CO2 installation) of sufficient capacity approved by class. System will consist of FM200 bottled in pressurized cylinders.

- Fire extinguishing gas will be released through nozzles when system is activated. Nozzles are connected by fitted pipes served by the cylinders.
- System according class approved diagrams and drawings.
- System acc. rules and ADN requirements (EU-directive §10.03b, 2d and ADN 9.3.2.40)
- The system is manual operated, activation from a system control box, fitted outside of the protected space, accessible from main deck.
- The control box is fitted with 2 door switches, one triggering ventilations emergency stop, and one triggering the acoustic and visual alarms installed in the protected spaces.

5105 Floor plates

Covering floorings in engine room are installed made of aluminum bulb plate ensuring safe access of the personnel and for all maintenance operations. The aluminum flooring is installed on steel angle bar profiles, rubber strokes are fitted in between to avoid noise and vibrations.
To be able to control all main equipment visually in an easy way the floor plates must not hide important equipment. The floorplates can be easily dismantled and are fixed with a sufficient number of counter sunk bolts of stainless steel material.
If for any reason a valve is placed under the floor, an access hatch is built in the platform allowing access in order to operate it and for maintenance. A label fixed onto the platform notes the tag number and the use of the valve.

5106 Workbench and tools

In engine room a metal welded workbench is installed, fitted with a 300mm bench vice.
Above the workbench a tool board made of 18mm plywood is installed. Tools are owners supply.
A cupboard with several shelves to store e.g. filters is included.

5107 Name tags

All valves and control equipment are labelled with white tags engraved with black text,
Outside tags to be fitted with stainless steel nails.

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5200 HVAC SYSTEMS

5201 General

The accommodation and wheelhouse are air-conditioned and pressurized by an air-pressure unit. Engine rooms are equipped with forced ventilation maintaining the maximum temperatures according to the rules during operation of the pusher. Fore and aft peaks, deck stores and other machinery spaces are natural ventilated. Opening height are according the rules and/or respecting the stability booklets.

5202 Engine room ventilation

In the engine room ventilation is ensured via forced 400VAC ventilation fans (centrifugal type or less noisy type) which brings fresh air into the engine room. The engine room fans are 2 speed or variable speed control from the wheelhouse are able to maintain max 45°C with external temperatures up to 35 °C. Power supply from the main switchboard. Auto start/stop on engines running contact.
The ventilation casings openings are protected by stain steel closable fire grids according the rules.

5203 Pressurized air system

The pressurizing air handling units, create an air pressure of min 0.1 kpa inside accommodation and wheelhouse. Steel galvanized spiro channels will be used transporting air. Air is filtered, heated when necessary, and transported through the accommodation and wheelhouse. Air nozzles will be used for accessing rooms. Units are equipped with:

- Suction section with manual controlled fire grid
- Filter sections, replaceable by crew
- electrical heating section
- Air pressurizing fan intake unit
- Work switch and flow switch

Flow switches are installed in the pressurizing units. Measurement of air pressure differential in pressure box. When there is no pressure differential between outside and inside deckhouse, red groups are automatically switched off.

5204 Air conditioning system

The air conditioning units consist of inside- en outside units connected by insulated cooling medium pipes. The inside units are all wall-mount devices and supplied with remote control.
The water condensate has to be fed to the sewage tank.

Units for accommodation rooms and wheelhouse shall have heat pump function; heating shall be possible with inside units. Every inside unit has the possibility for local temperature control.
Outdoor units are delivered with spark-free certificate, so they can be used during ADN operation according to inland rules.

5205 Wheelhouse HVAC

A single split air conditioning unit installed in the wheelhouse, able to maintain 18-22°C with external temperatures up to 35 °C. Condense of the inside unit flows outside via a drain. Outside unit is installed on a frame aside the wheelhouse base.

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The wheelhouse is pressurized by an air-pressure unit placed outside according regulations. Air supply can be heated using a heating unit in the overpressure system.

Oil filled electric heaters with thermostat shall be able to increase the temperature up to 22°C.

5206 Accommodation HVAC

The air conditioning unit provides the accommodation modules and is able to maintain 18-22°C in each covered room with external temperatures up to 35 °C. This unit covers the mess and crew cabins. The compressor units are preferable installed in a well ventilated machinery room, these parts shall be designed to work in this ambient temperature and fulfil the requested performance.

The accommodation is pressurized by an air-pressure unit placed outside according regulations. Air supply can be heated using a heating unit in the overpressure system.
The polluted air is extracted or purged by overpressure from the ceiling of the galleys extraction hood, toilet room and the wet cell.

Additional oil filled electric heaters with thermostat shall be able to increase the temperature up to 22°C in the mess, corridor or crew cabins.

Galley and bathroom\toilet extraction exhausts ends are fitted with closable stainless steel mushroom heads located on accommodation deck.

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6000 INTERIOR/ UPHOLSTERY/ CARPENTRIES

6001 General

All the materials used for base construction, flooring / walls / ceilings and doors are made from marine type and fire resistant, low flame spread in the event of fire, including the floor coverings. Wood is authorized for making the furniture (cabinets, couch, worktables, etc.).

- All furniture will be “marine type” construction and resistant for intensive use.
- Materials and colors of the ceilings, walls and floor will be proposed and samples given to the operator for acceptance.
- Floor is made minimal of 2 layers of 18mm panels.
- Thermal insulation has to be installed on every face of the accommodation and wheelhouse and shall meet regulation requirements for fire protection and the max sound levels required for continuous operation (B). Special care is taken for the floor above the bow engine room acquiring this sound level in the accommodation.
- The floor will be covered with marine type PVC material, edges all around fitted with sealant.

6002 Wheelhouse

The wheelhouse is pressurized, air-conditioned and will have an efficient lay-out which offers an unobstructed view in all directions, this arrangement will include:

- A navigation desk as per item 6003
- 2 low office (computer) cabinets with a door and 1 shelf
- 1 low office cabinet with a 3 drawers
- 1 small office desk per operator’s request
- 2 double clothes hooks.
- One small couch covered with black artificial leather, color black,

6003 Navigation desk

The navigation control desk is installed in wheelhouse and made from powder coated steel, fitted with all necessary controls, screens and navigation equipment. Model shape as per operator’s request, arrangement is proposed to the operator for acceptance. Gratings are installed ventilating installed electrical equipment. Other materials in consultation with operator’s accordance fulfilling ADN rules.

6004 Accommodation

The accommodation is pressurized, air-conditioned and will have an arrangement as required to operate the pusher for continuous operation (B) accommodating sufficient crew. It will accommodate a mess with open galley, a wet cell and bedroom cabins. Arrangement is proposed to the operator for acceptance.

The windows have single curtains for day and the crew cabins darkening curtains for the night. Curtains are made of flame retardant fabricate. Ceiling curtain skirting’s will be fitted.

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Doors are placed in powder coated steel frames and equipped with standard hinges and locks. RAL 9010.

6005 Mess / Galley

The open galley / mess is equipped with:

- Worktop surface for preparing food. The work surface is built over a cupboard with shelving. The cupboard will have several doors. Above the surface also a cupboard with shelving, arrangement in accordance with the operator.
- single sink with overflow, hot and cold water tap, waste water drain with trap.
- Microwave in high cabinet.
- Cooking plate with 2 or 4 heaters.
- Extractor hood discharging outside placed above the cooking plate.
- One combined low fridge \ freezer.
- Sufficient dimmable lighting spots in LED.
- Emergency lightings.
- Switches and sockets for 230 VAC suitably positioned for lighting and plugging in appliances.
- One TV shelf or cabinet to support a TV set.
- One TV plug connected to antenna.
- One sofa for the crew with coffee table.

All equipment should be chosen from well-known manufacturers.
Kitchen utensils and crockeries will be provided by the operator.

6006 Crew cabins

Each crew cabin is pressurized and air-conditioned and equipped with:

- Double bed with two drawers in the lower section. Beds supports crew up to a weight of 100 kg.
- Mattresses included, descent type or manufacturer to be proposed.
- Storage cupboards extending for the full height of the room. The cupboards have a full height doors according its size, shelves and a place to hang clothes. One door is fitted with a mirror 1600 x 400 approx.
- Shelve above each bed.
- Reading light with a switch above each bed.
- Office desk.
- 4 hook coat rack.
- Sufficient dimmable lighting spots in LED.
- Emergency lightings.
- Switches and sockets for 230 VAC suitably positioned for lighting and plugging in appliances.

6007 Wet cell

The wet cell is equipped with:

- Ceramic toilet with sewage water evacuation and water flushing system.
- Toilet paper holder and brush.
- Shower fitted with a door to prevent water being sprayed outside its basin, hot and cold water thermostatic tap and a drain for waste water evacuation.
- Sink basin with overflow and hot/cold water tap, and a drain for waste water evacuation.
- Bathroom cabinet above the sink with mirror, lighting and socket for electric razor.

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- Cupboard with door and shelving under the sink.
- Double support for towels.
- Electric radiator towel rack with thermostat.
- 2 hook coat rack.
- Washing machine connection.
- Tumble dryer connection with separate air outlet to outside.
- Sufficient lighting spots in LED and an outside placed switch.
- The floor is covered with ceramic tiles (color to be proposed to the operator).

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7000 ELECTRICAL SYSTEMS

7001 General

This pusher will be installed according Class Rules and Regulations, conform the European directive 2006/87/EC and the ADN. Ship controls, interlocks and alarms to be realized with a PLC system. Also, the installation will meet the requirements for one-man navigation.

After finalizing the complete system, all components will be tested and presented to class surveyor where requested. System functionality to be presented to operator and its crew.

7002 Documentation:

Following documentation to be provided when finalizing electrical installation,

Drawings / lists, class approved:

- Electrical general circuit diagram (One-line diagram).
- Electrical power balance.
- Electrical power list.
- Electrical installation drawings.
- Electrical drawings of fire alarm system.
- As built drawings after installation, also installed in related cabinets
- ADN list installed equipment.

Fire alarm system:

- Type approval fire alarm system.
- Fire alarm system installation attestation (commissioning report).

Gas detection system:

- Type approval gas detection system.
- Calibration certificates gas detector heads and commissioning report.
- Class Attestation gas detection installation.

Attestations and type approvals:

- Class certificate of main switch boards.
- Attestation turning rate indicator, radar installation and AIS.
- Attestation grounding equipment general.
- Attestation tachograph.
- Attestation safe devices.
- Megger test.
- Certificates of battery chargers and inverters.
- Type approvals of used ship-cables.

All documents will be delivered in PDF; also 2x hard copy will be delivered.

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7003 General electrical power installation

Main supply:

The electrical system is a "TT" system, meaning that grounding the system is obtained by direct earth wiring connected to an earth net. Installation is performed with “zero”. It is assumed that during operation the main power plant is powering the pusher. Generator sets power determination are made according to the electrical balance calculation. As the power plant drives the propulsion thruster, it is classified as essential service.

Main power plant (estimated circa 550kWe)	60Hz main power supply (propulsion net).
Auxiliary generator (estimated circa 20kWe)	50Hz main power supply (board net).
Microgrid converter (estimated circa 60kWe)	50Hz main power supply (board net).
Shore connection	63/32A socket in engine room

Main power system:

The power plant is able to drive the propulsion thruster, and is also able to feed the normal shipboard power supply system via a microgrid converter on 50Hz. Special attention will be given to variable frequency currents , or prevention of harmonic distortion, resulting In a stable shipboard net.

Installation of an (active) microgrid converter drive, which takes power from the propulsion grid and transforms this to supply the shipboard power grid, will be installed separately. This converter will be water cooled via an internal cooling system.

24VDC system:

The 24Vdc system is serving the nautical and navigation equipment and emergency lighting. The voltage is obtained from a set of semi-traction batteries of 400Ah ± placed in the engine room. The emergency lighting is either provided in 24VDC or by means of an inverter (24/230V) from the 24Vdc batteries. Sufficient sized battery chargers will be installed. 24VDC/230VAC inverter(s) will be installed serving 230VAC equipment’s or appliances in need of power when generator sets are off.

Red groups:

The installation will have a central controlled “red” switch for power supplies for equipment which may not be used when pusher operates in ADN conditions according ADN 7.2.2.19, these equipment’s power supplies will be marked as “red”.

Earth fault indication system:

Primary and emergency system will be equipped with devices for checking the insulation resistance against vessels hull.

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7004 Electrical installation

- The electrical equipment is enclosed in sealed cabinets of minimum IP55 protection. The sealed cabinets are equipped with cable entry via marine type cable gland.
- Insulating rubber mats are fitted in front of the cabinets inside the engine rooms.
- Cabinet frames have a ground terminal connected to the hull via a grounding strand.
- Cabinets have a grounding strip to connect all the equipment which should be earthed.
- Electrical cabinets must be segregated for 400 V, 230 V and 24V. Bus bars shall be protected by Plexiglas screens.
- All equipment and electric terminal strips shall bear tags.
- Electric cables shall be marked with equipment name label at cabinet entry.
- All cores shall bear crimped tips.
- Wires and cables installed in closed plastic cable trays in their cabinets.
- All doors or hatches of electrical cabinets must be earthed to their housings.
- Cable entries in cabinets or boxes shall be made through marine type cable gland.
- The 400V electrical motors are minimum class F insulated, B temperature rise with IP55 minimum protection. They are supplied by well reputed manufacturers such as ABB or Leroy Somer. A heating resistor is provided for power above 5kW and for all motors is installed on main deck.
- The electrical cables are of a type approved by class society. HO7RNF cables are the minimal accepted quality. They are of flame retardant, low fume emission and non-halogen emission type in the event of fire. When the cables are reinforced, the armour (mechanical protection) is earthed at both ends. The control cables shielding are connected to electronic earth on the controlled side to avoid any interference and referential problems.
- Cables for fire detection equipment shall be fire resistant and type approved for this purpose.
- Except for big power cables, a loop shall be made before entry in equipment connection boxes & electric cabinets in order to have an extra length of cable if needed for later maintenance.
- Connections to movable equipment (mast, etc.) a large loop of cable shall allow the full movement of the equipment without any abnormal stress/wear and deterioration of cables or cable strand.
- Passages through sealed bulkheads and the main deck are equipped with bulkhead passage boxes of approved type.
- The cable paths of the power circuits and control circuits are separated to prevent interference on the control signals.
- Special attention will be given for power cables transporting variable frequency current.
- Electric cables shall be laid into cable trays (galvanised type), or mounted on strips.
- Electric cables in exposed areas should be mechanically protected.
- It is prohibited to paint electric cables.

7005 Main switch boards

The main switchboards and/or 24VDC switchboard is placed in the engine room.
They will accommodate several compartments for the main power plants system, shipboard power supply and 24VDC components such as circuit breakers, contactors, terminals, etc. Various equipment can be operated locally. Starters heavier than 5 kW are carried out as a star / delta switch, the lower values are switched directly. The switchboard shall be ventilated if necessary.

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The switchboards will accommodate electrical equipment for:

- Distribution and control to miscellaneous equipment
- Power plants power control and coupling
- Power management / power load information
- Generator sets power control and coupling
- PLC control system
- Frequency /Amp / Volt / Power measuring.
- Shore supply connection 400V
- Deck equipment
- Machinery equipment
- Engine room fans
- Lighting and 24 VDC emergency lighting
- 16A 400V socket mounted on switchboard
- Wheelhouse distribution supply
- Accommodation distribution supply
- Engine and machinery room distribution and lighting system
- Aft peak distribution and lighting system
- Local controls for pumps, fans and generators sets.

Main switchboard and propulsion switchboard to be approved by classification society in the manufacturer's workshop before it is installed on the pusher.

Shore connection:

When shore power is available the power source selection can be made from the switchboard. A circuit breaker shall protect each shore power line from over-intensity. An automatic reversing phase device is installed in order to drive all electric motors in the right direction.

7006 Wheelhouse

The wheelhouse is fitted with the following electrical equipment, installed and/or connected.

- Navigation headlights on forward top edge wheelhouse roofs centreline.
- Window wiper(s) and its intervals
- 2 x gas discharge or LED flood lights under wheelhouse roof edge (front).
- Blue sign and its flashing light
- 4x spots, dimmable above navigation desk in navigation mode colours.
- 1 x kick space heater 3kW.
- Sufficient lighting spots in LED and emergency lightings.
- Switches and (inverted) 230VAC sockets suitably positioned for lighting and plugging in appliances.

7007 Wheelhouse navigation desk

The wheelhouse navigation desk is fitted with the following electrical equipment, installed and/or connected:

- 400VAC, 230VAC / 24VDC distributions for wheelhouse and nautical equipment
- Start / stop / running signal generator sets
- Navigation lights panel with alarms, lighting control visualized in engraved signal panel.

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- Voltage - current – measurement of 400 / 230V shipboard supply
- Voltage - current - measurement of 24VDC, light batteries
- Control panels and operation screen/panels for remote control of the power plant.
- Control panels and operation screen/panels for the propulsion thruster.
- Navigation / communication equipment (item 8000)
- Camera system screens
- Fire control panel
- Alarm screen/panel showing all defaults and alarms.
- PLC control screen
- Connection, safety and starter for power pack in wheelhouse.
- Radio/DVD player, car type, with 2 loudspeakers flush mounted in the ceiling
- Footswitches for VHF, horn and intercom.

Aluminum panels engraved in navigation control desk wheelhouse:

The obliquely standing edges of the navigation desk are provided with engraved aluminum panels or equivalent. Buttons / switches manufacturer EAO, type flat 24x24mm, 2mm height with dimmable lighting and engraved texts. Also around all equipment "edge lines" engraved.

Panel(s) fitted with switches (or push buttons) for: (arrangements in accordance with operator's request)

- Navigation or communication equipment
- Alarm or control panels propulsion/steering systems
- Window wiper and interval control
- Horn
- Buttons / dimmers for lighting wheelhouse.
- Joystick elevating control of wheelhouse upper part
- Joystick elevating navigation mast
- Deck lightings
- Firefighting pump
- Blue sign
- Flash light
- Joystick and control searchlight
- Camera controls
- Call controls serving various spaces
- General alarm / reset / lamp test
- Alarm data system / PLC controls
- Spares

7008 PLC system with touchscreen control.

The electrical system will be controllable by supplied and connected PLC system,
PLC units with analogue and digital in/out modules will be installed in main switchboards and wheelhouse navigation desk, inter-connections of the PLC units by Ethernet cables or equivalent.
Double cabling to ensure constant communication between these PLC modules.

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Supply and connection of a 15 inch HMI touch control screen installed in navigation desk, connected to the PLC module installed in navigation desk. Touch screen will be programmed with screen pages. Each screen programmed with buttons and indications for controlling this PLC system. It will consist of following control screens:

- Home screen serving general info
- Power screen serving control and visualization of generators sets, power lines, breakers, power measurements, shore connections etc.
- Engine room machineries control and indications
- Deck lightings control and indications
- Navigation lightings control and indications
- Alarm control and indications
- Red groups control screen including air pressure systems control and indications

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7009 Navigation mast

The navigation mast is fitted with the following electrical equipment, installed and/or connected:

- One motorized searchlight (rotation 360°, +15° over horizon and 75° below horizon, range of beam lighting 500m) shall be provided and installed on the navigation mast. This 24VDC searchlight is remote controlled from the wheelhouse.
- 2x anchor light (SB anchor light serves also as 2nd blue light signal)
- Orange flashing light
- Fog horn and air horn light
- Antennas for radio communication and radio navigation equipment, spare sockets to be provided.
- 3x 500W IP55 LED flood lights (stern, port and starboard side)

7010 Radar mast

The radar mast is fitted with the following electrical equipment, installed and/or connected:

- Socket and foundation for radar scanner
- Socket for intercom
- GPS antenna

7011 Sidelight boxes:

Side light boxes are fitted with the following electrical equipment, installed and/or connected:

- Navigation sidelights.
- 1x 500W IP55 LED flood lights each
- Camera(s) as per item 8012

7012 Main deck

Main deck is fitted with the following electrical equipment, installed and/or connected:

- Push button boxes or remote controls for deck equipment (winches) with IP 65 protection
- Several deck lightings / brass bully's mounted around accommodation.
- Navigation stern lights on accommodations stern foundation.
- Intercom posts

7013 Accommodation

The accommodation has a distribution cabinet serving the lighting, alarm, fire control and communication systems. General alarm and intercom system according the rules is installed. Arrangement of lightings, sockets etc. in accordance with the operator's request. An emergency lighting system is installed.

7014 Aft peak / thruster room

The aft peak is fitted with the following electrical equipment, installed and/or connected:

- Sufficient fluorescent lighting units 2x18 watt mounted around walking zones / working areas.
- Sufficient 230VAC double wall sockets
- 24 VDC emergency lighting system
- Lighting switches located near the entrance hatch
- All the electrical equipment (push button, sockets, etc.) with IP 55 protection

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7015 Engine room

The engine room is fitted with the following electrical equipment, installed and/or connected:

- Main switchboards for 400VAC and 24VDC, main power supplies, shipboard and/or 24VDC.
- Main switchboards for propulsion system and propulsion drive.
- Power or control cabinets for propulsion system.
- Power or control cabinet's generator sets, remote controlled from wheelhouse and locally controlled.
- Batteries serving lighting system or engines, battery chargers etc.
- Machineries such as pumps, hydraulic power packs etc.
- Control boxes for deck equipment
- Engine room fans, 2 speed or variable speed control from the wheelhouse
- Sewage tank high level alarm with notification in the wheelhouse
- Miscellaneous items as Battery charger, etc.)
- Low and high fuel tank level sensors with alarm notification in the wheelhouse.
- Fire detectors (smoke detection and heat detection).
- Optical and acoustic alarms for fire extinguishing system including its cylinder sensors.
- Bilge level sensors with alarm notification in the wheelhouse
- Horn and flashing light general alarm / call.
- Sufficient fluorescent lighting units 2x18 watt mounted around walking zones / working areas.
- Sufficient 230VAC double wall sockets
- 24 VDC emergency lighting system
- Lighting switches located near the entrance hatch
- All the electrical equipment (push button, sockets, etc.) with IP 55 protection

7016 General alarm system

The general alarm system is installed as per rules, serving accommodation, aftpeak/thruster room and engine room. Call buttons in the wheelhouse serve also these applicable rooms.

7017 Fire detection system:

Supply and installation of complete fire alarm system with control panel, mounted directly visible position in wheelhouse, delivered with class type approval. Drawings of system, complete with overview of mounted sensors. Supply and installation of sensors in:

- Accommodation
- Wheelhouse
- Engine room
- Aftpeak / thruster room

Documentation delivered:

- Type approval fire alarm system
- Fire alarm system installation commissioning report

Alarms forwarded to ships control system, notifications to signal horns and alarm lights where applicable.

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7018 Gas detection system

Supply and connection of a type approved gas detection system with control system panel, mounted in wheelhouse. Gas sensors according the rules mounted at the following locations.

- Entrance door wheelhouse.
- Entrance door accommodation.
- Air intake pressurizing unit accommodation.
- Air intake pressurizing unit wheelhouse.

Alarms forwarded to ships control system, notifications to signal horns and alarm lights where applicable.

7019 Miscellaneous

Under the engine room flooring plates sandblasted and primed steel cable trays will be used , above the flooring plates galvanized steel cable ducts will be used.

Cable penetrations through watertight bulkheads to be sealed with class type approved materials.

50m shore connection cable to be supplied with a plug and socket. (3p + A-63A) 5x10mm2.

In switchboards, various enclosures and navigation desk self-adhesive text plates or printed tape will be put for circuit breakers and controls. Circuit breakers to be fully named with protected equipment text, not numbered. All as-built electric diagrams are to be inserted in the corresponding cabinets.

8000 NAUTICAL / COMMUNICATION SYSTEMS

8001 General

The nautical equipment is installed in the navigation control desk and its related sub-locations,
This equipment is power supplied by the 24VDC system, and has dimmable lighting.

8002 Communication systems

The following communication systems and related equipment are fitted:

- One AIS system, with antenna (s), AIS commissioning statement to be delivered by supplier
- One GPS system serving NMEA outputs for several nautical equipment and the ecdis system
- Two VHF radio units, inland type, with ATIS killer and antenna.
- (one VHF is provided with one man control, consisting of control switch/ gooseneck microphone)
- Three portable VHF devices are delivered, with charges

8003 Intercom system

One intercom system, with sub-stations on the following positions, as per rules:

- Fore deck with call possibility to master station.
- Aft deck with call possibility to master station.
- Accommodation posts

Stations on fore and aft deck are closed watertight stations.
The intercom has a “call” button, which provides public address functionality.

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8004 Radar unit

Installation of one radar system suited for inland navigation. The display unit features a daylight TFT screen with selectable ranges from 300 meters up to 32 kilometres. A 6 or 7 feet scanner with an incorporated transceiver is fitted on the radar mast. Radar correct functionality statement to be delivered by supplier. NMEA coupling with the AIS system.

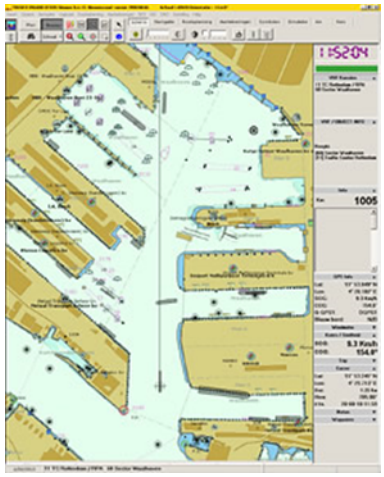
8005 River auto pilot

Installation of one navigation river auto pilot, serving the propulsion thruster, complete with control boxes and thruster system connections.
Rate of turn indicators is installed and connected to the river auto pilot.

8006 Depth echo sounder

Installation of echo sounder control panel, with adjustable working depth control and acoustic alarm signaling. Transducer is installed at an appropriate place in echo sounders housing, in the engine room.

8007 Ecdis chart mapping



Installation of navigation ECDIS chart mapping software delivered and installed on a supplied PC.

- One small form factor PC delivered with windows software, CD-ROM player and wireless keyboard.
- 1OneTrackball mouse for control of the PC and its navigation chart software
- One 17/19-inch build-in TFT screen serving this PC and software, with dimmer function.
- One UPS capable of supplying this PCs power consumption
- One NMEA coupling with the AIS system, showing AIS targets in the Ecdis screen
- Map areas: Basic charts of the Netherlands or Belgium. Extra charts are owner supply.

8008 Communication

Computer-laptop:
No provisions are supplied; Board PC / laptop or equivalent is owner supply
Office printer is owners supply

Telephone system or Cellphone:
No provisions are supplied

Internet:
One Ethernet system will be installed:

- Switch 8x installed in wheelhouse
- TCP/IP Ethernet cabled RJ45 plugged connections from PC/laptop, printer, Ecdis PC and accommodation
- Two Wifi access points (wheelhouse and accommodation)
- Internet dongle/station, subscription fees and SIM card are owners supply

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8009 TV System

TV /Hifi sets and brackets are owners supply. Subscription fees etc. are owners supply.

8010 Camera CCTV system

One camera system serving nautical views in the wheelhouse is fitted.
The camera views will be displayed each on a 12-inch LCD screen, or on a 17 inch screen with a dividing quattro box serving 4 camera views.
Fixed IP68 camera with anti-condense protection, are installed on following positions

One dome camera fitted in aft mast including wheelhouse view angle control serving 360 degrees
Two cameras fitted under each side light box (one serving forward view, one backwards view)
One camera wide angle, engine room view

9000 LIFE SAVING AND OTHER INVENTORIES

9001 General life saving appliances

Lifesaving appliances are in accordance with the Class regulations for an Inland waters vessel of this class. The equipment is of an approved type.

For the lifesavings, general and nautical inventories including helmsmen chair a provisional sum of 15.000 euros is included in this specification.
The required equipment is properly fitted on convenient locations on board of the vessel, including the required plastic sealed plans, like Safety Plan, etc.

9002 General inventories

General required inventories are included in above inventories provisional sum.

Additional below convoy/barge equipment is delivered on each pusher.
2 aluminium arms for ship side or anchor lanterns, fitting in a barges lantern post.
1 aluminium masts for 3 in triangle head lights, fitting in a barges lantern post.
1 aluminum mast for stern light, fitting in a barges lantern post.

9003 Nautical inventories

Nautical required inventories are included in above inventories provisional sum.

9004 Spares

Following equipment to be delivered:

- 1 Set of spare bulbs (interior lighting)
- 1 Set of spare bulbs (navigation lighting)
- 1 Spare" fire" detector of each kind and dummy.

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