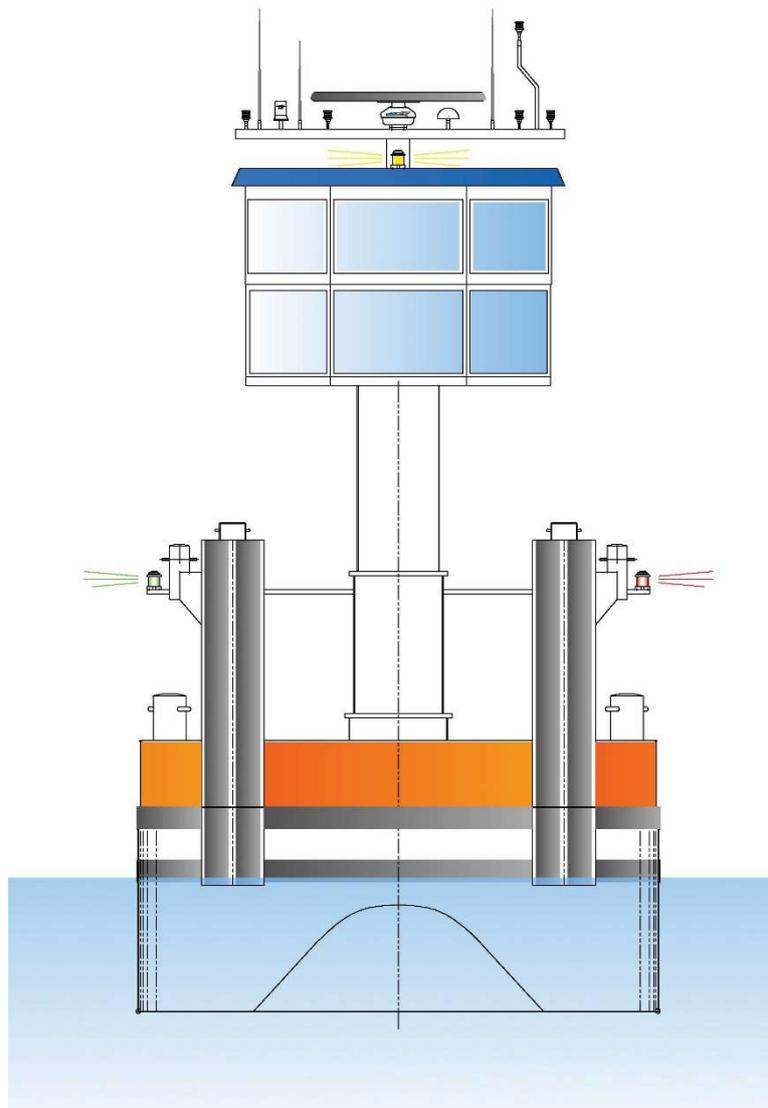


DESIGN SPECIFICATION

For the Watertruck+ Pusher



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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'; a convoy composed of a pusher and a pushed craft coupled so as to permit guided articulation is also considered as rigid. <i>[EU-Directive 2006/87/ec Art. 1.01]</i>
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 Completion	Casco steel work could be including some outfitting equipment Outfitting work, could be on different location than hull/casco yard
BENELUX Owner	Belgium, The Netherlands, Luxemburg Watertruck+ BVBA or its representative
BENELUX Operator	Pusher operator or its representative
BENELUX Shipyard	Main contractor of the pusher / builder (could be hull/casco and/or completion yard)
Hull / Casco Completion	Casco steel work could be including some outfitting equipment 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

0000 - GENERAL

0001 Design Philosophy

The push boats in the Watertruck+ project are to be modern, high performance pusher 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

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 will be selected. Alternatives will be evaluated in terms of reliability, durability, installation cost, life cycle costs, ease and cost of repairs. Proposals shall be discussed with the owner and operator.

Building and operational cost:

The design is to be developed cost conscious without harming the functionality.

General design description:

The pusher is 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 rectangular in the basis 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 two shaft lines each comprising an electric started and box cooled main engine, a gearbox, a propeller shaft in a stern tube and a fixed pitch propeller in a nozzle. For maneuvering the pusher electric controlled hydraulic driven steering gear units is fitted.

Below decks the vessel is divided in 3-5 compartments with the following functions.

- Forepeak (pending on the design and Operator's preference) suitable for ballast purposes.
- Workshop and storage facility.
- Engine room for the main propulsion.
- Steering gear room.
- Storage tanks
- Aft peak (pending on the design the aft peak could function as steering gear room).

I

In general, all compartments are to be easy accessible. The steering gear 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 3 crew members. 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 aircraft. Furthermore, the wheelhouse is to be equipped with the required Nav-Com equipment.

The deck equipment basically consists of the following:

- 4 hydraulic/electrical winches, 2 positioned on aft and 2 on fwd. deck with a holding force of 40 tons.
- 2 anchors and 2 electrical anchor winches with remote controlled brakes.
- At least 6 double bollards with pins positioned 2 positioned aft and 2 forward, PS and SB. SWL 40 ton.
- 1 optional Towing bit/bating positioned on the aft deck.

The system complete system shall be designed taking the following into account:

- The shaft may be positioned under an angle or inclined.
- In principle a fixed nozzle shall be used which may not extend below the baseline.
- The steering gear will be a classic rudder system with rudders positioned in line with the propeller.

0002 Main particulars

Main dimensions of the pusher are the following:

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]	2500

Minimum Tank Capacities

MDO Fuel tanks (1 PS, 1 SB)	[m ³]	2 x 7,0 m3
Potable water tank	[m ³]	2 x 2,0 m3
Sewage (black) water tank	[m ³]	1 x 1,0 m3
Lubrication oil	[m ³]	1 x 0,5 m3
Hydraulic oil	[m ³]	1 x 0,5 m3
Dirty oil	[m ³]	1 x 0,5 m3

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

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:

- Installation of a diesel direct bow thruster in engine room / machinery room.
- Installation of a towing hook on/near the bating behind the accommodation
- Installation of anchoring equipment on forward side of the pusher

0014 Performance and Speed

The pusher need to perform well at all loading conditions of the pusher and its pushed convoy.

The pusher will have pushing capacity certificate of 2500 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.

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.

0100 CLASSIFICATION

0101 Classification Society

The pusher is to be designed and built under supervision of and in accordance with the Rules and Regulations for the Classification of Inland Waterway Ships from an IACS member class society.

All drawings and documents are to be in accordance with the Rules and Regulations applicable for the class notation for a: **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.

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 in a language as specified by the operator.

The full design class approved drawing package necessary for the building of the pusher is to be developed by the Builder in consultation with the Owner and or Operator or it's representative.

At least the following design drawings are required:

- General Arrangement
- Lines plan
- Class Construction plans
- Hull outfitting drawings
- Stability calculations / Booklets
- Strength calculations
- Anchor equipment calculations
- Class Machinery diagrams
- Engine Room Arrangement
- Propulsion Arrangement
- Coupling Arrangement
- Visibility plan
- Safety plan
- Deck Arrangements including Deck Equipment
- Fire control and Safety Plan
- ADN plan of conformity (distances/ventilation etc.)
- Artist impressions

Upon delivery a construction file shall be delivered, containing all material certificates, compliance certificates, drawings and documents approved by the Classification Society. Delivered in hard copy 1x and PDF.

0203 Design Parameters

The pusher is to be designed for the following pushing capacity:

Pushing Capacity of convoy (certified)	[t]	2500	
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0204 Hull Arrangement

The pusher's hull arrangement can be described in short as follows:

- A mono hull with streamlined aft ship towards the propeller(s).
- A fore ship has to be shaped in order to minimize resistance equipped with two vertical pushing horns/fenders.

0205 Hull Subdivision

The hull will be divided in 3-5 watertight compartments at least consisting of an aft peak, forepeak and engine room. Pending on the design a workshop and steering gear room may be designed as separate watertight compartments as well.

0206 Compartments

The storage tanks are designed symmetrical in the hull from the centerline, to establish a pusher with minimized heeling effect.

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.

1000 HULL STRUCTURE AND HULL OUTFITTINGS

The hull is made of steel plates and profiles (grade A or equivalent), certified by one of the major Classification Societies. In order to reduce weight high tensile steel might be used.

The hull structures in the bow sections are adequately reinforced, in order to support the pushing forces. Two transverse bulkheads divide the hull in 3 major watertight compartments:

- Aft peak / Engine room
- Cargo hold
- Fore peak

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 (ANSI 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.
- Pipe penetrations through watertight bulkheads will be continuously welded on both sides.
- All piping's except for fuel and lube oils are galvanized.

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.

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.

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 a low resistance shape. Hull structure is to be build 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.
- 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.

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/flare 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 manhole for cleaning and inspection.
- 1 quick closing valve outlet with regulatory remote closure control from outside this space.
- Between the fuel tanks a crossover is installed, min diameter ND80, connected between the quick closing valves. On the lowest point an accessible drainage tap is fitted.

1108 Lube oil tanks

One lubrication oil tank with a capacity as specified in 0002. The tank has to be integrated in the structure. Tank fitted and equipped according to the applicable rules and regulations at least with:

- 1 ND50 vent pipe with spark/flame arrestor, ending in a gooseneck, lowest point min. > 600mm above main deck.
- 1 ND40 filling inlet pipe equipped with a standardized cap (TW coupling). The tank inlet is to be mounted in such way that spraying/splashing of lube oil is avoided.
- 1 manhole for cleaning and inspection.

1109 Hydraulic oil tank

One hydraulic oil tank with a capacity as specified in 0002. The tank has to be integrated in the structure. Tank fitted and equipped according to the applicable rules and regulations at least with:

- 1 ND50 vent pipe with spark/flame arrestor, ending in a gooseneck, lowest point min. > 600mm above main deck.
- 1 ND40 filling inlet pipe equipped with a standardized cap (TW coupling). The tank inlet is to be mounted in such way that spraying/splashing of lube oil is avoided.
- 1 manhole for cleaning and inspection.

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.

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.
- 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.

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.

1113 Forepeak

The forepeak will be accessible via a hatch or manhole and a ladder below to the bottom. Pending on the design the forepeak could be used as void or ballast tank. In case of a ballast tank the internal structure shall be welded double continuously. Underdeck stiffeners are to be foreseen in way of the pushing fenders and applicable deck equipment. The fore peak will also house the hawse pipe for the anchor.

1114 Engine room

The engine room will be accessible via a steel weather tight door and stairs. An easy accessible emergency exit is to be arranged on the opposite side of the entrance leading to the main deck. A workshop with workbench and storage room are to be located in the engine room, alternatively in a separate room pending the design.

The engine room will have structural integrated seating's for both engine(s) and gearbox(es), according approved foundation propulsion arrangement drawings.

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

Pending on the design the aft peak contains the steering gear and rudder trunks. In general, the rudder trunks and steering gear tables are to be well integrated in the ships structure and well aligned according the rules and rudder manufacturer's arrangements and recommendations.

The aft peak will also house the hawse pipe for the stern anchor(s).

1116 Deckhouse

The pusher will have a superstructure (deckhouse) to accommodate the crew. It will be an all welded steel construction mounted on the hull. To minimize tension in the steel 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, stairways and sufficient drainage scuppers.

- Entrance door(s) will be designed according rules, for accommodation and engine/workshop rooms.
- Engine room entrance door could be directly to outside, or via a workshop room as long as the engine room has an (other) access directly from outside. Design according rules.
- The exhaust funnel is fitted at the aft deck near center line and contains the exhaust piping of the diesel engines and act as an engine room ventilation outlet.
- Ventilation casings integrated in the deckhouse act as ventilation inlets.
- The accommodation deck can be reached by stairways at the aft side near the funnel casing and are integrated sloped in the deckhouses aft wall.
- 2 additional stairways at port and starboard side of the fronts deckhouse located outside the wheelhouse outer lines. Also integrated sloped in the front deckhouse wall (designs to be discussed with operator)
- Deckhouse deck to be designed/fitted with a bridged bulwark on either side, ending in a railing surrounding the deck on the aft side and behind the wheelhouse. Height min 900mm. (note required aircraft)
- Drainage of the accommodation deck is arranged by means of galvanized steel pipes 60.3 x 5.0 mm fitted in the deckhouse walls, ending 100mm above main deck.

Per design requests from operator also the funnel exhausts casing could be integrated in the deckhouses aft wall.

1117 Deckhouse casing and dismantling hatch.

To enable the removal of the main engines and other large machinery from the engine room, a flush engine room hatch to be fitted on a designed engine room casing at accommodation deck. Hatch to be provided with lifting lugs and closed by bolts and appropriate watertight sealing. A similar design with a removable accommodated casing could also be fitted for the smaller pusher in order not to lose interior crew space. Alternative a dismantling hatch above the engine rooms entrance or equivalent.

1200 HULL STRUCTURE OUTFITTING

1201 Bollards

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

- 12 bollards, fabricated of thick-walled pipe having each two pins, diameter 40mm.
- 2 double bollards on aft deck/bulwark on each side
- 4 single bollards fitted on the fore ships main deck , on each side, mounted on top of 4 coupling rollers (item 3204)
- 2 single bollards or bitts fitted at fore ship near center line.
- 2 single bollards are fitted aside pushing bow fenders its outer side, on a raised coaming. (See item 1202)
- Coupling force analysis to be carried out for dimensioning the bollards used for pushing convoys.
- One strong bitt or bating behind the accommodation serving towing functionality.

Additional cleats, rollers and bollards may be required for the requested convoy operations.

1202 Pushing fenders

The pushing posts are to be designed such that the pusher is suitable for pushing different and multiple barges of different sizes. The strength of the pushing fenders shall be sufficient for the specified push capacity for the convoys requested by the Operator.

The height of the pushing bow fenders is designed for all the pushed barges / convoys loading conditions, and related to fit under the pushers required aircraft. 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 stairways perpendicular to centre line for access to the top of the pushing fender onto the pushers. Railing is fitted on the inner side of the stairways. Clamps on the fenders side per operator request.
- One bollard on top, with 40mm pin.
- One bollard on the outer side, circa 1.2m above main deck
- A jib for hose/cable handling to the pushers.
- Sockets for power/air fitted in a steel housing build in the fender, closed with an aluminium hinged door and closure toggle.

1203 Pushing fender platforms

The pushing posts are connected by an access platform from the accommodation deck to each pushing bow fender. Platforms are fitted with galvanised steel gratings and a railing as per rules. Stanchions are adequately supported to avoid vibrations.

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.

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 if designed as ballast tank
- Ballast tanks
- Closed void spaces.
- Sewage tank.
- Fresh water tank

1206 Railings

Railings are to be installed as per applicable Rules and Regulations.

The accommodation deck will be fitted with railings where possible concerning aircraft requirement.

1207 Stairs / Ladders

If possible stairs shall be used instead of ladders. The stairs are to be removable if necessary for access reasons. The stairs have to be designed with a comfortable angle of max 60degrees and their width has to be at least 600mm, the treads are of metal bulb plate or galvanized gratings. Stairs are to be fitted with railings on both sides.

Stairs/ Ladders giving access e.g. to the aft and fore peak, engine rooms, workshop or machinery spaces, 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 stairs / ladders to be installed in the pusher as per drawing.

- Aft peak/machinery space
- Engine room and emergency exit(s)
- Workshop
- Forepeak

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. According requirements specified in the EU-Directive 2006/87/EG. Stanchions or stiffeners per max 1500mm.

On both sides of the bulwarks sufficient clamps to be welded for fender purposes.

On both sides of the bulwark the pushers name is to be welded. (Alternatively, on the deckhouse bridged bulwark) The letters, having a height of approximately 450 mm are to be fabricated from 6 mm steel plates. On the transom the pusher's name letters are to be welded. The name is to be positioned exactly 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 soldered at the stern and on the both sides of hatch coaming.

All digits and letters are to be painted in a sufficiently contrasting color.

1210 Anti-skid arrangement

Non-slip studs (stainless steel spot welds) are welded to 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 (double) 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 on PS, in ND50x8.

2000 CONSERVATION / CORROSION PROTECTION

Empty



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 be suitable to fit properly in a designed anchor pocket or anchor tray. If no anchor pockets are designed, stored anchor should not exceed the pusher's length o.a. 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 dimensions and convoy sizes, anchor equipment should be installed concerning:

- Anchor winch installed either on the main deck or in a separate compartment under main deck, if installed under main deck, a central bolt easy dismantling hatch above will give crew access for maintenance.
- 1 or 2 anchor(s) high holding power anchors, pool type, standard or balanced (designer may propose alternatives), inclusively crown-shackle. Swivel and D-shackle connection. Amount of anchors pending on the design.
- Per anchor a steel wire, (diameter and break load according rules), swivel and D-shackle are to be connected to the anchor.

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.

Hydraulic/Electric operated coupling winches		2 x 40T	
Max static load per winch		400kN	
Nominal pull manual drive		40kN	

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 to be 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. The coupling drawing shall be approved by the Operator.

3204 Coupling rollers

4 () deck coupling rollers mounted on fore deck:

- 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.

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 air draft is achieved by lowering the navigation mast and wheelhouse upper part.

Viewing height above water line for the master	6 meters
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3600 OTHER DECK ITEMS

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.

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 accommodation 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.

4000 PROPSULSION / POWER MACHINERY

The propulsion consists of two shaft lines each comprising an electric started and box cooled main engine, a gearbox, a propeller shaft in a stern tube and a fixed pitch propeller in a nozzle. For maneuvering the pusher an electric controlled hydraulic driven steering gear units is fitted. Alternatives will be evaluated in terms of life cycle costs, durability, and ease and cost of repair. Proposals shall be discussed with the owner and operator.

4100 PROPULSION LINES ARRANGEMENT

4101 General

The propulsion consists of 2 lines each served by a main engine, gearbox, propeller shaft and a fixed pitch propeller in a nozzle.

4102 Propellers

The pusher will be fitted with 2 main propellers with following characteristics:

- Diameter to be proposed by the designer and to be discussed with the operator / owner or its representative.

The number of blades and gearbox reduction ratio are carefully chosen, to avoid vibrations. The blade frequency, hull and nozzle, gearbox, engine, and shaft frequencies are compared so that resonant vibration can be avoided in all operation modes.

4103 Nozzles

The pusher will be fitted with 2 fixed nozzles according:

- Type high performance and characteristics suitable for pushers.
- Nozzle bottom may not extend below the baseline
- Diameter according propeller's sizing.
- The propeller nozzles are to be well integrated in the aft ship construction
- Inside plating of propeller's working area in marine type stainless steel.

4104 Propeller shafts stern tube and brackets

The pusher two propeller shafts will have a thick walled single stern tube according regulations. Stern tube aft side supported by two streamlined brackets (V-shape). The brackets are streamlined to optimize the propeller wake-field and to prevent/minimize propeller induced vibration. The stern tubes are of the closed lubrication system type and are provided with sealing glands fore and aft.

4200 RUDDER ARRANGEMENT

4201 General

The pusher will have a rudder system, hydraulically driven and electrically controlled according to rules and regulations. Design of complete rudder system including steering and control systems will be as follows.

Rudder system	1 rudder systems, 2 rudders per propulsion line (pending the design)

4300 PROPULSION ENGINE ARRANGEMENT

This specification describes the requirements for a diesel-based system. Shipyards tendering are allowed to propose systems based on alternative fuel types or combinations thereof. Alternatives will be evaluated in terms of durability, installation cost, life cycle costs, supply and bunkering possibilities and ease and cost of repairs. Proposals shall be discussed with the owner and operator.

4301 Propulsion system

The design and lay-out of the propulsion installation is in accordance with the relevant classification rules. Each marine diesel engine drives a fixed pitch propeller through a reverse/reduction gearbox. Engine, gearbox and propeller shaft are mounted "in line". For the shaft arrangement both torsional and lateral (bending) vibration analysis will be performed to avoid resonances in the working speed range. These analysis reports shall be class approved.

4302 Main engines

The marine main diesel engines are electrically started and water cooled by means of a closed cooling system. Air supplied to the main engines is taken from outside, this air is served through steel air ducts routed through the engine room going into a casing integrated in the accommodations aft wall. The ventilation openings are protected by stainless steel grids preventing water or rain ingress.

4303 Resilient mounting of main engines

Each main engine is resiliently mounted on top plates, which are welded on the longitudinal bottom girders.

4304 Reduction/reverse gearbox

A gearbox is connected to each main engine with a flexible coupling and takes the axial thrust.

4400 AUXILIARY GENERATORS

4401 General

Two generator sets are installed in the engine room.