

SEStran Ferry Toolkit

Section 6: Specification for a Passenger Ferry Vessel

This document is part of iTransfer, a North Sea Region Interreg programme project, which is funded by the European Regional Development Fund.

iTransfer (Innovative Transport Solutions for Fjords, Estuaries and Rivers) aims to make ferry transport more freely accessible and sustainable, and encourage more people to travel by water. In areas in the North Sea Region (NSR) there are opportunities to replace existing vehicle routes with passenger ferries as a viable alternative. Travelling by ferry is more sustainable, easier and quicker. It can also provide lifeline services to remote communities.

For more information visit www.itransferproject.eu

SEStran Ferry Toolkit

Section 6: Specification for a Passenger Ferry Vessel

1. Specification for a ferry vessel

1.1. The two cross national activities for which SEStran is the lead organisation are shown below.

1.1.1. Activity 1 **“Partners will exchange best practice on through-ticketing and terminal/ferry landing design and condense it into a common transport system integration guide. Based on agreed quality criteria, they will carry out location analyses for efficient ferry interchange sites and demonstrate feasibility of applying a joint approach for regional accessibility strategies (Joint best practice catalogue).”**

1.1.2. Activity 2 **“develop a ferry connection set-up toolkit and a joint marketing concept for NSR ferries to introduce ferry connections efficiently.”**

1.2. This document is a first draft for a generic ferry vessel specification. It will form part of a series of publications that will be drawn together to provide a toolkit for practitioners when considering what needs to be examined in the development of a proposal for a new ferry service. Not all of the elements of the toolkit will be applicable in all cases but the use of the toolkit should ensure that all considerations that are relevant to a particular proposal are covered.

2. General Design

2.1. This section should describe the general format of the proposed ferry service including an indication of the route, frequency, form of service eg passenger or passenger plus freight, capacity of the vessel required, define the client and the general maritime codes that are applicable.

3. General Description

3.1. This section should specify the following:-

- required type of vessel eg RO-RO, RO-PAX, passenger only
- the materials used for construction
- any general requirements on layout.
- Any restrictions in length, beam, draught

4. Performance

4.1. This section should specify the following:-

- required speed capability at specified sea conditions
- the number of hours between major overhaul
- deadweight of the vessel for carriage of passengers, crew, freight, fuel, water, miscellaneous equipment
- the relevant draft
- maximum weight and weight control measures
- noise levels in cabins, passenger areas and crew areas
- vibration levels in cabins, passenger area and machinery rooms
- sea keeping performance at specified wave and wind levels
- principal dimensions
- manoeuvrability
- measures to minimise wash
- measures to minimise fuel consumption

5. General Arrangement

5.1. This section should specify the following:-

- number and design of cabins
- passenger public area design
- seating arrangements
- bar/catering facilities
- windows and doors for light and safety
- access to open areas
- freight capacity and format
- embarking and disembarking arrangements
- toilet facilities

6. Wheelhouse

6.1. This section should specify the following:-

- The configuration consistent with the requirements of the relevant Code taking account of the necessary staffing levels for safe control of the vessel.
- The configuration of the master's chair with particular reference to ease of steering.
- Equipment at the main conning consoles will be as per Code requirements including requirements for Night vision equipment.
- Whether it will be necessary to fit wing control stations with opening windows to effect speedy and safe berthing of the vessel.
- The need for Talkback, VHF, fog horn and a radar repeater screen at each wing station.

- The need for a console desk and seat for the engineer such that he can act as look out from his seated position and well as monitoring the engine console.
- Structural fire protection requirements of the division between the passenger areas and the wheelhouse and arrangements to prevent unauthorised access

7. Toilets

7.1. This section should specify the following:-

- The number and location of toilets
- The requirements for disabled access
- The requirements for ease of cleaning
- The requirements for fittings and disposal of waste

8. Survey/Certificates

8.1. The owner of the vessel should specify the country of registration, the relevant survey and class registration authorities. The following certifications are likely to be required:-

- Safety Certificate.
- Record of Safety Equipment Inspection.
- Load Line Certificate.
- Tonnage Certificate.
- Class – Hull and Machinery Certificates.
- Class – equipment certificates.
- Approved stability book.
- Green Passport

- Statement that the vessel configuration complies with the requirements of ISPS

9. Trials

9.1. When the vessel is substantially complete, sea trials will be required that include:-

- Progressive speed trial
- Turning and Manoeuvring trials
- Astern running
- Endurance
- All at specified ballast levels to replicate operational conditions and at specified sea conditions.

10. Structural

10.1. In considering the structural characteristics of the vessel, the following should be considered:-

- Loads from Class rules
- Fatigue cracking
- Corrosion
- Collision with floating debris
- The most efficient arrangement for engine mounting
- Air resistance
- Water shedding from external areas
- Checking and certification of welds and joints

11. Hull & Deck Fittings

11.1. In considering the hull and deck fittings of the vessel, the following should be considered:-

- Appropriate drainage to external areas and weather protection of access to internal areas
- Design of hatches to infrequently accessed areas, engine room, engine overhaul areas to maximise ease of access and minimise passenger disruption
- Appropriate design of external and internal doors to achieve water tightness, ease of access, security, insulation protection, visibility and disabled access.
- Appropriate design of windows to ensure forward visibility in all weathers, solar protection, navigational safety
- Handrail, stair and ladder safety
- Design of passenger access and egress from the vessel
- Design of vehicular access and egress from the vessel
- Fender design
- Engine room floor design and ventilation
- Mooring equipment
- Deck and loading machinery
- Cathodic protection

12. Interior Finish

12.1 This section should specify the following:-

- Floor Coverings to public and crew areas
- Insulation for heat retention and fire safety

- Side Linings
- Ceiling Panels
- Seating layout and quality
- Cabin layout and finishings
- Bar and restaurant furniture and equipment
- Safety /directional markings and Signs

13. Machinery

13.1. This section should consider the most appropriate design and specification to ensure the most efficient means of propulsion, efficient, resilient and safe operation of:-

- Water jets/Propellers/Shafting
- Main Engines and Gearboxes
- Mechanical Instruments and Controls
- Auxiliary Machinery

14. Piping and Tanks

14.1. Consideration will require to be given to the design and provision of the most appropriate tanks and piping for:-

- Ballast System
- Bilge and Fire Systems
- Engine Cooling/Sea chests
- Fuel System
- Main Engine and Generator Exhausts
- Potable Water Tank/System

- Air conditioning
- Sanitary System
- Compressed Air System
- Fixed Fire Fighting Equipment
- Lubricating Oil System

15. Electrical

15.1. Consideration will require to be given of the most appropriate level of provision and design of:-

- Generator sets
- Electrical Light and Power
- Navigation Lights
- Navigation Electronics and Equipment
- Emergency Lighting System .
- Interior Communication
- PA/Sound System
- Video and TV System
- Fire Alarm
- CCTV

16. Outfitting

16.1. Consideration will require to be given to the design and provision of:-

- Lifesaving/Safety Equipment
- Fire Fighting Equipment (Portable
- Galley/Bar/Restaurant Equipment
- Spares
- First Aid Equipment

- Anchor equipment

17. Painting

17.1. When considering the painting of the vessel the following should be considered:-

- Under sea sections of the hull with low friction paint
- Remainder of the hull with weatherproof paint
- Surfaces to be non-slip

18. Human Factors

18.1. Service Patronage, Vessel and Infrastructure design will be influenced by human factors such as susceptibility to seasickness, ease and speed of embarkation and evacuation, comfort and facility provision. When assessing the design of a passenger vessel with respect to *human factors*, two distinct groups of individuals emerge, namely the crew and the passengers. These two groups need separate analysis since the behaviour of each is very different. Also, when assessing the causes of behavioural changes of individuals and groups of individuals on board a ship, several areas of analysis are evident when determining human factors, namely:

- A ship's motions due to the marine environment or damage
- Vibrations
- Individual and group behaviour while either embarking,
- Disembarking or evacuating.

VOSPER THORNEYCROFT HYDROCRUISER



Typical High Speed Passenger Ferry

19. Passengers

19.1. Analysis of the main causes of motion sickness leads to the following design considerations:

- Motion compensation systems and other hydrodynamic systems designed to improve ride comfort and keep any major motion frequencies away from 0.2Hz
- Lighting, temperature, ventilation and visibility in and from the main passenger areas, especially the seating lounge, but also the design of the toilet area and other passenger areas. Good lighting, good ventilation, consistent temperature and good visibility are all paramount in enhancing comfort and reducing Motion Sickness Indicator (MSI)
- Temperature and ventilation on the bridge and other crew areas are just as important for all the same reasons.
- Reduce food on board. Avoidance of selling foods with strong odours will reduce cases of motion sickness. Related to this would

be the prohibition of smoking on board. Smoking is odorous and would be an irritant with respect to motion sickness.

- Installation of seating offering adequate support and meeting the requirements of the relevant code covering head injury criteria and thoracic trauma index. These requirements must be satisfied in order for the seat to be acceptable.
- Design of informative material on board the craft should be such that any pre-conceptions of an individual regarding their expected adverse response to the impending provocative motions environment are reduced or ideally eradicated, without direct reference. For instance, posters and leaflets on board referring to the vessel's superior ride control and passenger comfort.

19.2. Analysis of the main causes of inefficient disembarkation and embarkation leads to the following design considerations:

- Design of vessel exits taking account of the volume of passengers and the required turnaround of the vessel
- Design of areas immediately behind the exits on the vessel with respect to ease of access to the exit once disembarking has commenced
- Design of areas immediately within the vessel with respect to ease and efficacy of dispersal of passengers towards seating areas
- Design of corral on the quay to enable up to 125 passengers to congregate as close to the vessel embarkation point as possible
- Design of access gate at the embarkation quay to allow swift change from disembarkation mode to embarkation mode, whilst taking advantage of the entire aperture of the vessel door.

- Consideration of simultaneous disembarkation / embarkation using two doors and a split quay facility.

19.3. Analysis of the main causes of inefficient and unsafe evacuation leads to the following design considerations:

- Fast access for the crew to muster areas
- Good, clear PA system allowing clear instruction to be broadcast
- Clear signage of muster areas and escape routes
- Un-obstructed escape routes
- Design of ventilation systems and smoke barriers from areas of fire risk, e.g. machinery spaces and funnels
- Design of muster areas to enable effective escape, evacuation and if necessary, abandonment of the vessel.

20. Crew

20.1. The ship's motions are easily handled by the human being under normal conditions. Humans can ride a seaway using a sense of balance and motor control. However, under extreme circumstances, motions become either too large (high roll or pitch angles) or too severe (high accelerations) to be able to continue to function effectively. The most likely effect is to fall over.

20.2. All passengers should be encouraged to be seated for the duration of the crossing; however there are occasions when passengers will be standing or walking, such as using toilet facilities. The case for the crew can be different.

20.3. Although all crew must be provided with approved standard of seating, an individual with cause to stand during the crossing is likely to be a crew member. However this likelihood can be reduced, if not eradicated, by ergonomic design of the bridge.

20.4. Analysis of the main causes of whole-body motion and vibration leads to the following design considerations:

- Adequate hand rails and other stabilising equipment for passengers in and all around the cabin area.
- Adequate hand rails and stabilising equipment for crew on the bridge and other crew areas.
- Efficient design and layout of bridge

21. Disabled Passengers

21.1. Disabled passengers are just the same as other passengers in these scenarios, having the same risk of developing motion sickness. Arguably, however, a disabled passenger may be exposed to greater anxiety if they feel that access to toilet facilities in the event of motion sickness is limited or difficult. This in turn may result in a higher state of mental arousal in respect of motion sickness, potentially hastening its onset.

21.2. With respect to whole body motion, an analysis of the situation produces a number of new design aspects that need to be considered:

- Clear access to a designated area or areas for the specified number of wheelchairs.
- Some form of restraining system for the wheelchair, holding the chair in the designated place.

- Simple and clear access to disabled toilet facilities directly from the designated wheelchair area.

21.3. Aspects of the design of the vessel which will need special attention when disabled passengers have to leave the vessel, either under normal operations or in an emergency are as follows:

- Clear communication of any special requirements to disabled passengers
- Design and label provisions for elderly passengers close to exits so exit and escape routes are not slowed for normal walking speed passengers
- Consideration of how to include passengers requiring assistance within the muster and evacuation scenario
- Inclusion of reduction of exit speed of slow passengers when analysing disembarkation and exit strategies
- Analysis of optimum embarkation sequencing in order to facilitate a reduction in time to load

22. Appendix 1 The Scottish Ferries Review – Vessels

The Scottish Ferries review included a review of different types of vessel currently in use in Scotland and classified them as follows:-

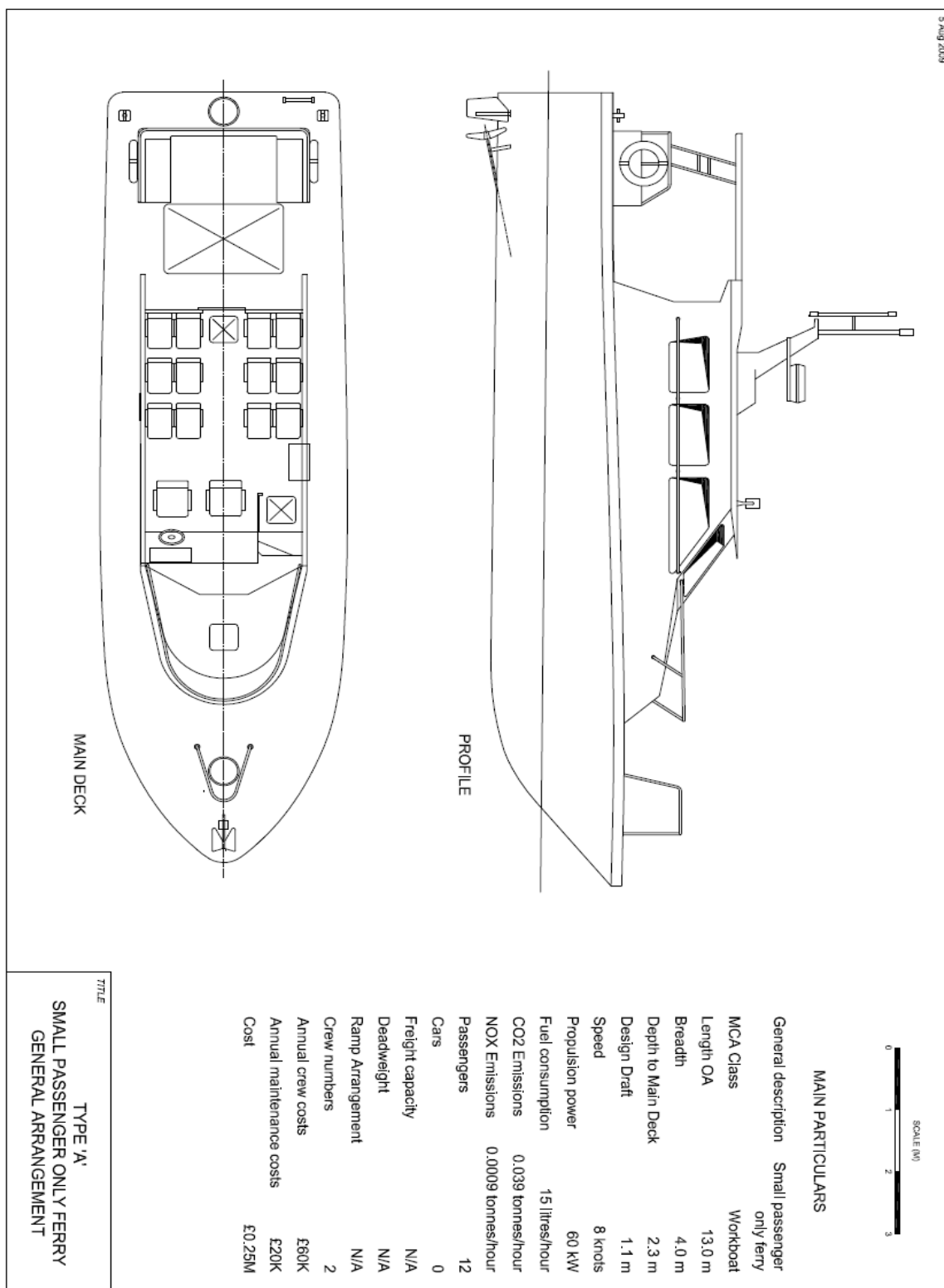
- Type A Small passenger only ferry
- Type B Small single ramp ROPAX ferry
- Type C Small double ended ROPAX ferry
- Type D Medium ROPAX ferry
- Type E Large ROPAX ferry
- Type F Very large ROPAX ferry
- Type G Very large RORO ferry

In addition it identified two further types not used in Scotland but which could be deployed:-

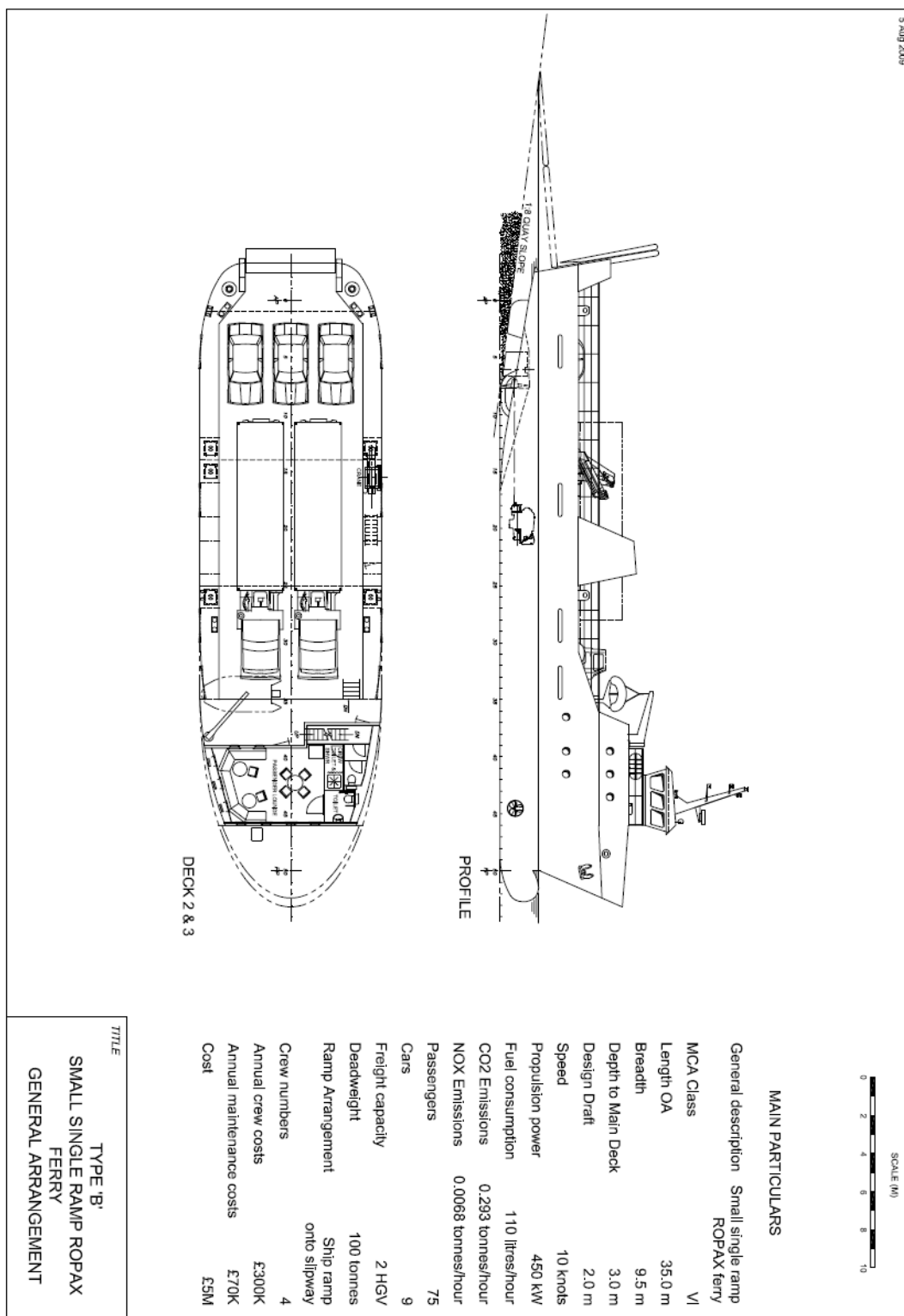
- Type X - Medium passenger only ferry
- Type Y – Large SWATH type ROPAX ferry

Schematic layouts of the above categories of vessel are as follows:-

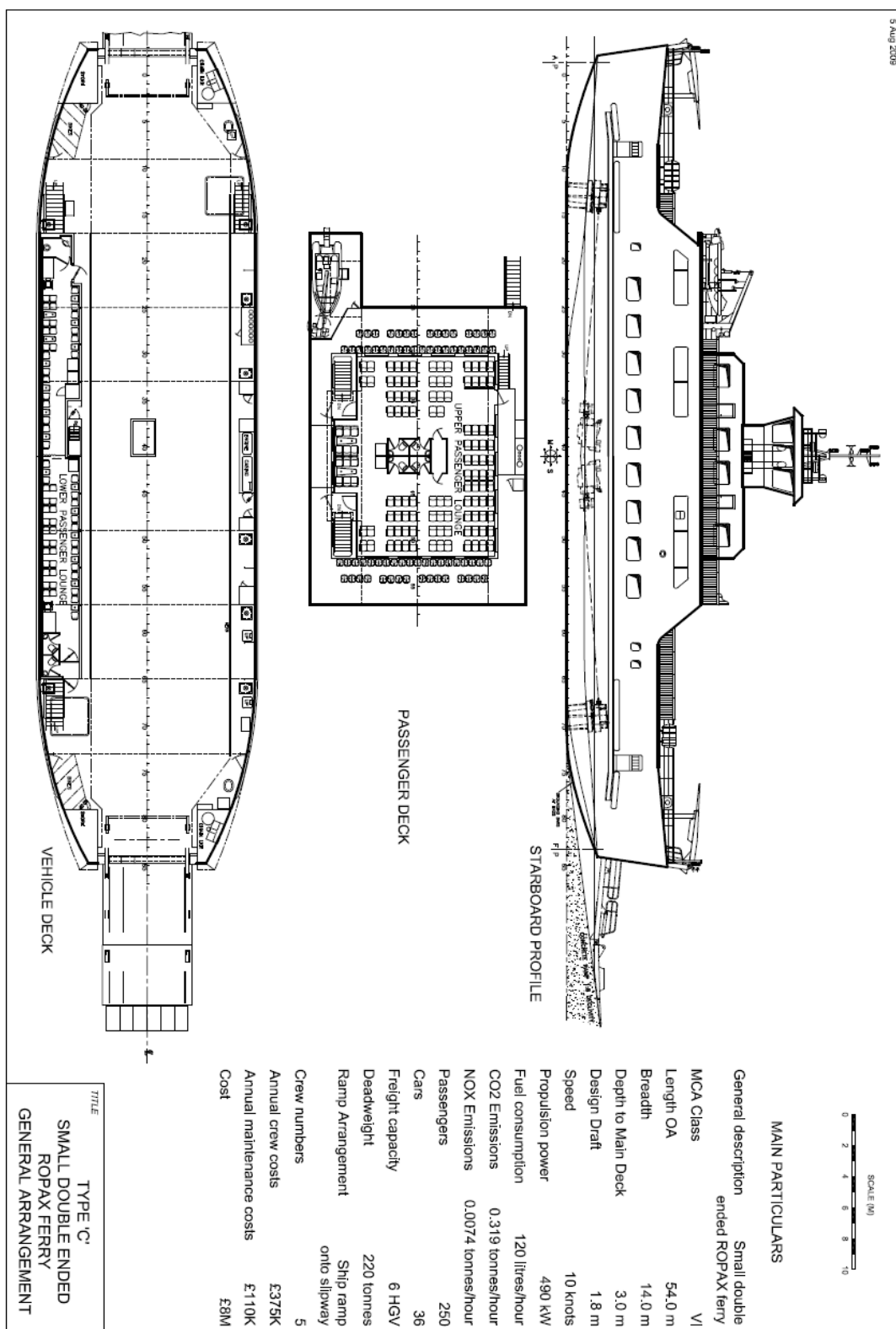
23. Type A – Small passenger only ferry



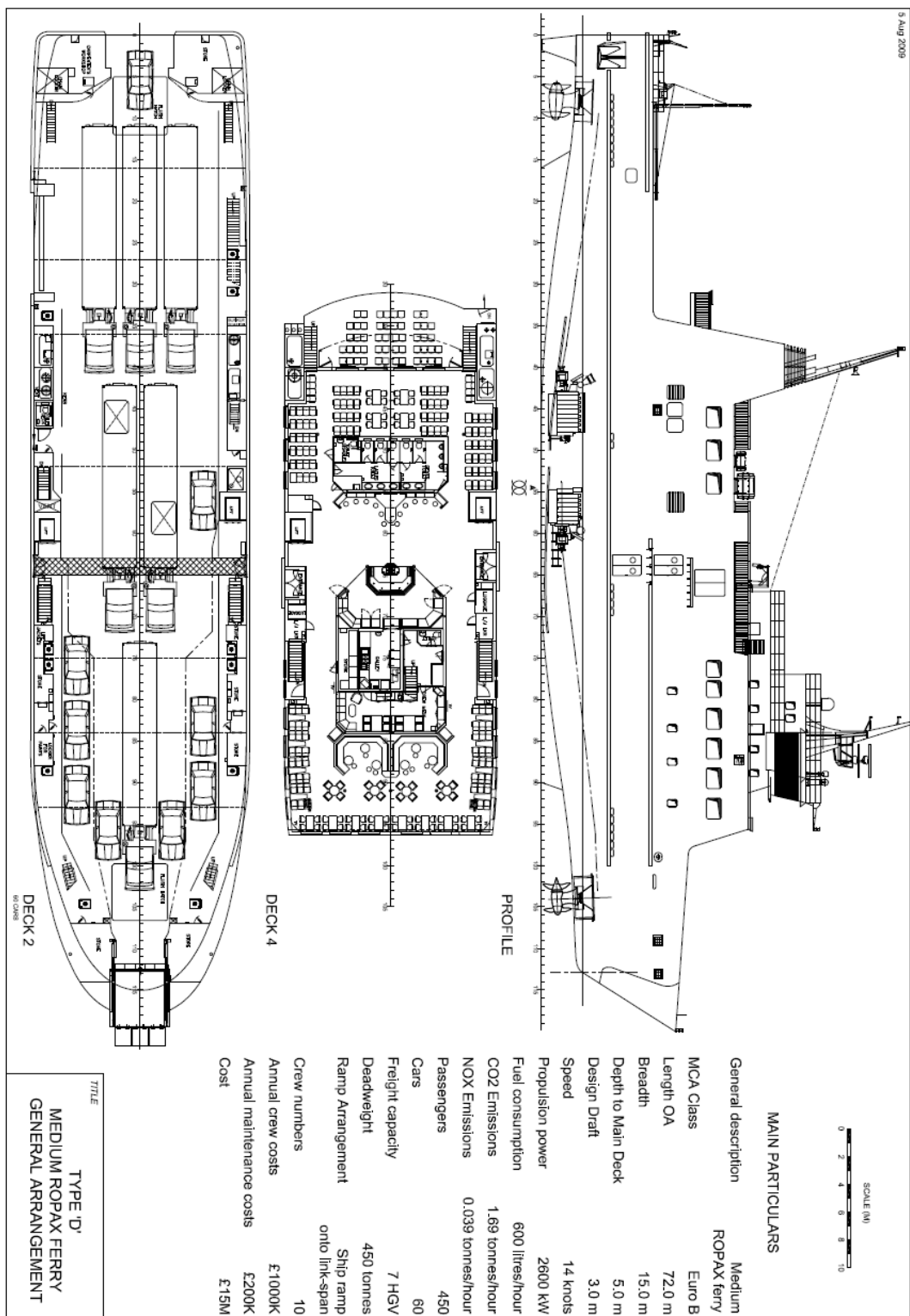
24. Type B – Small single ramp ROPAX ferry



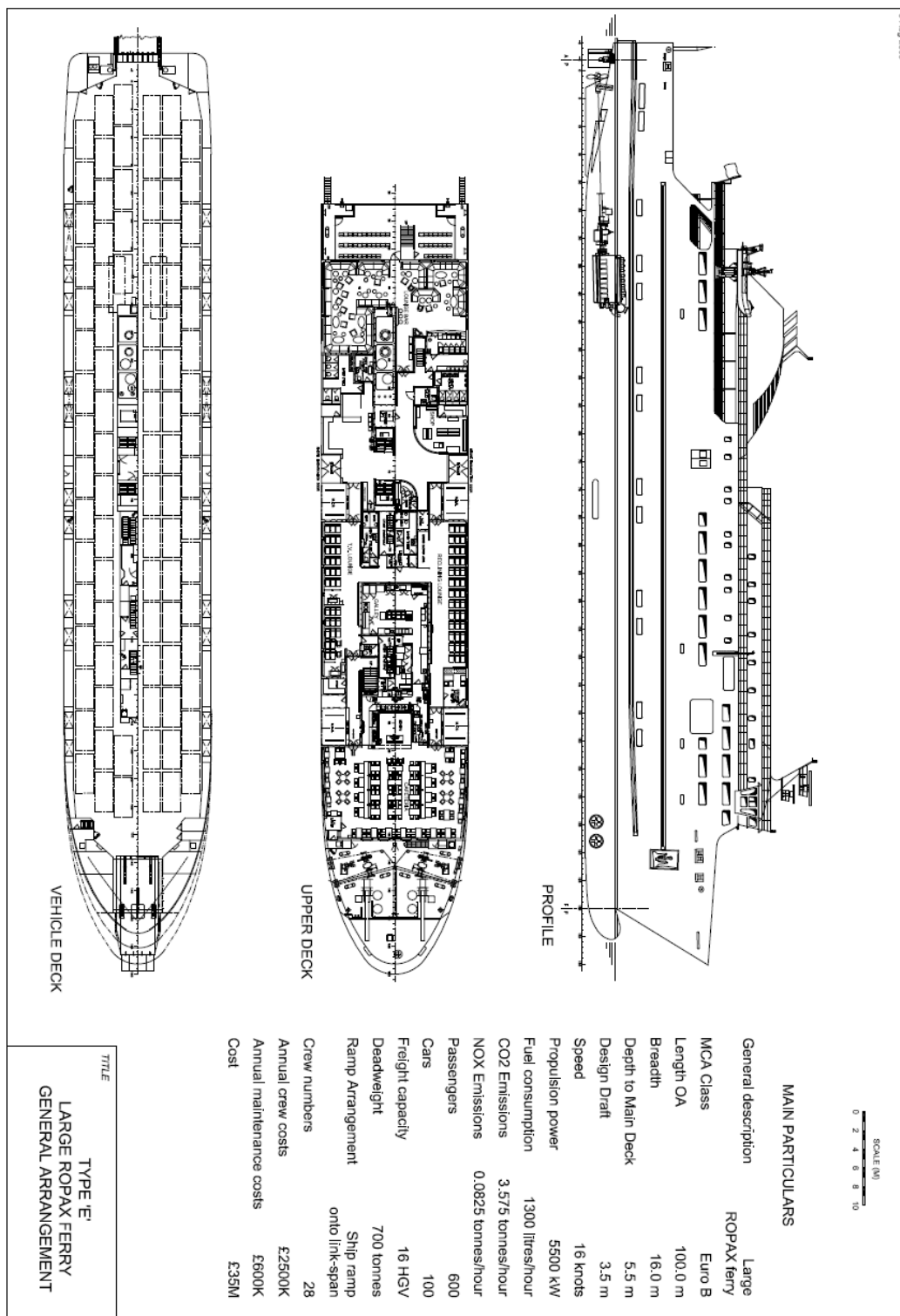
25.ROPAX ferry Type C – Small double ended



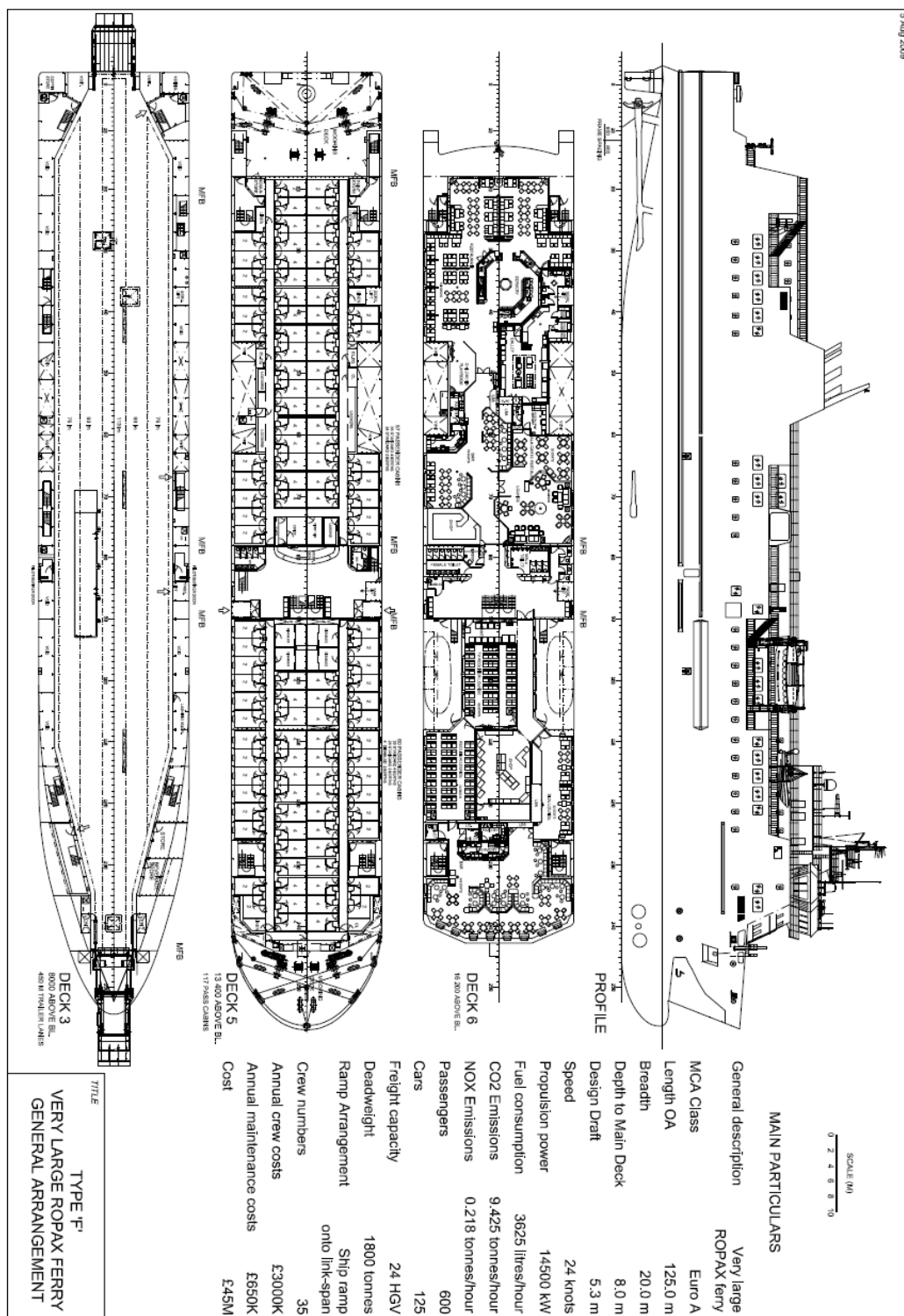
26.Type D – Medium ROPAX ferry



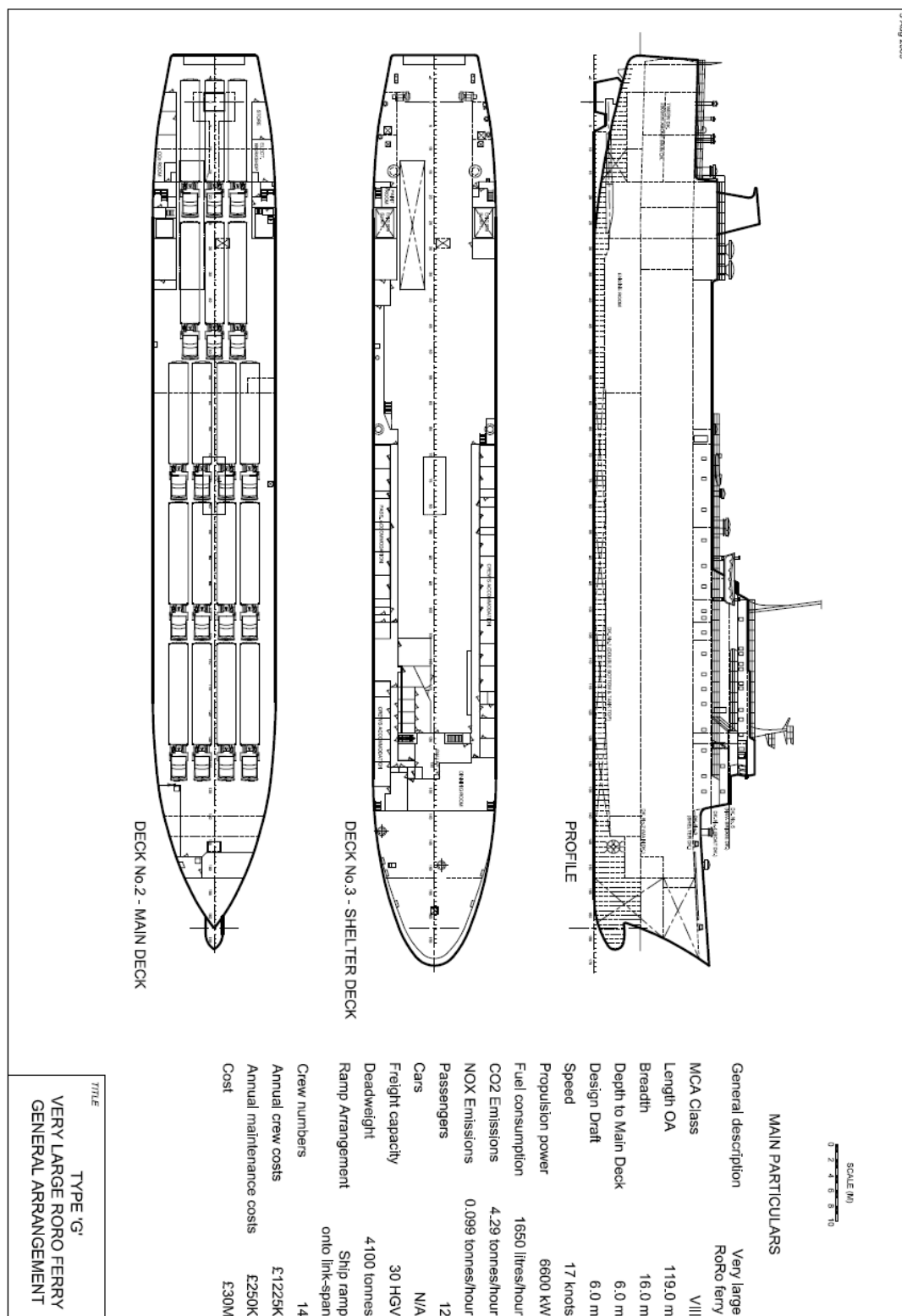
27.Type E – Large ROPAX ferry



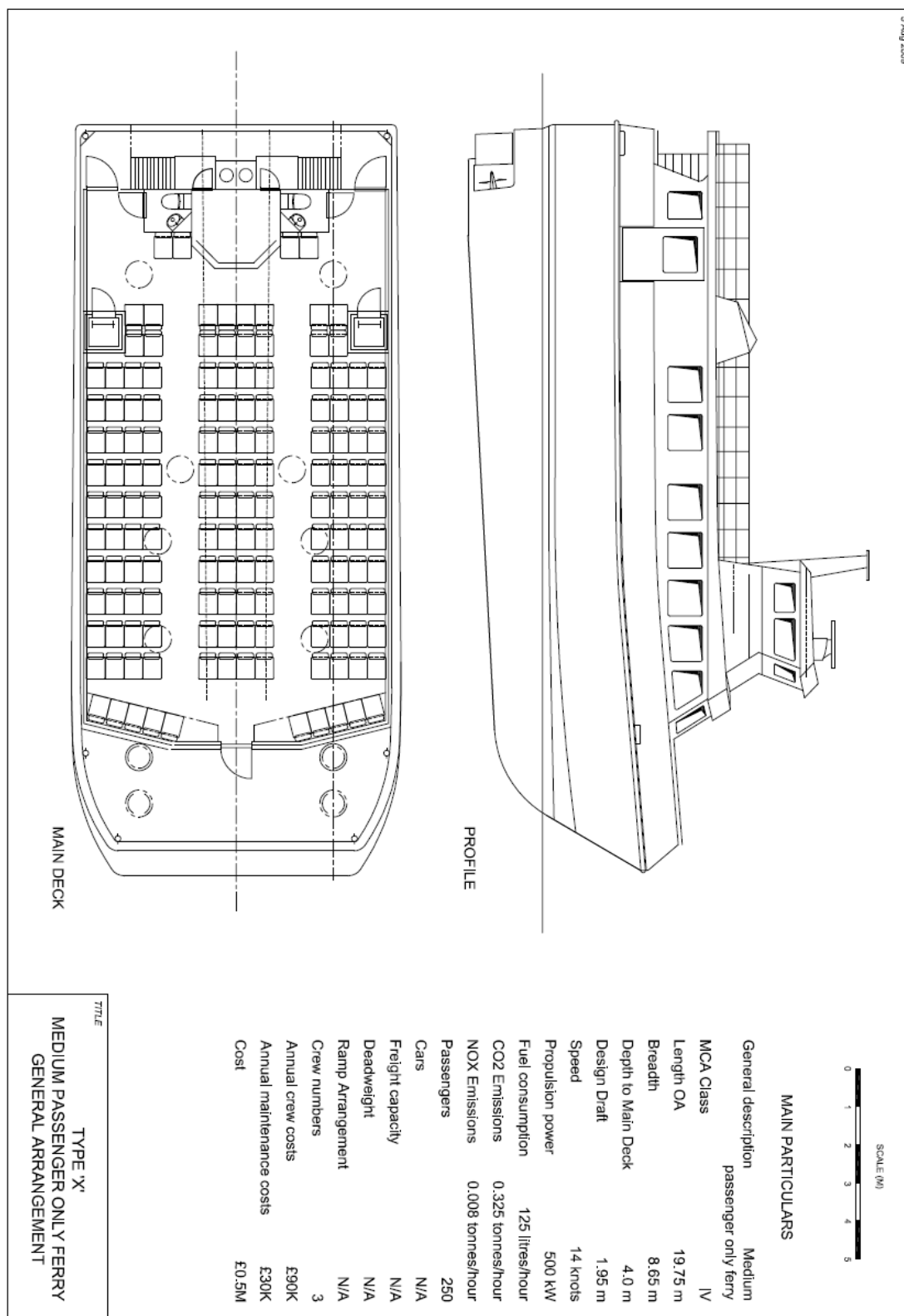
28.Type F Very large ROPAX ferry



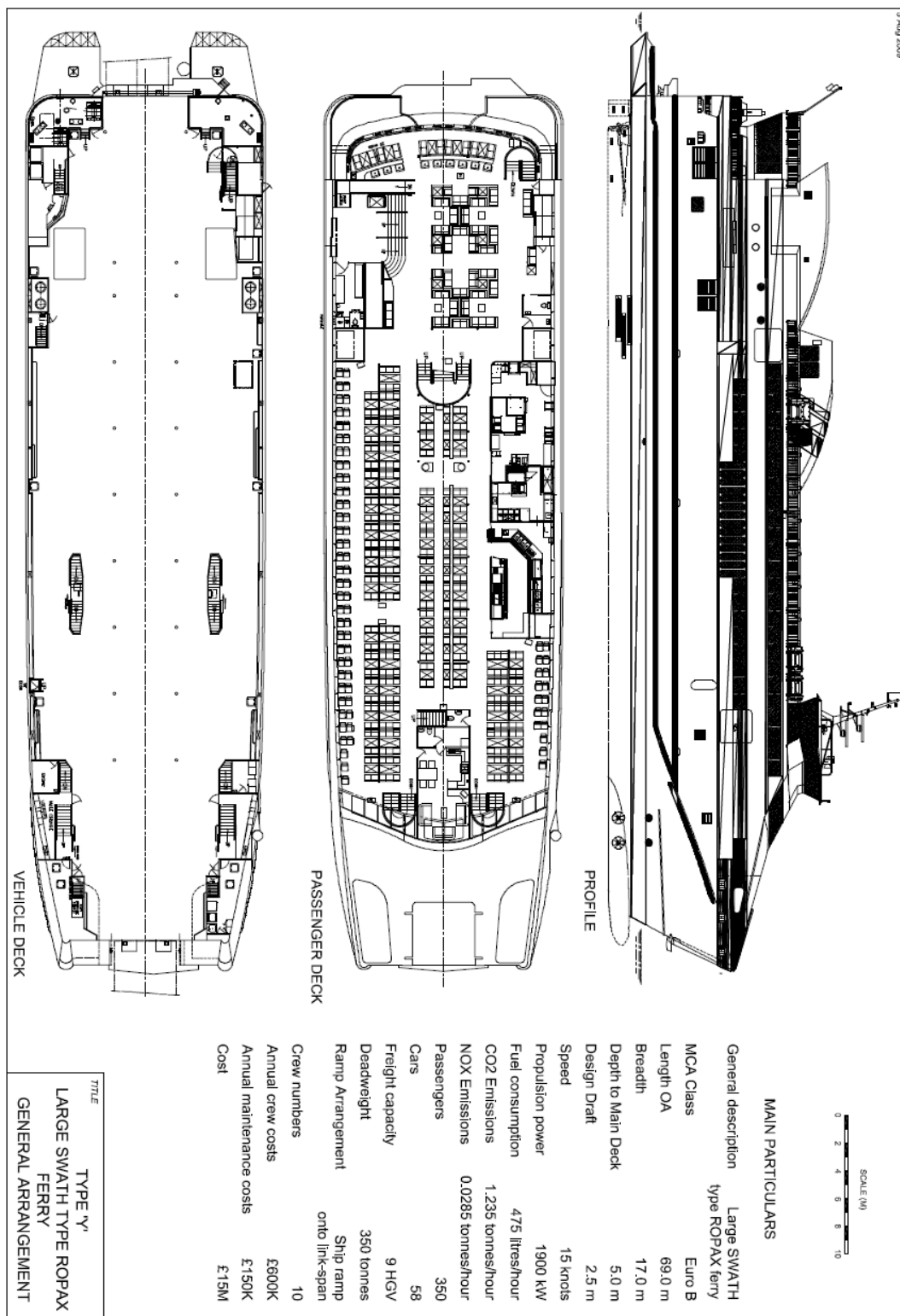
29.Type G – Very large RORO ferry



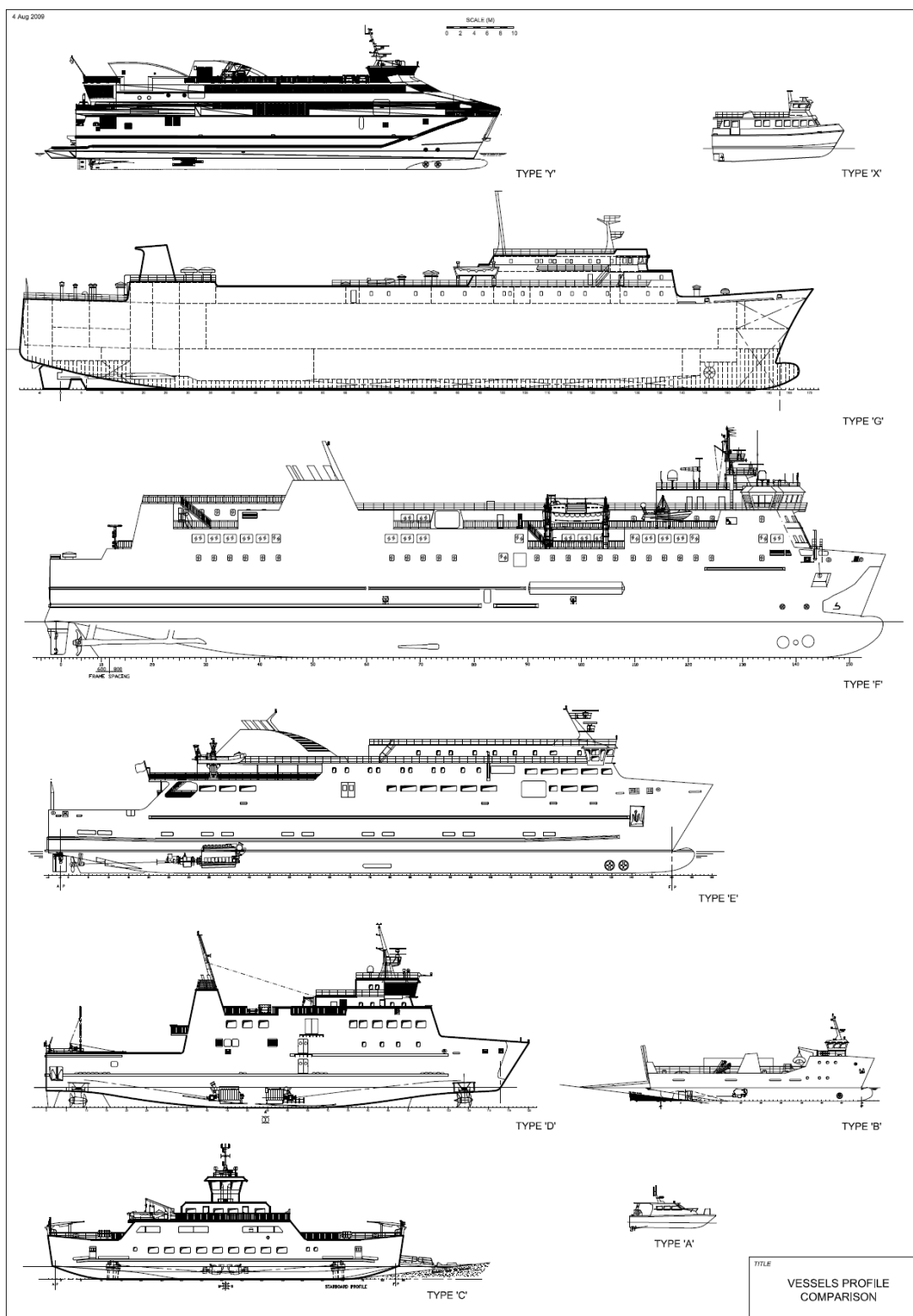
30. Type X - Medium passenger only ferry



31.Type Y – Large SWATH type ROPAX ferry



Vessel profiles



32. Appendix 2 Specification for a New Passenger High Speed Craft

32.1. Below is a specification for a new high speed passenger ferry craft which was developed for a cross Forth service in Scotland and is included here to illustrate the application of the generic vessel specification.

CONTENTS

- **GENERAL DESIGN**
 - Intent
 - Definitions
 - Plans
- **GENERAL DESCRIPTION**
 - General
 - Performance
 - General Arrangement
 - Wheelhouse
 - Toilets
 - Survey/Certificates
 - Trials
- **STRUCTURAL**
 - Engine and Gear Box Bearers
 - Jet Tubes / Propeller and Rudder support
 - Superstructure
 - Welding
- **HULL & DECK FITTINGS**
 - Scuppers and Drains
 - Hatches and Manholes
 - Doors
 - Windows
 - Wipers

- **Handrails**
- **Stairs and Ladders**
- **Gates**
- **Masts**
- **Guards/Fenders**
- **Engine Room Floor Plates**
- **Bitts and fairleads**
- **Deck Machinery**
- **Engine Room Ventilation**
- **Cathodic Protection**
- **Bike Racks**
- **INTERIOR FINISH**
 - **Floor Coverings**
 - **Insulation**
 - **Side Linings**
 - **Ceiling Panels**
 - **Seating**
 - **Tea/Coffee Bar**
 - **Markings/Signs**
- **MACHINERY**
 - **Water jets/Propellers/Shafting**
 - **Main Engines and Gearboxes**
 - **Mechanical Instruments and Controls**
 - **Auxiliary Machinery**
- **PIPING**
 - **Ballast System**
 - **Bilge and Fire Systems**
 - **Engine Cooling/Sea chests**
 - **Fuel System**
 - **Main Engine and Generator Exhausts**

- Potable Water Tank/System
- Air conditioning
- Sanitary System
- Compressed Air System
- Fixed Fire Fighting Equipment
- Lubricating Oil System
- **ELECTRICAL**
 - Electrical Light and Power
 - Navigation Lights
 - Navigation Electronics and Equipment
 - Emergency Lighting System
 - Interior Communication
 - PA/Sound System
 - Video and TV System
 - Fire Alarm
 - CCTV
- **OUTFITTING**
 - Lifesaving/Safety Equipment
 - Fire Fighting Equipment (Portable
 - Galley/Bar Equipment
 - Spares
- **PAINTING**
- **NOMENCLATURE**

33. GENERAL DESIGN

33.1. Intent

- 33.1.1. It is the intent of this specification to set out the performance criteria and required features for a High Speed Ferry capable of

operating on a daily commuter route across the Firth of Forth in Scotland, *carrying a minimum of 75 passengers*. Whilst the route is not fully decided present plans would envisage the craft operating from Burnt Island on the North Shore to Granton on the South Shore. In both ports new berthing pontoons would be installed for the craft to berth against. The berthing pontoons would be attached to piles and have a link span to the shore in order that the large tidal range can be accommodated. Access onto the craft would be by means of a short manhandled gang plank from the pontoon. The gang plank will remain on the pontoon whilst the craft is in service. Whilst it is essential that the craft be certified to operate on the Burnt Island - Granton route, the ability to operate outside category “D” waters i.e. in open sea with service restrictions, would be desirable. Items marked in *italics* are considered to be essential for the service and any vessel will need to fulfil that requirement or exceed it if to be considered suitable.

33.2. Definitions

33.2.1. The word “Owner” in this document refers to the route stakeholders and their retained consultants charged with the responsibility of defining and arranging the procurement of the craft.

33.2.2. The word “Code” in this document refers to the High Speed Craft Code 2000 as adopted as MSC resolution 93(73) and as amended.

33.3. Plans

33.3.1. Any offer made in response to this specification should be accompanied by a General Arrangement plan at minimum 1:100 scale showing the arrangement of the passenger cabin, the sub-division of the

hull(s) and the basic engine and propulsion disposition. The offer should also be accompanied by a Gantt chart showing the prospective build programme and ordering lead times for major pieces of equipment.

34. GENERAL DESCRIPTION

34.1. General

34.1.1. It is envisaged that the vessel will be a twin hulled (catamaran), high speed passenger ferry of welded aluminium construction. However the owners are open to alternative configurations and materials that can prove to be a more economical and technically less demanding solution. The superstructure will also be of welded aluminium construction and will contain the wheel house, passenger cabin, *and passenger toilets* as well as an open deck with some seats. The design of the superstructure should be such as to minimise noise and vibration in order to maximise passenger comfort. The hulls will be divided into watertight compartments consistent with the rule requirements. The engine and jet room will have access from main deck level.

34.2. Performance

- Speed - *The vessel is to be capable of a trial speed of 27 knots, at full load displacement, with the main engines developing power at the service rating suitable for 4300 hrs per year operation.* This speed should be achieved in calm sea conditions with the wind speed less than Beaufort 2.
- The vessel should have a clean hull.
- Deadweight – the deadweight of the vessel for trials should be :-
- Passengers 75 persons 7.5 tonnes
- Crew 0.5 tonnes
- Fuel 2.5 tonnes

- Fresh water 1.0 tonnes
- Miscellaneous equipment 0.5 tonnes

34.3. **Total Deadweight – trials 12.0 tonnes**

34.3.1. The maximum deadweight should be 15.0 tonnes, this will allow for weight growth during the life of vessel. This should be achieved at a draught not exceeding 1.4m. These figures should be amended to reflect a greater passenger number if that is achieved.

34.3.2. Weight Control – The builder in advance of contract signing is to demonstrate what measures and procedures he will use to strictly control the weight of the vessel and monitor it during construction. Additionally the explanation should be included how weight growth will be dealt with to ensure the vessel's performance is not compromised.

34.3.3. Noise – the noise levels in the passenger cabin should not exceed those given in the Code i.e. 75dB(A). These will be measured on sea trials.

34.3.4. *Sea Keeping – the vessel should have a good hull form designed to reduced craft motion. Such that the motion response of the craft gives vertical accelerations in all seat locations in the passenger cabin below the 2% MSI line for two hour duration in beam seas at 20 knots with a significant wave height of 1.5 metres. This should be proven to the owners prior to contracting either by model tests or computer simulation.*

34.3.5. Principal Dimensions – whilst there are no particular physical constraints on the principal dimensions, *the draught should be less than*

1.4m when fully loaded and the freeboard at the passenger loading point(s) should be one metre when fully loaded.

34.3.6. Wash – the wash of the vessel should be minimised, the builder should demonstrate that the hull form offered has been developed with wash minimisation in mind.

34.4. General Arrangement

34.4.1. *The passenger cabin should be a single space with seats arranged for comfort and ease and speed of embarking and disembarking.* The windows should be large to provide good natural light and visibility of the surrounds for when the vessel is used for alternative uses such as sight-seeing and functions. A ladies and gents WC with wash basin should be arranged with access directly from the cabin. The passenger cabin should be arranged to provide access to an open air area which is sheltered from the wind during transit, *with this area having a seating capacity equal to 20% of the main passenger cabin.* Safety of operation of the doors to the open area and the effect on passengers remaining in the cabin should be recognised and addressed.

34.5. Wheelhouse

34.5.1. The wheelhouse should be arranged in a Pilot and Co-pilot configuration consistent with the requirements of the Code. The master's chair should have an integral steering tiller fitted in the arm. Equipment at the main conning consoles will be as per Code requirements, except it is not intended that Night vision equipment will be supplied or fitted. It will be necessary to fit wing control stations to effect speedy and safe berthing of the vessel. Opening windows should be provided at these stations, to give a view of the craft side while still being able to control

both heading and speed. Talkback, VHF, fog horn and a radar repeater screen should be arranged at each wind station. A console desk and seat should be provided for the engineer such that he can act as look out from his seated position and well as monitoring the engine console. In addition to the structural fire protection requirements of the division between the passenger cabin and the wheelhouse the door will be fitted with a key pad combination lock to prevent unauthorised access.

34.6. **Toilets**

34.6.1. *Two toilets will be arranged on board, each will be suitable for use by disabled passengers and will comply with the relevant requirements for that.* Fresh water flush toilets, and wash hand basins with hot and cold water should be arranged. The fittings should be chromium plated brass or similar high standard. Toilet bowls and wash hand basins should be in porcelain. Electric hand dryers should be arranged. The whole of the toilet space, bulkheads and flooring should be designed for ease of cleaning and hygiene and also in accordance with DPTAC recommendations. A deck scupper with trap should be fitted in each space. In need of assistance cord pulls should be arranged to give an audio and visual alarm in the wheel house.

34.7. **Survey/Certificates**

34.7.1. *The vessel will be registered in the UK and surveyed by the MCA with a view to issuing a High Speed Craft 2000 Safety Certificate. The hull and machinery should be built under the survey and classed by Lloyds Register of Shipping with the following class notation:-*

34.7.2. ***Lloyds Register +100 SSC HSC G3 LMC, UMS, EP***

34.7.3. *EP – environmental protection notation will be the basic notation without enhancements A Green passport should be developed by the builder in conjunction with LR with a view to LR issuing a Green Passport on delivery of the vessel.*

34.7.4. *Whilst not a flag requirement that the craft complies with ISPS, the vessel should be configured and fitted with the relevant equipment to attain compliance with the ISPS. This should be certified by a competent authority. On delivery of the vessel the following certificates will be arranged by the builder and supplied to the Owner:-*

- High Speed Craft Safety Certificate.
- Record of Safety Equipment Inspection.
- Load Line Certificate.
- Tonnage Certificate.
- Class – Hull and Machinery Certificates.
- Class – equipment certificates.
- Approved stability book.
- Green Passport
- Statement that the vessel configuration complies with the requirements of ISPS

34.8. **Trials**

34.8.1. A sea trial will be carried out when the vessel is substantially complete. The trials will be carried out, the trial deadweight as defined previously in this document. The builder is to ballast the vessel by whatever means he can to replicate that deadweight, however the disposition of ballast should also replicate the vertical centre of gravity of the vessel in its normal operation. The trials shall be conducted in calm sea conditions with the wind speed less than Beaufort 2. The vessel should have a clean hull. The trials shall consist of :-

34.8.2. Progressive speed trial – carrying out two double runs over a course in excess of 1.5 nautical miles, in water in excess of 5 times the draught of the vessel, for four power settings (50, 75 90 and 100% mcr). The speed should be measured by differential GPS and power by torsion meter on each of the power drive shafts.

34.8.3. *Turning and Manoeuvring trials – turning circles and Zig-Zag trials should be carried out at contract speed and at slow speed, to demonstrate the ability of the craft to manoeuvre. The acceptance criteria for these trials are as laid down in IMO Resolution MSC 137(76) Standards for Ship Manoeuvrability.*

34.8.4. Astern running – the vessel should be ran astern for a period of about five minutes the speed and directional stability should be checked.

34.8.5. Endurance – in addition to any trials for the Classification Society for the UMS certification an owner's endurance trial is to be conducted. This should be to replicate day to operation and shall consist of 10 minutes of high speed running, followed by 10 minutes of lying idle with the main engines off, followed by 10 minutes of high speed running etc etc. for a total period of four hours. Any deficiencies in performance of the craft found during this trial are to be rectified to ensure their non-reoccurrence in service.

35. STRUCTURAL

35.1. General

35.1.1. The structure is to be designed and built of welded aluminium, with design features such that failures due to fatigue cracking are

minimised. Also rigorous attention is to be taken to the likelihood of corrosion and suitable measures taken to ensure this is minimised. The builder's construction standards and quality standards are to be supplied prior to contracting.

35.2. Framing

35.2.1. Extruded sections of 6000 series aluminium are to be used wherever possible to minimise the amount of welding

35.3. Plating

35.3.1. The thickness of plating of the stem plate and adjacent 10% of the length of the vessel aft of the stem is to be increased by 25% above the rule requirement, to provide additional strength for collisions with floating debris.

35.4. Engine and Gear Box Bearers

35.4.1. The design of the engine and gearbox bearers is to be approved by the engine supplier prior to start of fabrication. The design should be such as to maximise longitudinal continuity through the machinery and shafting area.

35.5. Jet Tubes / Propeller and Rudder support

35.5.1. The vessel may be powered by water jet or propellers. Ideally the jet tubes and transom for mounting the water jets on, should be supplied by the water jet manufacturer to ensure shape and strength requirements. In the event this is not the case the builder should seek approval of the design, from both strength and shape point of view, from the water jet supplier. The jet tubes should have a bolted inspection

hatch capable of being opened when the craft is afloat in light condition. The jet tubes should be coated in accordance with the manufacturer's recommendation, in the light of no recommendation they should be covered in Belzona from the cut water to the impeller liner ring. If propellers are used the shafting should be supported by "A" brackets and these should be in turn supported by strengthened parts of the hull. Additional strengthening will be required locally to support the loads from carrying the rudders and rudders stocks.

35.6. Superstructure

35.6.1. The superstructure should be designed to minimise air resistance, whilst still providing a stylish and open cabin. Any open deck should be cambered to shed spray and rain water. The superstructure may be welded directly to the hulls or resiliently mounted.

35.7. Welding

35.8. All welding should be carried out by Classification society approved welders. An NDT programme including x-ray and dye penetrant checks should be agreed with the owner and approved by Class. Distortion of plating from welding should be minimised by proper sequencing.

36. HULL & DECK FITTINGS

36.1. Scuppers and Drains

36.1.1. Limber holes should be arranged throughout the structure to eliminate the build up of water in any area. Scuppers should be arranged on any open deck to drain away spray and rain. A recessed drip pan with

scupper is to be arranged for a door mat at each cabin entrance to minimise rain water and snow entering the cabin.

36.2. Hatches and Manholes

36.2.1. Hatches to voids and non-regularly accessed spaces should be flush type with their own locking mechanism and handle – Freeman type or similar. Hatches for access to engine and jet rooms should have centre wheel operation of locking devices and be mounted on coamings. Steps and hand holds arranged for safe, regular access.

36.2.2. *Engine overhaul hatches should be arranged such that the hatch can be opened and removed with minimum disruption and the main engine or a generator lifted through it and taken ashore for overhaul and major repair.* If these hatches are in a passenger walk way area, they will be required to be flush with no trip hazard. Any structural fire protection fitted in way of these hatches should also be able to be removed without recourse to special contractors. All hatches are required to be labelled.

36.3. Doors

36.3.1. External doors are to be watertight doors with a window. Where doors are allowing passenger access to an open deck during the transit means to stop the door slamming are to be arranged. The methods used for anti-slamming should not make the door over cumbersome to open. Consideration should be given to sliding, automatic doors to the cabin, so that during loading heat/cooling is retained in the cabin. Sills should be minimise consistent with keeping water out of the cabin and where a sill

is fitted a secured removable slope way should be fitted which can remain in permanent position. Thus allowing disabled access as well as minimising trips and falls. All external doors should have a means of locking for securing the vessel overnight. Internal doors should have self closers and be colour co-ordinated to the remainder of the cabin outfit. The fittings of the doors should be brushed stainless steel and the frames made clearly distinguishable from their surroundings to guide visually disabled passengers.

36.4. Windows

36.4.1. Windows should be of glass and may either be mounted in aluminium frames or glued directly to the structure. The windows to the passenger cabin are to be tinted. Forward facing windows of the passenger cabin are to be fitted with blackout blinds for navigation at night. All forward facing bridge windows are to be fitted with anti-mist heaters, wipers and washers. The side windows of the bridge are to be opening to allow visibility of the ship side during berthing. Solar Blinds should be fitted in front of the two conning positions.

36.5. Wipers

36.5.1. All forward facing bridge windows are to be fitted with wipers and washers. The washer system is to have a drain down to prevent freezing in winter.

36.6. Handrails

36.6.1. Handrails are to be fitted in accordance with the Load Line Rules, and where fitted around passenger outside areas should be

designed to make climbing up them difficult. Hand holds and loops for safety harnesses should be fitted down the cabin side to allow crew members to wash the cabin windows.

36.7. Stairs and Ladders

36.7.1. Ladders to void spaces should be of aluminium but those in the engine room should be of steel. If stairs are fitted on the craft they should have non slip treads and rise at an angle no greater than 45 degrees to the horizontal. Handrails should be provided on either side of a staircase irrespective of the width.

36.8. Gates

36.8.1. A side gate, of at least 1300mm wide, should be arranged at passenger loading level port and starboard to allow the gangway from the pontoon to be landed onto the deck of the vessel. The gate should either slide or open inwards to prevent inadvertent opening, and should have positive means of locking. An inner gate should be arranged to allow the crew member to rig the gangway and make secure before “releasing” the passengers for disembarking.

36.9. Masts

36.9.1. A radar and signal mast should be arranged on the wheel house top with a forward and aft jack staff for anchor light and ensign respectively. Safe access for maintenance should be arranged to the radar mast.

36.10. Guards/Fenders

36.10.1. A heavy duty fender in aluminium is to be arranged along the entire length of either side of the vessel. This is to be arranged to coincide with fendering on the berthing pontoons and should also coincide with heavy duty structure within the craft. No structural damage should occur when contact is made with the pontoon, beam on, at 5 knots.

36.11. **Engine Room Floor Plates**

36.11.1. Chequered aluminium floor plates should be fitted in the engine rooms and jet rooms to provide access to all areas. These plates should be screwed down and hinged access opening made for equipment that is below floor plate level. Name plates should be fitted to any hinged access openings.

36.12. **Bitts and fairleads**

36.12.1. The vessel will be fitted with bitts and fairleads such that a bow and stern spring line and a head and a stern mooring rope can be used on either side of the vessel without the need to duplicate the use on any piece of equipment. All bitts and fairleads should be tested, certified and labelled with their safe working load, and should be sized commensurate with the size of the vessel offered.

36.13. **Deck Machinery**

36.13.1. An electric powered windlass will be provided on the forecastle deck for retrieval of the anchor. An electric or electro hydraulic capstan should be arranged at both the forward and aft ends of the vessel, two capstans may be required aft depending on the final arrangement of the

vessel. The arrangement of deck machinery and bitts and fairleads should be such to allow one man operation at either end of the vessel, to ensure the swift berthing of the vessel.

36.14. Engine Room Ventilation

36.14.1. Engine room ventilation will be by means of supply fans sized to deliver the main engine combustion requirements plus 25 %. Strict attention to sizing of vent trunks and air speed should be given to ensure that the noise requirements for the passenger cabin are not exceeded and that *external noise from the craft is kept to less than 65 db(A) 100m from the craft*. Remote release fire dampers are to be arranged. In the event water jets are fitted mechanical ventilation of the jet rooms should be arranged.

36.15. Cathodic Protection

36.15.1. Sacrificial anode protection should be arranged. This should be done in consultation with the water jet/propeller manufacturer.

36.16. Bike Racks

36.16.1. Bike racks for 10 bikes are to be arranged on an open part, in the after part of the vessel.

37. INTERIOR FINISH

37.1. Floor Coverings

37.2. The main cabin in way of the seats is to be carpeted with high quality hard wearing wool carpet. The main access ways into the cabin are to be covered in vinyl flooring. Open decks where passengers may congregate is

to be covered with an open grating flooring to provide a non-slip surface. The wheelhouse is to be carpeted, with a high quality hard wearing wool carpet.

37.3. Insulation

37.3.1. In addition to any structural fire protection requirements the deck head, end bulkheads and sides of the passenger cabin are to have thermal insulation of about 75mm fibreglass wool, which is sealed to prevent dust and degradation. Structural fire protection fitted in the engine rooms is to be sheathed in stainless steel sheet to prevent mechanical damage and oil absorption.

37.4. Side Linings

37.4.1. The bulkhead of the passenger cabin and wheelhouse are to be covered in lightweight honeycomb panels with laminate decorative finish. The colour selections of the carpets, ceiling and linings to be organised by the owner.

37.5. Ceiling Panels

37.5.1. The ceiling is to be made of a proprietary metallic ceiling system. This should be mounted in easily demountable and re-installable sections to provide access to equipment within the ceiling space. The clear height in all parts of the passenger cabin, below lights, signs, etc should not be less than 2200mm.

37.6. Seating

37.6.1. The interior passenger seats should be upholstered seats, 450mm wide between, upholstered arms, high enough to offer head support, with a net seat back pocket for a safety card. Life jacket stowage should be arranged discreetly under the seat. The seats should be mounted on flush tracks for easy removal for alternative use of the vessel. *The seat pitch should be in excess of 800mm, with aisle widths in excess 1000mm for good swift access* The cabin layout should be such that only one person has to move to allow access to a vacant seat. Space and lock down arrangements for two wheel chairs is to be provided in the cabin. External seats to be manufactured from GRP on stainless steel frame.

37.7. **Tea/Coffee Bar**

37.7.1. No catering facilities will be provided on board the vessel.

37.8. **Markings/Signs**

37.8.1. Safety signage is to be as per the rule requirements. Additional advertising and information boards are to be arranged.

38. **MACHINERY**

38.1. **Water jets/Propellers/Shafting**

38.1.1. The vessel may be driven by water jets or propellers. Water jets should be mounted in their jet duct which will be an integral part of the hull. The water jets should provide both steering and reversing capability for the vessel. Adequate arrangements should be made at the stern to protect the water jets from berthing damage. To avoid the possibility of cavitation and premature failure, grids should not be fitted to the inlet

duct. If propellers are fitted they should be able to be dismantled by a diver, in the event of damage. The shafting should be supported in “A” brackets with water lubricated bearings. Every effort should be made to protect the stern tube seal from damage by fishing lines. The rudders should be mounted on stainless steel stocks. The rudders should be electronically synchronised but should provide for independent operation in the event of failure of one set. A shaft brake should be provided for either shaft line, irrespective of whether water jets or propellers are used.

38.2. Main Engines and Gearboxes

38.2.1. The main engines should be resiliently mounted with flexible couplings to the gearboxes mounted on resin chocks. The engines should be cooled by means of box coolers fitted into the hull side, thus precluding salt water entering the vessel. Care will be needed to be taken in the shape of the opening of the box cooler sea chest to minimise hull resistance. The engines should be started by means of 24v electric starter motors, battery powered. Starting from the engine side and wheelhouse should be arranged. An oil drip pan should be fitted under each main engine to minimise oily bilge build up in the hull. The choice of main engines should be such that servicing and access to spares is easily available in the Edinburgh area.

38.3. Mechanical Instruments and Controls

38.4. A computer based monitoring and control system is to be fitted to the vessel to allow control and monitoring of the main engines and generators from the wheelhouse and also locally in the engine rooms.

38.5. Auxiliary Machinery

- 38.5.1. Two generators should be provided each capable of supplying the full load requirement both for normal and emergency operation. An oil drip pan should be fitted under each generator engine to minimise oily bilge build up in the hull.

39. PIPING

39.1. Ballast System

- 39.1.1. No ballast system is required.

39.2. Bilge and Fire Systems

- 39.2.1. A bilge and fire systems are to be provided to meet rule requirements. In each engine room an oily piping for the bilge and fire main shall be 316 stainless steel.

39.3. Engine Cooling/Sea chests

- 39.3.1. The main engines and generators are to be cooled by the jacket water passing through a series of box coolers mounted on the hull sides. The sea chest will be designed to minimise hull resistance maximise cooling and be fitted with sacrificial anodes for cathodic protection. Grids should be easily removable and made from nylon or aluminium.

39.4. Fuel System

- 39.4.1. Two fuel tanks with a combined capacity to provide for twelve hours in service running should be arranged within the hulls. They should be independent of the shell plating and not susceptible to collision

damage. The tanks will be filled from a common bunkering line with a bunkering station arranged port and starboard at main deck level. The bunkering stations should have 50mm cam lock flanges and save alls in keeping with rules requirements. The longitudinal position to be dictated by the terminal design. The tanks should have remote reading gauges. Water separating and particulate filters to be fitted in the fuel lines ahead of all engines.

39.5. Main Engine and Generator Exhausts

39.5.1. The main engine and generator exhausts will be fitted with silencers to achieve a 35 db(A) reduction in noise levels. Stainless steel flexible coupling and resilient mounting will assist in reducing structure borne noise to the passenger cabin. The exhausts will be directed overboard through the shell.

39.6. Potable Water Tank/System

39.6.1. One fresh water tank of 1000 litre capacity is to be arranged on board the vessel. The tank will be constructed of aluminium and fitted with plastic distribution piping. A pressure pump with standby unit will supply water to the toilets and wash basins. An inline electric water heater, will provide hot water to the hot water taps, which is capable of regulating the water temperature for passenger comfort.

39.7. Air conditioning

39.7.1. Two deck head mounted air handling units with remote condensing units will serve the passenger cabin for heating and cooling. An additional unit will be arranged to serve the wheelhouse. Fresh air make up vents with adjustable louvers will be arranged to ensure that an

adequate supply of fresh air is injected into the passenger cabin and wheelhouse. Exhaust fans will be arranged to ensure the flow of air. The fans and louvers should be sized to replace, with fresh air, 20% of the cabin and wheelhouse volume with fresh air every hour. Black heaters will maintain temperature above zero degrees centigrade, in engine rooms, and toilets, to prevent freezing overnight. Each toilet will have its own extraction fan capable of making 15 changes per hour to the space. *The system should be sized to enable the inside temperature (in passenger cabin and wheelhouse) to be kept, in summer, at 24 degrees C with an outside air temperature of 30 degrees C and in winter 22 degrees C with an outside air temperature of -10 degrees C.*

39.8. Sanitary System

39.8.1. The toilets will be gravity flush from a cistern, leading to an aluminium sewage holding tank of 1000 litres. Grey water from the wash basins will also lead to this tank. The tank will be emptied by means of a macerator pump, pumping to on deck stand pipe, with a 50mm cam lock coupling.

39.9. Compressed Air System

39.9.1. No compressed air system is required for the vessel.

39.9.2. Fixed Fire Fighting Equipment

39.9.2.1. A fixed fire suppression system is required for the engine room, this should be of the water mist type or of a non-ozone depleting gas type. Fixed fire suppression systems are to be fitted to the passenger cabin and wheelhouse as required by the rules. A fire main with hydrants, hoses and nozzles to be arranged according to the rules.

39.9.3. **Lubricating Oil System**

39.9.3.1. A 300 litre lubricating oil storage tank is to be arranged with the ability to pump from the tank to either engine room, to facilitate the topping up of sump oil in both main engine and generators. The tank is to be filled from a hand pump on an oil drum on the berthing pontoon.

40. ELECTRICAL

40.1. **Electrical Light and Power**

40.1.1. Two main generators are to be supplied each capable of powering the craft in normal and emergency conditions. Switchboards and distribution are to be the simplest consistent with fulfilling the rules. Powering for lights, sockets for cabin cleaning, passenger laptop re-charge sockets etc, should be distributed through one of two 440/240 V transformers, each transformer capable of 100% of the distributed load. *The lux levels, at night, in the passenger cabin should be 200 lux and 150 lux on external decks.* A shore power breaker and connection facility should be arranged, with suitable interlocks for protection of the main circuits. This should be 440v 3 phase 40 amp.

40.2. **Navigation Lights**

40.2.1. Navigation lights should be fitted according the Colregs, however it should also be assumed that a flashing yellow is also required, as envisaged in those rules

40.3. **Navigation Electronics and Equipment**

40.3.1. The navigation equipment should include two radars, ECDIS, gyro system, magnetic compass, DGPS, VHF, AIS, laid out and to the performance standards as required by the rules. The AIS should be compatible with a tracking station fitted at each terminal, to alert passengers to craft location.

40.4. **Emergency Lighting System**

40.4.1. The emergency lighting may be of maintenance free battery type.

40.5. **Internal Communication**

40.5.1. An internal communication system is not required.

40.6. **PA/Sound System**

40.6.1. A public address suitable for making safety announcements and playing background music is to be arranged with a CD player, controls etc. arranged in the wheelhouse. In addition to any rule requirements for the PA system it should be fitted with an induction loop, for passengers with hearing aids – suitable signs to be arranged to show this facility is available on board.

40.7. **Video and TV System**

40.7.1. A DVD/video and TV system is to be arranged with monitors in the passenger cabin, to display safety videos, route news, and TV

channels, the audio for these to be played over the PA system, if thought suitable for all passenger consumption.

40.8. Fire Alarm

40.8.1. An addressable fire alarm and call point system should be fitted throughout the vessel.

40.9. CCTV

40.9.1. A colour CCTV system should provide monitoring in the Wheelhouse of engine rooms, mooring decks, passenger cabin, and passenger embarkation points.

41. OUTFITTING

41.1. Lifesaving/Safety Equipment

41.1.1. Life saving equipment for the number of persons on board should be arranged according to the rule requirements. It is envisaged that life rafts and mini slides will form the main method of evacuation but alternative arrangements will be considered.

41.2. Fire Fighting Equipment (Portable)

41.2.1. Hoses and nozzles should be discreetly stowed away in the passenger cabin in boxes reflecting the general décor, but with luminous signage. Portable fire extinguishers should be supplied and fitted so as to be readily available but not to hinder passenger access during embarking.

41.3. Galley/Bar Equipment

41.3.1. No galley or bar equipment will be arranged other than a small area of the wheelhouse for the crew to boil a kettle and make tea. This area will be arranged to ensure that the motions of the vessel do not result in hot water being spilt.

41.4. **Spares**

41.4.1. In addition to any spare required by the Flag State and Classification Society, all other equipment should be supplied with spares to the manufacturers recommendation.

41.5. **First Aid Equipment**

41.5.1. First aid equipment in accordance with MCA requirements to be supplied and stowed for ready use on the wheelhouse.

42. PAINTING

42.1. The underwater parts of the hull are to be coated with International Paints – Intersleek or equivalent. The hull and superstructure are to be painted with polyurethane finish. Decks are to be coated with epoxy non-slip type paint. All painting to be carried out to the recommendations of the paint supplier. *A five year paint warranty is to be given.*

43. NOMENCLATURE

43.1. The following have been used in this document:-

- MSI – Motion Sickness Incidence – the percentage of occurrence of sickness due to craft motion.
- MSC – The Maritime Safety Committee of the International Maritime Organisation (IMO)

- MCA – The UK Maritime and Coast Guard Agency
- DPTAC – The Disabled Passenger Transport Advisory Committee
- LR – Lloyds Register of Shipping
- HSC – High Speed Craft
- G3 – A service notation which covers craft intended for service in waters where the range to refuge is 150 nautical miles or less. The geographical limits of the intended service are to be specified.
- SSC – The special service craft rules of Lloyds Register
- LMC – LR class notation confirming that the propelling and essential auxiliary machinery have been installed and tested in accordance with LR's rules and regulations.
- UMS – LR class notation confirming that the control engineering equipment has been installed and testing in accordance with LR's rules and regulations.
- ISPS – The International Code for the Security of Ships and of Port Facilities.
- mcr – maximum continuous rating of an engine.
- NDT – non-destructive testing
- Load Line Rules – the International Convention for Load Lines 1966 – as amended.
- db(A) – decibel rating on an A weighted scale for frequency.
- ECDIS – Electronic Chart Display and Indication System
- DGPS – Differential Global Positioning System.
- AIS – Automatic Identification System.

iTransfer is part funded by the North Sea Region programme, part of the EU Inter-regional (Interreg) initiative. Investing in the future by working together for a sustainable and competitive region, Interreg is financed through the European Regional Development Fund (ERDF).