ANNEX 5

FRESH WATER PRODUCED ON BOARD SHIP

1 General Requirements

1.1 This section outlines the procedures and conditions associated with the approval and use of equipment for the production of fresh water on board UK registered ships in accordance with the Regulations 27(4) and 36(1)(e).

1.2 Submissions requesting approval should be prepared by the Manufacturer and forwarded to a Nominated Body for type approval (see Merchant Shipping Notice No. M.1645). The submission should include:

1.3 In addition to the Regulations and these Instructions the Merchant Shipping (Provisions and Water) Regulations 1989 are also relevant.

2 Low Pressure Evaporators

2.1 Type approval is undertaken to ensure:-

2.1.1 the adequacy or otherwise of the design to withstand the pressures to which it might be subject in service, and the provision of over-pressure safeguards; and

2.1.2 the ability, in the context of the Merchant Shipping (Crew Accommodation) Regulations 1997 to produce fresh water acceptable for domestic purposes (no submission is necessary if the plant has already been approved and has a valid type approval certificate).

2.2 Prototype designs of plant for which approval is required should be submitted for consideration of both 2.1.1 and 2.1.2 above.

2.2.1 The actual designation of the plants for which acceptance is required should be made known.

2.2.2 Diagrammatic arrangement plans for each plant should be forwarded together with detailed engineering drawings of the high pressure pump, relief valves, pressure valve (including membrane modules), tanks and flow control design so that the strength and suitability of these items can be assessed. Details of materials, bores or outside diameters, wall thicknesses and flanges of rigid pipes and particulars of all flexible pipes should also be submitted for consideration. The Nominated Body will require to witness pressure and functional tests on the above mentioned items.

2.2.3 In respect of electrical matters, the following information is required:

2.2.3.1 A schematic circuit diagram.

2.2.3.2 Full details of make and rating of all fuses, contactors, switches, overload relays and other control components.

2.2.3.3 Full details of each pump motor with a copy of the manufacturer's type test certificates.

2.2.3.4 Confirmation that all components are constructed to the relevant British Standard (or equivalent).

2.2.3.5 Details of cables/wiring used (size and type of insulation). All electric equipment should comply with the relevant Regulations for the Electrical and Electronic Equipment of Ships, issued by the Institution of Electrical Engineers.

2.2.4 Installation, operational and maintenance manuals for each plant should be forwarded.

2.2.5 Where chemicals are to be used for either the pre-treatment of the feed water, etc. full details of these should be given including the strength, dosage rate and basic chemical compositions.

2.2.6 The production of drinking water by the plant should be witnessed by the Nominated Body's surveyor at the manufacturers works and samples forwarded to an independent analyst for complete chemical and bacteriological examination. The pH value should also be determined. In regard to these tests the plant should be operated using good clean sea water to ensure that the plant will remove salt and then operated using polluted type deck water to demonstrate its capabilities.

2.2.7 The water from which the distillate is produced is to be taken from a pump used exclusively for sea water service. Such a connection may be made from the discharge side of the pump if the bore of the discharge pipe is 75 millimetres or over. No connection is to be taken from the discharge side of any heat exchanger, or similar vessel, which may provide a source of contamination.

2.3 Typical Conditions of Approval (Evaporators)

2.3.1 A copy of the manufacturer's installation, operation and servicing manual is to be supplied with each generator.

2.3.2 Water intended for domestic purposes is to be effectively treated after manufacture by an automatic chlorination plant or alternatively disinfected by a unit and/or method accepted by the MCA.

2.3.3 The plants are not to be used in water in which weed or other organisms are present and in water affected by estuarial discharge and in any case a 20 mile limit from any coast must be observed. A notice to this effect is

to be fixed to each plant and this information is to be stated in the manual referred to in 2.3.1 above.

2.3.4 On installation satisfactory operation tests should be witnessed by a Nominated Body's surveyor.

2.3.5 Spare parts not less than the manufacturer's minimum recommended spares list are to be carried for each plant.

2.3.6 The arrangement of installation on the ship, i.e. piping and valves should comply with the Load Line Rules.

2.3.7 Any acceptance is based on the information supplied by the manufacturer and on the understanding that the MCA reserves the right to require check tests of the plants to be made at any time.

2.3.8 No modification to the plants will be permitted without the prior consent of the MCA or Nominated Body.

3 Reverse Osmosis Desalination Plants

3.1 In order to gain type approval of RO plants for use on board UK ships the following information is required by a Nominated Body:

3.1.1 The actual designation of the plants for which acceptance is required should be made known.

3.1.2 Diagrammatic arrangement plans for each plant should be forwarded together with detailed engineering drawings of the high pressure pump, relief valves, filters, pressure vessels (including membrane modules) tanks and flow control design so that the Nominated Body can adequately assess the strength and suitability of these items. Details of materials, bores or outside diameters, wall thicknesses and flanges or rigid pipes and particulars of all flexible pipes should also be submitted for consideration.

3.1.2.1 A hydraulic test to destruction or to 6 x working pressure on a prototype membrane fibre glass filter chamber should be witnessed by the Nominated Body surveyor.

3.1.2.2 The Nominated Body will require to witness functional tests on the plant including hydraulic tests on the system. All line filters on the high and low pressure sides are to be tested to 2 x working Pressure and Piping should be subjected to the following:

LP side 1.5 x WP
HP side 1.3 x Max WP

3.1.3 In respect of electrical matters, the following information is required:

3.1.3.1 a schematic circuit diagram;

3.1.3.2 full details of make and rating of all fuses, contactors, switched overload relays and other control components;

3.1.3.3 full details of each pump motor with a copy of the manufacturer's type test certificates;

3.1.3.4 confirmation that all components are constructed to the relevant British Standard (or equivalent); and

3.1.3.5 details of cables/wiring used (size and type of insulation).

3.1.4 All electric equipment should comply with the Regulation for the Electrical and Electronic Equipment of Ships, 6th Edition 1990 (1st amendment 1994), issued by the Institution of Electrical Engineers (IEE).

3.1.5 Installation, operational and maintenance manuals for each plant should be forwarded.

3.1.6 The actual value in mg/L to which it is proposed to set the salinometer should be stated; this should be not greater than 500 mg/L for chloride.

3.1.7 The chemical composition of the membranes should be accurately stated. The actual type of membranes being used should be made known.

3.1.8 Where chemicals are to be used for either the pre-treatment of the feed water or in cleaning cycles of the membranes etc. full details of these should be given including the strength, dosage rate and basic chemical compositions.

3.1.9 The production of drinking water by the plant should be witnessed by the Nominated Bodies surveyor at the manufacturer's works and samples forwarded to an independent analyst for complete chemical and bacteriological examination. The pH value should also be determined. In regard to these tests the plant should be operated using good clean sea water to ensure that the plant will remove salt and then operated using polluted type dock water to demonstrate its capabilities for consideration and record. See details of test procedures below.

3.1.10 The manuals referred to in 3.1.5 above should contain at the beginning the following statement:

'The plant is not to be used in waters in which weed or other organisms are present and in waters affected by esturial discharge and in any case a 20 mile limit from any coast must be observed'.

3.2 Typical Conditions of Approval (RO Plant)

3.2.1 In accepting of RO plants it will be necessary for the MCA/Nominated Body to lay down conditions which are outlined below. The manufacturer should indicate that he agrees to abide by these before formal acceptance is given.

3.2.1.1 The manufacturer or agents appointed by them are to give the shipbuilder, for ships intended for United Kingdom registry, all the technical data available to ensure that plants will be correctly installed and effectively operated.

3.2.1.2 A set of manufacturers instructions covering fully the installation, operation and maintenance of the plant is to be supplied with each plant.

3.2.1.3 No bypass is to be fitted by the shipbuilder around the plant or any connection provided which could enable a temporary bypass to be arranged.

3.2.1.4 The feed pump should be solely used for supplying the plant and should not be used for any other purpose.

3.2.1.5 The salinometer should be set at the manufacturer's works so that product water does not contain more than 500 mg/L of chloride. The arrangement for control should be such that the ships staff cannot alter or vary the setting.

3.2.1.6 After installation of the plant it should run for 30 minutes the water being produced during this time being dumped so as to ensure that the plant is clean and free from impurities. The precaution should also be observed when any part of the plant, including piping is dismantled for maintenance etc.

3.2.1.7 The plant is not to be used in the waters in which weed or other organisms are present and in waters affected by esturial discharge and in any case a 20 miles limit from any coast must be observed. A notice is to be fixed to each plant conveying this information:

> "When membranes are replaced only .....
> ..... manufactured by ..... are to be fitted."

3.2.1.8 Water intended for domestic purposes is to be effectively treated after manufacture by an automatic chlorination plant or alternatively disinfected by a unit and/or method accepted by the MCA.

3.2.1.9 Spare parts not less than the manufacturers minimum recommended spares list are to be carried for each plant fitted and the owners notified that they are to obtain at least the standard kit on each occasion that a renewal of the membranes is necessary. Spare

membranes should be carried on any ship fitted with reverse osmosis plants on the basis of one spare membrane for every 10 membranes or part thereof contained in a plant. This scale of spares is to be applied for each separate plant.

3.2.1.10 The installation of each plant should be surveyed by the NB's surveyors.

3.2.1.11 The arrangement at ship i.e. piping and valves should comply with the Merchant Shipping (Load Line) Regulations 1998.

3.2.1.12 Any acceptance is based on the information supplied by the manufacturer and on the understanding that the MCA reserves the right to require check tests of the plant to be made at any time.

3.2.1.13 No modification to the plant will be permitted without the prior consent of the MCA/Nominated Body.

3.2.1.14 Where it is known that plants are intended for UK registered ships the manufacturer is to convey the above considerations to the shipbuilder.

4 Chemical and Bacteriological Tests on Samples of Water

Note: These are to be carried out by or on behalf of the manufacturers or installers of the fresh water making plant.

4.1 Procedure

4.1.1 A record giving the following information is to be signed by the person in charge of the test for the plant makers and countersigned by the ship's master and Chief Engineer and forwarded with the samples for testing:

(i) Name of ship and owners etc.;

(ii) Identification of plant;

(iii) Capacity of plant (name plate with these particulars should be fitted);

(iv) Confirmation that the samples of water have been drawn off before any chlorination or filtration (except gauze or mechanical strainer) is made;

(v) Log of times of starting up plant, tests and completion, etc.; and

(vi) Position of ship at the time of each test.

4.1.2 Two samples of the distillate for chemical examination and two for bacteriological examination should be taken at any time when the ship is more than 20 miles from land but must not be taken less than an hour apart, one sample for chemical test and one for bacteriological test may be taken at the same time;

4.1.3 The samples should be sent to the Government Chemist for analysis (or to Public Health or other equivalent Authority if the vessel is abroad). If the samples for bacteriological examination cannot be dispatched so as to arrive with the Government Chemist within 48 hours they should be submitted to a local independent analyst whose report should be sent to the NB for consideration.

4.1.4 The name of the ship, and the date and time that the sample was taken, are to be stated on the bottle label for each sample.

4.1.5 The capacity of the plant was determined by recording the actual quantity of fresh water produced over a set period, noting how it was measured.

4.2 Desirable Determinands

4.2.1 Chemical Examination

E - Essential O - Optional
* - Only if chlorine is added

Ammonium nitrogen as NH4	(mg/l)	=	E
Kjeldahl nitrogen as N	(mg/l)	=	E
Nitrate nitrogen as NO3	(mg/l)	=	E
Nitrite nitrogen as NO2	(mg/l)	=	E
Total alkalinity as HCO3	(mg/l)	=	O
Total hardness as Ca	(mg/l)	=	E
Total organic carbon	(mg/l)	=	O
Sulphate as SO4	(mg/l)	=	O
Chloride	(mg/l)	=	E
Free residual chlorine	(mg/l)	=	E*
Total residual chlorine	(mg/l)	=	E*
Fluoride	(mg/l)	=	O
Phosporus as P2 O5	(mg/l)	=	O
Aluminium	(mg/l)	=	O
Calcium	(mg/l)	=	O
Magnesium	(mg/l	=	O
Potassium	(mg/l)	=	O
Sodium	(mg/l)	=	E
Cadmium	(mg/l)	=	E
Chromium	(mg/l)	=	O
Cobalt	(mg/l)	=	O
Copper	(mg/l)	=	E
Iron	(mg/l)	=	E
Lead	(mg/l)	=	E
Manganese	(mg/l)	=	O
Mercury	(mg/l)	=	O
Nickel	(mg/l)	=	E
Zinc	(mg/l)	=	E

4.2.2 Physical Examination

pH	=	E
Conductivity (siemens/cm at 20°C)	=	O
Clarity	=	O
Colour	=	O
Odour	=	O
Sediment	=	O

4.2.3 Bacteriological Examination

No colonies/ml on nutrient agar:

(a)	37°C/1 day	=	E
(b)	22°C/3 days	=	E

MPN/100 ml:

(a)	Coliaerogenes	=	E
(b)	Escherichia Coli	=	E
(c)	Faecal streptococci	=	O

MPN/20ml:

(a)	S-R Clostridia	=	O

5 Electrolytic Silver Release Fresh Water Disinfection Systems

5.1 The MCA accepts electro-silver ionisation systems for the automatic disinfecting of fresh water produced on board UK registered ships.

5.2 A summary of the conditions of acceptance which are applicable to the fitting of such disinfection systems is given below.

5.2.1 Any proposal for fitting a system on a passenger class UK registered ship is to be submitted to the MCA for individual consideration.

5.2.2 The manufacturers or agents appointed by them, are required to supervise the installation of any units, supplied for ships intended for United Kingdom registry, to ensure that they are fitted in accordance with their detailed instructions.

5.2.3 A set of manufacturer's instructions covering fully the installation, operation and maintenance of the disinfection systems should be filed with the MCA for record and supplied with each unit for the reference of the operators.

5.2.4 The disinfection unit is to be fitted in the fresh water system between the production unit and the storage tanks, as near to the former as is practicable and in a readily accessible position.

5.2.5 Each system is to be designed for the maximum flow rate of the fresh water production unit.

5.2.6 'Fail safe' operation of the disinfection units is to be achieved by fitting an automatic, normally closed solenoid operated valve in the system. The valve is to be under the independent control of the electrode monitor such that the valve will close and prevent the passage of water into the storage-distribution system should the unit malfunction in any way.

5.2.7 An audible visible automatic alarm should be installed connected to the 'Fail Safe' control system and should give a warning of failure of power supply or any malfunction of the disinfection unit causing closure of the solenoid operated valve. The electricity supply required to operate the alarm should be independent of the supply to the disinfection unit.

5.2.8 No facility for by-passing the disinfection unit is to be fitted or provided.

5.2.9 The design setting of each unit is to be checked by the manufacturers before dispatch and is to be such as to ensure that a minimum of 0.1 ppm silver concentration will be added to the water produced under maximum flow conditions.

5.2.10 The fresh water storage and distribution system should be designed such that the silver contact time with the water is a minimum of 4 hours before use.

5.2.11 Any water 'conditioning' units should be installed after the disinfecting unit and before storage.

5.2.12 Spare parts not less than the manufacturer's minimum spares list (see manufacturer's instructions) are to be carried for each unit fitted.

5.2.13 Acceptance is based on the information supplied by the manufacturer and is subject to the system operating satisfactorily in service. The MCA reserves the right to require check tests to be made at any time.

6 Miscellaneous

Filters, water softeners and the like, are normally not subject to approval/acceptance procedures, however, whenever it is intended that the domestic water should be 'treated' using equipment incorporating materials and/or chemicals likely to affect the acceptability and/or quality of the water then suitable samples of 'treated' water should be submitted through Headquarters for consideration and clearance by the Government Chemist or another Chemist appointed by the MCA of this purpose.