



OCEAN SAFETY®

Ocean Safety

Ocean Open Reversible Liferaft Service Manual



DATE:	10.09.15	CREATED BY:	I. Brindle
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Section:	Introduction to Manual - Ocean Open Reversible Liferafts			 OCEAN SAFETY®
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1 Introduction To Manual

- Scope
- Maintenance and Control of Manual
- Definition of Terms
 - Warnings
 - Cautions
 - Notes

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1 Introduction to Manual

This manual has been compiled as a descriptive guide to the Scheduled / Periodic service and maintenance of the Ocean Safety Ocean Open Reversible Liferaft range.

The information contained within this manual is for the use of approved service stations appointed and trained by Ocean Safety for the sole purpose of servicing and maintaining the Open Reversible liferaft range and approved variations.

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1.1 Scope

The manual details the required information and procedures to service the Ocean Safety Ocean Open Reversible Liferaft range and emergency packs.

The range encompasses liferaft sizes 25, 50, 65 and 132 person liferafts in cylindrical and/ or square container format. Emergency packs comprise E Pack (HSC pack) only.

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1.2 Maintenance and Control of Manual

Ocean Safety has a policy of continual development and improvements for the design of the Ocean Safety Ocean Open Reversible Liferaft range. Where required the manual will be updated to reflect changes.

Manual revisions are to be inserted in the correct position within the manual. At the beginning of each section of the manual there is a copy of the table below. Any changes to the manual shall be documented in the relevant section in the table provided.

Once sections of the manual have been removed and replaced; the old copy shall be destroyed to avoid confusion in future service intervals.

Revision N°	Sections Affected	Issue Date	Inserted Date	Signature

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1.3 Definition of Terms

1.3.1 Warnings

Warnings indicate a procedure that if not completed correctly could result in injury or fatality of service personal or persons using or handling the liferaft

1.3.2 Cautions

Cautions indicate a procedure that if not completed correctly could results in damage to mechanical parts or the fabric of the liferaft.

1.3.3 Notes

Notes are methods to aid service engineers through the procedures and make specific jobs easier.

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Modifications Log - Description Classification and Data

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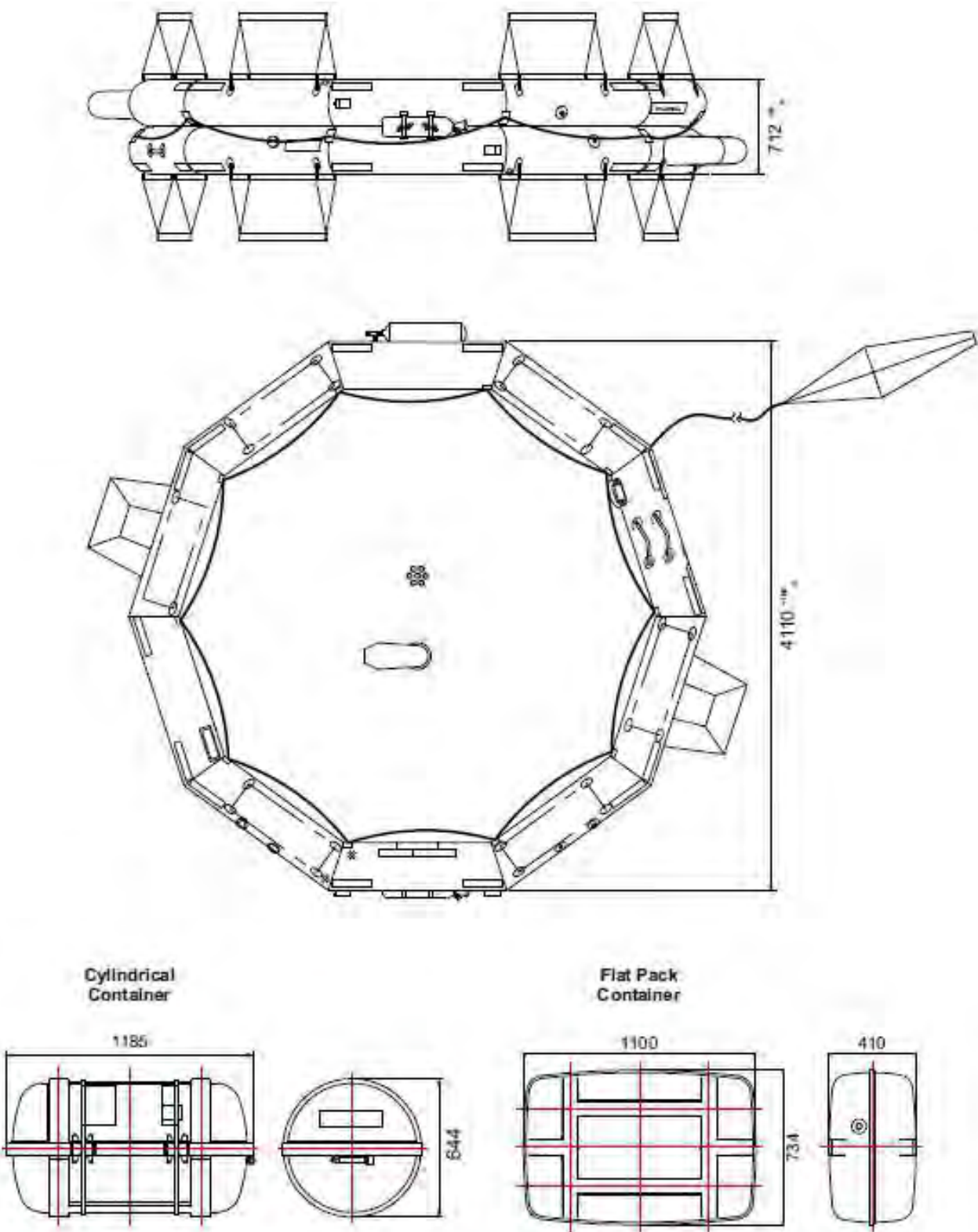
2 - Liferaft Description Classification and Data

- 2.1 - The Ocean Safety Ocean Open Reversible Range
- 2.2 - Emergency Packs
- 2.3 - Cylinder & inflation System
- 2.4 - Manufacturers Recommended Service Intervals
- 2.5 - Container

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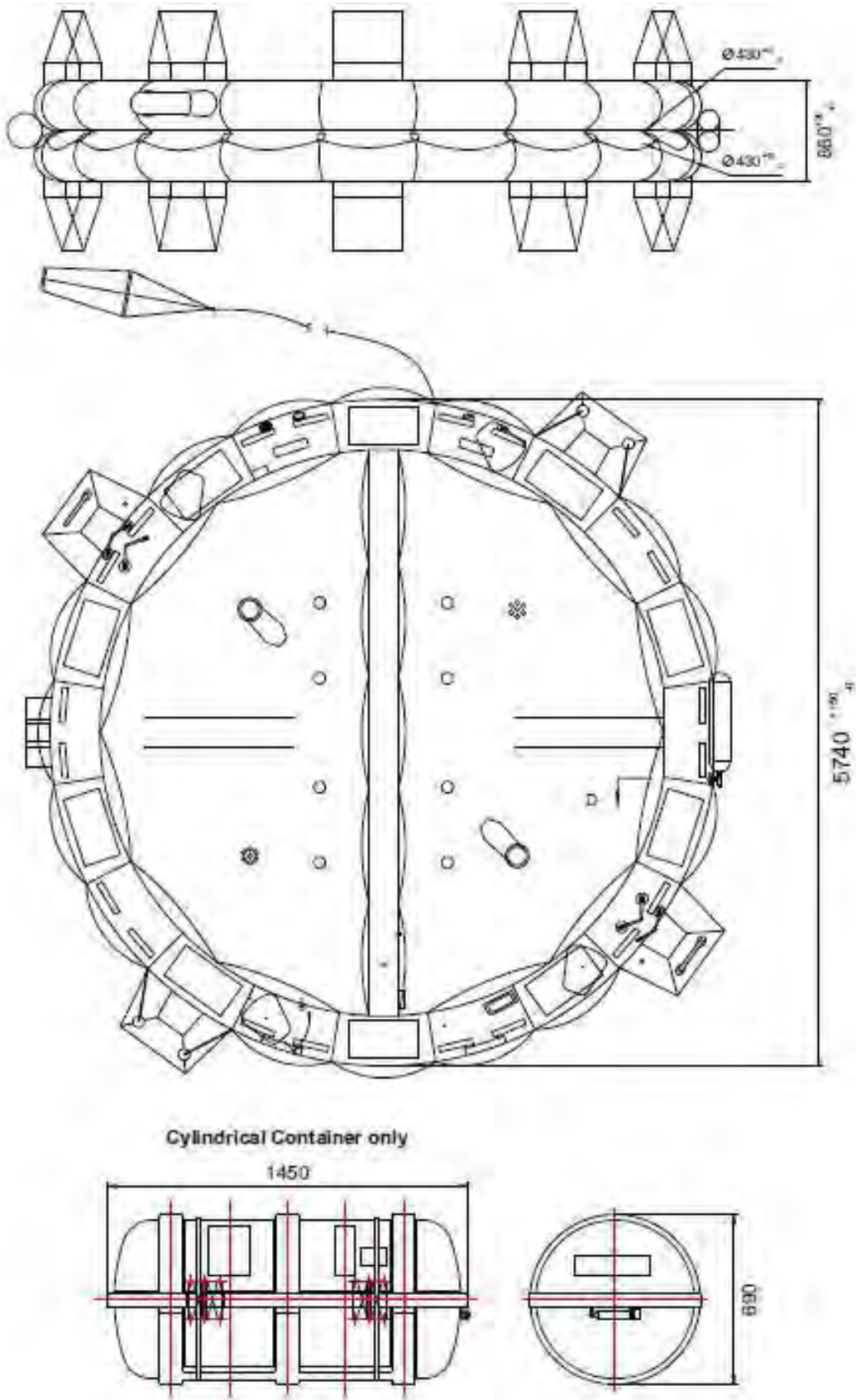
2.1 Ocean Safety Ocean Open Reversible Range

25 man Ocean ORL



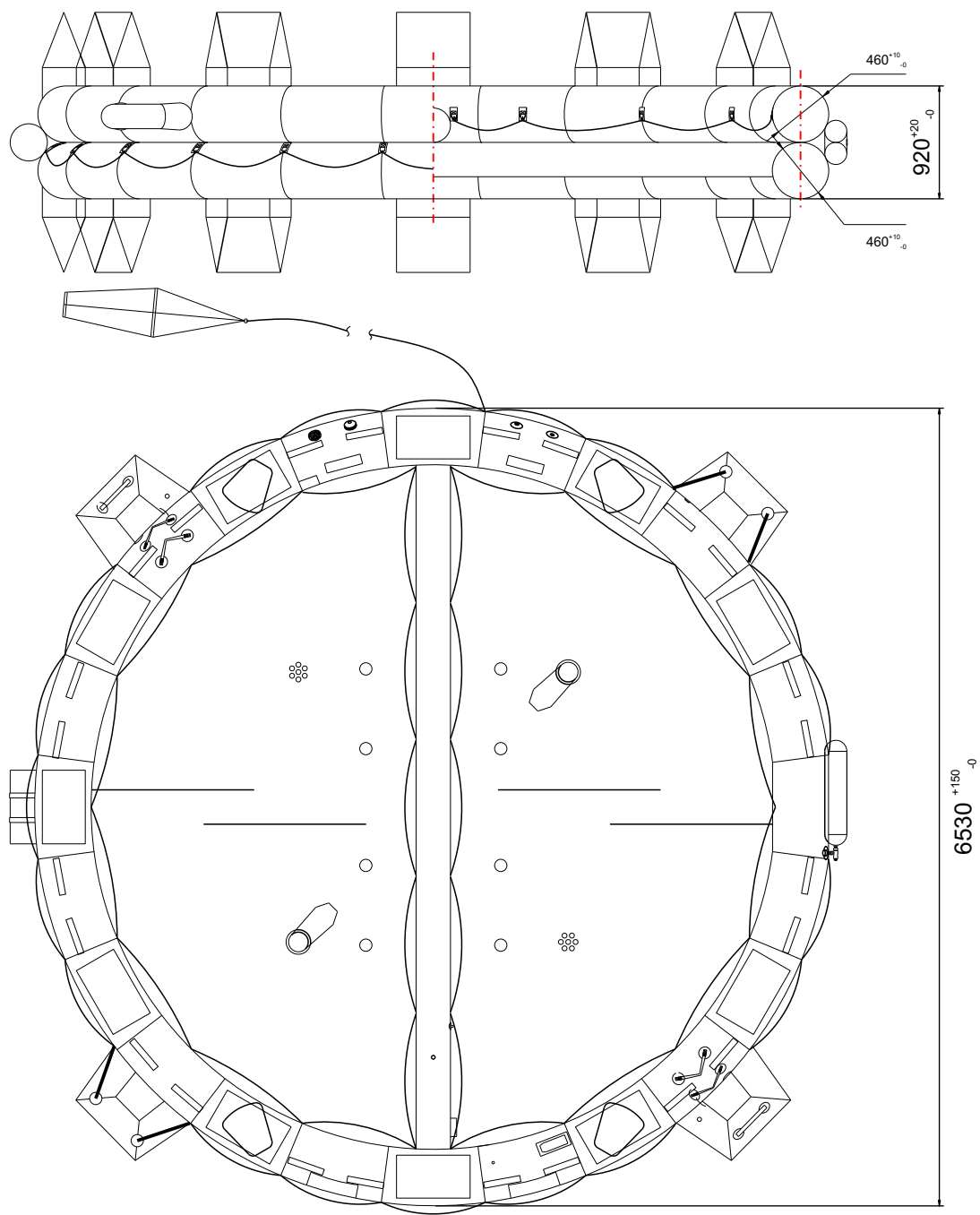
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50 man Ocean ORL



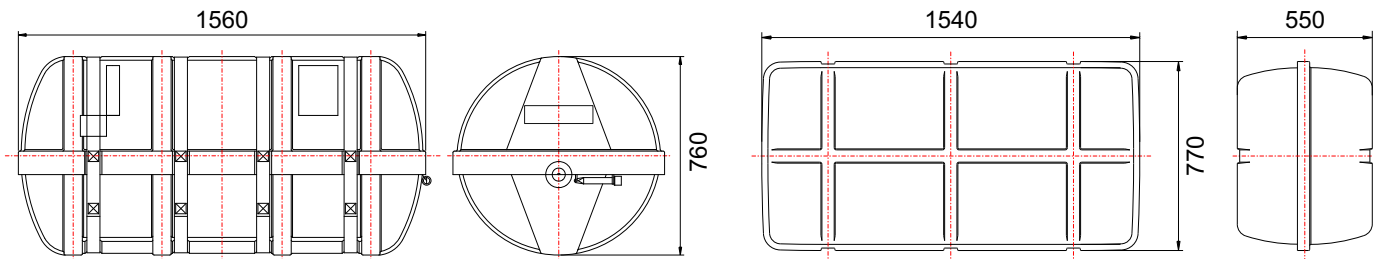
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65 man Ocean ORL



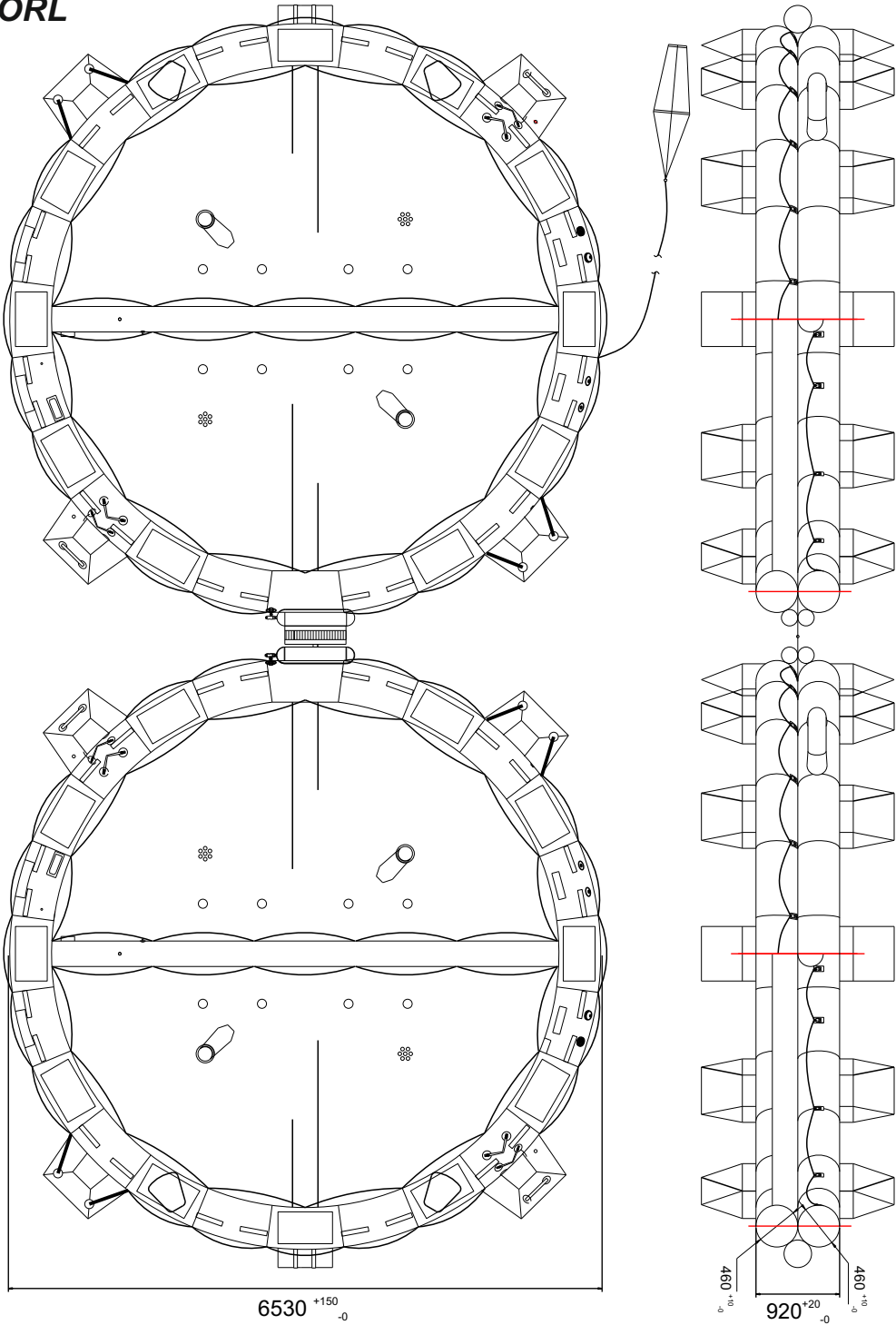
Cylindrical Container

Flat Pack Container



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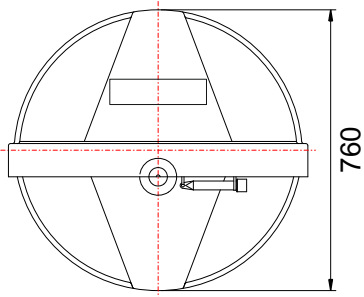
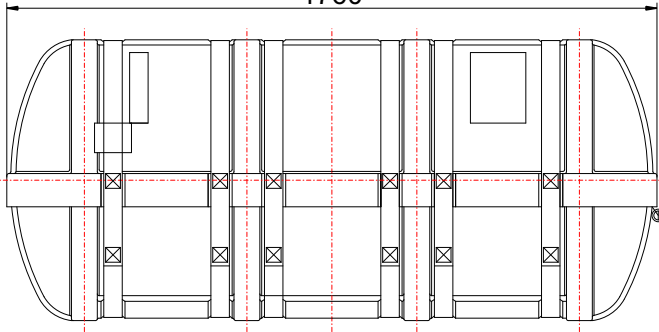
132 man Ocean ORL



6530 ⁺¹⁵⁰₋₀
1760

460 ⁺¹⁰₋₀
920 ⁺²⁰₋₀

Cylindrical
Container
only



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2.2 Emergency Packs

Table 1 - E Pack/ HSC Pack

The table below details the equipment that makes up the Ocean Safety Ocean Open Reversible Liferaft Emergency Pack.

Description	Part No	25p	50p / 65p / 132p
Bailer		1	1
Sponge		2	2
Whistle		1	1
Torch & Spares		1	1
Bellows		1	2
Repair Kit		1	1
Paddles		2	2
Sea Anchor		1	1
Rescue Quoit & Line		2	2
Lifesaving Signal Card		1	1
Survival Guide		1	1
Equipment Bag		1	1
Safety Knife		2	2
Log Book		1	1
Hand Flares - Red	FLR5505	2	2
First Aid Kit	MED0100	1	1
Operating Manual		1	1
Immediate Action Card		1	1

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2.3 Cylinder & Inflation System

2.3.1 Cylinder

Cylinder Data Ocean ISO

Test Pressure - 309 bar

Classification - EN 1964-1

Certifying Body - TUV

Hydraulic Test Interval - 5 years

The Ocean Safety Ocean ORL Liferaft range is supplied with fully certified cylinders. In the range there are 4 sizes of cylinder

Liferaft capacity	25p	50p	65p	132p
Part No.				
Cylinder Volume (L)	7.00	14.00	18.00	18.00
Quantity	x2	x2	x2	x4
CO ₂ (Kg)	4.20	8.00	10.10	10.10
N ₂ (Kg)	0.28	0.80	1.00	1.00

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2.3.2 - Inflation System

Ocean Safety Ocean ORL Liferaft Range

The inflation system installed on the Liferaft comprises of:

Part	Description	25p	50p	65p	132p
10-1000A	Painter line	1	0	0	0
11-1500A	Painter line	0	1	1	1
PF-V	Operating Head	2	2	2	4
DJ-II	Non-return Gas-inlet Valve	2	2	2	4
AF-I	Safety Relief Valve	2	2	2	4
DX-II	Non-return Transfer Valve	2	2	2	4
PB-1	Deflation & Topping-up Valve	2	2	2	4
PQ-II	Deflation Valve (on boarding ramp)	2	2	2	4

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2.4 Manufacturers Recommended Service Intervals

The following service intervals are the manufacturers recommended minimum service intervals for average use in average conditions. If the liferaft is exposed to extreme conditions it is recommended that the length of the service interval is reduced accordingly.

Where the liferaft is being used to conform to local or international statutory requirements, the service guide lines laid out by the regulative body shall be followed up to a maximum length of the interval stated by the manufacturer.

The Ocean Safety Ocean SOLAS Compact Liferaft requires servicing annually. The type of testing required at each annual service depends on the age of the liferaft Table 2.4 refers. Note that the Gas Inflation test is timed to coincide with the cylinders hydraulic test.

Table 2.4 - Testing schedule

Year of Service	Working Pressure Test	Gas Inflation Test	Floor Seam Strength Test	Necessary Additional Pressure Test
Year 1	X			
Year 2	X			
Year 3	X			
Year 4	X			
Year 5		X		
Year 6	X			
Year 7	X			
Year 8	X			
Year 9	X			
Year 10		X	X	
Year 11			X	X
Year 12			X	X
Year 13			X	X
Year 14			X	X
Year 15 Onwards		X	X	X

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2.5 Container

Containers are manufactured from GRP and are supplied in two halves. The bottom half features drainage holes, grommet location hole. The top half features a lip to aid location over the bottom half when packing.

The halves are held in place by using a break cord. Refer to the specific packing instructions for further details.

All containers are drop tested to 10m and temperature tested between -30°C to +65°C. Only Ocean Safety supplied spares may be used in the assembly of the liferaft.

There are 4 sizes of container for the Ocean ORL liferaft Range.

Raft Type	25p	50p	65p	132p
Size (mm)	Φ730 x 1138	Φ760 x 1495	Φ760 x 1495	Φ791 x 1720

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3 - Disassembly & Inspection

- 3.1 - Unpacking
- 3.2 - Cleaning
- 3.3 - Inspection
- 3.4 - Liferaft
- 3.5 - Emergency Pack
- 3.6 - Inflation System
- 3.7 - Container

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Introduction

The following section is a descriptive guide to the unpacking and inspection of equipment required prior to the servicing of the Ocean Safety Ocean Open Reversible Liferaft.

The section encompasses the unpacking of the liferaft from cylindrical container format and the disassembly of the inflation system.

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3.1 Container



1) Position the container so the labels are uppermost.

Cut the retaining cords from each side of the container.

Caution - Beware of airborne debris when cutting the cord. Wear the required safety equipment.



2) Carefully lift the top of the container off of the packed liferaft.



3) Unroll the liferaft until the gas cylinders are visible.



4) Untie the firing lines from the operating heads

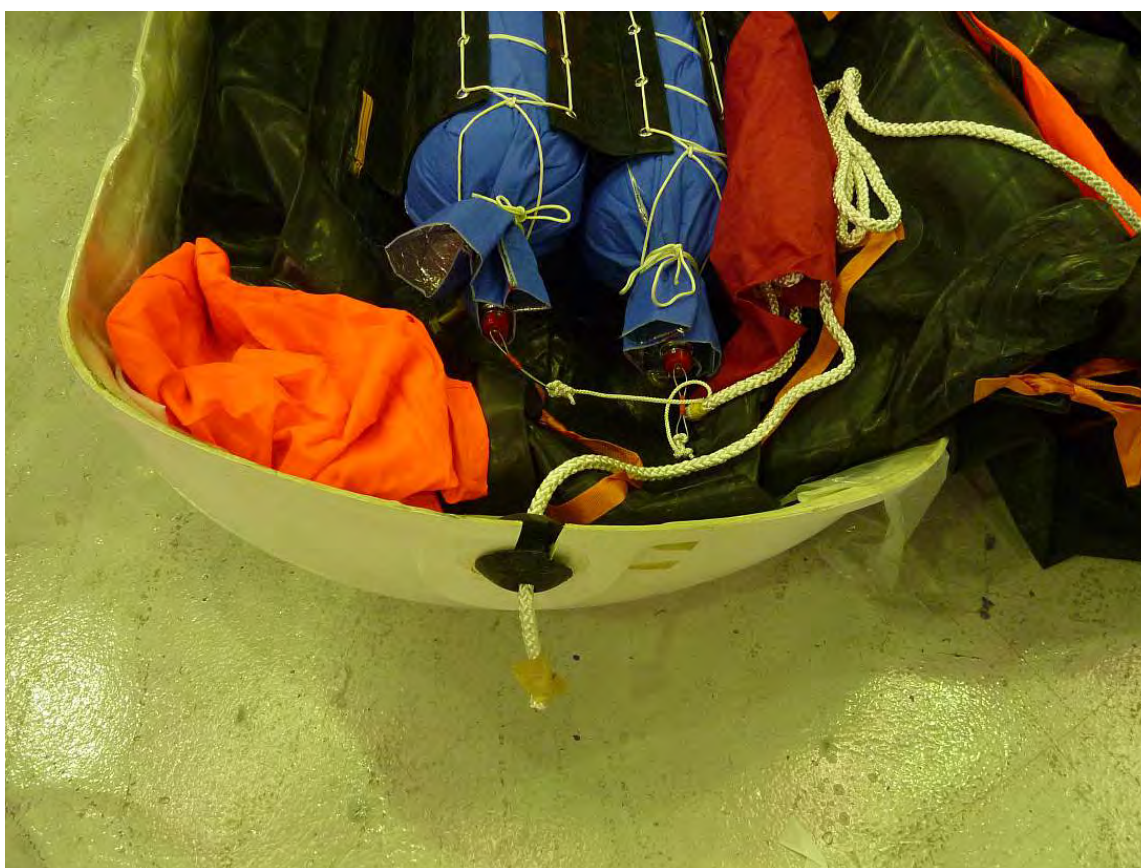
Warning - The inflation system remains in an armed state during this process. Ensure that no force is applied to the firing line or operating head release wire throughout this operation. Note the system remains armed until the completion of step 7.

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5) With the firing lines untied from the operating heads you may untie the painter from its strong point on the raft and lay it to one side.

6) Carefully unscrew the nut attaching each operating head to the gas inflation valves on the upper and lower buoyancy tubes.

Caution: care should be taken in this operation to ensure the operating head release wires are not accidentally pulled, thus initiating the gas inflation process.



7) When the operating heads have been detached from the gas inflation valves, each can be removed from its gas cylinder utilising two spanners; one for the operating head and one for the gas cylinder valve. When the operating heads have been removed from the gas cylinders, screw the dust caps onto the cylinder valves.

8) Unlace the cylinder pockets and remove the gas cylinders from the raft.

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9) With the cylinders removed, lift the raft out of the container and unfold it on the floor.



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3.1.3 Inflation Procedure

With the liferaft unpacked and laid out flat on the floor, inflate the liferaft through the gas inflation valves. Locate the inflation adaptor onto the bottom buoyancy tube and inflate until the PRV exhausts.

Repeat the process for the top tube. Ensure that the boarding ramps on both buoyancy tubes inflate before the PRV exhausts.



3.2 Cleaning

3.2.1 Liferaft

Warning - Do not use any solvent in the process of cleaning the liferaft.

Warning - Locate the PRV bung in the valve before cleaning the exterior of the liferaft.

To clean the liferaft use warm water with PH neutral washing detergent.

Wash down using clean fresh water following the above process.

Dry off using lint free cloth or clean rag.

Leave to completely dry before re-packing.

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3.2.2 Container

Wash the container clean using washing detergent. For stubborn or oily marks use solvent to clean the surface of the container.

Wash the container down with clean fresh water following the application of detergent or solvent.

All faces of the container shall be completely dry before the re-packing of the liferaft can commence.

3.2.3 Cylinder

Wash the painted exterior wall of the cylinder clean using washing detergent. For stubborn or oily marks use solvent to clean the surface of the cylinder.

Wash down the cylinder with fresh clean water following the application of detergent or solvent.

3.2.4 Inflation System

The function of the inlet valves will have been checked during the inflation of the buoyancy tubes. Disconnect the air line and confirm the one way valve is operating correctly and there is no leak of gas through the valve.

3.2.5 Operating Heads

The operating heads are sealed for life units. The units shall not be dismantled. If the liferaft has been inflated in salt water, wash each operating head through with fresh water.

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3.3 Inspection

3.3.1 Liferaft

The liferaft shall be checked for signs of damage, deterioration or for missing parts. There are two areas of the liferaft to visually inspect.

- The top buoyancy of the liferaft: the buoyancy tube and all markings/attachments, the floor and all markings/attachments and the boarding ramps.
- The lower buoyancy of the liferaft: the buoyancy tube and all markings/attachments, the floor and all markings/attachments and the boarding ramps.

3.3.2 Liferaft Fabric

Visually inspect the tubes and floor of the liferaft. Check the fabric for signs of abrasion, staining, broken stitching or fraying. If any damage is found mark the affected area with a chinagraph pencil.

Visually inspect the markings and labels on the liferaft; check that all markings are clean, clear and legible.

Check the quantity and quality of retro tape on the liferaft; there should be a total of 150cm².

The liferaft is of a bonded construction. Check all seams for visual signs of derogation.

Test all cordages and patches with a sharp pull in the right direction. All parts must remain intact as a result of the test.

Inspect the boarding arrangement. The boarding arrangement is an inflatable structure fed from each buoyancy tube. Confirm the ramp has inflated correctly. Check that all parts of the ramp are in good working order. Inspect the webbings and fabric for signs of abrasion, broken stitching or fraying. Ensure that the connection to the buoyancy chamber is made good with the end of the ramp pointing slightly upwards.

3.3.3 Valves and Attachments

Having checked the fabric of the liferaft, proceed to check the following:

Top up valves - Check that the valves are clean and are in working order. Take the cap off the valve and depress the centre of the valve. Check that the valve reseats and stops the escape of gas from the buoyancy tube. Replace the cap.

Check the condition of the rescue quoit and line. Give a sharp tug on the quoit to check the connection between it and the line. Ensure that the line is neatly stowed and will not tangle any other part of the liferaft.

Visually inspect the condition of the knife. Check the blade is good condition, sharp and free from corrosion.

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Inspect the condition of the drogue and line. When unpacking the drogue note how it is packed for reference when re-packing. Check the condition of the line. Ensure that the line is spliced onto the drogue, not tied with a knot. The ends of the line should be taped. Check that all ends of the rope are securely taped.

Inspect the owners manual. Check that all information contained in the manual is legible.

Inspect the light and light patch on each buoyancy tube. As part of the inflation the lights should have been activated. In the operation of the light the activation pin will have been pulled from the battery housing. Relocate the pin in the raised buttons and reset the system.

Inspect the expiry date on the battery. If the light is not functioning correctly or the expiry date is less than 12 months from the current date, replace the unit.

Check the condition of the webbings securing the emergency equipment pack between the buoyancy tubes.

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3.4 Emergency Pack

Inside the emergency pack there are dated and non dated items. All items shall be checked for the condition of each part. Where a part is date sensitive, regardless of exterior condition the product shall be replaced with approved spares supplied by Ocean Safety.

The table below details each part of the emergency pack and states where items are date sensitive. Note that additional equipment that does not make up part of the standard pack will require inspection to ascertain whether an expiry date applies.

Description	Part No	Expiry	Notes
Bailer		N/A	Check condition and function
Sponge		N/A	Check condition and function
Whistle		N/A	Check condition and function
Torch & Spares		3 years	Operation and expiry date
Bellows		N/A	Check condition and function
Repair outfit		N/A	Check condition and function
Paddles		N/A	Check condition and function
Sea Anchor		N/A	Check condition and function
Rescue quoit & line		N/A	Check condition and function
Lifesaving Signal Card		N/A	Check condition and function
Survival Guide		N/A	Check condition and function
Equipment Bag		N/A	Check condition and function
Safety Knife		N/A	Check condition and function
Log Book		N/A	Check condition and function
Hand flares red	FLR5505	4 years	Expiry date and condition
Parachute red	FLR5500	4 years	Expiry date and condition
First aid kit	MED0100	3 years	Expiry date and condition
Operating Manual		N/A	Check condition and function
Immediate Action Card		N/A	Check condition and function

3.5 Inflation System

3.5.1 Cylinder

Warning - only service operators correctly trained and certified are permitted to undertake the service and inspection of cylinders and cylinder valves.

Fully charged cylinders shall only be discharged by operators correctly trained and certified by Ocean Safety or a notified body. The discharge of a cylinder shall be undertaken with the cylinder securely fastened inside a chain vice or similar device.

Any cylinder found to be damaged by impact or corrosion shall be returned to Ocean Safety or the nearest agent for full hydraulic testing and possible refurbishment or disposal.

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3.5.2 Gas Inlet Valves

Inspect the gas inlet valves for signs of damage or corrosion. If any defect is found, refer to the remedial action section.

3.5.3 Operating Heads

With the the operating heads removed from the cylinder valve, pull the actuation cable to remove it from the body. Both operating cables will be replaced at every service.

If no fault or defect is found, the operating head may be rearmed following instructions in the remedial actions section.

3.5.4 Pressure Relief Valve

The pressure relief valves should reseal at no less than **160mb**.

If the pressure in the inflatable structure drops below the stated figure the valves should be inspected for tightness and leaks. If a leak is tracked to the PRV, refer to the remedial action section for details.

3.6 Container

Outer Surface

Visually inspect the outer face of the container checking for cracks through the container or chips or cracks in the white gel coat layer. The container shall be replaced if there are cracks or holes right through the laminate. Chips in the gel coat may be repaired using a GRP repair kit.

Inner Surface

Ensure that there are no sharp points that could damage the fabric of the liferaft. If any sharp points are found they may be rubbed flat using abrasive paper.

Caution - while sanding down GRP correct protective equipment must be worn to protect the operator from complications due to exposure to GRP or FRP dust.

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4 - Testing

- 4.1 - Tools required
- 4.2 - Test Schedule
- 4.3 - Conditions and corrections
- 4.4 - Test procedure
- 4.5 - Pressure Relief Valve Reseat Pressure
- 4.6 - Working pressure test
- 4.7 - Gas Inflation test
- 4.8 - Necessary Over Pressure test
- 4.9 - Floor Seam Strength Test
- 4.10 - Cylinder Testing

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4 Testing

4.1 Tools Required

Description	Part No	Qty
Open Ended Torque Spanner	N/A	1
Torque Spanner/ Screwdriver		
Screw Driver set		
Fine screw driver or tool - removal of gaskets		
China graph pencils		
Fine point indelible pens		
Manometer (0-400 mbar)		
Timing device		
Thermometer		
Clean and dry air supply - compressor		
Table surface area of 1m x 1.5m - on wheels		
Vacuum pump		
Scales to weigh gas cylinders to an accuracy of +/- 1g		
Service manual		

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4.2 Test Schedule

Liferaft testing is required to follow a set schedule based on the liferafts age. Refer to the table below for details of periodic testing. The specific test procedures are detailed in the following sections.

Table 4.2 - Test Schedule

Year of Service	Working Pressure Test	Gas Inflation Test	Floor Seam Strength Test	Necessary Additional Pressure Test
Year 1	X			
Year 2	X			
Year 3	X			
Year 4	X			
Year 5		X		
Year 6	X			
Year 7	X			
Year 8	X			
Year 9	X			
Year 10		X	X	
Year 11			X	X
Year 12			X	X
Year 13			X	X
Year 14			X	X
Year 15 Onwards		X	X	X

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4.3 Conditions and corrections

All tests are to be carried out under stable conditions, as free as possible from draughts and direct sunlight. All repair patches are to be subject to a minimum of 72 hours cure time prior to inflation testing.

4.3.1 Atmospheric Corrections

The ambient pressure shall be recorded at the beginning and end of each test. Where the conditions vary during the test the following allowances may be employed to determine the results of the test.

The corrections only apply to a maximum atmospheric pressure rise or fall of 3mb.

- For every 1mb rise in atmospheric pressure increase the final test pressure by 1mb
- For every 1mb fall in atmospheric pressure decrease the final test pressure by 1mb

4.3.2 Temperature Corrections

The ambient temperature shall be recorded at the beginning and end of each test. Where the conditions vary during the test, the following allowances may be employed to determine the results of the test. Temperature corrections may only be applied to ambient temperature fluctuations with a maximum rise or fall of 3°C.

- For every 1°C rise in temperature reduced the final test pressure by 4mb.
- For every 1°C fall in temperature increase the final test pressure by 4mb.

4.3.3 Combined Corrections

If there is a combined temperature and atmospheric pressure change then add the two correction factors together.

increase in temperature by 2°C = -8mb

increase in atmospheric pressure by 2mb = +2mb

Resultant correction factor = -8mb +2mb = -6mb

4.4 Test Procedure

Prior to conducting the Testing, the following figures shall be recorded.

- Ambient temperature at start of test in °C
- Ambient temperature at the completion of test in °C
- Ambient pressure at the start of the test in mb
- Ambient pressure at the completion of test in mb
- Internal pressure of buoyancy tubes at start of test in mb
- Internal pressure of buoyancy tubes on completion of the test in mb

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4.5 Pressure Relief Valve Reseat Pressure

Inflate each buoyancy tube separately and record the reseat pressure of the relief valve. Refer to table 4.1 for designed reseat pressure for each liferaft in the Ocean ORL Range. If the pressure taken from the buoyancy tube is less than the figure in table 4.1, the valve shall be replaced. Please refer to chapter 5 Remedial Action and Repairs.

Table 4.1 - Valve Pressures

Valve	Maximum Opening Pressure (mb)	Minimum Reseat Pressure (mb)
AF-1	213	160

4.6 Working Pressure Test

Inflate each chamber in turn through the gas inflation valve until the PRV exhausts.

Allow the pressure to settle for 30 minutes. Begin the test by taking a pressure reading from each buoyancy tube.

Allow each chamber to stand for 60 minutes and take a further reading from the buoyancy tubes.

Apply the necessary temperature and atmospheric corrections for the ambient conditions. The sum of the ambient corrections and the variation in the pressure must not exceed 5% of the original pressure.

4.7 Gas Inflation Test

The gas inflation test is an inflation test using the primary means of inflation. As part of the test the operation of the gas inflation system and function of the over pressure valves are to be confirmed. To prepare the raft for the test, remove the packed liferaft from the container by taking the following steps.

- Cut the banding
- Remove the top half of the container
- Remove the packed liferaft from the lower half of the container and place on the floor.

With the packed liferaft removed from the container, pull the painter line until the line has fully deployed and the inflation system is activated.

During the inflation note the operation of the transfer valves into the boarding ramps. Also note the correct operation of the pressure relief valves.

Once inflated, leave to stand for a minimum period of 30 minutes to confirm air holding and stabilisation of the buoyancy tube.

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Following the 30 minute stabilisation period, the liferaft is to undergo a working pressure test (4.6 refers). Note that if the pressure inside the buoyancy tubes is below that of the minimum reseal pressure of the PRV's, the tube may be topped up to above the minimum reseal pressures of the PRV's (table 4.1 refers).

Note - If the pressure is increased to the PRV opening pressure, the stabilisation period shall be observed before the working pressure test may commence.

4.8 Necessary Over Pressure Test (NAP)

The test is required in accordance with the schedule detailed in table 4.2. The test is present to identify aging fabric and seams. The liferaft is to be inflated to two times working pressure. Refer to table 4.8 below for details of pressure.

Table 4.8 - NAP test Pressures

Select the lowest of the two pressures detailed in the table.

	Ocean ORL
Pressure equal to 20% of minimum tensile strength	481 mb
NAP test pressure	320 mb

Method

- Install the bungs in the PRV's
- Gradually raise the internal pressure to a minimum of the pressure stated in table 4.8.
- Allow the structure to stabilise for 5 minutes.
- Inspect the inflatable structure. look for any signs of seam slippage, cracks appearing in the fabric or other defects.

Pass Fail criteria

Pass - No sudden pressure loss or defect found

Fail - Rapid pressure loss or visible defect located.

If the liferaft successfully passes the NAP test, the PRV bungs shall be removed and the pressure allowed to fall to working pressure.

If the liferaft fails the NAP test, it shall be deemed beyond economic repair and scrapped.

4.9 Floor Seam Strength Test (FSS)

The floor seam strength tests the strength of the seams between the floor and buoyancy tube. This is tested by supporting the liferaft so, when in position, the floor to buoyancy tube seams are unsupported. After loading, the seams shall be inspected for signs of seam slippage or edges lifting at intervals stated in table 4.2.

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Fig 4.9.1 - Test Procedure Detail

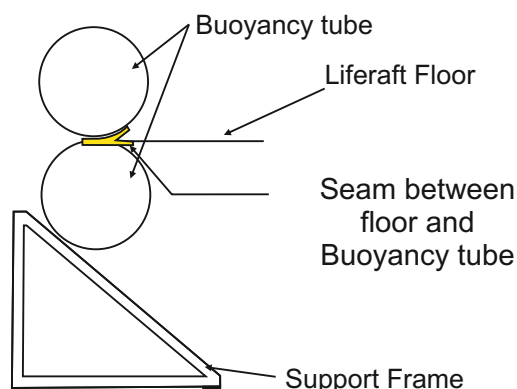


Fig 4.9.1 is a detailed view of the required arrangement to isolate the floor/buoyancy tube seam.

The liferaft should be suspended between the supporting frames so that the floor/buoyancy tube seam is unsupported.

With the liferaft at working pressure a person weighing not less than 82.5kg shall walk or crawl around the periphery of the floor.

The seam shall be inspected for signs of defect or damage. If any sign of defect or damage are found, the liferaft shall be condemned.

4.10 Cylinder Testing

Cylinders that have not been discharged in either testing or deployment may be visually inspected and check weighed before being reassembled.

Cylinders that have been discharged require inspection to ascertain condition and hydraulic test date.

Cylinders that are used in gas inflation test require inspection, hydraulic testing and refilling.

The cylinder shall be inspected by a qualified engineer appointed by Ocean Safety at each scheduled or unscheduled service.

4.10.1 Visual Inspections

Visually inspect the outer surface of the cylinder for signs of damage or corrosion. If any signs are located, the cylinder shall be discharged and refurbished.

Find the hydraulic test date detailed on the cylinder. If there is less than 12 months left until the test date, the cylinder shall be tested.

4.10.2 Check Weighing of Cylinders

To check weigh a cylinder remove the following components

- Operating Head
- HP Hoses
- Recoil caps and dust caps

Place the cylinder on scales able to read to 3 decimal places. The weight measured shall be within $\pm 14g$ of the stated figure on the cylinder. If the cylinder is within tolerance it may be reassembled to the liferaft. If the cylinder is out of tolerance, the cylinder shall be discharged for further inspection.

4.10.3 Discharge of Cylinders

Cylinders may only be discharged when secured within a chain vice or similar clamping arrangement. Once discharged the internal walls and neck require inspection. Inspect the thread for signs of damage. Inspect the internal wall for signs of corrosion. If any defect is found the cylinder shall be refurbished if possible and disposed of if deemed non salvageable.

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4.10.4 Hydraulic Testing

Hydraulic testing shall be undertaken at 5 year intervals. The interval is set to mirror the requirement for gas inflation testing. To undertake the test, the cylinder must be discharged and have the cylinder valve removed.

The test shall be conducted using water as a test medium. The integrity of the cylinder shall be tested at 1.5 x working pressure.

Test requirement

- Interval - 5 years
- Test pressure - 300 Bar

With the internal test pressure attained, the cylinder shall be inspected for signs of leakage or deformation. If the cylinder fails at this stage the unit shall be scrapped.

If the Hydraulic test is successfully completed, the internal and external walls shall be inspected.

The cylinder must be completely dry internally before the recharging process can be undertaken.

Once the test has been completed the cylinder shall be marked with the new hydraulic test date.

4.10.5 Cylinder filling

Cylinder filling shall only be undertaken by suitably competent personnel. Cylinders are charged with cylinder valve and components installed. Only the components detailed in section 2 table 2.3.2 may be used.

The cylinder shall be charged up to the values stated in section 2 table 2.3.1.

4.10.6 Chemical Leak Test

Following cylinder recharging, cylinder assemblies shall be leak tested before reassembly to the liferaft. The following parts are required,

- Polythene bag
- Elastic bands
- 25 ml of test solution
- Pour 25ml of test solution into a polythene bag.
- Place the bag over the cylinder valve and secure in place using an elastic band. Ensure the distance between the cylinder valve and solution is approximately 200mm.
- Leave the solution in place for a minimum of 2 hours.
- Following the test period, gently shake the bag and note any colour change.

Pass - No colour change evident from start of test.

Fail - If the solution has change its colour to a clear liquid.

Note that a control sample is required to test for CO₂ contamination within the test area. The sample is a sealed bag containing 25ml of test solution, located near the test area. If the control sample has also lost its colour, the cylinder leak test must be repeated following sufficient ventilation of the test area.

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5 - Remedial Actions and Repairs

5.1 - Introduction

5.2 - Adhesives

5.3 - Fabric Repairs

5.4 - Cordage

5.5 - Replacement of component parts

5.6 - Container

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5 - Remedial Action & Repairs

5.1 Introduction

The following section defines the scope and procedures for repairs on the Ocean Safety Ocean Open Reversible Liferaft. All replacement parts or adhesives used on the liferaft shall be Ocean Safety approved spares.

Any part of the liferaft or equipment that is found to be damaged or non functional during the process of inspection and testing requires remedial action to be taken. Any part of the liferaft or ancillary equipment that can not be repaired within the parameters of this manual or appropriate manufacturers owner's manual must be replaced using Ocean Safety supplied spares.

5.2 Adhesives

Repairs to the fabric of the liferaft shall only be undertaken using adhesives supplied by Ocean Safety. Current approved adhesives include Bostik 2402, Bostik NE486 or Apollo A3480. If however these are not available, please contact the adhesive manufacturer for details of other acceptable replacement adhesives.

WARNING - Adhesives shall be used in accordance with the manufacturers instructions and only used in areas of the liferaft permitted by this manual.

WARNING - Only use solvents/ adhesives in well ventilated areas and always use the appropriate personal safety equipment when working with them.

5.2.1 Storage instructions

Adhesives and hardeners have a shelf life of 12 months from the date of manufacture. Adhesives and hardeners shall be stored in the container provided and shall be stored with the supplied lid securely located.

The adhesive and hardener shall be stored in a clean dry place out of direct sun light. The storage condition of the adhesive and hardener shall not exceed 25°C and not fall below 10°C. Any adhesive or hardener that is stored outside the prescribed parameters must be disposed of in accordance with local laws.

Before using a batch of adhesive, the condition of the solution shall be checked for:

- An increase in viscosity (usually caused by an incorrectly fitted lid)
- Signs that the adhesive has separated leaving a residue over the surface
- Cloudiness or crystallisation of the hardener

if any of the above are found on inspection of the adhesive or hardener, the affected part shall not be used for repairs. The adhesive and/or hardener shall be disposed of in accordance with local laws.

5.2.2 Mixing Instructions

Prior to any measuring out of adhesive, the sediment at the bottom of the holding container shall be mixed back into the main body of the adhesive.

The mixing of the adhesive and the hardener shall be performed in lacquered, glass or polythene containers. Ensure that containers are clean and dry prior to mixing.

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Measure out the desired quantity of adhesive. Measure out an equivalent 4% mass of hardener and add it to the pot. With both parts in one pot, stir the mixture for a minimum of 5 minutes. When the mixed adhesive is not in use, cover the pot to maintain a good pot life. Pot life of mixed adhesive is dependant on conditions, pot life of up to one hour is achievable. Once the adhesive becomes stringy on application, replace the adhesive.

5.2.3 Preparation for Application of Adhesive

Prior to the application of adhesive, the fabric shall be cleaned, abraded and prepared. Great care is required to ensure that the fabric is clean of debris and grease prior to any application of adhesive. Bonding interfaces shall be cleaned with a **Toluene** based cleaner/ thinner (**Bostik M501 or similar**) to ensure the fabric is clean. All surfaces must be completely dry with all solvent evaporated before adhesive may be applied.

Following cleaning of the desired area, mark the area for the patch out using masking tape (or similar), abrade the surface lightly using a **80 - 200 fine grade paper**, abrading the surface until the shine is removed ensuring not to remove the coating completely.

Once abraded, clean the area again thoroughly with the toluene cleaner/ thinner to ensure the fabric is clean of all debris and grease.

5.2.4 Application of Adhesive

Adhesive shall be applied using a brush with a wooden handle and natural fibre brushes. To apply the adhesive use a clean brush with a width of 25mm and a bristle length of 30mm. For woven fabrics three layers of adhesive are required. The first two layers are to be worked into the weave of the textile. The third should be used to finish with a smooth layer. Sufficient time shall be given between layers to allow the adhesive to become touch dry on the first two layers. This time will change with ambient conditions. On the third coat the two parts being bonded shall be brought together whilst the adhesive is tacky to the touch.

Warning - When applying and checking adhesive do not use finger tips. This will contaminate the adhesive. Use the back of a finger to touch the fabric. Keep contact to a minimum.

When bringing the two surfaces together the two parts must be lined up before contact is made. Once the pieces come together they may not be repositioned. If parts are not aligned correctly they must be pulled apart and the gluing process repeated.

Once parts are correctly positioned, the bond shall be consolidated using a spatula or heavy roller. Work from the inside out and remove any air bubbles created when bringing the two layers together.

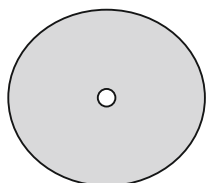
5.3 Fabric Repairs

An approved service station is required to hold stock of suitable coated fabric for repair patches. Any repair patch shall be cut from a fabric the same colour as the area being repaired. Fabric can be supplied as a service spare from Ocean Safety.

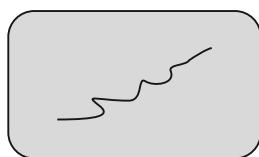
For the application of adhesive to patch a liferaft, refer to sections 5.2.3 and 5.2.4. All patches shall be checked for air holding capability following the required cure period of 72 hours. Any patches that are found to be leaking shall be reworked.

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5.3.1 Fabric Repair examples



Use a circular patch to repair pin holes - minimum diameter 50mm



Use a rectangular patch to repair tears. The patch shall be a minimum of 25mm in width from the outside edge of the tear.



Use an L shaped patch to cover striking tears. The patch shall be a minimum of 25mm in width from the outside edge of the tear.

5.4 Cordage

Any repairs to the cordage of the liferaft must be performed using a sewing machine. Repair by hand sewing is not permitted.

All Liferafts repaired using a sewing machine shall be pressure tested in accordance with the air holding test procedure

5.5 Replacement of Component Parts

5.5.1 Pressure Relief Valves

Due to the design of the PRV's, most leaks are evident from the centre of the valve. This makes an assessment of the root cause difficult. Both a loose valve and an issue with the sealing faces would result with a leak through the centre of the valve.

Firstly check the torque setting for the valve - Note this check shall be performed before any water or other lubricants are used. Using a torque wrench and the B10 tool, confirm the torque is set to **27Nm**.

If the torque is correctly set and the issue remains, inspect the sealing faces. Remove any debris with water.

If damage is located on the sealing faces, or the cleaning of the valve does not resolve the issue, the valve will require replacement.

The pressure relief valve is made up of two parts that are located internally and externally of the buoyancy tube. The valve can be removed by unscrewing the outer section of the valve using either the service spanner or the factory spanner.

To replace a pressure relief valve both parts of the valve are to be removed. To retrieve the bottom half of the valve the old patch must be cut to gain access to the internal parts. A replacement valve shall be installed on a replacement patch to the correct torque ready for attachment to the buoyancy tube.

The doubler patch is to be bonded into the required position following the procedure detailed in section 5.2.3 and 5.2.4. A doubler patch shall be consolidated correctly using a boning tool or roller. All patches must be checked for air holding capability following a minimum cure period of 72 hours. And patches that fail the air holding test shall be reworked.

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5.5 Replacement of Component Parts

5.5.2 Inlet Valves

Inlet Valves may be replaced if a fault is found with the valve or there are signs of damage to the valve.

5.5.3 Top Up Valves

Top Up Valves may be replaced if a fault is found with the valve or there are signs of damage to the valve. The Ocean ORL Range of liferafts is supplied with the PB-1 Top up valve.

The workings of the valve are in the top section, therefore there is no need to cut the tube to replace the valve. Use the appropriate service tool socket to remove the top section of the valve. Ensure the parts of the valve located on the inside of the tube are retained and not lost in the process.

5.5.4 Drogue/ Sea Anchor

If damage is present in the fabric of the drogue or the webbings of the drogue, the whole unit shall be replaced.

5.5.5 Knife

A blade showing signs of surface rust may be cleaned using abrasive paper. Anything more than surface rust will deem the part unfit for purpose and will require replacement.

Any units showing signs of damage are to be replaced with Ocean Safety supplied spares.

5.6 Container

5.6.1 Surface of the container

If minor chips or cracks are present in the container, the damaged area may be repaired using a gel coat repair kit. Follow the product specific instructions to complete the work.

Anything more than minor damage will result in the container being scrapped.

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Modifications Log - Pre Packing Assembly

All modifications to the following sections shall be recorded in the table provided below. Once a new section is issued, replace the old version of the manual and destroy the obsolete pages.

Revision N°	Sections Affected	Issue Date	Inserted Date	Signature

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Introduction

The Ocean Open Reversible range is packed following inspection and testing. Only items and rafts that pass testing and inspection shall be re-packed to re-enter service.

Packing is conducted in stages. The following section details the pre packing assembly of emergency packs and ancillary equipment.

All components shall be assembled in accordance with the following sections. No deviation is permissible from the equipment schedules detail in section 2 or the assembly process laid out in the following section of the manual.

Scope

- Pre packing assembly processes for all variants within the Ocean Open Reversible Range.

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Drogue/ Sea Anchor Attachment

- Ensure the drogue line is dry before repacking is started. With the 30m of line assembled in the folds of the drogue, locate the tail end of the drogue.
- Attach the drogue line to the drogue patch using a bowline as depicted below.
- Secure the knot by taping the tail end.



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Cylinder Assembly

Cylinders are charged and leak tested before assembly to the liferafts. The Ocean ORL uses the following components in the cylinder assembly.

Table 4.5 - Inflation System Assembly

Part	Description	25p	50p	65p	132p
10-1000A	Painter line	1	0	0	0
11-1500A	Painter line	0	1	1	1
PF-V	Operating Head	2	2	2	4
DJ-II	Non-return Gas-inlet Valve	2	2	2	4
AF-I	Safety Relief Valve	2	2	2	4
DX-II	Non-return Transfer Valve	2	2	2	4
PB-1	Deflation & Topping-up Valve	2	2	2	4
PQ-II	Deflation Valve (on boarding ramp)	2	2	2	4

Each cylinder shall be tested in accordance with the schedules and testing requirements as prescribed in section 5 Testing. If a cylinder does not meet the requirements of section 5, it shall be either refurbished or scrapped. Once the cylinders has passed it shall be re assembled to the Liferaft.

As a final check before assembly confirm the cylinder capacity and gas charges are in line with the table below.

Table 4.6 - Cylinder and Gas Charge Details

Liferaft capacity	25p	50p	65p	132p
Part No.				
Cylinder Volume (L)	7.00	14.00	18.00	18.00
Quantity	x2	x2	x2	x4
CO₂ (Kg)	4.20	8.00	10.10	10.10
N₂ (Kg)	0.28	0.80	1.00	1.00

- Now take the first cylinder and locate the cylinder into the blue protective valise.
- Connect the operating head to the gas inlet valve.
- Lace the pocket and secure the cylinder in position with a double turn around the cylinder neck.
- Follow the same steps with the second cylinder.



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Painter Line Assembly

The painter line assembly consists of the following parts

- Painter line - 28 Metres*
- Painter line pouch**
- Firing Line - 20 cm
- Firing Line Distance - **Vessel Specific - Stowage Height TBC**
- Container Cord - 1 metre

* Painter line diameter is relates to liferaft capacity. The 25 person liferaft requires a 10.0kN line which is 10mm in diameter. The 50 - 132 person liferafts require a 15kN line which is 12mm in diameter.

Due to variation in painter line diameter, the painter pouches are sized differently

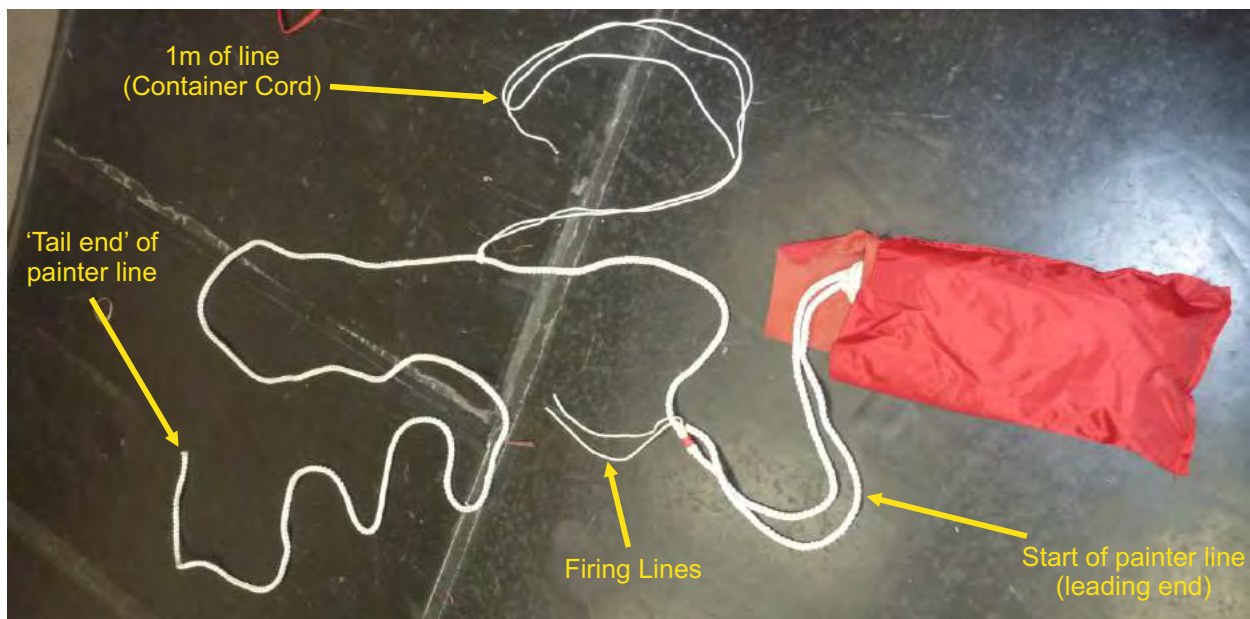
IF a painter line features any defects, damage or is not fit for use, all service stations must replace the painter line assembly. Use the tools required below & follow the instructions for re-packing:

Tools Required

- Swedish Fid
- Ball ties

1) Take the correct sized painter line and painter pouch. Mark out 2m of painter line from one end. This will be the tail end of the painter line and will be attached to the vacuum bag eyelet.

2) Hold the painter pouch with the open end facing upwards. The painter pouch has a folded closed side and a stitched side. The folded side is to be the base of the pouch. Place the 2m mark against the folded base and flake the remaining 26m of line into the pouch ensuring that the 2 ends do not cross.



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6 - Assembly and Packing

- 6.1 - Deflation Process
- 6.2 - Packing procedure
- 6.3 - Container packing procedure

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6.0 Deflation Procedure

Before the liferaft may be packed the inflated structure requires deflation to aid packing. When deflating the structure use dry clean air and a vacuum pump or similar device to extract all excess gas within the liferafts buoyancy tubes.



Using a vacuum pump or similar device deflate the top tube through the top up valve.

Once the tube has been fully deflated, re-install the top up valve cap.



Using a vacuum pump or similar device deflate the top tube boarding ramps through each deflation valve.

Once the ramp has been fully deflated, re-install the screw valve cap.



Using a vacuum pump or similar device deflate the Bottom tube through the top up valve.
Once the tube has been fully deflated, re-install the top up valve cap.

While the liferaft is deflating ensure that the folds of fabric are laying in a uniform manner.

With the bottom tube deflated, deflate the boarding ramps through each deflation valve.
Once the ramp has been fully deflated, re-install the screw valve cap.

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Folding Procedure Open Reversible



Fig 1

2) Once folded, flatten the area ensuring that the layers of the liferaft are as flat as possible expelling all the trapped air. Straighten the raft in preparation for the next fold.

Fold the raft out to form a “butterfly” fold. Fold 2 should run down the centre line of the raft from the gas cylinders.



Fig 2



Fig 3

3) Before moving to the next stage of folding, ensure that all folds are assembled neatly, all water pockets are laid out neatly and as much air as possible is expelled from the folds.

4) Make two further folds ensuring as you do so that as much air as possible is expelled from between the folds and the folds are as neat as possible.

Once the left side of the raft is folded, repeat for the right side.



Fig 4

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Folding Procedure Open Reversible



5) Regulations require the drogue to be positioned for automatic deployment. Ensure therefore that when folding the raft, the drogue is positioned such that automatic deployment can be achieved.

6) Check the width of the folds against the container to ensure they are not too wide. Then fold the cylinders over as shown in Fig. 6.



7.1) Fold the cylinders over a second time as shown in Fig. 7.1.

7.2) Place a sheet of polythene over the fold as shown in Fig 7.2 before placing the container onto the fold.



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Folding Procedure Open Reversible



Fig 8

8) Turn the container back so that the cylinders are exposed and lying uppermost.

9) Connect the firing lines from the painter onto the operating head release wires using a **round turn and two half hitches**. Place the painter line valise in position as shown in Fig. 9 and locate the rubber painter seal in its locating slot at the end of the container.



Fig 9



Fig 10

10) Using a suitable pole under the raft, lift and turn the folded raft across the cylinders as shown in Fig. 10.

11) Commencing from the Emergency pack, fold the liferaft up towards the container. Making every effort to ensure each fold is as flat as possible and there is minimal trapped air in between the fold, before moving on to the next fold.

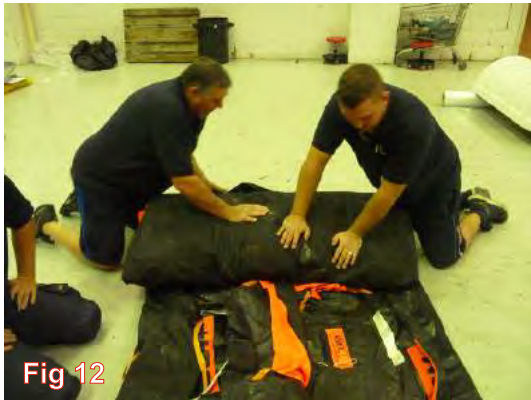
See Fig. 11



Fig 11

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Folding Procedure Open Reversible



12) Continue folding the raft carefully up to the container ensuring each fold is evenly spaced.

13) Before making the final fold over into the container, check the folds are as flat as possible and the width is such that the folds will fit inside the container. See Fig.13.



14) Make a final fold over into the container as shown in Fig.14.

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Closing the container



Fig 1

1) Carefully position the upper container on the folded raft.

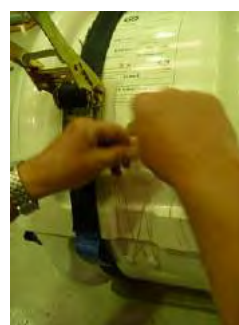
2) With the upper and lower container halves correctly aligned, place two ratchet straps at each end of the container and tighten until the container is closed.

NOTE: use a boning tool to fit any excess liferaft in to the container whilst tightening the straps.



Fig 2

3) Secure the container using lacing cord at the six points on the container. Follow the pattern shown in the following photographs.



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Modifications Log - Service Information & Data Label

All modifications to the following sections shall be recorded in the table provided below. Once a new section is issued, replace the old version of the manual and destroy the obsolete pages.

Revision N°	Sections Affected	Issue Date	Inserted Date	Signature

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7- Service Information & Data Labels

7.1 - Introduction

7.2 - Manufacturers recommended service intervals

7.3 - Container

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8 Service Information & Data Labels

8.1 Introduction

This section details the information externally visible once the liferaft is packed. This information will be used by the owner of the liferaft and service personnel at service intervals and as such should be completed using the dymo machine fitted with UV stable paper and ink.

The labels shall be competed and assembled to the liferafts so that all information is correctly completed and clear.

8.2 Manufacturers Recommended Service Intervals

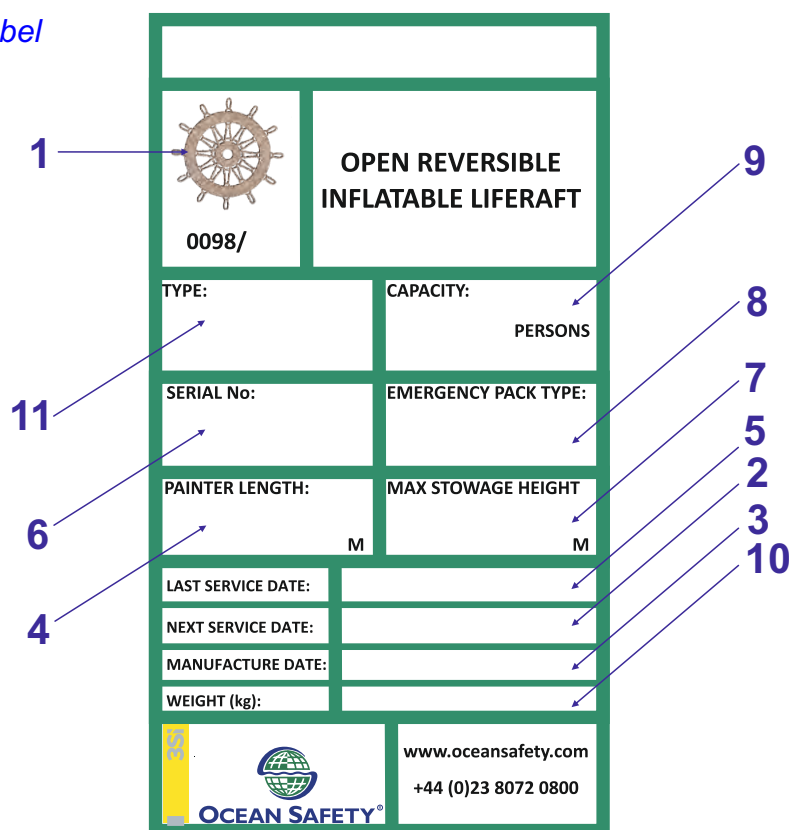
The manufacturers recommended minimum service intervals for average conditions is an Annual service. If the liferaft is exposed to extreme conditions it is recommended that the length of the service intervals is reduced accordingly.

Where the liferaft is being used to conform to local or international statutory requirements, the service guide lines laid out by the regulative body shall be followed up to a maximum length of the interval stated by the manufacturer.

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8.3 Container label sets

1. Information Label



		OPEN REVERSIBLE INFLATABLE LIFERAFT	
0098/			
TYPE:		CAPACITY:	PERSONS
SERIAL No:		EMERGENCY PACK TYPE:	
PAINTER LENGTH:	M	MAX STOWAGE HEIGHT:	M
LAST SERVICE DATE:			
NEXT SERVICE DATE:			
MANUFACTURE DATE:			
WEIGHT (kg):			
  OCEAN SAFETY®		www.oceansafety.com +44 (0)23 8072 0800	

When the container is closed, banded and taped, the data label (1) may be affixed.

Once the label is affixed, the blank spaces are to be filled in with the liferafts specific information.

- 1) **Ships Wheel Mark** - This is the MED mark of conformity. The label already details the notified body number, in the space provided print out and affix the year of manufacture.
- 2) **Next Service Date** - The liferaft requires an annual service. Mark the box with a date 12 months from the date of this service.
- 3) **Date of Manufacture** - The date of manufacture shall be taken from the liferaft. Copy the date of manufacture from the liferafts canopy in the format DD/MM/YY. Affix the label to the container in the space provided.
- 4) **Painter Line Length** - The painter line length for the ORL liferaft is 28m as standard, but this check this prior to packing. In the space provided, print out and affix a label stating the length.
- 5) **Last service** - Print out a label that details the date of service. Affix the label in the box provided.
- 6) **Serial Number** - Detail the Ocean Safety serial number in the space provided.
- 7) **Max Stowage Height** - The maximum stowage height for the ORL is 10m. In the space provided, print out and affix a label stating the stowage height.
- 8) **Pack type** - For ORLs this should state 'E Pack'
- 9) **Persons** - Affix a label detailing the capacity of the liferaft in the box provided.
- 10) **Weight** - Final checked weight of the packed liferaft
- 11) **Type** - Shortened manufacturer's product code *i.e. RAFT-R 25 etc.*

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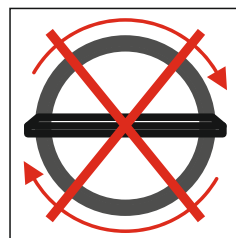
2. Ocean Safety Logo Sticker



3. Deployment instructions



4. Anti-Rolling Label

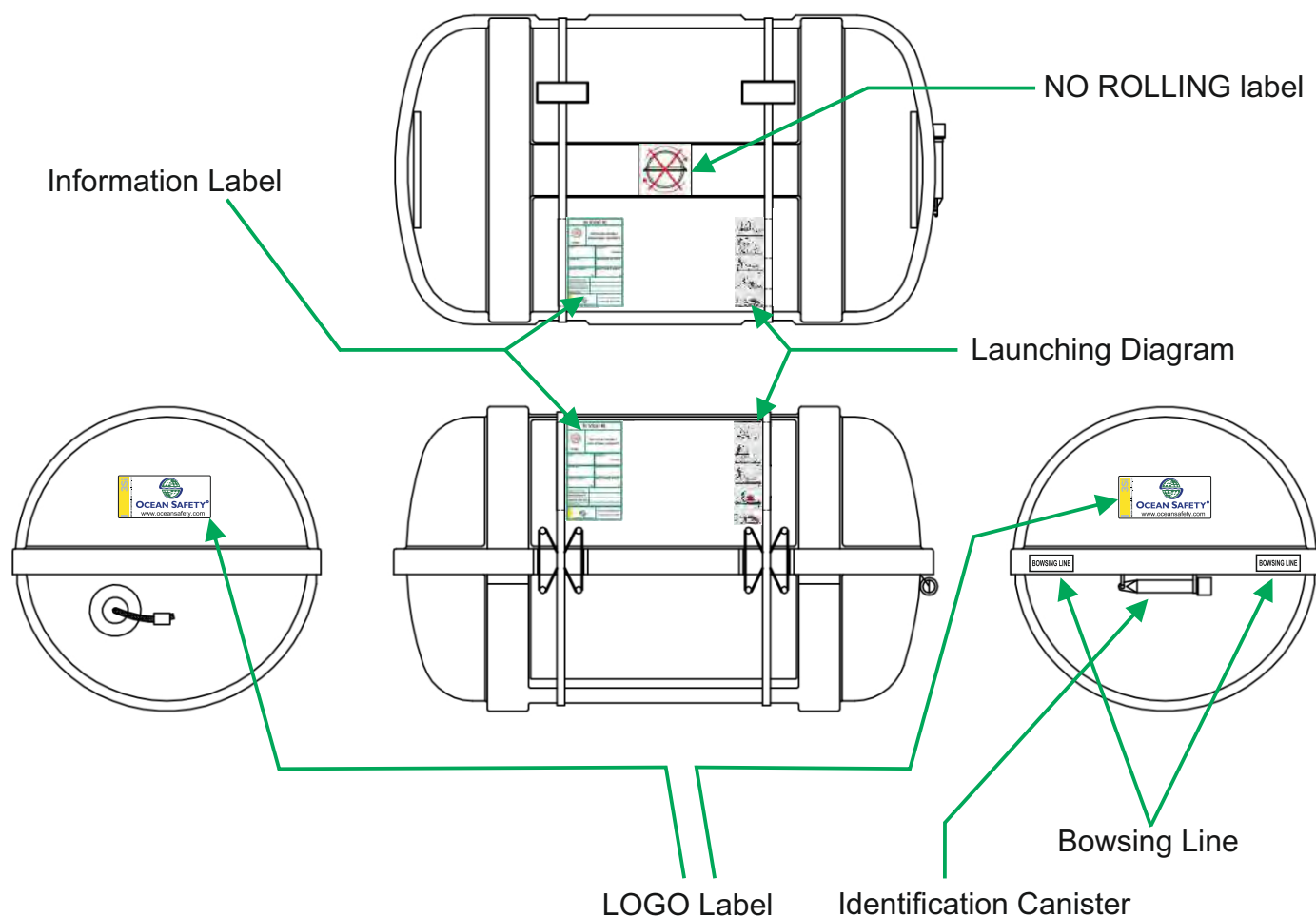


5. Bowsing Line Location Label

BOWSING LINE

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Ocean ORL Container Sticker Arrangement



With the Data label complete, affix the 2 branding labels to the container.

- 1) **Information Label** - x1
- 2) **Ocean Safety Logo Label** - x2
- 3) **Deployment** - x1
- 4) **Anti-Rolling Label** - x1
- 5) **Bowsing Line Location** - x2