

INSPECTION AND REPAIR

CONTENTS

INSPECTION OF TOTALLY ENCLOSED LIFT BAGS	1.0
INSPECTION OF PARACHUTE LIFT BAGS	2.0
INSPECTION OF TEST PLUGS	3.0
INSPECTION OF WEBBING SLINGS	4.0
INSPECTION OF SHACKLES AND MASTER LINKS	5.0
HOT AIR GUN REPAIR PROCEDURE	6.0
SAFE WORKING LOAD TEST	7.0

CODE OF PRACTICE FOR THE INSPECTION, REPAIR AND CERTIFICATION OF UNDERWATER LIFTING BAGS TO SAFE WORKING LOAD STANDARDS.

This inspection procedure should be carried out at 6 monthly intervals.

1.0 TOTALLY ENCLOSED LIFT BAGS

General Inspection

- 1.01 Select a clean and dry environment with good lighting. Ensure the lifting bag is free from dirt and grease and is generally in a clean condition.
- 1.02 With a totally enclosed lift bag, fully inflate until the pressure relief valves vent and air can be felt coming through all the valves. It may be necessary where more than one valve is installed to cover or temporarily plug one valve in order to get all the valves to vent. This is purely due to slight variances in the valve spring retention settings and will not adversely affect the performance of the air bag. Should a pressure relief valve prove defective replace immediately with manufacturers approved parts. Similarly, the inlet valve should be inspected, and any damage repaired using manufacturers replacement parts. Particular attention should be paid to the flange mounting of both inlet and pressure relief valves. Any sign of wear should be repaired immediately by the manufacturer.
- 1.03 When frilly inflated carefully inspect the main bag skin and strap panels for any tears, abrasions or cuts. If necessary soapy liquid can be used to identify leaks around slightly abraded areas. Small tears, abrasions or cuts can be repaired using a standard hot air welding technique. Where there are any larger cuts, leaks or abrasions in excess of 4" long the bag should be returned to the manufacturer for factory repair.
- 1.04 **IMPORTANT.** Should a cut or tear go across and sever or partially sever a welded seam the bag should be withdrawn from service immediately and returned to the manufacturer for assessment and factory repair.
- 1.05 Slightly deflate the air bag and inspect the webbing straps. Inspect the webbing in accordance with section 4.0 of this manual.
- 1.06 Inspect any shackles and master links in accordance with section 5.0 of this manual.
- 1.07 Any hotgun repairs are to be conducted in accordance with section 6.0 of this manual.

2.0 PARACHUTE TYPE LIFTING BAGS

- 2.1 To inspect parachute type lifting bags the following equipment will be necessary:
 - a) Test plug TB - PR2, PR3 and PR5
 - b) Test plug TBI - M5, M10, PR1 and PR1V
 - c) Test plug TB2 - PR10
 - d) Test plug TB4 - PR35
- 2.02 Lay out the parachute bag in clean, well lit area. Remove the main lifting shackle(s) to allow easier fitting of test plug and place the test plug into the mouth of the bags and inflate using a suitable compressor. Make sure that the test plug inflates evenly and locks itself into the mouth of the bag. Continue inflating until the lift bag is fully inflated.
- 2.03 **CAUTION!** Because the PR type lifting bags do not have pressure relief valves extreme caution should be used to ensure that the bag is not over inflated. Once the bag has formed its shape and is firm to the touch the compressed air should be turned off prior to the beginning of the inspection procedure and only turned on again for topping up purposes should the air bags being inspected become too soft to handle. Under no circumstances should the air bags be left unattended during the primary inflation sequence.

2.04 Carry out the inspection procedure as per 1.0 of this manual, as applicable.

3.0 TEST PLUG

3.01 Close attention should be given to the general condition of the test plug. It is possible that the plug may fail if damage has occurred so as to weaken the structure of the test plug. For inspection and repair instructions refer to sections 1.0 and 6.0 of this standard.

4.0 INSPECTION OF WEBBING SLINGS

The webbing straps should be inspected using the following guidelines as contained in BS3481 'Flat lifting Slings':

- 4.1
- i) 'Slings should be examined throughout their length for surface chafe, cross or longitudinal cuts in webbing, cuts or chafe damage to the selvages, or any damages to the stitching, eyes or end fittings.
 - ii) 'The effect of the chafe on the fabric surface is variable, but some loss of strength should be expected. Any substantial chafe, particularly localized, should be viewed critically. Local abrasion, as distinct from general wear, may be caused by the passage of the sling over sharp edges under tension and may cause a serious loss of strength'.
 - iii) 'Chemical attack is indicated by local weakening or softening of the material in the webbing so that surface fibres can be plucked off, as a powder in extreme cases'.
 - iv) 'Cuts, particularly at the selvedge, will result in a serious loss of strength. A sling so affected should be taken out of service immediately'.
 - v) 'Seams should not be allowed to deteriorate'.

4.02 Where required additional inspection may be necessary as listed below:

- i) Lay the sling on a flat surface in a well lit area.
- ii) Examine both sides of the sling.
- iii) Endless slings must be examined over whole length.
- iv) The inside of sling eyes should be examined with particular care.
- v) All equipment should be examined by one person only.

4.03 Sling Damage

Polyester webbing slings lose strength either from fair wear and tear or physical damage due to misuse, thereby reducing the safety factor. If at all in doubt the sling must be discarded and a new replacement fitted. On inspection of a sling it should be possible to recognize the early signs of strap deterioration, so that wherever possible, the cause can be analyzed and corrective action initiated to prevent further damage and ultimate failure.

4.04 TYPICAL CAUSES AND RESULTS

4.04.1 Friction damage I - Burning

Overloading or wrong positioning of sling is the most frequent cause of this damage. When the webbing is pulled quickly over or along even smooth edges of very heavy goods, the heat created is so great that it melts the surface of the webbing. This damage is usually across the whole width of the webbing. The surface of the web will be hard and brittle to touch and will shine, easily reflecting light. The best way to examine the extent of the damage is to fold the webbing to see the extent of the burning. The sling should always be replaced.

4.04.2 **Friction damage II - Cutting**

Cuts result from unprotected sharp edges on the sling. The damage is similar to that of burning except that the cut may be clean or matted and soft in appearance. Examination for the extent of damage is the same for burning. It is common for a cut to be combined with surface burning, the sling should always be replaced.

4.01.3 **Friction damage III - Wear**

Damage from wear arises in localized areas only caused by dragging along the ground. A scuffed surface will appear in patches. If the scuffing is severe and whole threads are broken, the sling should always be replaced.

4.04.4 **Impact damage I - Unbroken load bearing threads**

Usually the longitude threads burst out from the middle or sides. If they are unbroken, there is no loss of strength. The threads can catch and break if left unattended, but they are easily repaired.

4.04.5 **Impact damage II - Broken load bearing threads**

Since the load bearing threads are broken, the strength of the webbing has decreased, very often at a higher degree than corresponds with the number of broken threads. It is imperative to replace this sling.

4.04.6 **Sling eye damage - Webbing burst at edges**

This damage is nearly always caused by using a hook with a radius smaller than the webbing width. The sling should always be replaced.

4.04.7 **Strop eye damage - Burst leather protection**

This damage only occurs when the S W L has been exceeded. The leather protection is easily repaired but close inspection of the rest of the sling is imperative

4.04.8 **Seam and stitch damage**

Particular attention should be paid to the condition of the sewn joints and seams. Where there is any identification of loose or torn stitching then the webbing straps should be replaced with manufacturers replacement part.

4.04.9 **Chemical damage**

The deleterious effect of chemicals on polyester or polyamide slings is difficult to judge. Some cannot be seen until in an advanced stage of deterioration. If there is the slightest doubt, the sling must be replaced.

5.0 **INSPECTION OF SHACKLES AND MASTER LINKS**

Examine all shackles and master links for mechanical damage. Pay attention to all screw threads. Where there is any sign of wear or damage then the complete shackle or master link should be replaced.

6.0 **HOT AIR GUN PROCEDURE** The general procedure for using a hot air gun is as follows:

6.01 Lay out air bag in clean dry and well lit conditions.

6.02 Select or cut a patch from the material supplied in the repair kit. To make an effective repair the patch should overlap by a minimum of 80mm (3 inches) around the damaged area.

6.03 Adjust the heat setting on the base of the hot air gun and switch on. Allow the gun to heat up thoroughly. The recommended setting for the heavy fabric is between 7 and 9.

- 6.04 Do some test welds to fine tune the heat setting. When pulling apart, one layer of P. V. should pull off leaving the polyester weave uncovered.
- 6.05 Clean the area to be patched as thoroughly as possible. A general P V C cleaning solvent should be used.

Position roller in the centre of the patch (see fig 1). Lift one edge and slide gun between patch and bag surface up to position of roller. Maintaining a firm and even pressure on the roller draw the gun carefully to the edge of patch while steadily following with the roller. Work this principle until the whole patch has been welded, always working from centre to edge. Care should be taken not to allow the nozzle to come into contact with the bag. Localized burning will result.

When the repair has been completed, heat edge of patch with gun, angling head of roller at approximately 45 degrees to chamfer the edge of patch to give a smooth finish.

Patches welded on the outside of the bag are generally found to be adequate, however where the patching area is restricted on the outside of the bag, a second patch inside is essential.

- 6.06 The hot air gun can be used for any splits/holes up to 8" or 200mm long, larger damage should be referred back to the manufacturer, especially where tears or cuts sever or partially sever any main seam or where size of the patch is restricted by valves, anchor tabs etc.

Hot air gun patches should extend no less than 80mm all the way round a repair for maximum strength.

7.0 **SAFE WORKING LOAD TEST**

- 7.01 To test the air bag to safe working load limits a suitable gantry or crane will be required together with a good water supply and load cell or gauge calibrated and certified to a recognized standard. Ensure test equipment is suitable for the loading required.
- 7.02 Suspend the air bag and load cell/gauge from the gantry and gradually fill with water to the required amount. During the filling process carry out a final inspection of the air bag to ensure there are no further leaks in the air bag skin and all the webbing straps, links and shackles come under tension in the correct fashion and are not twisted.

RECOMMENDATIONS FOR THE STORAGE OF LIFTING BAGS.

- 1) After use, the airbags should be washed in soapy water using a mild detergent. They should then be washed down with clean water to remove any remaining detergent.
- 2) After cleaning and prior to the next use, all airbags should be inspected as per the Inspection & Repair Section of this manual.
- 3) All airbags should be stored in a cool dry place, away from direct sunlight.

