

## **ENCLOSED CYLINDRICAL TYPE BAGS RIGGING & INSTALLATION**

When used correctly to lift a load, and with all the pressure relief valves operating, this type of bag is particularly suitable for shallow water due to its low profile and shallow draught.

A major problem with the parachute type bag is the danger of air loss on the surface, this problem has been overcome by the totally enclosed bag. These are fitted with one or more pressure relief valves, set to maintain a differential of 2 psi. These valves are extremely important to the successful operation of these bags, and their failure may cause a bag to rupture on or below the surface. Maintenance of the valves is therefore most important after use. The valves should be tested and valve diaphragms seen to be free to operate. For inflation, totally enclosed bags are generally fitted with ball type valves with lever handles. Great care is necessary in rigging to ensure that these handles do not foul the rigging lines, straps or samples.

The number of lifting points, pressure relief and inlet/outlet valves fitted are dependant on the size of the bag. When using lifting bags with multiple lifting points, it may be necessary to consider a lifting beam or 'strongback' to distribute the lift, hence minimizing bag distortion.

It is important to use totally enclosed bags with a total capacity slightly in excess of the load to be lifted. Always remember that a fully inflated lifting bag is not intended for a free untethered flight to the surface. The rapidly expanding air may overwhelm the pressure relief valves, causing the bag to rupture, in which case it is possible that the remaining buoyancy will allow the load to sink, and in a tide way, the load may drift to the bottom some distance away and even be lost. The pressure relief valves specified and used by J W Automarine Ltd will dump approximately 1.0 ft<sup>3</sup> of air per second, or 60 ft<sup>3</sup> per minute. Since the pressure relief valve is adjusted to maintain an internal pressure of 2 psi above ambient, the working pressure of these bags is 2 psi. When rigging and installing totally enclosed air bags it is most important to ensure that they are operated in the horizontal plane, +/- about 5°. Should they be inclined at more than 5° excessive tension will be placed on the cradle strap and securing panels to such an extent that the straps could tear away from the air bag.

### **TOTALLY ENCLOSED AIR BAGS SHOULD NEVER BE RIGGED IN THE VERTICAL POSITION.**

It is also most important to ensure that the various anchor points are kept the same distance apart and not tethered together on the same pick up point. Should it not be possible to achieve this, it is recommended that a steel beam or strongback be used (see drawings section), the airbag being connected to the various anchor points on the lifting beam and the load connected to the two lower anchor points. It is important to ensure that when the lifting bags are attached, they are trimmed and set correctly, each half-filled whilst a last check is made, after which they should be completely filled. Do not fill all the bags at one end together, but distribute the lift evenly around the object. When on the surface, an additional amount of buoyancy, equal to one third of that already used should be added as a safety factor, before commencing any sort of towing operation.

There is a requirement for some basic seamanship and an understanding of breaking strains when rigging lifting bags, which will certainly involve rope, wire and possibly chain, webbing slings, shackles, 'stoppers', hooks, thimbles and the like. When dealing with any natural or synthetic rope, wire or chain, each has a safe working limit (S.W.L) which is greatly influenced by the manner in which it is used. For instance, the minimum bending radius of most rope and cable is its diameter x 3: therefore, to pass a steel cable through a hole in a piece of steel plate 3/8 in thick, and shackle it to a 5 ton lifting bag, is asking for trouble. The wire will then have been reduced in strength by about 50%, and when the load is applied, will part, leaving the bag free to head for the surface. If the bags have to be anchored in this manner, then wood packing strips will help increase the diameter of the bend, alternatively increase the cable size to compensate or use a chain with appropriate size shackles instead of wire. In the same way, splices greatly reduce the strength of wire and rope, and knots and hitches in rope weaken its S W L by as much as 60 to 70%.

## **GENERAL HINTS ON THE USE OF TOTALLY ENCLOSED AIR BAGS**

The following notes are relevant:

- a) When rigging and installing totally enclosed air bags it is most important to ensure that they are operated in a horizontal plane. Should they be inclined at more than 5°, excessive tension will be placed on the cradle strap and securing panels to such an extent that the straps could tear away from the air bag.

### **TOTALLY ENCLOSED AIR BAGS SHOULD NEVER BE RIGGED IN THE VERTICAL POSITION**

- b) Always use a total lifting force at least equal to the weight of the load, but remember too little will not lift, too much may cause the load to ascend out of control or even be lost.
- c) Place the bags as to minimise stress differentials. Uneven lifting stress may well cause physical damage to the load as well as endanger the divers. Attach and inflate bags methodically when used in groups or clusters to avoid one forcing another to collapse.
- d) Do not allow a load to ascent at a rate faster than 2 - 3 feet per second.
- e) Bags should be inflated evenly on the load to prevent rolling or tipping.
- f) Use extreme caution when employing excess buoyancy to 'break-out' a load initially.
- g) When attached to the underside of a load, great care is necessary to ensure that air bags are not 'pinched' or 'strangled' as for example by the bilge of a vessel. In such cases, air will not be free to pass to all the bags, hence reducing the potential lift.
- h) Towing speed should be kept to 2 - 3 knots depending on sea state. Exceeding the recommended could cause pressure build up in front of the bag and reduce volume.
- i) After use, whether in salt or fresh water, the bags should be washed off, lightly scrubbed if necessary to remove mud, oil, tar etc, then hung up to dry. Inspect all the lifting strops carefully. Damaged straps or fastenings may govern the success or failure of the next task. It is almost impossible to avoid some damage, and straps showing exceptional wear should be replaced (refer to Inspection & Repair Section).