

CIVIL DEFENCE ORGANISATION  
SOUTH AUSTRALIA

HYDRAULIC RESCUE EQUIPMENT

THE REQUIREMENT

A very high proportion of all rescue tasks will, in the main, consist of opening voids or survival points where people are trapped inside. There are many ways in which the job can be done, but one of the simpler ways is to force the components of the void apart and thus provide a means of access.

NEW EQUIPMENT

In the past, this technique has been carried out with either a heavy house lifting jack or a very heavy lever. The more modern practice is to employ the tremendous mechanical advantage which is now available in the shape of a ram or one of two spreader attachments which can be coupled to a standard type of hydraulic pump. The power per weight of equipment can be readily appreciated by the fact that a pump and ram weighing approximately 20 lbs. can lift a load of 10 tons.

CONTENTS OF KIT

The Hydraulic Rescue Kit consists of the following major items:

2 x Hydraulic pumps	1 x Alligator spreader
2 x 6ft. lengths of pressure hose	2 x Flat base plates
2 x rams of 10 ton capacity	2 x Ram toes
2 x screwed adaptors for Rams	2 x Plunger toes
1 x Wedge spreader	

It will be noted that each set has two basic jacking units. i.e., two pumps and two rams and the various fittings for each ram. In addition there is provided one wedge spreader and one alligator spreader. The reason for this is that there will be a number of jobs where two jacks working simultaneously will have to be used, but relatively few occasions where two of the same type of spreader are required together.

METHOD OF OPERATION

The apparatus is operated by oil pressure from the pump through one, or more, lengths of hose to the ram and its accessories, or to the spreaders.

The various items comprising the kit can be connected or disconnected by finger operated screw couplers. No tools are required. When the lifting or spreading attachment has been coupled to the hose, power is applied simply by operating the hand lever on the pump.

NOTE: If undue force has to be applied to the operating handle when the ram or spreaders are near the end of their travel, cease pumping immediately otherwise damage to the equipment may occur. The Australian pump has an inbuilt relief valve but too much reliance should not be placed upon it, especially when using either of the spreaders or when the ram plunger is near the end of its travel.

THE COMPONENTS

Pump: Hand operated, normal working position flat on floor with foot on foot plate, can be used in any position except with oil reservoir pointing downwards, i.e. hose connection uppermost. Operating lever has metal clip to secure it in position so lever may be used as a carrying handle.



On the right hand side of the pump is located the release valve wheel. This must be tight when the load is being lifted and unscrewed a couple of turns when the time comes for the ram or spreader to be closed up. Lowering can be very finely adjusted by use of this wheel.

On the head of the pump is also located the relieve valve. This only operates when the weight lifted by the ram (and only the ram) exceeds the safe working load of the equipment. i.e. 10 tons. When a marginal load is being lifted on the ram this valve should be carefully watched - any flow of oil from it indicates the load has been exceeded, and an alternative means of lifting must be found, e.g. the use of two pumps and rams on the same job.

Ram: This is simply a compact metal cylinder weighing about 5 lbs. out of which extends a metal plunger when oil is pumped in under pressure. When closed up the overall height is  $4\frac{1}{4}$  inches full extension is  $6\frac{1}{4}$  ins. Although this lift seems extremely small it does enable the ram to be operated in very confined spaces initially, and by the normal process of packing as the operation proceeds an 8 to 10 inch opening can be rapidly achieved. Using the ram itself on a vertical lift, 10 tons is the limit. If, however, the base plate and ram toe or the plunger toe and ram toe are being used, a load of not more than 5 tons should be applied. This is because the load is being lifted on one side of the central axis and a bending movement is set up in the ram.

Hose: 6 ft. lengths with a male coupler at one end, and a female coupler at the other. Hoses are interchangeable and are pre-charged with oil ready for immediate use. A slight seepage of oil is of no consequence when couplings are being made or broken. Great care should be taken to ensure inner washers are not displaced or lost and that no dust or grit enters the system when coupling up.

Base Plate, Screwed Adaptor and Serated Saddle:

The serated saddle is the normal head for the plunger. It is simply a push fit into the hollow shaft of the plunger and is interchangeable with the screwed adaptor. Thread on this adaptor will screw into either the plunger toe or base plate; with the base plate fitted and the ram inverted the load to be lifted is spread over a much wider area.

Ram Toe: Is a collar which screws on the top of the ram cylinder and has a lifting lug projecting from it. When used in conjunction with the base plate, jacking can commence from an opening about 2" high, instead of the  $4\frac{1}{4}$ " required for the straight ram.

Plunger Toe: Screws onto the screwed adaptor and when used with the ram toe provides a very useful type of spreader. Experience will dictate which one of these many combinations is the correct one for the job.

Wedge Spreader: Where clearances for operating the ram are nil, this wedge can be carefully driven in and then power applied to it with the pump. An initial lift of about  $2\frac{1}{2}$ " can be achieved but the weight at the tips of the wedge must not exceed 15 cwt.

Alligator Spreader: This screws onto the top of the ram body and is an enlarged version of the wedge. When fitting, the serated saddle is removed from the ram and the push rod of the alligator spreader inserted into the hole in the ram plunger. This is important. Check and see that it is so.

When closed, the spreader requires an opening of  $1\frac{1}{4}$ ", but has a maximum opening of 1'. The weight on the tips of the jaws should not exceed 1 ton.



## MAINTENANCE

Oil Check: From time to time the oil level in the pump should be checked. This is done by holding the pump vertically and removing the screw at the rear of the oil reservoir. A dip stick is attached to the screw and if necessary, oil should be added to bring the level up to the notch on the stick. Do not over fill as air space must be left in the reservoir to allow the pump to function.

NOTE: Only good quality Hydraulic Jack Oil should be used for topping up. Hydraulic Brake Fluid or engine oil should NOT be used. However, in cases of extreme emergency, any non-viscous liquid can be used, e.g. SAE 10 motor oil, or even water. If this has occurred, the whole system should be drained at the earliest opportunity.

AIR IN THE SYSTEM: Should air get into the system it will not function effectively. Difficulty will be encountered in getting the ram or spreaders to extend or hold their extended position. Air should be expelled in the following way:

- (i) Connect ram to pump and fully extend it.
- (ii) Open release valve.
- (iii) Invert ram and push down on plunger until fully collapsed.
- (iv) Close release valve.
- (v) With pump vertical (hose end downwards) give 8 to 12 rapid strokes.

Repeat the procedure if necessary.

Blank Caps: Whenever any item of kit is not in use, the blank cap should be screwed into the coupler to protect the valves from dirt or grit.

Accessories: Apart from keeping all screw threads clean and oiling the moving parts of the wedge and alligator spreaders, no maintenance is called for.

## SPECIAL FEATURES OF THE EQUIPMENT

The entire kit is very light and portable considering the fact that the two rams have a combined lifting capacity of 20 tons.

The pump permits very selective control over lifting and lowering.

The flexible hose allows the power tools (ram and spreaders) to be operated in a position that may be inaccessible for normal type jacking equipment. It also allows the operator to keep well clear of the actual job.

The ram and spreaders will work upside down, sideways, any way. They are still equally effective.

It is important to realise that the hydraulic rescue set is not only an extremely efficient lifter, but is also just an effective pusher.

## CONCLUSION

The purpose of this precis has been to outline the need for, and the use of the hydraulic rescue kit. It is pointed out that no attempt has been made to give detailed information as to how the equipment is used in the infinitely variable field of rescue work. Practical training is essential if the rescuers are to become completely familiar with the wide range of problems the hydraulic rescue kit can solve.



NOTES ON CARE AND PROTECTION OF EQUIPMENTI - COMPONENTS

COMPONENT	SYMPTOMS OF TROUBLE	POSSIBLE CAUSE AND REMEDY
Hydraulic Push Rams	Oil leaks around plunger.	<p>1. <u>Ram has been heavily loaded off centre.</u> Workshop repair - probably new plunger and cups needed. Precaution - <u>always</u> ensure that the whole face of the saddle is in contact with the object.</p> <p>2. <u>Dirt or grit has got into the valve.</u> Remedy - clean inside couple pump ram up about 1", disconnect hose and depress the valve spindle and press the plunger down to force oil through the valve to clear the seat.</p>
Hydraulic Pumps	Fails to deliver oil.	<p>1. <u>Suction valve sticks open.</u> Remedy is to free ball with pump held horizontal - give sharp tap on operating beam with piece of wood if necessary.</p> <p>2. <u>Shortage of oil.</u> Indication of this is if pump will only operate with hose end pointing downwards. Remedy is to top up oil to correct level as seen on dip-stick.</p> <p>3. <u>Overfilled with oil.</u> Remedy is to adjust level by removing surplus. <u>Precaution</u> - <u>Never</u> overfill reservoir. An air space is essential to enable oil to be drawn off by the pump unit.</p>
Hoses	Oil leaks by Sealing valves.	<p><u>Generally due to the penetration of dirt on to the valve seat.</u></p> <p>Remedy - as for rams, i.e., connect to pump and flush with valve pushed open. <u>Precaution</u> - always replace plugs and caps (after wiping away any dirt) <u>immediately</u> following disconnecting.</p>

Notes:

- (a) Hoses are built on a double-wire braided casing, and, should a puncture occur, the casing will gradually bulge out like a tennis ball as pressure is gradually released.
- (b) Never disconnect the hoses while the ram is under load. The valves are not designed to hold the heavy pressures generated in the system.



NOTES ON CARE AND PROTECTION OF EQUIPMENT

II - ATTACHMENTS

- Base Plates As far as practicable, always see that these are placed on or against a flat surface. They are a malleable casing and will bend to a certain extent, but, if too heavily loaded off-centre, may fracture.
- Spreader Ram Toes If the spreader ram toes are used, a load of not more than five tons should be applied. This is because the load is being lifted on one side of the central axis and on bending movement is set up in the ram. They are malleable castings, but care should be taken to see that they (also the base plates) are screwed right home before load is applied.
- Wedge Spreader Coupler should be cleaned and plugs replaced immediately after use. An occasional light oiling of the pivot pin will keep wear to a minimum. Will accept full pressure of the pump. Overload by abusive use of pump may cause cup to turn-over and jaws will not return. Oil leaks from built-in hydraulic unit is a major workshop repair.
- Alligator Spreader Accepts full pressure of ram. Abusive use of pump (i.e. extending pump handle, or two men working together) will cause arms and connecting links to bend. Remedy is replacement. Light oiling of pivot pins is recommended. Keep push rod clean. Always see that spreader is fully screwed home in the ram body.

ALWAYS KEEP THE EQUIPMENT CLEAN AND THE PUMP RESERVOIR  
TOPPED UP TO DIP-STICK LEVEL. A GOOD QUALITY HYDRAULIC  
JACK OIL SHOULD BE USED WHEN TOPPING UP OR REFILLING THE  
PUMP.

-----oOo-----