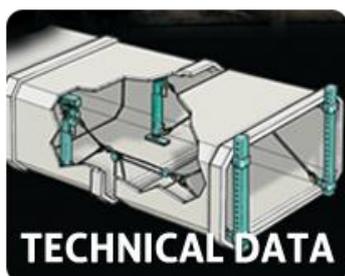


Operating Instructions for The Bristol Bulldog



Lifting Gear & Safety offer an exclusive system for closing concrete box section culvert units together.

The **Bristol Bulldog** saves considerable time compared to traditional methods and is particularly effective for the installation of long culvert runs where accuracy and steerability is an issue.

The Bulldog system comprises four key items:

- [1] The Anchor itself which grips inside the culvert unit
- [2] The Soldier which bears on the outside of the joining unit
- [3] A Lever Hoist which generates closing power
- [4] Connecting double legged slings.

Key Features

- Adjustable height – fits almost any culvert
- Robust design – ideal for Civil Engineering environment
- Simple to understand components – makes rigging & operating easier and faster
- Uses Lever Hoists – enables power generation in the confined area of a culvert unit
- Portable – for easy movement around sites

Advantages

- When two systems are used (as shown above) the box section becomes very slightly ‘steerable’ which assists aligning and could be critical if the culvert run needs to follow non-straight lines.
- The units can be placed close to the culvert side walls (their strongest point) reducing any possibility of damage to the culvert.
- The Bulldog can work near to the mouth of the culvert run which, whilst making access easier, allows for non straight-line culvert runs.

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- Description of kit
- General Bulldog notes
- Basic Safety Instructions
- Setting up and usage.

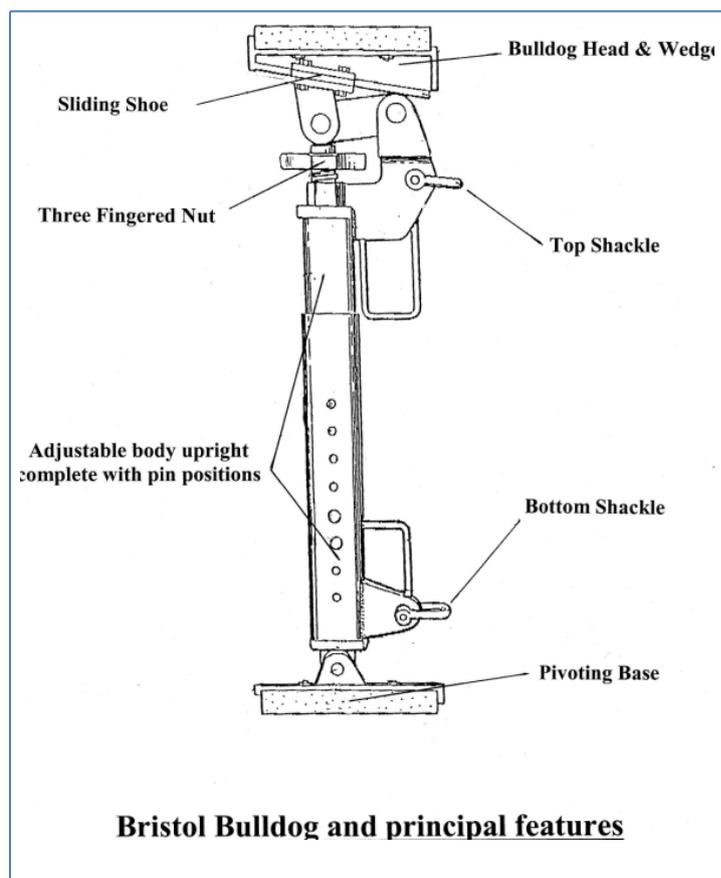
Introduction

The Bristol Bulldog refers to a system for the closing of Rectangular Box section concrete culvert units, however the 'Bulldog' itself is generally recognised as the Anchor part that grips inside the culvert against the floor and ceiling.

Although the Bulldog is a simple concept, employing basic mechanical principles, the equipment **should not be operated** without the user having first read these instructions.

In case of any doubt – do not proceed. Please contact Lifting Gear & Safety on 01.179,714.883 – who will be only too pleased to help.

Essentially the Bulldog is an adjustable prop, the body of which is made from rectangular hollow section steel. It has a sliding shoe that runs on a tapered wedge at both head and foot each of which are lined with robust timber sections to offer a frictional interface between the sliding shoe and the concrete of the culvert.



When the Bulldog is in position inside the prime culvert, the idea is that the sliding shoe will travel up the slope of the wedge as load is applied. This will continue until totally restricted by the internal height constraints of the box culvert.

At this point, the Bulldog is wedged in so that no more movement is possible and the Bulldog effectively becomes a fixed anchor point.

Of course, the double legged slings provided will have been secured to both top and bottom shackles so that the effort exerted by the Lever Hoist will transmit through the master link of the slings and thus spread to the shackle points.

The double legged sling connects to a Lever Hoist which in turn has another double legged sling secured to it's other hook. This second sling radiates to adjustable anchorage points on a soldier (Rectangular box section) which bears on the outer edge of the joining culvert section. As effort is applied to the system, the joining culvert is drawn to the prime unit. A jointing strip (Tocstrip or similar) is a sealing compound placed between the female end of one culvert to the male end of another.

When the joining culvert is drawn onto the existing one, the compound (usually warmed on application) is compressed until the compacted dimension meets the manufacturers recommendations and thus forms a seal between the two units – in other words, a sort of Gasket for Concrete. 'Curing times as recommended by the sealant manufacturers should be observed.

Unless otherwise advised, a rule of thumb of 1 tonne per linear metre of the culvert section is the effort typically required to join two units. As an example, taking a culvert of dimensions of 1.5 metres high x 2.5 metres wide will give a linear dimension of 8 metres and thus will require a compaction effort of 8 tonnes.

When the two units have been joined together, the Bulldog can be moved forward to a new position – or – it could be left in place. In this latter case, the contractor will save the work of re-positioning the Bulldog but will find himself short in respect of the new and greater distance between Bulldog & Soldier. To cater for this LGS offer single legged chain slings fitted with length adjusters to minimise the chain travel required of the Lever Hoist.

Some culverts have a central ‘gully’ which will mean that the floor each side of it slopes from the culvert side walls down to the gully. The Bulldog can cope with this slope when fitted with alternative tapered timber feet (See special instruction to cover this situation - below)

If the size of the culvert units exceeds the capacity of the Bulldogs, it will be necessary to use extra Bulldogs and – to maintain even loadings – sheave blocks and extra slings. (Please refer to page 10)

The Bulldog can also be used for joining circular concrete pipes . Should the pipes be too small for the Bulldog, LGS have a derivative of the Bulldog – please ask for details of the Bristol Bantam.

Finally, it could be that the internal height of the culvert is too low that a problem arises in getting an operator inside the culvert without compromising comfort and safety. For this situation, LGS offer what we call “the Chair” which bears on the outside of the culvert in the same way as a Soldier. Not too much imagination has gone into the naming of the Chair – which looks like a chair ! (without seat padding). To enable exterior operation of the Lever Hoist, it is connected to a load bearing crossbar (in the inside of the knee position of a standard straight back upright chair) allowing the operator to work the Lever Hoist from a safe position outside of the culvert (see page 11)

Special Instruction for Bulldogs with angled feet for sloping floors

Just to be extra safe, it’s a good idea to cut a scaffold board (or similar) to ‘space’ between the Bulldog feet and avert any possibility of the feet from edging down the slope.

Description of the kit (Definitions)

The Bristol Bulldog

Conceived in Bristol ~ simple, strong and with good bite. The Bulldog is essentially an internal prop with timber lined shoes at the head and at the base. The head of the Bulldog comprises a sliding shoe which runs up a tapered wedge. Once in position the prop becomes tighter as more load is imposed upon it.

The Soldier

The Soldier is a prop which is placed onto the outside face of the joining culvert section. It is made from rectangular hollow section tube and has a series of holes at both top and bottom to allow repositioning of the sliders.

The Slider

The Slider is a short tubular section – also of RHS – centrally drilled, which slides up and down the Soldier. It is positioned on the Soldier and retained by a cross bolt & nut. The Slider incorporates a shackle location point.

Double Legged Sling

A double legged sling – normally wire rope but could be chain – that has a central main master link and which terminates in shackles. The shackles locate to the lugs on the sliders and to the shackle points on the Bulldog. The slings thus connect both Bulldog & Soldier to the centrally placed Lever Hoist.

Lever Hoist.

Sometimes also known as a Pullift, the Lever Hoist is the mechanical means by which effort is applied to bring the culvert units together. The unit works, as its name suggests, by operating a lever (set to forward or reverse) which – through gearing – drives a chain sprocket wheel. Lever Hoists are normally fitted with link chain to give approximately 1.5 metres of travel and are fitted at the head of the unit and at the end of the chain, with a safety hook. (Individual Lever Hoists may vary slightly in their features, but all do the same work – please see separate operating instructions)

Shackle

A Dee or Bow shaped forged connector which will be complete with a Screwed collar Pin. This is the connecting piece to Bulldog & Slider lugs.

The Chair.

The Chair is a fabricated structure not unlike the frame of an outsize high-backed dining room chair – with seat and upholstery removed. From the cross bar that would go ‘under the knees’ there are different location levels to suit different height culvert centres. The Chair is used with either a moveable anchor plate which locates to tooth-cut anchor points, or with a Round sling which will be fitted to one of the cross bars. (Note: this sling will be ‘wrapped around and around the cross bar such that the final ‘eye’ is central and close to the cross bar. The ‘wrap’ of the sling ensures that the imposed load is spread along the restraining cross bar)

General Bulldog Safety Notes

We can claim that the Bulldog system is 'light weight' and this is true by comparison to other equipment used in Civil Engineering. It does not mean that the components are necessarily light in terms of their own self weight and care should be taken to comply with Manual Handling Regulations when supporting, lifting and moving the equipment. By the nature of the beast and the need for slideable pivoting features, the handler must ensure that care is taken to avoid trapped fingers etc.

Given that the equipment is fabricated from robust steel components, to perform its function the user must recognise that its self weight must be respected and that, unsupported & unloaded, it cannot be self standing. Therefore – **at all times** – sufficient site personnel must support the Bulldog during rigging and de-rigging operations to prevent the unit falling whilst unloaded.

Like handling any steelwork sections, care must be taken by the operator not to place himself in a position of danger – should the steelwork become unsupported and thus unstable. This also applies to Soldiers when the load has been released. Under load and when bearing against the ends of the culverts, the soldier cannot move however, when that load is released they must be supported so as to prevent them naturally falling away.

The Bulldog 'Head' must always be at the top of the unit with the non sliding foot at the base.

It is important that the slings used with the Bulldogs and Soldiers, are of an appropriate length and are not so short as to create an inclusive angle of more than 90 degrees. To do so would have the effect of trying to pull down the all important wedge and foot ~ thus reducing the grip that is made with the concrete floor and roof.

It is important to ensure that the whole of the taper is available for use and thus vital that – when pulling begins – the sliding shoe is at the lowest point of the tapered section.

When setting the sliders on the soldiers, always ensure that they are as far apart as possible, i.e. as close as possible to both floor and roof. This is to ensure that no bending takes place in the soldier.

Do not attempt to try to compact more than one culvert at a time. The resistance offered by extra 'in line' culverts is cumulative and thus will exceed the capacity of the Bulldog assembly. Another reason for closing only one unit at a time is that the Bulldog does offer a degree of steerage which would be nullified by trying to close multiple units.

Foreword to Instructions for Setting Up

Used correctly, the Bristol Bulldog system has consistently shown that it can be used to install culvert sections in a very short time. It has to be realised however, that whilst the Bulldog is quick and simple, it is nonetheless made from robust steel sections and therefore requires careful and thoughtful effort to set it up.

One of the 'selling points' for using the Bulldog system is that its use will significantly reduce the cost of expensive crane hire and of course attendant labour. This does not mean that the Bulldog is labour free and will require such manpower as to make its erection and dismantling easy, and above all – safe.

This is especially important on larger set-ups, for example 3 metre units – or two Bulldog applications. Without doubt, the installation of culverts of such a size that more than 12 tonnes is required for compaction, will need increased labour for safety reasons. In so saying, we would suggest that when installing exceptional sized culverts, it is a reasonable expectation that their safe and accurate positioning will take up increased resource

Setting up.

In a standard culvert pulling exercise and in order to achieve an effective even pull, two Bulldog arrangements will be deployed, i.e one on each internal side of the culvert – each being a mirror of the other. Therefore, it is only necessary to describe one side.

It is assumed that the Basic Safety Instructions will have been read and understood.

Once the operator has used the Bulldog and become fully conversant with it, he will doubtless introduce some procedures of his own and indeed, we at LGS are always pleased to receive feedback and suggestions from users who will by their very nature, have gained more 'on the job' practical experience. However, the following describes appropriate steps that will establish a safe method.

- 1 Place the Bulldog adjacent to a side wall. The strongest part of the culvert will be next to the side walls and siting the bulldog here avoids any potential for damage to the culvert roof whilst at the same time giving better 'steerage' of the joining culvert section.
- 2 The Bulldog should have plenty of 'floor' both behind it and in front. Unlike standing on a wet sandy beach where the effect of pressure applied by body weight can be seen by the way the retained water in the sand changes its colour, the pressure generated through the Bulldogs wooden pads cannot be seen on solid concrete but of course, it is there. Having the Bulldog in a fairly central position (i.e not right at the mouth of the culvert) allows pressure to radiate over a wider area.
- 3 Position the foot in line with the direction of pull and lean the Bulldog back slightly so that, as the pull is taken and the shoe slides up the wedge guide, the unit will be vertical. (Always strive to allow the shoe as much 'travel' as possible to gain maximum gripping effort)

- 4 Adjust the approximate height of the Bulldog by use of the bolts that locate in the drilled holes up the sides of the Bulldogs inner and outer box sections.
- 5 In setting the Bulldog up, place the shoe so that it is at the lowest point of the slope
- 6 Run the 3-fingered nut by hand until the ball end of the large screwed stud comes to bear on the under pad of the Bulldog head. Then – using a lump hammer, tap the nut until it is clear that a ‘bite’ has been taken. (There is no need to overdo this and a lump hammer is quite sufficient – do not use a sledge hammer !)
- 7 Now with the Bulldog in a fixed position, but still having support labour on hand to make sure it stays there, connect a double legged sling to the shackle location holes – making sure that the angle between the sling legs does not exceed 90 degrees.
- 8 Attach the master ring of the sling to the top hook of the Lever Hoist and extend its chain toward the culvert opening – (when connecting the Lever Hoist to both sling master links - take care to make sure that the Lever Hoist chain is not twisted.
- 9 Place a soldier vertically against the far open end of the culvert section to be joined and make sure that the sliders are as close to roof and floor as the adjusting holes will allow. At all times, ensure that this soldier is supported – especially under no load conditions.
- 10 Attach a double legged sling to the location holes on the soldier’s sliders and fix that slings master link over the free Lever Hoist hook.
- 11 Begin to take up the slack – gently – making sure that the shoe is where placed (at the low point of the slope), As you take the load, the shoe will begin to travel up the slope but, although well greased, please remember that shoe and wedge have a metal to metal interface. Accordingly, the travel of the shoe up the slope cannot be expected to be smooth and some jerking may be experienced.
- 12 Before coming to full load, check to make sure that the assembly satisfies all requirements, i.e. shoe not over centre on wedge, sling legs equal and not twisted
- 13 Take the pull and follow instructions regarding closure of the compound. It is important that there is good communication between the operators and the person overseeing the closure – so that each knows how the general pull is going. It is also a good thing to have both sides closing at the same rate although final inspection of the distance between the male and female culvert faces will determine that the pull on each side will be the same.
- 14 With the units both closed, leave with the load on for the required period of time as specified by the jointing manufacturers.
- 15 When unloading the system, ensure that all personnel are clear of the end soldiers unless specifically detailed to hold them upright and in place until they can be safely dismantled. Unsupported soldier sections will not by themselves, stand safely upright.

- 16 Once the load is off the system, it is very likely that the Bulldog will remain wedged in position. It is important to have the Bulldog supported when disengaging the head. To disengage the head, tap the 3-fingered nut with the lump hammer until it becomes free and run it a little way back into its housing. Although the nut may have been released, the head may still be wedged against the ceiling. If this is the case, it will be necessary to use the lump hammer to free the head.
- 17 When lowering and moving the equipment, take care to keep fingers away from any articulating parts.

One or two useful tips

Despite the weight of the concrete culvert sections, we are considering a load moving in the horizontal plane. Therefore the job will be made easier if efforts are made to reduce the friction between ground and culvert and of course, any build-up of other material gathered by the leading edge of the joining culvert. A smooth ground surface is essential but is made far better by placing thin ply sheeting beneath the culvert unit. A light dressing of sand will help further since it reduces friction and aids sliding.

Unit 2 might be the same weight as Unit 1 to which it is joining. To be certain that it is unit 2 that does the travelling, you could place Unit 3 on top of unit 1 to increase its ground weight.

If at the start of the line, the distance covered by Bulldog, slings and Lever Hoist is such that it is longer than two culvert sections, a further 'dry' culvert section (ie free of jointing strip) could be placed at the far end of the line so as to act as a spacer.

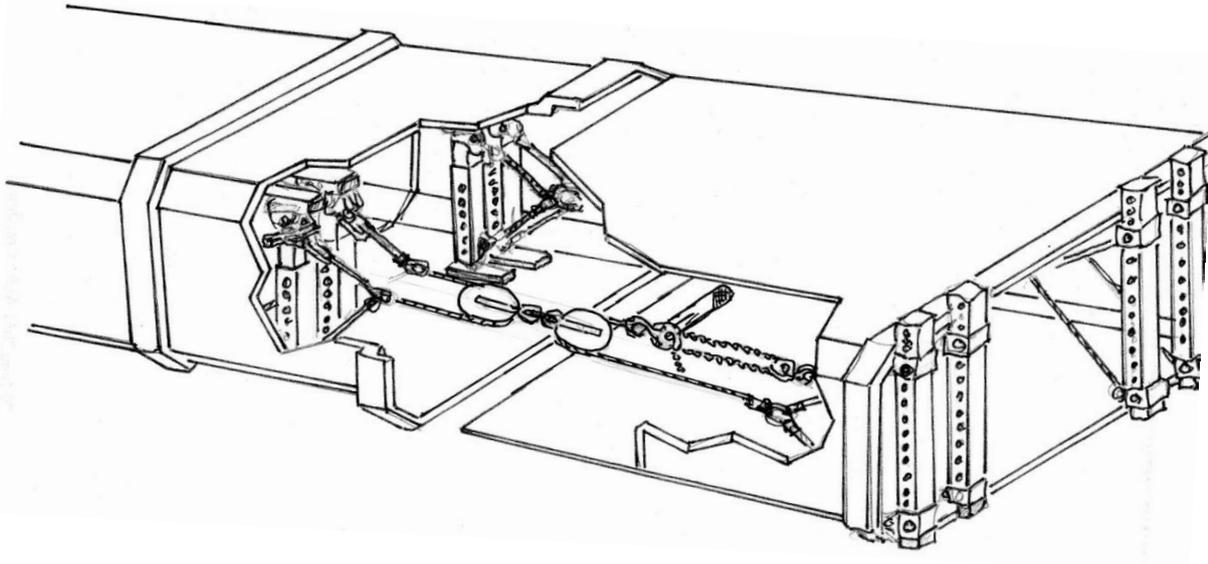
In culvert runs (typically storm water holding tanks) with two closed end culverts, Bulldogs may be used back to back, i.e. facing each other.

Although only one culvert section may be pulled at a time, for convenience, it is quite possible to leave the Bulldog in position but continue to extend the soldier position to the outside of new culvert units by using an adjustable chain sling. The chain sling may be 6 metres for example and will be fitted with a master link at one end & safety hook the other. The master link will be supplied with an integral shortening clutch and this enables the user to adjust the length to suit the distance required.

BASIC DO'S AND DON'TS

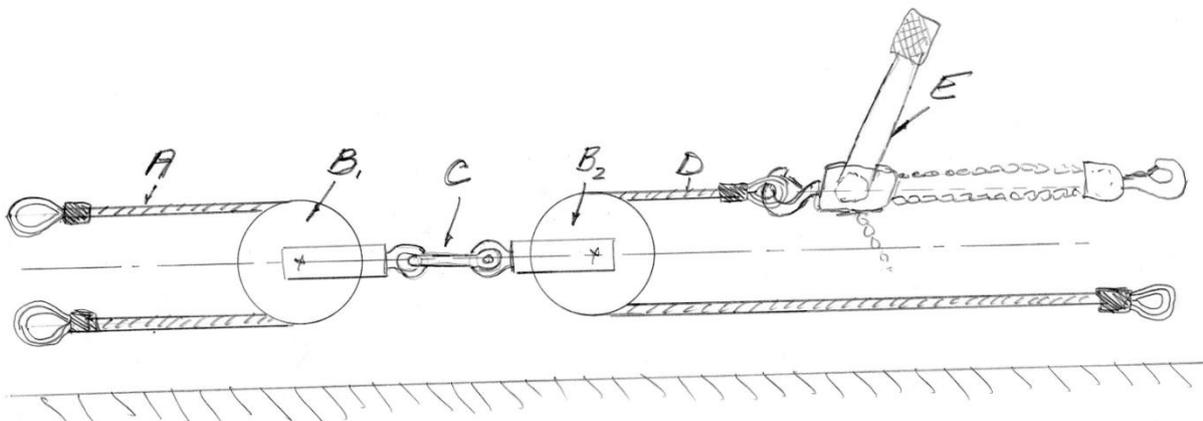
1. DO make sure that the floor area on which the Bulldog will be mounted, is free from grit, rubble and any items that would hinder the full interface of the foot on the floor.
2. DO make sure that the working area is clear and free of other tools and equipment that might be a hazard.
3. DO make sure that only those persons engaged in the compaction of culvert sections are in the working area – and that those people are fully conversant with all of the instructions.
4. DO make sure that the path of the shoes on the Bulldog Wedge, is clean and free of grit and is well greased.
5. DO make sure that the top of the screw and the thread itself are well greased.
6. DO make sure that the timber friction pads are always fully seated (full face) onto the concrete.
7. DO make sure that the sliders are always at the low part of the taper when starting a pull to make sure that gain the maximum travel possible.
8. DO make sure that the Bulldog is aligned with the direction of pull.
9. DO make sure that, when disengaging the Bulldog, clean lump hammer blows are struck 'face on' to the fingers of the nut. Use only necessary force.
10. DO make sure that, when moving or handling the Bulldog, fingers are always kept away from the articulating grip pads, (Of essence, the Bulldog head must be free to articulate which inevitably presents a risk potential)
11. DO make sure that the Bulldog is fully supported when both rigging and de-rigging This means that one operator needs to ensure the unit is upright whilst another engages or disengages it.
12. DO make sure that sling legs are not twisted and that, when rigged, they are equal in length.
13. DO make sure a pair of suitable steps are available for the rigging and de-rigging of tall Bulldogs.
14. DO make sure that, when striking the nut or Bulldog head, only a Lump Hammer is used.
15. DO NOT – ever – use a sledge hammer.
16. DO NOT drag the Bulldog with the timber pads face down on concrete.
17. DO NOT exceed the rated capacity of the Bulldog of 6 tonnef
18. DO NOT use the Bulldog for lifting purposes

Using Bulldogs in Tandem



Please excuse the poor sketchwork of the above illustration. What it tries to show is the arrangement of Snatch Blocks and wire slings that resolve different loads on the Bulldogs such that their exact positioning is not crucial. Of course, they need to be in a reasonably logical position but the arrangement ensures even loading if they are not.

It also means that the increased load required and spread over two Bulldogs can be applied using only one Lever Hoist (placed away from the wall for ease of operation)



The sketch above shows the short wire rope stop (A) which (by shackles on the thimbles) connects to the master link of the double legged sling and thus to the Bulldog. The fact that it passes around snatch block (B1) means that the wire stop will take up a position with possibly unequal sides (as they come off the block) to compensate for the Bulldogs being in slightly different places.

A Shackle connects the two snatch blocks and must be able to take the full load since (unlike the wire) the load is not shared on two parts.

On the other side of the arrangement, more distance is needed to accommodate the lever hoist. For this reason, wire stop (D) will perform as per (A) but will only have a short part coming off the inside of the block (B2). The effect of the load applied through the lever hoist (E) will double the load through the shackle as mentioned above.

The Chair

Bearing in mind that site safety demands that protective footwear will be worn, as well as a hard hat – it’s not difficult to see that the operators effective height will be somewhat in excess of his/her normal height. Accordingly, when the culvert units are quite low ~ say 1.2 metres ~ it is impractical to commit operators to being inside the culvert whilst closing takes place.

Using the example of a 1.2 metre (4-ft) culvert, the centre line of the sling will clearly be only 0.6 metres (2-ft) which gives the operator the problem of working the handle of the lever hoist whilst having only a small radius to swing the handle. Furthermore they will be in the kneeling position which is hardly comfortable when applying serious effort to the lever hoist handle. The problem shouts for the operator to be safely outside the culvert.

Although the Bulldog itself still requires setting up inside the culvert, at least the business of operating the system, can be done in fresh air. To achieve this, LGS offer the “Chair” (Described in “definitions”)

Method.

Set up the Bulldog as per “Setting up” and attach the safety hook at the end of the Lever Hoist chain.

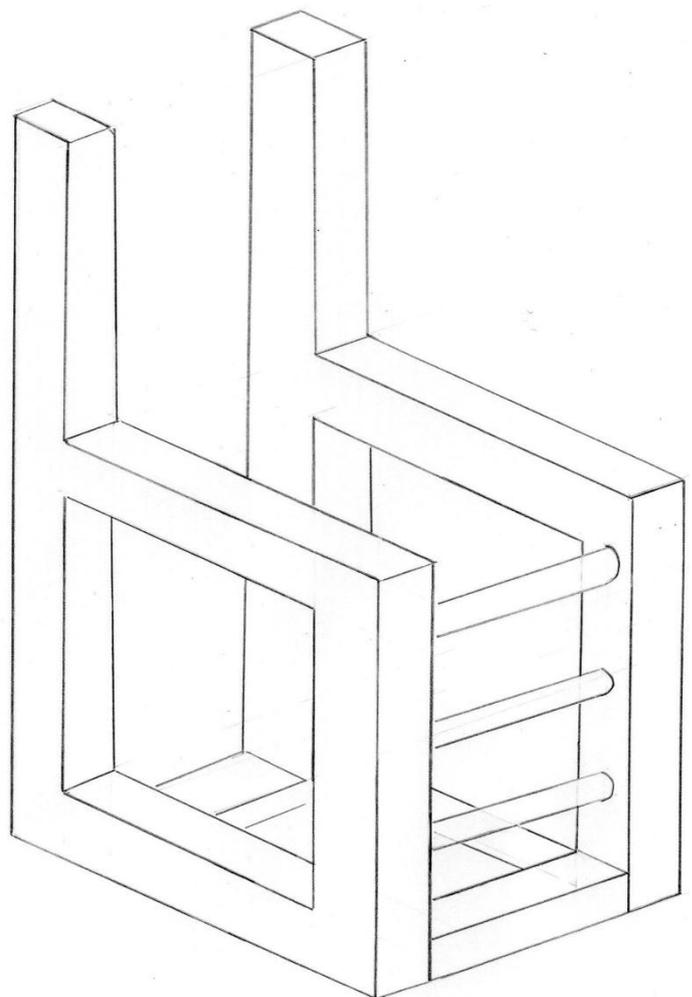
Let the chain out to the required distance between the master link of the double legged sling and the cross bar of the chair (Select the nearest height). Now wrap the round sling provided around a restraint crossbar and overlap the ends until an ‘eye’ is achieved close to the bar. This should mean that the round sling has been spread along the bar and will bring the body and handle of the lever hoist to easy operating reach.

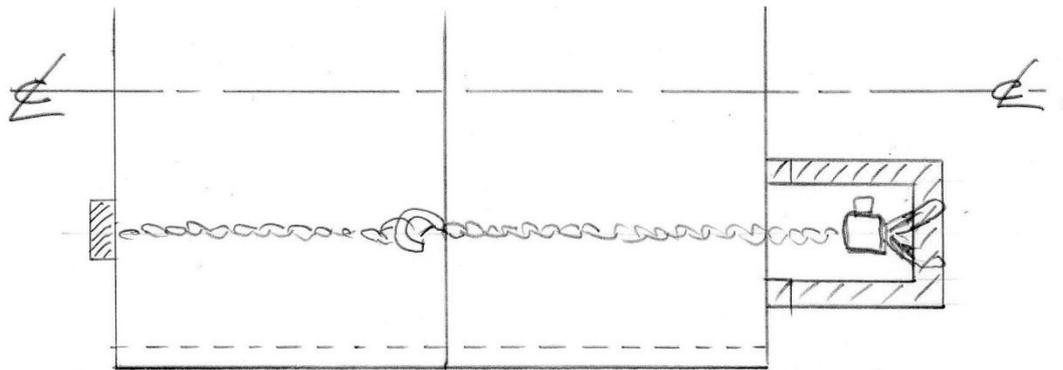
Once set up, the back of the chair will bear on the face of the culvert and, with the load applied, will force closure of the joint as before.

When the joint has been made, the rig is dismantled and the chairs can be lifted or slid out of the way to allow the next culvert unit to be placed.

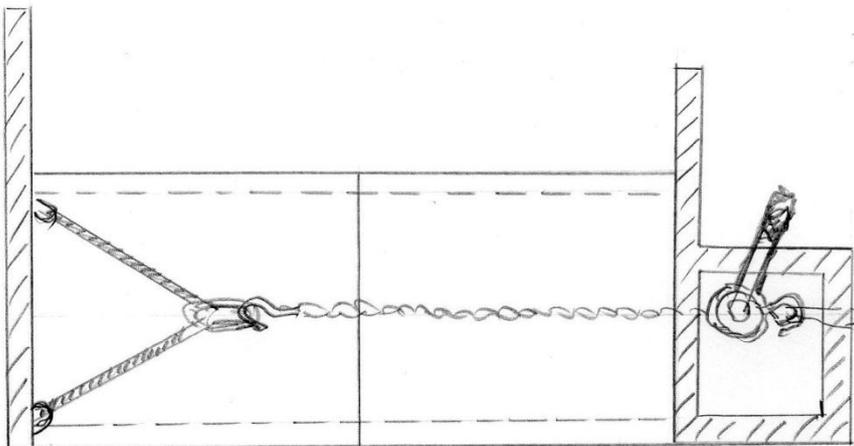
(Note that on some chairs, a rack is provided which does not require a round sling)

Please also see following sketches of a typical Chair rig.

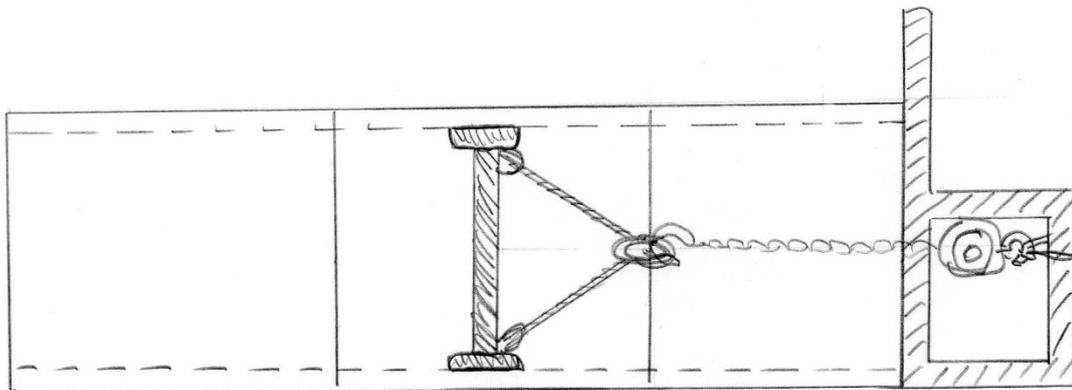




PLAN VIEW OF JOINING OF FIRST TWO SECTIONS
(CHAIN + SHACKLE ON ONE SIDE - REPEAT OTHER SIDE)



SIDE VIEW .



SIDE VIEW WITH BULLDOZER PLACED AS PROGRESSIVE ANCHOR

And finally –

**if you are in any doubt at all – do not proceed
but ring LGS (Lifting Gear & Safety) on**

01.179.714.883