INSTALLATION OF ROCLA LARGE DIAMETER CONCRETE PIPES

This bulletin deals with the handling, transport and installation of large diameter concrete pipes (i.e. pipe larger than 1800mm diameter). It should be read in conjunction with Australian Standard AS3725-1989.

HANDLING AND STORAGE

If a pipe is provided with a lifting hole, a lifting device, which passes through the pipe wall and distributes the supported mass along the inside barrel of the pipe may be used.

The most effective lifting device, provided it is correctly designed and properly maintained, for use with ~ lifting hole consists of a threaded steel eyebolt with a wing-type nut and a steel or timber bearing block usually not less than 150mm wide. A timber bearing block is fre¬quently fitted with a steel pressure plate under the nut.

Safe working loads on eyebolts with a metric thread are:

Nominal size of eyebolt (Thread Size)	S.W.L. (tonnes)
M36	2.7
M42	3.8
M48	5.0
M56	6.9
M64	9.2

Reference: A.S. 2317-1979. Table A-1

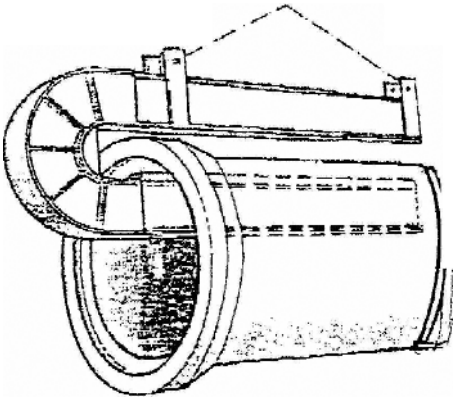
If a specially designed lifting device is not available, a single-fall wire rope sling, passed through the lifting hole may be used for lifting the smaller diameter pipes. A steel bar through the lower loop of the sling completes the lifting assembly.

Safe working loads for 6/24 construction, 1570 grade, galvanised wire rope single-fall slings are:

Wire size (diameter) mm	S.W.L. tonnes
22	3,6
24	4,2
26	50
78	5,8
32	7,6

Reference: A.S. 1666-1976, Table B-1. Adjusted for factor of safety 6.

Notwithstanding the provision of a lifting hole, the most effective method of handling large diameter pipe in the field is with the aid of specially designed lifting gear as illustrated below, or with two wire rope slings or woven straps of appropriate capacity used in conjunction with a straight lifting beam or spreader bar.

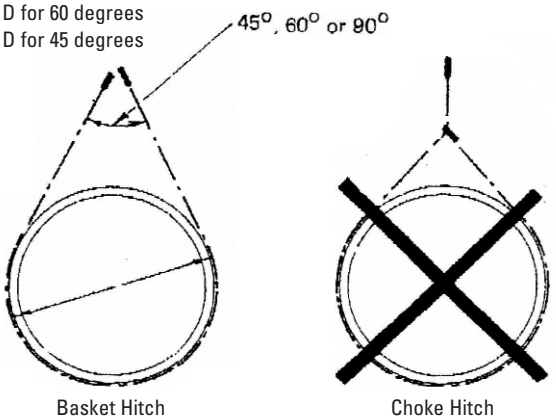


Safe working loads for 6/24 construction 1570 grade wire rope slings, used in basket hitch configuration, are:

Wire Diameter mm	S.W. L. (tonne) for basket hitch around pipe - per sling		
	45°	60°	90°
20	5.5	5.2	4.2
22	6.7	6.25	5.1
24	7.9	7.4	6.1
26	9.3	8.75	7.1
28	10.8	10.1	8.25
32	14.1	13.2	10.8

Reference: A.S. 1666-1976, Table B-1. Adjusted for factor of safety 6.

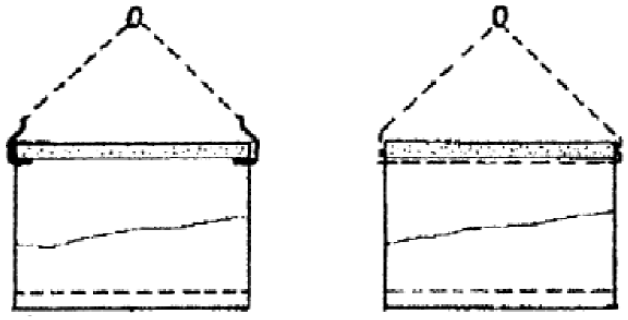
Length of sling
L= 3.4 D for 90 degrees
L= 3.9 D for 60 degrees
L= 4.4 D for 45 degrees



Basket Hitch Choke Hitch

Note that the use of a choke hitch is not recommended.

Under no circumstances should a large diameter pipe be lifted by means of hooks placed in the end of the pipe or by means of a sling passed axially through the pipe.



These handling methods must not be used.

Whichever handling method is used, care must be taken to avoid chipping spalling or other damage, especially to the pipe ends.

Locations for unloading should be as near as possible to where the pipes will be installed. They should be chosen with care so that there will be a minimum amount of rehandling in getting the pipe to the trench. Pipes which have to be moved on site should be lifted with care - never rolled or dragged.

Pay particular attention to a potential hazard presented by the proximity of overhead electricity supply lines.

Pipes stored in the field should be supported under the barrel so that the pipe ends are free of load. The supports must be chocked to prevent accidental movement of pipes. Pipes must always be stored with a TOP mark uppermost.

Large diameter pipes, if kept in storage for a prolonged period, may need internal support to prevent the development of longitudinal cracks caused by a combination of self-weight and temperature stresses. When inserting internal support props or 'toms', care must be taken to ensure that they do not bear too tightly against the internal surface of the pipe. If a prop is too tight, it may prevent free contraction of the pipe wall as temperature falls at night and cracking may still occur. A resilient packing such as a strip cut from the tread of an old car tyre should be placed between the prop-head and the pipe wall.

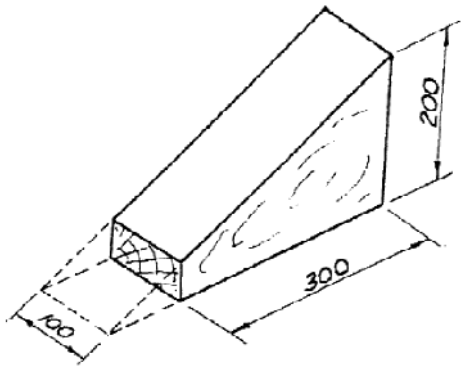
Temperature stresses can be reduced by coating the pipe with a white pigmented wax-emulsion curing membrane, such as 'Mulrex', or a white P.V.A. paint to lower its heat-absorbing properties.

TRANSPORT

Large diameter pipes must be carried only on vehicles specially equipped for their cartage. The vehicle tray must be provided with substantial timber bearers, preferably softwood, not less than 100mrn x 100mm and placed approximately, but not less than, half the length of the pipe apart. For the cartage of 2.5 metre long pipes, the supporting timber bearers should be 1.25 to 1.5 metres apart.

Each pipe-carrying vehicle shall be provided with adequate steel wire rope or tested chain, maintained in good condition, for securing the load.

Wedge-shaped chocks, no less than 200mm high x 100mm wide x 300mm long, cut from 400mm long timber, shall be nailed or pinned firmly to the supporting timbers at the front and rear ends of pipes loaded across a vehicle tray or both sides of a pipe carried 'gun barrel' style along a vehicle tray.



Where more than one pipe is carried in a load and each pipe is not individually chocked, timber shall be placed between each pipe to prevent their accidental contact during loading, transport and unloading.

As with pipes in storage, large diameter pipes may need internal support props to prevent their being overstressed during transport. A pipe securely held down by wire ropes or chains and supported on timber bearers lacks the side support given by properly compacted backfill at installation.

Unloading should preferably be by means of a crane although, if the transporting vehicle is properly equipped with an unloading winch and substantial ramps, pipes may be lowered to their ground support bearers in this manner. Again, pipes must be stored TOP uppermost.

INSTALLATION – LOWERING PIPES

Each pipe should be inspected carefully before lowering it into the trench, to detect any damage which may have occurred during transport, handling, and storage on site. Particular attention must be paid to the joint surfaces.

Pipes should be lowered into the trench with tackle suitable for their mass and the depth of the trench. Lifting appliances must be capable of smooth hoisting, lowering and, if applicable, of travelling with the heaviest pipe to be handled.

When slings are used for pipelaying, shallow grooves should be made in the bed to facilitate their removal. When lifting, the position of the slings should be checked when the pipe is just clear of the ground, to ensure a proper balance.

Pipes marked TOP must be laid with the 'TOP' uppermost.

INSTALLATION - JOINTING PIPES

Proper jointing cannot be achieved in a wet trench. Before commencing pipe laying it is important that the trench be properly dewatered. It may be necessary in preparation of the trench to divert ground water through the use of sub-soil drains or a dewatering system.

The following descriptions apply primarily to the laying of pipes with rubber ring joints. The same general principles apply to the laying of drainage pipes with a flush interlocking joint.

(a) Pipes with a Sliding Ring Joint

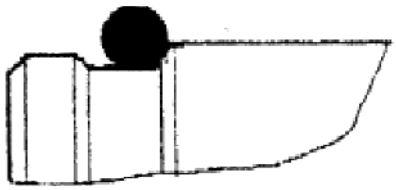
In this type of joint the rubber ring is restrained in a groove formed in the pipe spigot. The joint is made by the socket surface sliding over the rubber ring which, in this case, is not free to roll. Consequently it is necessary to apply a lubricant to the pipe socket before attempting to make the joint.

Pipes are usually laid so that the spigot end enters the socket of the last pipe - that is, sockets face the direction of the laying.

Before preparing to joint two pipes carefully inspect the jointing surfaces of both pipes for smoothness, freedom from large bubble holes, chips, cracks or loose material which might effect the sliding or seating of the rubber ring or the integrity of the joint. The tapered lead-in to the socket must be quite smooth. Any surface roughness in the lead-in or socket may cause the sliding ring to roll or twist. If this happens, the pipe socket may be broken. The jointing surface must free of mud or dirt.

Fitting the Rubber Ring

1. Stretch the rubber ring over the spigot and lodge it in its groove, making sure that the ring is quite dry.
2. After seating the ring properly, check that it is under uniform tension throughout and is free of kinks or twists. To ensure that there are no twists, lift the ring away from the pipe at several places around the circumference, in turn, and allow it to spring freely back into position each time.
3. Position the rubber ring so that it is against the shoulder of the ring groove as illustrated below.



4. Check the condition, cleanliness and fit of the rubber ring before proceeding further.

Apply C-Tech “PL1 Pipe Lubricant” liberally (but not wastefully) to the socket jointing surface and the socket lead-in. A wide, soft brush, such as bannister brush can be used to apply the pipe lubricant. If the lubricant is too firm, there is a risk that insufficient lubrication will be given to the joint.

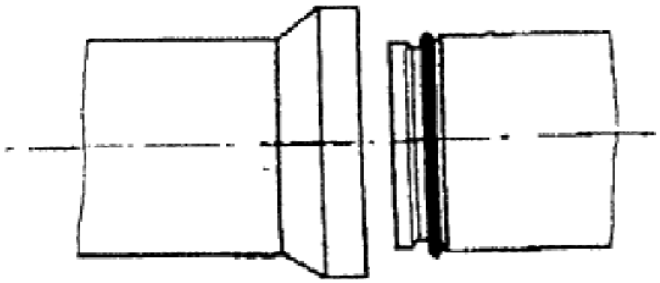
Only the sockets (including the socket lead-in) of pipes are to be lubricated.. If the lead-in is not lubricated, high jointing forces, uneven pipe entry and squeezing of the rubber ring over the spigot shoulder may occur. It is essential, in the interests of achieving a satisfactory joint, that the spigot or ring not be lubricated (lubricant on the spigot or ring can cause the rubber ring to climb out of its groove) and that the socket is lubricated a short time before the joint is made. If lubricant is applied too early it will dry, thus increasing the friction between the ring and pipe socket. Similarly, laying in wet conditions may wash the jointing lubricant from the socket before the joint can be made.

It is not recommended that pipes are laid in wet conditions.

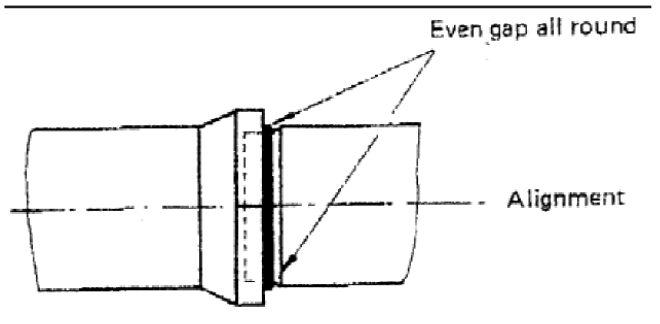
Making the Joint

The joint to the pipe already laid is made as described below, with the new pipe suspended from the lifting equipment and kept clear of the surface of the trench bed so that the weight of the suspended pipe does not bear on the rubber ring when the joint is made.

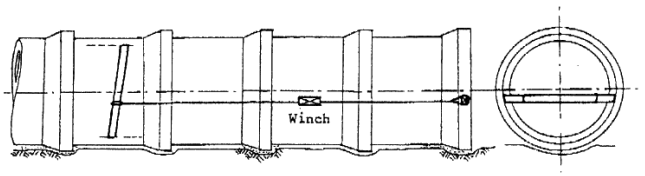
1. Make sure the incoming pipe is level and is correctly aligned with the socket of the previous pipe. If a spreader bar with two slings or a special pipe lifting beam is used, height adjustment to the spigot end of the incoming pipe may be achieved by the use of a supplementary chain hoist connected between one end of the beam and the hook of the lifting crane.
2. Bring the spigot up to (but not against) the socket of the pipe already laid.



3. Make sure that the rubber ring is correctly positioned in the spigot groove.
4. Gently bring the pipes together until the rubber ring bears against the bevelled lead-in of the socket of the previous pipe. Pause at this stage for a careful inspection before continuing with the jointing. Is the spigot accurately aligned and concentric with the mating socket?



5. It is recommended for large diameter pipes that a hand operated screw or mechanical tackle is used to bring the pipes together and to make the joint. This system links a crossbar set in the socket shoulder of the new pipe with a 'deadman' fitted inside the pipeline four or five pipe lengths back. An ideal system will have two winch systems (left and right side of the crossbar that will enable the installer to correct the alignment the pipe in the horizontal plane.



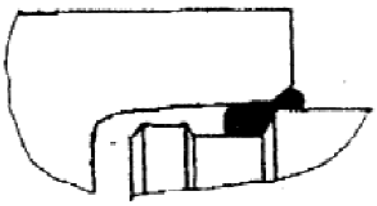
To guard against excess jointing force which can lead to pipe damage in some circumstances, the capacity of the jointing equipment should be related to the jointing force required. Rocla can advise the jointing force required. The use of equipment which is larger than necessary can lead to problems if there is a restriction during jointing, which is overcome merely by applying more force. The fitting of an overload device to the operating mechanism is recommended.

6. Keeping the suspended pipe correctly aligned and level, slowly pull it forward using the mechanical tackle or screw so that the rubber ring is progressively compressed between the surfaces of the socket and spigot.

   This is the critical part of the jointing operation. The pipe must be lined up so that it enters the socket of the previously laid pipe without deflection and with an even gap all round its spigot (the two winch system will assist with this process). Failure to observe the basic precautions at this stage may lead to misplacement of the rubber ring when the pipe is jointed.

   Station a person at the socket of the previously laid pipe to correct the alignment or grade, if necessary, to that of the previous pipe and to observe that the rubber ring enters the socket lead-in evenly all round the pipe.

   If the rubber ring is seen to be squeezing over the spigot shoulder, STOP JOINTING IMMEDIATELY.



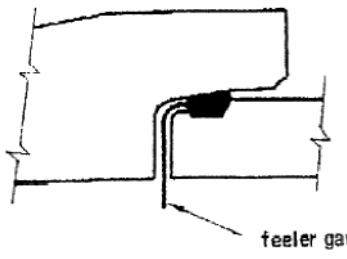
Also, if there is any difficulty in jointing or undue force has to be applied to make the joint STOP JOINTING IMMEDIATELY. Check the alignment of the suspended pipe and use a feeler gauge to check whether the rubber ring has started to squeeze over the spigot shoulder within the socket.

If the alignment is incorrect but the rubber ring has remained in position, correction of the alignment win usually permit jointing to proceed.

If not, or if the rubber ring is squeezing over the spigot shoulder, REMOVE THE PIPE, clean the spigot jointing surface and the rubber ring, inspect the socket jointing surface for roughness or dirt, inspect the rubber ring for signs of damage and re-lubricate the socket and socket lead-in before repeating the jointing procedures.

It is desirable to have a person stationed inside the pipe, at the joint, to observe closure of the joint. This man will place timber joint stoppers into the closing joint, one on each side, to prevent total closure on one side jf the pipe being jointed should swing out of alignment during jointing.

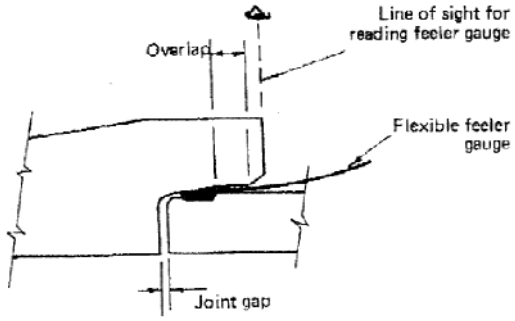
When jointing has been completed, withdraw the joint stoppers and insert a feeler gauge to check, from the inside, that the rubber ring is positioned correctly.



This is in addition to the external check described in Paragraph 8.

Remember:
If undue force is required to make a joint stop immediately and check, as detailed above.

7. When satisfied that the pipe and ring are correctly positioned, force the pipe home to the full depth of the joint. When correctly done, the rubber is compressed evenly at all points around the joint.
8. When fully home, the rubber ring and the shoulder of the spigot will have disappeared out of sight inside the socket. Inside the pipeline it will be found that the two pipe ends are in close proximity.
9. Each joint should be checked before proceeding to the installation of the next pipe. From the outside check that the small clearance between the socket and the barrel is uniform all around the pipe and, by use of a feeler gauge made from flexible material, check the position of the rubber ring and spigot shoulder. The gauge should be marked with a dimension taken from the joint drawing so that it can be read by sighting down the socket face.



The rubber ring and spigot shoulder should be well inside the inner edge of the socket lead-in so that there is substantial overlap.

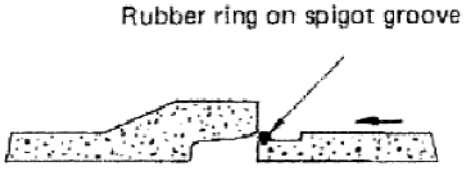
From the inside, check that the joint gap does not exceed the specified value.

10. Any deflection to the joint must be attempted only after jointing to the line and grade of the previous pipe has been completed.

(b) Pipes With a Rolling Ring Joint

These pipes employ a rubber jointing ring which is free to roll along the spigot surface as the joint is made.

1. Spigot about to enter socket



2. Spigot entering socket

Rubber ring rolling along spigot as joint is made

3. Joint completed

Feeler gauge to check rubber ring position

Joints are made generally as described for a sliding ring joint, with the exception that a joint lubricant is not used.

Fitting the Rubber Ring

Joints are made generally as described for a sliding ring join

Making the Joint

Make the joint generally as described for a sliding ring joint, with the exception that a joint lubricant is not used.

As jointing proceeds, the rubber ring rolls out of its shallow groove at the end of the pipe spigot, being compressed by the socket of the mating pipe as it does so. If jointing is done correctly, the rubber is simultaneously rolled and compressed evenly at all points around the joint and there is no skidding of concrete past rubber.

When fully home the rubber ring will have rolled right back to the shoulder of the spigot and this shoulder along with the rubber ring will have disappeared well out of sight inside the socket. Inside the joint the pipes should have closed to the designed joint gap. If the spigot tends to creep out of its socket for no apparent reason, it is usually an indication that the rubber ring has not rolled evenly. The pipe should then be pulled out and the joint made again.

Immediately after assembly, check the joint gap against the specification and use a feeler gauge as illustrated in the preceding diagram around the spigot circumference to ensure that the rubber ring is in the correct position, and that there is clearance between the spigot and socket.

INSTALLATION - PIPELAYING ON STEEP SLOPES

It is usual to lay pipes on Sleep slopes with the socket facing up the grade. In this way, the sockets tend to locate the pipes, preventing any tendency to slide down the slope and so open the joint.

The trench excavation may interfere with natural drainage and cause water to be channelled down the pipeline. The flow of water can erode the foundation, bedding or backfill, affecting the line of the pipes and their load carrying capacity.

If ground water is likely to be a problem, sub-drains should be provided, discharging to natural outlets. Puddled clay cut-off walls may be placed across the trench at intervals along the line.

In-situ' anchoring may be specified. Anchor blocks must be designed and installed so that they do not differentially support a pipe in a manner likely to seriously stress it longitudinally or to interfere with the flexibility of a rubber ring joint.

INSTALLATION - PIPE DEFLECTION

Deflection in a pipeline may be achieved by one of several methods depending upon the extent of the deflection required.

a) For small deflections - by simply opening up the pipe joint to the maximum extent recommended after jointing has been completed.

   The permissible deflections and corresponding permissible joint gaps for rubber ring jointed pipes are detailed in our product guide. Some Rocla factories supply pipes with shorter sockets which have smaller permissible deflections and joint gaps than in this table. Refer to your local Rocla sales office to confirm permissible joint deflections and joint gaps provided.

b) For larger deflections - by installing specially made pipes if available incorporating a skewed socket or with one or both ends of a flush joint pipe to a maximum angle of about 5 degrees.