



Concrete Pipe Association
of Australasia



**Concrete Pipes
Foreman's Laying Guide**



Introduction.....	1
Unloading and Handling.....	2
Rubber Rings.....	3
Digging the Trench.....	4
Site Investigations.....	4.1
Excavating the Trench.....	4.2
Excavated Material.....	4.3
Foundations.....	5
Bedding.....	6
Laying the Pipes.....	7
Jointing.....	8
Backfilling.....	9
Compacting the Backfill.....	10

1. Introduction



This is the abridged version of “The Foreman’s Guide to Laying Pipes” which is a full installation guide to ensure that pipes are installed to comply with a controlled installation procedure(s) such that they meet all expectations. It does not replace the specification or any contractual requirements and should be seen as complementing these documents.

This abridged version is directed primarily at sub-division type works and reflects a growing trend among local authorities to nominate rubber ring joint pipes up to and including DN600mm. It does not address trench-shoring techniques or trenchless techniques as the majority of subdivisions do not utilise these areas - the unabridged version covers these.

With a focus on safety it is intended that this guide will illustrate to all who are involved that the right way is invariably the quickest and least expensive way to install Steel Reinforced Concrete Pipe (SRCP).

**Safety
First!**

2. Unloading and handling

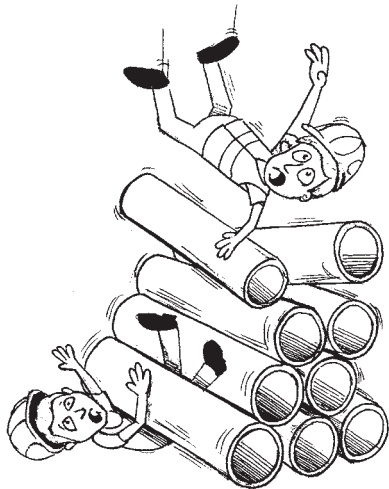


SRCP can be handled with most conventional lifting equipment but it should not be handled carelessly. Damaged pipe ends may have to be repaired so that effective joints can be made and such repairs can be time consuming and costly. *Note - In NZ pipes DN600 and above have cast-in lifting anchors. Appropriate lifting chains and equipment, including equal length chains are necessary for safe handling.*

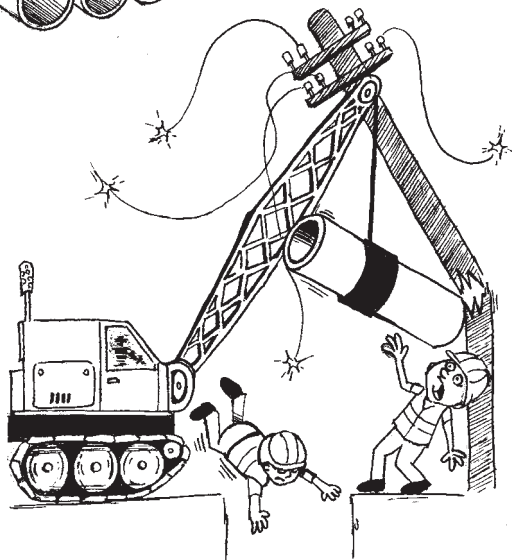
Locations for unloading should be chosen with care to ensure there will be a minimal amount of rehandling and intra site transport prior to getting the pipe into the trench. Profits can be made or lost in this area. Pay particular care to potential interference from overhead wiring. **THIS IS A SOURCE OF GREAT DANGER!**

Pipe sections should be adequately chocked while stockpiled at the job site. A slight slope, soft ground or vibration from trenching operations could start the pipes rolling and the results could be disastrous. The cost of chocking is a very small price to pay for insurance against possible construction delays not to mention the potential for injury or loss of life.

It is good practice to inspect each pipe as it comes off the truck. Pipes damaged in transit or not up to specification should be put back on the truck for return to the plant. This inspection plan will then ensure that only first class product will be installed. Pipes taken by customers, which are purchased on an FOT ex Works basis, become their responsibility when they leave the plant. The driver should be instructed to inspect the pipes as they are loaded and to carry them so as to avoid damage in transit. Pipes delivered by CPAA member companies remain their responsibility until unloaded on site.



"Maybe we shoulda
chocked the piiiipes!"



"TIMBEEER! Boy the manoeuvring on this job!"

3. Rubber Rings



Rubber rings should be kept clean and away from contaminants like petroleum products, and should be stored undercover if the pipes are not to be installed in the trench within a few days.

CAUTION: Do not attempt to use rings other than those shipped with the pipes.

They are matched to the product. Any other type of ring may be too large and make jointing difficult, or if too small will not effect a proper seal.

Figure 2 - Rolling ring joint profile

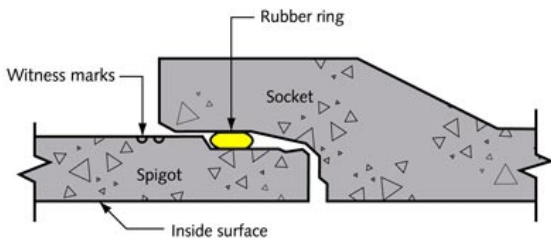
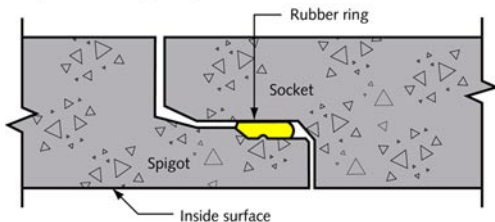


Figure 3 - Skid ring joint profile



4. Digging the Trench



4.1. Site Investigations

Before commencement of work, contractors, designers and authorities should endeavour to obtain as much information as possible about the ground conditions of the work site. Sources of information, which may be available, are:

- Natural surface features, such as rocky outcrops, watercourses or swamps should be inspected and the drainage system for the surface run off located in relation to the line of the proposed excavation.
- Information on ground conditions may be available from nearby works such as existing railway cuttings or roadways.
- Results of any test bores are generally available from the appropriate authorities. Where not available test shafts can be put down in suspect areas before commencing excavation.

4.2. Excavating the trench

The information outlined in this section refers to excavations having vertical faces or near vertical sides and does not apply to those excavations where the sides of the excavation have been battered back so as to slope at such an angle that there is no danger of them collapsing. In the unabridged version the area of trench shoring methods is comprehensively addressed.

Trench walls which are firm and solid when first dug may not remain so. In hot dry weather, enough of the soil's moisture may be evaporated from the exposed faces to cause eventual collapse. In wet weather, water may saturate an initially stable trench wall and cause it to fail. Also vibrations from nearby construction equipment may be enough to trigger a collapse. The time to control a trench wall

movement is before it starts, so consider carefully the most efficient method for the job before you start digging. Remember all trenches whether considered deep or shallow are potential death traps. Statistics will be readily available showing the number of fatalities in trenches less than 1.5 metres in depth.

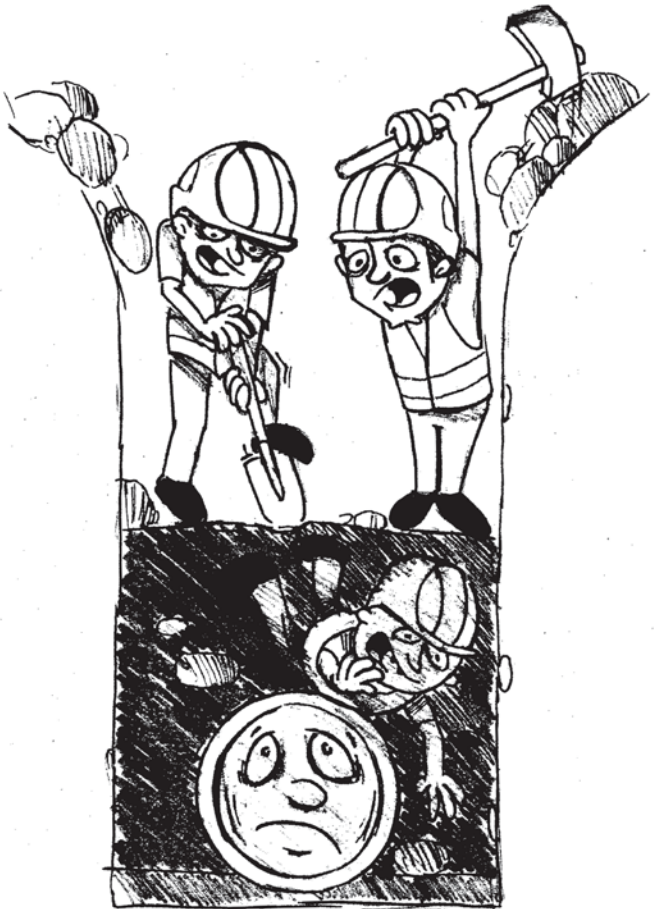
4.3. Excavated material

Excavated material should be placed far enough from the top of the trench to allow sufficient clearance for installation operations and to minimise the danger of rocks and or lumps rolling back into the trench. Where there is restricted room it may prove to be economical to load out all or part of the excavated material and stockpile it for use as backfilling elsewhere. A large part of the cost of a trenched pipeline installation is in the excavation and backfill. And therefore large savings can be realised by care in planning these operations and by evaluating the alternatives available, including shoring.

The weight of the excavated material if placed too close to the trench may increase the likelihood of the trench wall collapsing.



A well planned excavation and installation minimises costs and safety hazards.



"Poor Pat! I guess we should have shored the trench walls!"

5. Foundations

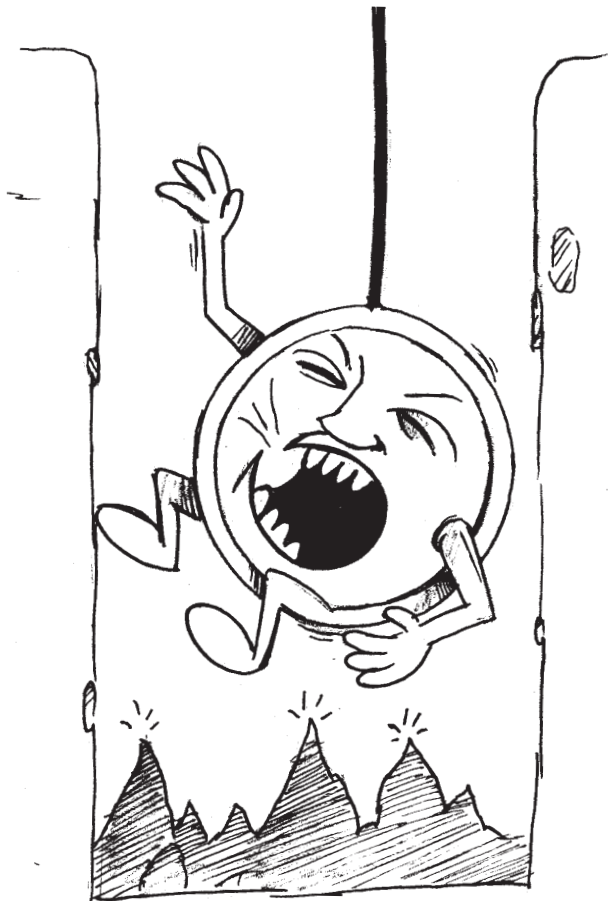


The foundation for a pipeline is the material under the pipes. Its stability and uniformity along the line rates as one of the most important aspects to ensure crack free installation. Pipes are designed to be uniformly loaded along their length and to be uniformly supported along their length to carry the load.

Common trouble spots are locations adjacent to maintenance holes or other structures where there has been over excavation to enable the structures to be placed. Similar conditions exist where the line has to pass over other services for which excavations have recently been made.

Unless the disturbed foundation material is replaced with carefully compacted material the pipes laid above will be left with inadequate support and pipes may crack circumferentially as a result. Where the pipes are connected to pits and maintenance holes it is good design and installation practice to use two short lengths so increasing the flexibility of the line in this area of potential ground movement.

Problems are also associated with hard foundation material. Where it consists of rock or other very firm material it becomes difficult or impossible to excavate a trench with a bottom even enough to provide uniform support for the pipes. It is therefore necessary to over excavate and replace a sufficient depth with suitable material to ensure a uniform and slightly yielding support all along the pipeline. The depth of the over excavation must be sufficient for the effect of unevenness of the hard material below not to be transmitted through the pipes, this is a source of point loading. Most importantly holes (recesses) must be excavated to allow a cushion to be provided underneath the sockets and so remove the most common cause of point loading.



"YE OWWW! Where's the bedding?"

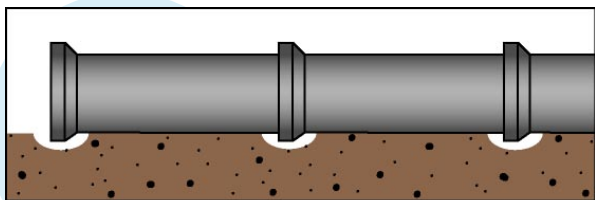
6. Bedding



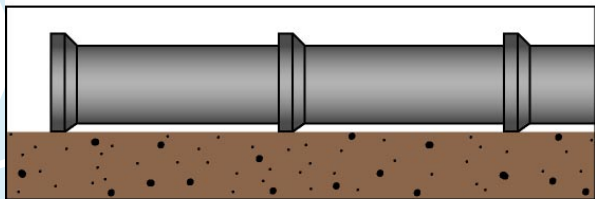
The bedding is the cushion material between the pipes and the foundation. Its function is to ensure uniform support for the pipeline both with regard to grade and hardness. A bedding specification must form part of any pipe laying specification as it influences the pipe strength required.

Depending on the foundation the bedding material may consist of the foundation material or of an imported material.

The best bedding material is granular and uniformly graded which assists in handling and spreading. It only needs sufficient compaction to ensure that laying tolerances are maintained when pipes are laid and backfilled. Holes (recesses) in bedding must be provided for the protruding socket to ensure uniform support of the barrel and hard point supports must be avoided.



CORRECT



INCORRECT



Sand is granular and uniformly graded, making for good bedding.



Example of a good installation - trenches are neatly excavated and the pipes are progressively backfilled.

7. Laying the Pipes



Before handling the pipes check their mass and make sure the handling equipment is of adequate strength. Pipe laying usually progresses in an upstream direction with spigots pointing downstream having been inserted into the socket. Doing it this way restrains the joints from opening up as a result of pipeline movement and joint surfaces are protected against entry of foreign matter. If adequate precautions are taken against these points there is no reason why the order may not be reversed.

Many pipes are manufactured with elliptical steel reinforcement and as such must be laid in a specific orientation. These pipes are supplied with a top mark. Pipes with lifting holes or cast-in lifting anchors, have the holes or anchors coinciding with the top. Whether pipes have lifting holes or not it is critical to ensure that they are laid "TOP UP".

To ensure pipes are laid to correct grade within specified tolerances some installers will opt to lay pipes on timber, brick or stone supports. Such supports if placed on a hard foundation can result in damage to the pipes on account of the point load (concentrated reaction) they impose on the pipe when backfilled. Such supports must be removed before backfilling. The desire to achieve tight laying tolerances for line and grade must not result in the uniform support of the pipe being compromised or sacrificed.

Rubber ring jointed pipes must be laid with joint gaps between the pipes to ensure that the lines are able to deflect without damage to the pipes. Recommended joint gaps are shown on all product drawings and are tabulated in the CPAA Pipe Manual. Witness marks are provided on the outside of pipes to show maximum and minimum gaps. Adherence to gaps ensures deflation and hydraulic/hydrostatic capability will be met.



"It can't be the level!"

8. Jointing

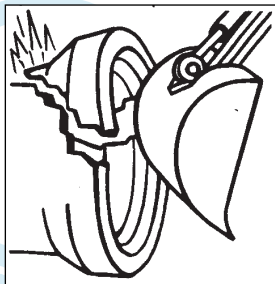


The use of RRJ pipes in subdivisions up to and including DN 600 is becoming the norm. This is because many lines will be hydraulically surcharged in peak flows and ingress of backfill has been an increasing issue.

The rolling ring must be assembled dry and without the use of lubricant whereas the skid ring type requires lubricant. Before jointing clean and inspect all joint surfaces. Dirt dust and foreign matter must be removed from the spigot and socket, pipes with damaged joints must be repaired or discarded, rolling rubber rings must be clean and dry - damaged rings must not be used. Place the rubber ring on the spigot and ensure the ring is free of kinks and twists and is uniformly tensioned. To ensure this happens lift the ring away from the circumference of the pipe at several places, each time letting it spring back. The spigot is then offered to the socket with uniform contact for 360 degrees to the socket lead in. The pipe is then pushed home. Up to DN600 pipes can usually be barred home and a block of wood should be placed near the invert (to prevent steel to concrete contact) and protect the socket. Refer to the previous section re joint gaps.



Correct



Incorrect

9. Backfilling



The most important point about backfilling is to realise that the compaction loads/ construction vehicle loads will in most cases be the most severe load to which the the pipe is subjected. Make sure the designer has allowed for this.

1. Avoid damaging the pipes by direct impact. Keep heavy rocks and other such material out of the fill adjacent to the pipe and the embedment zone.
2. Bring up the fill on both sides together to ensure pipeline alignment is maintained. Use a hand held compactor to do this, Refer to the CPAA charts to ensure there is no overload.
3. Avoid running heavy construction equipment over the pipes in an uncontrolled manner The CPAA charts may be used for a guide.
4. Ensure the detail of the backfill is clearly understood and the grade of installation is nominated on the drawings. Do not use construction vehicles that were not allowed for in the design. Make sure the designer has nominated construction vehicles. If a non-specified vehicle is to be used check that it's OK , with the designer prior to installation.
5. Ensure that the pipe is compacted with a pedestrian roller to the requisite level over the top of the pipe prior to bringing on compaction and construction loads.
6. If the backfill procedure is to be varied from design then seek approval from designer and in any instance do not hesitate to call the CPAA.

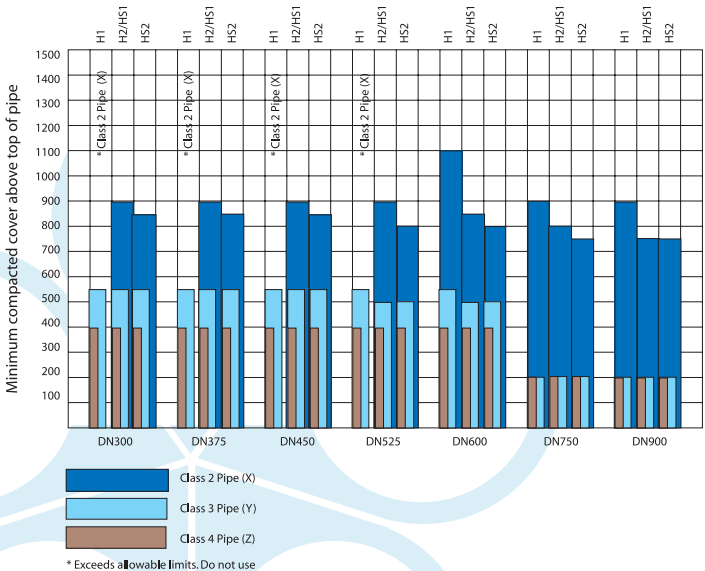
10. Compacting the Backfill



The sample chart below is taken from the CCAA master chart which details the height of backfill over the top of a pipe that **MUST** be carefully compacted prior to use of major compaction/construction vehicles. The charts cover pipe sizes from DN300 – DN900 and load classes 2,3 & 4 together with a broad range of construction/compaction wheels for the more common bedding installations. *Note - The current chart also includes the use of excavator mounted sheep's foot roller; the use of these rollers is being discouraged.*

Vibratory Smooth Drum Roller (10t)

Bedding type





Initial backfill compaction being undertaken with a hand held compactor - a controlled operation.

The Concrete Pipe Association of Australasia, will be more than happy to provide you with impartial details to allow you to make your own decision.

We want facts to speak for themselves — which is all the more reason why we want you to have them all — without selective 'editing' or distortion.



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