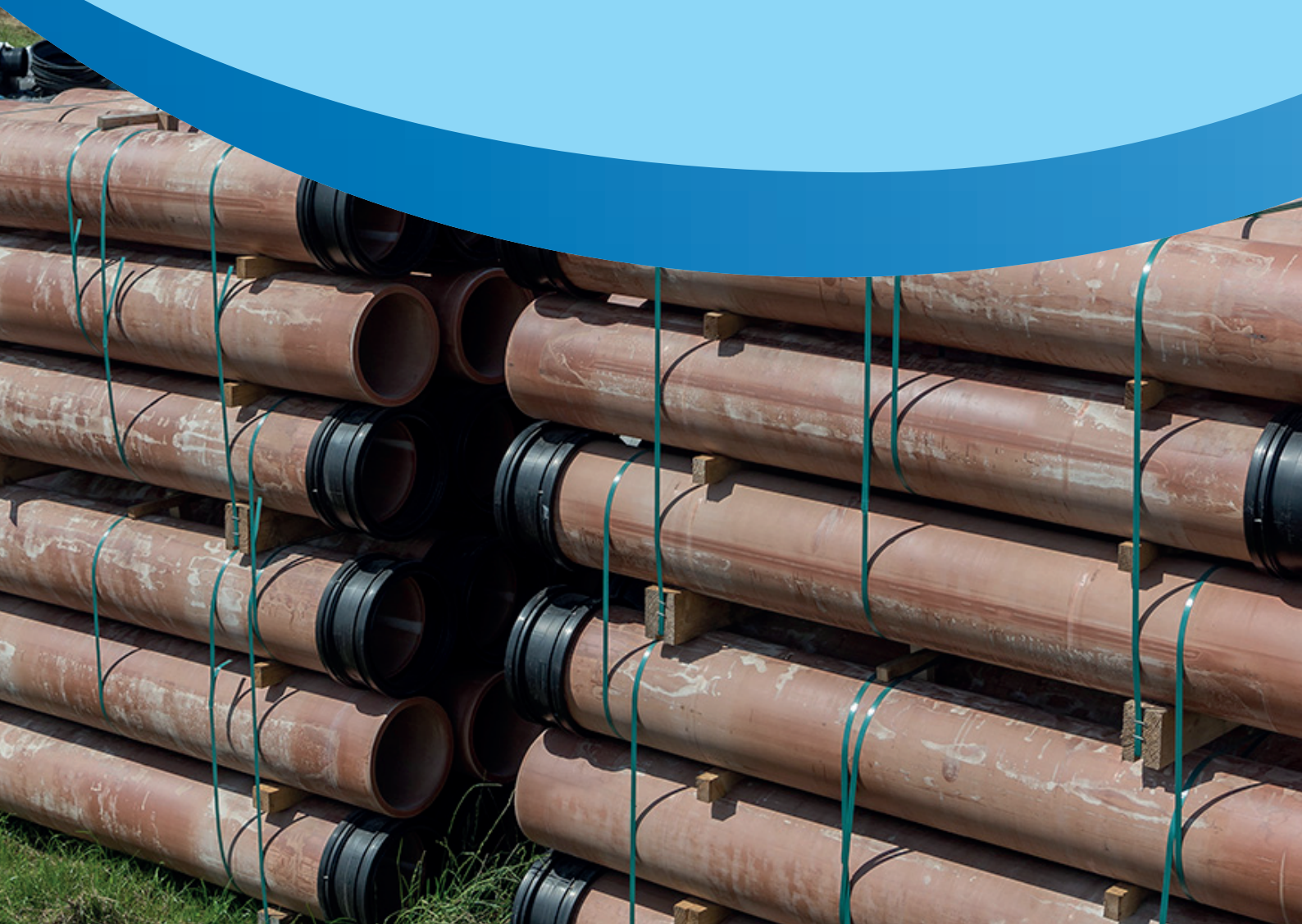
Clay Pipe Development Association Ltd

(TN4) Concrete bedding to pipes



Installation: Pipe laying

Concrete bedding to pipes (TN4)

Bedding or surrounding a pipe in concrete may be required in some cases. The indiscriminate use of concrete for pipe beddings can cause problems unless carefully specified procedures are adopted as set out in this Technical Note.

The trench formation should provide a firm foundation for the concrete bed or its value in strengthening the pipeline will be lost. It may therefore be necessary to seal or firm up the trench bottom before laying the concrete bedding using a blinding layer of weak concrete or granular material. It may also be necessary to excavate soft spots and compact in some more suitable material, such as granular bedding material or small hardcore.

It is important that the following minimum dimensions for concrete bedding or surround are used in order to ensure that the specified bedding factors are realised. Any concrete bed or surround should extend at least 150mm either side of the pipe. The depth of concrete below the pipe, and above the pipe for a surround, should be at least 150mm or one quarter of the outside diameter, whichever is the greater.

The flexibility of a pipeline bedded on or surrounded with concrete should normally be maintained by the provision of flexible construction joints through the concrete at each pipe joint.

Where more uniform support of the pipeline is found, the construction joints may be less frequent. However, it is recommended that they are no more than 5m apart.

These should be made from bitumen impregnated insulating board complying with BS EN 622-4, or other equally compressible material such as expanded polystyrene.

The board should be cut to fit the pipes, and placed at the face of sockets or at one end of sleeve joints.

Where large shear forces may be expected to occur at construction joints because of heavy imposed loads, it is preferable to omit flexible construction joints and to longitudinally reinforce the concrete bed to obviate possible excess shear forces causing pipeline failure.

Examples are on shallow pipelines under main roads or on very deep pipelines. However, it is necessary to introduce one flexible construction joint at least every 5m length, keeping the longitudinal reinforcement continuous, so as to avoid problems due to the expansion and shrinkage of the concrete. This construction joint should be positioned at the face of a pipe joint.

All concrete for pipe bedding should be of structural quality, minimum C20/25, and should be thoroughly compacted into place. Care should be taken in placing concrete so as not to move pipes or construction joints.

No load shall be applied within the 24 hour period immediately after the completion of placing the concrete, except for an uncompacted protective layer of selected backfill material. Mechanical compaction should not be used and traffic loads should not be imposed until at least 72 hours after completion of concreting. This is to allow the concrete to reach a high enough strength to resist backfill and compaction loads, usually quoted as 14 MN/m^2.

Unreinforced and reinforced concrete beddings and surround are illustrated in Fig. 10, page 103.

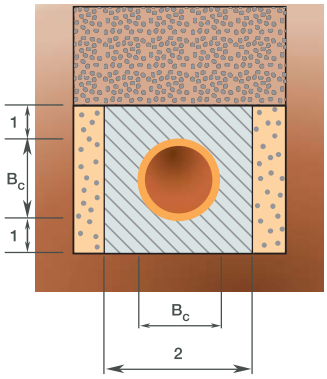
The use of concrete arches is not recommended because it is difficult to ensure adequate support at the sides of the pipes. Additionally, the width of the top of the concrete, rather than the outside diameter of the pipe, is used to calculate the load on the pipe/bed construction. This higher load can counterbalance the higher bedding strength of the arch or surround.

For reinforced concrete beds, the minimum transverse steel area should not be less than 0.4% of the area of the concrete in longitudinal section.

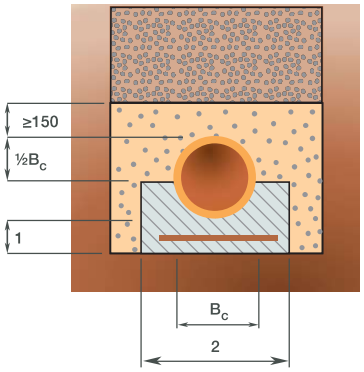
If the area of transverse steel is increased to 1.0% of the concrete area in longitudinal section in a concrete bed and surround both above and below the pipe, the bedding factor may be increased up to 4.8. This bedding factor has been derived from the 4.8 for a 1.0% reinforced concrete arch.

The area of vertical steel within the reinforced surround and longitudinal steel in bedding or surround is nominal for construction purposes, where flexibility at joints is maintained.

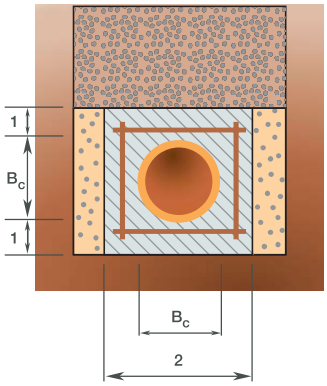
Fig. 10 – Plain and reinforced beddings and surrounds



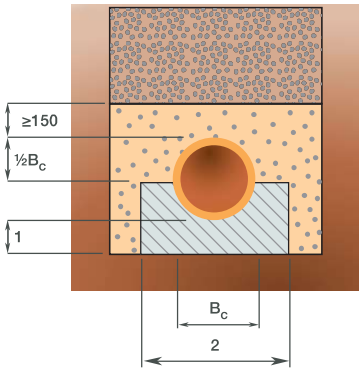
a. Unreinforced concrete surround. Bedding factor 4.5 (maximum diameter 600 mm). Reference: ASCE Gravity sanitary sewer design and construction [1]



b. Reinforced concrete bed. Bedding factor 3.4 (0.4% steel)



c. Reinforced concrete surround. Bedding factor 4.8 (4 × 1% steel). Reference: TRRL Simplified tables [2]



d. Unreinforced concrete bed. Bedding factor 2.6

Key

1	= The larger of ¼B_c or 150mm
2	= The larger of 1½B_c or B_c + 300mm
	= Main backfill
	= Selected backfill
	= Structural concrete

[1] AMERICAN SOCIETY OF CIVIL ENGINEERS and WATER POLLUTION CONTROL FEDERATION. Gravity sanitary sewer design and construction, Reston, Virginia: ASCE Publications, 1982.

[2] YOUNG, O.C., BRENNAN, G. and M.P. O'REILLY. Simplified tables of external loads on buried pipelines. Transport and Road Research Laboratory, Department of Transport. London: HMSO, 1986.