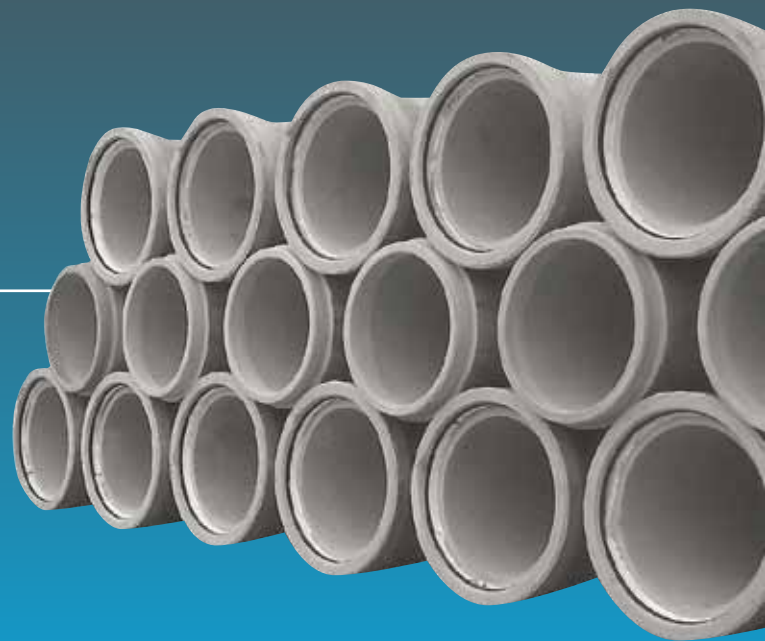
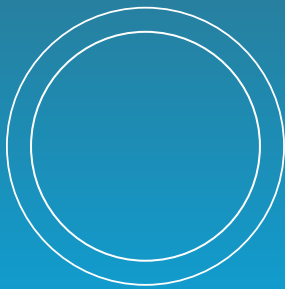
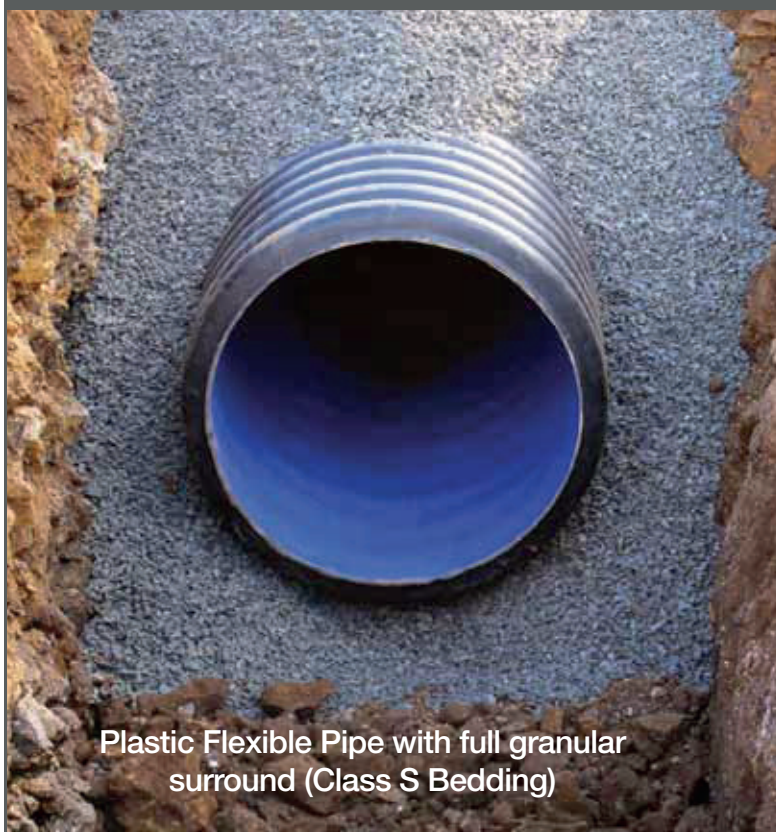


CPM Pipe Bedding

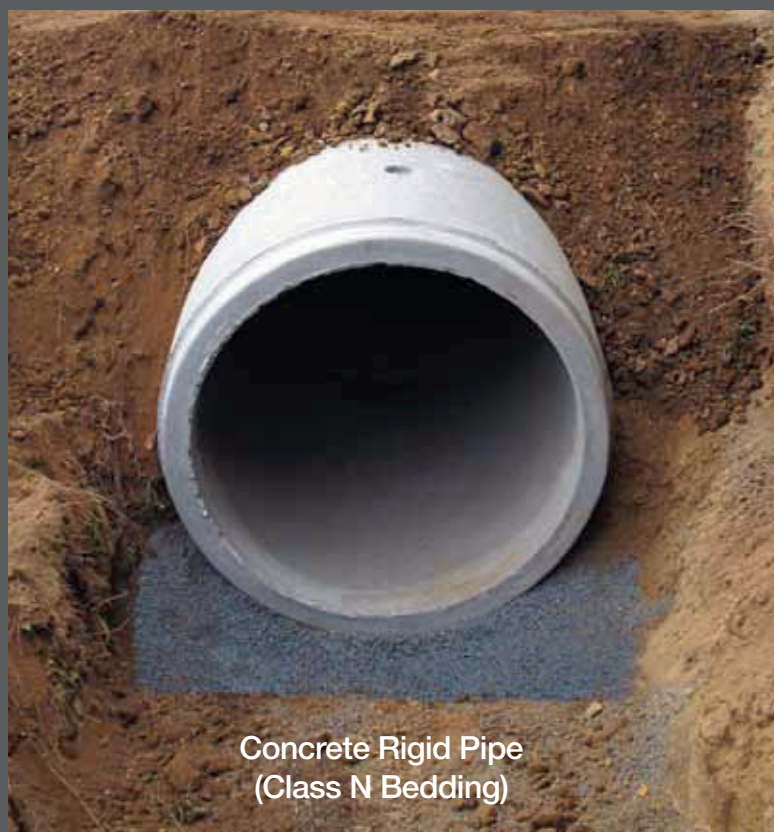


Did you know?

Using the correct pipe bedding class could save you a fortune.



Plastic Flexible Pipe with full granular surround (Class S Bedding)



Concrete Rigid Pipe (Class N Bedding)

For further details on the materials cost calculator visit the CPSA website:
www.concretepipes.co.uk/calculators/material-cost

Potential savings of up to **£174.94 per linear metre***

*Figure quoted is the difference between Class S (Plastic Flexible Pipe) and Class N (Concrete Rigid Pipe) costs, based on a DN1800 pipe. Potential cost savings are based on normal ground conditions, including granular bedding costs of £15 per tonne and cost of material being taken off-site to landfill at £6 per tonne (figure shown is independent of pipe costs). The bulk density of granular bedding material is assumed to be 2.0 and for excavated material is assumed to be 2.1



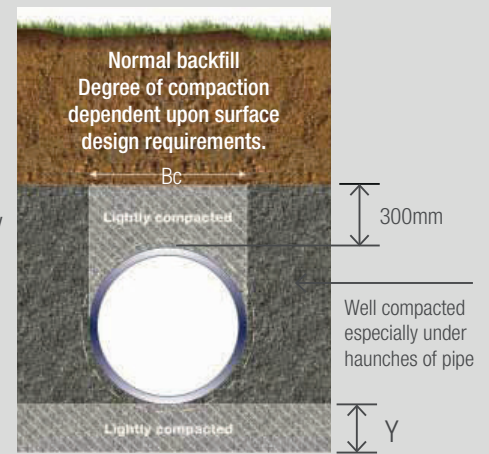
A leading UK manufacturer
of precast concrete products

Class S

360° Granular bedding and surround / Bedding factor = 2.2

Lay, joint and bed pipes as for Class B. Place sidefills and densely compact the layers using the same bedding material at each side, up to crown level, taking care not to displace the pipes. This is followed by 300mm of the same granular bedding material but lightly compacted directly over the pipe, after which ordinary backfilling is commenced.

Class S Bedding Costs Full pipe granular surround cost per metre for:
DN1800 £225.29 / **DN1500** £173.63 / **DN1350** £140.62 / **DN1200** £110.95
DN1050 £88.52 / **DN900** £68.49 / **DN1800 Plastic** £221.20

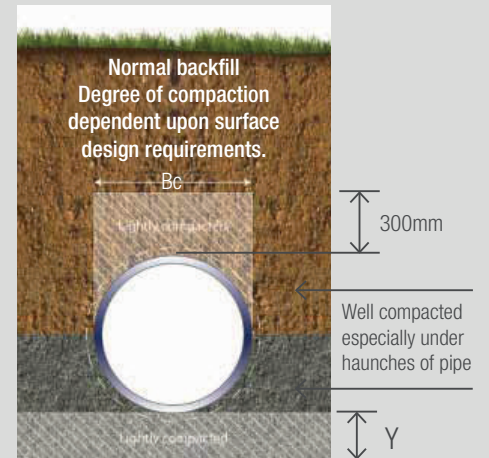


Class B

180° Granular bedding and surround / Bedding factor = 1.9

Lay pipes on a layer of granular bedding material on the formation. Scoop out socket holes, lay and joint pipes. Place sidefills and densely compact the layers of the same bedding material at each side of pipes, up to springing level, taking care not to displace them.

Class B Bedding Costs Partial pipe granular surround cost per metre for:
DN1800 £135.77 / **DN1500** £102.94 / **DN1350** £83.29
DN1200 £65.84 / **DN1050** £52.23 / **DN900** £40.14

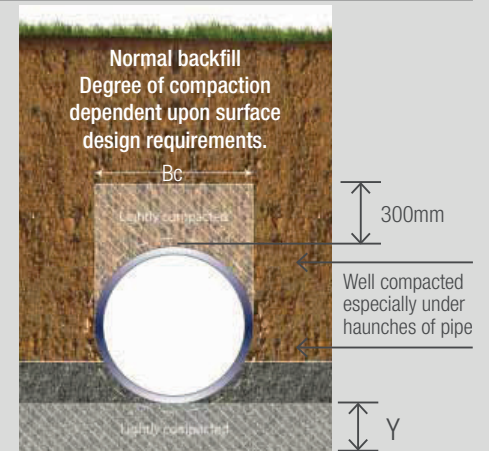


Class F

Granular bedding / Bedding factor = 1.5

Lay pipes on a flat layer of the granular bedding material on the formation. Scoop out socket holes; lay and joint pipes, which will settle slightly into the bedding. Place sidefills and densely compact the layers.

Class F Bedding Costs Partial pipe granular surround cost per metre for:
DN1800 £91.35 / **DN1500** £66.16 / **DN1350** £53.28
DN1200 £42.10 / **DN1050** £32.72 / **DN900** £24.52

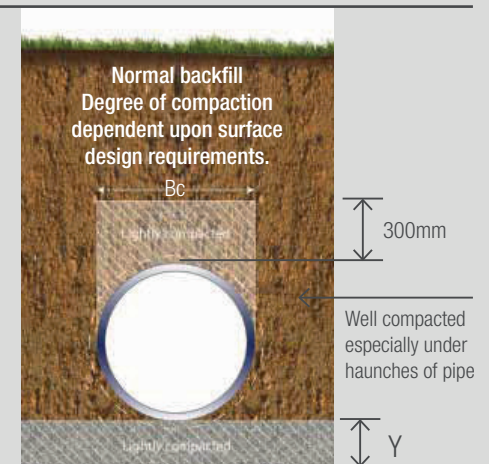


Class N

Flat Granular layer / Bedding factor = 1.1

Lay pipes on a flat layer of all-in or selected material.

Class S Bedding Costs Partial pipe granular surround cost per metre for:
DN1800 £83.21 / **DN1500** £59.99 / **DN1350** £48.30
DN1200 £38.16 / **DN1050** £29.60 / **DN900** £22.13



Potential savings of up to
£174.94 per linear metre*

*Figure quoted is the difference between Class S (Plastic Flexible Pipe) and Class N (Concrete Rigid Pipe) costs, based on a DN1800 pipe. Potential cost savings are based on normal ground conditions, including granular bedding costs of £15 per tonne and cost of material being taken off-site to landfill at £6 per tonne (figure shown is independent of pipe costs). The bulk density of granular bedding material is assumed to be 2.0 and for excavated material is assumed to be 2.1

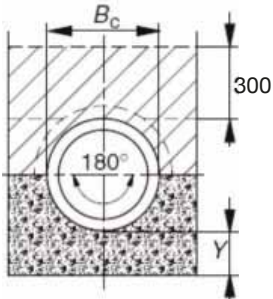
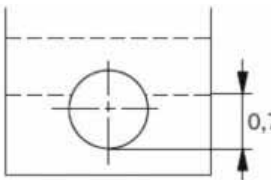
For further details on the materials cost calculator, visit the CPSA website: www.concretepipes.co.uk/calculators/material-cost

Below we have listed eight industry specifications and guidance references justifying the use of bedding classes for rigid pipes with a lower bedding factor than Class S

1

BS EN 1295-1: 1997 (incorporating corrigenda May 2006, July 2008, February 2010 and March 2010).
Structural design of buried pipelines under various conditions of loading. Part 1: General requirements

Most standard stiffness flexible plastic pipes are 2 kN/m^2 or 4 kN/m^2 and this is significantly lower than the minimum recommended stiffness of 10 kN/m^2 if Class B bedding is to be considered. In other words, all standard stiffness flexible plastic pipes will generally require Class S embedment, unlike rigid concrete pipes where there is a range of bedding choices and the opportunity to reduce installation costs.

| Rigid Pipe embedments: Class B (Table NA.7) | | | | Flexible Pipe embedments: Class B (Table NA.8) | | | |
|--|---|-----|---|--|-----------|--|---|
|  | B | 1.9 | Wide trench 1.9 (See ref 4, B.1.12) 2.5 (See ref 9, B.1.12) Embankment 1.9 to 2.3 (See ref 4, B.1.12) | | B1 and B2 | | Class B embedments not recommended for use with pipes of less than 10 kN/m² stiffness. |
| | | |  | | | | |
| | | | Class B1: Upper surround as for S3 or S4 Lower surround as for S1 or S2 | | | | |
| | | | Class B2: Upper surround as for S5 Lower surround as for S1 or S2 | | | | |
| | | | | | | | |

2

BS 9295:2010 *Guide to the structural design of buried pipelines*

7. The design of flexible pipelines

7.1 General

- It is important to remember that flexible pipes derive much of their structural strength from the embedment that is the sides of the installed pipeline. Considering the response of flexible pipes to loading (see 4.2), it can be appreciated that **THE EMBEDMENT SELECTION AND COMPACTION ARE VERY IMPORTANT WHERE CONTROL OF OVALISATION IS REQUIRED.**

Annex A: A1 removal of trench support systems

For flexible pipes, the void formed by removing the trench support systems between the trench wall and the backfill will reduce support from the native soil significantly and increase pipe deflection. Where the pipe installation relies on the sidefill compaction, then it should be carried out in layers and the trench support pulled progressively to enable the specified compaction to be achieved.

WITH FLEXIBLE PIPE MORE CARE AND TIME IS NEEDED TO ENSURE THE SIDEFILL EMBEDMENT IS SATISFACTORY.

3

Water Industry Information & Guidance Note IGN 4-08-01 February 1994. Issue 4 Section 4.

Selection of suitable bedding and sidefill materials

Where the structural performance of the pipeline does not depend on the sidefill, (e.g. for some rigid pipe installations), sidefill may contain stones up to 37.5mm and clay lumps up to 75mm for any pipe diameter. For rigid pipes larger than DN 500, stone sizes up to 10% of the pipe diameter will normally be acceptable.

4

Sewers for Adoption 6th edition (SfA6) / Sewers for adoption 7th edition (SfA7) / Civil Engineering Specification for the Water Industry 7th Edition (CESWI7) / Sewers for Scotland 3rd Edition (SfS3)

SfS3: 2.14.7 Bedding details, materials and backfilling of pipelines shall be in accordance with Part 4 of this specification. Unless otherwise agreed, **CLASS B BEDDING SHALL BE USED FOR RIGID PIPES AND CLASS S BEDDING FOR FLEXIBLE PIPES.**

SfS3: 4.5.2 Pipe Bedding. Note (iii) Full bed and surround may not be required for rigid, large diameter pipes. Reference should be made to the manufacturer's instructions.

SfA6: 5.5.2 (iii) Pipe Bedding / 5.5.4 (i) Pipe Surround.

Full bed and surround may not be required for rigid, large diameter pipes. Reference should be made to manufacturer's instructions.

SfA7: E5.2 (iii) Pipe Bedding / E5.4 (i) Pipe Surround

Full bed and surround may not be required for rigid, large diameter pipes. Reference should be made to manufacturer's instructions.

CESWI7: 5.2 (iii) Pipe bedding / 5.4 (i) Pipe Surround

Refer to BS EN 1295-1 for pipe bedding design details. Further guidance is available in BS EN 1295-1.

5

Water Industry Specification 4-35-01: Issue 1. July 2000

Specification for thermoplastic structured wall pipes

Foreword

For pipes greater than 500, lower long-term stiffness classes than quoted in 6.15 are permitted, but structural soil calculations must be carried out for every installation technique modified to suit the results of that calculation.

Most standard stiffness flexible plastic pipes are 2kN/m² or 4kN/m² and this is significantly lower than the minimum recommended stiffness of 10kN/m² if a Class B bedding is to be considered. In other words, all standard stiffness flexible plastic pipes will generally require Class S embedment, unlike rigid concrete pipes where there is a range of bedding choices and the opportunity to reduce installation costs.

6.15 Nominal Short Term Ring Stiffness

When tested in accordance with BS EN ISO 9969 : 1985, the nominal short term ring stiffness shall not be less than:

- the given nominal value in Table 6, or
- the creep obtained in 6.6 of this standard multiplied by the appropriate 2 year stiffness in Table 6 whichever is greater.

Table 6 - Stiffness Classes

| Nominal short term stiffness (kN/m ²) | 2 year stiffness (kN/m ²) |
|---|---------------------------------------|
| 8 | 4 |
| 4 | 2 |

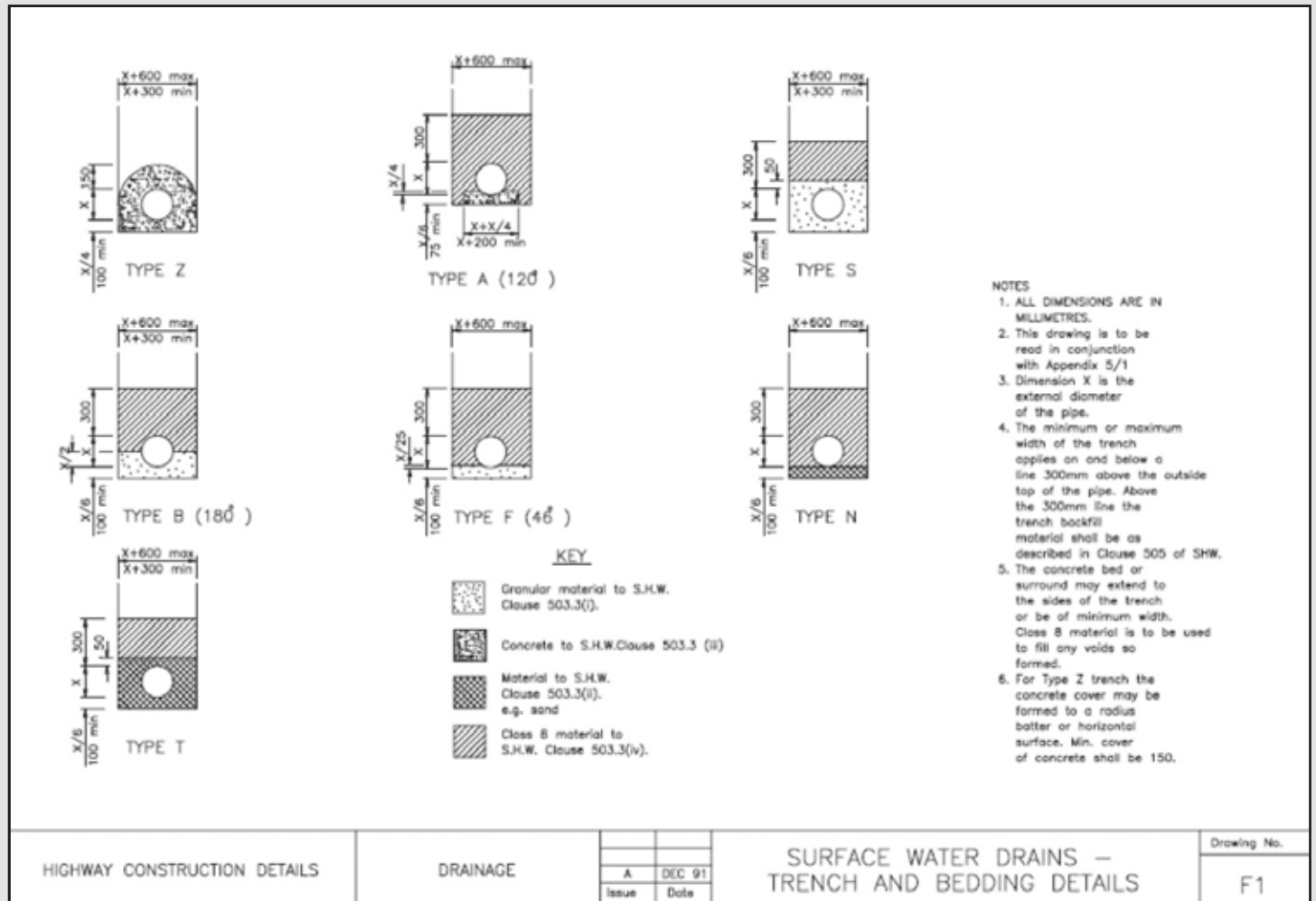
6

Design Manual For Roads And Bridges Volume 4 Section 2 Part 5 HA40/01

2.1 Design Considerations. Range of bedding types

Methods of bedding pipes are shown in the Highway Construction Details, drawing F1 (see below) for carrier drains and F2 for filter drains (see Appendix B). These different beddings provide varying degrees of support to the pipe. In the case of filter drains, the granular bedding and surround additionally functions as a filter medium. Not all possibilities that would give a satisfactory bedding are included in the HCD, **THE CHOICE HAS BEEN RESTRICTED TO SAVE GRANULAR MATERIAL** and to combinations most likely to be of use. Bed types A, B, F, N and S in drawing F1 are for use with rigid pipes (section 2.5) and bed types S and T with flexible pipes (section 2.7).

Highway Construction Details - Drawing F1



7

Specification For Highways Works Series 500 Drainage And Service Ducts

Bedding, Backfill and Surround Material

(11/03) All systems shall be installed in accordance with the pipe and bedding combinations given in Advice Note HA 40 (DMRB 4.2.5). Other combinations shall be supported by calculations in accordance with BS EN 1295-1 UK National Annex. Bedding, backfill and surround materials are classified in Clause 503 and Clause 505.

8

Building Regulations Approved Document H

Bedding and backfilling

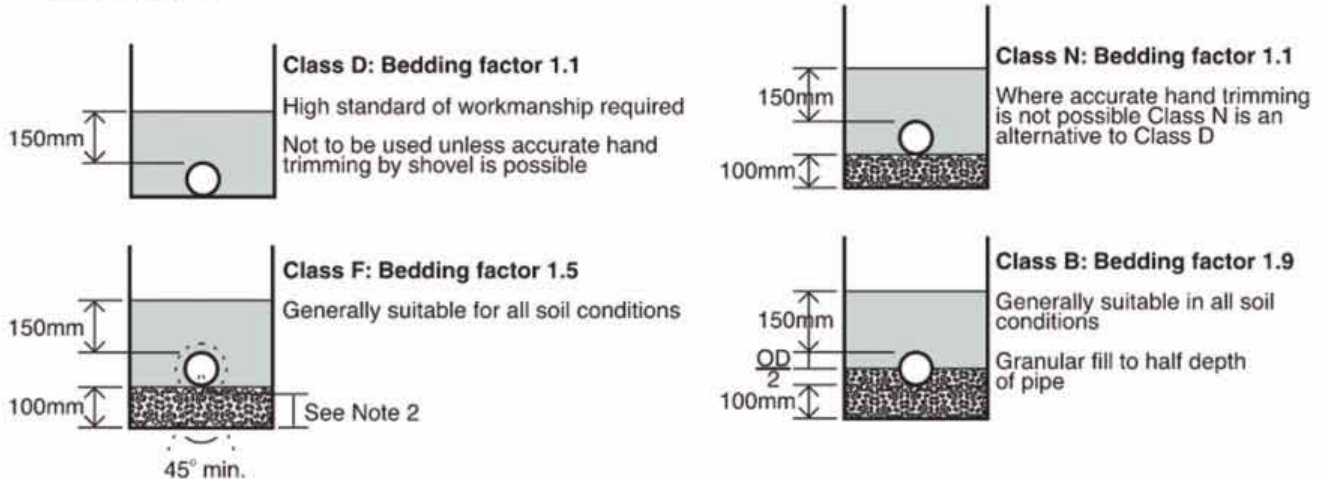
2.41 The choice of bedding and backfilling depends on the depth at which the pipes are to be laid and the size and strength of the pipes.

2.42 Rigid pipes – The types of bedding and backfilling which should be used for rigid pipes of standard strength laid in a trench of any width are shown in Diagram 10.

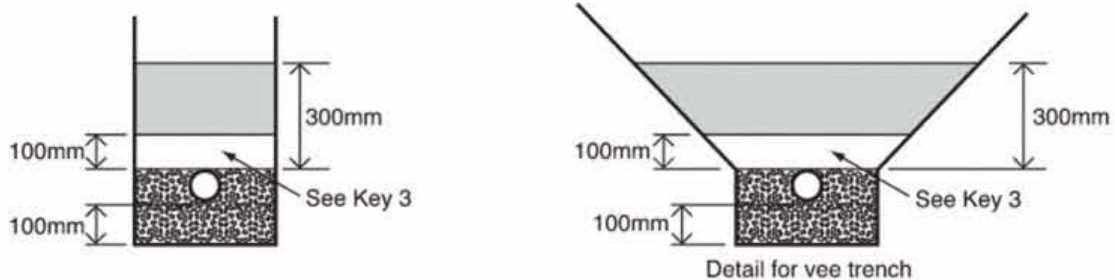
2.43 Flexible pipes – **THESE WILL BECOME DEFORMED UNDER LOAD AND REQUIRE SUPPORT TO LIMIT THE DEFORMATION.** The bedding and backfilling should be as shown in Diagram 10.




Diagram 10 Bedding for pipes

a) Rigid pipes



b) Flexible pipes



- Key**
-  **1** Selected fill: free from stones larger than 40mm, lumps of clay over 100mm, timber, frozen material, vegetable matter.
 -  **2** Granular material – For rigid pipes the granular material should conform to BS EN 1610 Annex B Table B.15 and should be single size material or graded material from 5mm up to a maximum size of 10mm for 100mm pipes, 14mm for 150mm pipes, 20mm for pipes from 150mm up to 600mm diameter and 40mm for pipes more than 600mm diameter. Compaction fraction maximum 0.3 for class N or B and 0.15 for class F.
 -  **3** Selected fill or granular fill free from stones larger than 40mm.

Notes:

1. Provision may be required to prevent groundwater flow in trenches with class N, F or B type bedding.
2. Where the pipe has sockets and Class D bedding is used, holes which should be as short as is practicable should be prepared in the trench bottom to give a clearance of 50mm beneath the socket.
3. Where the pipe has sockets and Class F or N bedding is used, the sockets should be not less than 50mm above the floor of the trench.
4. All dimensions are in mm.

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