



British Precast Drainage Association

Publications from the British Precast Drainage Association (BPDA):

BPDA was formed in 2017 from the integration of the Concrete Pipeline Systems Association (CPSA) and the Box Culvert Association (BCA).

Information published by both CPSA and BCA will be rebranded and replaced as BPDA in due course. New material will be branded BPDA.

All CPSA and BCA web traffic will be redirected to the new BPDA web site at www.precastdrainage.co.uk

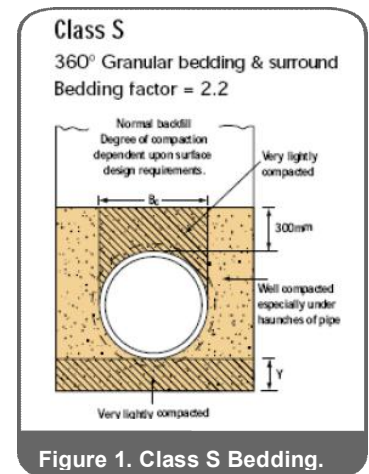
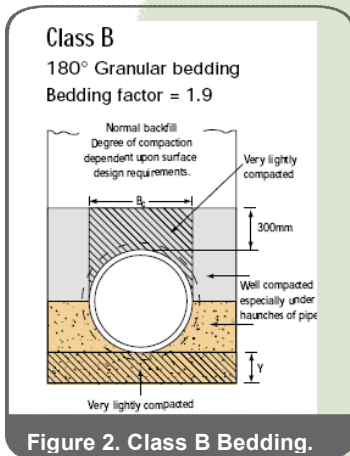
The influence of Bedding Class on pipe material choice

The bedding design and infill material used to install buried pipes may differ with the type of pipe installed. Flexible pipes (e.g. plastic pipes) usually work with a full surround of granular material known as Bedding Class S. Rigid pipes such as concrete can often be installed using other Bedding Classes such as B, F, and N requiring significantly less granular material. This can have a significant effect on installation costs, time and environmental impacts.

Rigid and Flexible Pipeline Systems

For structural design purposes, pipe materials are defined as rigid, semi-rigid, and flexible based on the different mechanisms used to cope with the imposed loads and their interaction with the surrounding soil.

- **Plastic pipes** are classified as **flexible** and have relatively **little inherent strength**. They deflect to transfer the majority of imposed loads to the surrounding bedding. The system depends heavily on suitable design and high quality installation where the surrounding soil takes around 85-95% of the pipeline's designed strength with the remaining 5-15% only taken by the deformed pipe. It is therefore imperative that flexible pipes are installed properly, fully surrounded in the correct granular material and with a sufficient level of compaction.



- **Concrete pipes** are **rigid** pipeline systems that do not deform, utilising their **inherent strength to withstand loads** and stresses. They receive additional structural support from the soil underneath and around the pipe. Typically, 60 to 100% of the design strength of a pipeline is built into the pipe itself at the manufacturing stage.
- **Rigid pipelines** can often be installed from a **choice of bedding designs** (Classes) which can lead to **reduced material costs, installation time and environmental impact**.
- The most common design for a concrete pipeline is bedding Class B which employs 180° granular bedding with selected backfill material. Class B bedding is suitable for concrete pipeline installations with cover depths reaching up to 8 metres . a depth that many flexible pipeline systems may not be able to meet.
- Class S bedding can also be used with concrete pipes. However, Class B bedding is usually sufficient for most installations in the UK with cover depths between 2 to 4 metres.

| Maximum Cover Depth (metres) – Urban Road Loading* ¹ | | | |
|---|-------------------------|-----------------|-----------------|
| | Bedding Class B | Bedding Class F | Bedding Class N |
| DN 300 | 8 | 4.0 | 2.2 |
| DN 600 | 6.4* ² / 3.8 | 3.9 | 2.0 |
| DN 1200 | 4 | 3.3 | 2.0 |
| Maximum Cover Depth (metres) – Off Road Loading | | | |
| | Bedding Class B | Bedding Class F | Bedding Class N |
| DN 300 | > 8 | 4.0 | 2.7 |
| DN 600 | 7.4* ² / 5 | 4.2 | 2.2 |
| DN 1200 | 5 | 3.8 | 2.2 |

* Notes: 1. 30 Units HB Loading 2. For unreinforced pipe

Table 1. Maximum installation cover depth in metres for bedding Classes B, F and N

Installation Cost, Time and Environmental Impacts

The material savings using bedding Classes B, F, and N can be considerable.

- A Structural Design Calculator is available at the CPSA web site to assist the design of buried pipelines and selection of appropriate bedding Classes <http://www.concretepipes.co.uk/calculator/design/designload.php>
- When suitable bedding Classes have been selected, the costs of alternative designs can then be compared using the online Material Cost Calculator <http://www.concretepipes.co.uk/calculator/beddingmaterial.php>
- The differences in material costs based on bedding Class can be stunning. For example, using a **DN600 pipe**, the cost of imported bedding (@£15/t) and disposal of excavated material (@£6/t) will be £42.11 per linear metre for a plastic pipe with Class S bedding compared with £24.77 per linear metre for a concrete pipe using Class B bedding (reducing further to £15.44 for Class F and £14.04 for Class N). This equates to **£17,340 savings (Class B: Class S) per km of pipeline**.
- The time required to install pipes may also be affected by the amount of effort required to adequately compact granular material for Class S installations. This can make **rigid pipelines quicker to install** when using alternative bedding designs.
- **Bedding Classes B, F and N** can reduce the volume of excavated material taken to landfill compared with Class S and result in considerable **carbon footprint savings**. Table 2 assumes the carbon footprint for granular is *8 kg CO₂e/tonne*, the distance to landfill/disposal site is *15 miles* and the location of the quarry for granular bedding is also *15 miles*. The Table clearly shows the additional carbon emissions generated using a Class S bedding (no laying, compaction, or site handling impacts are included in the Table).

The Carbon impact (kg CO₂e/linear metre) of importing additional granular for bedding

| | Flexible pipe Class S | Rigid pipe Class B | Rigid pipe Class F | Rigid pipe Class N |
|---------|--------------------------|-----------------------|-----------------------|-----------------------|
| DN 300 | 8.72 | 4.41 | 2.80 | 2.57 |
| DN 600 | 20.64 | 10.40 | 5.32 | 4.57 |
| DN 1200 | 52.51 | 26.07 | 12.43 | 10.16 |

Table 2. Carbon emissions (kg CO₂e/linear metre) associated with importing granular to/ removing native soil from site with different Bedding Class options B, F, or N compared to Bedding Class S¹.

For further information please contact your usual supplier:

Buchan Concrete Solutions

Tel: 01606 843 500
Web: www.buchanconcrete.com

Milton Precast

01795 425191
www.miltonprecast.com

CPM Group

Tel: 0117 981 2791
Web: www.cpm-group.com

Stanton-Bonna Concrete Ltd

Tel: 01159 441 448
Web: www.stanton-bonna.co.uk

FPMcCann

Tel: 01530 240 000
Web: www.fpmccann.co.uk

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¹ The Density of aggregates is assumed 2.24 tonnes/m³ (Source: CIBSE).