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

BS 5911 Part 3:2014 - Important Changes

This Technical Bulletin provides essential information on the key changes introduced in the revised Standard BS 5911-3:2014 Specification for unreinforced and reinforced manholes and soakaways (complementary to BS EN 1917:2002).

The most important changes are:

a) inclusion of rectangular sizes up to LN1250;
b) specification for precast base units;
c) test loads for cover slabs aligned with Eurocodes; and
d) maximum installation depth calculation method for rectangular manholes.

Rectangular Manholes

Table 4 – Nominal sizes, internal manufacturing sizes and tolerances of rectangular units introduces two new rectangular (in this case square) manhole preferred nominal sizes 1000mm x 1000mm and 1250mm x 1250mm.

Care should be taken to ensure the correct selection of functional equivalent circular and rectangular manholes. BS EN 752:2008 Drain and sewer systems outside buildings and Sewers for Adoption 7th Edition provide guidance on minimum nominal sizes for circular and rectangular manholes. This can be summarised as shown below.

Circular manhole diameter	Minimum square manhole	BS 5911-3 preferred nominal size (minimum for compliance)
1050mm dia (not SfA7)	1050mm each side (not SfA7)	1250mm x 1250mm
1200mm	1200mm each side	1250mm x 1250mm
1500mm	1500mm each side	1500mm x 1500mm

Square manholes sized as functionally equivalent to circular manholes

- DN1050 circular manholes and LN/WN 1000 rectangular manholes do not comply with Sewers for Adoption minimum nominal internal dimension requirements.

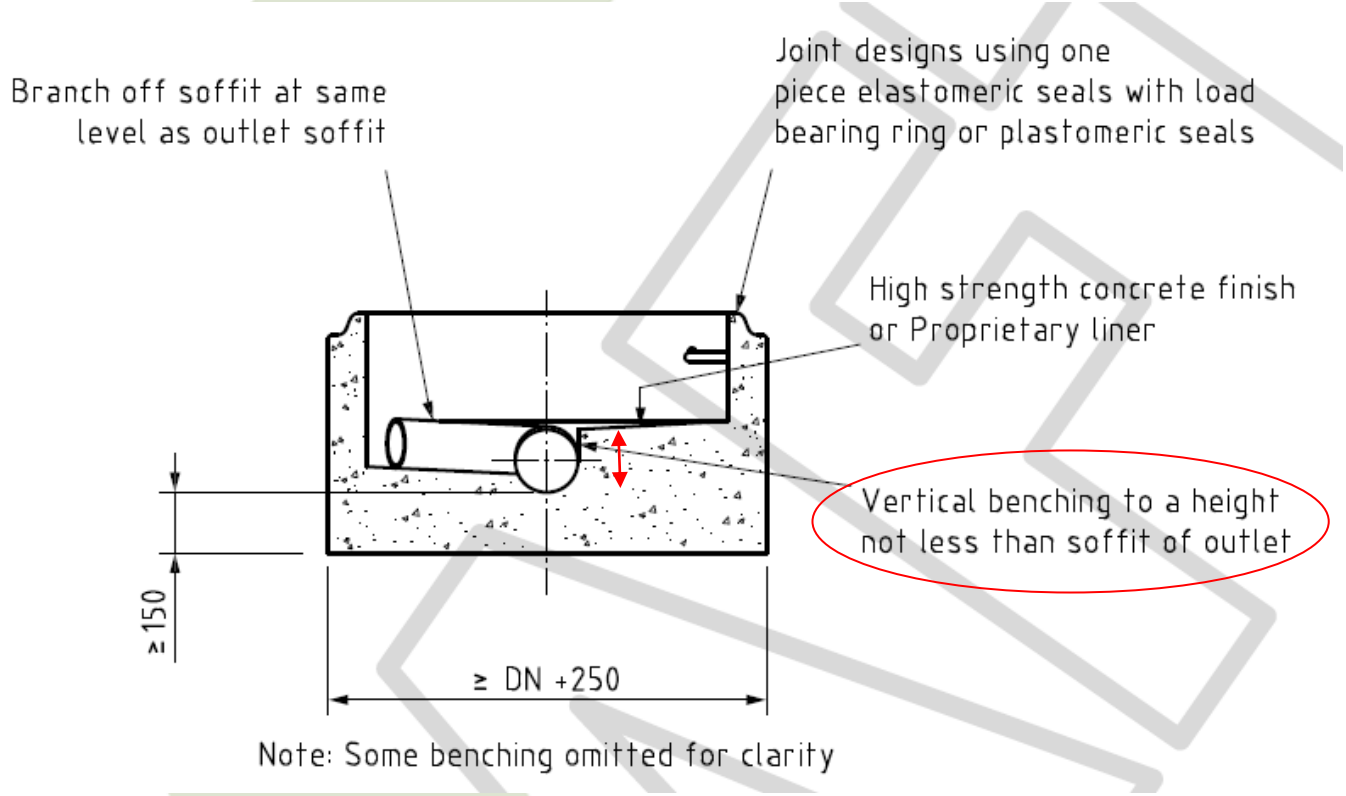
- HSE Safe Work in Confined Spaces [Confined Spaces Regulations 1997: Approved Code of Practice, Regulations and guidance] states “In the case of a shaft containing a ladder or step irons, 900 mm clear space is recommended between the ladder/ steps and the back of the shaft.” As ladders/steps usually protrude in excess of 100mm, a rectangular manhole 1000mm x 1000mm is not expected to comply with HSE Guidance when used with a ladder/step. A 1200 diameter or 1250 x 1250 rectangular manhole generally meets the guidance.

Precast Bases

Figures 2 and 3 provide typical details for precast base units.

Clause 5.4.4 notes “The provisions for benching arrangements shall be in accordance with BS EN 752:2008.”

This includes a requirement that vertical benching to the main channel shall be to a height not less than the soffit of the outlet. The illustration below clarifies.



Test Loads

Table 8 – Vertical proof loads for cover, reducing and landing slabs to fit chambers greater than DN1250 and corbel slabs (Figures 11, 12, 13, 14).

This section introduces new test load requirements consistent with Load Model 1 EN 1991 -2:2003.

The test load of 250kN over a 400x400 contact area is a combination of the 150kN and 100kN wheel loads from adjacent lanes simplified as a single load for testing purposes.

Maximum Installation Depth

Annex A (informative): Assessment of strength class for shaft units at given design depth

A distinction is made between the structural behaviour of circular and rectangular manholes. Rectangular manholes will develop surfaces in tension across their vertical sides when under lateral soil load whereas circular manholes will develop circumferential compression within the chamber walls without developing tension faces. This section provides a mathematical calculation method to determine the maximum permissible installation depth of rectangular manholes for a defined strength class.

Example

Consider a manhole designed to be in accordance with Sewers for Adoption 7th Edition at a maximum depth of 3.5m in good ground (D=20kN/m3, ø'=30˚) with a road surcharge of 12kN/m^2

Design in accordance with BS5911-3 Annex A , BS EN 1992-1-1, BS EN 1997-1

Option A – 1250 x 1250 rectangular Strength Class 24 / Fn = 30kN/m

From 3.1	M(Rd,c)	= 3.24 kNm	
From 3.2	σ_O	= 49.5kN/m^2	
From 3.3	M(Ed,ext)	= 8.08 kNm	External corner gives critical moment
From 3.4	3.24 / 1.15= 2.82	< 8.08	Unit not satisfactory

Select higher strength class and recheck

Option B – 1200ø circular shaft Strength Class 25 / Fn = 30kN/m

Compressive stress under installed conditions

fc = σ_O D / 2t where D = average diameter, t = wall thickness

= 49.5 x 10^-3 x 1290 / 2 / 90= 0.35 N/mm^2

From BS EN 1992-1-1 cl 3.1.6

Design compressive strength fcd = αcc fck / γc = 0.8 x 30 / 1.5 = 16N/mm^2

16 > 0.35N/mm^2 Unit satisfactory

Select Class 25 circular unit