

BS 5911-3:2010+A1:2014

Incorporating Corrigendum No. 1



BSI Standards Publication

Concrete pipes and ancillary concrete products

Part 3: Specification for unreinforced and reinforced concrete manholes and soakaways (complementary to BS EN 1917:2002)

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Foreword

Publishing information

This part of BS 5911 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 May 2010. It was prepared by Technical Committee B/505, *Wastewater engineering*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 5911 supersedes BS 5911-3:2010, which is withdrawn.

Relationship with other publications

BS 5911-3 was prepared to complement, and to be used in conjunction with, BS EN 1917. In order not to create any barrier to trade, products under the scope of this British Standard are specified as conforming to “BS EN 1917 and BS 5911-3 or equivalent”.

BS EN 1917:2002 does not contain all the requirements for manholes in the existing national specifications of CEN members because complete agreement could not be achieved. BS 5911-3 contains complementary requirements from BS 5911-200¹⁾ that could not be agreed upon for inclusion in BS EN 1917. Although the scope of BS EN 1917 does not include soakaways, they have continued to be specified in this British Standard.

Information about this document

The several parts of BS 5911 specify requirements for various types of precast concrete pipe and ancillary concrete products such as manholes, inspection chambers and street gullies.

For an enquiry or order to be fully understood, it is essential that the manufacturer be given the information set out in Annex A of this part of BS 5911.

Text introduced or altered by Amendment No. 1 is indicated in the text by tags [A1] [A1]. Text introduced by or altered by Corrigendum No. 1 is indicated in the text by tags [C1] [C1]. Minor editorial changes are not tagged.

Product certification. Users of this part of BS 5911 are advised to consider the desirability of third party certification of product conformity with this British Standard. Appropriate conformity attestation arrangements are described in BS EN 1917. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

Amendment 1 introduces the following principal changes:

- a) inclusion of rectangular sizes up to LN 1250;
- b) full specification for base units;
- c) specification for elastomeric load bearing seals;
- d) test loads for cover slabs, reducing slabs, landing slabs and corbel slabs aligned with Eurocodes;

¹⁾ Now withdrawn.

- e) new requirements (and appropriate test method) for lifting anchorages; and
- f) introduction of Annex F giving guidance on permissible installed depth for rectangular manholes.

This corrigendum is to correct non-technical errors in seven figures, two annexes and other minor areas introduced in Amendment 1.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

[A1] BS EN 1917 specifies requirements and describes test methods for precast concrete manholes of circular and rectangular (with or without chamfered or rounded corners) or elliptical cross-section, unreinforced, steel fibre and reinforced, with nominal sizes or nominal lengths not exceeding DN 1250 or LN 1250, respectively. The intended use of BS EN 1917 is to permit access to, and to allow aeration of, drain or sewer systems for the conveyance of sewage, rainwater and surface water under gravity or occasionally at low head of pressure, mainly installed in areas subjected to vehicular and/or pedestrian traffic.

This part of BS 5911 specifies complementary requirements to those in BS EN 1917 for unreinforced and reinforced concrete manholes of circular and rectangular cross-section (with or without chamfered or rounded corners), as provided for in BS EN 1917, i.e. units with nominal sizes or nominal lengths not exceeding DN 1250 or LN 1250, respectively. Full requirements for unreinforced and reinforced circular concrete manholes with nominal sizes greater than DN 1250, but not exceeding DN 3000, are also specified. The manholes are intended to be installed in carriageways of roads (including pedestrian streets), hard shoulders and parking areas for all types of road vehicles, though provision is also made for units subject to lighter traffic loading. Requirements for base units, elastomeric load bearing seals, soakaways, landing slabs and corbel slabs are also specified.

NOTE 1 Rectangular manholes greater than LN 1250 are to be treated as structures and should be accompanied by appropriate calculations in accordance with the relevant Eurocodes.

*NOTE 2 BS EN 752, BS EN 1295-1 and BS EN 1610 relate to the planning, design, installation and testing of drains and sewers. **[A1]***

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 3123, *Specification for spring calipers and spring dividers*

BS 4027, *Specification for sulfate-resisting Portland cement*

BS 4035, *Specification for linear measuring instruments for use on building and civil engineering constructional works – Steel measuring tapes, steel bands and retractable steel pocket rules*

BS 4449, *Steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product – Specification*

BS 4482, *Steel wire for the reinforcement of concrete products – Specification*

BS 4483, *Steel fabric for the reinforcement of concrete – Specification*

BS 4484-1, *Specification for measuring instruments for constructional works – Part 1: Metric graduation and figuring of instruments for linear measurement*

BS 7979, *Specification for limestone fines for use with Portland cement*

BS 8500-2:2006, *Concrete – Complementary British Standard to*

BS EN 206-1 – Part 2: Specification for constituent materials and concrete

BS EN 197-1, *Cement – Part 1: Composition, specifications and conformity criteria for common cements*

BS EN 197-4, *Cement – Part 4: Composition, specifications and conformity criteria for low early strength blastfurnace cements*

BS EN 450-1, *Fly ash for concrete – Part 1: Definition, specifications and conformity criteria*

BS EN 934-2, *Admixtures for concrete, mortar and grout – Part 2: Concrete admixtures – Definitions, requirements, conformity, marking and labelling*

BS EN 1008, *Mixing water for concrete – Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

BS EN 1917:2002, *Concrete manholes and inspection chambers, unreinforced, steel fibre and reinforced*

BS EN 12620, *Aggregates for concrete*

BS EN 13101:2002, *Steps for underground man entry chambers – Requirements, marking, testing and evaluation of conformity*

BS EN 14216, *Cement – Composition, specifications and conformity criteria for very low heat special cements*

BS EN 15167-1, *Ground granulated blast furnace slag for use in concrete, mortar and grout – Part 1: Definitions, specification and conformity criteria*

3 Terms and definitions

For the purpose of this part of BS 5911, the terms and definitions given in BS EN 1917 and the following apply.

3.1 cementitious content

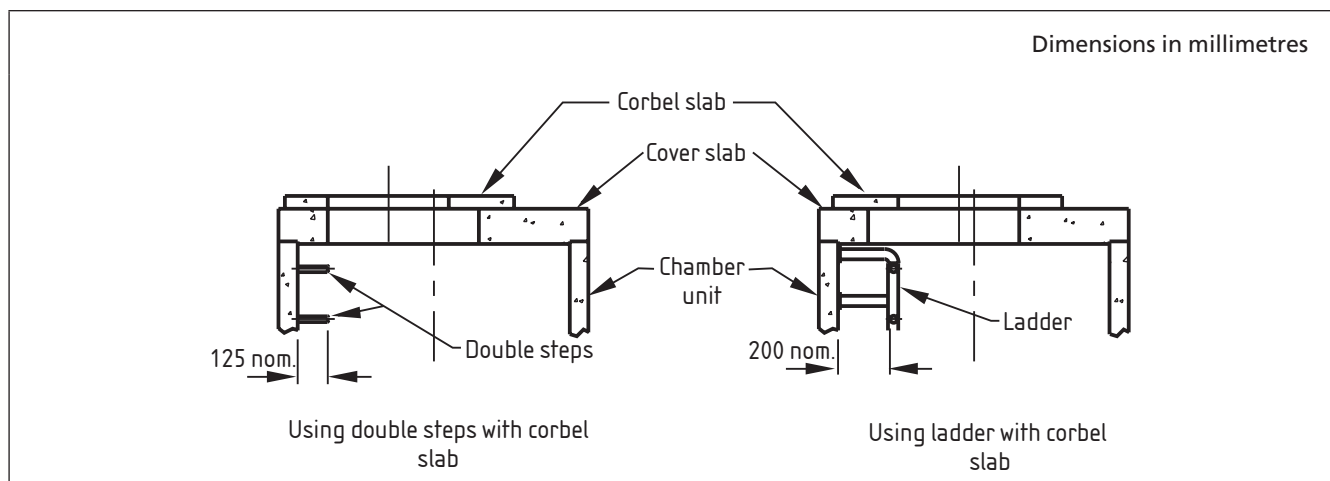
amount of cement plus any pozzolanic or latent hydraulic addition in the concrete mix

3.2 corbel slab

component without a joint or installed step incorporating a load-bearing overhang, used to adjust the total height of a structure and/or to accommodate an appropriate frame or cover

NOTE See Figure 1.

Figure 1 Use of corbel slabs in conjunction with double steps or ladder



- 3.3 elastomeric seal and load distributing element**
combination of seal and load distributing element designed to be watertight and evenly distribute vertical loads generally manufactured in EPDM

NOTE See Figure 2a BS EN 1917. **A1**

- 3.4 landing slab**
component forming an intermediate horizontal platform within a manhole and having an access opening
- 3.5 manufacturing diameter**
diameter of a circular unit that a manufacturer seeks to achieve
- 3.6 manufacturing size**
dimensions of a rectangular unit that a manufacturer seeks to achieve

- 3.7 plastometric seal**
deformable non-cured compound of rubber and mineral fibre

NOTE See Figure 2b and Figure 2c BS EN 1917. **A1**

- 3.8 soakaway**
vertical chamber of circular cross-section, perforated to allow the passage of water and with or without an access shaft

- 3.9 **C1** rectangular opening **C1****
A1 shaped access hole whose corners may be relieved by nominal 75 mm × 75 mm chamfers, or by nominal 75 mm radii **A1**

4 Symbols

The meanings of symbols used in this part of BS 5911 shall be as given in BS EN 1917:2002, Table 2.

5 General requirements

NOTE The numbers in brackets after subclause headings are the corresponding subclause numbers in BS EN 1917:2002.

5.1 Application

For units with nominal size or nominal length not exceeding DN 1250 or LN 1250, respectively, the requirements of this part of BS 5911 shall be in addition to those specified in BS EN 1917 and for the purposes of the latter, the reference specifications shall be those listed in Annex B.

For manholes with nominal sizes greater than DN 1250, landing slabs, corbel slabs and soakaways, the requirements of BS EN 1917 shall also apply, except as otherwise required by, or stated in, this part of BS 5911.

5.2 Concrete (4.2) – composition

5.2.1 Types of cement

The cement used shall conform to Table 1.

5.2.2 Cementitious content

The fully compacted concrete shall have a minimum cementitious content of not less than the relevant amount shown in Table 1. The composition/specification of cement groups shall be as shown in Table 2.

Table 1 Limiting values of composition and properties for concrete where a DC-class is specified

DC-class (design chemical class)	Max. water content ratio	Min. cement or combination content in kg/m ³ for max. aggregate sizes (mm) of:				Cement and combination types ^{A)}	Grouping used in BRE SD1:2005
		≥40	20	14	10		
DC-1 ^{B)}	—	—	—	—	—	All in Table 2	A to G
	0.55	300	320	340	360	IIB-V+SR, IIIA+SR, IIIB+SR, IVB-V	D, E, F
DC-2	0.50	320	340	360	380	CEM I, SRPC, IIA-D, IIA-S, IIA-V, IIB-S, IIB-V, IIIA, IIIB	A, G
	0.45	340	360	380	380	IIA-L or LL ≥ class 42,5	B
	0.40	360	380	380	380	IIA-L or LL class 32,5	C
DC-2z	0.55	300	320	340	360	All in Table 2	A to G
	0.50	320	340	360	380	IIIB+SR	F
DC-3	0.45	340	360	380	380	IVB-V	E
	0.40	360	380	380	380	IIB-V+SR, IIIA+SR, SRPC	D, G
DC-3z	0.50	320	340	360	380	All in Table 2	A to G
	0.45	340	360	380	380	IIIB+SR	F
DC-4	0.40	360	380	380	380	IVB-V	E
	0.35	380	380	380	380	IIB-V+SR, IIIA+SR, SRPC	D, G
DC-4z	0.45	340	360	380	380	All in Table 2	A to G
DC-4m	0.45	340	360	380	380	IIIB+SR	F

^{A)} For the sulfate-resisting characteristics of other cements and combinations, see BRE SD1 [1] and IP 17/05 [2].

^{B)} If the concrete is reinforced or contains embedded metal, the minimum concrete quality for 20 mm maximum aggregate size is C25/30, 0.65, 260 or designated concrete RC25/30.

Table 2 General purpose cements and combinations

Type	Notation	British Standard	Broad designation	Grouping used in BRE SD1:2005
Portland cement	CEM I	BS EN 197-1	CEM I	A
Portland silica fume cement ^{A)}	CEM II/A-D	BS EN 197-1	IIA	A
Portland limestone cement	CEM II/A-L	BS EN 197-1	IIA	B ^{B)} or C ^{B)}
	CEM II/A-LL	BS EN 197-1	IIA	B ^{B)} or C ^{B)}
Portland slag cements	CEM II/A-S	BS EN 197-1	IIA	A
	CEM II/B-S	BS EN 197-1	IIB-S	A
Portland fly ash cements	CEM II/A-V	BS EN 197-1	IIA	A
	CEM II/B-V	BS EN 197-1	IIB-V	A
	CEM II/B-V+SR ^{C)}	BS EN 197-1	IIB+SR	D
Blastfurnace cements	CEM III/A	BS EN 197-1 or	IIIA	A
	CEM III/A+SR ^{D)}	BS EN 197-4	IIIA+SR	D
	CEM III/B	BS EN 197-1 or	IIIB	A
	CEM III/B+SR ^{D)}	BS EN 197-4	IIIB+SR	F
Pozzolanic cement	CEM IV/B(V)	BS EN 197-1 or BS EN 14216	IVB-V	E
Sulfate-resisting Portland cement	SRPC	BS 4027	SRPC	G
Combinations conforming to BS 8500-2:2006, Annex A, manufactured in the concrete mixture from Portland cement and fly ash, ground granulated blast furnace slag (ggbs) or limestone fines:				
CEM I cement conforming to BS EN 197-1 with a mass fraction of 6% to 20% of combination of fly ash conforming to BS EN 450-1	CI/A-V	BS 8500-2:2006, Annex A	IIA	A
CEM I cement conforming to BS EN 197-1 with a mass fraction of 21% to 35% of combination of fly ash conforming to BS EN 450-1	CI/B-V	BS 8500-2:2006, Annex A	IIB-V	A
	CI/B-V+SR ^{C)}		IIB+SR	D
CEM I cement conforming to BS EN 197-1 with a mass fraction of 36% to 55% of combination of fly ash conforming to BS EN 450-1	CIVB-V	BS 8500-2:2006, Annex A	IVB-V	E
CEM I cement conforming to BS EN 197-1 with a mass fraction of 6% to 20% of combination of ggbs conforming to BS EN 15167-1	CI/A-S	BS 8500-2:2006, Annex A	IIA	A
CEM I cement conforming to BS EN 197-1 with a mass fraction of 21% to 35% of combination of ggbs conforming to BS EN 15167-1	CI/B-S	BS 8500-2:2006, Annex A	IIB-S	A
CEM I cement conforming to BS EN 197-1 with a mass fraction of 36% to 65% of combination of ggbs conforming to BS EN 15167-1	CI/IIA	BS 8500-2:2006, Annex A	IIIA	A
	CI/IIA+SR ^{D)}		IIIA+SR	D
CEM I cement conforming to BS EN 197-1 with a mass fraction of 66% to 80% of combination of ggbs conforming to BS EN 15167-1	CI/IIB	BS 8500-2:2006, Annex A	IIIB	A
	CI/IIB+SR ^{D)}		IIIB+SR	F
CEM I cement conforming to BS EN 197-1 with a mass fraction of 6% to 20% of combination of limestone fines conforming to BS 7979	CI/A-L	BS 8500-2:2006, Annex A	IIA	B ^{B)} or C ^{B)}
	CI/A-LL		IIA	B ^{B)} or C ^{B)}

^{A)} When IIA or IIA-D is specified, CEM I and silica fume may be combined in the concrete mixer using the *k*-value concept; see BS EN 206-1:2000, 5.2.5.2.3.

^{B)} The classification is B if the cement or combination strength is class 42,5 or higher and C if it is class 32,5.

^{C)} With a minimum proportion of fly ash of 25%.

^{D)} Where the alumina content of the slag exceeds 14%, the tricalcium aluminate content of the Portland cement fraction should not exceed 10%.

5.2.3 Mixing water (4.1)

Mixing water for concrete shall conform to BS EN 1008.

NOTE BS EN 1008:2002, 3.1, specifies that potable water does not need testing.

5.3 Finish (4.3.2) – surface voids

With the exception of the external edges of slabs and of adjusting units and of corbel slabs, when tested in accordance with Annex C, surfaces of units and components shall be free from voids that permit diametrically opposite points of the rim of the gauge to touch the surface of the unit or component simultaneously.

Units and components exhibiting any surface void greater than 12 mm deep shall be deemed not to conform to this part of BS 5911.

NOTE Voids up to and including 12 mm deep may be made good by the manufacturer (see BS EN 1917:2002, 4.3.2).

5.4 Geometrical characteristics (4.3.3)

5.4.1 General

Subject to the requirements of this clause, the dimensions and thickness of units and components shall conform to those stated in the factory documents.

5.4.2 Nominal sizes

NOTE 1 Nominal size is defined in BS EN 1917:2002, 3.1.16, as a numerical designation of the size of a component within a structure, which is a convenient integer approximately equal to the manufacturing dimension in millimetres; for a circular unit it is the internal diameter (DN), and for a unit having a rectangular or elliptical internal shape it is the internal length/width (LN/WN).

The nominal sizes of circular and rectangular vertical units and tapers for use with them shall be those given in Table 3 and Table 4, respectively. Steps shall not be permitted in DN 900 shafts or associated components.

NOTE 2 DN 900 units are intended only to be used as a winch shaft because, if fitted with steps or a ladder, the clear space to the back of the shaft would be less than the 900 mm as recommended in the HSE publication, "Safe work in confined spaces" [3] and in BS EN 752:2008, Table NA.22. Equally, ladders should not be fitted to DN 1050 units.

5.4.3 Internal manufacturing diameter and manufacturing size of vertical units

The internal manufacturing diameters and manufacturing sizes of circular and rectangular vertical units shall not be outside the limits given in Table 3 and Table 4, respectively.