

Concrete pipes and ancillary concrete products —

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

ICS 91.100.30; 91.140.80

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee B/505, Wastewater engineering, upon which the following bodies were represented:

- British Plastics Federation
- Chartered Institution of Water and Environmental Management
- Clay Pipe Development Association
- CPSA — Concrete Pipeline Systems Association
- Institute of Cast Metals Engineers
- Institution of Civil Engineers
- LOTAG — London Technical Advisors Group
- METCOM
- ODPM represented by BRE
- Water UK

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Foreword

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.

BS 5911-3 has been prepared under the direction of Technical Committee B/505. It is a revision of part of the content of BS 5911-200. 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 5911-3 together with BS EN 1917 supersedes BS 5911-200. However, BS 5911-200 will remain current until 24 months after the publication of EN 1917:2002, i.e. October 2004, when it will be withdrawn.

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 5911-200 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 revision of BS 5911-200.

A1 The requirements for cementitious content and cement groupings have been aligned with the provisions of BS 8500-1:2002 and BRE Special Digest 1 [1] insofar as they relate to precast concrete pipeline systems. **A1**

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by **A1** **A1**.

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.

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.

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

BSI Committee B/505, whose constitution is shown in this British Standard, takes collective responsibility for its preparation under the authority of the Standards Policy and Strategy Committee. The Committee wishes to acknowledge the contribution of the following organizations:

The British Precast Concrete Federation;
The Concrete Society;
The Institution of Highways and Transportation.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 25 and a back cover.

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1 Scope

BS EN 1917 specifies requirements and describes test methods for precast concrete manholes of circular, 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 that European Standard, i.e. units with nominal sizes or nominal lengths not exceeding DN 1250 or LN 1250, respectively. Full requirements for unreinforced and reinforced 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 soakaways, landing slabs and corbel slabs are also specified.

Steel fibre concrete manholes are not manufactured in the United Kingdom and so have been excluded from this part of BS 5911.

BS EN 752-2, -3 and -4, BS EN 1295-1 and BS EN 1610 deal with the planning, design, installation and testing of drains and sewers.

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 146, *Specification for blastfurnace cements with strength properties outside the scope of BS EN 197-1.*

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

BS 3892-1, *Pulverized-fuel ash — Part 1: Specification for pulverized-fuel ash for use with Portland cement.*

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, *Specification for carbon steel bars for the reinforcement of concrete.*

BS 4482, *Specification for cold reduced steel wire for the reinforcement of concrete.*

BS 4483, *Steel fabric for the reinforcement of concrete.*

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

BS 6699, *Specification for ground granulated blastfurnace slag for use with Portland cement.*

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

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, *Steps for underground man entry chambers — Requirements, marking, testing and evaluation of conformity.* 

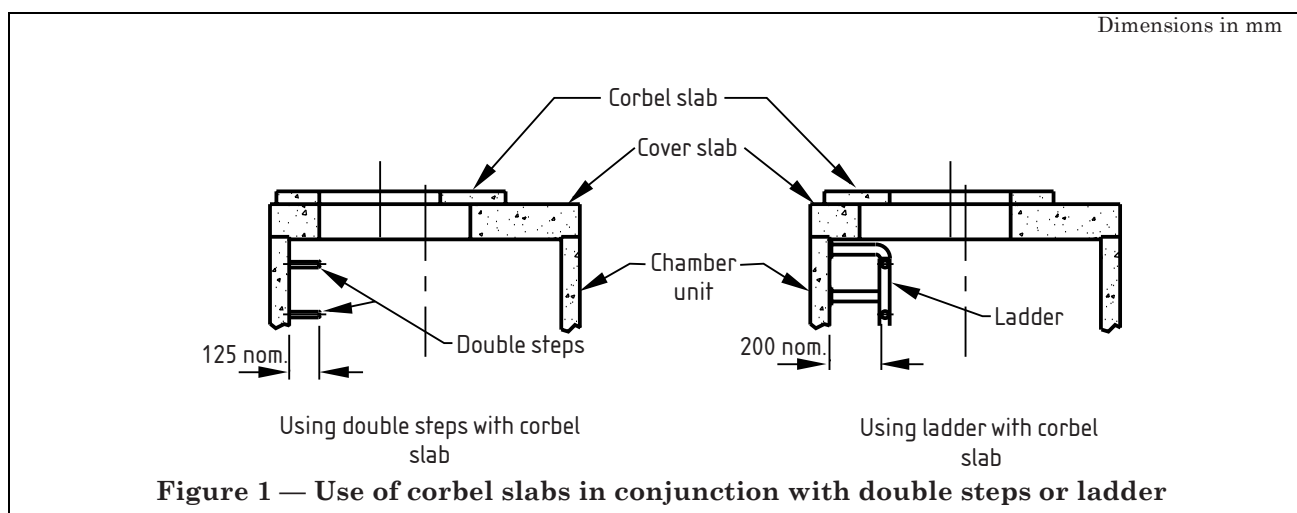
3 Terms and definitions

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.



3.3
landing slab
component forming an intermediate horizontal platform within a manhole and having an access opening

3.4
manufacturing diameter
diameter of a circular unit that a manufacturer seeks to achieve

3.5
manufacturing size
dimensions of a rectangular unit that a manufacturer seeks to achieve

3.6
soakaway
vertical chamber of circular cross-section, perforated to allow the passage of water and with or without an access shaft

3.7
square or rectangular opening
square or rectangular shaped access hole whose corners may be relieved by nominal 75 mm × 75 mm chamfers, or by nominal 75 mm radii

4 Symbols

The meanings of symbols used in this part of BS 5911 shall be as given in Table 1, together with those in BS EN 1917:2002, Table 2.

Table 1 — Symbols

Symbol	Meaning	Unit	Reference
h_s	Height of studs on straightness gauge	mm	D.3.2
h'	Effective height minus 0.03 m	m	D.3.2

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 of this Standard. 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)

5.2.1 Composition

5.2.1.1 Types of cement

The cement (see BS EN 1917:2002, 4.1) shall either:

- a) be factory-produced by the cement manufacturer and conform to one of the following Standards as appropriate:

Type of cement	Standard
CEM I	BS EN 197-1
CEM II/B-V	BS EN 197-1
Ⓐ ₁ BIII/B Ⓐ ₁	BS 146
Sulfate-resisting Portland	BS 4027; or

- b) consist of a combination of cement conforming to CEM I as specified in BS EN 197-1 and an addition in the form of ground granulated blastfurnace slag (ggbs) or pulverized-fuel ash (pfa) Ⓐ₁ in the proportions specified in 5.2.1.2 Ⓐ₁, to be included as part of the concrete mix by simultaneously combining them with the other concrete materials at the concrete mixer.

In all cases where combinations of cement conforming to CEM I as specified in BS EN 197-1 and ggbs or pfa are used, the relevant proportion of ggbs or pfa shall be fully documented in the production records.

5.2.1.2 Cementitious content

The fully compacted concrete shall have a minimum cementitious content of not less than the relevant amount shown in Table 2. The composition/specification of cement groups shall be as shown in Table 3.

Table 2 — Cementitious content^a

Class ^b	Aggregate carbonate range ^c	Cement or combination group	Minimum cement or combination content kg/m ³	Maximum w/c ratio
DC-2	A, B, C	1, 2, 3	340	0.45
DC-3	A	2a	400	0.40
	A	2b, 3	380	0.45
	B, C	2, 3	340	0.45
DC-3*	B	2, 3	380	0.45
DC-3**	C	2, 3	380	0.45
DC-4	A	2a	400	0.35
	A	2b, 3	400	0.40
	A	2, 3	380	0.33
	B, C	2, 3	380	0.45
	B, C	2, 3	360	0.40
DC-4*	B	2, 3	380	0.33
	B	2, 3	400	0.40
DC-4**	C	2, 3	380	0.33
	C	2, 3	400	0.40
DC-4m	A	2b, 3	380	0.33
	A	2b, 3	400	0.40
	B	3	400	0.40
	B, C	3	360	0.40
	B, C	3	380	0.45
DC-4m*	B	3	380	0.33
DC-4m**	C	3	380	0.33
	C	3	400	0.40

^a The table is consistent with the provisions of BS 8500-1:2002 and BRE Special Digest 1 [1] insofar as they relate to precast concrete pipeline systems, except that the maximum water content (w/c) ratio is limited to 0.45 in accordance with BS EN 1917:2002, 4.2.4.2.

^b The class designations are those for design chemical class (DC-class) in BS 8500-1:2002, Table A.15. Where there is more than one option in a class the choice is at the manufacturer's discretion.

^c See BRE Special Digest 1 — Part 4, Table 4.



Table 3 — Cement groups^a

Type (see 5.2.1.1)	Designation	Standard	Grouping with respect to sulfate resistance
Portland cement	CEM I	BS EN 197-1	1
Portland fly ash cements	CEM II/B-V ^b	BS EN 197-1	2a ^c
Sulfate-resisting Portland cement	SRPC	BS 4027	3
Blastfurnace slag cements ^e	BIII/B ^d	BS 146	2b ^e
<i>Combinations conforming to BS 8500-2:2002, Annex A manufactured in the concrete mixer from Portland cement and pfa or ggbs:</i>			
CEM I cement conforming to BS EN 197-1 with a mass fraction of 6 % to 21 % of combination of pfa conforming to BS 3892-1	CIIA-V	BS 8500-2	1
CEM I cement conforming to BS EN 197-1 with a mass fraction of 21 % to 35 % of combination of pfa conforming to BS 3892-1	CIIB-V ^b	BS 8500-2	2a ^c
CEM I cement conforming to BS EN 197-1 with a mass fraction of 36 % to 55 % of combination of pfa conforming to BS 3892-1	CIVB-V ^b	BS 8500-2	2a ^f
CEM I cement conforming to BS EN 197-1 with a mass fraction of 6 % to 35 % of combination of ggbs conforming to BS 6699	CII-S ^g	BS 8500-2	1
CEM I cement conforming to BS EN 197-1 with a mass fraction of 36 % to 65 % of combination of ggbs conforming to BS 6699	CIIIA	BS 8500-2	1
CEM I cement conforming to BS EN 197-1 with a mass fraction of 66 % to 80 % ^e of combination of ggbs conforming to BS 6699	CIIB ^d	BS 8500-2	2b ^e

^a The table is consistent with BS 8500-1:2002, Table A.17 and BS 8500-2:2002, Table 1.

^b Where the proportions for sulfate resistance are required, i.e. not less than 25 % and not more than 40 % pfa, add to the abbreviation “+SR”.

^c Provided the pfa content is a mass fraction of not less than 25 % of cement or combination. Where it is less than 25 %, the cement or combination falls within group 1.

^d Where the proportions for sulfate resistance are required (see ^e), add to the abbreviation “+SR”.

^e Where the alumina content of the slag exceeds 14 %, the tricalcium aluminate content of the Portland cement fraction should not exceed 10 %. Where this is not the case, the grouping with respect to sulfate resistance is “1”.

^f Provided the pfa content is a mass fraction of not more than 40 % of cement or combination. Where it exceeds 40 %, no guidance is provided.

^g Where necessary, this class can be subdivided into CIIA-S (6 % to 20 % ggbs) and CIIB-S (20 % to 35 % ggbs).



5.2.1.3 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)

5.3.1 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.