

Concrete pipes and ancillary concrete products —

Part 5: Specification for prestressed non-pressure pipes and fittings with flexible joints

ICS 23.040.50

Committees responsible for this British Standard

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

British Plastics Federation

British Water

CMF — Cast Metals Federation

Chartered Institution of Water and Environmental Management

Clay Pipe Development Association Ltd.

CPSA — Concrete Pipeline Systems Association

Institute of Cast Metal Engineers

Institute of Civil Engineers

Institute of Plumbing

LOTAG — London Technical Advisors Group

ODPM (represented by Waterman Burrow Crock)

Society of British Water Industries

Water UK

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Foreword

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

BS 5911-5 has been prepared under the direction of Technical Committee B/505. BS 5911-5:2004+A1:2010 supersedes BS 5911-5:2004, which is withdrawn.

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags **A1** **A1**. Minor editorial changes are not tagged.

Amendment A1 introduces the following principal changes:

- all references to other standards have been updated;
- Table 2 and Table 3 have been replaced to align with BS 8500.

BS EN 1916:2002 covers unreinforced, steel fibre and reinforced concrete pipes and fittings with flexible joints, but does not contain all the requirements of the existing national specifications of CEN members because complete agreement could not be achieved. BS 5911-1 contains requirements from the former BS 5911-100 that could not be agreed upon for inclusion in EN 1916.

Prestressed non-pressure concrete pipes are manufactured for the same market as unreinforced and reinforced ones but are not covered by any existing or proposed European Standard. Nevertheless, for consistency and convenience it was appropriate for BS EN 1916 to be used in connection with this revision of BS 5911-103, even though the scope of the former standard is not expressed as covering prestressed non-pressure concrete pipes.

The requirements for cementitious content and cement groupings have been aligned with the provisions of BS 8500-1:2006 and BRE Special Digest 1 [1] insofar as they relate to precast concrete pipeline systems.

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, based on the conformity attestation arrangements described in BS EN 1916:2002. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

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

The Concrete Society;

The Institution of Highways and Transportation.

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.

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

This part of BS 5911 specifies requirements and describes test methods for prestressed concrete non-pressure circular pipes and fittings with flexible joints (with seals either integrated in the units or supplied separately) and nominal sizes not exceeding DN 3200, for which the main intended use is the conveyance of sewage, rainwater and surface water under gravity or occasionally at low head of pressure, in pipelines that are generally buried.

BS EN 752, 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.

Text deleted.

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

Text deleted.

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.*

Text deleted.

Text deleted.

BS 5896:1980, *Specification for high tensile steel wire and strand for the prestressing of concrete.*

Text deleted.

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 206-1:2000, *Concrete — Part 1: Specification, performance, production and conformity.*

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

BS EN 681-1, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber.*

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 1916:2002, *Concrete pipes and fittings, unreinforced, steel fibre and reinforced.*

BS EN 12620:2002, *Aggregates for concrete.*

BS EN 12390-2, *Testing hardened concrete — Part 2: Making and curing specimens for strength tests.*

BS EN 12390-3, *Testing hardened concrete — Part 3: Compressive strength of test specimens.*

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, specifications and conformity criteria.*

3 Terms and definitions

For the purposes of this part of BS 5911, the terms and definitions given in BS EN 1916 and the following apply.

3.1

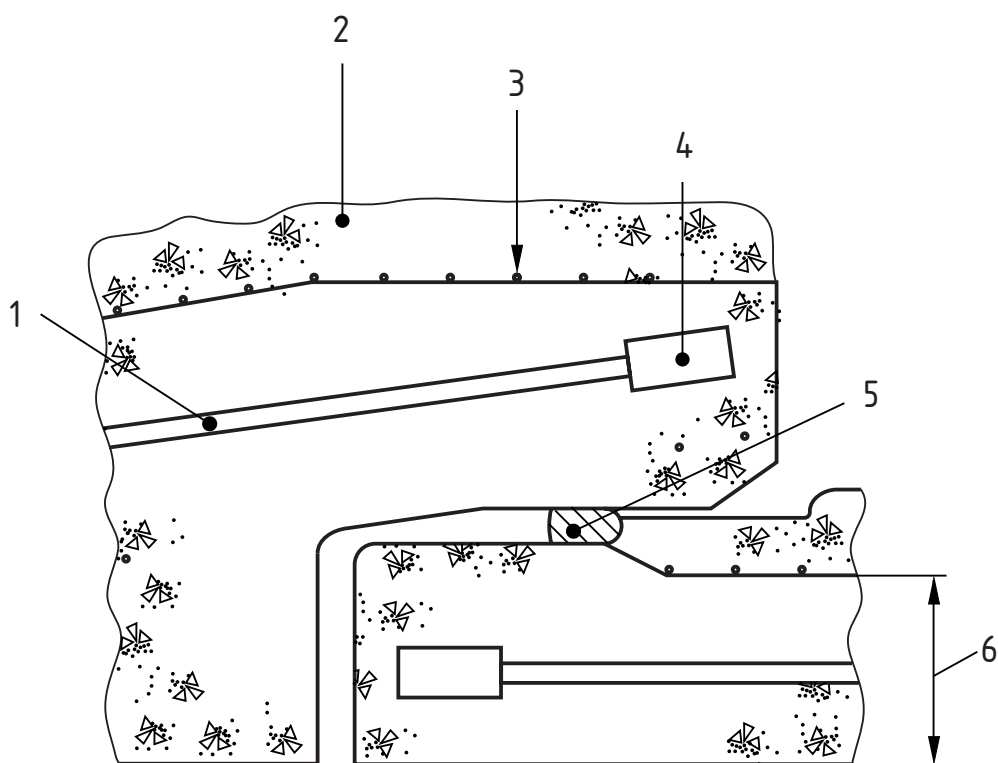
cementitious content

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

3.2

core pipe

pipe that is structurally reinforced with non-tensioned steel, or longitudinally prestressed with pretensioned high tensile steel wire, or a combination of both, embedded in the concrete (see Figure 1)



Key

- | | |
|--|----------------------------|
| 1 High tensile steel wires for longitudinal prestressing, or mild steel reinforcement cage | 4 Longitudinal wire anchor |
| 2 Cover coat | 5 Elastomeric seal |
| 3 High tensile steel wires for circumferential prestressing | 6 Concrete core |

Figure 1 — Typical section of a prestressed concrete pipe with a spigot and socket joint

3.3

cover coat

layer of cement/fine aggregate mortar applied to the outside of a circumferentially prestressed core pipe (see Figure 1)

3.4

manufacturing diameter

diameter of a unit that a manufacturer seeks to achieve

3.5**prestressed concrete pipe**

core pipe that is circumferentially prestressed to withstand design loads for the installed condition and is protected by a cover coat

NOTE A typical section through a prestressed concrete pipe with spigot and socket joint is shown in Figure 1.

3.6**slurry coat**

coat of cement and water sprayed over a core pipe and circumferential prestressing wire before application of the cover coat

3.7**splay pipe**

prestressed concrete pipe formed with either the socket or the spigot off-set at an angle to its longitudinal axis (see Figure 2)

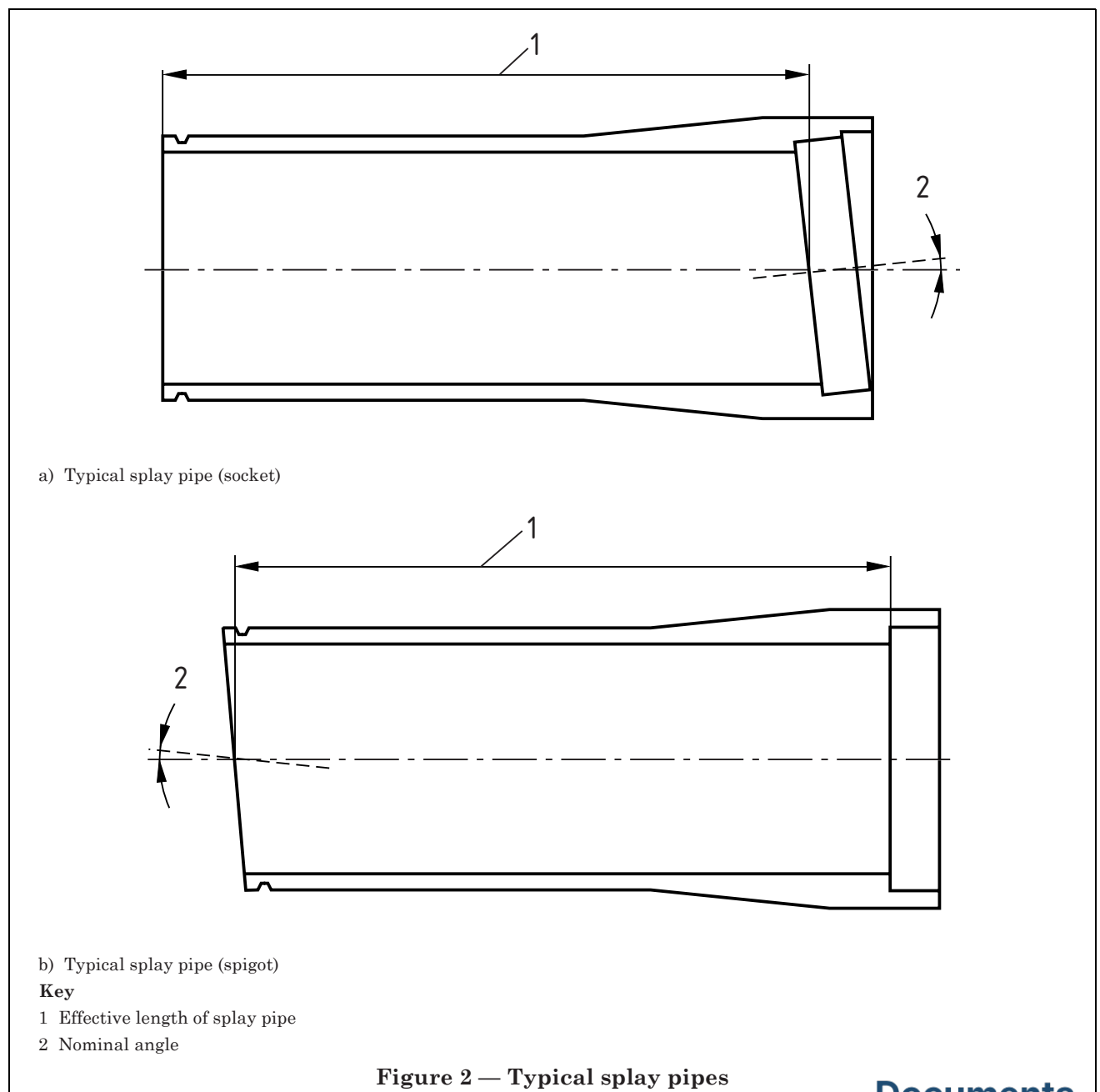


Figure 2 — Typical splay pipes

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 1916:2002, Table 2.

Table 1 — Symbols

Symbol	Meaning	Unit	Reference
D_w	Nominal diameter of prestressing wire	mm	C.3.2 and C.3.3
h_s	Height of studs on straightness gauge	mm	E.3.2.1
l'	Internal barrel length minus 0.1 m	m	E.3.2.1

5 General requirements

NOTE The numbers in parentheses after subclause headings are the corresponding subclause numbers in BS EN 1916:2002.

5.1 Application

Except where otherwise prescribed, the requirements of this part of BS 5911 shall be in addition to those specified in BS EN 1916 for reinforced concrete pipes and, for the purposes of the latter, the reference specifications shall be those listed in Annex B of this standard.

5.2 Prestressing wire

Wire for prestressing a core pipe shall be cold-drawn high tensile steel wire, straightened and stress relieved, conforming to BS 5896:1980, Section Two and Annex C of this standard.

5.3 Concrete (4.2)

5.3.1 Types of cement

A1 The cement used shall conform to Table 2. **A1**

5.3.2 Cementitious content (4.2.4)

5.3.2.1 Core pipe

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.

5.3.2.2 Slurry coat

The slurry coat shall consist of one part by mass of water mixed with 1.5 to 1.6 parts by mass of Portland cement.

5.3.2.3 Cover coat

The cover coat mortar shall consist of one part by mass of Portland cement mixed with not more than three parts by mass of fine aggregate conforming to BS EN 12620 designation 0/4 (CP), category G_F85 and have a water/cement ratio not greater than 0.35.

5.3.2.4 Cement compatibility

Cement conforming to BS 4027 shall not be used with any other cement within the same unit.

5.3.3 Chloride content (4.2.5)

The calculated chloride ion content of the concrete, mortar or slurry mixes shall not exceed 0.1 % by mass of their respective cementitious contents.

Table 2 — 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 3	A to G
DC-2	0.55	300	320	340	360	IIB-V+SR, IIIA+SR, IIIB+SR, IVB-V	D, E, F
	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 3	A to G
DC-3	0.50	320	340	360	380	IIIB+SR	F
	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 3	A to G
DC-4	0.45	340	360	380	380	IIIB+SR	F
	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 3	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.

A1