BRITISH STANDARD

BS 5911-6:2004
+A1:2010

Concrete pipes and ancillary concrete products —

Part 6: Specification for road gullies and gully cover slabs

ICS 93.080.30

BSI
British Standards

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

Institution 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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Amendments issued since publication

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A1	June 2010	See Foreword

Contents

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 road gullies.

BS 5911-6 has been prepared under the direction of Technical Committee B/505. BS 5911-6:2004+A1:2010 supersedes BS 5911-6:2004, which is withdrawn.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 and BS EN 1917:2002 covers manholes and inspection chambers manufactured from the same types of precast concrete. Neither contains all the requirements of the existing national specifications of CEN members because complete agreement could not be achieved. Therefore, BS 5911-1, -3 and -4 contain requirements from former national British Standards that could not be agreed upon for inclusion in EN 1916 and EN 1917.

Precast concrete road gullies and gully cover slabs are two of the ancillary products often made by manufacturers of concrete pipes and so for over 50 years they have been specified within the same British Standard. Accordingly, for consistency and convenience, it was appropriate for this revision of BS 5911-230 to be aligned with BS EN 1916, BS EN 1917 and BS 5911-1, -3 and -4 wherever practicable.

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 herein. 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 Policy and Strategy Committee. The committee wishes to acknowledge the contribution of the following organizations:

— The British Precast Concrete Federation;

— The Concrete Society;

— The County Surveyors' Society;

— The Highways Agency.

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 precast concrete road gullies manufactured from monolithic concrete or prefabricated sections of concrete. A gully outlet may incorporate a permanent former, with or without a jointing profile, for the connection of a pipeline. Requirements are also specified for gully cover slabs. The intended use for gullies is the interception of silt and debris from surface water being discharged into drainage systems.

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.

〉A1〈 *Text deleted.* 〉A1〈

〉A1〈 *Text deleted.* 〉A1〈

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

BS 5204-2*, Specification for straightedges — Part 2: Steel or granite straightedges of rectangular section.*

〉A1〈 *Text deleted.* 〉A1〈

〉A1〈 BS 7979, *Specification for limestone fines for use with Portland cement.* 〉A1〈

〉A1〈 BS 8500-2:2006, *Concrete — Complementary British Standard to BS EN 206-1 — Part 2: Specification for constituent materials and concrete.* 〉A1〈

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

〉A1〈 BS EN 197-4, *Cement — Part 4: Composition, specifications and conformity criteria for low early strength blastfurnace cements.* 〉A1〈

〉A1〈 BS EN 450-1, *Fly ash for concrete — Part 1: Definition, specifications and conformity criteria.* 〉A1〈

BS EN 934-2*, Admixtures for concrete, mortar and grout — Part 2: 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 12620*, Aggregates for concrete.*

〉A1〈 BS EN 14216, *Cement — Composition, specifications and conformity criteria for very low heat special cements.* 〉A1〈

〉A1〈 BS EN 15167-1, *Ground granulated blast furnace slag for use in concrete, mortar and grout — Part 1: Definitions, specifications and conformity criteria.* 〉A1〈

3 Terms and definitions

For the purposes of this part of BS 5911, the following terms and definitions apply.

3.1
unit
gully (whether trapped or untrapped) or a gully cover slab

NOTE Although unreinforced, the concrete in units conforming to this part of BS 5911 may be strengthened for handling purposes.

3.2
type
units of the same manufacturing process and design

3.3
gully
device for the interception of silt and debris from surface water being discharged into a drainage system

3.4
untrapped gully
hollow cylinder, with base, manufactured from concrete with an outlet to facilitate the connection of a pipeline, which acts as a rodding eye

NOTE It is permissible for the outlet to incorporate a permanent former, with or without a jointing profile, for the connection of pipelines.

3.5
trapped gully
gully as described in **3.4** but with the outlet designed to form a water seal, and provided with a rodding eye

NOTE It is permissible for the outlet to incorporate a permanent former, with or without a jointing profile, for the connection of pipelines.

3.6
gully cover slab
frame or surround manufactured from concrete, with or without a drainage slot, to accommodate a road gully grating and frame

3.7
nominal size
for a gully, the expression of nominal section and nominal depth separated by solidus (e.g. “450/900” or “300/385/900”); for a gully cover slab, the nominal section of the gully with which it is designed to fit

3.8
nominal section
numerical designation of the plan shape of a gully which for circular sections is a convenient integer approximately equal to the internal diameter in millimetres and for rectangular sections is convenient integers approximately equal to the internal length and width in millimetres

3.9
nominal depth
numerical designation of the depth of a gully, or gully outlet, which is a convenient integer approximately equal to the internal depth in millimetres

3.10
manufacturing dimension
dimension(s) of section, diameter or depth which a manufacturer seeks to achieve

3.11
actual dimension
dimension(s) of section, diameter or depth as measured

3.12
cementitious content
amount of cement plus any pozzolanic or latent hydraulic addition in the concrete mix

3.13
inspection
process of measuring, examining, testing, gauging or otherwise comparing a unit with the applicable requirements

3.14
routine inspection
inspection by sampling at prescribed intervals in order to determine the acceptability of the items represented by the samples

3.15
continuous inspection
routine inspection according to a sampling plan which indicates the number of units from a specific process evaluated to have attained, and continue to be in, a state of control, and the associated acceptance criteria

3.16
sample
one or more units selected at random without regard to their quality

3.17
specific process
manufacture of units of the same nominal size and type, essentially under the same conditions over any period of time

3.18
switching rules
rules that govern the decision to increase or decrease the severity of inspection

4 Symbols

The meanings of symbols used in this part of BS 5911 shall be as given in Table 1.

Table 1 — Symbols

Symbol	Meaning	Unit	Reference
A_w	absorption of water by immersion	%	**B.5**
m_1	constant mass of immersed sample	kg	**B.4.1**, **B.5**
m_2	constant mass of dry sample	kg	**B.4.2**, **B.5**
N	test per nominal size	—	Annex F
R	routine inspection test	—	Clause **6**
T	initial type test	—	Clause **6**
Y	test per type and nominal size produced, per 1000, with a minimum of one per type and year	—	Annex F

5 General requirements

5.1 Materials

5.1.1 *Cements*

Cements shall conform to **5.2.4**.

5.1.2 *Aggregates*

Aggregates shall conform to BS EN 12620.

NOTE BS EN 12620:2002, **4.3.7** permits special aggregate gradings where these are needed to suit the manufacturing process, provided the special grading envelopes are defined using the R20 series of sieves specified in ISO 565:1990 and incorporating the appropriate sieves from a specified range of sizes.

5.1.3 *Admixtures*

Admixtures shall conform to BS EN 934-2.

5.1.4 *Additions*

Additions shall be in the form of ground granulated blastfurnace slag (ggbs) or pulverized-fuel ash (pfa), conforming to ▌A1⟩ BS EN 15167-1 and BS EN 450-1 ⟨A1▐ respectively.

5.1.5 *Mixing water*

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.

5.2 Concrete

5.2.1 *Concrete materials*

NOTE Although unreinforced, the concrete in units conforming to this part of BS 5911 may be strengthened for handling purposes.

Only materials described in **5.1** shall be used.

5.2.2 *Concrete quality*

The concrete in any unit shall be dense, homogeneous and conform to the requirements of **5.2.3**, **5.2.4** and **5.2.5**.

5.2.3 *Water content of concrete*

Concrete shall have such a composition that the ratio of water to cementitious content in the fully compacted state is not greater than 0.45 and is consistent with the serviceability conditions in **5.3.6**.

5.2.4 *Types of cement*

〈A1〉 The cement used shall conform to Table 2. 〈A1〉

5.2.5 *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.

〈A1〉 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/m³ 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〉

Table 3 — 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 CEM II/A-LL	BS EN 197-1 BS EN 197-1	IIA IIA	B[b] or C[b] B[b] or C[b]
Portland slag cements	CEM II/A-S CEM II/B-S	BS EN 197-1 BS EN 197-1	IIA IIB-S	A A
Portland fly ash cements	CEM II/A-V CEM II/B-V CEM II/B-V+SR[c]	BS EN 197-1 BS EN 197-1 BS EN 197-1	IIA IIB-V IIB+SR	A A D
Blastfurnace cements	CEM III/A CEM III/A+SR[d] CEM III/B CEM III/B+SR[d]	BS EN 197-1 or BS EN 197-4 BS EN 197-1 or BS EN 197-4	IIIA IIIA+SR IIIB IIIB+SR	A D A 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	CIIA-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	CIIB-V CIIB-V+SR [c]	BS 8500-2:2006, Annex A	IIB-V IIB+SR	A 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	CIIA-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	CIIB-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	CIIIA CIIIA+SR[d]	BS 8500-2:2006, Annex A	IIIA IIIA+SR	A 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	CIIIB CIIIB+SR[d]	BS 8500-2:2006, Annex A	IIIB IIIB+SR	A 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	CIIA-L CIIA-LL	BS 8500-2:2006, Annex A	IIA IIA	B[b] or C[b] 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%.

5.2.6 *Chloride content*

The amount of chloride ion in the concrete shall be evaluated by calculation and shall not exceed 1.0 % by mass of the cementitious content, or 0.4 % if the concrete contains steel for handling purposes.

5.2.7 *Water absorption*

When tested in accordance with Annex B the water absorption of the concrete shall not exceed 6 % by mass.

5.3 Units

5.3.1 *General*

Units shall conform to the following requirements at the time of delivery.

5.3.2 *Fabrication*

Where a gully is to be assembled from fabricated sections, they shall be bonded together with special mortar.

5.3.3 *Finish*

Units exhibiting any surface void greater than 12 mm deep shall be deemed not to conform to this part of BS 5911. A surface void not exceeding 12 mm deep and any damage affecting the performance of a unit, including joints but excluding the external edges of gully cover slabs, shall be made good. After any final treatment, a unit shall conform to all relevant requirements of this part of BS 5911.

5.3.4 *Geometrical characteristics*

5.3.4.1 *General*

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

5.3.4.2 *Nominal sizes*

The nominal sizes of gullies shall be those given in Table 4. The nominal sizes of gully cover slabs shall be 375, 450 and 300/385.

5.3.4.3 *Dimensions and configuration of gullies*

The dimensions and configuration of a gully shall conform to the requirements in Table 4 when tested in accordance with Annex C.

5.3.4.4 *External manufacturing section and top flange*

The external manufacturing section of a gully shall be not less than 1.15 times the internal manufacturing diameter or length or width and the top flange shall be of width not less than 0.15 times that diameter, length or width (see Figure 1, Figure 2, Figure 3 and Figure 4).

5.3.4.5 *Gully outlet*

The diameter of a gully outlet shall be 150 mm ± 5 mm (see Figure 1, Figure 2, Figure 3 and Figure 4).

5.3.4.6 *Gully cover slab thickness*

The thickness of a gully cover slab shall be not less than 65 mm when tested in accordance with **C.3**.

5.3.5 *Watertightness*

When tested in accordance with Annex D a gully shall not show any leakage.

NOTE Moisture appearing on the surface in the form of patches or beads is acceptable.

5.3.6 *Serviceability*

Units conforming to this part of BS 5911 are at least suitable for use in humid conditions and a slightly aggressive chemical environment (i.e. for most soils and groundwaters). Special attention needs to be paid if more severe conditions are expected [see c) of Annex A]; primarily the manufacturer shall adjust as necessary the amount of cement plus any pozzolanic or latent hydraulic addition in the concrete (see **5.2.5**).

NOTE The durability of installed units is specifically ensured by the following requirements:

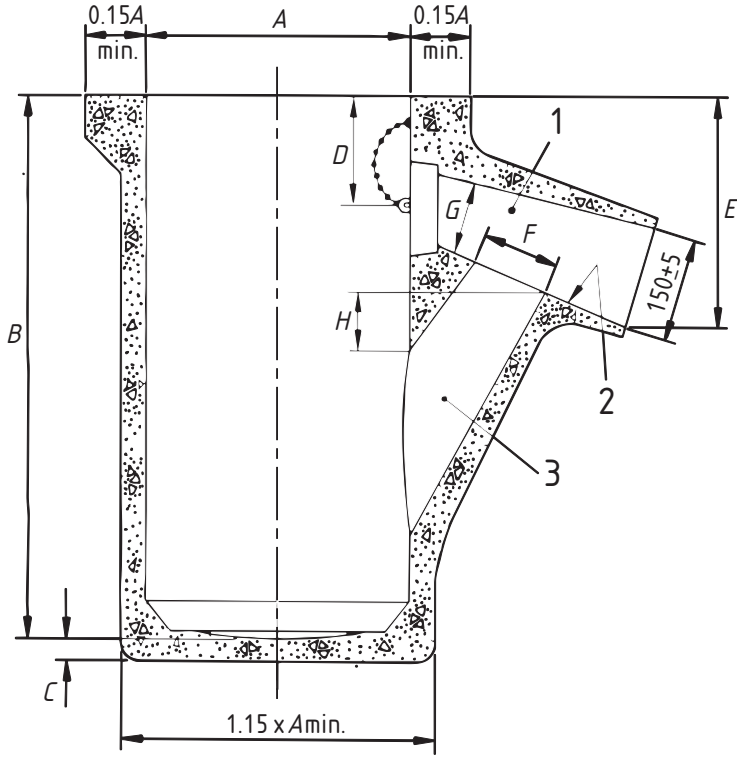
— a maximum water/cement ratio of the concrete (see **5.2.3**);
— a maximum chloride content of the concrete (see **5.2.6**);
— a maximum water absorption of the concrete (see **5.2.7**).

Table 4 — Nominal sizes dimensions for gullies

Nominal size of gully (see 3.7)			Limits of internal manufacturing section of gully (see 3.10)	Deviation of actual internal manufacturing depth (see 3.10)	Limits of internal manufacturing depth (see 3.10)	Deviation of actual internal depth from internal manufacturing depth	Minimum thickness of base	Maximum inside depth to centre of outlet (untrapped) or rodding eye (trapped)	Maximum outside depth of outlet (see 3.7)	Trapped gullies only			
										Minimum dimension of riser	Minimum cross sectional area of riser	Minimum internal diameter of rodding eye	Minimum depth of water seal
Nominal section		Nominal depth	A		B		C	D	E	F		G	H
Nominal diameter	Nominal width/ length		mm	mm	mm	mm	mm	mm	mm	mm	mm^2	mm	mm
375		750	365 to 385	6	740 to 760	25	50	300	400	90	8 000	100	85
		900			890 to 910								
450		750	435 to 465	9	740 to 760	25	50	300	400	90	8 000	100	85
		900			890 to 910								
		1 050			1 040 to 1 060								
		1 200			1 180 to 1 210								
	300/385	700	AW 290 to 310	6	690 to 710	25	50	335	430				
			AL 375 to 395										
	300/385	750	AW 290 to 310	6	740 to 760	25	50	335	430				
			AL 375 to 395										
	300/385	700	AW 290 to 310	6	690 to 710	25	50	195	290	N/A	8 000	100	80
			AL 375 to 395										

NOTE Typical arrangements for gullies and the dimensions A, B, C, D, E, F, G and H are shown in Figure 1, Figure 2, Figure 3 and Figure 4.

Dimensions in millimetres

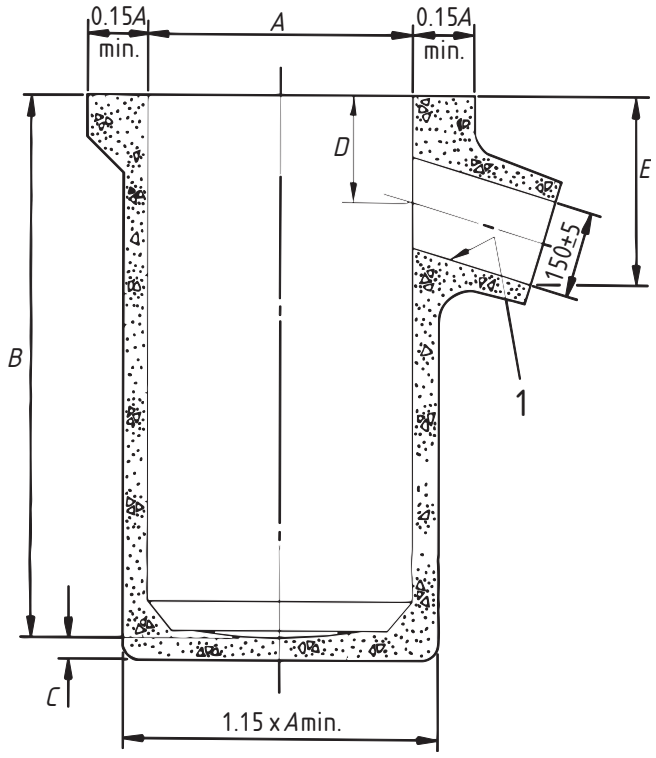


Key

1	Rodding eye
2	Minimum slope 1 in 10
3	Riser
A	Internal manufacturing diameter
B	Internal manufacturing depth
C	Minimum thickness of base
D	Maximum inside depth to centre of outlet
E	Maximum outside depth of outlet
F	Minimum dimension of riser (for trapped gullies)
G	Minimum internal diameter of rodding eye (for trapped gullies)
H	Minimum depth of water seal (for trapped gullies)

Figure 1 — Typical trapped gully with spigot outlet

Dimensions in millimetres



Key

1 Minimum slope 1 in 10

A Internal manufacturing diameter

B Internal manufacturing depth

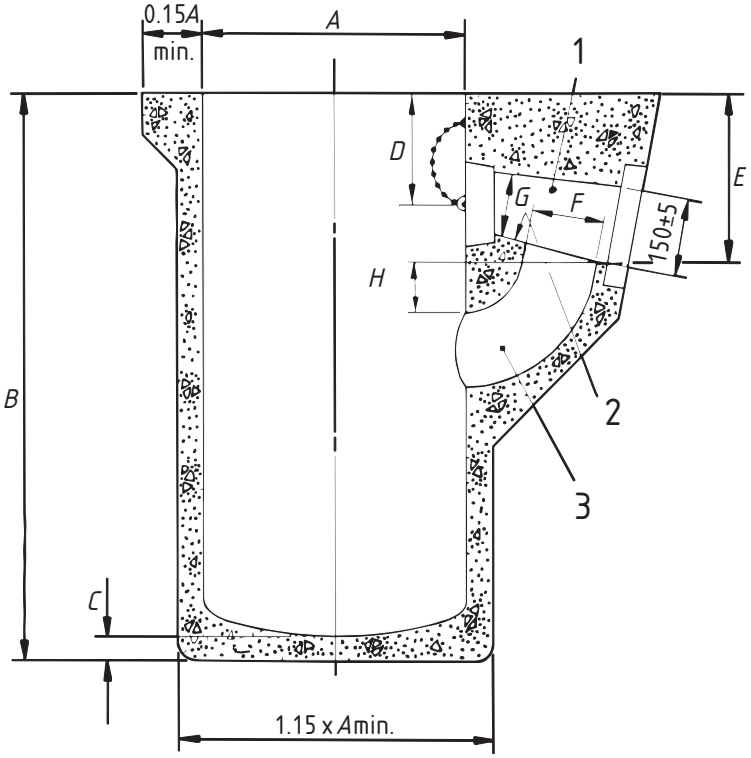
C Minimum thickness of base

D Maximum inside depth to centre of outlet

E Maximum outside depth of outlet

Figure 2 — Typical untrapped gully with spigot outlet

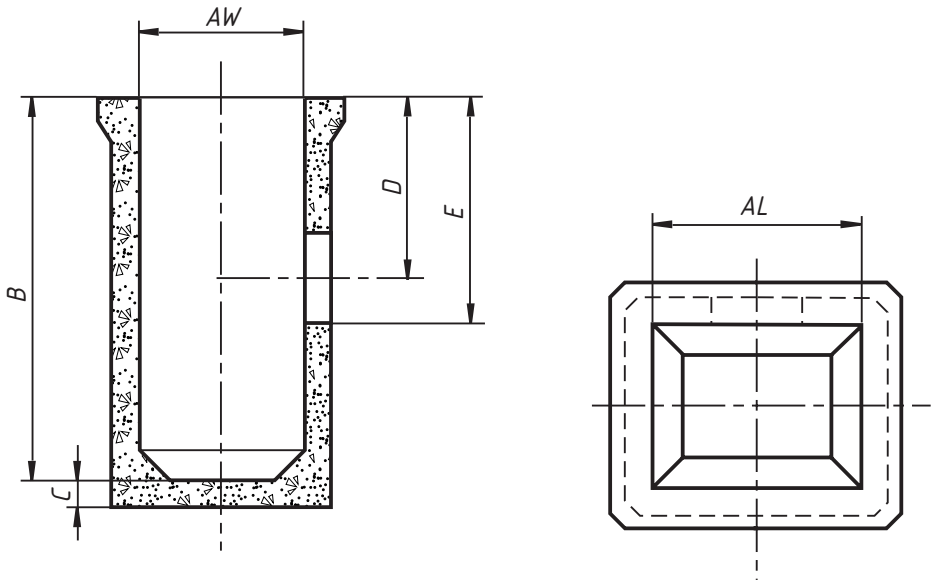
Dimensions in millimetres



Key

1	Rodding eye
2	Minimum slope 1 in 10
3	Riser
A	Internal manufacturing diameter
B	Internal manufacturing depth
C	Minimum thickness of base
D	Maximum inside depth to centre of outlet
E	Maximum outside depth of outlet
F	Minimum dimension of riser (for trapped gullies)
G	Minimum internal diameter of rodding eye (for trapped gullies)
H	Minimum depth of water seal (for trapped gullies)

Figure 3 — Typical trapped gully with socket outlet



Key

A Internal manufacturing width

B Internal manufacturing depth

C Minimum base thickness

D Maximum inside depth to centre of outlet

E Maximum outside depth of outlet

Figure 4 — Typical untrapped rectangular gully with socket outlet

6 Test requirements for finished products

Finished products shall be tested in accordance with the test requirements in Table 5.

Table 5 — Summary of test requirements

Clause	Requirement	Gullies		Gully cover slabs
		Untrapped	Trapped	
5.2.7	Water absorption	T/R	T/R	T/R
5.3.3	Visual inspection of finish	T/R	T/R	T/R
5.3.4.3 and **5.3.4.6**	Dimensions:			
	gullies	T/R	T/R	—
	gully cover slabs	—	—	T/R
5.3.5	Watertightness	T/R	T/R	—

T means initial type test;
R means routine inspection test.

7 Conformity evaluation

7.1 General

The manufacturer's quality assurance system shall be as specified in Annex E.

NOTE 1 It is recommended that conformity to this part of BS 5911 should be demonstrated by means of product certification by an approved certification body complying with the requirements of BS EN 45011.

NOTE 2 When units are certified by an approved certification body (and in accordance with BS EN 45011) receiving inspection by, or on behalf of, the purchaser is not necessary, except for the marking.

7.2 Product evaluation procedures

7.2.1 *General*

Product evaluation procedures shall be as follows:

a) initial type testing of units;

b) factory production control;

c) further testing of samples in accordance with the sampling plan prescribed in this part of BS 5911.

7.2.2 *Initial type testing*

Initial type testing shall be undertaken to show conformity to this part of BS 5911.

NOTE Tests previously performed in accordance with the requirements of this standard (same product or specified product grouping, same characteristics, same method of sampling and same or more demanding test) may be taken into account.

Initial type testing shall also be undertaken:

— at the start of production of a new type;

— whenever there is a significant change in design or method of manufacture.

The initial type test shall consist of taking samples (as indicated in Table F.1 of Annex F) from the production line and subjecting them to the relevant test(s). To satisfy the requirements of the initial type test, all samples shall conform to the requirements of this part of BS 5911.

The results from initial type tests shall not be included for the purposes of routine inspection.

When the manufacturer's test equipment is officially calibrated, initial type testing shall normally be carried out with that equipment.

7.2.3 *Factory production control*

Factory production control shall be based on a quality assurance system as described in Annex E.

7.2.4 *Further testing of samples taken at the factory*

Conformity to this part of BS 5911 shall be demonstrated by taking samples during initial type testing and at further routine inspection as described hereinafter. Tests shall be carried out on the samples at the minimum age declared by the manufacturer for conformity to this part of BS 5911.

For watertightness tests the manufacturer shall use continuous inspection for each type and nominal size of unit in accordance with the provisions of Annex G.

7.2.5 *Tasks for a certification body*

Where conformity to this part of BS 5911 is to be demonstrated by means of product certification by an approved certification body, the tasks for that body shall be as specified in Annex H.

8 Marking

Each unit shall be marked indelibly and in a clearly visible manner. Identification of the unit(s) shall be made in such a way that no doubt is possible.

Marking shall include the following minimum information:

a) the manufacturer's name, trade mark or identification mark, and site of production;

b) the identifier of this Standard, “BS 5911-6”;

c) the date of manufacture;

d) identification of serviceability conditions other than normal;

e) identification of any third party certification body.

Annex A (informative)
Information to be supplied in an enquiry or order

The following particulars cover essential details required by the manufacturer so that an enquiry or order may be fully understood:

a) quantity, type and nominal size(s) of gullies (see Table 2 and Figure 1, Figure 2, Figure 3 and Figure 4);

b) quantity and nominal sizes of gully cover slab(s) (see **3.7**);

c) design chemical class (DC-class) of concrete in units (see **5.2.5**);

d) if the products are to be fully covered by a third party certification scheme (see the Foreword and **7.1**).

Annex B (normative)
Water absorption test

B.1 Principle

The water absorption of hardened concrete is evaluated by immersion, which is defined as the difference between the mass of a given sample immersed in water and the mass of the same sample when dried, expressed in terms of the mass of the dry sample.

B.2 Sample

The sample shall have a mass of not less than 2 kg and not more than 4 kg when cut from a hardened unit.

B.3 Apparatus

B.3.1 *Ventilated oven*, controlled at 105 °C ± 5 °C.

B.3.2 *Scales*, sensitive to 0.05 % of the sample's mass.

B.4 Procedure

B.4.1 *Determination of mass of immersed sample m_1*

Bring the sample to a temperature of 20 °C ± 3 °C, then immerse it in tap water at the same temperature until a constant mass m_1 has been reached and record it. Achieve this in stages by successively immersing the sample at intervals of one hour to approximately 1/3 of the height, approximately 2/3 of the height and the total height, with a final water level of 20 mm above the top surface of the sample.

The constant mass m_1 shall be assumed to have been achieved when two weighings, 24 h ± 1 h apart, result in a difference in mass smaller than 0.1 % of the mean value of the mass of the immersed sample.

Dry the surface of the sample before each weighing, for example by a sponge (wet and squeezed) so as to remove all surface water.

B.4.2 *Determination of mass of dried sample m_2*

Dry the sample to constant mass in a ventilated oven at a temperature of 105 °C ± 5 °C.

NOTE It is necessary to check that the capacity and ventilation of the oven are sufficient to dry the number of samples placed in it. Wet samples should not be placed in the oven before earlier samples have been completely dried.

After cooling the sample to 20 °C ± 3 °C determine and record the mass m_2. The state of constant mass m_2 shall be assumed to have been reached when two weighings at least 24 h apart result in a difference smaller than 0.1 % of the mean value of the mass of the dry sample.

B.5 Expression of results

Calculate and record the absorption of water by immersion A_w expressed in per cent to two decimal places using the following expression:

$$A_w = 100 \times (m_1 - m_2) / m_2$$

where

m_1 is the constant mass of immersed sample;

m_2 is the constant mass of dry sample.

Annex C (normative)
Dimensional tests

NOTE At the manufacturer's discretion it is permissible to use purpose-made "go/no-go" steel gauges for dimensional measurements in lieu of the apparatus specified for the tests in this Annex.

C.1 Internal section test

C.1.1 *Principle*

The internal section of a gully is evaluated to determine whether it conforms to **5.3.4.3**.

C.1.2 *Apparatus*

C.1.2.1 *Steel measuring tape or retractable pocket rule*, conforming to BS 4035 with metric graduation and figuring conforming to BS 4484-1.

C.1.3 *Procedure*

Make three measurements of the internal section at the top of the bore, for circular sections at approximately 60° to each other; for rectangular sections at the centre and each end of the length and width.

C.1.4 *Expression of results*

Record whether each measured value of the internal section conforms to **5.3.4.3**.

C.2 Internal depth and thickness of base test

C.2.1 *Principle*

The internal depth of a gully is evaluated to determine whether it conforms to **5.3.4.3**.

C.2.2 *Apparatus*

C.2.2.1 *Cast iron or steel straightedge*, conforming to BS 5204-2 and not less than 600 mm in length.

C.2.2.2 *Steel measuring tape or retractable pocket rule*, conforming to BS 4035 with metric graduation and figuring conforming to BS 4484-1.

C.2.3 *Procedure*

With the gully resting on a flat and level surface place the straightedge centrally across the top with overhangs approximately equal, at right angles to the diameter or axis coincident in plan with the centre-line of the outlet. Measure and record the internal depth at the centre of the gully and the external height at each side.

Calculate the mean of the two measured values of external height, subtract that of the internal depth and record the resulting value for the thickness of the base.

C.2.4 *Expression of results*

Record whether the measured and calculated values of the internal depth and thickness of base respectively conform to **5.3.4.3**.

C.3 Thickness of cover slab test

C.3.1 *Principle*

The thickness of a gully cover slab is evaluated to determine whether it conforms to **5.3.4.6**.

C.3.2 *Apparatus*

C.3.2.1 *Steel measuring tape or retractable pocket rule*, conforming to BS 4035 with metric graduation and figuring conforming to BS 4484-1.

C.3.3 *Procedure*

Measure the thickness at the outer edge at each corner of the slab.

C.3.4 *Expression of results*

Record whether each measured value of the thickness conforms to **5.3.4.6**.

Annex D (normative)
Watertightness test

D.1 Principle

The watertightness of a gully is evaluated to determine whether it conforms to **5.3.5**.

D.2 Apparatus

D.2.1 *Rigid frame*, to secure the gully and facilitate inspection of all its surfaces, including the underside.

D.2.2 *Expanding stopper*, to create a temporary watertight seal in the gully outlet.

D.3 Procedure

Insert the expanding stopper into the gully outlet to create a watertight seal. Secure the gully in the frame. Fill the gully with water until the water level is 25 mm ± 2 mm below the top of the gully.

Leave the gully for 1 h, topping up as necessary to maintain the water level. After a final topping up, leave the gully for a further period of 30 min.

D.4 Expression of result

Record whether the watertightness of the gully conforms to **5.3.5**.

Annex E (normative)
Manufacturer's quality assurance system

E.1 Organization

E.1.1 *Responsibility and authority*

The responsibility, authority and the interrelation of all personnel who manage, perform and verify work affecting quality shall be defined, particularly for personnel who need the organizational freedom and authority to:

— initiate action to prevent the recurrence of defectives;

— identify and record any product quality problem.

E.1.2 *Management representative for factory production control*

The manufacturer shall appoint a person who, in addition to any other duties, shall have the appropriate authority, knowledge and experience of the production of units to be responsible for conducting and supervising factory production control procedures and for ensuring that the stated requirements are implemented and maintained.

E.1.3 *Management review*

The production control system adopted to satisfy the requirements of this annex shall be reviewed by the manufacturer's management at the intervals specified in the factory documents to ensure its continuing suitability and effectiveness. Records of such reviews shall be maintained.

E.1.4 *Factory documents*

Factory documents shall include the following specifications as appropriate:

— limits of internal manufacturing diameters and depths of gullies (**5.3.4.1**);

— design dimensions and configuration of units (**5.3.4.1**);

— intervals for review of production control system (**E.1.3**).

E.2 Factory production control system

The manufacturer shall establish and maintain a documented factory production control system as a means of ensuring that units conform to the specified requirements. Particular attention shall be paid to the following aspects:

— the preparation of documented factory production control system procedures and instructions in accordance with the requirements of this part of BS 5911;

— the effective implementation of the documented factory production control system procedures and instructions.

E.3 Inspection and testing

E.3.1 *General*

All necessary facilities, equipment and personnel shall be available to carry out the necessary inspections and tests.

NOTE This requirement may also be fulfilled if, by means of a contract, the manufacturer or his agent employs a subcontractor (whilst retaining prime responsibility) having the necessary facilities, equipment and personnel.

All test and measuring equipment shall be calibrated, inspected and maintained such that the conformity of units to the specified requirements can be demonstrated. Documentation and certificates for this equipment shall be made available. Equipment shall be used in a manner which ensures that measurement uncertainty is known and is consistent with its ability to measure the requirement.

E.3.2 *Inspection and test status*

Where appropriate, the inspection and test status of units shall be identified by means which indicate their conformity or nonconformity with regard to inspections and tests performed.

NOTE It is permissible to complete the marking of units during production, provided any certification mark and the British Standard identifier of this part of BS 5911 are deleted on defectives.

E.3.3 *Testing*

Testing shall be performed in accordance with the test methods specified in this part of BS 5911.

E.3.4 *Inspection and test records*

The results of factory production control shall be recorded in a satisfactory manner. The log(s) shall contain a record of the description of the units, the date of manufacture, the testing method, the test results, the limits used and the signature of the person carrying out the inspection.

Where inspected units do not conform to this part of BS 5911, or if there is an indication that they do not do so, a note shall be made in the manufacturer's log(s) as to the steps taken to deal with the situation (e.g. carrying out of a new test and/or measures to correct the specific process).

The manufacturer's log(s) shall be kept for at least five years.

E.3.5 *Complaints*

Details of all complaints received relating to the quality of units shall be recorded in a satisfactory manner. The log(s) shall contain a record of the description of the units, identification of the site, the date of manufacture, the nature of the complaint and the resultant action taken.

E.4 Action required in the case of defectives

E.4.1 *Unsatisfactory results*

If the result of a test on or inspection of a unit is unsatisfactory, the manufacturer shall immediately take the steps necessary to rectify the shortcoming. When the shortcoming has been rectified, the relevant test or inspection shall be repeated without delay, provided that this is technically possible and is necessary as evidence of rectification.

E.4.2 *Defectives*

Defectives (units that do not conform to one or more requirements of this part of BS 5911) shall be segregated and marked accordingly.

E.4.3 *Purchaser information*

Notification shall be made to purchasers if necessary for the purpose of avoiding any consequential damage, if units have been dispatched before the test results are available. If units have been delivered and the next determination of acceptability after their manufacture rejects production, the manufacturer shall notify each purchaser of units manufactured and delivered since the preceding determination that the conformity of those units cannot be ensured.

E.5 Handling, storage, packing and delivery of units

E.5.1 *General*

The manufacturer shall establish, document and maintain procedures where applicable for the handling, storage, packing and delivery of units.

E.5.2 *Handling*

The manufacturer shall use methods of handling that prevent damage or deterioration.

E.5.3 *Storage*

The manufacturer shall provide secure storage areas to prevent damage or deterioration of products before delivery.

E.5.4 *Packing and marking*

The manufacturer shall control packing, preservation and marking processes (including materials used) to the extent necessary to ensure conformity to this part of BS 5911.

E.5.5 *Traceability*

Delivered units or groups of units shall be definitively identifiable and traceable with regard to their production data. For this purpose, the manufacturer shall establish and maintain the records required in the relevant technical specification, and shall mark the units or their delivery documents accordingly.

E.6 Training and personnel

The manufacturer shall establish and maintain procedures for the training of all personnel activities affecting quality. Personnel performing specific assigned tasks shall be qualified on the basis of appropriate education, training and/or experience as required. Appropriate training records shall be maintained.

E.7 Materials, equipment and process control

Numerical results and those requiring action from the inspections and tests specified in Table E.1, Table E.2, Table E.3, Table E.4, Table E.5, Table E.6, Table E.7 and Table E.8 inclusive shall be recorded.

Table E.1 shall apply to all materials.

Table E.2 shall also apply to any materials:

— not certified by a third party complying with BS EN 45011;

— not produced under a quality assurance system according to BS EN ISO 9001 and certified by a third party complying with ▮A1⟩ BS EN ISO/IEC 17021 ⟨A1▮;

— not produced by a supplier operating a quality scheme in accordance with this clause and audited by the manufacturer.

Equipment control shall be conducted in accordance with Table E.3.

The control of concrete mix in accordance with the mix design, shall conform to Table E.4.

The control of production shall conform to Table E.5.

The control of marking and storage shall conform to Table E.6.

The control of delivery shall conform to Table E.7.

The control of laboratory equipment shall conform to Table E.8.

Table E.1 — Control for all materials

Material	Inspection/test	Purpose	Minimum frequency
All materials	Inspection of delivery ticket (and, where applicable, label on the container) showing conformity to the order [the order shall mention the specification(s)]	To ascertain if consignment is as ordered and from the correct source	Each delivery

Table E.2 — Control for certain materials

Material	Inspection/test	Purpose	Minimum frequency
1. Cements	Producer shall verify conformity to specification(s)	To ensure conformity	Per 1 000 tonnes with a minimum of twice per month
2. Aggregates	Visual inspection of consignment	For comparison with normal appearance with respect to grading, shape and impurities/contamination	Each delivery
3. Aggregates	Test by sieve analysis	To assess conformity to standard or agreed grading	Each source and grading 1. First delivery from new source 2. In case of doubt following visual inspection 3. Once per week, more often as required by local or delivery conditions
4. Aggregates	Test for organic impurities or shell content	To assess the presence and quantity of impurities or contaminations	1. First delivery from new source 2. In case of doubt following visual inspection
5. Admixtures	Visual inspection of the admixture	For comparison with normal appearance	Each delivery
6. Admixtures	Test for density	For comparison with normal density	Each delivery
7. Additions	Producer shall verify conformity to specification(s)	For comparison with normal appearance	Each delivery
8. Mixing water	Test by chemical analysis or in accordance with the reference specification	To ascertain that the water is free from harmful constituents	Only if the water is not taken from a public distribution system: 1. When new source is used for the first time 2. In any case of doubt 3. Every year 4. Three times per year where water is taken from a watercourse

Table E.3 — Equipment control

Equipment	Inspection/test	Purpose	Minimum frequency
1. Storage	As appropriate	To prevent risk of contamination	Weekly
2 Weighing equipment	Visual inspection of performance	To ascertain that the weighing equipment is functioning correctly	Daily
3.	Test of weighing accuracy	To avoid inaccurate weighing	1. On installation 2. Twice per year 3. In any case of doubt
4. Admixture dispenser	Visual inspection of performance	To ascertain that the dispenser is in a clean condition and functions correctly	First batch of the day for each admixture
5.	Test of accuracy	To avoid inaccurate dispensing	1. On installation 2. Twice per year 3. In any case of doubt
6. Water metering equipment	Comparison of the actual amount dispensed with the reading of the meter	To avoid inaccurate dispensing	1. On installation 2. Twice per year 3. In any case of doubt
7. Volumetric batching system	Visual inspection	To ascertain that the batching equipment is functioning correctly	Daily
8.	Comparison of the actual mass of the batch constituents with the intended mass by a suitable method for volumetric batching system	To ascertain batching accuracy	1. On installation 2. Three-monthly intervals 3. In any case of doubt
9. Mixers	Visual inspection	To check the wear of the mixing equipment	Weekly
10. Moulds and pallets	Visual inspection	To check for cleanliness of the moulds and pallets	Daily
11.	Dimensional checks	To check for excessive wear	On installation or reinstallation of mould or renewal of equipment

Table E.4 — Control of concrete mix

Process element	Inspection/test	Method	Minimum frequency
1 Concrete	Chloride content	By calculating the chloride content	At start and each change of supply
2.	Correct mixing	Visual check	Daily for each mixer
3 Mix composition	Correct proportions	By verifying that the correct recipe is used	Daily for each mixer

Table E.5 — Control of factory production

Process element	Inspection/test	Method	Minimum frequency
4. Production	Correct manufacturing process	By verifying conformity to factory documents	Daily
6. Product	Significant dimension(s) according to specific process	Measurement	At start and daily

Table E.6 — Control of marking and storage

Process element	Inspection/test	Method	Minimum frequency
7. Marking	Marking of units	Visual check	Daily
8. Storage	Segregation of defectives	Visual check	Daily

Table E.7 — Control of delivery

Process element	Inspection/test	Method	Minimum frequency
9. Marking	Correct marking of units/documents	Visual check	Daily
10. Loading	Correct loading	Visual check	Daily

Table E.8 — Control of laboratory equipment

Equipment	Inspection/test	Method	Minimum frequency
1. Measuring equipment	Determination of dimensions	Calibration by reference to official standard	Once per year
2. Weighing equipment	Determination of mass	Calibration by reference to official standard	Once per year
3. Temperature measuring device	Determination of temperature	Calibration by reference to official standard	Once per year

Annex F (normative)
Sampling procedures for inspection of finished products

Table F.1 shall apply to the inspection of finished products, where required by Clause **6**.

Table F.1 — Sampling procedures

Clause	Test where specified	Initial type test	Routine inspection
5.2.7	Water absorption	3 N	1 N/month
5.3.3	Visual inspection of finish	Every tested unit	Every tested unit
5.3.4.3 and **5.3.4.6**	Dimensions	3 N	3 Y
5.3.5	Watertightness (gullies only)	3 N	See **G.3.2**

N is test per type and nominal size;
Y is test per type and nominal size produced per 1 000, with a minimum of one per type and year.

Annex G (normative)
Sampling procedures for continuous inspection of watertightness

G.1 Inspection rates and interpretation of results

G.1.1 *Inspection rates*

Inspection rates shall be in three forms, of descending severity as follows.

— **Tightened inspection:** This shall be applied when a new production or a change in process occurs, or when the switching rules in **G.2** apply.

— **Normal inspection:** This shall be applied according to the relevant rate when the specific process is under a state of control, or when the switching rules in **G.2** apply.

— **Reduced inspection:** A lower rate of sampling may be applied when so permitted by the switching rules in **G.2**.

G.1.2 *Interpretation of results*

The acceptability results of routine tests and inspection shall be determined in accordance with the provisions of **G.4**.

G.2 Operating of switching rules

G.2.1 *Tightened to normal inspection*

Tightened inspection shall continue until five consecutive samples show conformity with the requirement, at which time normal inspection may be instituted or reinstated.

G.2.2 *Discontinuation of inspection*

If 10 consecutive samples remain on tightened inspection, the provisions of these sampling procedures shall be discontinued pending action to improve the quality of the submitted products.

G.2.3 *Normal to reduced inspection*

At the manufactuer's discretion reduced inspection shall be introduced when normal inspection is in effect, provided that the following conditions are met:

— the last 10 samples have shown conformity with the requirement;

— the production is in a state of control.

G.2.4 *Reduced to normal inspection*

When reduced inspection is in effect, normal inspection shall be reinstated if any of the following occur on original inspection (i.e. before any non-acceptance):

— a sample has shown nonconformity with the requirement;

— production becomes irregular or is delayed;

— other conditions warrant the reinstatement of normal inspection.

G.2.5 *Normal to tightened inspection*

When normal inspection is in effect, tightened inspection shall be reinstated if two or more samples have shown nonconformity with the requirement in any five consecutive tests of normal inspection.

G.3 Tightened, normal and reduced inspection

G.3.1 *Tightened inspection*

Tightened inspection shall correspond to twice the sampling rate of normal inspection.

G.3.2 *Normal inspection*

The maximum production on consecutive working days before a sampling under normal inspection of each type and nominal size shall be 250 units. If a particular nominal size has not been produced for a period of 60 consecutive working days, a sampling shall be carried out when production recommences, subject to at least one sampling per year.

G.3.3 *Reduced inspection*

Reduced inspection shall correspond to half the sampling rate of normal inspection.

G.4 Acceptability determination

G.4.1 *Inspection on the basis of individual assessments*

G.4.1.1 *Application*

Inspection on the basis of individual assessments shall be applied to test results for all samples.

G.4.1.2 *Procedure*

Compare every test result with the requirement in **5.3.5**.

G.4.1.3 *Acceptance criteria*

If the result is in conformity with the requirement in **5.3.5**, the corresponding production shall be accepted.

If a result is not in conformity with the requirement, a sample of two more units from the same production shall be tested. If both results of this second sample are in conformity, the corresponding production shall be accepted, with the exception of any defectives. If one or both results from this second sample are not in conformity, it shall be determined which part of the corresponding production is concerned and that part shall be rejected.

Annex H (normative)
Tasks for a product certification body

H.1 Initial inspection of factory and factory production control

Initial inspection of the factory shall determine whether the prerequisites in Annex E in terms of staff and equipment for continuous and orderly manufacture of units and for the factory production control are suitable.

All relevant facts of the initial inspection, in particular the factory production control system operated by the manufacturer and the evaluation of the acceptability of the system, shall be documented in a report.

H.2 Evaluation and approval of initial type testing of units

Where a factory does not already have a certified production in accordance with this part of BS 5911, in order to evaluate and approve the initial type testing, the certification body shall attend at tests on each standard requirement for each nominal size.

Where a factory already has a certified production in accordance with this part of BS 5911, in order to evaluate and approve the initial type testing of a new product or units coming from a new manufacturing facility, the certification body shall be notified by the manufacturer at least seven days before such products or units from such equipment are supplied.

H.3 Periodic surveillance, evaluation and approval of factory production control

The certification body's principal objective shall be to check whether the prerequisites in Annex E for manufacturing and the agreed factory production control system are being maintained.

The certification body shall operate an inspection schedule such that all the relevant requirements in Annex E are periodically inspected at a minimum frequency of twice a year.

The results from the manufacturer's production control shall be examined as part of a periodic inspection to ensure that the required routine testing has been carried out at the specified frequency and that proper actions have been taken, including those of calibration and maintenance of test equipment. Conformity to the requirements for marking shall also be checked.

The results of periodic inspections shall be documented in the records of the inspection.

H.4 Audit testing of samples taken at the factory

Since the basis of product certification is factory production control, the aim of audit testing shall be to check confidence in the results of such control and not to decide conformity or nonconformity of the units produced.

The audit testing shall be performed on units declared to conform to this part of BS 5911. When the manufacturer's test equipment is standardized or calibrated, testing shall normally be carried out using this equipment.

Audit testing shall be carried out in such a way as to ensure that a representative range of nominal sizes of units is tested during successive three-year periods.

H.5 Quality system

Where the manufacturer proposes to establish a certified quality system (e.g. in accordance with BS EN ISO 9001), it shall be verified and accepted by the approved product certification body prior to its application.

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