British Standard

BRITISH STANDARD

BS 5911-2: 1982

Incorporating Amendments Nos. 1, 2 and 3

Precast concrete pipes and ancillary concrete products —

Part 2: Specification for inspection chambers

ICS 23.040.50

Cooperating organizations

The Cement, Gypsum, Aggregates and Quarry Products Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following:

Association of Consulting Engineers*
Association of County Councils
Association of District Councils
Association of Metropolitan Authorities*
Autoclaved Aerated Concrete Products Association
British Precast Concrete Federation Ltd*
British Quarrying and Slag Federation*
British Railways Board
British Ready Mixed Concrete Association
British Steel Industry
Cement Admixtures Association
Cement and Concrete Association*
Cement Makers' Federation*
Chemical Industries Association
Concrete Society Limited*
County Surveyors' Society*
Department of the Environment (Building Research Establishment)
Department of the Environment (Housing and Construction)
Department of the Environment (PSA)
Department of the Environment (Transport and Road Research Laboratory)*
Department of Transport*
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Sand and Ballast Hauliers and Allied Trades Alliance
Sand and Gravel Association Limited*
Society of Chemical Industry
Stone Federation

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

Concrete Pipe Association
Ministry of Agriculture, Fisheries and Food
National Water Council
Pipe Jacking Association

This British Standard, having been prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee, was published under the authority of the Board of BSI and comes into effect on
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The following BSI references relate to the work on this standard:
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11030	January 2001	Indicated by a sideline

Contents

Foreword

The original edition and first amendment to this British Standard were prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee. The preparation of subsequent amendments has been entrusted to Technical Committee B/505, Waste water engineering.

As part of the new approach to harmonization of standards in Europe, work on a specification for inspection chambers is being undertaken in CEN/TC 165, Waste water engineering and the requirements for inspection chambers specified in the amended 1982 edition are now subject to a standstill agreement. Standstill is an obligation accepted by members of CEN/CENELEC not to take any action, during the preparation of a European Standard (EN), which could prejudice the harmonization process.

BS EN 752-3, BS EN 1295-1 and BS EN 1610 deal with the design, installation and testing of inspection chambers on drains and sewers. The original National Annex NB of BS EN 752-3:1997 gave information about traditional UK practice as described in BS 8301 and BS 8005-1, both of which are now withdrawn. The annex was amended on 15 November 2000 to take account of *Safe Work in Confined Spaces – Approved Code of Practice, Regulations and Guidance*, issued by the Health and Safety Commission under the provisions of the *Confined Spaces Regulations 1997 (SI 1997 No. 1713)* [1]. Members of CEN/CENELEC are permitted under the duty of care owed by the publisher of documents having a recognized national status to amend their existing national standards accordingly in such circumstances. Therefore, Amendment No. 3 to this standard reflects the revised information in National Annex NB of BS EN 752-3:1997, as amended by Amendments Nos. 1 and 2 as regards safe working in inspection chambers.

For certain products, Amendment No. 3 to this standard necessitates planned changes to manufacturing equipment which cannot be achieved overnight. In view of this and in order to complete the changeover with the orderly disposal of stock, the amendment comes into effect on 01 May 2001. For some products, consequently, the original requirements are retained for the time being and supplemented by an amended specification for corresponding ones. The former will be withdrawn by a further amendment as soon as the technical committee judges it reasonable to do so.

As regards the performance of units in service, it should be noted that the tests in this Part are intended to ensure that the units do not leak or suffer structural damage, provided that the method of installation and the general conditions under which they are operating are suited to the original design concept.

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

Product certification/inspection/testing. Users of this British Standard are advised to consider the desirability of third-party certification/inspection/testing of product conformity with this British Standard. Appropriate conformity attestation arrangements are described in BS EN ISO 9002:1994. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquires to the relevant association.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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 10, an inside back cover and a back cover.

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Section 1. Specification

1 Scope

This Part of BS 5911 specifies requirements for precast concrete inspection chambers, unreinforced or reinforced, for use over a drain or sewer not exceeding nominal size DN 250, in areas of light loading (see **3.5**). Requirements for covers and frames are specified in BS EN 124.

2 References

The titles of the publications referred to in this Part of BS 5911 are listed on the inside back cover.

3 Definitions

For the purposes of this Part of BS 5911, the following definitions apply:

3.1
component

an individually cast piece of concrete which when assembled with other components makes up into a unit

3.2
unit

an inspection chamber

3.3
inspection chamber

a chamber constructed over a drain or sewer so as to provide access thereto for inspecting, testing or the clearance of obstruction

3.4
cover slab

unit forming the horizontal roof of a chamber or shaft and having an access opening, above which a frame and cover is designed to fit. Some designs have no frame, the cover being supported directly in a recess around the perimeter of the opening

3.5
light loading

normal pedestrian and occasional wheel loads not exceeding 1 tonne (10 kN)

3.6
batch

the number of units or components of a particular specification produced under uniform conditions during a given production period by the same process

4 Cement

The cement shall comply with the relevant requirements of one of the following standards.

Type of cement	Standard to be complied with
Ordinary and rapid-hardening Portland	BS 12
Portland-blastfurnace	BS 146
Sulfate-resisting Portland	BS 4027

5 Aggregates

5.1 General. Aggregates shall consist of materials complying with the requirements of BS 882 except that the manufacturer shall be permitted to modify grading requirements of clause **5** of that standard (see clause **0** of BS 882:1992).

NOTE Typical samples of aggregates and evidence of satisfactory performance of the concrete manufactured with such aggregates should be made available to purchasers on request (see Appendix A).

5.2 Size. The maximum nominal size of aggregate shall not exceed the least of the following:

a) 20 mm;

b) the concrete cover to steel reinforcement (see clause **8**);

c) three-quarters of the minimum clear distance between reinforcing bars.

6 Other concrete materials

6.1 Water. Water shall be clean and free from harmful amounts of deleterious matter, either in suspension or in solution.

6.2 Admixtures. The composition and use of admixtures, including calcium chloride, shall follow the recommendations of **6.1.5** of BS 8110-1:1985.

7 Concrete

7.1 Cement content. The fully compacted concrete shall contain not less than 300 kg of cement per cubic metre.

7.2 Design mix. The 28-day characteristic strength of the concrete shall be not less than 30 N/mm^2, assessed in accordance with the requirements of BS 5328-2.

For each mix design, samples of freshly made concrete shall be taken from not less than 2 % of the total number of batches of concrete. Sampling shall be at a rate of not less than one sample per 20 m^3 of fresh concrete taken daily.

7.3 Chloride content. The total chloride ion content of the concrete mix shall follow the recommendations of **6.2.5.2** of BS 8110-1:1985.

7.4 Work in cold weather. Concrete, when placed, shall have a temperature of at least 5 °C, which shall be maintained until the concrete is thoroughly hardened.

Heating of aggregates and water before mixing, to a temperature not exceeding 60 °C, shall be permitted.

Other materials and moulds shall not be used if they are frozen.

8 Steel reinforcement

8.1 Materials and arrangement. Longitudinal bars, main reinforcement and reinforcement for handling purposes shall comply with the requirements of one of the following standards.

Type of reinforcement	Standard to be complied with
Carbon steel bars for the reinforcement of concrete	BS 4449
Cold reduced steel wire for the reinforcement of concrete	BS 4482
Steel fabric for the reinforcement of concrete	BS 4483

Reinforcement shall be free from loose rust, scale, oil, grease or any other deleterious matter. All bars shall be suitably fixed by welding, tying, or some other method in order to control spacing and shape and to permit safe handling.

8.2 Protection for reinforcement. The concrete cover over all steel reinforcement shall be such that, in any finished unit or component, it is nowhere less than 12 mm and in base slabs nowhere less than 20 mm.

An effective means shall be provided for maintaining the reinforcement in position and for ensuring correct cover during manufacture of the component or unit. Spacers for this purpose shall be of rustproof material or be of steel protected against corrosion.

Rust marks on the concrete originating from within a unit shall signify that it does not comply with the requirements of this Part of this standard.

9 Permissible deviations

9.1 Dimensions. The actual dimensions shall not vary from the manufacturer's stated dimensions by more than the permissible deviations given in Table 1.

Table 1 — Permissible deviations

Manufacturer's stated dimension	Permissible deviation
Up to 600 mm	± 6 mm
Over 600 mm	±10 mm

9.2 Twist. Any corner of a rectangular unit or component shall not be more than 6 mm from the plane containing the other three corners.

For circular units or components, the squareness of the ends of the unit or component in relation to the axis of the cylinder shall be within a limit of 6 mm.

9.3 Out of squareness. No two diagonals of a unit or component, measured in the same plane, shall differ from each other by more than the following amounts:

diagonals up to 1 000 mm: 8 mm;

diagonals above 1 000 mm: 10 mm.

10 Joints

Joints shall be either ogee (rebated) or tongued and grooved. The minimum depths shall be 6 mm for tongued and grooved joints and 10 mm for ogee joints.

The joints between components shall be so designed that they may be sealed by the use of cement mortar or a suitable proprietary jointing compound.

11 Marking of units and components

11.1 Requirements for marking. The following particulars relating to units and components made in accordance with this Part shall be clearly indicated on the delivery note, invoice or supplier's certificate supplied with a consignment of units:

a) the number of this British Standard, i.e. BS 5911-2[1)];

b) the letter 'S' where sulfate-resisting Portland cement has been used;

c) the manufacturer's mark and works identification mark.

In addition, at least 20 % of all units or components produced shall be clearly marked with the same information.

[1)] Marking BS 5911-2:1982 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

11.2 Example of marking. 'A' 'X' BS 5911-2 S.

The above marking on a unit shall signify:

"claimed by manufacturer 'A' to have been made at his works 'X' and to comply with the requirements of BS 5911-2; to be made with sulfate-resisting cement."

11.3 Method of marking. Units and components shall be marked with either:

a) indelible paint, applied by stencil brush or spray as soon as possible after removal from the moulds;

or

b) impressed characters approximately 2 mm deep.

All marks shall be visible and legible.

12 Inspection chambers

12.1 General. Inspection chambers shall consist of two or more of the following precast components:

cover slabs;

shaft sections;

corbel slabs;

reducing slabs;

tapers (straight back);

bases.

Components, except cover slabs and reducing slabs, shall have joints complying with the requirements in clause **10**.

Components shall be sampled and tested in accordance with the appropriate requirements given in clause **15**.

NOTE Typical arrangements for inspection chambers are shown in .Figure 1

12.2 Dimensions. The dimensions of inspection chamber components shall be those given in Table 2.

12.3 Base. The channels for the main pipe or branches in a precast base shall be for pipes not less than DN 75 and not more than DN 250.

NOTE The base may be precast or formed in-situ with channels to the angles and levels specified by the user.

12.4 Chamber sections. Chamber sections shall be circular, rectangular or rectangular with shaped ends.

12.5 Tapers. Tapers shall be of the straight back type to facilitate access.

12.6 Reducing slabs and corbel slabs. Where reducing slabs or corbel slabs are used as an alternative to tapers, the slabs shall have a minimum thickness of 50 mm and be reinforced.

The access hole shall have internal dimensions not less than the minimum internal dimensions of the shaft.

12.7 Shaft sections. Shaft sections shall be circular, rectangular or rectangular with shaped ends.

Shaft top sections shall provide a suitable seating for a cover slab conforming to **12.8**.

12.8 Cover slabs. Cover slabs shall have a minimum thickness of 75 mm, if unreinforced, or 50 mm, if reinforced.

Cover slabs shall be either:

Type 1 – Suitable for depths $\leq$ 1.2 m to invert with a minimum size access of 430 mm; or

Type 2 – Suitable for depths > 1.2 m to invert with a maximum size access of 300 mm × 300 mm or 350 mm diameter.

Openings in cover slabs shall be circular or rectangular. It is permissible for the vertical face(s) of an opening to be cast with a nominal release angle away from the opening, and to be designed to incorporate a recess around the perimeter of the opening to provide a seating and direct support for the inspection chamber cover.

NOTE 1 A larger clear opening is permitted in type 2 cover slabs provided the access is restricted to the above dimensions.
NOTE 2 The above guidance is consistent with the recommendations in Table NB.2 of BS EN 752-3:1997, as amended by Amendments Nos. 1 and 2.

12.9 *Text deleted*

13 *Text deleted*

Section 2. Tests

14 Compliance requirements

14.1 General compliance. In order to claim compliance with this standard, units and components shall comply with the relevant test requirements given in clause **15**, using the appropriate inspection procedures.

Records of all tests and inspection procedures shall be kept by the manufacturer.

14.2 Test equipment and facilities. The manufacturer shall either:

a) provide in his own works suitable equipment and facilities for sampling and testing the units and components before delivery;

or

b) make arrangements for the provision of suitable equipment and facilities elsewhere for the same purpose.

The manufacturer shall provide certification to show that all test equipment is calibrated at least annually.

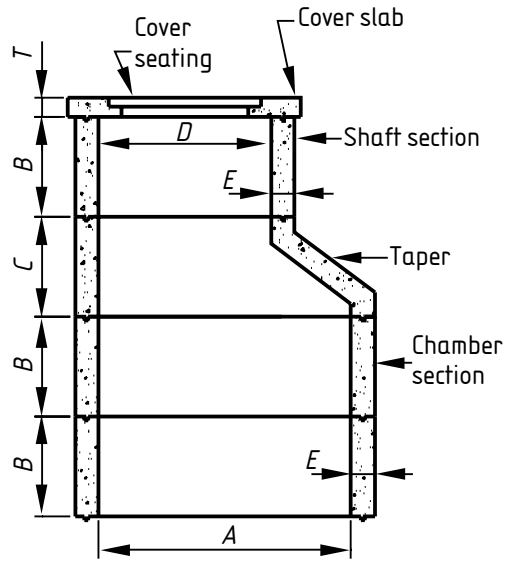
14.3 Acceptance of units. Units and components shall be considered ready for acceptance only after the batch of which the units or components form part has been tested and shown to comply with the requirements of clause **15**.

Table 2 — Inspection chambers

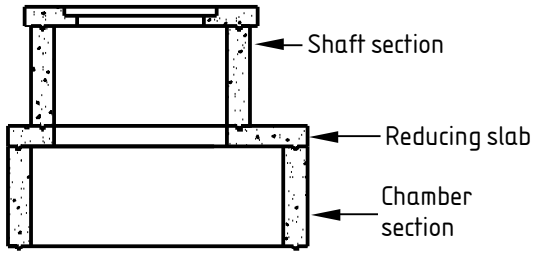
Dimensions in millimetres

	A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*J*	*K*	*T*
Type 1: For chambers 1.2 m or less in depth from cover level to invert	Not less than 600	Not less than 75	Not less than 150	Not more than *A*	Not less than 40	Not less than 430	Not less than 430	Not less than 430	Not less than 600	Not less than 450	For unreinforced not less than 75 For reinforced not less than 50
Type 2: For chambers 1.2 m in depth from cover level to invert	Not less than 600	Not less than 75	Not less than 150	Not more than *A*	Not less than 40	Not more than 350	Not more than 300	Not more than 300	Not less than 600	Not less than 450	For unreinforced not less than 75 For reinforced not less than 50

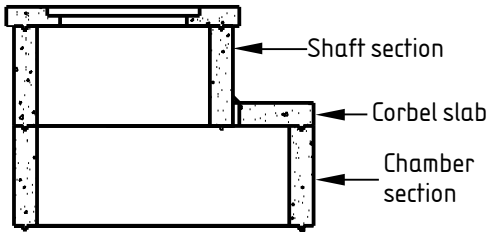
NOTE 1 Dimensions *A* to *T* are shown in Figure 1.
NOTE 2 A larger clear opening is permitted in type 2 cover slabs provided the access is restricted to the dimensions shown in *F*, *G* and *H*.
NOTE 3 The above guidance is consistent with the recommendations in Table NB.2 of BS EN 752-3:1997, as amended by Amendments Nos. 1 and 2.



Using taper



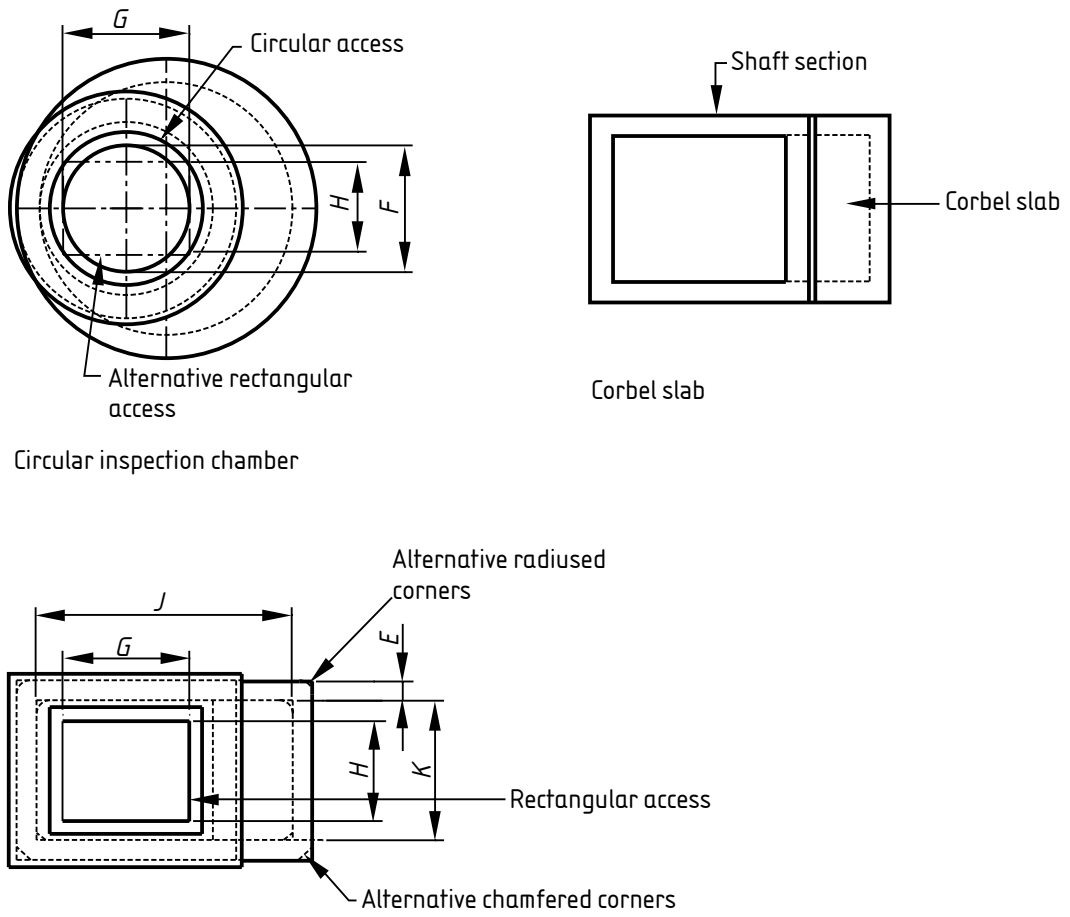
Using a reducing slab



Using a corbel slab
(for rectagular chambers only)

a) Sectional elevations

Figure 1 — Typical inspection chamber arrangements



b) Plan views

Figure 1 — Typical inspection chamber arrangements *(concluded)*

Figure 2 — *Deleted*

Table 3 — *Deleted*

All units and components within any batch shall be cured and matured under similar conditions. They shall not be dispatched until they are at least 10 days old.

14.4 Facilities for purchasers. The manufacturer shall provide the purchaser or his representative free access at all reasonable times to the place where the units are manufactured and/or tested, for the purpose of examining quality control procedures and records and of witnessing the testing and marking of units and components.

If the manufacturer is not covered by a scheme of third party certification acceptable to the purchaser, he shall permit the purchaser to select samples for test, using the appropriate inspection criteria specified by this standard.

14.5 Manufacturer's certificate. If required [see Appendix A g)], the manufacturer shall furnish a certificate confirming that the units or components supplied to the purchaser's order comply in all relevant respects with the requirements of this standard. The certificate shall be in the form set out in Appendix B.

15 Test requirements

15.1 Water absorption test (inspection chambers)

Components shall be sampled and tested in accordance with the procedure described in Appendix C. The increase in the dry mass of a single test piece by absorption of water shall not exceed:

a) 3.6 % after 30 min;

b) 6.5 % after 24 h.

A component from which a core specimen has been taken shall have the cored hole effectively sealed after the specimen has been removed.

15.2 Load test on cover slabs

Cover slabs shall be sampled and tested in accordance with the procedure described in Appendix D.

The cover slab shall withstand a load of 12.5 kN without visibly cracking.

NOTE The test load gives a safety factor of 1.25 for light loading (see **3.5**).

15.3 Test for depth of cover to reinforcement.

Reinforced units and components shall be sampled and tested for compliance with **8.2**. The depth of cover shall be determined by taking cores or cut sections.

NOTE For units not forming part of the sample, electromagnetic cover meter complying with BS 1881-204 and suitably calibrated for size of reinforcement and curved surfaces may be used.

15.4 *Text deleted*

16 Inspection procedures

16.1 Inspection procedure for the water absorption test (inspection chambers). When carrying out the water absorption test, the inspection procedure shall be as follows.

a) From each manufacturing process, select one in 500 or two units or components per week, whichever is the greater, and take specimens as described in Appendix C. The same type of specimen shall be used for all tests on a given product.

b) Subject the specimens to the water absorption test specified in **15.1**.

c) If the specimens pass the test, accept the units or components in the batch or batches from which they were taken. If any specimen fails, repeat a) and b), using a second sample.

d) If the specimens obtained from the second sample pass the test, accept the units or components in the batch or batches from which they were taken. However, if any of these specimens fail, proceed as follows.

1) Reject the batch or batches. However, it is permissible to take specimens from all the remaining units or components and subject them to the test. Only those that pass the test shall be accepted.

2) Investigate the cause of failure and take any necessary remedial action.

3) Resume production and increase the rate of inspection to 1 in 250 or 4 units or components per week, whichever is the greater.

4) Resume the rate of inspection given in a) only after all samples taken during a production period of five consecutive weeks have passed the test.

16.2 Inspection procedure for the load test on cover slabs. When carrying out the load test, the inspection procedure shall be as follows.

a) From each manufacturing process, select one in 500 or two of each type of cover slab per week, whichever is the greater.

b) Subject the sample to the load test specified in **15.2**.

c) If the sample passes the test, accept the batches from which each type of cover slab was taken.

If the sample fails, repeat b) using a second sample.

d) If the second sample passes the test, accept the batches from which each type of cover slab was taken.

However, if any sample fails, reject the batches. In such a case, it is permissible to take all the remaining cover slabs in the batches, and subject them to the test. Only cover slabs that pass the test shall be accepted.

16.3 Inspection procedure for test for depth of cover to reinforcement. When carrying out the depth of cover to reinforcement test, the inspection procedure shall be as follows.

a) From each manufacturing process, select one in 500 or two units or components per week, whichever is the greater, and take specimens as described in Appendix C. The same type of specimen shall be used for all tests on a given product.

b) Subject the units or components to the depth of cover to reinforcement test specified in **15.3**.

c) If the units or components pass the test, accept the batch.

However, if a unit or component fails the depth of cover to reinforcement test, the batch from which it was selected shall be rejected but it is permissible to subject the remaining units or components in the batch to the test. Only those that pass the test shall be accepted, subject to making good before dispatch.

16.4 *Text deleted*

Appendix A Information to be given to the manufacturer in an enquiry and order

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

a) quantity and nominal sizes of units and components;

b) type of cement to be used (see clause **4**);

c) whether sample of aggregates and/or evidence of satisfactory performance of concrete are required (see note to **5.1**);

d) whether admixtures are permitted (see **6.2**);

e) *Text deleted*;

f) the number and type of tests to be witnessed and whether any additional tests are required (see **14.4**);

g) whether certificates of compliance with the requirements of this standard are required (see **14.5** and Appendix B);

h) whether the products are to be covered by a third party certification scheme.

Appendix B Certificate of compliance with BS 5911-2

Date of certificate.....

We..... hereby certify that the concrete units and/or components supplied by us to your order no..... and referred to in delivery note no(s)..... have been sampled and tested in accordance with the requirements of BS 5911-2.

These units comply with all the requirements of BS 5911-2.

(Signed).....

Appendix C Water absorption test for inspection chambers

Specimens shall be either:

a) a specimen of the full thickness of the unit, taken from each unit or component, that is *either* approximately 100 mm square or a core approximately 75 mm in diameter; or

b) alternatively, a concrete test cube compacted in the same way as the concrete in the unit.

Dry the specimen at a temperature of 100 ± 5 °C for not less than 72 h in a ventilated drying oven that complies with the requirements of BS 2648. On removal from the oven, allow to cool to room temperature, weigh and immediately submerge in potable water at a temperature of 20 ± 2 °C.

After half an hour, remove the specimen and immediately wipe with a dry towel for a total period of half a minute to remove surface water and reweigh.

After weighing, re-immerse the specimen in water for 23½ h. Then remove, dry and weigh as before.

Calculate the % absorption after ½ h and the % absorption after 24 h from the formula:

$$\text{Absorption (percentage of dry mass)} = \frac{\text{wet mass} - \text{dry mass}}{\text{dry mass}} \times 100\%$$

Appendix D Load test for cover slabs

Support the cover slab on a rigid support having internal dimensions equal to those of the appropriate shaft section and with the top surface not less wide than the wall thickness of that shaft section.

Provide a uniform bedding consisting of rubber cut or formed from material having a hardness between 50 IRHD and 60 IRHD measured in accordance with BS 903-A26.

Place a rigid bearer on the cover slab in the way in which the cover is designed to be used in service. The rigid bearer shall be made to the same dimensions in plan as the cover designed to be used in service and faced on the underside with the same material as that specified above for the bedding.

Apply a load of 12.5 kN without shock to the upper surface of the rigid bearer.

Maintain the load for not less than 30 s.

Appendix E *Text deleted*

List of references

BSI Standards publications

BS 12:1991, *Specification for Portland cement.*

BS 146:1991, *Specification for Portland blastfurnace cements.*

BS 882:1992, *Specification for aggregates from natural sources for concrete.*

BS 903, *Physical testing of rubber.*

BS 903-A26:1969, *Determination of hardness.*

BS 1881, *Testing concrete.*

BS 1881-204:1988, *Recommendations on the use of electromagnetic covermeters.*

BS 2648:1955, *Performance requirements for electrically-heated laboratory drying ovens.*

BS 4027:1991, *Specification for sulfate-resisting Portland cement.*

BS 4449:1988, *Specification for carbon steel bars for the reinforcement of concrete.*

BS 4482:1985, *Specification for cold reduced steel wire for the reinforcement of concrete.*

BS 4483:1985, *Specification for steel fabric for the reinforcement of concrete.*

BS 5328, *Concrete.*

BS 5328-2:1991, *Methods for specifying concrete mixes.*

BS 8005-1, *Sewerage — Guide to new sewerage construction*[2)].

BS 8110, *Structural use of concrete.*

BS 8110-1:1985, *Code of practice for design and construction*[2)].

BS 8301:1985, *Code of practice for building drainage*[2)].

BS EN 124, *Gully tops and manhole tops for vehicular and pedestrian areas — Design requirements, type testing, marking, quality control.*

BS EN 752-3:1997 including Amendments Nos. 1 and 2, *Drain and sewer systems outside buildings — Planning.*

BS EN 1295-1, *Structural design of buried pipelines under various conditions of loading — General requirements*[2)].

BS EN 1610, *Construction and testing of drains and sewers*[2)].

BS EN ISO 9002:1994, *Quality systems — Model for quality assurance in production, installation and servicing*[2)].

Other references

[1] GREAT BRITAIN. Confined Spaces Regulations 1997. London: The Stationery Office.

[2)] Referred to in the foreword only.

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