# **DUS EAS 426-7**

# DRAFT UGANDA STANDARD

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# Concrete pipes and ancillary concrete products — Part 7: Specification for road gullies and gully cover slabs



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Draft Uganda Standards adopted by the Technical Committee are widely circulated to stakeholders and the general public for comments. The committee reviews the comments before recommending the draft standards for approval and declaration as Uganda Standards by the National Standards Council.

This Draft Uganda Standard, DUS EAS 426-7: 2006, *Concrete pipes and ancillary concrete products — Part 7: Specification for road gullies and gully cover slabs,* is identical with and has been reproduced from an East African Standard, EAS 426-7: 2006, *Concrete pipes and ancillary concrete products — Part 7: Specification for road gullies and gully cover slabs,* and is being proposed for adoption as a Uganda Standard.

This standard was developed by the Building and civil engineering Standards Technical Committee (UNBS/TC 3).

Wherever the words, "East African Standard" appear, they should be replaced by "Uganda Standard."

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# EAST AFRICAN STANDARD

Precast concrete pipes and ancillary concrete products — Part 7: Specification for road gullies and gully cover slabs

# EAST AFRICAN COMMUNITY

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# Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to achieve this objective, the Partner States in the Community through their National Bureaux of Standards, have established an East African Standards Committee.

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# Precast concrete pipes and ancillary concrete products — Part 7: Specification for road gullies and gully cover slabs

## Section 1: General

### 1.1 Scope

This Part of BS 5911 specifies requirements 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 pipelines. Requirements are also specified for gully cover slabs.

### 1.2 References

### 1.2.1 Normative references



This Part of BS 5911 incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed on the inside back cover. For a dated reference, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this Part of BS 5911 only when incorporated in the reference by amendment or revision. For an undated reference, the latest edition of the cited publication applies; together with any amendments.

### 1.2.2 Informative references

This Part of BS 5911 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

### 1.3 Definitions

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

### 1.3.1

unit

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

### 1.3.2

### untrapped gully

a hollow cylinder, with base, manufactured from concrete with an outlet to facilitate the connection of pipelines, 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.

### 1.3.3

### trapped gully

a gully as described in **1.3.2** but with the outlet so designed as to form a water seal, and provided with a rodding eye

### 1.3.4

### nominal diameter

a numerical designation of the diameter of a gully which is a convenient round number approximately equal to the internal diameter in millimetres

### 1.3.5

### nominal depth

a numerical designation of the depth of a gully, or gully outlet, which is a convenient round number approximately equal to the internal depth in millimeters

### 1.3.6

### manufacturing dimension

a dimension which a manufacturer seeks to achieve

### 1.3.7

### actual dimension

a dimension as measured

### 1.3.8

### gully cover slab

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

### 1.3.9

### batch

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

# Section 2: Materials

### 2.1 Cement

The cement shall either:

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

Standard to be complied with
BS 12
BS 146
BS 4027
BS 6588

or

b) consist of one of the following combinations of cement conforming to BS 12 and g.g.b.s. or p.f.a. in accordance with the following, to be included as part of the concrete mix by simultaneously combining them with the other concrete materials at the concrete mixer:

Cementitious component	Standard to be complied	% (m/m) of total cementitious content
other than cement	with	
ggbs	BS 6699	0 % to 65 %
pfa	BS 3892-1	15 % to 35 %

Where special combinations of cement conforming to BS 12 and g.g.b.s. or p.f.a. are to be used for additional resistance to sulfate attack (see note), the percentage by mass of the total cementitious content shall be in the ranges 70% to 90 % or 25 % to 40 % respectively.

In all cases where combinations of cement conforming to BS 12 and g.g.b.s. or p.f.a. are used, the relevant proportion of g.g.b.s. or p.f.a. shall be fully documented in the production records.

NOTE The requirements specified in **2.4.1** for minimum cement content and maximum water/cement ratio ensure that any of the permitted cements or standard combinations of cement conforming to BS 12 and g.g.b.s. or p.f.a. provide resistance to sulfate attack equivalent to classes 1 and 2 of Table 6.1 of BS 8110-1:1985. Where resistance to either class 3 or class 4 conditions as specified in Table 6.1 of BS 8110-1:1985 exists, see **2.4.1**.

### 2.2 Aggregates

### 2.2.1 General

Aggregates shall consist of materials conforming to BS 882.

NOTE The manufacturer may modify the gradings to suit the manufacturing process (see clause 0 of BS 882:1992).

### 2.2.2 Mechanical properties

The limiting values on the mechanical properties of coarse aggregates shall be either:

a) a minimum of 10 % fines value of 100 kN, when tested in accordance with BS 812-111; or

b) a maximum aggregate impact value of 30 %, when tested in accordance with BS 812-112.

When tested in accordance with BS 812-105.1, flakiness index shall be not more than 35.

### 2.2.3 Nominal maximum size

The nominal maximum size of aggregate shall not exceed 20 mm.

### 2.3 Other concrete materials

### 2.3.1 Water

Water shall be clean and free from harmful matter in such quantities as affect the properties of the concrete in the plastic or hardened state.

NOTE 1 See appendix A of BS 3148:1980.

NOTE 2 As a general rule, potable water, whether treated for distribution through the public supply or untreated, is suitable for making concrete.

### 2.3.2 Admixtures

**2.3.2.1** Admixtures shall conform to BS 5075.

NOTE Admixtures should not impair the durability of the concrete, nor combine with the ingredients to form harmful compounds nor increase the risk of corrosion of reinforcement.

**2.3.2.2** The chloride ion content of admixtures shall not exceed 2 % (m/m) of the admixture nor 0.03 % (m/m) of the cement, when used in:

a) any concrete containing reinforcement or other embedded metal; and

b) any concrete made with cement conforming to BS 4027.

### 2.4 Concrete mix, casting and finish

### 2.4.1 Cement content

**2.4.1.1** The fully compacted concrete shall contain not less than 330 kg/m3 of cement (inclusive of any g.g.b.s. or p.f.a.) and shall have a water/cement ratio of not greater than 0.45.

**2.4.1.2** Where the requirement is for class 3 exposure conditions, as specified in Table 6.1 of BS 8110-1:1985, a special combination of cement conforming to BS 12 and g.g.b.s. or p.f.a. shall be used (see **2.1** b), and the minimum cementitious content shall be increased from 330 kg/m3 to 380 kg/m3, or, alternatively, 330 kg/m3 of cement conforming to BS 4027 shall be used.

**2.4.1.3** Where the requirement is for class 4 exposure conditions, as specified in Table 6.1 of BS 8110-1:1985, cement conforming to BS 4027 shall be used and the minimum cement content shall be increased from 330 kg/m<sup>3</sup> to 370 kg/m<sup>3</sup>.

NOTE Where class 5 exposure conditions exist, the manufacturer's advice should be sought.

### 2.4.2 Chloride content

The total chloride content of the concrete mix shall be as given in Table 1.

### 2.4.3 Temperature of concrete and other materials

Concrete, when placed, shall have a temperature of at least 5 °C, which shall be maintained until the concrete is hardened.

NOTE It is permissible to heat aggregates and water, before mixing, to a temperature not exceeding 60 °C.

The temperature of any other materials and moulds used shall be at least 0 °C.

### 2.4.4 Compaction

All units shall be compacted so that, when hardened, they shall be free from honeycombing and from any individual large void as defined in **4.4.1** of BS 1881-120:1983.

NOTE Any individual void larger than 6 mm is unacceptable.

### 2.4.5 Fabrication

Where a gully is to be assembled from prefabricated sections, they shall be secured with one of the materials specified in **2.4.6.2** b), c) and d).

### 2.4.6 Making good

### 2.4.6.1 General

Any surface void up to 12 mm deep and any damage affecting the performance of the unit, including joints but excluding the external edges of gully cover slabs, shall be made good using materials specified in **2.4.6.2**.

### 2.4.6.2 Materials

Materials for making good shall be one of the following:

- a) neat cement grout, with or without the addition of styrene-butadiene rubber (SBR), the type of cement being compatible with that in the unit to be made good;
- b) 1 : 3 cement/sand mortar proportioned by mass with or without the addition of SBR. The cement shall be compatible with that in the unit to be made good and the sand shall conform to the requirements of BS 882 but have a grading such that 100 % of the material passes a 5 mm sieve;
- c) a sample of the concrete mix minus the aggregate retained on the 5 mm sieve, with or without the addition of SBR;
- d) epoxy or polyester resin, or polymer latex mortar.

NOTE For guidance on the use of epoxy and polyester resins, see CIRIA Report 69 *Effective use of epoxy and polyester* resins in civil engineering structures [1]. See also *The repair of concrete structures* [2] published by the Cement and Concrete Association, which also deals with polymer latex mortars, and **6.10.5** of BS 8110-1:1985.

Type of concrete	Maximum total chloride content expressed as a percentage of chloride ion by mass of cement (inclusive of g.g.b.s. or p.f.a when used) % (m/m)
Concrete made with cement conforming to BS	
4027	0.2
Concrete containing embedded metal and made with cement conforming to BS 12, BS 146, or combinations of cement conforming to BS 12 and g.g.b.s. or p.f.a.	0.4

### Table 1 — Limits of chloride content of concrete

# Section 3: Dimensions and tolerances

### 3.1 Nominal size

**3.1.1** The nominal size of a gully comprises its nominal diameter and nominal depth and shall be as specified in column 1 of Table 2.

**3.1.2** The nominal size of a gully cover slab shall be expressed as the nominal diameter of the gully with which it is designed to fit.

### 3.2 Internal manufacturing diameter and actual diameter

The internal manufacturing diameter of a gully (see **1.3.6**) shall be not outside the limits shown in column 2 of Table 2. The actual internal diameter of a gully (see **1.3.7**) shall not deviate from the manufacturing diameter by an amount greater than that given in column 3 of Table 2.

### 3.3 External manufacturing diameter and top flange

The external manufacturing diameter of the barrel of a gully shall be not less than 1.15 times the internal manufacturing diameter and the top flange shall be of width not less than 0.15 times that diameter.

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1 Nominal gully (see	size of 3.1)	2 Limits of internal manufacturing	3 Deviation of actual internal diameter from	4 Limits of internal manufacturing	5 Deviation of actual internal manufacturing	6 Minimum thickness of base	7 Maximu depth outlet	8 M Minimum of dimension of riser	9 Minimum crosssectional area of riser	10 Minimum internal diameter	11 Minimum depth of water
Nominal diameter	Nominal depth	diameter of gully (see 1.3.6) A	internal manufacturing diameter (see 3.2)	depth (see 1.3.6) B	depth from internal manufacturing depth	c	DE	trapped gullies) F	(for trapped gullies)	of rodding eye (for trapped gullies) (see 3.4) <i>G</i>	seal (for trapped gullies) (see 3.5) H
375	750 900	mm 365 to 385	mm(±) 6	mm 740 to 760 890 to 910	mm(±) 25	mm 50	mm m 300 40	m mm 00 90	mm <sup>2</sup> 8000	mm 100	mm 85
450	750 900 1050 1200	435 to 465	6	740 to 760 890 to 910 1040 to 1060 1180 to 1210	25	50	300 40	90	8000	100	85

Table 2 — Nominal sizes and tolerances for gullies and gully outlets

dimensions A, B, C, D, E, F, G and H are shown







Figure 3 — Typical trapped gully with socket outlet

# 3.4 Rodding eye

The internal diameter of the rodding eye of a trapped gully shall be not less than 100 mm (see Table 2).

### 3.5 Water seal

The depth of the water seal of trapped gully shall be not less than 85 mm (see Table 2).

### 3.6 Gully cover slab thickness

Gully cover slabs shall have a minimum thickness of 65 mm.

### 3.7 Gully outlet

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

# Section 4: Tests

### 4.1 General

### 4.1.1 Type and routine testing

**4.1.1.1** Type tests shall be carried out to prove the design. They shall be undertaken whenever there is a change in design, type of material or method of manufacture.

**4.1.1.2** Units shall be considered ready for acceptance only after the design has been proven by type tests and the batch of which the units form part has been routinely tested. Records of all tests shall be kept.

Units shall not be despatched until they are at least 10 days old.

### 4.1.2 Test equipment and facilities

**4.1.2.1** Suitable equipment and facilities shall be available for sampling and testing the units before despatch.

NOTE These may be provided either at the manufacturer's works or elsewhere.

**4.1.2.2** All test equipment shall be calibrated at least annually and certification to that effect shall be provided.

### 4.2 Test requirements

### 4.2.1 Water absorption test

When sampled in accordance with **5.1.1** and **5.1.2** and prepared and tested in accordance with Annex 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.

The hole in a unit from which a core specimen has been taken shall be sealed with material conforming to **2.4.6.4** d).

NOTE A hole sealed in this way does not preclude a unit from conforming to this standard.

### 4.2.2 Watertightness test

When sampled in accordance with **5.1.1** and tested in accordance with Annex D, the gully shall retain water for a period of 30 min without leaking.

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

# Section 5: Inspection procedures and marking

### 5.1 Inspection procedures

### 5.1.1 Size of batch

Any batch consisting of more than 150 units shall be produced within a 24 h period.

### 5.1.2 Inspection procedure for the water absorption test

When carrying out the water absorption test, the following inspection procedure shall be used.

- a) From each manufacturing process, select one unit in 500 or two/week, whichever is the greater, and take specimens as described in Annex C. Use the same type of specimen for all tests on a given product.
- b) Test the specimens for water absorption in accordance with 4.2.1.
- c) If the specimens pass the test, accept the units in the batch or batches from which they were taken. If any specimen fails, repeat a) and b), using a second sample from the same batch.

- d) If the specimens obtained from the second sample of units pass the test, accept the units 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. It is permissible to take specimens from all the remaining units and test them. Accept only those that pass the test.
  - 2) Investigate the cause of failure and take any necessary remedial action.
  - 3) Resume production and increase the rate of inspection to one unit in 250 or four/week, whichever is the greater.
  - 4) Resume the rate of inspection given in a) only after all samples taken during a production period of 5 consecutive weeks have passed the test.

### 5.1.3 Inspection procedure for the watertightness test

When carrying out the watertightness test, the following inspection procedure shall be used.

- a) From each manufacturing process select one gully in 100 or two/week, whichever is the greater.
- b) Subject the gullies to the watertightness test specified in **4.2.2**.
- c) If the gullies pass the test, accept the gullies in the batch or batches from which they were taken. If any gully fails, repeat a) and b), using a second sample from the same batch.
- d) If the gullies in the second sample pass the test, accept the gullies in the batch or batches from which they were taken. However, if any of these gullies fail, proceed as follows:
  - 1) Reject the batch or batches. It is permissible to take all the remaining gullies and test them. Accept only those that pass the test.
  - 2) Investigate the cause of failure and take any necessary remedial action.
  - 3) Resume production and increase the rate of inspection to one gully in 50 or four/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.

### 5.1.4 Records

Records shall be kept of all inspection procedures.

### 5.2 Marking

Each unit shall be visibly and legibly marked with the following information:

- a) the number and date of this British Standard, i.e. BS 5911-230:19941);
- b) the letter "S", where sulfate-resisting Portland cement has been used;
- c) the letter "B", where g.g.b.s, has been used;
- d) the letter "P", where p.f.a. has been used;
- e) the letter "A", where an admixture has been used;
- f) the manufacturer's mark and works identification mark.

NOTE The following is an example of marking "T" "X" BS 5911-230:1994 "SA"

The above marking on a unit would signify the following:

Claimed by manufacturer "T" to have been made at his works "X" and to conform to BS 5911-230:1994<sup>1</sup>), and made with sulfate-resisting Portland cement; to contain an admixture.

Units shall be marked with either:

- a) indelible marker, applied as soon as possible after removal from the mould; or
- b) impressed characters approximately 2 mm deep.

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<sup>&</sup>lt;sup>1)</sup> Marking BS 5911-230:1994 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the claimant's responsibility. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

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

The following are essential details that a purchaser should supply to the manufacturer so that an enquiry or order may be fully understood:

- a) quantity, type and nominal sizes of gullies (see Table 2 and Figure 1, Figure 2 and Figure 3);
- b) quantity and nominal sizes of gully cover slabs (see 3.1.2);
- c) the classification of exposure conditions for sulfate attack, if higher than class 2 (see note to **2.1** and **2.4.1**);
- d) if samples of aggregates and/or evidence of satisfactory performance of concrete made with such aggregates are required (see Annex B);
- e) if any restriction on admixtures is required (see 2.3.2);
- f) the number and type of tests to be witnessed and whether any additional tests are required (see Annex B);
- g) if the products are to be covered by a third party certification scheme (see Annex B).

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# Annex B (informative) Recommended facilities for purchasers

The purchaser or his representative, by arrangement with the manufacturer, should at all reasonable times have free access to the places 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.

Representative samples of the aggregates should be supplied to the purchaser on request.

When required by the purchaser, evidence of satisfactory performance of the concrete manufactured with such aggregates should be made available at the time of placing the order.

Where the manufacturer is not covered by a scheme of third party certification, the purchaser should be permitted to select samples for test, using the appropriate inspection criteria specified in this Part of BS 5911.

The allocation of the cost of carrying out any additional tests over and above the tests specified in this Part of BS NOTE 5911 is generally agreed between the manufacturer and the purchaser prior to testing.

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# Annex C (normative) Method of test for water absorption by concrete

### C.1 Apparatus

**C.1.1** *Ventilated drying oven,* conforming to BS 2648.

### C.2 Preparation of test specimens

From each unit selected for test, specimens shall be either:

- a) a specimen of the full thickness of the wall of the unit, taken from each unit, that is either approximately 100 mm square or a core approximately 75 mm in diameter; or
- b) a concrete test cube compacted, cured and stored in the same way as the concrete in the unit.

### C.3 Procedure

Prior to testing, do not treat any specimen with any coating.

Dry the specimen at a temperature of  $(100 \pm 5)$  °C for not less than 72 h in a ventilated drying oven (**C.1.1**). On removal from the oven, allow to cool to room temperature, weigh ( $M_1$ ) and immediately submerge in potable water at a temperature of  $(20 \pm 2)$  °C.

After 30 min, remove the specimen and immediately wipe with a dry towel for a total period of 30 s to remove surface water and reweigh ( $M_2$ ).

After weighing, re-immerse the specimen in water for a further 23.5 h. Then remove, dry with a towel and weigh as before  $(M_3)$ .

### C.4 Expression of results

Calculate the absorptions of dry mass *W* (in %) after 30 min and 24 h from the equation:

$$W = \frac{(M_2 \text{ or } M_3) - (M_1)}{(M_1)} \times 100$$

where

 $M_1$  is the mass of the specimen after drying for 72 h (in g);

 $M_2$  is the mass of the specimen after soaking for 30 min (in g);

 $M_3$  is the mass of the specimen after soaking for 24 h (in g).

### Annex D (normative) Method of test for watertightness of gully

Prior to testing, do not treat any gully surface with any coating or lining.

Insert an expanding stopper into the outlet to create a watertight seal. Set up the gully in a rigid frame so that all surfaces, including the underside, are available for inspection.

Fill the gully with water until the water level is  $(25 \pm 2)$  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 period of 30 min. During this period, visually examine the outside surfaces of the gully for any leakage.

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### List of reference (see 1.2)

- BS 12:1991, Specification for Portland cement.
- BS 146:1991, Specification for Portland blastfurnace cements.
- BS 812, Testing aggregates.
- BS 812-105.1, Methods for determination of particle shape.
- BS 812-105.1:1989, Flakiness index.

BS 812-111:1990, Method for determination of ten per cent fines value (TFV).

- BS 812-112:1990, Method for determination of aggregate impact value (AIV).
- BS 882:1992, Specification for aggregates from natural sources for concrete.
- BS 1881, Testing concrete.
- BS 1881-120:1983, Method for determination of the compressive strength of concrete cores.
- BS 2648:1955, Performance requirements for electrically-heated laboratory drying ovens.
- BS 3892, Pulverized-fuel ash.
- BS 3892-1:1993, Specification for pulverized-fuel ash for use with Portland cement.
- BS 4027:1991, Specification for sulphate-resisting Portland cement.
- BS 5075, Concrete admixtures.
- BS 5075-1:1982, Specification for accelerating admixtures, retarding admixtures and water reducing admixtures.
- BS 5075-2:1982, Specification for air-entraining admixtures.
- BS 5075-3:1985, Specification for superplasticizing admixtures.
- BS 6588:1991, Specification for Portland pulverized-fuel ash cements.
- BS 6699:1992, Specification for ground granulated blastfurnace slag for use with Portland cement.
- BS 8110, Structural use of concrete.
- BS 8110-1:1985, Code of practice for design and construction.

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