

RWANDA STANDARD

DRS
262

2nd edition

2014-mm-dd

Precast concrete road kerbs, edgings and channels – Specification

In order to match with technological development and to keep continuous progress in industries, Standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition

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Contents		Page
Foreword.....		v
1	Scope	1
2	Normative references	1
3	Terms and Definitions	1
4	Requirements	2
4.1	Materials	3
4.2	Product	3
5	Marking of product	9
6	Tests.....	9
7	Retest	11
8	Sampling.....	11
Annex A		12
Annex B		15

Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

PD 262- was prepared by Technical Committee RSB/TC 055, Roads and Highway Engineering

In the preparation of this standard, reference was made to the following standards:

- 1) SANS 927:2007 Precast concrete kerbs, edgings and channels
- 2) BS EN 1340 :2003 Concrete kerb units —Requirements and test methods

The assistance derived from the above source is hereby acknowledged with thanks.

This second edition cancels and replaces the first edition (RS 262: 2014). [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

Committee membership

The following organizations were represented on the Technical Committee on Roads and Highway Engineering (RSB/TC 55) in the preparation of this standard.

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UR-CST

TECOS

NPD

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Gasabo District

EMP Ltd

Rock Solid Construction

Rwanda Standards Board (RSB) – Secretariat

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Precast concrete kerbs, edging and channels — Specification

1 Scope

This Draft Standard specifies materials requirements, properties and test methods for various types of unreinforced precast concrete kerbs, edgings and channels intended for use in the construction of carriage ways and footways.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

RS EAS 18-1 — Part 1: Composition, specification and conformity criteria for common cements

RS 373: Aggregates for concrete — Specification

RS EAS 12 Potable water — Specification

ISO 19596 Admixtures for concrete

ISO 22965-2: Concrete -- Part 2: Specification of constituent materials, production of concrete and compliance of concrete

ISO 22965-1: Concrete -- Part 1: Methods of specifying and guidance for the specifier

RS ASTM C131M Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

3 Terms and Definitions

3.1

carriageway

part of the road constructed for use by vehicular traffic

3.2

footway

portion of a road reserved exclusively for pedestrians

3.3

kerb

border, usually upstanding, at the edge of a carriageway or footway

3.4

defective

product that fails in one or more respects to comply with the requirements of the standard

3.5

face

of kerb, edging or channel> surface that is exposed after the product has been laid in place for use

3.6

product

kerb, edging or channel that is made from precast concrete

3.6

bed face

lower surface in contact with the ground after laying

3.7

precast concrete product

concrete product cast and cured in a place other than the final location of use

4 Requirements

4.1 General

Only materials with suitability established in terms of their properties and performance shall be used in the manufacture of concrete kerb units. The suitability requirements of the materials used shall be given in the manufacturer's production control documentation.

Where, by conformity with relevant specifications, the properties and performance of materials have been demonstrated, further testing need not be performed.

4.2 Asbestos

Asbestos, or materials containing asbestos, shall not be used.

4.3 Materials

4.1.1 Cement

The cement used shall comply with the requirements of RS EAS 18-1.

4.1.2 Aggregates

Aggregates shall comply with the requirements of RS 373. The aggregate crushing value, aggregate impact value and aggregate abrasion value shall not exceed the corresponding requirements laid down in RS ASTM C131M. The aggregate impact test shall be done only as an alternative test to aggregate crushing value. The maximum size of coarse aggregates may be as large as possible within the limits specified but shall not be greater than one-fourth of the minimum thickness of the section.

4.1.3 Water

The water used in the mixing of the concrete shall be potable water complying with RS EAS 12.

4.1.4 Admixtures

If applicable, admixtures shall comply with the requirements of ISO 19596.

4.1.5 Concrete

The concrete shall be minimum of M 25 grade, strength requirements shall comply as specified in ISO 22965-1.

4.4 Product

4.2.1 Type

The type of kerbs, edgings or channels shall be one of those shown in the applicable figure in table 1, 2 or 3, as required.

4.2.2 Shapes and dimensions

Shapes of kerbs, edgings or channels shall be one of those shown in the applicable figure in table 1, 2 or 3, as required.

All dimensions shall conform to the appropriate values given in table 1, 2 or 3, as relevant, subject to a tolerance of ± 3 mm.

Length: Unless otherwise required, the length of units shall be $1 \text{ m} \pm 3 \text{ mm}$.

Straightness: The deviation from straightness of the longitudinal edges of the product shall not exceed 3 mm/m in length.

Squareness: The deviation from squareness of units shall not exceed 1 mm per 200 mm.

Radius: Radii shall be as specified in table 1, 2 or 3, as relevant.

4.2.3 Appearance

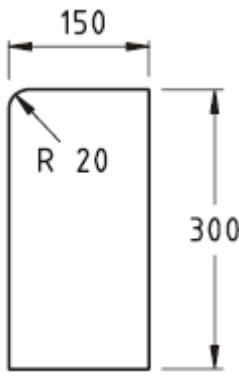
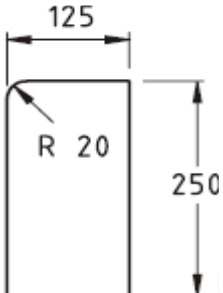
All products shall comply with the following:

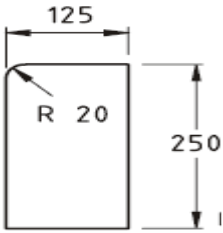
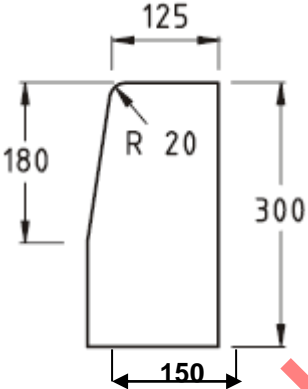
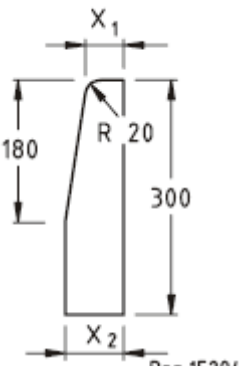
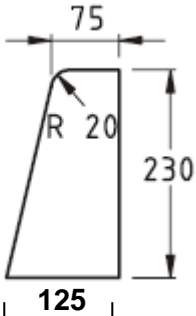
- they shall be free from cracks other than hairline cracks;
- the faces shall be free from visible twist and dents;
- arrises shall be truly formed and shall conform to those shown in the figures in table 1, 2 or 3, as relevant;
- there shall be no patching of defective surfaces or edges; and the colour of the products shall be uniform;
- all angles of the precast units with the exception of the angles resulting from the splayed or chamfered faces in the sections shown in figures shall be true right angles. The arrises shall be clean and, with the exception of the rounded arrises, sharp.
- the wearing surfaces shall be true and out of winding; and
- on being fractured, the interior of the products shall present a clean homogeneous appearance.

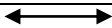
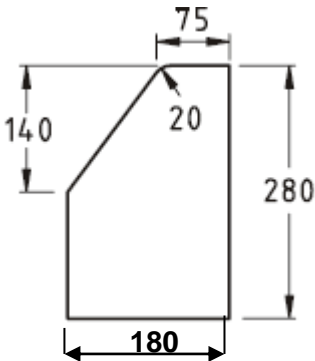
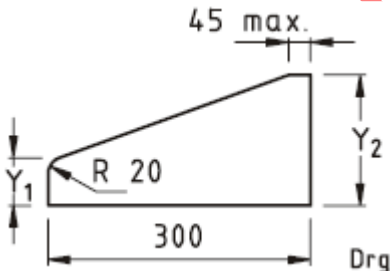
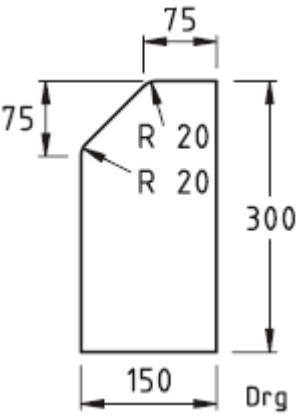
4.2.4 Finish and colour

Special finishes may be agreed upon between the purchaser and the Supplier. Unless otherwise specified by the purchaser, the kerbs, channels, etc., shall be supplied in natural colour. When these are ordered coloured, the colour shall be as agreed to between the purchaser and the supplier at the time of placing the order. These may be coloured throughout or only in a surface layer as agreed to between the purchaser and the supplier, and the surface layer shall be not less than 12.5 mm thick.

Table 1 — Sections, dimensions and strength of kerbs

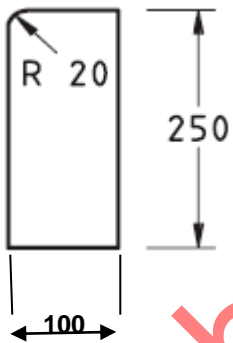
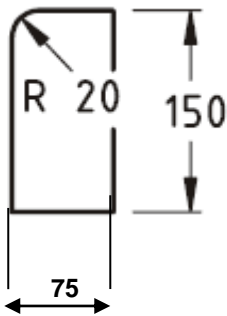
Type	Sections and dimensions mm	Minimum transverse strength kN
Rectangular	 <p>Figure 1</p>	22
	 <p>Figure 2</p>	13

Half-battered	 <p>Figure 3</p>	22
	 <p>Figure 4</p>	19
	 <p>Figure 5</p>	<p>5.5 for $X_1=62$ and $X_2=75$ 11 for $X_1=75$ and $X_2=100$</p>
Battered		8

	 <p>Figure 6</p>	
Mountable	 <p>Figure 7</p>	23
	 <p>Figure 8</p>	<p>11 for $Y_1=50$ and $Y_2=150$</p> <p>15.5 for $Y_1=75$ and $Y_2=175$</p> <p>15 for $Y_1=100$ and $Y_2=200$</p> <p>26.5 for $Y_1=125$ and $Y_2=225$</p>
Mountable	 <p>Figure 9</p>	21

NOTE The tolerance of longitudinal and radial dimensions is ± 3 mm.

Table 2 — Sections, dimensions and strength of edgings

Type	Sections and dimensions mm	Minimum transverse strength kN
Rectangular	 <p>Figure 10</p>	9
	 <p>Figure 11</p>	2.5

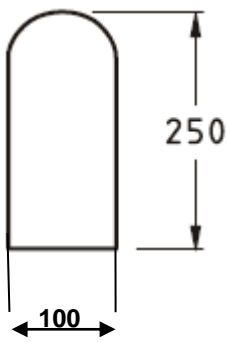
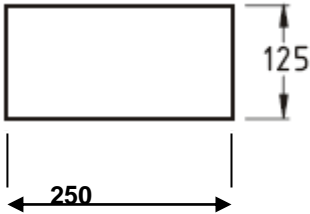
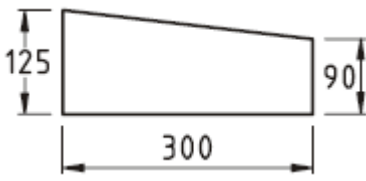
Half-round	 <p>Figure 12</p>	9
NOTE The tolerance of longitudinal and radial dimensions is ± 3 mm.		

Table 3 — Sections, dimensions and strength of channels

Type	Sections and Dimensions mm	Minimum transverse strength kN
Rectangular	 <p>Figure13</p>	13

Tapered	 <p data-bbox="722 683 841 719">Figure 14</p>	11
<p>Note The tolerance of longitudinal and radial dimensions is ± 3 mm.</p>		

4.2.5 Moulding

The kerbs, edgings and channels shall be made under hydraulic pressure. The pressure employed shall be not less than 7 MN/m^2 over the entire surface receiving the pressure. The escape of the finer particles of cement during the process of pressing shall be prevented as far as practicable.

4.2.6 Transverse strength

When determined in the manner described in 6.1, the average failing load shall be not less than the appropriate value given in table 1, 2 or 3, as relevant.

4.2.7 Water absorption

When determined in the manner described in 6.2, the average increase in mass of each group of three specimens by absorption of water in the first ten minutes shall not exceed 3.0 percent, and the absorption after 24 hours shall not exceed 8.0 percent, the percentages being calculated on the dry mass of the test pieces.

5 Marking of product

Each consignment of kerbs, edgings or channels shall be accompanied by a dispatch or consignment note that contains the following information:

- manufacturer's name or trade name or trade mark;
- date of manufacture;
- type of kerb (and size if applicable), edging or channel ;and
- dimensions, if applicable.

6 Tests

Sample of kerbs, edgings and channels selected in accordance with 7 shall satisfy tests for transverse strength and absorption of water.

6.1 Test for transverse strength

When tested in the manner described in Annex A, kerbs, edgings and channels shall support without damage, for at least one minute, the loads given in Table 1, 2 and 3 respectively.

The above test loads relate to tests for transverse strength carried out 28 days after the kerbs, edgings and channels are manufactured.

If tests are carried out after a longer period has elapsed, the load to be supported shall be the appropriate load stated in table 1, 2 or 3 multiplied by the ageing factors in table 4:

Table 4 –Ages of sample at test ageing factor

Months	Ageing factor
1	1.0
3	1.10
6	1.15
12	1.2
Ageing factors for intermediate ages may be obtained by interpolation.	

6.2 Test for water absorption

When tested in the manner described in Annex B, the average increase in mass of each group of three specimens by absorption of water in the first ten minutes shall not exceed 3.0 percent, and the absorption after 24 hours shall not exceed 8.0 percent, the percentages being calculated on the dry mass of the test pieces.

6.3 Test report

The following particulars shall be supplied in the test report other than for tests for factory production control:

- 1) name of the organisation carrying out the test;
- 2) name of the person carrying out the test;
- 3) date of the test;
- 4) name of the source providing the sample;
- 5) sample reference including the date of production;
- 6) name of the person taking the sample;
- 7) relevant RS number and annex where applicable;
- 8) name of the test;
- 9) test result;

10) pertinent remarks about the sample or test result.

7 Retest

Should any test sample fail to comply with the requirements of either of the tests specified in 6.1 and 6.2, two further test samples from the batch comprising the same order shall be tested.

Should one or both of these further test samples fail to comply with the requirements of the tests, the whole of the batch represented by the samples shall be rejected.

8 Sampling

For the purpose of the tests specified in 6, the purchaser or his representative should select up to three samples for every order of 900 m or less, and one further sample for every further 1 800 m or part of 1 800 m, comprising the same order.

The purchaser or his representative shall, at all reasonable times, have access to the place where the kerbs, edgings channels are manufactured or stored, for the purpose of examining and sampling the materials and the finished products, inspecting the process of manufacture, and testing and marking the products. The supplier/manufacturer shall, free of extra charge, provide or make arrangements for the provision of every facility and all labour required for such examination, sampling, inspecting, testing and marking before delivery, and shall provide and maintain or make arrangements for providing and maintaining in good working order suitable, convenient and accurate apparatus for testing samples as hereinafter provided.

Annex A (normative)

Method of test for transverse strength

A.1 Apparatus

A.1.1 Testing machine, that

- a) is of sufficient capacity to be capable of applying a flexural load at a rate of 20 N/min/mm of width of the specimen;
- b) is accurate to within 1.5 % of the applied test load;
- c) has two steel bearing platens with hardened faces;
- d) has an upper platen with a spherical seating, a bearing face width of 50 mm and a length that is at least equal to the width of the specimen, and
- e) has a lower platen fitted with two level and parallel self-aligning bearers of 40 mm diameter, 750 mm apart (centre to centre), and of length at least equal to the width of the specimen.

A.1.2 Hardwood fillet,

used for rectangular specimens, of width 50 mm and of the same length as the width of the specimen. The fillet is in contact with both the upper platen and the specimen over the full width of the specimen.

A.1.3 Hardwood wedge,

used for battered, mountable or half-round specimens, the face of which is complementary (i.e. so shaped that the cross section of the wedge-and-specimen assembly is rectangular) and provided with an end plate (or an overhang of the wedge) to prevent slipping.

A.2 Preparation of test specimens

Before testing, immerse three specimens in water for $24 \text{ h} \pm 2 \text{ h}$ at a temperature in the range of $20 \text{ }^{\circ}\text{C} \pm 5^{\circ}\text{C}$

A.3 Procedure

A.3.1 Support the specimen on the bearers on the lower platen (with the wide plane down, if applicable).

Each sample shall be supported as shown in Fig. A.1 upon two steel bearers **P**, each 6 mm wide on the supporting surfaces, parallel to each other and spaced 750 mm apart for kerbs and channels and 450 mm apart for edgings.

A.3.2 Position the bearing face of the upper platen at mid-span of the specimen and across the upper surface of the specimen parallel to the supporting bearers.

The sample **Q** shall be placed upon the bearers with the greatest width of its wearing face uppermost and its ends parallel to the bearers. The bearers shall be level in all directions and shall be so arranged as to support the sample when under test, throughout its whole width.

A.3.3 Interpose the hardwood fillet or wedge between the platen and the specimen. A bedding of soft board can be used for proper contact between the fillet and the specimen if necessary.

A.3.4 Apply the load at a rate of 20 N/min/mm width of the specimen until the specimen fails. The load **W** shall be applied through the medium of a hardwood fillet to a space 50 mm wide in the centre of the unsupported portion of the sample and extending the whole width of the sample, parallel to the bearers. The hardwood fillet shall be bedded in a thin layer of plaster of Paris which shall be allowed to set before testing is commenced. The load shall be steadily and uniformly applied, starting from zero, at a rate not exceeding 500 N per 300 mm of width (measured parallel to the bearers) per 10 seconds up to the maximum

A.3.5 Record the maximum load applied.

A.3.6 Repeat A.3.1 to A.3.5 for the other two specimens.

A.4 Calculation of test results

Using the work dimensions of the failure plane calculate the second moment of area **I** about a horizontal axis through the centre of the area of the failure plane.

Calculate the strength, **T**, in mega-pascals of the precast units tested from the equation

$$T = \frac{P \times L \times Y}{4 \times I}$$

where;

T is the strength, in mega-pascals;

P is the failure load in newton;

L is the distance apart of the supports in millimetres;

I is the second moment of area; determined from the work dimensions

y is the distance from the centroid to the extreme tensile fibre.

Record the individual result in mega-pascals.

A.5 Test report

The test report shall include the strength, **T**, of the precast units.

Report the average of the results so obtained as the average failing load of the sample and check for compliance with 4.2.6. If the failing load of any individual specimen is less than 80 % of the specified average failing load, deem the sample to be defective.

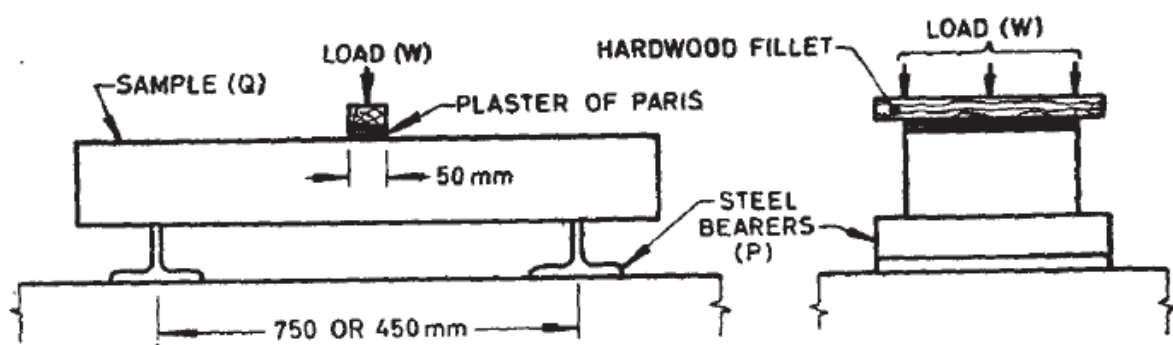


Figure A.1 – Method of test for transverse strength

Annex B (normative)

Method of test for water absorption

B.1. Test piece

B.1.1 From each sample kerb and channel three test pieces shall be taken approximating in size and shape to a 100 mm cube and having two moulded faces and four faces cut by hammer and chisel. From each sample edging three test pieces shall be taken approximately 100 x 100 X 50 mm having the two 100 x 100 mm faces moulded and the four 100 x 50 mm faces cut by hammer and chisel.

B.2. Water absorption test

B.2.1 The test pieces shall be dried for 72 hours in a suitably ventilated drying oven, the temperature of 105°C ± 5°C. On removal from the oven they shall be cooled for 24 hours in a desiccator or in a small dry airtight vessel. They shall then be weighed and immediately immersed in water at 20 ± 5°C for a period of 10 minutes ± 10 seconds. At the end of this period they shall be removed, shaken to remove the bulk of the water, and then dried with a cloth as rapidly as possible until all the free water is removed from the surface, and again weighed. They shall then be immersed in water again for a total period of 24 hours, after which time they shall be removed, dried as before and weighed.

B.3 Calculation of test results

Calculate the water absorption (W_a) of each specimen as a percentage of its mass from the equation:

$$W_a = \frac{M_1 - M_2}{M_2} \times 100 \%$$

where;

M₁ is the initial mass of the specimen (g);

M₂ is the final mass of the specimen (g).

Calculate the mean value as a test result for the unit.

B.4 Test report

The test report shall give the values of water absorption for each of the specimens

Bibliography

- [1] ISO/IEC Directives, Part 2, *Rules for the structure and drafting of International Standards*, 2016

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