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Aggregates for surface treatment of roads — Specification

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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.

DRS 292 was prepared by Technical Committee RSB/TC 55, Roads and highway engineering

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

1) ASTM D1139/D1139M – 22, Standard Specification for Aggregate for Single or Multiple Bituminous Surface Treatments

2) SANS 1200M:1996, Standards specification for civil engineering construction – Road (General)

3) SANS 1200 MG:1996, Standards specification for civil engineering construction – MG: Bituminous surface treatment

4) ASTM D8 – 22, Standard Terminology Relating to Materials for Roads and Pavements

5) ASTM D75/D75M – 19, Standard Practice for Sampling Aggregates

6) RS ASTM C131/C131M-20, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

7) ASTM C535 – 16, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

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

This second edition cancels and replaces the first edition (RS 292: 2016), [clauses 1, 3, 6 and 7] which has 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.

ASTRIK International Ltd

EDITRACE LTD and General Reliance

JV CSC&EC(Property) and Fair Construction Ltd

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Aggregates for surface treatment of roads — Specification

1 Scope

This Draft Rwanda Standard covers requirements, sampling and test methods for crushed aggregates for use in surface treatments in the construction, rehabilitation or maintenance of bituminous roads surfacing. Requirements are laid down for sizes, strength, gradation of aggregates and methods of sampling and test.

It is applicable to common rocks and minerals suitable for use in the form of crushed stone for surface treatments of roads.

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.

RS ISO 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1

gravel

product resulting from natural disintegration and human actions such abrasion of rock or processing of weakly bound conglomerate

3.2

uncrushed gravel

product resulting from screening and blending of material from the deposit, consisting of particles with a shape and texture largely dependent on the nature of the deposit

3.4

crushed gravel

product resulting from the crushing of rocks, with a requirement that at least a prescribed percentage of the resulting particles have fracture faces

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3.5

aggregate

granular material used in construction, such as sand, gravel, crushed stone, used with a cementing medium such as hydraulic cement or bituminous binder, to form hydraulic-cement concrete or mortar or asphalt concrete

3.6

coarse aggregate

aggregate of particle size retained on a square aperture test sieve of 4.75 mm nominal size not exceeding 37.5 mm

3.7

fine aggregate

aggregate of particle size passing a square aperture test sieve of 4.75 mm nominal size

3.8

grading

particle size distribution expressed as the percentages by mass passing a specified set of sieves

3.9

surfacing

layer or layers of processed material constructed upon the completed base. Surfacing is sometimes referred to as "wearing course".

3.10

slurry seal

homogenous mixture of asphalt emulsion, graded fine aggregates, mineral fille and water that has a creamy fluid-like appearance when applied

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4 Geometrical requirements

4.1 General

Aggregate sizes shall conform to the requirements prescribed in Table 1 for the size number specified. Conformance shall be determined by means of laboratory sieves having square openings complying with RS ISO 565.

Table 1 — Sizes of processed aggregates

Sieve size (mm)	Percentage passing by mass						
	26.5 mm nominal size	19.0 mm nominal size	13.2 mm nominal size	9.5 mm nominal size	6.7 mm nominal size	4.75 mm nominal size	2.36 mm Nominal size
37.50	100	-	-	-	-	-	-
26.50	85-100	100	-	-	-	-	-
19.00	0-30	85-100	100	-	-	-	-
13.20	0-5	0-30	85-100	100	-	-	-
9.50	-	0-5	0-50	85-100	100	-	-
6.70	-	-	0-10	0-50	85-100	100	-
4.75	-	-	-	0-10	0-50	85-100	100
3.35	-	-	-	-	-	0-30	-
2.36	-	-	-	-	0-5	0-10	0-100

4.2 Selection of aggregates

The size of the aggregate shall vary with the thickness of the surface course desired and with the type of construction contemplated, as described in Table 2.

Table 2 — Single-sized coarse aggregates

Sieve designation (mm)	percentage passing for single-sized aggregates of nominal size					
	26.5 mm	19.0 mm	13.2 mm	9.5 mm	6.7 mm	2.36 mm
37.5	100	-	-	-	-	-
26.5	85-100	100	-	-	-	-
19.0	0-30	85-100	100	-	-	-
13.2	0-5	0-30	85-100	100	-	-
9.5	-	0-5	0-50	85-100	-	-
6.7	-	-	0-10	0-50	100	-
4.75	-	-	-	0-10	0-30	100
2.36	-	-	-	-	0-10	100

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4.3 Sizes and grading of aggregates

4.3.1 General

The grading of the aggregate shall be determined by sieving in accordance with RS 96-4.

4.3.2 Single-sized coarse aggregates

Coarse aggregates shall be supplied in the nominal sizes given in Table 2. For any one of the nominal sizes, the proportion of other sizes shall also be in accordance with Table 2.

4.3.3 Fine aggregates

The grading of fine aggregates shall be within the limits given in Table 3 and shall be described as fine aggregates, Grading Zones I, II, III and IV. Where the grading falls outside the limits of any particular grading zone of sieves other than 600 µm sieve by a total amount not exceeding 5 %, it shall be regarded as falling within that grading zone. This tolerance shall not be applied to percentage passing the 600 µm sieve or to %age passing any other sieve size on the coarse limit of Grading Zone I.

Table 3 — Grades of fine aggregates

Sieve designation	Percentage passing for aggregate zones		
	Grading zone I	Grading zone II	Grading zone III
10 mm	100	100	100
4.75 mm	90-100	90-100	90-100
2.36 mm	60-95	75-100	85-100
1.18 mm	30-70	55-90	75-100
600 µm	15-34	35-59	60-79
300 µm	5-20	8-30	12-40
150 µm	0-10	0-10	0-10
NOTE For crushed stone sands, the permissible limit on 150 µm sieve is increased to 20 %. - As the fine aggregate grading becomes progressively finer, that is, from Grading Zones I to III, the ratio of fine aggregate to coarse aggregate is progressively reduced. The most suitable fine to coarse ratio to be used for any particular mix, however, depends upon the actual grading, particle shape and surface texture of both fine and coarse aggregates.			

5 Aggregate for slurry seal

5.1 Aggregate for use in slurry seal shall be an approved crusher sand obtained from a parent rock that has an ACV not exceeding 30 % or a mixture that consists of such crusher sand and not more than 25 % of approved clean natural sand.

5.2 The aggregate shall be clean, tough, durable and angular, and shall comply with the relevant grading requirements of Table 4 for the slurry and the grade or type of aggregate specified.

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Table 4 — Grading limits of aggregate for slurry seal

Nominal aperture size mm	Fine slurry			Coarse slurry	
	Fine grade	Medium grade	Coarse grade	Type 1	Type 2
	Percentage (by mass) passing sieve				
13.2	-	-	-	-	100
9.5	-	-	-	100	85-100
6.7	-	100	100	85-100	70-90
4.75	100	82-100	70-90	70-90	60-80
2.36	90-100	56-95	45-70	45-70	40-60
1.18	65-95	37-75	28-50	25-45	25-45
0.600	42-72	22-50	19-34	15-30	15-30
0.300	23-48	15-37	12-25	10-20	10-20
0.150	10-27	7-20	7-18	6-15	10-20
0.075	4-12	4-12	2-8	4-10	4-10

6 Physical requirements

6.1 General

The basic requirements for fine and coarse are summarised in Table 5 and detailed from 6.2 to 7.5.

Table 5 — Physical and Mechanical properties of aggregates

Parameter		Requirement	Test method
Physical properties			
Water absorption		≤ 1.5 %	ASTM C 127
Density		≥ 2 000 kg/m3	The test sample shall be dried at the temperature of 105 ± 50C for 24 hours
Soundness	Fine aggregates (limits for weighted loss:)	≤10 %, when tested with sodium sulphate (Na2SO4) ≤15 %, when tested with magnesium sulphate (MgSO4)	ASTM C 88
	Coarse aggregates (limits for weighted loss:)	≤ 12 %, when tested with sodium sulphate (Na2SO4) ≤ 18 % when tested with magnesium sulphate (MgSO4)	ASTM C 88

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The flakiness index	**≤ 15 %.**	RS 96-5
Deleterious substances	≤ 1.0 % 3.0 % 75 µm	
Mechanical properties		
Aggregate crushing value	≤ 30 %	RS ASTM C535: 2016
Ten percent fines value	≤ 210 kN	RS 96-8
Aggregate impact value	≤ 30%.	RS 96-9
Aggregate abrasion value	≤ 30 %	ASTM C 131

6.2 Water absorption

Water absorption, when determined in accordance with ASTM C 127, shall not exceed 1.5 %.

6.3 Density

The minimum oven dried particle density of aggregates shall be 2 000 kg/m^3. The test sample shall be dried at the temperature of 105 ± 5°C for 24 h.

6.4 Soundness

The aggregate, when subjected to five cycles of the soundness test according to ASTM C 88, shall not exceed the following limits for weighted loss:

a) **for fine aggregates:** 10 % when tested with sodium sulphate (Na_2SO_4) and 15 % when tested with magnesium sulphate ($MgSO_4$); and

b) **for coarse aggregates:** 12 % when sodium sulphate (Na_2SO_4) is used or 18 % when magnesium sulphate ($MgSO_4$) is used.

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6.5 Flakiness index

The flakiness index of the coarse aggregates, when tested in accordance with the method given in RS 96-5, shall not be more than 15 %.

6.6 Deleterious substances

6.5.1 Aggregate shall not contain any harmful material, such as pyrites, coal, lignite, mica, shale or similar laminated material, clay, alkali, soft fragments and organic impurities in such quantity as to affect the strength durability of road surface.

6.5.2 The maximum quantity of deleterious substances shall not exceed 1.0 % by mass. For substances finer than 75 µm, the quantity of deleterious substances shall not exceed 3.0 %.

7 Mechanical properties

7.1 Aggregate crushing value

The aggregate crushing value shall be determined according to ISO 20290-3 and shall not exceed 30 % of original mass.

NOTE 1 The aggregate crushing value gives a relative measure of the resistance of coarse aggregate to crushing under a gradually applied compressive load.

NOTE 2 The aggregate crushing value test is made on aggregate passing a 12.5 mm sieve and retained on a 10 mm sieve.

7.2 Ten percent fines value

The ten percent fines value shall be determined in accordance with RS 96-8, and shall not be less than 210 kN

7.3 Aggregate impact value

The aggregate impact value for coarse aggregate, when determined in accordance with RS 96-9 shall not exceed 30%.

NOTE The aggregate impact value gives a relative measure of the resistance of an aggregate to sudden shock or impact, which in some aggregates differs from its resistance to a slow compressive load.

7.4 Aggregate abrasion value

The aggregate abrasion value for coarse aggregate, when determined according to ASTM C 131, shall not exceed 30 %.

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8 Sampling and testing

8.1 Sampling

The method of sampling shall be determined in accordance with RS 96-3.

8.2 Testing

8.2.1 All tests shall be carried out as described in RS 96-4 to RS 96-12 and other relevant referenced test methods.

8.2.3 In the case of all-in-aggregate, for purposes of tests to verify its compliance with the limit requirements given in 6.5, and when necessary for such other tests as required by the purchaser, the aggregate shall be first separated into two fractions, one finer than 4.75 mm sieve and the other coarser than 4.75 mm sieve, and the appropriate tests shall be made on samples from each component, the former being tested as fine aggregate and the latter as coarse aggregate.

9 Supplier's certificate

9.1 The supplier shall satisfy himself that the material complies with the requirements of this standard and, if requested, shall supply a certificate to this effect to the purchaser.

9.2 If the purchaser requires independent tests to be made, the sample for such tests shall be taken before or immediately after delivery according to the option of the purchaser, and the tests carried out in accordance with this standard and on the written instructions of the purchaser.

9.3 The material required for tests shall be supplied free of charge

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Bibliography

[1] IRC: 15-2011, *Standard specifications and code of practice for construction of concrete roads (fourth revision*

[2] ASTM D448 – 12, *Standard Classification for Sizes of Aggregate for Road and Bridge Construction*

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