

DRAFT UGANDA STANDARD

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Bitumen and Bituminous binders – Part 3: Anionic bitumen emulsion--Specifications

PUBLIC REVIEW DRAFT

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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 DEAS 982-3: 2019, *Bitumen and Bituminous binders – Part 3: Anionic bitumen emulsion -- Specifications*, is identical with and has been reproduced from an International Standard, DEAS 982-3: 2019, *Bitumen and Bituminous binders – Part 3: Anionic bitumen emulsion -- Specifications*, and is being proposed for adoption as a Uganda Standard.

The committee responsible for this document is Technical Committee UNBS/TC 3, *Building and construction*.

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



DEAS 982-3: 2019
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DRAFT EAST AFRICAN STANDARD

Bitumen and Bituminous binders – Part 3: Anionic bitumen emulsion--Specifications

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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 the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the Principles and procedures for development of East African Standards.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee TC 021, Building and Civil Engineering.

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PUBLIC REVIEW DRAFT

Bitumen and Bituminous binders--Anionic bitumen emulsion--Specifications

1 Scope

This **Draft East African Standard** specifies requirements and test methods of anionic bitumen emulsions suitable for pavement construction.

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.

ASTM D5, *Test method for penetration of bituminous materials.*

ASTM D113, *Test method for ductility of bituminous materials*

ASTM D139, *Test method for float test for bituminous materials*

ASTM D140, *Practice for sampling bituminous materials*

ASTM D244, *Test methods and practices for emulsified asphalts*

ASTM D2042, *Test method for solubility of asphalt materials in trichloroethylene*

ASTM D3910, *Practices for design, testing, and construction of slurry seal*

ASTM D6930, *Test method for settlement and storage stability of emulsified asphalts*

ASTM D6933, *Test method for oversized particles in emulsified asphalts (sieve test)*

ASTM D6935, *Test method for determining cement mixing of emulsified asphalt*

ASTM D6936, *Test method for determining demulsibility of emulsified asphalt*

ASTM D6997, *Test method for distillation of emulsified asphalt*

ASTM D7226, *Test method for determining the viscosity of emulsified asphalts using a rotational paddle viscometer*

DEAS 982 – 1, *Bitumen and Bituminous binders – Penetration grade bitumen – Specifications*

ASTM D7553, *Standard Test Method for Solubility of Asphalt Materials in N-Propyl Bromide*

3 Definitions and Abbreviations

For the purposes of this document, the following definitions apply.

3.1 Definition

3.1.1 binder

material serving to adhere to aggregate and ensure cohesion of the mixture.

3.1.2 binder content

3.1.2 Binder content.

is the difference between the total content and the percentage of water content.

3.1.3 bitumen or asphalt cement

non-crystalline solid or viscous mixture of complex hydrocarbons that possesses characteristic agglomerating properties, softens gradually when heated, is substantially soluble in trichloroethylene and or N-propyl-bromide, and is obtained from crude petroleum by refining processes **and is used as a binder.**

3.1.4 Anionic bitumen emulsion or Anionic emulsified asphalt cement.

Anionic bitumen emulsion or Anionic emulsified asphalt cement.

Is Liquid mixture in which a substantial amount of bitumen is suspended in a finely divided condition in an aqueous medium by means of one or more suitable emulsifying agents and in which the droplets of bitumen carry a negative charge.

3.1.5 *lot*

that quantity of anionic bitumen road emulsion of the same batch identification, from one manufacturer, submitted at any one time for inspection and testing.

3.1.6 *high float (HF)*

emulsion in which chemical emulsifying agents called “tall oils” derived from pine trees are used that imparts resistance of flowing at high temperatures and low shear rates, less temperature susceptible than the base asphalt cement.

3.1.7 Types of Anionic bitumen emulsion.

3.1.7.1 *Anionic Rapid Setting - RS.*

Is a spray grade emulsion characterized by rapid breaking during application, and is unsuitable for mixing with stone chippings.

3.1.7.2 *Anionic Medium Setting - MS.*

an emulsion with sufficient stability to allow mixing with certain types of aggregate before breaking of the emulsion occurs.

3.1.7.3 *Anionic Slow Setting - SS.*

an emulsion with sufficient mechanical and chemical stability for all purposes involving mixing with stone chippings, natural gravels, and soil (including aggregates containing large proportions of fines or chemically active materials such as cement or hydrated lime)

3.1.7.4 *Anionic Quick Setting - QS.*

an emulsion designed for use in micro-surfacing and slurry seals when a quick curing time is needed for opening to traffic.

3.2 Abbreviations

ASTM: American Society for Testing and Materials

HFRS: High float rapid setting

HFMS: High float medium setting

4 Requirements

4.1 Composition

The emulsion shall be homogeneous and free from impurities, and shall not contain any material other than bitumen, emulsifying agent(s), water and, when relevant, fluxing agent (s).

4.2 Emulsifying agent(s)

The type and amount of emulsifying agent(s) in an emulsion shall not have any deleterious effect on the bitumen deposited.

DEAS 982-3: 2019

4.3 Bitumen base

The bitumen base used for the manufacture of the emulsion shall comply with the requirements of DEAS 982 – 1: 2019 (see clause 2), relevant to the grade of bitumen used.

4.4 Type and grade requirements

The emulsified asphalt shall be tested within 14 days of delivery. The emulsified asphalt shall be homogeneous after thorough mixing provided separation has not been caused by freezing. Emulsified asphalts separated by freezing shall not be tested. Emulsified asphalt shall conform to the requirements prescribed in table 1 or table 2. If no table is specified, default is table 1, appropriate to the type of emulsion specified by the purchaser (see annex A)

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Table 1 —Requirement for Anionic bitumen emulsion.

Property	Type and grade designation												Test methods
	Rapid-Setting						Medium-Setting						
	RS-1		RS-2		HFRS-2		MS-1		MS-2		MS-2h		
	min	max	min	max	min	max	min	max	min	max	min	max	
<i>Tests on emulsions:</i>													
Viscosity, Saybolt Furol at 25°C SFS	20	100	...	...	...	...	20	100	100	...	100	...	
Viscosity, Saybolt Furol at 50°C SFS	...	...	75	400	75	400	...	...	...	...	...	...	ASTM D7496
Storage stability test, 24-h, % ^A	...	1	...	1	...	1	...	1	...	1	...	1	ASTM D6930
Demulsibility, 35 ml, 0.02 N CaCl ₂ , %	60	...	60	...	60	...	...	...	...	...	...	...	ASTM D6936
Coating ability and water resistance:													
Coating, dry aggregate	...	...	...	...	...	...	good	good	good	good	good	good	
Coating, after spraying	...	...	...	...	...	...	fair	fair	fair	fair	fair	fair	ASTM D244
Coating, wet aggregate	...	...	...	...	...	...	fair	fair	fair	fair	fair	fair	
Coating, after spraying	...	...	...	...	...	...	fair	fair	fair	fair	fair	fair	
<i>Particle charge test</i>													
	-ve	...	-ve	...	-ve	...	-ve	...	-ve	...	-ve	...	ASTM D7402
Cement mixing test, %	...	...	...	...	...	...	...	...	...	...	...	...	ASTM D6935
Sieve test, % ^A	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	ASTM D6933
Residue by distillation, %	55	...	63	...	63	...	55	...	65	...	65	...	
Oil distillate by volume of emulsion, %	...	...	...	...	...	...	...	...	...	...	...	...	ASTM D6997
<i>Tests on residue from distillation test:</i>													ASTM D244
Penetration, 25°C 100g, 5 s	100	200	100	200	100	200	100	200	100	200	40	90	ASTM D5
Ductility, 25°C 5 cm/min, cm	40	...	40	...	40	...	40	...	40	...	40	...	ASTM D113
Solubility in trichloroethylene or n-propyl bromide,%	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	ASTM D2042 or ASTM D7553
Float test, 60°C s	...	...	...	...	1200	...	...	...	...	...	...	...	ASTM D139

Property	Medium-Setting						Slow-Setting				Quick-Setting		Test methods		
	HFMS-1		HFMS-2		HFMS-2h		HFMS-2s		SS-1		SS-1h			QS-1h	
	min	max	min	max	min	max	min	max	min	max	min	max		min	max
<i>Tests on emulsions:</i>															
Viscosity, Saybolt Furol at 25°C SFS	20	100	100	...	100	...	50	...	20	100	20	100	20	100	ASTM D7496
Viscosity, Saybolt Furol at 50°C SFS	...	...	...	...	...	...	...	...	...	...	...	...	...	...	ASTM D6930
Storage stability test, 24-h, % ^A	...	1	...	1	...	1	...	1	...	1	...	1	...	1	ASTM D6930
Demulsibility, 35 ml, 0.02 N CaCl ₂, %	...	...	...	...	...	...	...	...	...	...	...	...	...	...	ASTM D6936
Coating ability and water resistance:															
Coating, dry aggregate	good	good	good	good	good	good	good	good	...	...	...	...	...	...
Coating, after spraying	...	...	fair	...	fair	...	fair	...	...	...	...	...	...	...	ASTM D244
Coating, wet aggregate	fair	...	fair	...	fair	...	fair	...	...	...	...	...	...	...
Coating, after spraying	fair	...	fair	...	fair	...	fair	...	...	...	...	...	...	...
<i>Particle charge test</i>															
	-ve	...	-ve	...	-ve	...	-ve	...	-ve	...	-ve	...	-ve	...	ASTM D7402
Cement mixing test, %	...	...	...	...	...	...	...	...	2.0	...	2.0	...	N/A	...	ASTM D6935
Sieve test, % ^A	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	ASTM D6933
Residue by distillation, %	55	...	65	...	65	...	65	...	57	...	57	...	57	...	
Oil distillate by volume of emulsion, %	...	...	...	...	...	...	1	7	...	...	...	...	...	...	ASTM D6997
<i>Tests on residue from distillation test:</i>													ASTM D244		
Penetration, 25°C, 100 g, 5 s	100	200	100	200	40	90	200	...	100	200	40	90	40	90	ASTM D5
Ductility, 25°C 5 cm/min, cm	40	...	40	...	40	...	40	...	40	...	40	...	40	...	ASTM D113
Solubility in trichloroethylene or n-propyl bromide %	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	ASTM D2042 or ASTM D7553
Float test, 60°C s	1200	...	1200	...	1200	...	1200	...	...	...	...	...	...	...	ASTM D139

^A This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

Table 2 Requirement for Anionic bitumen emulsion.

Property	Type and grade designation												
	Rapid-Setting						Medium-Setting						
	RS-1		RS-2		HFRS-2		MS-1		MS-2		MS-2h		
	min	max	min	max	min	max	min	max	min	max	min	max	
<i>Tests on emulsions:</i>													
Viscosity, Rotational Paddle at 25°C, mPa S	45	220	...	...	...	...	45	220	220	...	220	...	
Viscosity, Rotational Paddle at 50°C, mPa S	...	...	165	880	165	880	...	...	...	...	...	...	ASTM D7496
Storage stability test, 24-h, % ^A	...	1	...	1	...	1	...	1	...	...	...	1	ASTM D6930
Demulsibility, 35 ml, 0.02 N CaCl ₂ , %	60	...	60	...	60	...	...	...	...	...	...	...	ASTM D6936
<i>Coating ability and water resistance:</i>													
Coating, dry aggregate	...	...	...	...	...	...	good	good	good	good	good	good	
Coating, after spraying	...	...	...	...	...	...	fair	fair	fair	fair	fair	fair	ASTM D244
Coating, wet aggregate	...	...	...	...	...	...	fair	fair	fair	fair	fair	fair	
Coating, after spraying	...	...	...	...	...	...	fair	fair	fair	fair	fair	fair	
<i>Particle charge test</i>	-ve	...	-ve	...	-ve	...	-ve	...	-ve	...	-ve	...	ASTM D7402
Cement mixing test, %	...	...	...	...	...	...	...	...	...	...	...	...	ASTM D6935
Sieve test, % ^A	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	ASTM D6933
Residue by distillation, %	55	...	63	...	63	...	55	...	65	...	65	...	ASTM D6997
Oil distillate by volume of emulsion, %	...	...	...	...	...	...	...	...	...	...	...	...	ASTM D6997
<i>Tests on residue from distillation test:</i>													
Penetration, 25°C 100g, 5 s	100	200	100	200	100	200	100	200	100	200	40	90	ASTM D244
Ductility, 25°C 5 cm/min, cm	40	...	40	...	40	...	40	...	40	...	40	...	ASTM D5
Solubility in trichloroethylene or n-propyl bromide,%	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	ASTM D113
Float test, 60°C s	...	...	...	...	1200	...	...	...	...	...	...	...	ASTM D2042 or ASTM D7553
	...	...	...	...	...	...	...	...	...	...	...	...	ASTM D139

Property	Medium-Setting								Slow-Setting				Quick Setting		
	HFMS-1		HFMS-2		HFMS-2h		HFMS-2s		SS-1		SS-1h		QS-1h		
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	
<i>Tests on emulsions:</i>															
Viscosity, Rotational Paddle at 25°C, mPa S	45	220	220	...	220	...	110	...	45	220	45	220	45	220	
Viscosity, Rotational Paddle at 50°C, mPa S	...	...	...	...	...	...	...	...	...	...	...	...	...	...	ASTM D7496
Storage stability test, 24-h, % ^A	...	1	...	1	...	1	...	1	...	1	...	1	...	1	ASTM D6930
Demulsibility, 35 ml, 0.02 N CaCl ₂, %	...	...	...	...	...	...	...	...	...	...	...	...	...	...	ASTM D6936
<i>Coating ability and water resistance:</i>															
Coating, dry aggregate	good	...	good	...	good	...	good	...	...	...	...	...	...	...
Coating, after spraying	fair	...	fair	...	fair	...	fair	...	...	...	...	...	...	...	ASTM D244
Coating, wet aggregate	fair	...	fair	...	fair	...	fair	...	...	...	...	...	...	...
Coating, after spraying	fair	...	fair	...	fair	...	fair	...	...	...	...	...	...	...
<i>Particle charge test</i>	-ve	...	-ve	...	-ve	...	-ve	...	-ve	...	-ve	...	-ve	...	ASTM D7402
Cement mixing test, %	...	...	...	...	...	...	...	...	2.0	...	2.0	...	N/A	...	ASTM D6935
Sieve test, % ^A	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	ASTM D6933
Residue by distillation, %	55	...	65	...	65	...	65	...	57	...	57	...	57	...	ASTM D6997
Oil distillate by volume of emulsion, %	...	...	...	...	...	...	1	7	...	...	...	...	...	...	ASTM D6997
<i>Tests on residue from distillation test:</i>															
Penetration, 25°C, 100 g, 5 s	100	200	100	200	40	90	200	...	100	200	40	90	40	90	ASTM D244
Ductility, 25°C 5 cm/min, cm	40	...	40	...	40	...	40	...	40	...	40	...	40	...	ASTM D5
Solubility in trichloroethylene or n-propyl bromide %	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	ASTM D113
Float test, 60°C s	1200	...	1200	...	1200	...	1200	...	...	...	...	...	...	...	ASTM D2040 or ASTM D7553
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	ASTM D139

^A This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

NOTE 1 — QS-1h is used for Quick Set Slurry Seal systems.

Table 3 Typical Anionic Emulsion Designations.

Emulsion Grade	Anionic	Setting time	Minimum binder content (%)	Note
RS-1	✓	Rapid	55	
RS-2	✓	Rapid	63	
HFRS-2	✓	Rapid	63	High Float
MS-1	✓	Medium	55	
MS-2	✓	Medium	65	
MS-2h	✓	Medium	65	h - harder.
HFMS-1	✓	Medium	55	High Float
HFMS-2	✓	Medium	65	High Float
HFMS-2h	✓	Medium	65	High Float
HFMS-2s	✓	Medium	65	High Float with 1-7% solvent
SS-1	✓	Slow	57	
SS-1h	✓	Slow	57	h - harder.
QS-1h	✓	Quick	57	harder Meet ASTM D3910

5 Methods of test

6 To insert a table of parameters and their corresponding test methods.

5.1 General

Except for the test sample required for the determination of residue on sieving, strain all test samples required for the tests through a sieve of nominal aperture size 710 μm .

5.2 The properties of the emulsified asphalts given in table 1 or table 2 shall be determined in accordance with their corresponding ASTM test methods:

7 Sampling and compliance with this standard.

7.1 General

This section applies to the sampling for inspection and testing before acceptance or rejection of single lots (consignments) in cases where no information about the implementation of quality control or testing during manufacture is available to help in assessing the quality of the lot.

7.2 Sampling

7.2.1 The relevant sampling procedure described in ASTM D140 shall be applied in determining whether a lot complies with the appropriate requirements of this standard. The sample so taken shall be deemed to represent the lot.

7.2.2 Samples shall be stored in clean, airtight sealed containers as specified in Practice ASTM D140 at a temperature of not less than 4°C until tested.

7.3 Compliance

The lot shall be deemed to comply with the requirements of this standard if, after inspection and testing the sample taken in accordance with 7.2 is found to comply with all the appropriate requirements of this East African Standard.

8 Packaging and marking

8.1 Packaging

The condition of each drum and tanker into which the anionic bitumen road emulsion is packed shall be such as to have no detrimental effect on the quality of the product during normal transportation and storage.

8.2 Marking

The following information shall appear in legible and indelible marking on each drum or, when the emulsion is supplied in tankers, on the relevant consignment documents:

- a) the manufacturer's identification;
- b) the description, type, and grade of the product;
- c) the batch identification;
- d) the manufacture and expiry date;
- e) storage instructions and
- f) the quantity.

**Annex A
(informative)**

Notes to purchasers

The following requirement shall be specified in tender invitations, and in the order or contract:

- a) the type (see 4.4)
- b) information on currently valid national and international standards can be obtained from the NSBs Office.

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Annex B (informative)

The classification and use of emulsions

B.1 These emulsions are not stable for indefinite periods; they should be used as soon as possible after delivery and should not be subjected to very low temperatures or to great fluctuations in temperature during storage.

B.2 Anionic bitumen emulsions should not be mixed with cationic bitumen emulsions because such mixing will result in breakdown of the products. Equipment that has been used for cationic type emulsions and that has then to be used for anionic type (or vice versa) should be carefully cleaned in accordance with procedures recommended by the manufacturer of the type with which it is to be used.

The emulsion referred to in this standard are not stable and should be used within the three month from the production date. The emulsion must be stored at a minimum temperature of 10oC and a maximum temperature of 80oC.

The length that emulsions can be stored varies according to the emulsion type and components used. For example, rapid-set emulsion has a shorter shelf life than a slow-set emulsion. You should seek advice from your emulsion supplier on the shelf life of their products. Sedimentation and sieve tests are good indicators of an emulsion's potential storage life. During long-term storage, sedimentation of the bitumen droplets occurs due to the higher density of the bitumen versus water. Regular circulation will help increase the shelf life of the emulsion but care must be taken not over circulating which shear the emulsion and cause residue to build up. Emulsions may increase in viscosity (thickness) over time and warming the emulsion prior to use will reduce the viscosity

B.3 Consumers whose equipment or conditions of use, for example, hand-spraying, require a viscosity outside the limits given in table 1 for spray type emulsions, should consult the supplier of the emulsion.

B.4 The dilution of any of the emulsion types shall be done only in consultation with the supplier of the emulsion.

B.5 Prior to diluting the emulsion, carry out a test using water from the intended water source, to ensure the desired result is obtained.

NOTE2 — Once an emulsion is diluted, the resulting product may no longer comply with one or more of the requirements of this East African Standard.

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