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DRAFT EAST AFRICAN STANDARD

Bitumen and Bituminous binders –Part 4: Cationic bitumen emulsions- Specifications

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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 EASC/TC 021, Building and Civil Engineering.

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Bitumen and Bituminous binders Cationic bitumen emulsions- Specifications

1 Scope

This **Draft East African Standard** specifies requirements and test methods for cationic 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 D140M, *Standard practice for sampling bituminous materials*

ASTM D244, *Standard test methods and practices for emulsified asphalts*

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

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

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

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

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 D7402 *Standard Practice for Identifying Cationic Emulsified Asphalts*

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

ASTM D7496 *Standard Test Method for Viscosity of Emulsified Asphalt by Saybolt Furol Viscometer*

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

3 Definitions

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*

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 *Cationic bitumen emulsion or Cationic 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 positive charge.

3.1.5 *lot*

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

3.2 Abbreviations

ASTM: American Society for Testing and Materials

4 Requirements

4.1 Types of Cationic bitumen emulsion.

When tested as per the test methods in table 1 and 2 Cationic bitumen emulsion may be categories as;

4.1.1. *Cationic Rapid Setting - CRS.*

A spray-type emulsion characterized by rapid breaking of the emulsion on application, and normally unsuitable for mixing with stone chippings

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4.1.2. *Cationic Medium Setting - CMS.*

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

4.1.3. *Cationic Slow Setting -CSS.*

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

4.1.4. *Cationic Quick Setting - CQS.*

a special slow setting emulsion are designed for use in micro-surfacing and slurry seals when a quick curing time is needed for opening to traf

4.2 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).

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. Emulsions separated by freezing shall not be tested.

4.3 Emulsifying agent(s)

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

4.4 Base bitumen

The bitumen base used for the manufacture of the emulsion shall comply with the requirements of [DEAS 982 - 1: 2019](#), relevant to the grade of bitumen used.

4.5 Fluxing agents

Fluxing agents shall, when tested in accordance with ASTM D86, comply with the following requirements:

- a) Initial boiling point: Not lower than 140 °C.
- b) Distillate at 350 °C: Not less than a volume fraction of 90 %.

4.6 Type and grade requirements

Emulsified asphalt shall conform to the requirements prescribed in Table 1 or Table 2. If no table is specified, the default is Table 1, appropriate to the type and, when relevant, the grade of emulsion specified by the purchaser, in accordance with annex A

Table 1 —Requirement for Cationic bitumen emulsion.

Property	Type and grade designation														Test Methods
	Rapid-Setting				Medium-Setting				Slow-Setting				Quick Setting		
	CRS-1		CRS-2		CMS-2		CMS-2h		CSS-1		CSS-1h		CQS-1h ^A		
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	
<i>Test on emulsions:</i>															
Viscosity, Saybolt Furol at 25°C [77°F] SFS									20	100	20	100	20	100	ASTM D7496
Viscosity, Saybolt Furol at 50°C [122°F] SFS	20	100	100	400	50	450	50	450							
Storage stability test, 24-h, % ^B		1		1		1		1		1		1			ASTM D6930
Demulsibility, 35 mL, 0.8 % dioctyl sodium sulfosuccinate, %	40	...	40	...											ASTM D6936.
<i>Coating ability and water resistance:</i>															
Coating, dry aggregate						good		good							ASTM D244
Coating, after spraying						fair		fair							
Coating, wet aggregate						fair		fair							
Coating, after spraying						fair		fair							
<i>Particle charge test</i>	positive		positive		positive		positive		positive		positive		positive		ASTM D7402.
Sieve test, % ^B		0.10		0.10		0.10		0.10		0.10		0.10		0.10	ASTM D6933
Cement mixing test, %										2.0		2.0		N/A	ASTM D6935.
<i>Distillation:</i>															
Oil distillate, by volume of emulsion, %		3		3		12		12							ASTM D6997
Residue, %	60		65		65		65		57		57		57		
<i>Tests on residue from distillation test:</i>															
Penetration, 25°C [77°F], 100 g, 5 s	100	250	100	250	100	250	40	90	100	250	40	90	40	90	ASTM D5
Ductility, 25°C [77°F], 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

^ACQS-1h is used for Quick Set Slurry Seal systems.

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

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Table 2 — Requirement for Cationic bitumen emulsion.

Property	Type and grade designation														Test Methods
	Rapid-Setting				Medium-Setting				Slow-Setting				Quick Setting		
	CRS-1		CRS-2		CMS-2		CMS-2h		CSS-1		CSS-1h		CQS-1h ^A		
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	
Test on emulsions:															
Viscosity, Rotational Paddle Viscometer at 25°C[77°F] mPa s									45	220	45	220	45	220	ASTM D7226
Viscosity, Rotational Paddle Viscometer at 50°C[122°F] mPa s	45	220	220	880	110	990	110	990							
Storage stability test, 24-h, % ^B		1		1		1		1		1		1			ASTM D6930
Demulsibility, 35 mL, 0.8 % dioctyl sodium sulfosuccinate, %	40	...	40	...											ASTM D6936.
Coating ability and water resistance:															
Coating, dry aggregate					good		good								ASTM D6998
Coating, after spraying					fair		fair								
Coating, wet aggregate					fair		fair								
Coating, after spraying					fair		fair								
Particle charge test	positive		positive		positive		positive		positive		positive		positive		ASTM D7402.
Sieve test, % ^B		0.10		0.10		0.10		0.10		0.10		0.10		0.10	ASTM D6933
Cement mixing test, %										2.0		2.0		N/A	ASTM D6935.
Distillation:															ASTM D6997
Oil distillate, by volume of emulsion, %		3		3		12		12							
Residue, %	60		65		65		65		57		57		57		
Tests on residue from distillation test:															D2042
Penetration, 25°C [77°F], 100 g, 5 s	100	250	100	250	100	250	40	90	100	250	40	90	40	90	ASTM D5
Ductility, 25°C [77°F], 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

^ACQS-1h is used for Quick Set Slurry Seal systems.

^BThis test requirement on representative samples is waived if successful application of the material has been achieved

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Table 3. Typical Cationic Emulsion Designations.

Emulsion Grade	Cationic	Setting time	Minimum Binder content (%)	Note
CRS-1	✓	Rapid	60	
CRS-2	✓	Rapid	65	
CMS-2	✓	Medium	65	
CMS-2h	✓	Medium	65	h-harder
CSS-1	✓	Slow	57	
CSS-1h	✓	Slow	57	PG, 60/70 and 40/50 Used for manufacturing
CQS-1h ^A	✓	Quick	57	Meet ASTM D3910

5 Methods of test

5.1 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 the following ASTM test methods:

NOTE -- Sieve test—Test method ASTM D6933, except use distilled water in all wetting and washing operations in place of the nonionic surfactant solution (1 %).

6 Sampling and compliance with this East African Standard

6.1 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. It is also used as the procedure for adjudicating in cases of dispute.

6.2 Sampling

The relevant sampling procedure described in ASTM D140M shall be applied in determining whether a lot complies with the appropriate requirements of this East African Standard. The sample so taken shall be deemed to represent the lot.

6.3 Compliance

The lot shall be deemed to comply with the requirements of this East African Standard if, after inspection and testing, the sample taken in accordance with 6.2 is found to comply with all the relevant requirements of this East African Standard.

7 Packaging and marking

7.1 Packaging

The condition of each drum and tanker into which the cationic 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.

7.2 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.

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**Annex A
(informative)**

Notes to purchasers

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

- a) the type (see 4.5);
- b) when relevant, the grade (see 4.5); and
- c) when relevant, that information regarding the average bitumen content used in the formulation.

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Annex B (informative)

The use of emulsions

B.1 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 10°C and a maximum temperature of 80°C.

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.2 Cationic bitumen emulsions should not be mixed with anionic bitumen emulsions because such mixing will result in breakdown of the products. Equipment that has been used for anionic type emulsions and that has to be used afterwards for cationic type emulsions (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.

B.3 The dilution of any of the emulsion types shall only be done in consultation with the supplier of the emulsion. Prior to diluting the emulsion, carry out a test using water from the intended water source, to ensure the desired result is obtained.

Once an emulsion is diluted, it might no longer comply with one or more of the requirements of this standard.

B.4 a purchaser should, by applying the aggregate coating-water resistance test to the aggregate that the purchaser intends to use for a specific construction project, ensure that the proposed premix emulsion is suitable for use with the aggregate.

B.5 Compliance with this standard shall not mean that the product bears a certification mark.

Bibliography

CD/T/153, *Civil engineering specifications — Penetration grade bitumen*

ASTM D977 *Standard specifications for emulsified asphalt*

ASTM D2397 *Standard specification for cationic emulsified asphalt*

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