DEAS 982-6: 2026

ICS 93.080.20

DRAFT EAST AFRICAN STANDARD

Bitumen and bituminous binders — Polymer modified emulsified bitumen — Specification

EAST AFRICAN COMMUNITY

First Edition 2026

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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. XXXXXX.

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 028, *[Construction of roads, rails, air and water transport infrastructure]*

Attention is drawn to the possibility that some of the elements of this document may be subject of patent rights. EAC shall not be held responsible for identifying any or all such patent rights.

EAS 982 consists of the following parts, under the general title *Bitumen and bituminous binders — Specifications*:

Bitumen and Bituminous binders — Polymer modified emulsified bitumen — Specification

1 Scope

This Draft East Africa Standard provides the specifications for 11 grades of polymer modified emulsified bitumen (cationic and anionic) for use in pavement construction in the manner designated. The modifier may be either a solid or a liquid polymer. The modifier may be added either to the asphalt binder or emulsifier solution prior to the emulsification process.

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.

ASTM D977 – Standard Specification for Emulsified Asphalt

ASTM D2397/D2397M-25e1 Standard Specification for Cationic Emulsified Asphalt

AASHTO R 5, Selection and Use of Emulsified Asphalts

EAS 982-1 Bitumen and bituminous binders — Specification — Part 1: Penetration grade bitumen

ASTM D5/D5M-20 Standard Test Method for Penetration of Bituminous Materials

ASTM D139-24 Standard Test Method for Float Test for Asphalt Materials

ASTM D36/D36M-14(2020) Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)

ASTM D244-23 Standard Test Methods and Practices for Emulsified Asphalts

ASTM D482-25 Standard Test Method for Ash from Petroleum Products

ASTM D6084/D6084M-21Standard Test Method for Elastic Recovery of Asphalt Materials by Ductilometer

ASTM D7496-18 Standard Test Method for Viscosity of Emulsified Asphalt by Saybolt Furol Viscometer

3 Terms and definitions

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

For the purposes of this document, the terms and definitions given in [external document reference xxx] and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
bitumen
non-crystalline solid or viscous mixture of complex hydrocarbons that possesses characteristic agglomerating properties, softens gradually when heated, is substantially soluble in trichlorethylene, and is obtained from crude petroleum by refining processes

3.2
binder
bitumen-based cement that is produced from petroleum residue either with or without the addition of modifiers

3.3
bitumen emulsion
liquid product 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. There are two types, anionic and cationic.

3.4
anionic emulsion
emulsion in which the anion of the emulsifier is at the interface with the bitumen particle that is negatively charged and in which the aqueous phase is normally alkaline.

3.5
cationic emulsion
emulsion in which the caution of the emulsifier is at the interface with the bitumen particle that is positively charged and in which the aqueous phase is normally acid.

3.6
penetration
measure of hardness or consistency of the bitumen. It is the vertical distance traversed by a standard needle entering the material under specified conditions of load, time and temperature; and is expressed in one-tenths of millimeter

3.7
polymer-Modified Bitumen
A binder consisting of polymeric materials dispersed in bitumen with enhanced binder performance for particular applications.

3.8
polymer-modified anionic emulsified asphalt
liquid mixture in which a substantial amount of bitumen and polymeric materials 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

3.9
polymer-modified cationic emulsified asphalt
liquid mixture in which a substantial amount of bitumen and polymeric materials 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

3.10
binder content (including emulsifier)
difference between 100 per cent and the percentage water content determined in accordance with Appendix F

3.11
Cationic Rapid Setting (CRS)
spray type emulsion characterized by rapid breaking of the emulsion on application, and normally unsuitable for mixing with stone chippings.

3.12
Cationic Medium Setting (CMS)
emulsion with sufficient stability to allow premixing with certain types of aggregate before breaking of the emulsion occurs

3.13
Cationic Slow Setting (CSS)
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)

3.14
Cationic Quick Setting (CQS)
special slow setting emulsion are designed for use in micro-surfacing and slurry seals when a quick curing time is needed for opening to traffic

3.15
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

3.16
anionic Rapid Setting (RS)
spray grade emulsion characterized by rapid breaking during application and is unsuitable for mixing with stone chippings

3.17
anionic Medium Setting (MS)
emulsion with sufficient stability to allow mixing with certain types of aggregate before breaking of the emulsion occurs.

3.18
anionic Slow Setting (SS)
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)

3.19
anionic Quick Setting (QS)
emulsion designed for use in micro-surfacing and slurry seals when a quick curing time is needed for opening to traffic

4 Requirements

4.1 Upon receipt, refer to ASTM D244- for the proper protocol for conditioning the emulsified asphalt prior to mixing and testing. The emulsified asphalt shall be homogeneous after thorough mixing. Complete testing of sample for emulsified asphalt properties within 14 days of the sample date. Complete testing for emulsified asphalt residue properties within 30 days of the sample date.

NOTE Dilution of the emulsified asphalt to aid in the field application of the material should not occur without approval of the buyer.

4.2 If the emulsified bitumen is determined to be inhomogeneous after reconditioning and mixing according to ASTM D244 discard and resample for testing if required by the buyer.

Note 3 When emulsified asphalts (in particular, rapid-setting grades) are held in containers at ambient temperature for an extended period, emulsified asphalt droplets can coalesce, leading to unrepresentative

changes in emulsified asphalt liquid properties. Coalescence can also lead to sieve development, and ultimately, destabilization of the emulsified asphalt. This can be noted as overall inhomogeneity of the sample even after careful reheating and mixing upon receipt.

4.3 If the sample was subjected to freeze–thaw cycling prior to receipt, discard and resample for testing. If the emulsified asphalt was frozen at any time before testing, results for emulsified asphalt liquid properties such as viscosity, sieve, and settlement will be invalid.

NOTE 1 Emulsified asphalt residue properties can also be affected when the liquid emulsified asphalt to be recovered shows signs of inhomogeneity or has been subjected to freeze–thaw cycling.

NOTE 2 If the emulsified asphalt is determined to be inhomogeneous or is suspected of having been subjected to freeze–thaw cycling prior to testing and a second, representative sample cannot be obtained, actual emulsified asphalt performance at time of construction should be reviewed. If sample integrity issues persist, consider sampling as per EAS 982-1 so that liquid emulsified asphalt samples are taken directly from heated storage tanks and are evaluated soon after cooling directly to the required test temperature.

4.4 Emulsified asphalt shall conform to the requirements in Tables 1, 2, or 3 for the type and grade specified.

4.5 By certification of compliance, the minimum polymer solids by percent mass of residual asphalt content shall be 2.5 percent for Table 1 grades and 3.0 percent for Table 2 grades.

4.6 Class

5.2.1 Emulsified bitumen is classified based on particle charge of the bitumen droplets within the water phase of the suspension. Anionic emulsified bitumen has a negative charge and cationic emulsified bitumen has a positive charge.

5.2.2 There are also a limited number of emulsified bitumen with no appreciable charge and they are classified as nonionic.

5.2.3. Cationic emulsified bitumen are designated by including the letter “C” before the prefix (i.e., CRS-2). Anionic emulsified bitumen is designated without including an additional letter or number in the prefix (i.e. RS-2).

5.2.4 High-float emulsified bitumen is a class of emulsified bitumen that can be either anionic or cationic. High-float emulsified bitumen is formulated with a gel structure to produce a thicker bitumen coating on aggregates. They are designated with the letters “HF” before the prefix (i.e., HFRS-2).

4.7 Grade

4.7.1 Emulsified bitumen are produced in two viscosity grades. The suffix “1” indicates low-viscosity emulsified bitumen and suffix “2” indicates high-viscosity emulsified bitumen.

4.7.2 Emulsified bitumen are designated in three stiffness categories:

4.7.3 Hard bitumen residue (lower penetration) is designated with an “h” (i.e., CRS-1h).

4.7.4 Soft bitumen residue (higher penetration) is designated with an “s” (i.e., CRS 1s).

4.7.5 The intermediate stiffness category, between hard and soft, is designated without an additional letter or number (i.e., CRS-1).

4.7.6 “P” is used to designate polymer-modified emulsified bitumen (i.e., CRS-2P). The modifier may be either a solid or latex polymer. The modifier may be added either to the bitumen binder or emulsifier solution prior to the emulsification process.

Table 1—Requirements for Polymer-Modified Emulsified Asphalt Typically Used for Chip Seal Application [a]

Type	Rapid setting										Medium Setting	
Grade	CRS-2hP		CRS-2P		CRS-2sP		CHFRS-2P		HFRS-2P		HFMS-2P	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Test on Emulsified Bitumen:												
Viscosity, Saybolt Furol at 50°C (122°F), [sb,c]	100	400	100	400	100	400	100	400	75	400	100	450
Or												
Viscosity, Rotational Paddle at 50°C (122°F), mPa·sb,c	200	800	200	800	200	800	200	800	150	800	200	900
Storage stability test, 24 h, %b,c		1		1		1		1		1		1
Demulsibility:												
35 mL, 0.8% Sodium dioctyl sulfosuccinate, %b	*40*		40		40		40					
35 mL, 0.02 N $CaCl_2$, %b												
50 mL, 0.10 N $CaCl_2$, %b									50			
Particle charge test	Positive		Positive		Positive		Positive					
Sieve test, %b,c		0.10		0.10		0.10		0.10		0.10		0.10
Distillation:												
Oil distillate, by volume of emulsified bitumen, %										3		3
Residue, % [d]	65		65		65		65		65		65	
Tests on residue from distillation:												
Penetration, 25°C (77°F), 100 g, 5 s, 0.1 mm	40	90	90	150	150	250	100	175	100	200	100	200
Elastic Recovery, 25°C (77°F), Straight Sided, 5 cm/min, 20 cm elongation, 5 min hold, % f	50		60		60		60		60		60	
Float test, 60°C (140°F), s							1800		1200		1200	
Ash content, %		1		1		1		1		1		1

[a] Refer to AASHTO R 5 for typical applications.

[b] This test requirement and associated specification limits are waived for emulsified asphalt products following dilution.

[c] This test requirement on representative samples may be waived if successful applications of the material has been achieved in the field.

[d] For emulsions that are diluted, the percent residue requirements must be adjusted accordingly.

[e] For information on residue from evaporation, see Section 6.1.2.

[f] Elastic Recovery at 10°C (50°F) may be used as an alternate, if approved by the owner.

Table 2—Requirements for Polymer-Modified Emulsified Asphalt Typically Used for MicroSurfacing[a]

Type	Quick – Setting			
Grade	**CQS-1hP**		**CQS-1P**	
	Min	Max	Min	Max
Tests on emulsified asphalt:				
Viscosity, Saybolt Furol at 25°C (77°F), s[b,c]	20	100	20	100
Or				
Viscosity, Rotational Paddle at 25°C (77°F), mPa·s[b,c]	40	200	40	200
Particle charge test[b]		Positive		Positive
Sieve test, %[b,c]		0.10		0.10
Distillation:				
Residue, %[d]	62		62	
Tests on residue from distillation: [e]				
Penetration, 25°C (77°F), 100 g, 5 s, 0.1 mm	40	90	90	200
Elastic Recovery, 10°C (50°F), Straight Sided, 5 cm/min, 20 cm elongation, 5 min hold, %	50		60	
Softening point, °F	135		128	
Ash content, %		1		1

[a] Refer to R 5 for typical applications.

[b] This test requirement and associated specification limits are waived for emulsified asphalt products following dilution.

[c] This test requirement on representative samples may be waived if successful applications of the material has been achieved in the field.

[d] For emulsified asphalts that are diluted, the percent residue requirements must be adjusted accordingly.

[e] For information on residue from evaporation, see Section 5.1.2.

Table 3—Requirements for Polymer-Modified Emulsified Asphalt Typically Used for Tack Coat Applications[a]

Grade	CRS-2hP		CRS-2P		CRS-2sP	
	Min	Max	Min	Max	Min	Max
Tests on emulsified asphalt:						
Viscosity, Saybolt Furol at 25°C (77°F), sc,d	20	100	20	100	20	100
Or						
Viscosity, Rotational Paddle at 25°C (77°F), mPa·s[c,d]	40	200	40	200	40	200
Storage stability test, 24 h, %[c,d]		1		1		1
Particle charge testc	Positive		Positive		Positive	
Sieve test, %[c,d]		0.10		0.10		0.10
Cement mixing test, %c				2.0		2.0
Demulsibility:						
35 mL, 0.8% Sodium dioctyl sulfosuccinate, %c	40					
Residue, %e	63		57		57	
Tests on residue from distillation: [f]						
Penetration, 25°C (77°F), 100 g, 5 s, 0.1 mm	90	150	40	90	40	90
Elastic Recovery, 10°C (50°F), Straight Sided, 5 cm/min, 20 cm elongation, 5 min hold, %	60		25		25	
Ash content, %		1		1		1

a Refer to AASHTO R 5 for typical applications.

b This grade is for spray paver applications.

c This test requirement and associated specification limits are waived for emulsified asphalt products following dilution.

d This test requirement on representative samples may be waived if successful application of the material has been achieved in the field.

e For emulsified asphalts that are diluted, the percent residue requirements must be adjusted accordingly.

f For information on residue from evaporation, see Section 6.1.2.

5 Sampling

4.1. Take samples of emulsified asphalt in accordance with EAS 982-1.

4.2. Store samples in clean, airtight, sealed plastic containers at a temperature of not less than 4°C (39°F) until tested.

6 Methods of test

6.1 Determine the properties of the emulsified asphalts given in Tables 1, 2, and 3 in accordance with ASTM D244. Determine the emulsified asphalt viscosity as given in Tables 1, 2, and 3 in accordance with the Rotational Paddle method in ASTM D7496or by the Saybolt Furol method in ASTM D244, as appropriate.

Determine the properties of the emulsified asphalt residue in accordance with ASTM D5, ASTM D139, ASTM D36, ASTM D482, or ASTM D6084, as appropriate.

Note 6—The distillation testing temperature is typically lower for polymer-modified emulsified asphalts than ASTM D 977 or ASTM D 2397 emulsified asphalts (see ASTM D244).

6.1.1 Residue by Distillation—The material from some polymer-asphalt systems may not be smooth after residue recovery. If this occurs, stir the material well to homogenize the residue as much as possible per ASTM D244, and continue with testing the required residual properties.

6.1.2 Residue by Evaporation—This method may be used as an alternate to distillation to prepare the emulsified asphalt residue for testing in accordance with ASTM D244, if approved by the owner.

Properties of the residue from the evaporation procedure may also differ from the specifications shown, if approved by the owner. The same method to prepare the residue (either evaporation or distillation) must be used when comparing test results from the residue.

Bibliography

[1] AASHTO M 316-18, Standard Specification for Polymer-Modified Emulsified Asphalt

