TECHNICAL DATA SHEET EMULSION CSS1, CRS1

Bitumen emulsion is heterogeneous, two-phase systems consisting of two immiscible liquids, bitumen and water, stabilized by a third component, the emulsifier. The bitumen is dispersed throughout the continuous aqueous phase in the form of discrete droplets, typically 0.5 to 5 microns in diameter, which are held in suspension by electrostatic charges. Bitumen emulsions can be divided into three classes of which the first two, in volume terms, is by far the most important:

- **Cationic emulsions**
- **Anionic emulsions**
- **Nonionic emulsion**

Production Method of Bitumen Emulsion

Bitumen Emulsions have being developed and exponentially increased sinned they were created in 1900. Estimated presently at 20% of the global bitumen use, bitumen emulsions are basically an O/W – Oil on Water solution – A dispersion of bitumen particles on water, stabilized with the addition of surfactants – Surface active agents – or most commonly known as emulsifiers, that will permit the bitumen to be diluted in water. They are primarily used for tack coats for use in between hot mix asphalt layers and prime coats for thin hot mix surfacing layers or a chip seal pavements

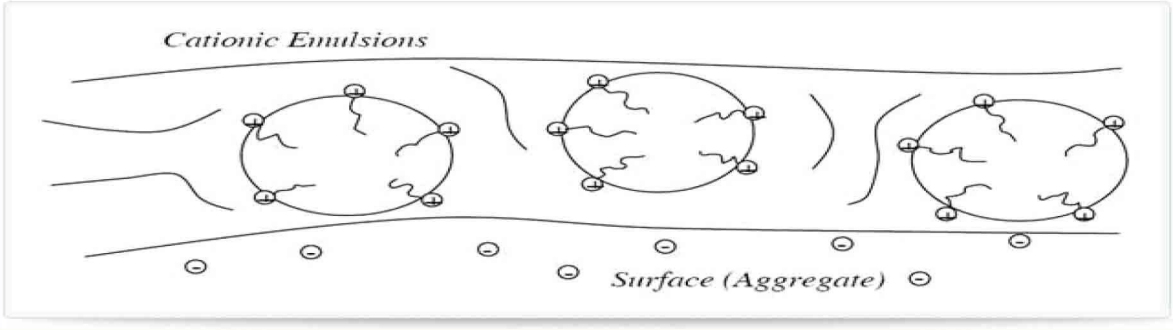
The main grades for bitumen emulsions are classified as follows:

Slow	Medium	Rapid
CSS	CMS	CRS

adhesion properties. Cationic Emulsion is both more favored and more widely used.

Emulsified Bitumen usually consists of bitumen droplets suspended in water. This dispersion under normal circumstances would not take place since everyone knows that oil and water don't mix, but if an emulsifying agent is added to the water the asphalt will remain dispersed. Most emulsions are used for surface treatments. Emulsions enable much lower application temperatures to be used. Application temperatures range from 45°C to 70°C. This is much lower than the 150 to 190°C used for hot mix asphalt cement. The lower application temperatures will not damage the asphalt and are much safer for field personnel.

In the production of bitumen emulsion, water is treated with an emulsifying agent and other chemicals and is pumped to a colloid mill along with bitumen. The colloid mill breaks the bitumen up into tiny droplets. The emulsifying agent migrates to the asphalt-water interface and keeps the droplets from coalescing. The emulsion is then pumped to a storage tank.



The object of a surface treatment is to seal the road from moisture intrusion and provide a new skid resistant surface, but be open to traffic as soon as possible and retain aggregate. Due to the chemistry of emulsions, they may react differently in specific weather and application conditions. If you have problems in any of these areas, the problem could be because of the weather, aggregate condition or emulsion used.

In bitumen emulsions, the basic bitumen has also been diluted in order to facilitate application. Hot bitumen, water, and emulsifier are processed in a high-speed colloid mill that disperses the bitumen in the water. The emulsifier produces a system in which fine droplets of bitumen, of between 30% and 80% of the volume, are held in suspension. If they separate in storage, the emulsion can easily be restored by agitation.

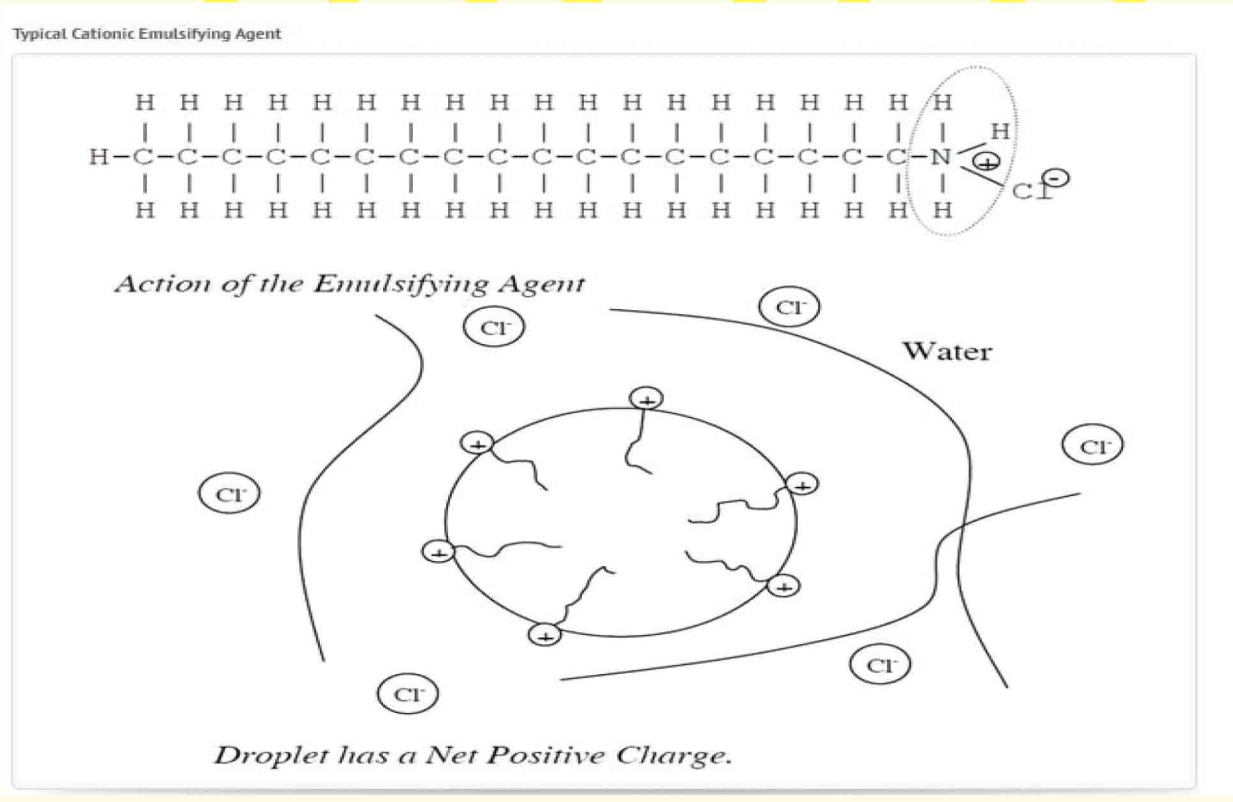
Bitumen emulsions have a low viscosity and can be workable at ambient temperatures, which makes them ideal for use in road pavements and surfacing. This application requires controlled breaking and setting. The emulsion must not break before they are laid on the road surface but, once in place, they should break quickly so that the road can be in service again without delay.

GKUC as the leading supplier cutback and emulsion bitumen in the local market. For any inquiries, please contact our sales team on gkucsales@gmail.com

The stability of emulsions is dependent on the following factors:

- **Types of bitumen emulsifier and its quantity**
- **Water evaporation rate**
- **Bitumen quantity**
- **Bitumen globules size**

The emulsions are applied by using sprays. For this viscosity is a primary concern. With the increase of bitumen content, the mixture becomes more viscous. This is found to be sensitive when the amount exceeds 60%.



BASED ON SETTING TIME

WHEN BITUMEN EMULSIONS ARE APPLIED ON AGGREGATES, WATER STARTS TO EVAPORATE CAUSING SEPARATION OF BITUMEN FROM WATER. AND THEN BITUMEN SPREADS ON THE SURFACE OF THE AGGREGATE AND ACTS AS A BINDING MATERIAL AND SLOWLY ATTAINS ITS STRENGTH.

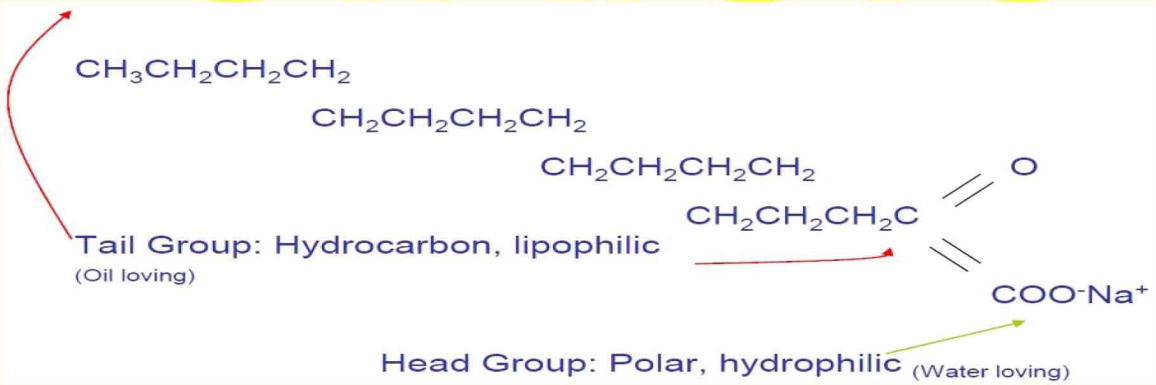
DEPENDING UPON THE SPEED AT WHICH WATER EVAPORATES AND BITUMEN PARTICLES SEPARATE FROM WATER, IT IS CLASSIFIED INTO FOLLOWING 3 TYPES.

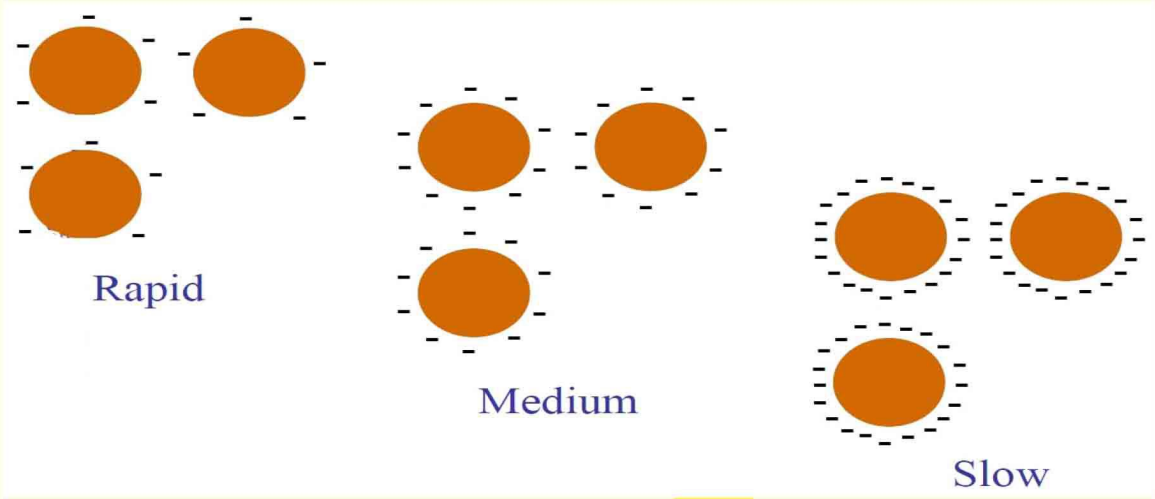
- **RAPID SETTING EMULSION (RS)**
- **MEDIUM SETTING EMULSION (MS)**
- **SLOW SETTING EMULSION (SS)**

NOTE: HERE THE WORD "SETTING" SHOULD NOT MEAN ATTAINMENT OF STRENGTH; GKUC IT MEANS THE TIME TAKEN BY THE BITUMEN TO SEPARATE FROM WATER.

Typical Emulsion Designations

Emulsion grade	Cationic	Anionic	Set	Minimum Asphalt content	Notes
CSS-1	*		Slow	57	
CRS-1	*		Rapid	60	
CRS-2	*		Rapid	65	





Naming the Emulsion

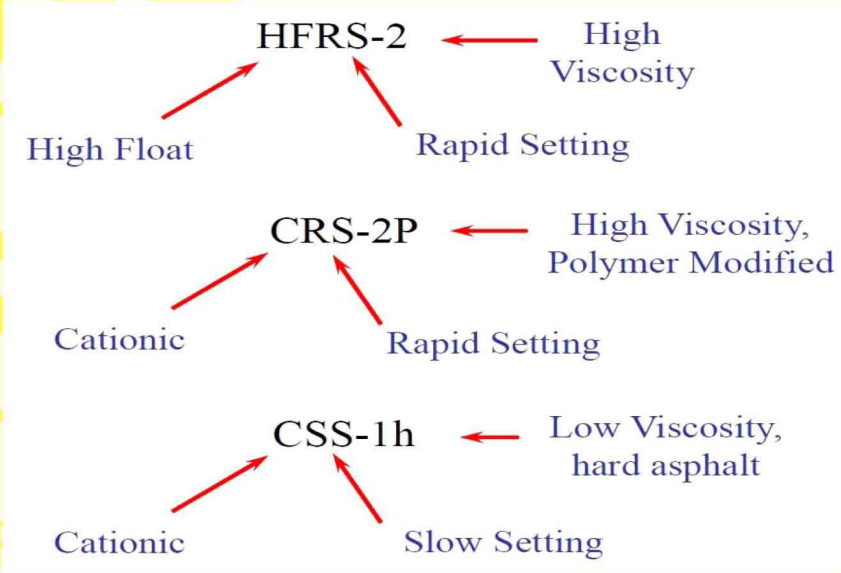
Prefix

- RS = rapid set
- SS = slow set
- QS = quick set
- MS = medium set
- HFRS = high float rapid set
- C = Cationic
- AE = anionic *emulsion*

Suffix

- 90,150, or 300 = penetration ranges
- h = hard penetration
- P,M or L = modified with polymer or latex
- 1 = low viscosity, stored @ cooler temps
- 2= high viscosity, stored @ higher temps

For example



Modifications

- Polymers
  -SBS & SBR
- Large Molecules
  -Increase Service Life of the Project
- Early Chip Retention
- Flexibility
- Elasticity

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GENERAL CLASSIFICATION

- Rapid-Setting
- Medium-Setting
- Slow-Setting
- Quick-Setting and Micro-Surfacing
- Designed to react quickly with aggregate and revert from the emulsion to the asphalt. ? Primarily used for spray applications.
  -RS-2, HFRS-2, MWS-90, and CRS-2

Advantages of using Bitumen Emulsion

- No need for the heating process when operating.
- No need for chemical solvents
- No risk of fire during storage, transportation, and implementation
- No risk of environmental contamination
- Bitumen emulsion applications produce no or minimal hydrocarbon emissions.
- Emulsification requires no petroleum solvents. (Some mixing grade emulsions may have small amounts of solvent to enhance mixing qualities.)
- Used at ambient temperatures, emulsions require no added heat for most applications and produce minimal fumes.
- Applicable in humid climates.
- Extensive application in road construction and maintenance.
- Another application of bitumen emulsion is stabilization of the shifting sands and mulching which are effective for the desert and western area of the country suffering the risk of exposure to dust.
- Emulsions are ideal for non-attainment areas where fume emissions are limited.
- Emulsions are ideal for remote locations where there are no hot mix plants.
- Bitumen emulsions readily coat damp aggregate surfaces, reducing the fuel required for drying aggregates.
- Pavement preservation applications greatly reduce needs for raw materials and energy for corrective maintenance and reconstruction.
- Preserved, smoother pavements reduce vehicle repair and fuel needs.
- The manufacturing and processing are handled by a team of highly skilled professionals from the industry who are dedicated towards producing high-quality bitumen Emulsion.

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CATIONIC BITUMEN EMULSION CRS -1

Bitumen emulsion consists of three basic ingredients: bitumen, water, and an emulsifying agent. Based on specifications it may contain other additives, such as stabilizers, coating improvers, anti-strips, or break control agents. It is well known that water and asphalt will not mix, except under carefully controlled conditions using highly specialized equipment and chemical additives.

GKUC Bitumen Emulsion CRS-1 is a cationic emulsion. Bitumen Emulsion CRS-1 are usually made by passing the mixture of hot bitumen and water phase between a rotating disc, cone or wheel and a stator. In the emulsification process, the hot binder is mechanically separated into minute globules and dispersed in water treated with a small quantity of emulsifying agent. The water is called the continuous phase and the globules of the binder are called the discontinuous phase.by proper selection of an emulsifying agent and other manufacturing controls.

Application of bitumen emulsion CRS-1

Specially designed for strong tack coat, penetration macadam, and sand seal purposes.

Cationic emulsions may be used at ambient temperatures with aggregates, which need not be completely dry. Emulsions are less hazardous to use in comparing with the cutback and can be applied in a wider range of conditions.

Successful performance of bitumen emulsions requires selecting the proper type and grade for the intended use. Guidelines presented in this chapter should help select the specific grade and type of emulsion to be used.The first consideration in picking the right type and grade of the emulsion is how the emulsion will be used.

- Climatic conditions anticipated during construction. The choice of emulsion grade, the design of mix or treatment, and the selection of construction equipment should be dictated by the conditions at the time of construction.
- Aggregate type, gradation, and availability.
- Contractor or construction equipment availability.
- Geographical location. The hauling distance and, in some cases, water availability are important considerations.
- Traffic control. Can traffic be detoured or only controlled through the work area?
- Environmental considerations.
- Proper application for pavement preservation or pavement distresses.
- Traffic type and volume.

While general guidelines can be given for selecting emulsions, laboratory testing is strongly recommended. There is no substitute for a laboratory evaluation of the emulsion and the aggregate to be used. Different types and quantities of emulsion should be tried with the aggregate to find the best combination for the intended use. An experienced technician can determine the type and grade of the emulsion to be used.

Cationic emulsions are preferred for use with negatively charged siliceous aggregates such as quartz, granite, sandstone and river gravel. In general, Cationic emulsions can be used with a wider range of aggregates, will tolerate greater quantities of moisture, and will break at a lower ambient temperature. The main application areas of Emulsion bitumen are surface dressing, tack coats, prime coat, slurry seal, and cold mixing.

- ✶ Dust control
- ✶ Tack coat
- ✶ Fog seal
- ✶ Chip seal, single, or multiple treatments
- ✶ Sand seal

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Advantage of using bitumen emulsion CRS-1

- No petroleum solvent required to liquefy
- little or no hydrocarbon emissions
- In most cases, used with no additional heat. It does not need any pre-heating. Thus results in the case of handling for the user, besides saving in cost.
- The ability to coat damp aggregate. It can be used even with wet aggregates thus enabling users to carry out work during the monsoon also.
- Can use cold materials at remote sites. Cold application of Bitumen Emulsion ensures safety to the workforce; it is a user-friendly product. Being cold applied the work progresses much faster.
- Wide variety of emulsion types available today
- Economical
- Free from danger (for fire)
- Environmental
- Harmless for worker health.
- It can use with moisture aggregates. It can be used even with wet aggregates thus enabling users to carry out work during the monsoon also.
- Application temperature is low and does not need heating while storage and transportation period. For this reason, it provides energy saving. • Emulators increase adhesion they effect as anti-stripping agent
- It can use in four seasons. Especially it gives a chance application in the rainy region and it extends application period.
- It has a lot of application area and construction methods.
- Bitumen Emulsion does not require petroleum solvent to make them liquid as in cut back and also it is not required to be heated like normal Bitumen. Thus saving imported petroleum oil or firewood.
- Toxic fumes (Hydrocarbon emission) normally emitted from heated bitumen & cutbacks not present when Cationic Bitumen Emulsion is used, as no heating is required for its application.

Packing of bitumen emulsion CRS-1

Packing of GKUC bitumen emulsion CRS-1 is in a new thick steel drum and supply as bulk form from the bowsers.

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Specification of bitumen emulsion CRS-1

Cationic Bitumen Emulsion

Emulsion Type: rapid-Setting
Grade: CRS-1
Standard: ASTM D 2397M – 13

Property	Min	Max	Test Method
Test on Emulsions			
Viscosity, Saybolt Furol at 25 °C, SFS	**20**	**100**	ASTM D244
Storage stability test, 24-h, %	**-**	**1**	ASTM D6930
Demulsibility, 35 mL, 0.8 % dioctyl sodium sulfosuccinate, %	**40**	**-**	ASTM D6936
Coating ability and water resistance:			
Particle charge test	**Positive**		ASTM D244
Sieve test, %	**-**	**0.1**	ASTM D6933
Distillation:			
Oil distillate, by volume of emulsion, %	**-**	**3**	ASTM D6997
Residue, %	**60**	**-**	ASTM D244
Test on Residue from distillation test:			
Penetration 77°F (25°C) 100g,5s mm	**100**	**250**	ASTM D5
Ductility 77°F (25°C) 5cm/min cm	**40**	**-**	ASTM D113
Solubility in trichloroethylene %	**97.5**	**-**	ASTM D2042

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CATIONIC BITUMEN EMULSION CSS-1

Bitumen emulsion consists of three basic ingredients: bitumen, water, and an emulsifying agent. Based on specifications it may contain other additives, such as stabilizers, coating improvers, anti-strips, or break control agents. It is well known that water and asphalt will not mix, except under carefully controlled conditions using highly specialized equipment and chemical additives.

GKUC Emulsion bitumen CSS-1 is a cationic emulsion. Bitumen emulsion CSS-1 are usually made by passing the mixture of hot bitumen and water phase between a rotating disc, cone or wheel and a stator. In the emulsification process, the hot binder is mechanically separated into minute globules and dispersed in water treated with a small quantity of emulsifying agent. The water is called the continuous phase and the globules of the binder are called the discontinuous phase.by proper selection of an emulsifying agent and other manufacturing controls.

GKUC bitumen emulsions CSS-1 have a positive charge and hence a direct and very rapid reaction between the emulsion and an aggregate or pavement is possible. The size of the charge or the Zeta potential affects stability, the larger the charge the greater the repulsion, but as the aggregate is negatively charged the higher the zeta potential the more rapid the reaction.

So it is possible to stabilize a cationic emulsion in the same way that makes it a more rapid break. The other mechanism of evaporation is available too but as the emulsion is stabilized this form of break becomes slower. Thus a balance must be struck. After the electrostatic part of the reaction is complete the emulsion will rely on flocculation and coalescence to complete break.

After the break is completed the water must still be completely evaporated for the residual Asphalt to achieve full strength.

Application of bitumen emulsion CSS -1

Cationic emulsions may be used at ambient temperatures with aggregates, which need not be completely dry. Emulsions are less hazardous to use in comparing with the cutback and can be applied in a wider range of conditions.

Successful performance of bitumen emulsions requires selecting the proper type and grade for the intended use. Guidelines presented in this chapter should help select the specific grade and type of emulsion to be used.

The emulsion will be used

- Climatic conditions anticipated during construction. The choice of emulsion grade, the design of mix or treatment, and the selection of construction equipment should be dictated by the conditions at the time of Construction.
- Aggregate type, gradation, and availability.
- Contractor or construction equipment availability.
- Geographical location. The hauling distance and, in some cases, water availability are important considerations.
- Traffic control. Can traffic be detoured or only controlled through the work area?
- Environmental considerations.
- Proper application for pavement preservation or pavement distresses.
- Traffic type and volume.

While general guidelines can be given for selecting emulsions, laboratory testing is strongly recommended. There is no substitute for a laboratory evaluation of the emulsion and the aggregate to be used. Different types and quantities of emulsion should be tried with the aggregate to find the best combination for the intended use. An experienced technician can determine the type and grade of the emulsion to be used.

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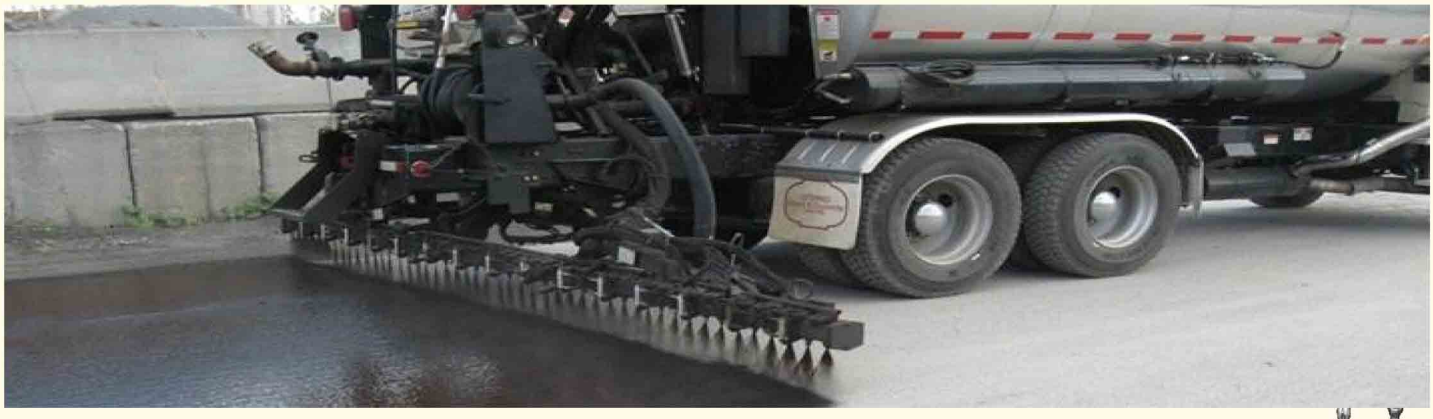
- ✶ Dust control
- ✶ Prime coat
- ✶ Fog seal
- ✶ Penetration prime
- ✶ Cold mix asphalt, Mulching, Asphalt Sealers
- ✶ Sand seal
- ✶ Slurry seal
- ✶ Structural and surface plant mixture
- ✶ In-place road mixing

Advantage of using bitumen emulsion CSS-1

- No petroleum solvent required to liquefy
- little or no hydrocarbon emissions •Because of low viscosity of the Emulsion as compared to hot applied Bitumen, The Emulsion has a good penetration and spreading capacity.
- In most cases, used with no additional heat. It does not need any pre-heating. Thus results in the case of handling for the user, besides saving in cost.
- The ability to coat damp aggregate • Can use cold materials at remote sites.
- Wide variety of emulsion types available today
- Economical
- Free from danger (for fire)
- Environmental
- Harmless for worker health. • It can use with moisture aggregates. It can be used even with wet aggregates thus enabling users to carry out work during the monsoon also.
- Application temperature is low and does not need heating while storage and transportation period. For this reason, it provides energy saving.
- Emulgators increase adhesion they effect as anti-stripping agent
- It has a lot of application area and construction methods.
- **Bitumen Emulsion** does not require petroleum solvent to make them liquid.
- Energy saving & control of pollution & safety:



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Packing of emulsion bitumen CSS-1

Packing of GKUC bitumen emulsion CSS-1 is in a new thick steel drum and supply as bulk form from the bowsers.

Specification of bitumen emulsion CSS-1

Analysis Cationic Bitumen Emulsion

Emulsion Type: Slow-Setting
Grade: CSS-1
Standard: ASTM D 2397M – 13

Property	Min	Max	Test Method
Test on Emulsions			
Viscosity, Saybolt Furol at 25 °C, SFS	**20**	**100**	ASTM D244
Storage stability test, 24-h, %	**-**	**1**	ASTM D6930
Particle charge test	**Positive**		ASTM D244
Sieve test, %	**-**	**0.1**	ASTM D6933
Cement mixing test, %		**2.0**	ASTM D6935
Distillation:			
Residue, %	**57**	**-**	ASTM D244
Test on Residue from distillation test:			
Penetration 77°F (25°C) 100g,5s mm	**100**	**250**	ASTM D5
Ductility 77°F (25°C) 5cm/min cm	**40**	**-**	ASTM D113
Solubility in trichloroethylene %	**97.5**	**-**	ASTM D2042

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