

UTAH DEPARTMENT OF TRANSPORTATION

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CHIP SEAL EMULSIONS

An emulsion chip seal is a practical economic measure to correct surface raveling and oxidation of old pavements or to provide a waterproof, skid resistant surface over existing pavements. The emulsified asphalt is applied from a distributor followed by an application of aggregate from a chip spreader. UDOT specifies a number of emulsion types, each applicable to traffic volumes, aggregate and existing surface conditions.



PROPER APPLICATION

The application rate and the type of asphalt emulsion depend largely on the average particle size. The object is to produce a pavement surface one stone thick with enough asphalt to hold the aggregate in place yet avoid bleeding. A successful design will embed the average particle 60-75 percent into the asphalt emulsion. Higher application rates are used for aggregate having gradations on the coarse side of the specified limits and lower application rates for aggregate gradations on the fine side of the specified limits. Certain road conditions require an adjustment in asphalt quantities. For example, badly cracked, coarse, or absorbent roads require an increase in the asphalt. If the existing road is flush with asphalt, quantities should be decreased. Adjust the asphalt for traffic conditions and volume. An increase in traffic requires a decrease in asphalt. Laboratory testing and calculations are commonly employed to determine the rate of application, however the following table is given as a general guideline.

Nominal Aggregate Size	Application Rate Gal/yd ²				Asphalt Type		
	Pavement Condition				Aggregate Types		Suggested Distributor Spraying Temperature
	Smooth	Slightly porous	Slightly pocked, Porous, oxidized	Badly pocked, Porous, oxidized	Silica Gravels	Lime Stones	
¾ - 3/8 inch	0.40-0.50	0.43-0.53	0.46-0.56	0.49-0.59	CRS-2A,	RS-2	125 - 185 °F
½ - No. 4	0.30-0.45	0.33-0.48	0.36-0.51	0.39-0.54	CRS-2B,		
3/8 - No. 8	0.20-0.35	0.23-0.38	0.26-0.41	0.29-0.44	CRS-2P,		
No. 4 - No. 6	0.15-0.20	0.18-0.23	0.21-0.26	0.24-0.29	LMCRS-2		

Asphalt emulsions offer several advantages over other asphalt materials due to their unique qualities. Emulsions are best used with clean, damp chips and do not require elevated temperatures for proper application. Spraying temperatures for the asphalt emulsions listed in the table should be between 125 °F and 185 °F. UDOT specifies that pavement temperatures are from 70 °F to 136 °F and air temperature is 70 °F and rising in the shade at the time of application.

Cure Rates – Several factors affect the cure rate of emulsions. A rough-textured, porous aggregate will speed the cure time by absorbing water from the emulsion. Wet aggregate will improve the coating properties of the asphalt but may slow the cure rate by requiring more time for evaporation. Weather conditions including temperature, wind velocity, and humidity all are contributing factors to the cure rate of emulsified asphalts.

SPECIFICATIONS/DETAILS

- Asphalt emulsions classified as rapid setting (RS) are common for single surface treatments because they set or “break” quickly. The letter C in the emulsion type (CRS) denotes cationic or positively charged emulsions that react well with most aggregates including silica gravels. The absence of the “C” denotes anionic or negatively charged emulsions and is good with limestones.
- Some compounds are often added to the basic asphalt types to produce desirable properties. LMCRS and CRS-2P emulsions have been modified with latex and polymers respectively. These modified emulsions are designed to stay in place and be less susceptible to temperature changes.
- For most chip seal applications CRS-2A type asphalt emulsions are common. The CRS-2B emulsions are harder based asphalts and are commonly used in warmer regions.
- For materials and procedures for applying emulsified asphalt on a cleaned surface refer to UDOT Specification Section 02785 – Chip Seal Coat.
- See UDOT Specification Section 02745 for Asphalt Materials.
- See AASHTO M-140 for requirements for Emulsified Asphalts.

COST INFORMATION

Unit costs for CRS-2A emulsions are approximately \$130-\$150 per ton.

Unit costs for CRS-2B emulsions are approximately \$125-\$150 per ton.

Unit costs for CRS-2P emulsions are approximately \$160-\$170 per ton.

LM emulsion unit costs are approximately \$140-\$170 per ton.

Costs for these emulsions are not fixed and should be referred to as an approximation only.

FURTHER INFORMATION

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