FIELD GUIDE TO EMULSIONS

FOURTH EDITION
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Preface

We at Ergon Asphalt & Emulsions hope you will find this handbook useful in your daily efforts in the areas of pavement preservation, maintenance, rehabilitation and construction. It is intended to be a simple guide and a quick reference to asphalt emulsions and their uses.

Asphalt emulsions have been used throughout the world for well over 50 years. In the early days, emulsions served as a solution to the problem of delivering asphalt at a usable temperature to remote locations. It was quickly recognized that the use of water as a carrier for asphalt had other distinct advantages. Emulsion expanded the types of materials that could be used and was much safer than hot or “cut back” products. Mixing asphalt with aggregates was easier, and the water phase carried the bitumen deep into cracks and crevices of a pavement surface that would have otherwise been left vulnerable to the elements.

As we move into the 21st century, the criterion of material selection is rapidly changing. The benefits and flexibility of asphalt emulsion products continue to emerge. A responsible awareness of the roadway construction and maintenance industry’s environmental impact, combined with the necessity of a healthy economy, demands we be less wasteful of our natural resources, more conscious of worker and user safety, and that we strive to efficiently manage limited taxpayer dollars. Two important research documents are referenced in this handbook. An “Eco-efficiency Study,” conducted by BASF Corporation, demonstrates the ecological advantage of using asphalt emulsion. A “Texas Chip Seal Study,” written by Dr. Doug Gransberg of Oklahoma University, proves the economical benefit of emulsion products. The complete studies can be accessed through the website of the Asphalt Emulsion Manufacturers Association at aema.org.

If you are planning to use an asphalt emulsion product we encourage you to use this handbook. Consider it an introduction to the vast knowledge and technology available to you from our industry. In the following pages, the many different grades of emulsions and their uses are outlined, storage and handling issues are discussed and you will find various conversion tables as well as other useful information. We hope you find this handbook very helpful, but as always, we encourage you to contact your local sales representative to address your individual needs.
Eco-Efficiency Study

Asphalt emulsions are the most environmentally friendly products used in the paving industry. Several recent eco-efficiency studies provide data demonstrating the differences between asphalt emulsion technologies and other, more traditional paving methods. The studies focus on:

- Optimum Performance
- Raw Material and Energy Consumption
- Recycling and Disposal
- Ecological and Economic Advantages

The charts on page 7 illustrate the balance between relative costs and the environmental impact for emulsion versus hot applied chip seals, and for emulsion micro-surfacing versus thin hot mix overlays, both with and without polymer modification. In both cases shown here, the emulsion applications had significantly higher eco-efficiency for similar relative costs.

The comprehensive analysis includes inputs of initial and life cycle costs, energy consumption, resource consumption, air emissions, water emissions, solid waste emissions, health effect potential, risk potential and land use. These categories were further broken down to such variables as global warming potential and photochemical ozone creation potential.

The goal of these analyses is to offer pavement engineers the best possible alternatives with the least environmental impact at the best cost. More information on these studies is available on the AEMA website at aema.org.

![Chart showing eco-efficiency of different surfacing methods]

![Graph comparing costs and environmental impact of different surfacing methods]
Texas Chip Seal Study

The study collected both design and performance data on 342 chip seal projects worth nearly $30 million that had been completed in the Texas Department of Transportation’s Atlanta District since 1996. 165 of these projects were emulsion projects utilizing CRS-2P as the binder and 177 were asphalt cement projects using AC15-5TR binders. The external variables were minimized as the Atlanta District had used the same seal coat contractor, Area Office, construction season, asphalt suppliers, and aggregate on all its districts’ chip seal projects for the past 12 years.

The one difference in the aggregate was that the AC15-5TR used a lightweight aggregate that was pre-coated unlike the emulsion seals’ lightweight aggregate that was not pre-coated. Thus, the comparison of the two binders can be made in a very direct manner, and the results can be viewed as specific to the engineering properties of the binders themselves without the need to qualify the conclusions based on independent parameters that could not be mathematically removed from the data. The study found that the emulsion chip seals performed as well as the hot asphalt cement seals and were the more cost effective of the two alternatives.

Emulsion chip seals also furnished a better long-term friction course as measured by the skid number. The following graph indicates the cost savings related to friction resistance, the lower the SNCI the better.

Asphalt Emulsion Defined

What is an asphalt emulsion?
Asphalt emulsion is a combination of three basic ingredients: asphalt, water, and a small amount of an emulsifying agent. These components are introduced into a colloid mill that shears the asphalt into very small droplets. The emulsifier, a surface-active agent, keeps the asphalt droplets in a stable suspension. The result is an asphalt based product with a consistency ranging from that of milk to that of heavy cream, which can be used in cold processes for road construction and maintenance.
**Why use asphalt emulsions?**
Asphalt emulsion does not require a petroleum solvent to make it liquid, and in most cases, asphalt emulsions can be used without additional heat. Both of these factors contribute to energy savings. Additionally, asphalt emulsions offer great flexibility in their application since they offer the end-user a great variety of characteristics not found in other paving and maintenance materials. Asphalt emulsions are environmentally friendly. There are little or no hydrocarbon emissions created with their use.

**Are asphalt emulsions new?**
Asphalt emulsions were first prepared in the early part of the 20th century, and today, they are used internationally. The use of asphalt emulsions is growing, and 10-20% of all asphalt is used in the form of asphalt emulsions.

**How are asphalt emulsions classified?**
Asphalt emulsions are classified into three categories: anionic, cationic, or nonionic. The anionic and cationic classes refer to the electrical charges surrounding the asphalt particles. The absence of the letter “C” denotes anionic emulsions. Asphalt emulsions are further classified on the basis of how quickly they coalesce; i.e., revert to asphalt cement. The terms RS (Rapid Set), MS (Medium Set), SS (Slow Set), and QS (Quick Set) have been adopted to simplify and standardize this classification. Additionally, trailing numbers are used to delineate the relative viscosity of the emulsion, and the letters “H” and “S” indicate whether hard or soft base asphalt is used to make the asphalt emulsions. Thus, a CSS-1H is a cationic slow set emulsion with a relatively low asphalt emulsion viscosity made with hard base asphalt.

**Do asphalt emulsions have any uses around the home?**
Driveway sealers, roofing repair materials, caulks and mastics may contain specially formulated asphalt emulsions.

**Where can I learn more about asphalt emulsions?**
You can order AEMA's Basic Asphalt Emulsion CD-ROM through the website at aema.org.

**What chemicals are present in the emulsion?**
The main components of the emulsion are asphalt (bitumen) and water. Emulsions typically contain between 55 to 75% asphalt. In addition to the asphalt and water, asphalt emulsions contain 0.1-2% of an emulsifier, or “soap,” which functions to stabilize the emulsion. These soaps are similar in nature to the soaps and detergents used in household cleaning and personal care. The asphalt emulsions may also contain trace amounts of other ingredients such as pH (acidity) regulators and viscosity regulators.

**Tell me more about the emulsifying agents.**
The most common products are fatty acids and lignin’s derived from wood; these form soap by reaction with sodium hydroxide. The soaps become negatively charged in water and give “anionic” asphalt emulsions. Another class of emulsifiers, amines, are derived from wood acids (tall oils) or animal fats (tallow). These emulsifiers form soaps which become positively charged in water and give “cationic” asphalt emulsions.

**How do they work?**
When asphalt emulsion is mixed with or exposed to the aggregates used in roadway applications, the emulsion is destabilized, and the droplets of asphalt fuse together.
providing a strong adhesive bond to “glue” the aggregates together. The water evaporates, but the emulsifiers remain in the asphalt where they provide a valuable function in helping the asphalt adhere to the aggregate.

**Chip Seal Defined**

**What is a chip seal?**
Chip seals are the most widely used pavement preservation method. They produce an all-weather surface that renews weathered pavements, improves skid resistance, aids in lane demarcation and seals and protects the underlying road surface. While the single surface treatment is the most commonly referenced, there are many types of chip seals including singles, doubles, triples, sandwich, inverted, racked in, etc. Each has a different construction technique and is chosen for a particular purpose. Visit savemyroad.com/educational-series for an in-depth look at the differences between these systems.

**How is a chip seal applied?**
Potholes are sealed, and any large cracks in the road surface are repaired. Sufficient curing of these repairs is allowed before applying the chip seal. The road surface is then cleaned using a power sweeper or rotary broom. For a conventional treatment like a single course chip seal, an asphalt emulsion is then uniformly spray-applied by an asphalt emulsion distributor, and aggregate (chips) are evenly applied with a self-propelled or a truck-attached mechanical spreader. A pneumatic tired roller is then used to embed the aggregate into the asphalt film. After initial cure, excess aggregate is removed by brooming. After the chip seal treatment has cured completely, the surface may be swept again and striping applied.

**What types of asphalt emulsions are used for chip seals?**
Typical asphalt emulsions used in chip seals are CRS-2, RS-2, and HFRS-2. For higher volume traffic roadways, polymer modified versions of these asphalt emulsions, like CRS-2P and CHFRS-2P, are used. See your state’s Product Locations & Applications page for more options.

**Is there any advantage in using an asphalt emulsion over hot asphalt in the chip seal application process?**
Asphalt emulsion is more environmentally friendly as it is applied at a much lower temperature. With lower storage and application temperatures, safety is vastly improved, and there is a significant energy savings. Asphalt emulsion does not require the use of pre-coated aggregates, and in fact, performs better with uncoated or bare aggregate. Asphalt emulsion fully penetrates and fills surface cracks and voids even in the presence of moisture; hot asphalt tends to bridge these areas. Asphalt emulsion is more forgiving and will work under a wider variety of field conditions than hot applied products.

**What are some keys to a successful chip seal surface treatment?**
- Coordinate construction to ensure continuous operation
- Use hard, cubical, and clean aggregate
- Properly calibrate application equipment
- Maintain traffic control while chip seal application cures

**Surfacing Types**

**What is slurry surfacing?**
Slurry surfacing is a thin, cold mixed pavement preservation treatment comprised of asphalt emulsion, aggregate, water and mineral filler. There are two basic
products, slurry seal and micro surfacing. Slurry seal is typically applied on residential streets, airports, sidewalks and parking lots. Micro surfacing is a premium product based on specially selected aggregates and polymer modified asphalt emulsion. Micro surfacing is designed to be applied in thicker lifts for high trafficked areas requiring heavier application rates and quick return to traffic. Micro surfacing is also used as a rut fill treatment.

**How is a slurry seal or micro surfacing applied?**
The raw materials are combined in a mobile mix unit. The slurry surfacing is applied to an existing pavement surface by means of a spreader box linked to the mixing unit. The slurry is introduced into the spreader box and is “laid down” as the mixing unit is driven forward.

**What type of asphalt emulsion is suitable?**
Slurry seal may use a variety of emulsions such as SS-1H or CQS-1H. Micro surfacing always uses a cationic polymer modified emulsion such as CSS-1HP. The emulsion type is selected on the basis of local specifications and through a laboratory mix design process, comprised of tests on the compatibility of the aggregate and the emulsion, and on the durability of the cured seals. See your state’s Product Locations & Applications page for more options.

**Tack Coats and Primes**

**What is tack coat?**
Tack coat (also known as bond coat) is a light application of asphalt emulsion between hot mix asphalt layers designed to create a strong adhesive bond without slippage. Heavier applications may be used under porous layers or around patches where it also functions as a seal coat.

**Why use tack coat?**
Without a tack coat, the asphalt layers in a roadway may separate, which reduces the structural integrity of the pavement and may allow water to penetrate the structure.

**What type of emulsion should be used for tack coats?**
The type of emulsion used for tack coats varies from country to country. Normal practice in the USA is to use a slow-setting emulsion that is diluted with water before application. Cationic rapid setting or specially designed, less tracking emulsions that are applied undiluted are becoming more popular. See your state’s Product Locations & Applications page for more options.

**Why use prime coat?**
Prime coats protect the integrity of the granular base during construction and help reduce dust. In the case of a base which is to be covered with a thin hot mix layer or a chip seal for a low volume roadway, priming ensures a good bond between the seal and the underlying surface which otherwise would have a tendency to delaminate.

**Why use asphalt emulsion prime?**
Compared to cut back asphalt primes, emulsion primes are more environmentally friendly. Solvent-less prime coats are available in some areas. Check your state’s Product Locations & Applications page for availability.

**What type of emulsion is most suitable for emulsion prime?**
Slow-setting grades of asphalt emulsions (diluted with...
water before application) are suitable. To ensure good penetration on dense granular or stabilized bases, the surface may need to be scarified and dampened before application of the emulsion. See your state’s Product Locations & Applications page for more options.

**Emulsion Recycling**

**How are asphalt emulsions used in recycling applications?**
Cold in-place recycling (CIR), hot in-place recycling (HIR) and full depth reclamation (FDR) are three of the most common applications that use asphalt emulsion as the binder that mixes with pulverized and reclaimed pavement to create a new level base course.

**What is cold in-place recycling?**
Cold in-place recycling is a treatment used to rejuvenate flexible hot mix asphalt roads. Initially, a milling machine processes 2-6 inches of the existing surface layer. The milled material is further crushed and compacted into the desired size for the project during the gradation control process. Virgin aggregate can be added during this process if necessary. Afterwards, a binding additive is mixed with the graded material, and the resulting mixture is placed over the remaining pavement structure. The recycled mix is then compacted to the specified density.

**What is hot in-place recycling?**
Hot in-place recycling is a rehabilitation treatment for deteriorated bituminous pavements. HIR is a continuous process that can be completed in a single pass. It works by heating the top 1-2 inches of existing asphalt until it is pliable, scarifying the pavement, removing the material and supplementing it with a small amount of new hot mix or binder, then placing the mix over the remaining roadway structure. The recycled material is then compacted using traditional roller operations.

**What is full depth reclamation?**
By addressing the entire pavement section, full depth reclamation is able to correct delinquent cross sections, increase the load-bearing strength of the base, and utilize 100% of the existing materials. Substantial savings can be realized while meeting environmental goals. Equipment for the process includes traveling hammer-mills, crushing units, stabilizers, or a combination of these types of machines. Critical to the success of this process is the preliminary testing to establish design criteria for gradation, residual asphalt content, and the possible use of additives. This reconstruction technique requires a wearing surface of a thickness to be determined by an analysis of traffic data.

**What is the difference between CIR/HIR and full depth reclamation?**
Cold in-place recycling pulverizes the existing pavement to a depth of 2 to 6 inches. Hot in-place recycling processes the top 1 to 2 inches of the surface. Full depth reclamation pulverizes to a greater depth than either of these treatments, reaching below the existing pavement into the underlying material to produce a stabilized base course.

**What are the advantages of recycling?**
Energy is conserved as the construction is completed in-place/on-grade, and little or no fuel is required for heating. Reflective cracking can be reduced with CIR/HIR
and eliminated by FDR. Additionally, the pavement crown and cross slope can be restored, and loss of curb height is reduced or eliminated.

Are there benefits to using asphalt emulsion?
Yes. In fact, there are significant benefits when using asphalt emulsion as the stabilizer, including a faster return to traffic, and the creation of a crack-resistant flexible base which can help reduce highway maintenance costs. Specifically for FDR, further benefits include the use of much less water, and the creation of much less dust. This results in significant environmental impact reduction and greatly increases project safety issues relating to construction workers and the traveling public.

Emulsion Mixes

What is the difference between “dense-graded” and “open-graded” emulsion mixes?
Dense-graded mixtures contain aggregate which have been selected to include fine material and filler; therefore, the compacted mixture has low air voids and is essentially impermeable to water. Open-graded mixtures contain aggregate without the fine fractions, and when compacted, have high voids and are permeable to water. Because of its high fines content, the aggregate in dense-graded mixes is generally more reactive towards asphalt emulsion and demands a slower-setting grade than open-graded mixtures.

Why should I use cold emulsion mix rather than hot mix?
Cold mixes use less energy and produce fewer emissions than hot mixes. Cold mix plants are lower cost, more simple and more mobile than hot mix plants, and emulsion mixes lend themselves to on-site and in-place manufacture. The ability to stockpile material for future use leads to less waste and reworking than with hot mix.

How should I select the emulsion for cold mix?
Emulsion selection is on the basis of laboratory mix designs. Mix designs ensure that the emulsion is compatible with the aggregate and that the mixture is durable. Slow-setting emulsions are generally used for dense mixes, and medium-setting emulsions for open-graded mixes. The emulsion formulation can be adjusted, if necessary, to best suit the aggregate and application. See your state’s Product Locations & Applications page for more options.

What are the advantages of warm mix?
Asphalt emulsion can be used in a conventional hot mix plant and requires much lower mix temperatures. The advantages are greatly reduced emissions, fuel savings, worker safety and less hardening of the asphalt binder. The higher viscosity of the base binder at the mix temperature allows thicker films to be deposited on open-graded aggregate.
### Alabama Locations & Product Applications

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- Emulsion is sprayed on the road and then covered with aggregate, can fill cracks
- Emulsion is mixed with aggregate and then placed on road, can fill some cracks
- Combination or specialty applications
- Emulsion is applied to the roadway or surface without any cover material
- Emulsion is mixed with aggregate and then the mix is stored or placed on the road

*Most emulsions can be used for multiple applications. Please contact the Area Sales Manager for more information.*

**BIRMINGPORT**

- **Plant Manager:** Mike White
- **Plant Telephone:** 205-436-3413
- **Plant Fax:** 205-436-3404
- **Plant Address:** 7890 Birmingport Road Mulga, AL 35118

- **Area Sales Manager:** Anthony Quattlebaum
- **Sales Telephone:** 205-568-7917
- **Sales Office Fax:** 205-436-3404
- **Sales Office Address:** 7890 Birmingport Road Mulga, AL 35118

**WEBSITES**

- ergonasphalt.com
- savemyroad.com
### Arizona Locations & Product Applications

**Product is available at this location**

- **CHANDLER**:
  - CHIP SEAL SINGLE
  - CHIP SEAL MULTIPLE
  - SAND SEAL
  - SLURRY SEAL
  - MICROFILLING
  - CRACK FILL
  - FDR
  - GPS
  - CAPE SEAL
  - REJUVENATING CHIP SEAL
  - DUST PALLATIVE
  - FOG SEAL
  - REJUVENATING FOG SEAL
  - TACK COAT
  - REJUVENATOR
  - PENETRATING PRIME
  - RECYCLE MIX
  - HOT IN PLACE RECYCLE
  - COLD IN PLACE RECYCLE
  - COLD PATCH

- **eTac**
  - LM CQS-1H
  - Plastic Seal II
  - GPR CQS-1H
  - GPR No Voc
  - Re-Balence
  - SS-1H

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*Emulsion is sprayed on the road and then covered with aggregate, can fill cracks*

*Emulsion is mixed with aggregate and then placed on road, can fill some cracks*

*Combination or specialty applications*

*Emulsion is applied to the roadway or surface without any cover material*

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*Most emulsions can be used for multiple applications. Please contact the Area Sales Manager for more information.*

*If the product you want is not marked as available in your area, please contact the sales manager.*
### Arizona Contact Information

#### CHANDLER

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<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Phone</th>
<th>Fax</th>
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<tr>
<td>Plant Manager</td>
<td>Albert Bailey</td>
<td>480-785-2538</td>
<td>480-763-0693</td>
<td>6940 West Chandler Boulevard, Chandler, AZ 85226</td>
</tr>
<tr>
<td>Area Sales Manager</td>
<td>Charlie Buchanan</td>
<td>480-505-8105</td>
<td>480-940-9595</td>
<td>420 North Roosevelt Avenue, Chandler, AZ 85226</td>
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**WEBSITES**

- ergonasphalt.com
- savemyroad.com
## Arkansas Locations & Product Applications

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### Product Applications

- **CHIP SEAL SINGLE**
- **CHIP SEAL MULTIPLE**
- **SAND SEAL**
- **SLURRY SEAL**
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- **CRACK FILL**
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- **TACK COAT**
- **REJUVENATOR**
- **PENETRATING PRIME**
- **RECYCLE MIX**
- **HOT IN PLACE RECYCLE**
- **COLD IN PLACE RECYCLE**
- **COLD PATCH**

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**Emulsion is sprayed on the road and then covered with aggregate, can fill cracks**

**Emulsion is mixed with aggregate and then placed on road, can fill some cracks**

**Combination or specialty applications**

**Emulsion is applied to the roadway or surface without any cover material**

**Emulsion is mixed with aggregate and then the mix is stored or placed on the road**

## Arkansas Contact Information

### LITTLE ROCK

- **Plant Manager:** Mark McGill
- **Plant Telephone:** 501-490-1451
- **Plant Fax:** 501-490-1021
- **Plant Address:** 601 Shamburger Lane
  Little Rock, AR 72206

- **Area Sales Manager:** Darryl Gardner
- **Sales Office Telephone:** 501-590-3145
- **Sales Office Fax:** 501-490-1021
- **Sales Office Address:** 7513 Toltec Drive
  North Little Rock, AR 72116

### WEBSITES

- ergonasphalt.com
- savemyroad.com

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### Florida Locations & Product Applications

<table>
<thead>
<tr>
<th>Product is available at this location</th>
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<tbody>
<tr>
<td><strong>BARTOW</strong></td>
</tr>
<tr>
<td>CHIP SEAL SINGLE</td>
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<tr>
<td>CHIP SEAL MULTIPLE</td>
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<tr>
<td>SAND SEAL</td>
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<tr>
<td>SLURRY SEAL</td>
</tr>
<tr>
<td>MICRO SURFACING</td>
</tr>
<tr>
<td>CRACK FILL</td>
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<td>FDR</td>
</tr>
<tr>
<td>UTBWC</td>
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<tr>
<td>CAPE SEAL</td>
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<tr>
<td>REJUVENATING CHIP SEAL</td>
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### Florida Contact Information

**BARTOW**

**Plant Manager:** Jeremy Caher  
**Plant Telephone:** 863-582-9246  
**Plant Fax:** 863-582-9249  
**Plant Address:** 3900 US Hwy 17 North  
Bartow, FL 33830

**Area Sales Manager:** Stephan Romanchak  
**Sales Office Telephone:** 813-394-0830  
**Sales Office Fax:** 863-582-9249  
**Sales Office Address:** 3900 US Hwy 17 North  
Bartow, FL 33830

### WEBSITES

ergonasphalt.com  
savemyroad.com
**Georgia Locations & Product Applications**

<table>
<thead>
<tr>
<th>Product</th>
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<tr>
<td>CHIP SEAL MULTIPLE</td>
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<tr>
<td>SAND SEAL</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>MICROSURFACING</td>
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<tr>
<td>CRACK FILL</td>
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<tr>
<td>FDR</td>
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<td>UTDWC</td>
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<td>CAPE SEAL</td>
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<tr>
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**Georgia Contact Information**

**GARDEN CITY**

- **Plant Manager:** Cliff Horton
- **Plant Telephone:** 912-964-0811
- **Plant Fax:** 912-964-0009
- **Plant Address:** 14 Foundation Drive, Garden City, GA 31408

- **Area Sales Manager:** Daniel Sapp
- **Sales Office Telephone:** 912-318-3427
- **Sales Office Fax:** 912-653-2039
- **Sales Office Address:** 1021 I.G. Lanier Road, Pembroke, GA 31321

**WEBSITES**

- ergonasphalt.com
- savemyroad.com

*If the product you want is not marked as available in your area, please contact the sales manager.*
## Kansas Locations & Product Applications

<table>
<thead>
<tr>
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<tr>
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<tr>
<td>EL DORADO</td>
</tr>
<tr>
<td>SALINA</td>
</tr>
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### Emulsion Applications

<table>
<thead>
<tr>
<th>CHIP SEAL SINGLE</th>
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<th>SAND SEAL</th>
<th>SLURRY SEAL</th>
<th>MICROSURFACING</th>
<th>CRACK FILL</th>
<th>FDR</th>
<th>UTBWC</th>
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### Kansas Contact Information

#### DODGE CITY
- **Plant Manager:** Gary Shouse
- **Plant Telephone:** 620-225-2264
- **Plant Fax:** 620-225-1261
- **Plant Address:**
  - 2600 Butter & Egg Road
  - Dodge City, KS 67801
- **Area Sales Manager:** Doug Francis
- **Sales Office Telephone:** 785-577-2615
- **Sales Office Fax:** N/A
- **Sales Office Address:**
  - 630 South Donmyer Road
  - Solomon, KS 67480

#### EL DORADO
- **Plant Manager:** Gregg Lewis
- **Plant Telephone:** 316-321-6760
- **Plant Fax:** 316-321-2609
- **Plant Address:**
  - 800 East 10th Street
  - El Dorado, KS 67042
- **Area Sales Manager:** Larry Reddick
- **Sales Office Telephone:** 913-553-9504
- **Sales Office Fax:** 913-299-0287
- **Sales Office Address:**
  - 10520 Wolcott Drive
  - Kansas City, KS 66109

#### SALINA
- **Plant Manager:** Bob Northcutt
- **Plant Telephone:** 785-825-1535
- **Plant Fax:** 785-825-8189
- **Plant Address:**
  - 1100 West Grand Avenue
  - Salina, KS 67401
- **Area Sales Manager:** Larry Reddick
- **Sales Office Telephone:** 913-553-9504
- **Sales Office Fax:** 913-299-0287
- **Sales Office Address:**
  - 10520 Wolcott Drive
  - Kansas City, KS 66109

#### WEBSITES
- ergonasphalt.com
- savemyroad.com
## Mississippi Locations & Product Applications

<table>
<thead>
<tr>
<th>Location</th>
<th>Product Availability</th>
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<tbody>
<tr>
<td>VICKSBURG</td>
<td>✓ ✓ ✓ ✓ ✓</td>
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</tbody>
</table>

### Product Types
- **CHIP SEAL SINGLE**
- **CHIP SEAL MULTIPLE**
- **SAND SEAL**
- **SLURRY SEAL**
- **MICROSURFACING**
- **CRACK FILL**
- **FDR**
- **UTBWC**
- **CAPE SEAL**
- **REJUVENATING CHIP SEAL**
- **DUST PALLATIVE**
- **FOG SEAL**
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---

## Mississippi Contact Information

### VICKSBURG
- **Plant Manager:** Bill Hoxie
- **Plant Telephone:** 601-630-8343
- **Plant Fax:** 601-630-8347
- **Plant Address:** 2611 Haining Road, Vicksburg, MS 39181

### Area Sales Manager – LA:
- **Area Sales Manager – LA:** Jerry Walley
- **Sales Telephone:** 318-574-6399
- **Sales Office Fax:** 318-574-9790
- **Sales Office Address:** P.O. Box 552, Tallulah, LA 71284

### Area Sales Manager – MS:
- **Area Sales Manager – MS:** Amy Walker
- **Sales Telephone:** 601-933-3339
- **Sales Office Fax:** 601-933-3363
- **Sales Office Address:** P.O. Box 1639, Jackson, MS 39215-1639

### WEBSITES
- ergonasphalt.com
- savemyroad.com

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### Nevada Locations & Product Applications

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<tr>
<th>Product is available at this location</th>
<th>LAS VEGAS</th>
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<tbody>
<tr>
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### Nevada Contact Information

**LAS VEGAS**

- **Plant Manager:** Michael Holst
- **Plant Telephone:** 702-736-2059
- **Plant Fax:** 702-837-5981
- **Plant Address:** 3901 West Ponderosa Way
  Las Vegas, NV 89118
- **Area Sales Manager:** Greg Hunt
- **Sales Office Telephone:** 702-235-7347
- **Sales Office Fax:** 702-837-5981
- **Sales Office Address:** 3901 West Ponderosa Way
  Las Vegas, NV 89118

**WEBSITES**

- ergonasphalt.com
- savemyroad.com
# Oklahoma Locations & Product Applications

## Product is available at this location

<table>
<thead>
<tr>
<th>Location</th>
<th>Product Applications</th>
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<tbody>
<tr>
<td>ARDMORE</td>
<td>CHIP SEAL SINGLE, CHIP SEAL MULTIPLE, SAND SEAL, SLURRY SEAL, MICROSURFACING, CRACK FILL, FDR, UTBWC, CAPE SEAL, REJUVENATING CHIP SEAL, DUST SEAL, REJUVENATING DUST SEAL, FOAM SEAL, REJUVENATING FOAM SEAL, TACK COAT, REJUVENATOR, PENETRATING PRIMER, RECYCLE MIX, HOT IN PLACE RECYCLE, COLD IN PLACE RECYCLE, COLD PATCH</td>
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<tr>
<td>CATOOSA</td>
<td>CHIP SEAL SINGLE, CHIP SEAL MULTIPLE, SAND SEAL, SLURRY SEAL, MICROSURFACING, CRACK FILL, FDR, UTBWC, CAPE SEAL, REJUVENATING CHIP SEAL, DUST SEAL, REJUVENATING DUST SEAL, FOAM SEAL, REJUVENATING FOAM SEAL, TACK COAT, REJUVENATOR, PENETRATING PRIMER, RECYCLE MIX, HOT IN PLACE RECYCLE, COLD IN PLACE RECYCLE, COLD PATCH</td>
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<tr>
<td>LAWTON</td>
<td>CHIP SEAL SINGLE, CHIP SEAL MULTIPLE, SAND SEAL, SLURRY SEAL, MICROSURFACING, CRACK FILL, FDR, UTBWC, CAPE SEAL, REJUVENATING CHIP SEAL, DUST SEAL, REJUVENATING DUST SEAL, FOAM SEAL, REJUVENATING FOAM SEAL, TACK COAT, REJUVENATOR, PENETRATING PRIMER, RECYCLE MIX, HOT IN PLACE RECYCLE, COLD IN PLACE RECYCLE, COLD PATCH</td>
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---

# Oklahoma Contact Information

## ARDMORE
- **Plant Manager:** Kelley Smith
- **Cell Phone:** 580-504-8123
- **Plant Telephone:** 580-223-8010
- **Plant Fax:** 580-223-9657
- **Plant Address:** 2500 Refinery Road, Ardmore, OK 73401
- **Area Sales Manager:** Johnny Roe
- **Sales Office Telephone:** 405-595-9073 (cell)
- **Sales Office Fax:** 580-223-9657
- **Sales Office Address:** 2500 Refinery Road, Ardmore, OK 73401

## CATOOSA
- **Plant Manager:** David Belcher
- **Plant Telephone:** 918-266-7070
- **Plant Fax:** 918-266-1417
- **Plant Address:** 5850 Arkansas Road, Catoosa, OK 74015
- **Area Sales Manager:** Wendell Nolan
- **Sales Office Telephone:** 918-408-0845
- **Sales Office Fax:** N/A
- **Sales Office Address:** 17967 South 71st East Avenue, Bixby, OK 74008

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Oklahoma Contact Information

LAWTON

Plant Manager: Sean Randall
Plant Telephone: 580-536-0098
Plant Fax: 580-536-0684
Plant Address: 9301 Southwest Koch Street
Lawton, OK 73505

Area Sales Manager: Johnny Roe
Sales Office Telephone: 405-595-9073 (cell)
Sales Office Fax: 580-536-0684
Sales Office Address: 9301 Southwest Koch Street
Lawton, OK 73505

WEBSITES

ergonasphalt.com
savemyroad.com
**Pennsylvania Locations & Product Applications**

- **CHIP SEAL SINGLE**
- **CHIP SEAL MULTIPLE**
- **SAND SEAL**
- **SLURRY SEAL**
- **MICROSURFACING**
- **CRACK FILL**
- **FDR**
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- **RECYCLE MIX**
- **HOT IN PLACE RECYCLE**
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- **COLD PATCH**

<table>
<thead>
<tr>
<th>Emulsion</th>
<th>Description</th>
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<tbody>
<tr>
<td>Red</td>
<td>Emulsion is sprayed on the road and then covered with aggregate, can fill cracks</td>
</tr>
<tr>
<td>Light Blue</td>
<td>Emulsion is mixed with aggregate and then placed on road, can fill some cracks</td>
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<tr>
<td>Beige</td>
<td>Combination or specialty applications</td>
</tr>
<tr>
<td>Green</td>
<td>Emulsion is applied to the roadway or surface without any cover material</td>
</tr>
<tr>
<td>Grey</td>
<td>Emulsion is mixed with aggregate and then the mix is stored or placed on the road</td>
</tr>
</tbody>
</table>

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**Pennsylvania Contact Information**

**READING**

- **Plant Manager:** Curt Wolf
- **Plant Telephone:** 610-921-0271
- **Plant Fax:** 610-921-1477
- **Plant Address:** 3847 Pottsville Pike, Reading, PA 19605

- **Area Sales Manager:** Nick Andreychek
- **Sales Office Telephone:** 717-576-7077
- **Sales Office Fax:** 610-921-1477
- **Sales Office Address:** 3847 Pottsville Pike, Reading, PA 19605

**WEBSITES**

- ergonasphalt.com
- savemyroad.com

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### Tennessee Locations & Product Applications

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<tr>
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<tr>
<td>PARSONS</td>
<td><img src="image" alt="Product Application Chart" /></td>
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### Tennessee Contact Information

#### MEMPHIS
- **Emulsion Plant Manager:** David Glover
- **Plant Telephone:** 901-475-8500
- **Plant Fax:** 901-774-4562
- **Plant Address:** 1989 Channel Avenue, Memphis, TN 38113

#### Arkansas Sales
- **Sales:** Darryl Gardner
- **Sales Telephone:** 501-590-3145

#### Mississippi Sales
- **Sales:** Amy Walker
- **Sales Telephone:** 601-933-3339

#### PARSONS
- **Plant Manager:** Mark Clark
- **Plant Telephone:** 731-847-6351
- **Plant Fax:** 731-847-2315
- **Plant Address:** 5445 Highway 412 East, Parsons, TN 38363

#### Area Sales Manager
- **Sales:** Mark Bailey
- **Sales Office Telephone:** 615-242-8110
- **Sales Office Fax:** 615-255-1614
- **Sales Office Address:** 1114 Visco Drive, Nashville, TN 37210

### WEBSITES
- [ergonasphalt.com](http://ergonasphalt.com)
- [savemyroad.com](http://savemyroad.com)

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<td>PLEASANTON</td>
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## Texas Contact Information

### AUSTIN
- **Plant Manager:** Jim Catron  
  - **Plant Telephone:** 512-345-0975  
  - **Plant Fax:** 512-345-8348  
  - **Plant Address:** 8803 North Mopac Expressway  
    Austin, TX 78759  
- **Regional Sales Manager:** Cary Brownlee  
  - **Sales Office Telephone:** 512-469-9292  
  - **Sales Office Fax:** 512-469-0391  
  - **Sales Office Address:** 11612 RM 2244  
    Building 1, Suite 250  
    Austin, TX 78738

### CORPUS CHRISTI
- **Plant Manager:** Danny Leal  
  - **Plant Telephone:** 361-289-6147  
  - **Plant Fax:** 361-289-8297  
  - **Plant Address:** 6746 Up River Road  
    Corpus Christi, TX 78409  
- **Area Sales Manager:** David Kopp  
  - **Cell Phone:** 830-708-6647  
  - **Sales Office Telephone:** 512-469-9292  
  - **Sales Office Fax:** 830-609-2219  
  - **Sales Office Address:** 11612 RM 2244  
    Building 1, Suite 250  
    Austin, TX 78738  
- **Regional Sales Manager:** Cary Brownlee  
  - **Sales Office Telephone:** 512-469-9292

### MOUNT PLEASANT
- **Plant Manager:** Jackie Gillean  
  - **Plant Telephone:** 903-572-9839  
  - **Plant Fax:** 903-572-1408  
  - **Plant Address:** 209 Robert Nance Road  
    Mt. Pleasant, TX 75455  
- **Area Sales Manager:** Tom O’Leary  
  - **Sales Office Telephone:** 903-752-2703  
  - **Sales Office Fax:** 903-596-7436  
  - **Sales Office Address:** 722 South Bois D’Arc, Suite 6  
    Tyler, TX 75701  
- **Area Sales Manager:** Kody Kohl  
  - **Cell Phone:** 512-574-9980  
  - **Sales Office Telephone:** 512-469-9292  
  - **Sales Office Fax:** 903-572-1408  
  - **Sales Office Address:** P.O. Box 1233  
    Prosper, TX 75078

### PLEASANTON
- **Plant Manager:** Ken Mogensen  
  - **Plant Telephone:** 830-569-8731  
  - **Plant Fax:** 830-569-6043  
  - **Plant Address:** 907 Second Street  
    Pleasanton, TX 78064  
- **Area Sales Manager:** David Kopp  
  - **Cell Phone:** 830-708-6647  
- **Regional Sales Manager:** Cary Brownlee  
  - **Sales Office Telephone:** 512-469-9292  
  - **Sales Office Fax:** 830-609-2219  
  - **Sales Office Address:** 11612 RM 2244  
    Building 1, Suite 250  
    Austin, TX 78738
Texas Contact Information

**WACO**

Plant Manager: J. D. Douglas  
Plant Telephone: 254-753-5885  
Plant Fax: 254-753-2404  
Plant Address: 1820 Hwy 6 East  
Waco, TX 76705

Regional Sales Manager: David Stroud  
Sales Office Telephone: 254-753-5885  
Sales Office Fax: 254-753-2404  
Sales Office Address: 1820 Hwy 6 East  
Waco, TX 76705

**WEBSITES**

ergonasphalt.com  
savemyroad.com
### Utah Locations & Product Applications

<table>
<thead>
<tr>
<th>Product is available at this location</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTH SALT LAKE CITY</td>
</tr>
<tr>
<td>CHIP SEAL SINGLE</td>
</tr>
<tr>
<td>CHIP SEAL MULTIPLE</td>
</tr>
<tr>
<td>SAND SEAL</td>
</tr>
<tr>
<td>SLURRY SEAL</td>
</tr>
<tr>
<td>MICROSPHERICAL</td>
</tr>
<tr>
<td>CRACK FILL</td>
</tr>
<tr>
<td>DUST PALLATIVE</td>
</tr>
<tr>
<td>SOFT SEAL</td>
</tr>
<tr>
<td>REJUVENATING CHIP SEAL</td>
</tr>
<tr>
<td>REJUVENATING SOFT SEAL</td>
</tr>
<tr>
<td>TACK COAT</td>
</tr>
<tr>
<td>REJUVENATOR</td>
</tr>
<tr>
<td>PENETRATING PRIME</td>
</tr>
<tr>
<td>RECYCLE MIX</td>
</tr>
<tr>
<td>HOT IN PLACE RECYCLE</td>
</tr>
<tr>
<td>COLD IN PLACE RECYCLE</td>
</tr>
<tr>
<td>COLD PATCH</td>
</tr>
</tbody>
</table>

- **Emulsion is sprayed on the road and then covered with aggregate, can fill cracks**
- **Emulsion is mixed with aggregate and then placed on road, can fill some cracks**
- **Combination or specialty applications**
- **Emulsion is applied to the roadway or surface without any cover material**
- **Emulsion is mixed with aggregate and then the mix is stored or placed on the road**

*Most emulsions can be used for multiple applications. Please contact the Area Sales Manager for more information.**

*If the product you want is not marked as available in your area, please contact the sales manager.*

### Utah Contact Information

**NORTH SALT LAKE PLANT**

- **Plant Manager:** Tracy Bryan
- **Plant Telephone:** 801-397-7600
- **Plant Fax:** 801-295-1346
- **Plant Address:** 95 West 1100 North
  North Salt Lake, UT 84054

- **Area Sales Manager:** Stu Zick
  - **Cell Phone:** 801-510-1648
  - **Sales Office Telephone:** 801-397-7612
  - **Sales Office Fax:** 801-295-1346
  - **Sales Office Address:** 95 West 1100 North
    North Salt Lake, UT 84054

### WEBSITES

- ergonasphalt.com
- savemyroad.com
Handling Asphalt Emulsions

Do’s & Don’ts of Storage & Handling of Asphalt Emulsions

DO
• Set the clearance on pumps for emulsions to prevent binding and to prevent breaking of the emulsion.
• Clear lines, valves, and pumps of emulsion.
• Drain pumps and remove plugs during freezing weather. No. 1 or No. 2 fuel oil may be used to keep pumps free.
• Warm the pump casings and packing glands to 150°F (65°C) to ease start-up.
• Store emulsions in vertical tanks to prevent excessive skin formation.
• Store emulsions at the temperature specified for the particular grade and application.
• Store emulsion in insulated tanks to protect from freezing and make most efficient use of heat.
• Use large, side mounted, slow moving propellers, mounted 3 feet from the bottom of the tank to “roll” the emulsion to prevent skin from forming if skin formation is an issue. Over-mixing should be avoided.
• Gently circulate emulsions when heating or after prolonged storage.
• Place inlet and return lines near the bottom of the tank to prevent foaming.
• Pump from the bottom of the tank to minimize contamination from skinning that may have formed.
• Check compatibility of water and emulsion in a flask prior to use on a larger volume.
• Dilute medium and slow-setting emulsions by adding warm water to the emulsion.
• Drain tanks to no measurable quantity before adding an emulsion of a different type. Emulsions with the same designation may be very different in performance.
• Provide adequate ventilation.
• Heat only to reasonable temperatures.
• Haul emulsion in truck transports with baffle plates to prevent sloshing.

DON’T
• Use tight clearance pumps; they may seize.
• Leave emulsion in pumps, valves or lines during freezing weather.
• Hold emulsions in lines and pumps for extended periods.
• Apply severe heat to pump casings or packing glands. The pump may be damaged, and the emulsion may break.
• Allow heating surfaces to exceed 185°F (85°C). This will cause emulsion to break on the heating surface.
• Store emulsions in horizontal tanks.
• Circulate emulsions excessively. Emulsions tend to lose viscosity when pumped. Air may also become entrained and lead to an unstable emulsion. Excessive pumping may also lead to the emulsion breaking.
• Use forced air to agitate emulsions.
• Dilute rapid-setting emulsions with water. Never add emulsion to water.
• Dilute emulsions with non-potable water or cold water.
• Dilute emulsions with fuel oil, diesel fuel or kerosene.
• Put fuel oil, diesel fuel or kerosene on top of a tank of emulsion to prevent skin from forming.
• Pump emulsions into open air or have inlet lines near the top of the tank.
• Place outlet lines in mid tank.
• Mix emulsions of different chemical types, classes, grades or designations in storage tanks, trailers, transports or
distributors. Anionic and cationic emulsions, may coagulate when mixed.
• Subject emulsion or the open air above it, to open flame or strong oxidants. Never heat the emulsion over 190°F (88°C).
• Load emulsion into storage tanks, tank cars, tank transporters or distributors containing remains of an incompatible material.
• Proceed if you have questions.

Asphalt Emulsions Storage

Why are asphalt emulsion storage and handling requirements important?
Asphalt emulsions are a dispersion of fine droplets of asphalt cement in water. Since water is the carrier, medium specific storage and handling procedures should be followed.

What is the proper storage temperature for storing asphalt emulsions?
Store asphalt emulsion between 50°F (10°C) and 185°F (85°C). Do not permit the asphalt emulsion to be heated above 185°F (85°C). At elevated temperatures, the water will evaporate, changing the characteristics of the asphalt emulsion. The following chart outlines minimum and maximum temperatures for various grades of asphalt emulsion.

What will happen if the asphalt emulsion freezes?
This will break the asphalt emulsion, separating the asphalt from the water. The result will be two layers in the tank, neither of which will be suited for the intended use. Likewise, the tank will be difficult to empty.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Minimum Temperature °F (°C)</th>
<th>Maximum Temperature °F (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-1</td>
<td>70° (20°)</td>
<td>140° (60°)</td>
</tr>
<tr>
<td>RS-2, CRS-1, CRS-2, HFRS-2</td>
<td>125° (50°)</td>
<td>185° (85°)</td>
</tr>
<tr>
<td>SS-1, SS-1H, CSS-1, CSS-1H, MS-1, HFMS-1</td>
<td>50° (10°)</td>
<td>140° (60°)</td>
</tr>
<tr>
<td>CMS-2, CMS-2H, MS-2, MS-2H, HFMS-2H, HFMS-2S</td>
<td>125° (50°)</td>
<td>185° (85°)</td>
</tr>
</tbody>
</table>

What type of storage tank is best suited for storing asphalt emulsions?
Vertical storage tanks are best suited to store emulsions. Vertical tanks expose the least amount of surface area to air, thus reducing the formation of an asphalt skin on the surface of the emulsion. Tanks must also be insulated with a weather resistant covering, to protect the asphalt emulsion from freezing and provide the most efficient use of heat. Additionally, side-entering propeller mixers can be used to gently agitate the asphalt emulsion. This eliminates any skin formation. Side entry mixer placement must be engineered to the size of the storage tank.

Can a pump be used to mix and circulate a storage tank of asphalt emulsions?
Yes. However, over-pumping is to be avoided since some asphalt emulsions are shear sensitive. Over-pumping and over-mixing can significantly alter the characteristics of the asphalt emulsion. Tanks should be circulated from top to bottom.
Can asphalt emulsions of different classes be mixed together?

Any amount of material remaining within a tank or tanker must be compatible with the added emulsion, and the amount remaining must be insufficient to cause the emulsion to fall out of specification. When asphalt emulsions of different classes are co-mingled in measurable quantities, the asphalt emulsion will become unstable and break. If in doubt, check with your asphalt emulsion supplier.

Asphalt Emulsions and Health

Are there any health or safety precautions that should be exercised when using asphalt emulsions?

Avoid breathing fumes, vapors, and mist. Obtain a copy of the supplier’s material safety data sheet (MSDS). Read the MSDS carefully and follow it. For a copy of an MSDS, please visit the Ergon web site at ergon.com and follow the links to the MSDS page.

Sampling

Goal: obtain samples that are truly representative of material, that are not contaminated, and that will resist deterioration during shipping and/or storage. Above all, sampling should be done in a manner safe for the employee. More information can be found in AASHTO T40 or ASTM D140, Standard Practice for Sampling Bituminous Materials.

- Before sampling, the Material Safety Data Sheet (MSDS) from the supplier should be carefully read and followed.
- Care should be taken to avoid breathing fumes, mists and/or vapors.
- To protect skin, gloves should be worn and long sleeves fastened over the gloves at the wrist.
- Face shields should be worn to protect against splashed material and any fumes.
- There shall be no smoking while sampling asphalt or emulsions.
- Sample containers must be new, clean and dry, and not be rinsed, washed or cleaned. Plastic gallon jugs are preferred for emulsions. Any containers that are not clean and dry should be discarded.
- The lid should fit tightly and properly on the sample container.
- Care should be taken to prevent any possible contamination.
- The sample container should not be submerged in solvent nor wiped with a cloth or rag containing solvent. If there is any material on the outside of the container, it should be wiped with a clean dry cloth immediately after the container is sealed and removed from the sampling device.
- During sealing and wiping, the container should be on a firm, level surface to prevent splashing, dropping or spilling.
• The sample must not be transferred to another container.
• The filled container should be tightly and positively sealed immediately after the sample is taken.
• The sample should be properly marked for identification with a permanent marker on the container itself, not the lid.
• The sample should be identified with the following at a minimum:
  - Shipper’s name and bill of lading or loading
  - Slip number
  - Date sampled
  - Sampler’s name
  - Sample location (place sample taken)
  - Product grade
  - Project identification
  - Other information as necessary
• Emulsion samples should be packaged, labeled, and protected from freezing during shipment. They should also be shipped to the laboratory the same day they are taken. To protect from shipping damage, the containers should be tightly sealed and carefully packed in protective material.

Crafco Pavement Maintenance Products
Crafco, Inc.
420 North Roosevelt
Chandler, Arizona 85226
sales@crafco.com
602-276-0406 ext 8023

Crafco Pavement Preservation Products Sealants
Crafco joint sealant extends the life of cement pavement. Joint sealant is designed to keep moisture out of the pavement sub-base, limit spills and prevent foreign objects (F.O.D.) from pavement surfaces.

RoadSaver 222 Sealant: Crafco RoadSaver 222 sealant is a single component, hot-applied petroleum based pavement crack and joint sealant which meets all requirements of ASTM D3405 and AASHTO M301. Packaging consists of individual boxes of sealant which are palletized into shipping units.

Crafco Joint Adhesive: Crafco’s hot-applied modified asphalt composition effectively bonds paving passes together, creating a watertight seal during thermal movement resulting in improved long-term performance of the joint with no significant cracking. This product is also effective for waterproofing exposed edges of asphalt concrete pavement areas such as at the curb gutter and shoulder interfaces. Additionally, waterproofing can be assured where manhole covers and hand valves (gas, water, etc.) are installed in asphalt concrete pavement.

Crafco Patching Products
Crafco PolyPatch is a versatile hot-applied, pourable, self-adhesive polymer modified asphalt binder containing selected aggregate to ensure good load bearing and skid resistant characteristics. PolyPatch is produced in several grades for various applications. PolyPatch is effectively used to level high manhole risers, drop inlets, bridge deck approaches, elevation discrepancies, utility cuts and more.
QPR is approved as a high performance patching material in most states and other user agencies within the United States. QPR is specifically formulated for the wide-ranging temperature and climate of our area. QPR is permanent and fully guaranteed against any failure.

Patching Systems
Patcher II is specifically designed to heat and mix PolyPatch and TechCrete for application. The Patcher II has two large openings for easy material loading. Advanced digital temperature controls maintain accurate material and oil temperatures and feature an auto flame shut down for safety. The products are thoroughly mixed by a horizontally mounted internal shaft with sweep paddles. To clean the Patcher for material type changeover, load the Patcher with clean aggregate, run the mixer, and then empty.

The Crafco Patcher Series Melter is available in two sizes. The Patcher II’s large volume easily handles large production projects. The Patcher I is designed for smaller patching tasks.

Spray Injection Patchers
Crafco offers three models of Spray Injection Patchers. The equipment’s integrated operation cleans the area to be repaired, applies a tack coat, coats the aggregate with asphalt emulsion, and then applies the mixture all in one easy continuous operation. Using high velocity air, the coated aggregate material is compacted during application, leaving virtually no voids in the final pavement repair. This makes a long lasting patch that is superior to conventional methods as proven by government studies.

Also available are the Magnum Spray Patcher and Air Stream™. The two most common products used are HFRS-2 and CRS-2.

Geo Composites
PavePrep is a high-density mastic laminated with a tough woven polyester designed to withstand the loads encountered by highway traffic and stress concentrations at pavement joints and cracks. PavePrep’s dense and flexible mastic reduces crack reflection through the overlay.

ISAC isolates the immense strain, impact loading and movement deflections that are created by airplane takeoffs and landings. Bridge decks and highways benefit from ISAC’s geosynthetics and asphalt mastic composite, creating an effective, durable and long lasting barrier against water and de-icing salts.

GeoTac is a peel-and-stick waterproofing membrane designed specifically as a moisture barrier. It prevents water permeation or penetration through pavement surfaces and the subsequent damage that moisture causes. GeoTac is high caliber with a full modified SBS asphalt mastic applied to a non-woven polyester geotextile.

GeoFilm is a peel-and-stick waterproofing membrane. It prevents water penetration and subsequent moisture damage. Applications include: box culverts, retaining walls, abutment back walls, concrete pipe joints, manholes, headwalls, median and paved shoulder inlets, catch basins, barrier median inlets, and foundations.
Pavement Preservation Equipment

Crafco provides our customers with the most comprehensive line of Pavement Preservation Products available. Crafco’s engineering and understanding of the industry sets the industry standards with quality performance products. Crafco Pavement Preservation Products are efficient, effective, long-lasting and cost effective.

Super Shot Melter/Applicators are designed to heat and apply sealant with efficiency and ease of use. Digital controls accurately regulate the heating temperature of the sealant and transfer oil. A patented internal pumping system eliminates clean out and features a hydraulic flow rate adjustment. There are no valves, no hose pressure build up, and fewer moving parts. Super Shot Melters will out-perform any comparable sized machine available.

E-Z Pour Melter/Applicators are the real workhorse of melter/applicators in the pavement preservation industry, and are the industry standard. They feature one hour heat-up time, handle field mix or packaged material, and heat and apply all hot pour sealant. Precision engineering and construction make the E-Z Pour trouble-free and safe to operate with the lowest operating cost in the industry. Safety features include a splash-proof lid, curb-side controls, and a low profile for easy sealant loading. The E-Z Pour is a flush-free clean-up system requiring no solvents.

Crafco Router: Crafco Routers are designed to rout out and clean cracked side walls to prepare the crack for sealant. Routing and sealing pavement cracks with an overband can produce a 50% savings in sealing costs over a 10 year period. The Model 200 clutch operated pavement cutter will provide long lasting, safe, and reliable service for many years. Different cutter blade configurations allow for cuts from 0.5 to 1.3 inches wide. A selection of cutter blades are available for various applications.

Tricor Pavement Preservation Products

Founded in 1930, the Golden Bear Oil Company, now Tricor Refining, LLC, has been a marketer of naphthenic oils for more than half a century. For more than 40 years, Tricor Refining, LLC has marketed specialized asphalt rejuvenating and recycling oils and emulsions, along with restorative seals, crack fillers and dust retardants. For more information about these products visit tricorrefining.com.

Reclamite® is an asphalt pavement rejuvenating agent used as a fog seal treatment. Reclamite increases penetration values while reducing viscosity values of aged asphalt binders. Reclamite seals out moisture and restores the asphaltene/maltene balance. Reclamite fluxes with the aged binder restoring the aggregate/asphalt bond. Reclamite is spray applied at rates that vary according to pavement absorption and application needs. A typical treatment can provide 5-7 years additional service life and a repeat application can be considered at that time.

CRF® is a petroleum oil and water, cationic emulsion that does not harden or “dry out” as it ages. CRF is designed as a one component emulsion that, in concentrated form, effectively repairs cracks. CRF also provides an excellent pavement restorative seal when applied in diluted form.
CRF Restorative Seal is a modern sand seal product. The sand penetrates the emulsion and provides additional binder strength. This sand/emulsion combination is kneaded by vehicular traffic to provide a long term seal.

Cyclogen recycling oils are used in Hot In-Place Recycling (HIR) and Cold In-Place Recycling (CIR) processes. Cyclogen restores select maltene fractions which have oxidized from the aged asphalt binder thereby re-balancing the asphalt components. Cyclogen increases penetration values/decreases micro viscosity of the existing asphalt binder rejuvenating the binder to provide extended service life to a recycled HMA pavement.

Coherex is a dust retardant that provides a clean and economical dust control. By coating the dust particles, Coherex creates cohesive membranes that attach themselves to adjacent particles resulting in “agglomerates” too heavy to be dislodged by wind. Coherex is also used as a soil stabilizer in the construction of roadway base courses. Added to the compaction/dust control water, Coherex will create a solid, dense, waterproof base. Coherex is a petroleum resin and water emulsion containing no volatiles or cutback solvents.
### Conversion Charts

#### Speed

<table>
<thead>
<tr>
<th></th>
<th>ft/sec</th>
<th>km/hr</th>
<th>m/sec</th>
<th>m/hr</th>
<th>knot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 foot per second</td>
<td>1</td>
<td>1.097</td>
<td>0.348</td>
<td>0.6818</td>
<td>0.5925</td>
</tr>
<tr>
<td>1 kilometer per hour</td>
<td>0.9113</td>
<td>1</td>
<td>0.2778</td>
<td>0.5214</td>
<td>0.5400</td>
</tr>
<tr>
<td>1 meter per second</td>
<td>3.281</td>
<td>3.6</td>
<td>1</td>
<td>2.237</td>
<td>1.944</td>
</tr>
<tr>
<td>1 mile per hour</td>
<td>1.667</td>
<td>1.609</td>
<td>0.4470</td>
<td>1</td>
<td>0.8689</td>
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<tr>
<td>1 knot</td>
<td>1.888</td>
<td>1.852</td>
<td>0.5144</td>
<td>1.151</td>
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</table>

#### Length

<table>
<thead>
<tr>
<th></th>
<th>meter</th>
<th>kilometer</th>
<th>inch</th>
<th>feet</th>
<th>miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 meter</td>
<td>1</td>
<td>1 x 10⁻²</td>
<td>39.37</td>
<td>3.281</td>
<td>6.214 x 10⁻⁴</td>
</tr>
<tr>
<td>1 kilometer</td>
<td>1000</td>
<td>1</td>
<td>3.937 x 10⁴</td>
<td>3281</td>
<td>0.6214</td>
</tr>
<tr>
<td>1 inch</td>
<td>0.0254</td>
<td>2.54 x 10⁻⁴</td>
<td>1</td>
<td>0.0833</td>
<td>1.578 x 10⁻⁴</td>
</tr>
<tr>
<td>1 foot</td>
<td>0.3048</td>
<td>3.048 x 10⁻⁴</td>
<td>12</td>
<td>1</td>
<td>1.894 x 10⁻⁴</td>
</tr>
<tr>
<td>1 mile</td>
<td>1609</td>
<td>1.609</td>
<td>6.336 x 10⁴</td>
<td>5280</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Area

<table>
<thead>
<tr>
<th></th>
<th>m²</th>
<th>cm²</th>
<th>ft²</th>
<th>inch²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 square meter</td>
<td>1</td>
<td>1.0 x 10⁴</td>
<td>10.76</td>
<td>1550</td>
</tr>
<tr>
<td>1 square centimeter</td>
<td>1.0 x 10⁻³</td>
<td>1</td>
<td>1.076 x 10⁻³</td>
<td>0.1550</td>
</tr>
<tr>
<td>1 square foot</td>
<td>9.290 x 10⁻²</td>
<td>929</td>
<td>1</td>
<td>144</td>
</tr>
<tr>
<td>1 square inch</td>
<td>6.452 x 10⁻⁴</td>
<td>6.452</td>
<td>6.944 x 10⁻⁴</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Volume

<table>
<thead>
<tr>
<th></th>
<th>m³</th>
<th>cm³</th>
<th>ft³</th>
<th>inch³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cubic meter</td>
<td>1</td>
<td>1.0 x 10⁶</td>
<td>35.31</td>
<td>6.102 x 10⁴</td>
</tr>
<tr>
<td>1 cubic centimeter</td>
<td>1 x 10⁻⁶</td>
<td>1</td>
<td>3.531 x 10⁻⁵</td>
<td>0.006102</td>
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<tr>
<td>1 cubic foot</td>
<td>2.832 x 10⁻¹</td>
<td>28.320</td>
<td>1</td>
<td>1728</td>
</tr>
<tr>
<td>1 cubic inch</td>
<td>1.639 x 10⁻⁵</td>
<td>16.39</td>
<td>5.787 x 10⁻⁴</td>
<td>1</td>
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</table>
### Mass Conversion Chart

<table>
<thead>
<tr>
<th>Mass Type</th>
<th>gram</th>
<th>kilogram</th>
<th>pound-mass (lbm)</th>
<th>slug</th>
<th>ton - mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 gram</td>
<td>1</td>
<td>1.0 x 10^{-3}</td>
<td>2.205 x 10^{-3}</td>
<td>6.852 x 10^{-5}</td>
<td>1.102 x 10^{-6}</td>
</tr>
<tr>
<td>1 kilogram</td>
<td>1 x 10^3</td>
<td>1</td>
<td>2.205</td>
<td>6.852 x 10^{-2}</td>
<td>1.102 x 10^{-3}</td>
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<tr>
<td>1 pound-mass</td>
<td>4.536 x 10^{-2}</td>
<td>0.4536</td>
<td>1</td>
<td>3.108 x 10^{-2}</td>
<td>5.0 x 10^{-4}</td>
</tr>
<tr>
<td>1 slug</td>
<td>1.459 x 10^4</td>
<td>1.459 x 10^1</td>
<td>3.217 x 10^1</td>
<td>1</td>
<td>1.609 x 10^{-2}</td>
</tr>
<tr>
<td>1 ton - mass</td>
<td>9.072 x 10^5</td>
<td>9.07 x 10^2</td>
<td>2.0 x 10^0</td>
<td>6.216 x 10^{-1}</td>
<td>1</td>
</tr>
</tbody>
</table>

### Force Conversion Chart

<table>
<thead>
<tr>
<th>Force Type</th>
<th>dyne</th>
<th>kgf</th>
<th>lb</th>
<th>pdf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 dyne</td>
<td>1</td>
<td>1.02 x 10^{-6}</td>
<td>1.0 x 10^{-5}</td>
<td>1.0 x 10^{-6}</td>
</tr>
<tr>
<td>1 kilogram force</td>
<td>9.807 x 10^5</td>
<td>9.807</td>
<td>2.205</td>
<td>7093</td>
</tr>
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<td>1 newton</td>
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### Balancing Temperature Conversion Chart

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### Freezing Temperature Conversion Chart

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<tr>
<td>300.00</td>
<td>204.00</td>
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</table>

### Conversion Formulas

**Fahrenheit to Celsius**:  
$$T_c = \left(\frac{5}{9}\right) (T_f - 32)$$

**Celsius to Fahrenheit**:  
$$T_f = \left(\frac{9}{5}\right)T_c + 32$$

**General Conversion Formula**:  
$$T_c = \left(\frac{5}{9}\right)T_f$$  
(Tc = Temperature Celsius, and Tf = Temperature Fahrenheit)
Glossary

**Agg Mix:** A mixture of asphalt emulsion and mineral aggregate prepared in a central mixing plant and spread and compacted while the mixture is at or near ambient temperature.

**Blade Mix:** Application of a mixture of aggregate and asphalt emulsion to a roadway. The emulsion is applied by an asphalt distributor on a flattened wind-row of in-place or imported material. The blade of a motor grader mixes the materials through a series of tumbling and rolling actions and spreads the mix evenly over the pavement. The mix is then compacted.

**Cape Seal:** A multiple surface treatment consisting of an application of a chip seal which is allowed to cure and then broomed before the application of a slurry seal.

**Chip Seal:** A preventive maintenance surface treatment, most commonly involving a single application of asphalt emulsion by a distributor followed by a cover aggregate applied by a chip spreader. The surface is then rolled to seat the aggregate. The all-weather surface renews aging, weathered pavements; improves skid resistance and lane demarcation; and seals and protects the pavement. There are many chip seal variations, including singles, doubles, triples, sandwich, inverted, racked in, etc. Each has its own construction technique and is chosen for a particular purpose. Visit savemyroad.com/educational-series for an in-depth look at the differences between these systems.

**CIR:** A process in which a portion of an existing bituminous pavement is pulverized or milled, sized, and mixed with an asphalt binder or other additive. The resultant blend is placed as a base for a subsequent overlay or surface treatment.

**Crack Fill:** A corrective maintenance technique in which asphalt emulsions are placed into non-working cracks (those with no horizontal movement) to substantially reduce the intrusion of incompressibles and infiltration of water, while also reinforcing the adjacent pavement. Typically there is little, if any, crack preparation prior to treatment.

**Crack Seal:** A preventive maintenance technique in which the crack is carefully prepared (routed, cleaned, dried, backer rod inserted), and a high quality sealant material is placed into working cracks. This reduces the intrusion of incompressible into the crack, and prevents the infiltration of water into the underlying pavement layers.

**Dust Palliative:** A diluted emulsion sprayed directly on an unsurfaced road as a dust control agent.

**Fog Seal:** A light application of diluted emulsion sprayed on an existing asphalt surface to enrich aging, weathered surfaces and reduce raveling. Fog seals are also used to reduce chip loss on chip seals and as a color coating.

**Full Depth Reclamation:** A reclamation technique in which the full flexible pavement section and a predetermined portion of the underlying materials are uniformly crushed, pulverized, or blended, resulting in a stabilized base course; further stabilization may be obtained through the use of available additives.

**HIR:** A process which consists of softening the existing asphalt surface with heat, mechanically removing the surface material, mixing the material with a recycling agent, adding virgin asphalt and aggregate to the material (if required), and then replacing the material on the pavement.
**Micro Surfacing:** A skid-resistant surface treatment composed of a mixture of polymer modified asphalt emulsion, well-graded aggregate, mineral filler, water and other additives, properly proportioned, mixed, and spread on a paved surface. Micro-surfacing cures more quickly than slurry, seal allowing thicker application, rut filling, and quick traffic return on high volume roadways. The maintenance treatment seals and protects the pavement surface.

**Mulch Treatment:** Spray application of an emulsion on soil, straw, or seeded area, leaving a thin membrane to hold hay or straw mulch in place.

**Penetrating Prime:** An application of emulsion to an absorbent surface to prepare an untreated base for an asphalt surface. The prime penetrates or is mixed into the surface of the base and plugs the voids, hardens the top and helps bind it to the overlying asphalt course.

**Recycle Mix:** A mixture produced after processing reclaimed asphalt pavement (RAP) materials with an asphalt emulsion. The recycled mix may be produced by hot or cold mixing at a plant, or by processing the materials cold and in-place.

**Rejuvenator:** A light spray application of diluted recycling emulsion applied to an existing asphalt pavement to restore the chemical balance and desired physical properties of the surface asphalt.

**Sand Seal:** A preventive maintenance surface treatment consisting of a spray application of asphalt emulsion followed with a light covering of fine aggregate, such as clean sand or screenings. The sand seal protects and seals the pavement.

**Sandwich Seal:** A surface treatment that consists of the application of asphalt emulsion and a large aggregate, followed by a second application of asphalt emulsion that is in turn covered with smaller aggregate and compacted. Sandwich seals are used to seal the surface and improve skid resistance, especially on asphalt pavement surfaces that are bleeding or flushing.

**Seal Coat:** A thin surface treatment to improve surface texture and protect an asphalt surface. Surface treatments include fog seals, sand seals, slurry seals, micro-surfacing, cape seals and sandwich seals. The terms “seal coat” and “chip seal” are sometimes used interchangeably.

**Slurry Seal:** A preventive or corrective maintenance surface treatment composed of a mixture of dense-graded aggregate, emulsified asphalt, mineral fillers, additives and water. The slurry seal improves surface texture, and seals and protects the pavement.

**Tack Coat:** A light application of diluted asphalt emulsion used to ensure a bond between two pavement layers.

**Warm or Hot Emulsion Mix:** A mixture of asphalt emulsion and mineral aggregate usually prepared in a conventional hot mix asphalt plant at a temperature less than 260°F (125°C). It is typically spread and compacted at a temperature above 200°F (95°C).
**Application: Blade Mixing**

**Recommended Emulsion(s):** See product application chart for your location.

**Recommended Application Rate:** Contingent Upon Mix Design

**Description:** Blade Mixing is a process of mixing emulsion and aggregate in the windrow using a motorgrader and/or cross shaft mixer. The motorgrader and/or cross shaft mixer blends the material together by a series of turning and tumbling actions. When using a motorgrader, the moldboard must be adjusted to give a rolling action as the blade moves through the windrow. After mixing is completed, the windrow should be moved to the side of the road in preparation for spreading.

**Notes:** A mix design must be completed before attempting blade mixing to determine the emulsion required.
Application: 3/8” Chip Seal

**Recommended Emulsion(s):** See product application chart for your location.

**Recommended Application Rate:** .36 to .40 gallons per square yard, depending on surface conditions.

**Description:** A single or multiple application of emulsion to a road surface, immediately followed by a single or multiple layer of aggregate of as uniform size as practical. The thickness of the chip seal is about the same as the nominal maximum size aggregate. A single chip is used as a wearing and waterproofing course, while a double chip seal provides a denser wearing and waterproofing course.

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<tr>
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<th>10’ Wide</th>
<th>12’ Wide</th>
<th>14’ Wide</th>
<th>16’ Wide</th>
<th>18’ Wide</th>
<th>20’ Wide</th>
<th>22’ Wide</th>
<th>24’ Wide</th>
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| 26 Lbs Per | 8’ Wide | 10’ Wide | 12’ Wide | 14’ Wide | 16’ Wide | 18’ Wide | 20’ Wide | 22’ Wide | 24’ Wide | 26’ Wide | 28’ Wide | 30’ Wide |
| Square Yard | 76.08 | 91.56 | 107.04 | 122.52 | 138.00 | 153.48 | 168.96 | 184.44 | 200.92 | 217.40 | 233.88 | 250.36 |
| 28 Lbs Per | 8’ Wide | 10’ Wide | 12’ Wide | 14’ Wide | 16’ Wide | 18’ Wide | 20’ Wide | 22’ Wide | 24’ Wide | 26’ Wide | 28’ Wide | 30’ Wide |
| Square Yard | 66.08 | 82.00 | 98.92 | 115.84 | 131.76 | 147.68 | 163.60 | 179.52 | 195.44 | 211.36 | 227.28 | 243.20 |
Application: 5/8” Chip Seal

**Recommended Emulsion(s):** See product application chart for your location.

**Recommended Application Rate:** .40 to .45 gallons per square yard, depending on surface conditions.

**Description:** A single or multiple application of emulsion to a road surface, immediately followed by a single or multiple layer of aggregate of as uniform size as practical. The thickness of the chip seal is about the same as the nominal maximum size aggregate. A single chip is used as a wearing and waterproofing course, while a double chip seal provides a denser wearing and waterproofing course.
**Application: Dust Control**

**Recommended Emulsion(s):** See product application chart for your location.

**Recommended Application Rate:** .10 to .50 gallons per square yard, depending upon surface conditions.

**Description:** The use of emulsions offers a practical and feasible solution to dust control. A diluted emulsion is sprayed directly on the unpaved surface. The material is applied with a distributor, using usual spray application techniques.

---

### Dust Control

<table>
<thead>
<tr>
<th>SHOT RATE</th>
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<th>10’ Wide</th>
<th>12’ Wide</th>
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<td>3,050</td>
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**Square Yards Per Mile**

**Gallons Required Per Mile**
Application: Fog Seal

Recommended Emulsion(s): See product application chart for your location.

Recommended Application Rate: .10 to .20 gallons per square yard, depending on surface conditions.

Description: A fog seal is a light application of slow-setting emulsion diluted with water. It is used to renew old asphalt surfaces, seal small cracks and surface voids and to inhibit raveling.
Application: Prime Coat

**Recommended Emulsion(s):** See product application chart for your location.

**Recommended Application Rate:** .10 to .30 gallons per square yard, depending upon surface conditions.

**Description:** A prime coat is an application of low viscosity emulsion to a granular base in preparation for a chip seal or asphalt surface course. The prime coat is designed to coat and bond loose particles on the base, harden the surface, waterproof the base, plug voids and provide adhesion between the base and the next course.

<table>
<thead>
<tr>
<th>SHOT RATE</th>
<th>8' Wide</th>
<th>10' Wide</th>
<th>12' Wide</th>
<th>14' Wide</th>
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Square Yards Per Mile

Gallons Required Per Mile

Ergon Field Guide to Emulsions 112

Ergon Field Guide to Emulsions 113
Application: Tack Coat

**Recommended Emulsion(s):** See product application chart for your location.

**Recommended Application Rate:** .05 to .20 gallons per square yard, depending upon surface conditions.

**Description:** A tack coat is a very light application, used to ensure a bond between a surface being paved and the new course.

**Notes:** The tack coat is diluted by adding an equal part of water to the emulsion.

---

### Tack Coat

<table>
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<th>Shot Rate</th>
<th>6' Wide</th>
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<thead>
<tr>
<th>Gallons Required Per Mile</th>
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<td>12,407</td>
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Key Websites

American Association of State Highway Transportation Officials—AASHTO
aashto.org

American Highway Users Alliance—AHUA
highways.org

American Public Works Association—APWA
apwa.net

American Road & Transportation Builders Association—ARTBA
artba.org

American Society for Civil Engineers—ASCE
asce.org

American Society for Testing and Material—ASTM
astm.org

Asphalt Education Partnership—AEP
beyondroads.com

Asphalt Emulsion Manufacturers Association—AEMA
aema.org

Asphalt Institute—AI
asphaltinstitute.org

Asphalt Recycling & Reclaiming Association—ARRA
arra.org

Associated General Contractors—AGC
agc.org

Canadian Technical Asphalt Association—CTAA
ctaa.ca

Federal Highway Administration—FHWA
fhwa.dot.gov

FHWA Construction & Maintenance—FHWA
fhwa.dot.gov/construction

FHWA Pavement Technology—FHWA
fhwa.dot.gov/pavement

FHWA Tech Applications Program—FHWA
dot.gov/dotinfo/fhwa/hta/fhwahta.html

FHWA Transportation System Preservation—FHWA
fhwa.dot.gov/preservation

Foundation for Pavement Preservation—FP2
fp2.org

International Bitumen Emulsion Federation—IBEF
ibef.net

International Road Federation—IRF
irfnet.org

International Slurry Surfacing Association—ISSA
slurry.org

National Asphalt Pavement Association—NAPA
hotmix.org

National Association of County Engineers—NACE
countyengineers.org

National Center for Pavement Preservation—NCPP
pavementpreservation.org

National Transportation Library—NTL
ntl.bts.gov/index.cfm
Notes