FIELD GUIDE TO EMULSIONS

ERGON

TENTH 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 “cutback” 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 (AEMA) 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 of 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.
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 binder. 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 district 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 55-75% 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 lignins 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.

**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 & 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 cutback asphalt primes, emulsion primes are more environmentally friendly. Solventless 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 to 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 to 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 FDR?
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 other 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 less water use 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 mixes.

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 less expensive to operate, simpler to use, and are more mobile than hot mix plants; emulsion mixes also lend themselves to on-site and in-place manufacturing. The ability to stockpile cold mix 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.
The e-Series

Ergon Asphalt & Emulsions’ exclusive e-Series products are designed for use in pavement preservation and maintenance applications to ensure optimal road performance. These products have been tested and proven to provide significant performance improvements over their conventional counterparts. Products include eFog, eFlex, eFlex ES, eScrub, ePatch, ePrime, eTac and eTac HB.

What is eFog Rejuvenating Fog Seal?
eFog is a rejuvenating fog seal developed to correct more severe distresses than a conventional fog seal — offering extended lifecycles for open-graded friction courses, dense-graded mixes and aged chip seal surfaces. Its unique polymer modification provides a more dense film thickness for increased durability and resistance to tracking. Its darker color makes striping more visible increasing the safety.

What is eFlex Premium Micro Surfacing?
eFlex premium micro surfacing is significantly tougher than conventional micro surfacing systems due to its increased level of polymer modification. eFlex provides a higher degree of tolerance to extreme temperatures as well as protection against distress typically seen soon after conventional micro surfacing applications, including power steering damage and other distress caused by passenger and utility vehicles. eFlex also provides long-term protection from activities such as snowplowing. It can be applied using Type II and Type III aggregate and is suitable for use on all road types.

What is eScrub Rejuvenating Chip Seal?
eScrub is a rejuvenating chip seal designed as a mass crack sealer to correct moderate to severely cracked roads. It renews surface friction and increases overall pavement quality. eScrub is a far less costly alternative to traditional remove and replace methods, and it can be used as a stress absorbing interlayer as well as the first course of a cape seal application.

What is ePatch High-Performance Cold Mix?
ePatch is a high-performance cold mix that offers increased durability over conventional cold mix products. The advanced formulation ensures patches stay fixed longer and require less maintenance. ePatch stays mobile for months, extending stockpile life and allowing continued use over time and projects. ePatch can be produced at a hot mix plant or via a pug mill operation.

What is ePrime Eco-Friendly Prime Coat?
ePrime is an environmentally friendly, solvent free (no VOCs) prime coat developed to safeguard the road base from moisture during the construction phase, its most vulnerable period. A quick cure allows for same-day paving as opposed to the 3- to 5-day waiting period required after a traditional prime coat application.
What is eTac Bond Coat?
eTac is a premium bond coat emulsion that is storage stable and provides excellent compatibility between pavement layers, creating a strong, long-lasting bond. eTac’s trackless quality makes it an extremely user-friendly bond coat of choice. eTac HB is Ergon A&E’s hot-applied asphalt bond coat and sister product of the eTac emulsion. Both products are designed to optimize production and reduce cleanup efforts during and after construction.
Alabama Locations & Product Applications

- Product is available at this location

<table>
<thead>
<tr>
<th>Location</th>
<th>CHIP SEAL SINGLE</th>
<th>CHIP SEAL MULTIPLE</th>
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<th>COLD PATCH</th>
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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. If the product you want is not marked as available in your area, please contact the sales manager.*

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**WEBSITES**

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

Product is available at this location

CHANDLER

**REJUVENATING SCRUB SEAL**

**CHIP SEAL SINGLE**

**CHIP SEAL MULTIPLE**

**SAND SEAL**

**SLURRY SEAL**

**MICRO SURFACING**

**CRACK FILL**

**FDR**

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WEBSITES

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

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## Arkansas Contact Information

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### WEBSITES

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

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Fontana, CA 92337

WEBSITES

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Florida Locations & Product Applications

产品在此位置可用

产品：
- TAMPA

- CR-6
- CS-1H
eFlex
eFog
ePatch
eTac
- RC-70/250
- RS-1H
- RS-2
- Special MS
- SS-1
- SS-1H

- CHIP SEAL SINGLE
- CHIP SEAL MULTIPLE
- SAND SEAL
- SLURRY SEAL
- MICRO SURFACING
- CRACK FILL
- FDR
- UTBWC
- CAPE SEAL
- REJUVENATING CHIP SEAL
- DUST PALLIATIVE
- FOG SEAL
- REJUVENATING FOG SEAL
- TACK COAT
- REJUVENATOR
- PENETRATING PRIME
- RECYCLE MIX
- HOT IN-PLACE RECYCLE
- COLD IN-PLACE RECYCLE
- COLD PATCH

**注意：**大多数乳液可以用于多种应用。请与区域销售经理联系以获取更多信息。如果产品在您的区域内未标示为可用，请联系销售经理。

Florida Contact Information

**TAMPA**

- Facility Telephone: 813-574-8340
- Facility Fax: 813-626-4103
- Facility Address: 5201 Causeway Blvd
  Tampa, FL 33619-6125

- Area Sales Manager: Joey Gelwix
- Sales Office Telephone: 813-695-0345
- Sales Office Fax: N/A
- Sales Office Address: 5201 Causeway Blvd
  Tampa, FL 33619-6125

**WEBSITES**

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### Georgia Locations & Product Applications

<table>
<thead>
<tr>
<th>Location</th>
<th>Product Applications</th>
</tr>
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<tbody>
<tr>
<td>CONLEY</td>
<td>REJUVENATING SCRUB SEAL, CHIP SEAL SINGLE, CHIP SEAL MULTIPLE, SAND SEAL, SLURRY SEAL, MICRO SURFACING, CRACK FILL, FDR, UTBWC, CAPE SEAL, REJUVENATING CHIP SEAL, DUST PALLIATIVE, FOG SEAL, REJUVENATING FOG SEAL, TACK COAT, REJUVENATOR, PENETRATING PRIME, RECYCLE MIX, HOT IN-PLACE RECYCLE, COLD IN-PLACE RECYCLE, COLD PATCH</td>
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<tr>
<td>GARDEN CITY</td>
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</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.*
<table>
<thead>
<tr>
<th>Facility</th>
<th>Manager Name</th>
<th>Telephone</th>
<th>Fax</th>
<th>Address</th>
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</thead>
<tbody>
<tr>
<td>Garden City</td>
<td>Neel Stewart</td>
<td>912-964-0811</td>
<td>912-964-0009</td>
<td>14 Foundation Drive, Garden City, GA 31408</td>
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<tr>
<td></td>
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<td>850-255-8007</td>
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<tr>
<td>Area Sales Manager</td>
<td>Bill Evans</td>
<td>706-975-9339</td>
<td>706-648-3704</td>
<td>120 Jay Dee Road, Thomaston, GA 30286</td>
</tr>
<tr>
<td>Conley</td>
<td>Dexter Davis</td>
<td>404-494-6698</td>
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<td>1577 Koppers Road, Conley, GA 30288</td>
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<tr>
<td></td>
<td>Bill Evans</td>
<td>706-975-9339</td>
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<td>120 Jay Dee Road, Thomaston, GA 30286</td>
</tr>
</tbody>
</table>

**WEBSITES**

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- savemyroad.com

**KANSAS**
Kansas Locations & Product Applications

| Product is available at this location | DODGE CITY | EL DORADO | SALINA |

|   | AEP | ARA | ARA-1P | ARA-2P | CHFRS-2P | CMS-1 | COS-1F | COS-1H | CRS-1H | CRS-1HM | CRS-1S | CRS-2 | CRS-2P | CRS-2S | CSS Special | CSS-1H | CSS-1HMP | CSS-1HP | CSS-1HM | CSS-1HMMP | CSS-1HMHP | CSS-1HMHP | CSS-1HMPHP | CSS-2HMP | CSS-2HMHP | CSS-2HMHP | CSS-2HMPHP | CSS-2HMHPHP | CSS-2HMPHPHP | CSS-2HMPHPHPHP |
| REJUVENATING SCRUB SEAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CHIP SEAL SINGLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CHIP SEAL MULTIPLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAND SEAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLURRY SEAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MICRO SURFACING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRACK FILL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UTBWC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CAPE SEAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REJUVENATING CHIP SEAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DUST PALLIATIVE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FOGL SEAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REJUVENATING FOGL SEAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TACK COAT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REJUVENATOR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PENETRATING PRIME | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RECYCLE MIX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HOT IN-PLACE RECYCLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COLD IN-PLACE RECYCLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COLD PATCH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Kansas Contact Information

**DODGE CITY**

Facility Manager: Gary Shouse  
Facility Telephone: 620-225-2264  
Facility Fax: 620-225-1261  
Facility Address: 2600 Butter & Egg Road  
Dodge City, KS 67801

Area Sales Manager: Doug Francis  
Sales Office Telephone: 785-577-2615  
Sales Office Fax: 785-246-8157  
Sales Office Address: 630 South Donmyer Road  
Solomon, KS 67480

**EL DORADO**

Facility Manager: Gregg Lewis  
Facility Telephone: 316-321-6760  
Facility Fax: 316-321-2609  
Facility Address: 800 East 10th Street  
El Dorado, KS 67042

Area Sales Manager: Larry Reddick  
Sales Office Telephone: 913-553-9504  
Sales Office Fax: 316-321-2609  
Sales Office Address: 10416 Caenen Drive  
Overland Park, KS 66215

**SALINA**

Facility Manager: Bob Northcutt  
Facility Telephone: 785-825-1535  
Facility Fax: 785-825-8189  
Facility Address: 1100 West Grand Avenue  
Salina, KS 67401

Area Sales Manager: Larry Reddick  
Sales Office Telephone: 913-553-9504  
Sales Office Fax: 785-825-8189  
Sales Office Address: 10416 Caenen Drive  
Overland Park, KS 66215

**WEBSITES**

ergonasphalt.com  
savemyroad.com
Mississippi Locations & Product Applications

<table>
<thead>
<tr>
<th>Facility Manager:</th>
<th>Bill Hoxie</th>
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<tbody>
<tr>
<td>Facility Telephone:</td>
<td>601-630-8343</td>
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<tr>
<td>Facility Fax:</td>
<td>601-630-8347</td>
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<tr>
<td>Facility Address:</td>
<td>2611 Haining Road Vicksburg, MS 39181</td>
</tr>
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</table>

Area Sales Manager – LA: Mark Hartman
Sales Telephone: 225-397-8143
Sales Office Fax: 601-933-3363
Sales Office Address: 16160 Confederate Avenue Baton Rouge, LA 70817

Area Sales Manager – MS: Seth Spiers
Sales Telephone: 601-933-3167
Sales Office Fax: 601-933-3363
Sales Office Address: P.O. Box 1639 Jackson, MS 39215-1639

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

- Product is available at this location

**LAS VEGAS**

Facility Manager: Michael Holst  
Facility Telephone: 702-736-2059  
Facility Fax: 702-739-9232  
Facility 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

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savemyroad.com

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New Mexico Locations & Product Applications

Product is available at this location

<table>
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<tr>
<th>MATERIALS</th>
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<td>CMS-2P</td>
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<td>COS-1H</td>
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<td>CQS-1H-5% Latex</td>
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<td>PMRE</td>
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<td>SS-3H</td>
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</table>

Chip Seal Single
- 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

Chip Seal Multiple
- Combination or specialty applications

Rejuvenating Scrub Seal
- Emulsion is applied to the roadway or surface without any cover material

Slurry Seal
- Emulsion is mixed with aggregate and then the mix is stored or placed on the road

Micro Surfacing
- Combination or specialty applications

Crack Fill
- Emulsion is sprayed on the road and then covered with aggregate, can fill cracks

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

UTBWC
- Combination or specialty applications

Cape Seal
- Emulsion is applied to the roadway or surface without any cover material

Rejuvenating Chip Seal
- Emulsion is mixed with aggregate and then the mix is stored or placed on the road

Dust Palliative
- Combination or specialty applications

FOG Seal
- Emulsion is applied to the roadway or surface without any cover material

Rejuvenating Fog Seal
- Emulsion is mixed with aggregate and then placed on road, can fill some cracks

Tack Coat
- Combination or specialty applications

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

Penetrating Prime
- Emulsion is mixed with aggregate and then placed on road, can fill some cracks

Recycle Mix
- Combination or specialty applications

HOT in-Place Recycle
- Combination or specialty applications

COLD in-Place Recycle
- Combination or specialty applications

Cold Patch
- Combination or specialty applications

New Mexico Contact Information

**ROSWELL**

Facility Manager: Juan Miranda
Facility Telephone: 575-347-9727
Cell Phone: 520-404-7346
Facility Fax: 575-347-9896
Facility Address: 49 East Martin Street
Roswell, NM 88203

Area Sales Manager: Ralph Meeks
Sales Office Telephone: 575-347-9727
Cell Phone: 505-508-9790
Sales Office Fax: 575-347-9896
Sales Office Address: 49 East Martin Street
Roswell, NM 88203

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### Oklahoma Locations & Product Applications

<table>
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<tr>
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<tr>
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<tr>
<td>Catoosa</td>
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<tr>
<td>lawton</td>
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### Oklahoma Contact Information

#### ARDMORE
- **Facility Manager:** Kelley Smith
- **Facility Telephone:** 580-223-8010
- **Cell Phone:** 580-504-8123
- **Facility Fax:** 580-223-9657
- **Facility 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
- **Facility Manager:** David Belcher
- **Facility Telephone:** 918-266-7070
- **Facility Fax:** 918-266-1417
- **Facility 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

Facility Manager: Rick Mann
Facility Telephone: 580-536-0098
Facility Fax: 580-536-0684
Facility 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

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## Tennessee Locations & Product Applications

- **Product is available at this location**

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<th>AE-3 Mod</th>
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<th>CP-1</th>
<th>COS-1H</th>
<th>CRS-2P</th>
<th>CRS-2</th>
<th>CSS-1</th>
<th>CSS-1H</th>
<th>CSS-1 HP</th>
<th>e-Fog</th>
<th>e-Patch</th>
<th>e-Scrub</th>
<th>e-Tac</th>
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</table>

### Product Applications

- **Rejuvenating Scrub Seal**
- **Chip Seal Single**
- **Chip Seal Multiple**
- **Sand Seal**
- **Slurry Seal**
- **Micro Surfacing**
- **Crack Fill**
- **FDR**
- **UTBWC**
- **CAPE Seal**
- **Rejuvenating Chip Seal**
- **Dust Palliative**
- **FOG Seal**
- **Rejuvenating FOG Seal**
- **Tack Coat**
- **Rejuvenator**
- **Penetrating Prime**
- **Recycle Mix**
- **Hot In-Place Recycle**
- **Cold In-Place Recycle**
- **Cold Patch**

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Tennessee Contact Information

COLUMBIA

Emulsion Facility Manager: Mark Jackson
Facility Telephone: 931-325-5400
Facility Fax: 931-325-5404
Facility Address: 1251 N. Main Street
Mt. Pleasant, TN 38474

Area Sales Manager: Mark Clark
Sales Office Telephone: 731-549-5692

Tennessee Sales: Mark Clark
Sales Telephone: 731-549-5692

MEMPHIS

Emulsion Facility Manager: Tim Breeding
Facility Telephone: 901-947-5800
Facility Fax: 901-774-4562
Facility Address: 1989 Channel Avenue
Memphis, TN 38113

Area Sales Manager: Mark Clark
Sales Office Telephone: 731-549-5692

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

Mississippi Sales: Bear Horne
Sales Telephone: 901-619-9229

PARSONS

Facility Manager: Russell Carrington
Facility Telephone: 731-847-6351
Facility Fax: 731-847-2315
Facility Address: 5445 Highway 412 East
Parsons, TN 38363

Area Sales Manager: Mark Clark
Sales Office Telephone: 731-549-5692
Sales Office Fax: 731-847-2315
Sales Office Address: 5445 Highway 412 East
Parsons, TN 38363

WEBSITES

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**Texas Locations & Product Applications**

<table>
<thead>
<tr>
<th>Product is available at this location</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUSTIN</td>
</tr>
<tr>
<td>MOUNT PLEASANT</td>
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</table>

| **Emulsion**               | AEP | AES-300 | ARA-1 | Axys | CBC-1H | CHFRS-2P | CMS-1PC | CMS-1PF | CMS-23 | CMS-1HLM | CMS-1HT | CMS-2H | CSS-1PC | CSS-1PF | CMS-2S | CSS-2H | CMS-2P | CSS-1 |
|---------------------------|-----|---------|-------|------|--------|----------|---------|---------|--------|----------|---------|--------|---------|---------|--------|--------|--------|--------|--------|
| **REJUVENATING SCRUB SEAL** |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **CHIP SEAL SINGLE**      |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **CHIP SEAL MULTIPLE**    |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **SAND SEAL**             |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **SLURRY SEAL**           |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **MICRO SURFACING**       |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **MASTIC SURFACE**        |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **FRICIONAL MASTIC SURFACE** |   |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **CRACK FILL**            |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **FDR**                   |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **UTBWC**                 |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **CAPE SEAL**             |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **REJUVENATING CHIP SEAL** |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **DUST PALLIATIVE**       |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **FOG SEAL**              |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **REJUVENATING FOG SEAL** |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **TACK COAT**             |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **REJUVENATOR**           |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **PENETRATING PRIME**     |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **RECYCLE MIX**           |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **HOT IN-PLACE RECYCLE**  |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **COLD IN-PLACE RECYCLE** |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |
| **COLD PATCH**            |     |         |       |      |        |          |         |         |        |          |         |        |         |         |        |        |        |        |        |

*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.*
**AUSTIN**

Facility Manager: John Wenz  
Facility Telephone: 512-345-0975  
Facility Fax: 512-345-8348  
Facility Address: 8803 North Mopac Expressway  
Austin, TX 78759  

Area Sales Manager: Cody Chambliss  
Sales Office Telephone: 512-618-5313  
Sales Office Fax: 512-618-1945  
Sales Office Address: 11612 RM 2244  
Building 1, Suite 250  
Austin, TX 78738

**CORPUS CHRISTI**

Facility Manager: Calvin Brown  
Facility Telephone: 361-289-6147  
Facility Fax: 361-289-8297  
Facility Address: 6746 Up River Road  
Corpus Christi, TX 78409  

Area Sales Manager: Ernesto Santillan  
Sales Office Telephone: 361-271-6465  
Sales Office Fax: 512-469-0391  
Sales Office Address: 11612 RM 2244  
Building 1, Suite 250  
Austin, TX 78738

**LUBBOCK**

Facility Manager: Jake Neitsch  
Facility Telephone: 806-589-4850  
Facility Fax: 806-744-0369  
Facility Address: 1611 Marshall Street  
Lubbock, TX 79403  

Area Sales Manager: Tracy Cumby  
Sales Office Telephone: 806-549-5133  
Sales Office Fax: 806-368-6659  
Sales Office Address: 10506 Hartford Avenue  
Lubbock, TX 79423

**MOUNT PLEASANT**

Facility Manager: Alvin Alexadner  
Facility Telephone: 512-469-9292  
Cell Phone: 806-983-0490  
Sales Office Telephone: 806-983-0490  
Sales Office Fax: 512-469-9292  
Sales Office Address: 10506 Hartford Avenue  
Lubbock, TX 79423

Area Sales Manager: Tom O'Leary  
Sales Office Telephone: 318-426-3708  
Sales Office Fax: 512-469-0391  
Sales Office Address: 11612 RM 2244  
Building 1, Suite 250  
Austin, TX 78738
Texas Contact Information

PLEASANTON
Facility Manager: Johnny Martinez
Facility Telephone: 830-569-8731
Facility Fax: 830-569-6043
Facility Address: 907 Second Street
Pleasanton, TX 78064
Area Sales Manager: Cody Chambliss
Sales Office Telephone: 512-618-5313
Sales Office Fax: 512-469-0391
Sales Office Address: 11612 RM 2244
Building 1, Suite 250
Austin, TX 78738
Area Sales Manager: Ernesto Santillan
Sales Office Telephone: 361-271-6465
Sales Office Fax: 512-469-0391
Sales Office Address: 11612 RM 2244
Building 1, Suite 250
Austin, TX 78738

SAGINAW
Facility Manager: Nathan Swearingen
Facility Telephone: 817-232-3658
Facility Fax: 817-847-0657
Facility Address: 600 Minton Road
Saginaw, TX 76179
Area Sales Manager: Patrick Coyle
Sales Office Telephone: 817-379-9451
Sales Office Fax: 817-379-9432
Sales Office Address: 10381 Alta Vista Road, Suite 137
Fort Worth, TX 76244

SAN ANTONIO
Facility Manager: Ken Mogenson
Facility Telephone: 210-521-2730
Facility Fax: 830-569-6043
Facility Address: 9960 Braun Road
San Antonio, TX 78254
Area Sales Manager: David Kopp
Sales Office Telephone: 830-708-6647
Sales Office Fax: 512-469-0391
Sales Office Address: 11612 RM 2244
Building 1, Suite 250
Austin, TX 78738

TEMEPLE
Facility Manager: Danny Leal
Facility Telephone: 254-773-8040
Facility Address: 4648 Western Way
Temple, TX 76504
Texas Regional Manager: David Stroud
Sales Office Telephone: 254-773-8040
Sales Office Address: 4648 Western Way
Temple, TX 76504

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 larger volume use.
- Dilute medium and slow-setting emulsions by adding warm water to the emulsion.
- Provide adequate ventilation.

**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.
- Subject emulsion or the open air above it to open flame or strong oxidants. Never heat the emulsion over 190°F (88°C).
• 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.
• 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.

<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 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.

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 & Health

<table>
<thead>
<tr>
<th>Last Product in Tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product to be Loaded</td>
</tr>
<tr>
<td>Asphalt Cement (includes Industrial Asphalt)</td>
</tr>
<tr>
<td>Cationic Emulsion</td>
</tr>
<tr>
<td>Anionic Emulsion</td>
</tr>
<tr>
<td>Asphalt Cement</td>
</tr>
</tbody>
</table>

Are there any health or safety precautions that should be exercised when using asphalt emulsions?
Avoid breathing fumes, vapors, and/or 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 website at ergonasphalt.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.
6165 W. Detroit Street
Chandler, Arizona 85226
sales@crafco.com
602-276-0406 ext 8023

Crafco Pavement Preservation Products

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 customers with the most comprehensive line of pavement preservation products available. Crafco’s engineering and understanding of the industry sets 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 workhorses of melter/applicators in the pavement preservation industry, and are the industry standards. 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 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 0.5-1.3 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 maltenes fractions which have oxidized from the aged asphalt binder thereby rebalancing the asphalt components. Cyclogen increases penetration values and decreases microviscosity of the existing asphalt binder rejuvenating the binder to provide extended service life to a recycled hot mix asphalt 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 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

<table>
<thead>
<tr>
<th>Pressure</th>
<th>atm</th>
<th>inches of water</th>
<th>cm of Hg</th>
<th>N/m²</th>
<th>lb/in² (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 atmosphere</td>
<td>1</td>
<td>4.068 x 10²</td>
<td>7.6 x 10¹</td>
<td>1.013 x 10²</td>
<td>1.470 x 10¹</td>
</tr>
<tr>
<td>1 inch of water</td>
<td>2.458 x 10⁻³</td>
<td>1</td>
<td>0.1868</td>
<td>2.491 x 10⁻²</td>
<td>3.613 x 10⁻²</td>
</tr>
<tr>
<td>1 cm of water</td>
<td>1.316 x 10⁻²</td>
<td>5.353</td>
<td>1</td>
<td>1.333 x 10⁻³</td>
<td>0.1934</td>
</tr>
<tr>
<td>1 newton/m²</td>
<td>9.869 x 10⁻⁶</td>
<td>4.105 x 10⁻³</td>
<td>7.501 x 10⁻⁴</td>
<td>1</td>
<td>1.450 x 10⁻⁴</td>
</tr>
<tr>
<td>1 lb/in²</td>
<td>6.805 x 10⁻²</td>
<td>2.768 x 10⁻¹</td>
<td>5.17</td>
<td>6.895 x 10⁻³</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Density</th>
<th>slug/ft³</th>
<th>lbm/ft³</th>
<th>lbm/in³</th>
<th>kg/m³</th>
<th>g/cm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 slug per ft³</td>
<td>1</td>
<td>3.217 x 10¹</td>
<td>1.862 x 10⁻²</td>
<td>5.154 x 10⁻²</td>
<td>0.5154</td>
</tr>
<tr>
<td>1 pound - mass per ft³</td>
<td>3.108 x 10⁻²</td>
<td>1</td>
<td>5.787 x 10⁻⁴</td>
<td>1.602 x 10⁻¹</td>
<td>1.602 x 10⁻²</td>
</tr>
<tr>
<td>1 pound - mass per inch³</td>
<td>5.371 x 10⁻¹</td>
<td>1.728 x 10⁻³</td>
<td>1</td>
<td>2.768 x 10⁻⁴</td>
<td>2.768 x 10⁻⁵</td>
</tr>
<tr>
<td>1 kilogram per meter³</td>
<td>1.940 x 10⁻⁴</td>
<td>6.243 x 10⁻⁵</td>
<td>3.613 x 10⁻⁵</td>
<td>1</td>
<td>1 x 10⁻¹</td>
</tr>
<tr>
<td>1 gram per centimeter³</td>
<td>1.940</td>
<td>6.243 x 10⁻¹</td>
<td>3.613 x 10⁻³</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
### Conversion Charts

#### Length

<table>
<thead>
<tr>
<th>Length</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>$1 \times 10^{-3}$</td>
<td>39.37</td>
<td>3.281</td>
<td>$6.214 \times 10^{-4}$</td>
</tr>
<tr>
<td>1 kilometer</td>
<td>1000</td>
<td>1</td>
<td>$3.937 \times 10^{4}$</td>
<td>3281</td>
<td>0.6214</td>
</tr>
<tr>
<td>1 inch</td>
<td>0.00254</td>
<td>$2.54 \times 10^{-5}$</td>
<td>1</td>
<td>0.0833</td>
<td>$1.578 \times 10^{-5}$</td>
</tr>
<tr>
<td>1 foot</td>
<td>0.3048</td>
<td>$3.048 \times 10^{-4}$</td>
<td>12</td>
<td>1</td>
<td>$1.894 \times 10^{-4}$</td>
</tr>
<tr>
<td>1 mile</td>
<td>1609</td>
<td>1.609</td>
<td>$6.336 \times 10^{4}$</td>
<td>5280</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Speed

<table>
<thead>
<tr>
<th>Speed</th>
<th>ft/sec</th>
<th>km/hr</th>
<th>m/sec</th>
<th>mi/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>0.6214</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>1.467</td>
<td>1.609</td>
<td>0.4470</td>
<td>1</td>
<td>0.8689</td>
</tr>
<tr>
<td>1 knot</td>
<td>1.688</td>
<td>1.852</td>
<td>0.5144</td>
<td>1.151</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Area

<table>
<thead>
<tr>
<th>Area</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>$1.0 \times 10^{4}$</td>
<td>10.76</td>
<td>1550</td>
</tr>
<tr>
<td>1 square centimeter</td>
<td>$1.0 \times 10^{-4}$</td>
<td>1</td>
<td>$1.076 \times 10^{-3}$</td>
<td>0.1550</td>
</tr>
<tr>
<td>1 square foot</td>
<td>$9.290 \times 10^{-2}$</td>
<td>929</td>
<td>1</td>
<td>144</td>
</tr>
<tr>
<td>1 square inch</td>
<td>$6.452 \times 10^{-4}$</td>
<td>6.452</td>
<td>$6.944 \times 10^{-3}$</td>
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#### Volume

<table>
<thead>
<tr>
<th>Volume</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>$1.0 \times 10^{6}$</td>
<td>35.31</td>
<td>$6.102 \times 10^{4}$</td>
</tr>
<tr>
<td>1 cubic centimeter</td>
<td>$1 \times 10^{-6}$</td>
<td>1</td>
<td>$3.531 \times 10^{-5}$</td>
<td>0.06102</td>
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<tr>
<td>1 cubic foot</td>
<td>$2.832 \times 10^{-3}$</td>
<td>28.320</td>
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<td>1728</td>
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<tr>
<td>1 cubic inch</td>
<td>$1.639 \times 10^{-5}$</td>
<td>16.39</td>
<td>$5.787 \times 10^{-4}$</td>
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### Conversion Charts

#### Mass Conversion

<table>
<thead>
<tr>
<th>Mass</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>
</tr>
<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^-3</td>
<td>6.216 x 10^-1</td>
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#### Force Conversion

<table>
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<tr>
<th>Force</th>
<th>dyne</th>
<th>kgf</th>
<th>N</th>
<th>lb</th>
<th>pdf</th>
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<tbody>
<tr>
<td>1 dyne</td>
<td>1</td>
<td>1.020 x 10^-6</td>
<td>1.0 x 10^-5</td>
<td>2.248 x 10^-5</td>
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<tr>
<td>1 kilogram force</td>
<td>9.807 x 10^5</td>
<td>1</td>
<td>9.807</td>
<td>2.205</td>
<td>7093</td>
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<tr>
<td>1 newton</td>
<td>1.0 x 10^5</td>
<td>0.1020</td>
<td>1</td>
<td>0.2248</td>
<td>7.233</td>
</tr>
<tr>
<td>1 pound</td>
<td>4.448 x 10^5</td>
<td>0.4536</td>
<td>4.448</td>
<td>1</td>
<td>32.17</td>
</tr>
<tr>
<td>1 poundal</td>
<td>1.383 x 10^4</td>
<td>1.410 x 10^-2</td>
<td>0.1383</td>
<td>3.108 x 10^-2</td>
<td>1</td>
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</tbody>
</table>

#### Celsius to Fahrenheit Conversion

\[ Tc = \left(\frac{5}{9}\right) \times (Tf - 32) \]

#### Fahrenheit to Celsius Conversion

\[ Tf = \left(\frac{9}{5}\right) \times Tc + 32 \]
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 windrow 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.

**Cold In-Place Recycling (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 incompressibles 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.
Highly Modified Micro Surfacing: A skid-resistant surface treatment, this highly modified micro surfacing follows the conventional definition (see in glossary) and methods for traditional micro surfacing, but contains a higher level of polymer that enhances performance. The additional polymer creates more flexible surfaces that stiffen faster and are able to hold up in extreme temperatures and significantly reduce scuffing and tearing soon after application. This type of micro surfacing also provides enhanced surface friction and is most suitable for high-traffic roadways.

Hot In-Place Recycling (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.

Scrub Seal: A preventive maintenance surface treatment that comprises a single chip seal application in which a mechanized scrub broom is used to force emulsion deeper into cracks prior to the application of cover aggregate and the rolling to follow. This type of treatment is most suitable for addressing moderate-to-severe cracking.
**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.

**Solvent-Free Prime Coat:** An eco-friendly penetrating prime coat that dries faster than traditional solvent-containing prime coats, which allows for same-day paving.

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

**Trackless Tack:** A bonding agent between asphalt layers, this type of tack coat prevents material from being tracked across jobsites. This helps improves production because crews do not have to spend extra time cleaning the site and equipment.

**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.

Note: 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.
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: 0.10 - 0.50 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>
<th>8' Wide</th>
<th>10' Wide</th>
<th>12' Wide</th>
<th>14' Wide</th>
<th>18' Wide</th>
<th>22' Wide</th>
<th>26' Wide</th>
<th>30' Wide</th>
</tr>
</thead>
<tbody>
<tr>
<td>.10</td>
<td>469</td>
<td>586</td>
<td>704</td>
<td>821</td>
<td>1,056</td>
<td>1,240</td>
<td>1,525</td>
<td>1,760</td>
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<tr>
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<td>938</td>
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<td>1,408</td>
<td>1,642</td>
<td>2,112</td>
<td>2,481</td>
<td>3,050</td>
<td>3,520</td>
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<td>1,760</td>
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</table>

- Gallons Required Per Mile
- Square Yards Per Mile
Application: Fog Seal

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

Recommended Application Rate: .10-.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-.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>
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<td>3.721</td>
<td>4.576</td>
<td>5.280</td>
<td>6.000</td>
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</table>
Application: Tack Coat

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

Recommended Application Rate: .05 -.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.

<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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<tbody>
<tr>
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<td>2,481</td>
<td>3,050</td>
<td>3,520</td>
</tr>
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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

Research In Progress—RIP
rip.trb.org

The Road Emulsion Association Ltd
rea.org.uk

The Asphalt Contractor Online
asphalt.com

The Recycled Materials Resource Center—RMRC
rmrc.unh.edu

The Road Information Program—TRIP
tripnet.org

Transportation Research Board—TRB
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Transportation Research Information Service—TRIS
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ergon.com

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Pavement Preservation
savemyroad.com

Tricor Refining, LLC
tricorrefining.com