

## REJUVENATING SEALS

### GENERAL INFORMATION AND RESOURCES

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#### SCOPE

Asphalt cements consist of two chemical fractions: asphaltenes (empirically described as the “solid fraction”) and maltenes (the “liquid fraction”). The asphaltene fraction is dispersed within the maltene fraction. During the aging process, the maltene fraction oxidizes and increases in molecular weight and polarity. As a result, the ratio between the maltenes and asphaltenes is reduced and the asphaltene dispersion becomes less uniform, making the asphalt more plastic and less elastic. A rejuvenating emulsion can be used to restore the maltene-to-asphaltenes ratio and improve the dispersion of asphaltenes. As a result, the physical and mechanical properties of the aged binder are partially restored.

#### DEFINITIONS

##### REJUVENATING SEAL

A rejuvenating seal consists of a single application of a diluted rejuvenating emulsion on an aged road surface with the purpose of restoring the chemical balance of the asphalt binder in the upper pavement layers. This seal may also help by closing hairline cracks and filling surface pores. Rejuvenating seals are typically applied on moderately- to severely-aged asphalt pavement surfaces but can also be used on a newly constructed asphalt surface to combat the aging that the binder experienced during the hot mix production process.

#### MATERIALS

##### REJUVENATING EMULSION

The rejuvenating emulsion is a water-based product that combines water and a rejuvenating agent together with surfactants. The rejuvenating agents are carefully selected oils of various chemical compositions that are compatible with asphalt, penetrating the asphalt cement film and restoring most of its pre-aged properties.

#### DESIGN CRITERIA

When designing a rejuvenating seal, a number of factors have to be examined and assessed in order to ensure that the surface will perform for its service life (5 years): aggregate shape, existing surface, and residual rejuvenating agent content.

##### TRAFFIC

The type and volume of traffic will have a large effect on the amount of rejuvenating emulsion required. These factors will also dictate whether or not there is a need for a light sand application after spraying the rejuvenating emulsion.

##### AGGREGATE SHAPE

If an aggregate is needed to enhance the surface friction, a crushed, clean sand is an effective choice.

##### EXISTING SURFACE

The texture and condition of the existing road surface will affect the spray rate and the volume of aggregate required (if aggregate is required at all). A dry, porous road surface may need a higher volume of emulsion. A rejuvenating seal typically requires a 2:1 diluted emulsion (providing a ~40% residue) with an application rate of 0.3 to 0.5 L/m<sup>2</sup> followed by a light sand application of 0.5 to 1.0 kg/m<sup>2</sup>. The sand application should be done 30 to 60 minutes after spraying the rejuvenating emulsion or when the liquid has been completely absorbed into the pavement.



#### **MCASPALT INDUSTRIES LIMITED**

8800 Sheppard Ave East T 416.281.8181 TF 1.800.268.4238  
Toronto, ON M1B 5R4 F 416.281.8842 E info@mcaspalt.com

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#### RECOMMENDED PERFORMANCE GUIDELINES

In order to construct a well-designed, high-quality rejuvenating seal, the following guidelines should be followed:

- Evaluate the existing road surface for texture, porosity, micro cracks, and pocks.
- Design a rejuvenating seal application and, depending on local conditions, assess the need for sand blotting.
- Use a clean, angular sand.
- Calibrate and inspect all equipment.
- Correctly execute all required construction techniques.
- Use traffic control to protect the seal when it is freshly applied.
- Work only in weather suitable for the type and grade of emulsion being used.

#### RESOURCES AND REFERENCES

1. "Basic Asphalt Emulsion Manual", Fourth Edition, Asphalt Institute and Asphalt Emulsion Manufacturers Association, 2008
2. "Recommended Performance Guidelines", Second Edition, Asphalt Emulsion Manufacturers Association, Annapolis, Maryland, 2006



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8800 Sheppard Ave East T 416.281.8181 TF 1.800.268.4238  
Toronto, ON M1B 5R4 F 416.281.8842 E info@mcasphalt.com

[mcasphalt.com](http://mcasphalt.com)  
ISO 9001/14001/45001