

## CHAPTER 5

# Chip Seal Materials Selection

The performance of a chip seal is largely dependent on the materials used. Therefore, selecting the appropriate aggregates and asphalt emulsion and deciding whether to apply a fog seal to the surface play a significant role in the success of the project. The following discussion provides guidance regarding these factors.

## 5.1 Chip Gradation

The gradation of the chip should be one- or two-sized, but the maximum size should be selected based on traffic volume, pavement texture, and the required level of sealing. Generally, larger aggregate provides greater ability to seal because of the higher volume of binder required to hold the chips in place, and depending on traffic volume, provides longer life expectancy. However, larger aggregates increase the chances for vehicle damage, noise, and roughness.

## 5.2 Modified or Unmodified Emulsion

Modified emulsions usually refer to some sort of elastomeric polymer or rubber added to the emulsion or to the base asphalt binder prior to emulsification. Because modified emulsions should offer greater adhesivity and potentially shorter time required before opening to traffic, they are generally used on higher traffic pavements, where vehicle damage potential is

greater and where limited time under traffic control is usually desirable.

## 5.3 Fog Seal After Chip Seal

A fog seal may be applied to any completed chip seal as a means of providing a high color contrast for paint stripes. There are also some preliminary indications that the fog seal provides some additional waterproofing (Shuler 2007). Care should be taken whenever applying a fog seal since pavement friction could be reduced if the fog seal is applied at too high an application rate, the fog seal emulsion has a high residue content, or the fog seal has not broken sufficiently to support uncontrolled traffic.

## 5.4 Emulsion-Aggregate Compatibility

There is anecdotal evidence of apparent incompatibility arising from use of anionic or cationic emulsions with siliceous or calcareous aggregates, respectively. This incompatibility manifests itself with a loss of aggregate from the chip seal. This behavior was not observed during the NCHRP Project 14-17 research, in which 20 combinations of aggregates and emulsions were represented. Therefore, unless impractical, anionic emulsions should be paired with positively charged aggregates (i.e., calcareous), and cationic emulsions should be matched with negatively charged aggregates (i.e., siliceous) to avoid possible incompatibility between the materials.

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# Chip Seals Manual And Guide

**Scott Shuler**



## **Chip Seals Manual And Guide:**

**Kansas Department of Transportation 2014 Chip Seal Manual** Dean M. Testa, 2014 A chip seal is a very effective thin surface treatment process used by maintenance managers to preserve existing asphalt pavements The Kansas Department of Transportation KDOT 2014 Chip Seal Manual is a guide that provides guidelines background and general information for the design construction and inspection of chip seals This manual is intended for use by KDOT field engineers laboratory personnel construction inspectors and contractor s estimators supervisors operators and workers to provide procedures for the design of chip seals The information recommendations and best practices provided in this manual may refer to either 1 learning the overall chip seal operation 2 learning about the workings maintenance calibration and proper operation of equipment used in chip sealing or 3 learning chip seal design procedures This manual consists of seven chapters Chapter 1 is the introduction Chapter 2 is about selection of chip seal Chapter 3 discusses the materials for chip seal and the design process Chapter 4 discusses surface preparation prior to chip sealing Chapter 5 describes equipment inspection and calibration Chapter 6 discusses the actual application process Chapter 7 underlines the areas of concern during construction process

**Chip Seal Best Practices** Douglas D. Gransberg, David M. B. James, National Cooperative Highway Research Program, 2005 TRB s National Cooperative Highway Research Program NCHRP Synthesis 342 Chip Seal Best Practices examines ways to assist in the development and implementation of pavement preservation programs by identifying the benefits of using chip seal as part of a preventive maintenance program and by highlighting advanced chip seal programs in use around the world The report includes approximately 40 best practices in the areas of chip seal design methods contract administration equipment practices construction practices and performance measures According to the report the increased use of chip seals for maintenance can be a successful cost effective way of using preventive maintenance to preserve both low volume and higher volume pavements

**Bearing Capacity of Roads, Railways and Airfields** Andreas Loizos, Imad Al-Qadi, Tom Scarpas, 2017-07-20 Bearing Capacity of Roads Railways and Airfields includes the contributions to the 10th International Conference on the Bearing Capacity of Roads Railways and Airfields BCRRA 2017 28 30 June 2017 Athens Greece The papers cover aspects related to materials laboratory testing design construction maintenance and management systems of transport infrastructure and focus on roads railways and airfields Additional aspects that concern new materials and characterization alternative rehabilitation techniques technological advances as well as pavement and railway track substructure sustainability are included The contributions discuss new concepts and innovative solutions and are concentrated but not limited on the following topics Unbound aggregate materials and soil properties Bound materials characteristics mechanical properties and testing Effect of traffic loading In situ measurements techniques and monitoring Structural evaluation Pavement serviceability condition Rehabilitation and maintenance issues Geophysical assessment Stabilization and reinforcement Performance modeling Environmental challenges Life cycle assessment and sustainability

Bearing Capacity of Roads Railways and Airfields is essential reading for academics and professionals involved or interested in transport infrastructure systems in particular roads railways and airfields

**Manual for Emulsion-based Chip Seals for Pavement Preservation** Scott Shuler, Transportation Research Board of the National Academies, National Cooperative Highway Research Program, United States. Federal Highway Administration, 2010 This report documents a study contracted to develop a manual of practices recommended for designing and constructing chip seals placed on hot mix asphalt pavements The manual identifies factors that influence chip seal design construction and performance and provides guidelines that enables practitioners to improve the opportunity for success when building these systems Many practices in chip seal technology have been subjective for many years and considered art by some Therefore this study focused on elements of chip seal technology that were subjective or not practiced in the United States The manual replaces the subjective or qualitative judgments previously used during chip seal design and construction with field and laboratory testing Some of the findings of this study include a means of determining when to broom or allow traffic on fresh chip seals a quantitative method for measuring chip embedment a simple method for measuring viscosity of emulsions during construction an improved method to recover emulsion residues and a recommendation for emulsion and residue properties related to environmental conditions

**Guidelines for the Preservation of High-traffic-volume Roadways** David G. Peshkin, 2011 TRB's second Strategic Highway Research Program SHRP 2 Report S2 R26 RR 2 Guidelines for the Preservation of High Traffic Volume Roadways explores the state of the practice for preservation treatments on high and low volume asphalt and concrete roadways The report also includes suggested guidelines on the application of preservation treatments on high volume roadways

**Synthesis of Highway Practice** National Cooperative Highway Research Program, 2005

**Preservation Approaches for High-Traffic-Volume Roadways** David G. Peshkin, 2011

Thin-surfaced Pavements Donald N. Geoffroy, National Cooperative Highway Research Program, 1998 This synthesis report will be of interest to pavement design engineers in local state and federal transportation agencies Pavement materials construction and maintenance engineers will also find it of interest In addition it will be of interest to local technology transfer centers and pavement research engineers This synthesis describes the state of the practice for thin surfaced pavement project selection and structural design It does not establish preferential design criteria e g mix design nor does it systematically evaluate existing design methods This report of the Transportation Research Board describes the conditions in which thin surfaced pavements are considered appropriate what thin surfaced pavement types are considered appropriate for given conditions and the decision criteria used in their selection Information for the synthesis was collected by surveying state and local transportation agencies and by conducting a literature search including foreign resources Case studies and an extensive collection of survey data are presented

**Videotape/publication Library Catalog**, 2004

*Pavement Preservation Studies Technical Advisory Guide* D. Jones, 2007

*An Introductory Guide to EC Competition Law and Practice*

Valentine Korah,1994      **Flexible Pavement Condition Rating** G. J. Chong,W. A. Phang,Ontario. Ministry of Transportation. Research and Development Branch,G. A. Wrong,1989      **Maintenance and Preservation, 2013** ,2013 TRB s Transportation Research Record Journal of the Transportation Research Board No 2360 contains 10 papers that study holistic approaches to maintenance and preservation of transportation infrastructure guidelines for thermographic inspection of concrete bridge components in shaded conditions bridge preservation by action type fatigue testing and structural health monitoring of retrofitted web stiffeners on steel highway bridges and vulnerability of bridges exposed to scour This issue also examines performance measures for bridge preservation risk modeling of advanced deterioration in bridge management systems modeling hurricane hazards and damage on Florida bridges developing bridge management components that facilitate decision making and a method to assess bonding characteristics of membrane layers in wearing course on orthotropic steel bridge decks Pub online blurb      **Quantifying the Benefits of Improved Rolling of Chip Seals** Y. Richard Kim,2008 This report presents an improvement in the rolling protocol for chip seals based on an evaluation of aggregate retention performance and aggregate embedment depth The flip over test FOT Vialit test modified sand circle test digital image processing technique and the third scale Model Mobile Loading Simulator MMLS3 are employed to evaluate the effects of the various rolling parameters and to measure chip seal performance The samples used to evaluate the chip seal rolling protocol were obtained directly from field construction In order to determine the optimal rolling protocol the effects of roller type number of coverages coverage distribution on the sublayers of a multiple chip seal i e the split seal and triple seal and rolling pattern are evaluated using the results of aggregate retention performance tests the modified sand circle method and the digital image process It is found that two types of roller the pneumatic tire roller and the combination roller are recommended as the optimal rollers for the chip seal In addition it is found that the optimal number of coverages for the chip seal is three coverages Moreover the performance of the triple seal without coverage at the bottom layer does not affect the aggregate retention performance although the split seal does require coverage at the bottom layer Finally it is found from the MMLS3 results that the delayed rolling time between the spreading of the aggregate and the initial rolling significantly affects the aggregate loss and that the delayed rolling time is related to the aggregate moisture condition and the ambient temperature Effects of different rolling patterns are investigated based on the delayed rolling time and roller speeds and recommendations are developed for two and three roller scenarios      *Transearch* ,1991      *Haynes GM N-Cars Owners Workshop Manual, No. 1420* Bob Henderson,J. H. Haynes,1992      *Pavement Condition Survey Guide for City Streets* Kathryn A. Zimmerman,ERES Consultants, Inc,Curt A. Beckemeyer,David G. Peshkin,1994 This guide was developed to provide an easy consistent means of assessing city street pavement conditions both within a community and statewide The guide includes an easy to use subjective condition rating methodology that defines pavement condition ratings from 0 to 100 In addition guidance for determining a pavement s necessary level of repair is provided      *Rural Road Condition Survey*

*Guide* Curt A. Beckemeyer, 1995 Developed to help provide a consistent means of assessing rural roadway conditions both within a country and statewide The roadway evaluation methodology described in this guide will provide county highway agencies with uniform and consistent means of defining pavement and roadway conditions By adopting a standard approach to rating the observable condition of a pavement or gravel surfaced road local road agencies can uniformly and objectively compare pavement conditions Illustrated Manual for Emulsion-based Chip Seals for Pavement Preservation Scott Shuler, 2011 TRB's National Cooperative Highway Research Program NCHRP Report 680 Manual for Emulsion Based Chip Seals for Pavement Preservation examines factors affecting chip performance highlights design and construction considerations and explores procedures for selecting the appropriate chip seal materials The report also contains suggested test methods for use in the design and quality control of chip seals Appendices A to J of NCHRP Report 680 provide further elaboration on the work performed in this project American Machinist, Metalworking Manufacturing , 1962

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