

## Resultat från sökning ”försegling”

Internationella transportforskningsdatabasen TRID  
Engelskspråkiga publikationer utgivna 2007-2017

### Sökord:

*sealing*  
*seal coat*  
*chip seal*  
*underseal*  
*stuffing*  
*protective coating*  
*protective layer*  
*joint filler*  
*bitumen*  
*asphalt*  
*flexible pavement*

### Uteslutet:

*broar*  
*betongvägar*  
*chip seal (beläggning, ej lagning)*

TY - CONF

AN - 01046394

AU - Masson, Jean-Francois

AU - Woods, John R

AU - Collins, Peter

AU - Al-Qadi, Imad L

AU - Transportation Research Board

**TI - Accelerated Aging of Bituminous Sealants: Small-Kettle Aging**

PY - 2007

SP - 13p

AB - Bituminous sealants used in the maintenance of roadways are installed hot and heated to 150°C-200°C during installation. High temperatures can degrade polymers in sealants, but there is no standard method to account for this possible degradation. In an attempt to find such a method, the aging of two sealants in large kettles during field applications was compared to that obtained in the laboratory by heating in a small kettle. The results indicate that 4h of small kettle aging (SKA) at the highest suggested sealant application temperature (HiSAT), or about 2h at HiSAT + 10°C, provided as much copolymer aging as that found in sealants sampled midway through installation.

U1 - Transportation Research Board 86<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20070121 EndDate:20070125 Sponsors: Transportation Research Board

KW - Aging (Materials)

KW - Aging infrastructure

KW - Bituminous materials

KW - Bituminous mixtures

KW - Degradation (Materials)

KW - Degradation failures

KW - Heat

KW - Heating

KW - High temperature

KW - Sealing compounds

KW - Temperature

UR - <https://trid.trb.org/view/801713>

ER -

TY - CONF

AN - 01046312

AU - McGraw, James William

AU - Olson, John

AU - Transportation Research Board

**TI - Evaluating Minnesota Crack Sealants by Modified Bending Beam Rheometer Procedure**

PY - 2007

SP - 10p

AB - Due to poor performance of many of the crack sealing projects in Minnesota, research is being conducted to determine methods of improving Minnesota's crack sealing program. The current method for the selection of crack sealants is by specifying different types of sealants satisfying the ASTM D 6690 specification. Unfortunately the ASTM specification doesn't predict expected field performance for Minnesota's climate. Minnesota Department of Transportation (Mn/DOT) performed an evaluation of five hot-pour crack sealants that were developed for Minnesota's climate. The evaluation used the modified Bending Beam Rheometer (BBR) method developed by the U.S.- Canada Crack Sealant Consortium and determined that a state department of transportation (DOT) asphalt binder testing laboratory can successfully test crack sealants using the modified BBR. The Mn/DOT laboratory staff was able to use creep stiffness, creep m-value and steady-state creep rate tests to rank the sealants by expected field performance. The BBR tests showed differences between low modulus crack sealants (ASTM Type IV) and showed that some ASTM Type II sealants may perform as well as some low modulus products. The findings indicate that once the U.S.- Canada Crack Sealant Consortium have validated the sealant BBR performance criteria, the low temperature performance of crack sealants may be estimated better than with the current ASTM D 6690 tests. This procedure will be extremely valuable in grading sealants by low pavement temperature, improving the crack sealant selection process and can be used as an evaluation tool for new products.

U1 - Transportation Research Board 86<sup>th</sup> Annual Meeting Transportation Research Board  
Washington, DC, United States StartDate:20070121 EndDate:20070125 Sponsors: Transportation Research Board

KW - Binders

KW - Crack sealing

KW - Hot pour sealants

KW - Laboratory tests

KW - Maintenance

KW - Minnesota

KW - Rheometers

KW - Sealing compounds

KW - State departments of transportation

KW - Winter maintenance

UR - <https://trid.trb.org/view/801885>

ER -

TY - JOUR

AN - 01044190

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Al-Qadi, Imad L

AU - Yang, Shih-Hsien

AU - Dessouky, Samer H

AU - Masson, Jean-Francois

**TI - Low-Temperature Characterization of Hot-Poured Crack Sealant by Crack Sealant Direct Tensile Tester**

SN - 9780309104166

PY - 2007

IS - 1991

SP - pp 109-118

AB - The current specifications for selecting crack sealants correlate poorly with actual field performance. To address this issue and assist in predicting the low-temperature properties of hot-poured bituminous crack sealants, a modified direct tensile tester method has been developed. Sample geometry is modified to accommodate testing sealants. A sensitivity analysis considering various loading rates, sample lengths, and cross-section areas was conducted to define both optimized specimen geometry and testing protocol. Two types of sealants, having a wide range of rheological behaviors (one polymer-modified and one having crumb rubber), were tested at low temperature. Results showed that the rich polymer-modified sealant has a high resistance to failure compared with the sealant with crumb rubber-modified. Each sealant was tested at the lowest corresponding expected service temperature. A performance parameter, strain energy density, was proposed to differentiate crack sealant material in the laboratory.

KW - Bituminous materials

KW - Bituminous mixtures

KW - Crack sealants

KW - Cross sections

KW - Crumb rubber

KW - Direct tensile test

KW - Hot pour sealants

KW - Low temperature

KW - Pavement maintenance

KW - Pavement performance

KW - Pavements

KW - Rheology

KW - Sealing compounds

UR - <http://dx.doi.org/10.3141/1991-13>

UR - <https://trid.trb.org/view/802252>

ER -

TY - CONF

AN - 01046275

AU - Al-Qadi, Imad L

AU - Fini, Eli H

AU - Elseifi, Mostafa A

AU - Figueroa, Hector

AU - Masson, Jean-Francois

AU - McGhee, Kevin Kenneth

AU - Transportation Research Board

**TI - Repeatability and Reproducibility of the Newly Developed Hot-Poured Bituminous Sealant Viscosity Test**

PY - 2007

SP - 17p

AB - Current standard test methods for hot-poured bituminous-based sealants are mostly empirical in nature and do not correlate well with field performance. Hence, there is a need for testing methods that are based on sealant rheological properties and can accurately predict field performance. Recent research has allowed the development of a new testing procedure to control sealant installation by measuring the viscosity under conditions similar to those encountered in the field. Viscosity of the sealant not only affects the installation process but it also plays an important role in dictating the strength of the bond to the crack. This paper aims to validate the newly developed test procedure through statistical analysis following ASTM practices C802 and C670. A round-robin test was conducted with seven laboratories, and the repeatability of the measurement was determined through statistical analysis. Average coefficient of variation within and between laboratories was found to be 1.6% and 6%, respectively. Using the data from the round robin testing, and based on ASTM precision and bias standards, maximum permissible differences within a laboratory and between laboratories were defined at 4.6% and 16.9%, respectively. Considering the presence of a high percentage of polymer and crumb rubber in sealants, temperature sensitivity of the sealant, and chances for segregation, the repeatability and reproducibility of the developed test is within an acceptable range. These values are comparable with those of asphalt binder: 3.5% and 14.5% based on ASTM D4402-02 and 3.5% and 12.1% based on AASHTO 2006 T316.

U1 - Transportation Research Board 86<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20070121 EndDate:20070125 Sponsors: Transportation Research Board

KW - Binder content

KW - Binders

KW - Bituminous mixtures

KW - Crack sealants

KW - Crack sealing

KW - Crumb rubber

KW - Hot-pour sealants

KW - Repeatability

KW - Round robin testing

KW - Sealing compounds

KW - Shear reinforcement

KW - Shear strength

KW - Viscosity

UR - <https://trid.trb.org/view/802398>

ER -

TY - JOUR

AN - 01044680

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Heydorn, Allan

**TI - What Happened to Coal Tar in 2006?**

PY - 2007/01

VL - 22

IS - 1

SP - pp 12, 14, 16, 18-19

AB - Crude tar had been an important component of sealcoating for the last 50 years. However, there have been problems with availability of crude tar in recent years, which has resulted in shortages or delivery delays of refined coal tar sealer. This article discusses the availability issues that plagued refined tar producers, sealer producers and sealcoating contractors in 2006 and earlier, and tries to predict what may happen in the future. Production of coal tar has decreased in the last decade due to strikes, plant closings and production cutbacks. In addition, most coal tar is sold to the aluminum industry, which is a growing market, further reducing the sealcoating market's share. Sealcoating supply companies are reacting by distributing coal tar to their contractor customers on an as-needed basis, increasing production of asphalt/coal tar blends, and increasing production and marketing of asphalt-based sealers. There are few indications that supplies of refined coal tar will improve in 2007.

KW - Coal tars

KW - Demand

KW - Forecasting

KW - Industries

KW - Market assessment

KW - Production

KW - Raw materials

KW - Seal coating

KW - Seal coats

KW - Sealing compounds

KW - Supply

KW - Tar

UR - <https://trid.trb.org/view/805056>

ER -

TY - JOUR

AN - 01046545

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

**TI - Blinded by "Science"**

PY - 2007/02

VL - 22

IS - 2

SP - pp 22, 27

AB - The city of Austin, Texas banned the use of coal tar pavement sealers in 2005. This article discusses this ordinance and whether there is scientific evidence to justify the ban. The Austin city council banned the coal tar-based products due to the belief that coal tar sealants are a major source of polycyclic aromatic hydrocarbons (PAHs), an organic contaminant that is carcinogenic and toxic to aquatic life. This ban was based primarily on a study by the U.S. Geological Survey that suggested that runoff with the sealant is contaminating the city's streams. However, the seal coating industry has challenged the objectivity and data quality of this study. Other research has suggested that coal tar sealants are not a major contributor to PAH contamination. A new study, which relies on both scientific principles and input from a variety of organizations, is currently underway.

KW - Austin (Texas)

KW - Coal tars

KW - Environmental sciences

KW - Local government

KW - Ordinances

KW - Pollutants

KW - Polycyclic aromatic hydrocarbons

KW - Research

KW - Runoff

KW - Seal coats

KW - Sealing compounds

KW - Water pollution

UR - <https://trid.trb.org/view/805655>

ER -

TY - JOUR

AN - 01046557

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Dickens, Rod

**TI - Sealing Cracks: Money for You and Value for Your Customers**

PY - 2007/02

VL - 22

IS - 2

SP - pp 32, 34, 38

AB - Sealing cracks can be a profitable venture for contractors. This article discusses the equipment and methods used in crack sealing, and some of the challenges that contractors may face in educating customers on the value of sealing cracks. Although smaller contractors may choose to clean and dry cracks with a backpack blower and then use a basic melter and pour pot to fill in cracks, larger contractors can employ a melter/applicator with a dedicated air compressor to clean and dry cracks and a pump/hose configuration to apply the sealant. In order for a crack sealing operation to be successful, contractors must demonstrate the cost-efficiency of sealing cracks compared to putting down an overlay.

KW - Contractors

KW - Cost effectiveness

KW - Crack sealing

KW - Maintenance equipment

KW - Maintenance practices

KW - Pavement cracking

KW - Pavement maintenance

KW - Sealing (Technology)

UR - <https://trid.trb.org/view/805668>

ER -



TY - JOUR

AN - 01049760

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Heydorn, Allan

**TI - Understanding Sealer Options**

PY - 2007/03

VL - 22

IS - 3

SP - pp 16, 18-26

AB - Although refined coal tar sealer has been the most popular pavement sealer in the past, limited availability is forcing contractors to explore alternative products. This article describes some of the available sealers. Asphalt emulsion sealers are the primary alternative to coal tar, but these sealers perform very differently than refined coal tar sealers and there currently are no industry specifications for asphalt-based sealers. Asphalt-based sealers can vary substantially from producer to producer and even from batch to batch in terms of physical properties and chemical composition. Contractors and producers both generally consider asphalt-based sealers to be inferior to coal tar sealers in terms of durability, drying time and consistency. Products that blend asphalt and coal tar also are available. The handling and use of these products is determined by which product dominates the blend. A blend that is predominately coal tar may be a useful way of extending the limited supply of that product. Blended sealers generally take longer to cure than either 100% asphalt or 100% coal tar products. Some producers refuse to make blended products because they feel that the two products are chemically incompatible. A few producers are using ceramics with asphalt material to produce what could be a new and stronger pavement sealer. This sealer has the same characteristics as coal tar, but without its drawbacks. Set and cure times generally are quicker than coal tar and the cost is comparable to that of asphalt sealers.

KW - Asphalt emulsions

KW - Ceramic materials

KW - Coal tars

KW - Mix design

KW - Pavement design

KW - Paving

KW - Properties of materials

KW - Seal coating

KW - Seal coats

KW - Sealing compounds

UR - <https://trid.trb.org/view/807073>

ER -

TY - JOUR

AN - 01050001

JO - Journal of Materials in Civil Engineering

PB - American Society of Civil Engineers

AU - Shoenberger, James Edwin

AU - DeMoss, Tere A

**TI - Material Properties of Coal-Tar Emulsion Sealers**

PY - 2007/04

VL - 19

IS - 4

SP - pp 305-312

AB - Coal-tar emulsion sealers are used to protect hot-mix asphalt pavements from damage due to the spillage of petroleum-based materials. This paper contains the results of a study, which has field tests and laboratory tests, concerning the effect of various amounts of aggregate, temperature variations, a polymer additive, and aging on the material properties of coal-tar emulsion mixtures. The material properties tests included thermal expansion, creep stiffness test, and by measuring tensile strength, the stress-strain relationships. The study results indicate that the thermal expansion of the mixtures increased with increasing amounts of coal-tar emulsion; however, this effect was slightly reduced with the addition of a polymer additive. Creep stiffness values increased with age and increasing amounts of aggregate in the mixture. The results of the stress-strain evaluation were not consistent. Increased amounts of aggregate, lower temperatures, and decreased amounts of polymer generally resulted in greater stress levels being achieved prior to failure.

KW - Aggregates

KW - Aging (Materials)

KW - Asphalt emulsions

KW - Asphalt pavements

KW - Chemical spills

KW - Coal tars

KW - Creep

KW - Deformation curve

KW - Failure analysis

KW - Field tests

KW - Hot mix asphalt

KW - Laboratory tests

KW - Oil spills

KW - Petroleum products

KW - Polymers

KW - Properties of materials

KW - Sealing compounds

KW - Tensile strength

KW - Thermal expansion

UR - <https://trid.trb.org/view/808942>

ER -

TY - RPRT

AN - 01054969

AU - MARTIN, T

AU - AUSTROADS

**TI - Interim works effects models**

SN - 1921139889

PY - 2007/01

IS - AP-R300/07

SP - 60P

AB - This report documents the development of interim and preliminary works effects (WE) models for a wide range of maintenance and rehabilitation treatments for Tasmania, South Australia, Victoria, Queensland and New South Wales. The interim WE models are statistically significant and use only statistically significant independent variables. Use of the interim WE models for asphalt overlays is preferred to the calibrated HDM-4 asphalt overlay model. (a)

KW - Administration

KW - Durability

KW - Highway

KW - Maintenance

KW - Management

KW - Mathematical model

KW - Mathematical models

KW - Overlays (Pavements)

KW - Pavement

KW - Pavements

KW - Performance

KW - Roads

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Strengthening (Maintenance)

KW - Strengthening (pavement)

UR - <https://trid.trb.org/view/814299>

ER -

TY - RPRT  
AN - 01075975  
AU - Zhou, Fujie  
AU - Hu, Sheng  
AU - Scullion, Tom  
AU - Texas Transportation Institute  
AU - Texas Department of Transportation  
AU - Federal Highway Administration  
TI - Preliminary Results of Repeatability and Sensitivity Study on Overlay Tester for Crack Sealants  
PY - 2007/08//Technical Report  
SP - 20p  
AB - This brief summary report documents the main findings from the work done in the last fiscal year. This summary report is composed of three major components: 1) Overlay Tester for crack sealants and associated draft test protocol, 2) repeatability of Overlay Tester for crack sealant, and 3) sensitivity of Overlay Tester for crack sealant. Finally, this report discusses the work recommended by the Pavement Monitoring Committee on October 11, 2006.  
KW - Cracking  
KW - Repeatability  
KW - Sealing compounds  
KW - Sensitivity  
KW - Test procedures  
KW - Testing equipment  
UR - <http://tti.tamu.edu/documents/0-5457-1.pdf>  
UR - <https://trid.trb.org/view/835368>  
ER -

TY - JOUR

AN - 01077202

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Masson, Jean-Francois

AU - Collins, Peter

AU - Bundalo-Perc, Slađana

AU - Woods, John R

AU - Al-Qadi, Imad L

**TI - Early Thermodegradation of Bituminous Sealants Resulting from Improper Installation: Field Study**

SN - 9780309104166

PY - 2007

IS - 1991

SP - pp 119-123

AB - Bituminous sealants used in roadway maintenance often have a short effective service life, in great part as a result of improper installation and heating, in particular. To determine the effect of thermal history on sealant characteristics, sealant samples were collected during an operation that started with reheating of a full kettle of bituminous sealant. Results of Fourier transform infrared spectroscopy, thermogravimetry, gel permeation chromatography, and dynamic shear rheometry showed that the sealant had degraded and that the extent of degradation was greatest early in the operation. Application of degraded sealant throughout installation showed the need for improved material and construction specifications, along with improved field control measures.

KW - Bituminous materials

KW - Dynamic shear rheometry

KW - Field studies

KW - Fourier transforms

KW - Gel permeation chromatography

KW - Highway maintenance

KW - Infrared spectroscopy

KW - Installation

KW - Laboratory tests

KW - Sealing compounds

KW - Service life

KW - Thermal degradation

KW - Thermogravimetric analysis

UR - <http://dx.doi.org/10.3141/1991-14>

UR - <https://trid.trb.org/view/836283>

ER -

TY - JOUR

AN - 01080293

JO - Roads & Bridges

PB - Scranton Gillette Communications

AU - Perriam, Brian

**TI - High Sealing: New Zealand Pushes for an Upgrade in Road Maintenance**

PY - 2007/09

VL - 45

IS - 9

SP - pp 42-44

AB - New Zealand has a large network of roads, most of which have been sealed with a layer of hot-sprayed bitumen and chip. This article describes how the country must maintain these sealed roads in the face of rising costs and diminishing resources. Over the years, bitumen and chip have grown to the point that the ratio of binder to chip has caused the mixture to become unstable. The only solution has been to mill the binder-rich seal layers into the base course and, at significant expense, reconstruct the seal coats from new. A new solution, according to the author, is to use emulsion binders, which offer full chip embedment right after chip is applied. After the emulsion binder has cured there is better chip wetting and binder contact area.

KW - Asphalt emulsions

KW - Benefit cost analysis

KW - Bituminous binders

KW - Chip seals

KW - Highway maintenance

KW - New Zealand

KW - Seal coating

UR - <https://trid.trb.org/view/837011>

ER -

TY - CONF

AN - 01080553

JO - Journal of the Association of Asphalt Paving Technologists

PB - Association of Asphalt Paving Technologists (AAPT)

AU - Al-Qadi, Imad L

AU - Yang, Sheh-Hsein

AU - Dessouky, Samer H

AU - Masson, J-F

**TI - Development of Crack Sealant Bending Beam Rheometer (CSBBR) Testing to Characterize Hot-Poured Bituminous Crack Sealant at Low Temperature (With Discussion)**

PY - 2007

VL - 76

SP - pp 85-121

AB - Hot-poured bituminous crack sealants are used to protect pavement systems from the intrusion of water and help delay pavement degradation. Crack sealing is a widely accepted, cost-effective routine maintenance procedure that increases pavement service life. Current American Society for Testing Materials (ASTM) standards do not correlate the selection of crack sealants to their field performance. The development of performance-based guidelines will assist in selecting a sealant based on specific local needs, such as climate conditions. Several testing methods have been developed as part of the ongoing research to develop performance-based guidelines for hotpoured bituminous crack sealants. In this paper, a modified test using a bending beam rheometer (BBR) has been developed and identified as a reliable method to evaluate the rheological behavior of hot-poured bituminous crack sealants. In this test that uses the crack sealant bending beam rheometer (CSBBR), a double thickness of the standard bending beam was found to overcome excessive deflections during testing. The new beam geometry had a negligible effect on the resulting deflection caused by shear. In addition to changes in specimen geometry and preparation, a newly developed aging procedure, a validated testing period, and a time at which stiffness is determined were introduced. Nine sealants, with a wide range of rheological behaviors, were tested between  $-4^{\circ}\text{C}$  and  $-40^{\circ}\text{C}$ . Three performance parameters, the stiffness at 240s, the average creep rate, and the dissipated energy ratio were analyzed and successfully used to distinguish among sealant behaviors. A viscoelastic model using Prony series expansion to characterize crack sealant mechanical behavior at low temperatures and strain levels was developed. A three-dimensional finite element was used to determine the time-dependent deflection at the mid-span of the CSBBR specimen. A description of the linearity response of crack sealants at low temperature is also presented. The developed model was found to be capable of simulating deflection both during the loading and the unloading process for tested sealants.

U1 - 2007 Journal of the Association of Asphalt Paving Technologists: From the Proceedings of the Technical Sessions San Antonio, TX, United States StartDate:20070311 EndDate:20070314

KW - Aging (Materials)

KW - Bituminous mixtures

KW - Crack and seat treatment

KW - Creep

KW - Deflection

KW - Dissipation

KW - Hot mix asphalt

KW - Mechanics

KW - Pavement cracking

KW - Pavement maintenance

KW - Rheology  
KW - Rheometers  
KW - Sealing compounds  
KW - Stiffness  
KW - Strain (Mechanics)  
KW - Temperature  
KW - Test procedures  
KW - Viscoelasticity  
UR - <https://trid.trb.org/view/839412>  
ER -



TY - CONF

AN - 01080558

JO - Journal of the Association of Asphalt Paving Technologists

PB - Association of Asphalt Paving Technologists (AAPT)

AU - Fini, E H

AU - Al-Qadi, Imad L

AU - Masson, J-F

**TI - A New Blister Test to Measure Bond Strength of Asphaltic Materials**

PY - 2007

VL - 76

SP - pp 275-302

AB - Approximately 60% of the U.S. annual national transportation budget is spent on pavement maintenance. One of the most common pavement maintenance treatments is crack sealing. Sealing pavement cracks significantly extends pavement service life, provided that an appropriate sealant is selected and properly installed. However, adhesion loss often leads to premature sealant failures. The adhesion quality and field performance of bituminous crack sealant cannot be predicted because the current test method (ASTM D6690) is empirical and only provides a qualitative measure of bond strength. Hence, there is a great need for test methods based on bituminous sealant rheology, which can better predict field performance. This paper presents the development of a pressure-loaded blister test and apparatus to measure the adhesion of asphaltic materials, and bituminous crack sealant in particular. The blister test provides two fundamental parameters of the tested material, the interfacial fracture energy, which is related to the adhesion strength, and the modulus. In this test, a fluid is injected at a constant rate at the interface between the substrate (aggregate or a standard material) and the adhesive (crack sealant) to create a blister. The fluid pressure and blister height are measured as a function of time. Using these two quantities and utilizing the classical plate and fracture mechanics principle, the interfacial fracture energy is calculated.

U1 - 2007 Journal of the Association of Asphalt Paving Technologists: From the Proceedings of the Technical Sessions San Antonio, TX, United States StartDate:20070311 EndDate:20070314

KW - Adhesion

KW - Asphalt based materials

KW - Blistering

KW - Bond strength (Materials)

KW - Crack sealing

KW - Debonding

KW - Fracture energy

KW - Pavement cracking

KW - Rheology

KW - Sealing compounds

KW - Tests

UR - <https://trid.trb.org/view/839423>

ER -

TY - JOUR

AN - 01082314

JO - Better Roads

PB - James Informational Media, Incorporated

AU - Kuennen, Tom

**TI - Road Science Illustrated: Identifying Top-Down Cracking**

PY - 2007/11

VL - 77

IS - 11

SP - pp 35-38

AB - This pull-out guide illustrates a variety of causes for top-down cracking in pavement and how to repair them. The article describes: 1) reflective cracking, which is the most common form of asphalt distress; 2) bottom-up fatigue cracking, which starts in the lowest layer; and, 3) top-down cracking, which follows wheel paths. The most common reason for pavement cracking appears to be mix segregation, and the solution is to seal cracks as soon as possible. The guide also explains how to prepare cracks for sealing as well as how to fill the crack. In addition, the guide includes two accompanying articles on top-down cracking which further discuss potential causes of top-down cracking.

KW - Pavement cracking

KW - Pavement maintenance

KW - Rutting

KW - Sealing compounds

UR - <https://trid.trb.org/view/840731>

ER -

TY - SER

AN - 01081597

JO - Land Transport New Zealand Research Report

PB - Land Transport New Zealand

AU - MINCHINGTON, J

AU - BRADSHAW, P

**TI - Accident benefits of sealing unsealed roads**

SN - 0478287267

PY - 2007

IS - 314

SP - 30P + APPENDICES

AB - Research was carried out between 2005 and 2006 to determine if there were benefits or disbenefits associated with sealing unsealed roads, and if so, to determine a procedure for calculating the accident savings (or costs). Road data and seal extension site information were obtained from various district councils in New Zealand and combined with the Ministry of Transport's accident data to give accident rates before and after sealing. No statistically significant change in the accident rate was found following the sealing of roads. To determine any regression to the mean effects, a background trend analysis was conducted and found no significant overall change in the accident rate during the period 1990-2005. The research concludes that there is no statistical benefit or disbenefit associated with sealing unsealed roads and recommends that site specific before and after studies are conducted into the study outliers and a portion of flat South Island sites. (a)

KW - Accident

KW - Accident prevention

KW - Accident rate

KW - Before and after studies

KW - Before and after study

KW - Cost

KW - Costs

KW - Crash rates

KW - Crashes

KW - Highway

KW - Prevention

KW - Regression analysis

KW - Roads

KW - Safety

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Statistics

KW - Terrain

UR - <https://trid.trb.org/view/840827>

ER -

TY - CONF

AN - 01089635

AU - Soliman, Haithem

AU - Shalaby, Ahmed

AU - Transportation Research Board

**TI - Glass Transition Temperature and Low-Temperature Stiffness of Hot-Pour Bituminous Sealants**

PY - 2008

SP - 16p

AB - Joint and crack sealants exposed to cold-climates experience high tensile stresses. Sealants should have the ability to dissipate these tensile stresses to perform their function properly. In cold climates, the state of sealing materials may change from rubbery to solid state due to low in-service temperatures. As a result, sealants become stiffer and less capable of dissipating the induced tensile stresses. This paper introduces a laboratory evaluation method for joint sealants based on dynamic testing at low temperatures. Dynamic Mechanical analyzer (DMA) test was conducted on seven hot-pour bituminous sealants using the temperature sweep mode to characterize the stiffness-temperature behavior of sealants. Glass transition temperature ( $T_g$ ), which is the boundary temperature between rubbery and solid states, was estimated for each sealant. Glass transition temperature and low-temperature stiffness can be used to predict the field performance of sealants, and evaluate the compatibility of a sealant to a certain environment.

U1 - Transportation Research Board 87<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20080113 EndDate:20080117 Sponsors: Transportation Research Board

KW - Bituminous mixtures

KW - Cold weather

KW - Crack sealants

KW - Cracking

KW - Dynamic mechanical analyzer

KW - Glass transition temperature

KW - Pavement maintenance

KW - Sealing compounds

KW - Stiffness

KW - Tensile stress

UR - <https://trid.trb.org/view/848576>

ER -

TY - JOUR

AN - 01089531

JO - Better Roads

PB - James Informational Media, Incorporated

AU - King, Helen

**TI - Putting Fog and Rejuvenator Seals to the Test**

PY - 2008/01

VL - 78

IS - 1

SP - pp 28-33

AB - Fog and rejuvenator seals can be cost-effective for preserving pavement according to an FHWA-organized study in four states. The study found that effectiveness depends on pairing the right product and technique with a particular pavement. The article includes a list of products used in test sections of sites in Michigan, Minnesota, Arizona and California, their descriptions, and the base material of the pavement best paired with the product. Fog and rejuvenator seals had fallen out of favor because some agencies attributed loss of skid resistance to them. The article provides information on the project sites, the testing methods, and the lessons learned, including how to handle the initial friction drop immediately after some of the products are applied.

KW - Crack and seal treatment

KW - Pavement maintenance

KW - Preservation

KW - Sealing compounds

KW - Testing

UR - <https://trid.trb.org/view/849919>

ER -

TY - JOUR

AN - 01099112

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Dubey, Girish

**TI - Altering Sealer Mix Design**

PY - 2008/03

VL - 23

IS - 3

SP - pp 32-36

AB - Although contractors can and should sometimes make adjustments in sealer mix design, they should first understand some fundamentals that influence film formation and the proper set and cure of sealer films. This article provides an overview of sealer composition, film formation and the conditions for proper film formation. Pavement and ambient temperature, relative humidity and wind velocity all have a substantial effect on the rate of water release from wet sealer film and the final cure. Suggestions are given on how mix design can be altered in special circumstances influenced by these factors. For best results, contractors should always consult with their sealer manufacturer before altering mix design.

KW - Films (Coatings)

KW - Humidity

KW - Mix design

KW - Sealing compounds

KW - Temperature

KW - Wind

UR - <https://trid.trb.org/view/855992>

ER -

TY - CONF

AN - 01098824

AU - SOLIMAN, H

AU - Shalaby, A

AU - Transportation Association of Canada

**TI - Evaluation of Joint and Crack Sealant Based on Cyclic Loading and Rheological Properties**

PY - 2007

SP - 12 p.

AB - Sealing pavement joints and cracks is one of the essential pavement maintenance practices to protect subsurface layers from the ingress of moisture and debris. In-service temperature range can be considered the most important factor affecting the expected life of a sealant. Using inappropriate crack sealant reduces its expected life which leads to reducing pavement design life. Development of a reliable characterization method for crack sealants has been a challenging process in the last decade. Currently, field studies are the most reliable method to evaluate sealants performance in cold climates which is not a cost-effective method. This research discusses two laboratory tests that were used for characterizing the performance of hot-pour sealants in cold climates. The results of a two years field study were used to verify the reliability of these methods. These laboratory methods can replace costly and time-consuming field studies, and provide the ability to test and evaluate the performance of new sealing materials as they become available in market. For the covering abstract of this conference see ITRD number E216511.

U1 - 2007 Annual Conference and Exhibition of the Transportation Association of Canada:

Transportation - An Economic Enabler (Les Transports: Un Levier Economique)Transportation

Association of Canada Saskatoon, Saskatchewan, Canada StartDate:20071014 EndDate:20071017

Sponsors: Transportation Association of Canada

KW - Canada

KW - Conferences

KW - Cracking

KW - Decision making

KW - Joint sealing

KW - Laboratories

KW - Life cycle analysis

KW - Repeated loads

KW - Rheology

KW - Test procedures

UR - <http://www.tac-atc.ca/english/pdf/conf2007/s12/soliman.pdf>

UR - <https://trid.trb.org/view/858978>

ER -

TY - SER

AN - 01100214

JO - Transportation Synthesis Report

PB - Wisconsin Department of Transportation

AU - CTC & Associates LLC

AU - Wisconsin Department of Transportation

**TI - Improved Life for Longitudinal Joints in Asphalt Pavement**

PY - 2008/05/01

SP - 7p

AB - Longitudinal joints in asphalt pavements have drawn a significant amount of research attention in the last 20 years. It seems to be generally accepted that low density at the joint is the culprit in longitudinal joint failures. Unless they are properly sealed and compacted, longitudinal joints prove too permeable to resist damage that shortens the effective life of the joint. Research suggests that the problem is the same for overlay joints and new pavement joints. Poor density generally results from the construction process, in which crews must lay multiple lanes of hot-mix asphalt (HMA). Because crews lay one lane at a time, one mat will be paved hot against another that is cold, and this differential at the joint makes proper compaction challenging. The most widely accepted design of longitudinal joints for optimal performance is the Michigan or notched-wedge joint employed by the Wisconsin Department of Transportation (WisDOT). This has been a standard since research in the late 1990s by the National Center for Asphalt Technology. Nevertheless, longitudinal joint performance continues to be the subject of research attention, construction guidelines, and pilot projects of construction methods, designs and products. States and national agencies have taken several approaches to this problem. This report first looks at the current WisDOT approach to establish a baseline. It then reviews research and guidelines regarding joint design, and then looks at research devoted to proper compaction and density of HMA at the joint. Following this section it considers construction and specifications, including documents that detail best construction approaches and that look at the development of a joint density specification to ensure proper construction. This report also looks at recommendations and research from a few states on the use of sealants to prevent or mitigate joint failure, and reviews the use of a field permeameter for quality control. Finally, it reviews the research in progress that five agencies are conducting on these topics.

KW - Asphalt pavements

KW - Compaction

KW - Density

KW - Design practices

KW - Hot mix asphalt

KW - Literature reviews

KW - Longitudinal joints

KW - Permeameters

KW - Quality control

KW - Research

KW - Road construction

KW - Sealing compounds

KW - Service life

KW - Specifications

UR - <http://wisdotresearch.wi.gov/wp-content/uploads/tsrlongitudinaljoints.pdf>

UR - <https://trid.trb.org/view/859673>

ER -



TY - SER

AN - 01099896

JO - AAPA PAVEMENTS INDUSTRY CONFERENCE, 2007, SYDNEY, NEW SOUTH WALES, AUSTRALIA

PB - Australian Asphalt Pavement Association

AU - DISTIN, T

**TI - South African seal design method and practice**

PY - 2007/10

SP - 26P

AB - Approximately 80 per cent of the road network in South Africa is surfaced or resealed with surfacing seals making it the most common type of surfacing used in Southern Africa. The popularity of seals stems from them being relatively inexpensive when compared to other surfacing types concomitant with their successful performance over a variety of traffic conditions on various roads from highways to rural and urban streets. The recently updated Technical Recommendations for Highways (TRH 3) provides practitioners with guidelines for the selection, design and construction of seals in South Africa. Although the design process and input parameters are described in the revised seal design method, the purpose of this paper is to look at some of the key input parameters and the interpretation of these measurements given their sensitivity and their significance in reducing the risk of premature failures. The paper will also look at pushing the operational limits of surfacing seals and the parameters influencing their design and construction when applied to highly trafficked roads. This paper is a consolidation of the papers presented at CAPSA 07 on best practice in surfacing seals in southern Africa.(a) For the covering entry of this conference, please see ITRD abstract no. E216180.

KW - Conference

KW - Construction management

KW - Construction method

KW - Durability

KW - Pavement

KW - Pavement design

KW - Pavements

KW - Performance

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Specifications

KW - Surfacing

UR - <https://trid.trb.org/view/859731>

ER -

TY - RPRT

AN - 01099923

AU - CHOI, Y

AU - AUSTROADS

**TI - Temperature susceptibility of the ball penetration test: stage 1: laboratory assessment**

SN - 9781921329357

PY - 2007/11

IS - AP-T90/07

SP - 26P

AB - The temperature sensitivity (K factor) of the ball penetration test is an important parameter in estimating the embedment allowance of the overlaying seal design. A series of ball penetration tests were performed in the laboratory to investigate the K factor. In general, the K factors measured in the laboratory were somewhat different to the K factors recommended by the standard for each different surfacing. The closest values were observed for the seal surfacings while the largest difference was observed from the primed granular surfacing. Different surface condition of a seal surfacing (good texture or flushed) appeared to have little impact on the K factor and penetration result. (a)

KW - Bituminous mixture

KW - Bituminous mixtures

KW - Experimental road

KW - Experimental roads

KW - Moisture content

KW - Pavement design

KW - Pendulum tests

KW - Penetration

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Temperature

KW - Test method

KW - Test procedures

UR - <https://trid.trb.org/view/859758>

ER -

TY - JOUR

AN - 01104540

JO - Journal of Materials in Civil Engineering

PB - American Society of Civil Engineers

AU - Soliman, Haithem

AU - Shalaby, Ahmed

AU - Kavanagh, Leonnie

**TI - Performance Evaluation of Joint and Crack Sealants in Cold Climates Using DSR and BBR Tests**

PY - 2008/07

VL - 20

IS - 7

SP - pp 470-477

AB - Joint sealants are used widely in Canada to protect pavements from infiltration of water and incompressible materials. Sealants are typically selected based on field studies, which are commonly repeated on a 10-year cycle. This paper examines a laboratory evaluation method based on two laboratory tests that are commonly used for testing asphalt binders: dynamic shear rheometer (DSR) and bending beam rheometer (BBR). Creep stiffness, rate of change in creep stiffness, and rate of change in complex shear modulus with temperature were used to evaluate sealant performance in cold climates. A sealant ranking system was proposed based on the calculation of a sealant index, which combines the proposed evaluation criteria. This method can potentially provide a cost-effective and rapid alternative to field studies. Eight hot-pour sealants were evaluated using this method. Results were verified from an ongoing field study that started in 2004. A good correlation was found between the proposed simplified evaluation method and the existing method.

KW - Bituminous binders

KW - Cracking

KW - Evaluation

KW - Frigid regions

KW - Joint sealing

KW - Pavement joints

KW - Pavements

KW - Performance measurement

KW - Rheological properties

KW - Sealing compounds

KW - Shear modulus

KW - Stiffness

UR - <https://trid.trb.org/view/863744>

ER -

TY - RPRT

AN - 01104969

AU - Kleven, Courtney C

AU - Red Lake County Highway Department

AU - Minnesota Department of Transportation

**TI - Evaluation of Paving Fabrics for Isolation of Bituminous Cracking**

PY - 2008/01//Final Report

SP - 85p

AB - New studies propose to upgrade thousands of County State Aid Highway (CSAH) miles from 7-ton to 9-ton to 10-ton routes. Bituminous pavements require major maintenance for both thermal and distress crack repairs. Structural or maintenance overlays often include intensive and expensive milling or reclaim operations to reduce the effects of existing cracking or crack sealants. Less expensive alternatives to isolate existing problems, retain strength and usability of existing roadways are needed. Paving fabric may: 1) Isolate overlay pavements from current cracking and moisture intrusion paths; 2) Allow retention of base and bituminous for route upgrades; and 3) Reduce the need for and impacts of future crack treatments. This report describes results to date over a three year period of testing spun glass paving fabric as a means of preserving existing bituminous pavements by isolating the effects of heavy crack sealants and reflective cracking. It describes test segments, photo documentation of pre-pave conditions, material used, installation with bituminous overlay projects, monitoring and evaluation, pre-and post-installation surface conditions for the contract report period (2 plus years), results of FWD strength comparisons and cost comparisons with mill and replace, and two years' electronic file photo documentation of cracking with/without pavement fabric between new/old bituminous.

KW - Asphalt concrete

KW - Bituminous materials

KW - Bituminous overlays

KW - Bituminous pavements

KW - Concrete overlays

KW - Crack sealing

KW - Falling weight deflectometers

KW - Overlays (Pavements)

KW - Pavement layers

KW - Pavement maintenance

KW - Reflective cracking

UR - <http://www.lrrb.org/pdf/200802.pdf>

UR - <http://ntl.bts.gov/lib/56000/56000/56019/MN2008-02.PDF>

UR - <https://trid.trb.org/view/864678>

ER -

TY - JOUR

AN - 01108910

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Al-Qadi, Imad L

AU - Fini, Eli H

AU - Masson, Jean-Francois

AU - McGhee, Kevin M

**TI - Effect of Bituminous Material Rheology on Adhesion**

SN - 9780309113120

PY - 2008

IS - 2044

SP - pp 96-104

AB - Bituminous materials are used in many civil engineering applications in which adhesion to a substrate is essential for good performance. Yet it is not possible to predict the adhesion of these materials. The particular case of bituminous crack sealants is of interest; the effect of sealant viscosity, aging, test temperature, and loading rates was investigated by means of a blister test. This test provided the bonding characteristics to a model aggregate in relation to interfacial fracture energy (IFE). From testing of several sealants, it was found that pouring viscosity affects adhesion and that higher viscosities help to attain higher IFEs. Temperature was found to play a key role on bonding characteristics and failure mechanism because it affected the viscoelastic properties of the sealant. The glass transition temperature ( $T_g$ ) was found to have a governing role on bonding characteristics. At temperatures above  $T_g$ , bond strength was found to be affected by sealant flow such that failure was flow related; that is, cohesive failure prevailed. At temperatures below the  $T_g$ , at which sealants were stiff and bulk deformation was low, stress was directed toward the interface so that failure tended to be adhesive. In taking into account temperature and test rates, an IFE master curve was obtained for a sealant. Such a curve may be used in predicting and comparing sealant IFE.

KW - Adhesion

KW - Bituminous materials

KW - Bond strength (Materials)

KW - Bonding

KW - Glass transition temperature

KW - Pavement maintenance

KW - Rheology

KW - Sealing compounds

KW - Temperature

KW - Viscosity

UR - <http://dx.doi.org/10.3141/2044-11>

UR - <https://trid.trb.org/view/868653>

ER -

TY - JOUR

AN - 01111630

JO - Road Materials and Pavement Design

PB - Taylor & Francis

AU - Tallapragada, Pavan K

AU - Ioannides, Anastasios M

**TI - Performance Prediction and Life Cycle Costs at the Ohio Route 50 Test Pavement**

PY - 2008

VL - 9

IS - 1

SP - pp 7-30

AB - This article describes the application of mechanistic-based pavement performance prediction equations and life cycle costing at a joint sealant experiment at the Ohio Route 50 project. Rehabilitation costs that accrued for each sealant material over the life cycle of the pavement system were compared. This then allowed for evaluating the cost effectiveness of different kinds of sealant material options. In addition, in order to select an appropriate distress prediction methodology, performance prediction in pavements was studied. Focus was on mechanistic-based performance prediction, particularly since there has been a significant increase in this type of approach to pavement design.

KW - Life cycle analysis

KW - Life cycle costing

KW - Mechanistic design

KW - Pavement design

KW - Pavement performance

KW - Sealing compounds

UR - <https://trid.trb.org/view/870516>

ER -

TY - SER

AN - 01111879

JO - TRL Published Project Report

PB - TRL

AU - HEWITT, N C

AU - SANDERS, P J

AU - LANGDALE, P C

**TI - Sustainable structural maintenance of a flexible composite road using crack and seat and ViaForm**

SN - 1846087295

PY - 2008

IS - PPR228

SP - complex pagination

AB - Crack and seat has become an established technique for the cost-effective rehabilitation of flexible composite roads in the UK. However, as the treatment requires exposure of the underlying lean concrete base, it has, in the past, required the transportation and disposal of large amounts of asphalt planning's and the placement of a new hot mix asphalt overlay. Cemex UK Construction Services Limited (Cemex) were appointed as the main contractor for a major crack and seat maintenance scheme on the A46 trunk road in Warwickshire. In order to improve the sustainability of the maintenance treatment, Cemex sought to incorporate a layer of ViaFoam Cold Recycled Base Material (CRBM) in the new overlay. This material would be produced by Cemex in an ex situ process utilizing the asphalt planning's arising from the crack and seat phase of the scheme. As this was believed to be the first time in the UK that a recycled material has been used over a crack and seat treated cement bound layer, verification was required that the proposed construction would satisfy the design requirements for both components. This report contains details of the design approach used, observations during the construction of the scheme, presents the results of the in situ and laboratory testing and presents a discussion of potential future applicability of the combined treatment. An estimation of the reduction in CO2 emissions owing to the use of the combination of crack and seat and ViaFoam in comparison to two conventional alternatives is also presented. (A)

KW - Arterial highways

KW - Base course (Pavements)

KW - Bitumen

KW - Building materials

KW - Composite

KW - Composite materials

KW - Cracking

KW - Design

KW - Design (overall design)

KW - Environment protection

KW - Flexible pavement

KW - Flexible pavements

KW - Guidance

KW - Joint sealing

KW - Main road

KW - Maintenance

KW - Material (constr)

KW - Planing

KW - Planing (surface)

KW - Recycling  
KW - Recycling (mater)  
KW - Roadbase  
KW - Strengthening (Maintenance)  
KW - Strengthening (pavement)  
KW - Sustainability  
KW - Sustainable development  
KW - Test method  
KW - Test procedures  
KW - United Kingdom  
UR - <https://trid.trb.org/view/871420>  
ER -



TY - JOUR

AN - 01115573

JO - International Journal of Pavement Engineering

PB - Taylor & Francis

AU - Masson, Jean-Francois

AU - Woods, John R

AU - Collins, Peter

AU - Al-Qadi, Imad L

**TI - Accelerated Aging of Bituminous Sealants: Small Kettle Aging**

PY - 2008

VL - 9

IS - 5

SP - pp 365-371

AB - Bituminous sealants used in the maintenance of roadways are installed hot and heated to 150 — 200°C during installation. High temperatures can degrade polymers in sealants, but there is no standard method to account for this possible degradation. In an attempt to find such a method, the aging of two sealants in large kettles during field applications was compared to that obtained in the laboratory by heating in a small kettle. The results indicate that 4 hours (h) of small kettle aging at the highest suggested sealant application temperature (HiSAT), or about 2 h at HiSAT + 10°C, provided as much copolymer aging as that found in sealants sampled midway through installation.

KW - Aging (Materials)

KW - Asphalt mixtures

KW - Bitumen

KW - Bituminous binders

KW - Degradation (Thermodynamics)

KW - Materials at high or low temperatures

KW - Polymers

KW - Sealing compounds

UR - <http://www.informaworld.com/10.1080/10298430802068899>

UR - <https://trid.trb.org/view/875006>

ER -

TY - CONF

AN - 01117719

AU - Kucharek, Anton S

AU - Davidson, J Keith

AU - Linton, Peter

AU - Phillips, Ted

AU - Polyscience Publications

**TI - Resurfacing of Highway 127 in Ontario Using a High Performance Double Chip Seal**

SN - 0921317670

PY - 2007

SP - pp 325-348

AB - This paper, from the proceedings of the 52<sup>nd</sup> Annual Conference of the Canadian Technical Asphalt Association (CTAA), reports on a project that used high-performance, double-chip seal for the resurfacing of Highway 127 in Ontario, Canada. Highway 127 is a two-lane roadway between Maynooth and Highway 60 in Eastern Ontario which carries 1,600 Average Annual Daily Traffic (AADT) with 8.5 percent commercial vehicles. Prior to 2006, the pavement surface consisted of moderate to severely oxidized hot-mix asphalt, with non-uniform, heterogeneous sections. The Ministry of Transportation, Ontario (MTO) Eastern Region chose to use double chip seal treatment for a 16.4 km section of this road as a way to improve surface characteristics but also as a holding strategy before having to proceed with full road rehabilitation. The project included aggregate-binder compatibility testing and surface treatment performance testing. The seal used a CRS-2P emulsion with Ontario Provincial Standard Specification (OPSS) 304 Class 1 aggregate for the first lift and a ¼-1/8" chip for the second lift. The authors describe the stages of this project, outlining the laboratory work and the several design methods incorporated, and emphasizing how the project parameters led to adjustments in binder application rates. They conclude by discussing the construction stage, including equipment calibration, materials application and process control, traffic control and logistical aspects.

U1 - Fifty-Second Annual Conference of the Canadian Technical Asphalt Association (CTAA)Canadian Technical Asphalt Association Niagara Falls, Ontario, Canada StartDate:20071118 EndDate:20071121 Sponsors: Canadian Technical Asphalt Association

KW - Aggregates

KW - Asphalt additives

KW - Asphalt pavements

KW - Bituminous binders

KW - Chip seals

KW - Durability

KW - Durability tests

KW - Field tests

KW - Ontario (Canada)

KW - Seal coats

KW - Sealing (Technology)

KW - Service life

KW - Surface course (Pavements)

KW - Surface treating

KW - Traffic control

UR - <https://trid.trb.org/view/877845>

ER -

TY - CONF

AN - 01120592

AU - KUCHARREK, AS

AU - DAVIDSON, JK

AU - Kennedy, M

AU - Polyscience Publications

**TI - Development of a Solvent-Free Asphalt Emulsion for Prime Coats and Granular Sealing**

PY - 2008

SP - p. 83-103

AB - Prime coats and granular sealing refer to sprayed treatments intended to bind and stabilize the granular material on roads and on unpaved roadway shoulders. In addition to conferring cohesion and bond, these treatments also protect the underlying layers of granular material from moisture by creating a waterproofing layer at the surface. This paper presents the development stages of a solvent-free asphalt emulsion designed to match the performance of a cutback primer. Starting with the basic principles such an emulsion has to meet, a number of formulations have been produced, tested and optimized at the laboratory level. Specialized tests such as the Modified Sand Penetration Test were used to assess duration and depth of penetration of the emulsions into granular materials having different mineralogy, different levels of compaction and variable moisture content. A number of field trials of granular sealing on shoulders were done during 2006 and 2007, using emulsions optimized as described. Penetration during spraying was very good and performance to date of the treated areas is excellent.

U1 - Proceedings of the Fifty-third Annual Conference of the Canadian Technical Asphalt Association (CTAA) Canadian Technical Asphalt Association Saskatoon, Saskatchewan, Canada

StartDate:20081100 EndDate:20081100 Sponsors: Canadian Technical Asphalt Association

KW - Bitumen

KW - Canada

KW - Conferences

KW - Emulsions

KW - Granular materials

KW - Liquid asphalt

KW - Seal coats

KW - Water

UR - <https://trid.trb.org/view/878261>

ER -

TY - CONF

AN - 01120609

AU - Tighe, S

AU - Moore, G

AU - MACTAGGART, C

AU - DAVIDSON, K

AU - Polyscience Publications

**TI - Evaluating Warm Mix Asphalt Technology as a Possible Tool for Resolving Longitudinal Joint Problems**

PY - 2008

SP - p. 385-407

AB - This paper summarizes preliminary findings from an integrated laboratory and field study that is currently underway in the City of Hamilton to examine the impact of warm asphalt and how it can be used as a possible tool for examining longitudinal joint problems. It is a partnership between the City of Hamilton, the Centre for Pavement and Transportation Technology located at the University of Waterloo, and McAsphalt Industries. A longitudinal joint is the interface that exists between two Hot Mix Asphalt (HMA) lanes that are paved one after another. Premature failure of these longitudinal joints can vary from slight raveling at the joint to complete erosion of the mix at the longitudinal joint leaving a large gap in the pavement. Overall, this paper shares some of the key findings from the initial laboratory and field evaluation. This includes Dynamic Modulus and Resilient Modulus results observed from the laboratory prepared samples. In addition, findings from the field evaluations, including longitudinal joint permeability testing and surface distress surveys are presented.

U1 - Proceedings of the Fifty-third Annual Conference of the Canadian Technical Asphalt Association (CTAA) Canadian Technical Asphalt Association Saskatoon, Saskatchewan, Canada

StartDate:20081100 EndDate:20081100 Sponsors: Canadian Technical Asphalt Association

KW - Bitumen

KW - Canada

KW - Conferences

KW - Durability

KW - Field tests

KW - In service behavior

KW - Joint sealing

KW - Joints (Engineering)

KW - Laboratories

KW - Longitudinal

KW - Mix design

KW - Test procedures

KW - Vehicle performance

UR - <https://trid.trb.org/view/878274>

ER -

TY - JOUR

AN - 01123137

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Wilde, W James

AU - Johnson, Eddie N

**TI - Effect of Crack Sealant Material and Reservoir Geometry on Surface Roughness of Bituminous Overlays**

SN - 9780309126250

PY - 2009

IS - 2108

SP - pp 69-74

AB - Many state, county, and municipal highway agencies have experienced the formation of bumps when placing single-lift overlays or the first lift of a multiple-lift overlay. These bumps are produced at the location of a previously existing crack, and even then almost exclusively when the crack has been sealed in advance of the overlay. When such bumps are not covered with a subsequent lift, what remains is often a rough ride on a newly overlaid roadway. The effects of crack sealant material type and geometry (shape) of the routed cracks in the existing surface on the formation of bumps in bituminous overlays are described. A matrix of four sealant type treatments and six geometries was designed and implemented in a test section in Jackson County, Minnesota. The overlay on the test section was constructed in September 2007. Results of this investigation indicate that cooler pavement surface temperatures, no over band, hot-poured crumb rubber, and hot-poured elastic sealants provide the best resistance to the formation of bumps in overlays.

KW - Bituminous overlays

KW - Crack geometry

KW - Crumb rubber

KW - Hot pour sealants

KW - Jackson County (Minnesota)

KW - Pavement maintenance

KW - Roughness

KW - Sealing compounds

KW - Surface temperature

KW - Test sections

UR - <http://dx.doi.org/10.3141/2108-08>

UR - <https://trid.trb.org/view/881637>

ER -

TY - JOUR

AN - 01122044

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Williams, Stacy Goad

AU - Pervis, Ashly

AU - Bhupathiraju, Leela Soujanya

AU - Porter, Annette

**TI - Methods for Evaluating Longitudinal Joint Quality in Asphalt Pavements**

SN - 9780309126144

PY - 2009

IS - 2098

SP - pp 113-123

AB - Longitudinal joint quality is essential to the successful performance of hot-mix asphalt (HMA) pavements. Longitudinal joints have received a considerable amount of attention recently, because many state agencies are moving toward implementation of longitudinal joint specifications. Most measures of joint quality are based on density determinations. However, distress at the joint is caused by the ability of air and water to enter the pavement structure, an action that is directly related to the permeability of the joint. In other words, density alone may not be sufficient to describe the quality of a longitudinal joint. The objective of this study was to identify the most appropriate test method or methods for describing HMA longitudinal joint quality. Three projects were selected for the study, and four testing stations were identified for each project. At each station, a number of test methods were performed at the longitudinal joint and to either side of the joint to assess the ability of each method to properly discriminate between levels of joint quality. Multiple measures of density, permeability, and gradation were obtained at each station. Overall, the methods providing the most accurate predictions of joint quality and the greatest level of discrimination were the vacuum sealing and saturated surface-dry (SSD) methods for determining the bulk specific gravity of field cores. Although measures of permeability and infiltration showed promise, it was recommended that the vacuum sealing and SSD methods for the determination of field core density be considered in the evaluation of longitudinal joint quality.

KW - Aggregate gradation

KW - Asphalt pavements

KW - Cores (Specimens)

KW - Density

KW - Longitudinal joints

KW - Paving

KW - Permeability

KW - Quality control

KW - Road construction

KW - Saturated surface dry method

KW - Specific gravity

KW - Test procedures

KW - Vacuum sealing method

UR - <http://dx.doi.org/10.3141/2098-12>

UR - <https://trid.trb.org/view/882235>

ER -

TY - RPRT

AN - 01120941

AU - ALDERSON, A

AU - OLIVER, J

AU - AUSTROADS

**TI - Seal distress mechanisms: an initial study into flushing**

SN - 9781921329814

PY - 2008/08

IS - AP-T108/08

SP - 39P

AB - A review of bleeding or flushed seals was undertaken to determine what physical changes had taken place within the seal that had resulted in the binder lying at or close to the surface. The evaluation process used a visual appraisal and a digital image process. A number of experienced personnel examined samples of seals taken from the road bed and asked to comment on the condition of the seal. The collated comments were compared to a digital analysis technique. The digital analysis technique applied algorithms to measure various areas within the seal and quantify a number of indicative parameters. This work was seen as a pilot study and further work looking at a broader range of seal types and distress levels was deemed necessary to validate the digital analysis process. (a)

KW - Binder

KW - Binders

KW - Bleeding (concrete/bitumen)

KW - Bleeding (Pavements)

KW - Deterioration

KW - Evaluation

KW - Evaluation (assessment)

KW - Experimental road

KW - Experimental roads

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

UR - <https://trid.trb.org/view/882948>

ER -

TY - ABST

AN - 01120944

AU - CHOI, Y

AU - AUSTROADS

**TI - Review of foamed bitumen sealing in Australia**

SN - 9781921329838

PY - 2008/08

IS - AP-T111/08

SP - 11P

AB - In 1993, Austroads performed an extensive trial of foamed bitumen sprayed sealing in Australia, as a part of environmental and energy effective sealing technology development program. The trials were conducted in various states and reported to be successful in producing satisfactory performing pavements. However, the technology is currently not used in Australia (or France) due to several operational problems encountered, and commercial viability issues. A recently introduced spraying system (synchronized sprayer) may be able to resolve some of the operational problems previously encountered. The report therefore proposed specific procedures to revive the technique, if required (e.g. due to environmental concerns). (a)

KW - Bitumen

KW - Construction management

KW - Construction method

KW - Foamed bitumen

KW - Foamed materials

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Surface dressing

UR - <https://trid.trb.org/view/882951>

ER -



TY - RPRT

AN - 01120948

AU - CHOI, Y

AU - AUSTROADS

**TI - Review of surface texture measurement method for seal design input**

SN - 9781921329944

PY - 2008/09

IS - AP-T112/08

SP - 35P

AB - This report presents an extensive literature review of pavement surface texture measurement methods with a specific interest in how they affect operator safety and delays to traffic. The literature review shows that there are a number of methods in use, such as the volumetric technique, image analysis technique and the laser profile techniques. Among the various methods, the vehicle mounted laser profile technique was the only method which effectively resolves the operator safety and traffic delay issues. However, adopting the vehicle laser profiler would also be impractical at present due to other issues, such as the high cost. The report also looked into the feasibility of network survey data for use in seal design purposes and found that the texture data collected from routine network surveys can be used for a preliminary desk-top estimation, prior to a detailed seal design. (a)

KW - Data acquisition

KW - Data collection

KW - Evaluation

KW - Evaluation (assessment)

KW - Flexible pavement

KW - Flexible pavements

KW - Measurement

KW - Pavement

KW - Pavements

KW - Profilometer

KW - Profilometers

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Surface texture

KW - Texture

UR - <https://trid.trb.org/view/882955>

ER -

TY - RPRT

AN - 01122988

AU - Federal Highway Administration

**TI - Pavement Preservation Treatment Construction Guide**

PY - 2008

SP - v.p.

AB - This online guide begins with an introductory chapter that presents an overview of pavements and how a pavement preservation strategy that implements preventive maintenance treatments can be used to preserve the condition of a highway system and extend its service life. A discussion of pavement distresses identifies the potential causes of the distress types. Also discussed are the various treatment types used in preventive maintenance, including the selection of the most appropriate treatment. These topics are discussed in greater detail in Chapters 2-10. The final chapter, Chapter 11, describes how to choose a pavement preservation strategy to preserve the condition of a highway system and extend its service life. It identifies factors involved in selecting feasible treatment types and presents a means of evaluating those various treatment types to determine which is best suited to specific pavement distresses. Chapter headings are as follows: (1) Introduction; (2) Materials; (3) Crack sealing, crack filling and joint sealing of flexible and rigid pavements; (4) Patching and edge repair; (5) Chip seals; (6) Fog seals; (7) Slurry seals; (8) Micro surfacing projects; (9) Thin functional and maintenance overlay projects; (10) Ultra-thin, hot-mixed, bonded overlay projects; and (11) Selecting a pavement preservation treatment.

KW - Asphalt

KW - Asphalt emulsions

KW - Asphalt Rubber

KW - Chip seals

KW - Crack filling

KW - Crack sealing

KW - Flexible pavements

KW - Fog seals

KW - Guidelines

KW - Joint sealing

KW - Materials

KW - Micro surfacing

KW - Overlays (Pavements)

KW - Patching

KW - Pavement distress

KW - Pavement preservation

KW - Polymer asphalt

KW - Preventive maintenance

KW - Repairing

KW - Rigid pavements

KW - Slurry seals

KW - Ultra-thin hot mix overlays

UR - <http://fhwapap34.fhwa.dot.gov/NHI-PPTCG/index1.htm>

UR - <https://trid.trb.org/view/884616>

ER -

TY - RPRT

AN - 01124308

AU - Al-Qadi, Imad L

AU - Masson, Jean-Francois

AU - Fini, Eli H

AU - Yang, Shih-Hsien

AU - McGhee, Kevin Kenneth

AU - University of Illinois, Urbana-Champaign

AU - Virginia Department of Transportation

AU - Federal Highway Administration

AU - Virginia Transportation Research Council

**TI - Development of Performance-Based Guidelines for Selection of Bituminous-Based Hot-Poured Pavement Crack Sealant: An Executive Summary Report**

PY - 2009/01//Final Contract Report

SP - 41p

AB - This report summarizes research presented in separate technical reports, papers, and journal articles that collectively document the development of a systematic process to aid in the selection of appropriate bituminous hot-poured sealants for pavement cracks and joints. The following process elements are summarized herein: Apparent Viscosity Test for Hot-Poured Crack Sealants, Development of a Short-Term Aging Test and Low-Temperature Testing Bibliography, Sealant Flow and Deformation by Dynamic Shear Rheometry in Summer Temperatures, Characterization of Low Temperature Creep Properties of Crack Sealants Using Crack Sealant Bending Beam Rheometry, Characterization of Low Temperature Mechanical Properties of Crack Sealants Using Crack Sealant Direct Tension Test, and Development of Adhesion Tests for Crack Sealants at Low Temperature. This report brings the results of this cumulative research together to introduce a set of tests and performance parameters for sealant at installation and service temperatures; an aging procedure to simulate sealant weathering; and most important, a simplified chart with thresholds for all performance parameters for the straightforward selection of crack sealant.

KW - Adhesion

KW - Aging (Materials)

KW - Bituminous materials

KW - Creep tests

KW - Guidelines

KW - Hot-pour sealants

KW - Literature reviews

KW - Low temperature tests

KW - Mechanical properties

KW - Pavement cracking

KW - Pavement joints

KW - Rheometers

KW - Sealing compounds

KW - Tension tests

KW - Viscosity

UR - [http://www.virginiadot.org/vtrc/main/online\\_reports/pdf/09-cr7.pdf](http://www.virginiadot.org/vtrc/main/online_reports/pdf/09-cr7.pdf)

UR - <https://trid.trb.org/view/885601>

ER -

TY - RPRT

AN - 01125388

AU - American Association of State Highway and Transportation Officials (AASHTO)

**TI - NTPEP Report 16002.2 - Two-Year (Twenty-Nine Months) Report of Field and Laboratory Evaluation of Hot Mix Asphalt Crack Sealing Materials (2005 Minnesota US 169 Test Deck) - Part A**

PY - 2009/02

SP - 55p

AB - The National Transportation Product Evaluation Program (NTPEP) was developed in order to evaluate a variety of traffic, construction and maintenance products. This report provides information concerning the installation and field evaluation of Hot-Mix Asphalt (HMA) Crack Sealing Materials submitted by manufacturers in 2005. It presents the results of the evaluation. Results presentation are continued in Part B. Minnesota is the host state.

KW - Crack and seat treatment

KW - Crack sealants

KW - Evaluation

KW - Field tests

KW - Hot mix asphalt

KW - Laboratory tests

KW - Products

UR - [http://www.ntpep.org/Documents/Technical\\_Committee/CS/Reports/CS\\_Rpt\\_16002.2\\_Feb-2009\\_Pt-A.pdf](http://www.ntpep.org/Documents/Technical_Committee/CS/Reports/CS_Rpt_16002.2_Feb-2009_Pt-A.pdf)

UR - <https://trid.trb.org/view/885840>

ER -

TY - RPRT

AN - 01125373

AU - American Association of State Highway and Transportation Officials (AASHTO)

**TI - NTPEP Report 16002.2 - Two-Year (Twenty-Nine Months) Report of Field and Laboratory Evaluation of Hot Mix Asphalt Crack Sealing Materials (2005 Minnesota US 169 Test Deck) - Part B**

PY - 2009/02

SP - 45p

AB - The National Transportation Product Evaluation Program (NTPEP) was developed in order to evaluate a variety of traffic, construction and maintenance products. This report provides information concerning the installation and field evaluation of Hot-Mix Asphalt (HMA) Crack Sealing Materials submitted by manufacturers in 2005. Minnesota is the host state. The report continues the presentation of results begun in Part A.

KW - Crack and seat treatment

KW - Crack sealants

KW - Evaluation

KW - Field tests

KW - Hot mix asphalt

KW - Laboratory tests

KW - Products

UR - [http://www.ntpep.org/Documents/Technical\\_Committee/CS/Reports/CS\\_Rpt\\_16002.2\\_Feb-2009\\_Pt-B.pdf](http://www.ntpep.org/Documents/Technical_Committee/CS/Reports/CS_Rpt_16002.2_Feb-2009_Pt-B.pdf)

UR - <https://trid.trb.org/view/885841>

ER -

TY - CONF

AN - 01124579

AU - HOLTROP, W

AU - ARRB Group Limited

**TI - Sprayed sealing practice in Australia**

SN - 1876592559

PY - 2008/07

SP - 27p

AB - This paper provides an overview of current sealing practice in Australia, including priming and primer sealing, types of sprayed seals and their selection, the current national seal design procedure, and plant and field procedures commonly used. Asphalt is the preferred treatment in urban areas, on heavily trafficked urban freeways and arterial roads, and areas of high traffic stresses. Sprayed sealing is the surfacing treatment commonly used in rural areas, and is the most economic type of surfacing for the rural road network. It is also used for specific applications, such as strain alleviating membranes to minimize crack reflection, on all classes of roads. The main type of sprayed seal is a single layer of binder covered with a single layer of aggregate (single/single seal) used on both new and resurfacing work. Sprayed seal design as referred to in this paper is the design of rates of application of binder and aggregate spread rates. The continued success of sprayed seals as a surfacing requires care in choosing an appropriate treatment for the conditions, a high standard of preparation of pavements and attention to detail. To successfully select and design a sprayed seal requires a mix of engineering and 'practical know how'.

U1 - International Sprayed Sealing Conference, 1<sup>st</sup>, 2008, Adelaide, South Australia, Australia

StartDate:20080727 EndDate:20080729

KW - Aggregates

KW - Asphalt

KW - Binders

KW - Pavement design

KW - Seal coats

KW - Sprays (Materials)

UR - <https://trid.trb.org/view/885865>

ER -

TY - CONF

AN - 01124602

AU - HOLLERAN, G

AU - HOLLERAN, I

AU - ARRB Group Limited

**TI - Coalescence control in sealing emulsions to promote break and cure under variable conditions**

SN - 1876592559

PY - 2008/07

SP - 14p

AB - Emulsion sealing is a method of making sprayed seals in many countries including UK, USA and France. More recently in New Zealand emulsions have been mainly used for two coat seals.

Emulsion seals have potential to be used under a range of conditions and with a range of stone sizes for single coat seals. Safety considerations and the general need to be environmentally responsible have pushed Fulton Hogan to emulsion sealing as a solution. Polymer emulsions have been used to extend seal performance for some years, however cost considerations make polymer modification undesirable in some situations. Emulsions are chemical systems and surfactant development has been intense in the last decade. This work examines the coalescence in emulsion aggregate systems and develops methods to measure stone retention under various conditions of cure. The effect of emulsion characteristics, such as particle size distribution, and emulsifier type are examined.

Emulsions which can be controlled for break and cure under widely varying conditions can be formulated. Control of inversion, wetting and particle size are very important in emulsion performance. These aspects are discussed as well as the test methods developed.

U1 - International Sprayed Sealing Conference, 1<sup>st</sup>, 2008, Adelaide, South Australia, Australia

StartDate:20080727 EndDate:20080729

KW - Asphalt

KW - Bitumen

KW - Concrete curing

KW - Emulsion breaking

KW - Emulsions

KW - Polymer modified binders

KW - Sprays (Materials)

UR - <https://trid.trb.org/view/885889>

ER -

TY - CONF  
AN - 01124705  
AU - ARRB Group Limited  
**TI - 1<sup>st</sup> International Sprayed Sealing Conference: 27-29 July 2008, Adelaide, South Australia**  
SN - 1876592559  
PY - 2008/07  
SP - 1 CD ROM  
AB - No abstract provided.  
U1 - International Sprayed Sealing Conference, 1<sup>st</sup>, 2008, Adelaide, South Australia, Australia  
StartDate:20080727 EndDate:20080729  
KW - Asphalt  
KW - Binders  
KW - Chip seals  
KW - Contracts  
KW - Emulsions  
KW - Pavement design  
KW - Pavement testing  
KW - Road materials  
KW - Seal coats  
KW - Sprays (Materials)  
KW - Surfacing  
UR - <https://trid.trb.org/view/885997>  
ER -



TY - JOUR

AN - 01124735

JO - Road and Transport Research

PB - ARRB Group Limited

AU - Holtrop, W

**TI - Sprayed sealing practice in Australia**

PY - 2008/12

VL - 17

IS - 4

SP - 41-60

AB - This paper provides an overview of current sealing practice in Australia, including priming and primer sealing, types of sprayed seals and their selection, the current national seal design procedure, and plant and field procedures commonly used. Asphalt is the preferred treatment in urban areas, on heavily trafficked urban freeways and arterial roads, and areas of high traffic stresses. Sprayed sealing is the surfacing treatment commonly used in rural areas, and is the most economic type of surfacing for the rural road network. It is also used for specific applications, such as strain alleviating membranes to minimize crack reflection, on all classes of roads. The main type of sprayed seal is a single layer of binder covered with a single layer of aggregate (single/single seal) used on both new and resurfacing work. On new work the pavement material is usually locally available gravel, often of marginal quality, with better quality crushed rock material used on the more heavily trafficked roads. Sprayed seal design as referred to in this paper is the design of rates of application of binder and aggregate spread rates. The continued success of sprayed seals as a surfacing requires care in choosing an appropriate treatment for the conditions, a high standard of preparation of pavements and attention to detail. To successfully select and design a sprayed seal requires a mix of engineering and "practical know how".

KW - Asphalt

KW - Australia

KW - Pavement design

KW - Pavement performance

KW - Sprays (Materials)

UR - <https://trid.trb.org/view/886028>

ER -

TY - JOUR

AN - 01127052

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Johnston, Kimberly

**TI - Know Your Options for Hot Pour Crack Sealing**

PY - 2009/02

VL - 24

IS - 2

SP - pp 32-35

AB - Hot pour crack sealing can be an important part of a contractor's business or simply an add-on service. The type of equipment needed for crack sealing depends strongly on the type and size of crack sealing jobs that will be done. This article discusses the available options. A pour pot, which holds only a few gallons of sealant, may be all that is needed for small jobs. A bander, which is often found in 10-gallon capacities, may be more appropriate for larger jobs. Some banders come with their own heat source and can act as a melter/applicator system, while some need separate melting kettles like a pour pot. The largest jobs require melter/applicator units. These units are usually trailer mounted and come in 100-, 200- and 400-gallon capacities. These large units come with an array of options such as dual or heated hoses and a material transfer conveyer. Equipment purchasers should have an idea of their planned use of the equipment before they talk to manufacturers, and should test out larger application units before they make a final decision.

KW - Equipment characteristics

KW - Hot mix asphalt

KW - Maintenance equipment

KW - Pavement cracking

KW - Sealing (Technology)

UR - <https://trid.trb.org/view/887757>

ER -

TY - RPRT

AN - 01128391

AU - Hu, Xiaodi

AU - Zhou, Fujie

AU - Scullion, Tom

AU - Texas Transportation Institute

AU - Texas Department of Transportation

AU - Federal Highway Administration

**TI - Development of the Crack Sealant Adhesion Test**

PY - 2009/04//Technical Report

SP - 56p

AB - Crack sealants are widely used in Texas to prevent water from entering into lower structural layers thereby extending pavement life. However, most current crack sealants have been reported to have a very short life mainly due to adhesive failures. Although adhesive failure is known to be the major failure mechanism very little attention has been paid to measuring this property in the laboratory. The main objective of this project was to develop a performance related adhesion test using the Texas Department of Transportation's Overlay Tester. In this report the crack sealant adhesion test protocol developed in year 1 of this study was finalized. The final test protocol includes a molding jig, a detailed sample preparation procedure, an adhesion test protocol, and criteria for interpreting the results. In this study 13 sealants (some of them have never been used in Texas) were evaluated following the proposed test protocol. The results clearly showed that the crack sealant adhesion test can effectively differentiate the poor sealants from the good ones. Furthermore, based on these test results, a draft crack sealant special specification was proposed. This is different from the current specification, which is mainly based on crumb rubber content. The new special specification is based on the results of the new adhesion test. In addition to this performance test other complementary factors such as flash point, softening point, and viscosity have been included in the new specification. In the proposed specification, the sealants are classified as: Type A (min. 100 cycles to failure at 45 °F), Type B (min. 400 cycles to failure at 45 °F), and Type C (min. 400 cycles to failure at 33 °F). In addition, preliminary recommendation on optimum sealant types were made for each district in the state based on climatic conditions (freeze thaw cycles). Finally, an experimental test plan was developed to validate the draft special specification.

KW - Adhesion

KW - Freeze thaw durability

KW - Performance based specifications

KW - Performance tests

KW - Sealing compounds

KW - Test procedures

UR - <http://tti.tamu.edu/documents/0-5457-2.pdf>

UR - <https://trid.trb.org/view/888912>

ER -

TY - RPRT

AN - 01128387

AU - Watson, Mark

AU - Olson, Roger C

AU - Pantelis, John

AU - Johnson, Eddie N

AU - Wood, Thomas J

AU - Minnesota Department of Transportation

AU - Minnesota Department of Transportation

**TI - Long Term Maintenance Effects on HMA Pavements Caused by Rumble Strips and Available Preventive Treatment Methods**

PY - 2008/10//Final Report

SP - 23p

AB - Rumble strips are a cost effective safety treatment for rural pavements, however they allow water to pool and increase the surface area of the pavement exposed to the elements. This research sought to address the maintenance effects of rumble strips on hot mix asphalt pavements and what effect, if any, these have on the service life of the pavement. A survey was conducted which found that most respondents either noted the presence of distresses in rumble strips, or were concerned that the rumble strips were the direct cause of distresses. Next this study recommended several treatment options for pavements with rumble strips. Many of these recommendations are anecdotal and based on engineering judgment, which underscores the need for additional research. The recommended preventive maintenance treatment is to use construction funds to apply a cationic rapid set polymer modified diluted (CRS-2pd) fog seal over the entire shoulder, including the rumble strips. This will ensure an initially sealed surface and provide the maximum benefit in terms of service life extension. Crack sealing, although not an integral part of preventive maintenance for rumble strips should be applied to the adjacent cracks to slow the growth of cracks into ground in rumble strips.

KW - Asphalt pavements

KW - Crack sealing

KW - Fog seals

KW - Pavement maintenance

KW - Preventive maintenance

KW - Rumble strips

KW - Service life

UR - <http://www.lrrb.org/PDF/200850.pdf>

UR - <https://trid.trb.org/view/888930>

ER -

TY - CONF

AN - 01131515

JO - Journal of the Association of Asphalt Paving Technologists

PB - Association of Asphalt Paving Technologists (AAPT)

AU - Fini, E H

AU - Al-Qadi, I L

AU - Masson, J-F

AU - McGhee, K K

**TI - Interfacial Fracture Energy: An Indicator of Bituminous Material Adhesion**

PY - 2008

VL - 77

SP - pp 827-850

AB - That an effective binder-aggregate bonding prediction method is the pressurized blister test is demonstrated in this paper. The blister test recently has been introduced as a reliable approach to bituminous sealant and aggregate bonding prediction. There can be test application on any bituminous material, from the most brittle binder to the softest bituminous crack sealant, since this test measures a geometry-independent parameter that is an inherent property interface. Cohesive failures becomes a concern with very brittle material. An increase in thickness of the adhesive specimen can easily prevent such a failure. A specimen's thickness increase, however, also gives rise to shear forces that this analysis cannot neglect. This paper presents shear force effect on the interfacial fracture energy (IFE) of adhesive bituminous materials by utilizing theoretical and experimental analyses. Shear force effect on blister deflection is shown as a material thickness function. Additionally, bituminous material IFE dependence on temperature and loading rate was investigated through laboratory testing. For each material where IFE is optimized, an optimum temperature and loading rate can be identified. For improved performance under defined environmental conditions, this may help select appropriate binder/sealant.

U1 - Asphalt Paving Technology 2008Philadelphia,PA StartDate:20080427 EndDate:20080430

KW - Adhesion

KW - Aggregates

KW - Binders

KW - Bituminous materials

KW - Blistering

KW - Bonding

KW - Brittleness

KW - Fracture energy

KW - Interfacial properties

KW - Loading rate

KW - Mathematical prediction

KW - Optimization

KW - Sealing compounds

KW - Shear forces

KW - Temperature

KW - Testing

UR - <https://trid.trb.org/view/891100>

ER -

TY - RPRT

AN - 01131646

AU - CHOI, Y

AU - Austroads

**TI - Ball penetration test: stage 2: field validation**

SN - 9781921551178

PY - 2009/02

IS - AP-T127/09

SP - 38P

AB - Field testing was carried out to validate the K factors of the ball penetration test and found generally comparable trends to the previously determined laboratory data. Consequently, a replacement K factor (0.06) was recommended for 'fatty roads and asphalt surfaces' (currently 0.08). Extensive field work was carried out to investigate factors affecting ball penetration test on unsealed/primed bases. It was found that the moisture content of the base was the major factor affecting the ball penetration test. The findings in this report were based on a limited amount of data collected for this study and thus further field data (K factors and base investigation) need to be collected from other areas of Australia and New Zealand. (a)

KW - Base course (Pavements)

KW - Basecourse

KW - Experimental road

KW - Experimental roads

KW - Field tests

KW - In situ

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Temperature

KW - Test method

KW - Test procedures

UR - <https://trid.trb.org/view/891822>

ER -

TY - CONF

AN - 01139040

AU - Shuler, Scott

AU - Ranieri, Vittorio

AU - Politecnico di Torino

**TI - A Study of the Performance of Six Crack Seal Installation Procedures**

PY - 2009

SP - 10p

AB - This paper describes how the most common method of preventing moisture and debris infiltration into cracked pavement structures is by filling the cracks with asphalt sealers. Maintenance personnel responsible for this activity often have different opinions regarding the most effective method to use to seal these cracks and little objective evidence exists in the literature regarding the best techniques. Often, expedience and safety lead workers to fill the cracks as rapidly as possible without significant initial preparation. Mechanical routing of the crack to form a geometrically defined reservoir for the sealant requires more effort and time. This research was conducted to measure differences in performance between minimal crack preparation and significant preparation. Preparation techniques included routing cracks and air blowing to remove debris, blowing out debris while simultaneously heating the crack to remove any moisture, and simply blowing out debris with compressed air. After crack preparation each crack was filled using two techniques. These techniques included filling to the surface and overfilling and spreading the excess sealant over the edges of the crack. Three sealant suppliers provided five different products at three separate sites. Each combination of product and application technique was placed in six transverse cracks. This resulted in an experiment with a total of 420 filled cracks on approximately 16 km (10 miles) of pavement at three sites. Results after twelve months service indicate a significant difference in performance depending on the preparation method and filling technique. The best results were obtained when cracks were filled using the over-banding technique regardless of whether routed, hot air lanced or air blown. In addition, performance improved between the five month survey and the twelve month survey for some treatments indicating that some healing of the crack sealants may be occurring.

U1 - Sixth International Conference on Maintenance and Rehabilitation of Pavements and Technological Control (MAIREPAV6) International Society for Maintenance and Rehabilitation of Transportation Infrastructure Transportation Research Board Turin, Italy StartDate:20090708 EndDate:20090710 Sponsors: International Society for Maintenance and Rehabilitation of Transportation Infrastructure, Transportation Research Board

KW - Asphalt air blowing

KW - Crack sealing

KW - Debris removal

KW - Moisture damage

KW - Pavement cracking

KW - Pavement maintenance

KW - Sealing compounds

KW - Transverse cracking

UR - <https://trid.trb.org/view/899372>

ER -

TY - CONF

AN - 01139972

AU - Hessling, J

AU - Shuler, S

AU - American Society of Civil Engineers

**TI - Effect of De-Icing Chemicals on Crack Sealant Performance in Colorado, USA**

SN - 9780784410431

PY - 2009

SP - pp 104-109

AB - Crack sealants prevent moisture and debris intrusion into pavements. The length of time that crack sealants are effective is important to highway agencies. Many highway agencies utilize a magnesium chloride solution to prevent snow and ice accumulation on roadway surfaces. It has been reported that this de-icing solution leaves a residue inside unfilled cracks in asphalt pavements, potentially affecting the performance of crack sealants. The purpose of this study was to assess the effect of magnesium chloride application on the performance of two types of crack sealants at two elevations in Colorado, United States. The experiment was designed to evaluate the association between crack fill remaining over a three year period and two different crack sealants, with and without exposure to magnesium chloride. Using factorial ANOVA, a statistically significant difference ( $p < 0.05$ ) between the two crack fill products was observed at both elevations; however, the effect of magnesium chloride was only observed for the crack sealants at the higher elevation.

U1 - Geo Hunan International Conference: Challenges and Recent Advances in Pavement Technologies and Transportation Geotechnics American Society of Civil Institute Central South University, China Federal Highway Administration Transportation Research Board Texas Transportation Institute Texas Department of Transportation Chongqing Jiaotong University, China Deep Foundation Institute Hunan University International Society for Asphalt Pavements Jiangsu Transportation Research Institute Korea Institute of Construction Technology Korean Society of Road Engineers Chinese Society of Pavement Engineering Changsha, Hunan, China StartDate:20090803 EndDate:20090806 Sponsors: American Society of Civil Engineers, Asphalt Institute, Central South University, China, Federal Highway Administration, Transportation Research Board, Texas Transportation Institute, Texas Department of Transportation, Chongqing Jiaotong University, China, Deep Foundation Institute, Hunan University, International Society for Asphalt Pavements, Jiangsu Transportation Research Institute, Korea Institute of Construction Technology, Korean Society of Road Engineers, Chinese Society of Pavement Engineering

KW - Colorado

KW - Cracking

KW - Deicing

KW - Deicing chemicals

KW - Magnesium chloride

KW - Pavements

KW - Sealing compounds

UR - <https://trid.trb.org/view/900099>

ER -



TY - SER

AN - 01142083

JO - Civil Engineering Studies, Illinois Center for Transportation Series

PB - University of Illinois, Urbana-Champaign

AU - Al-Qadi, Imad L

AU - Fini, Eli H

AU - Figueroa, Hector D

AU - Masson, Jean-Francois

AU - McGhee, Kevin K

AU - University of Illinois, Urbana-Champaign

AU - Federal Highway Administration

AU - Virginia Department of Transportation

**TI - Adhesion Testing Procedure for Hot-Poured Crack Sealants**

PY - 2008/11

IS - 08-026

SP - 105p

AB - Crack sealing is a common pavement maintenance treatment because it extends pavement service life significantly. However, crack sealant often fails prematurely due to a loss of adhesion. Because current test methods are mostly empirical and only provide a qualitative measure of bond strength, they cannot predict sealant adhesive failure accurately. Hence, there is an urgent need for test methods based on bituminous sealant rheology that can better predict sealant field performance. This study introduces three laboratory tests aimed to assess the bond property of hot-poured crack sealant to pavement crack walls. The three tests are designed to serve the respective needs of producers, engineers, and researchers. The first test implements the principle of surface energy to measure the thermodynamic work of adhesion, which is the energy spent in separating the two materials at the interface. The work of adhesion is reported as a measure of material compatibility at an interface. The second test is a direct adhesion test, a mechanical test which is designed to closely resemble both the installation process and the crack expansion due to thermal loading. This test uses the Direct Tensile Test (DTT) machine. The principle of the test is to apply a tensile force to detach the sealant from its aggregate counterpart. The maximum load,  $P_{max}$ , and the energy to separation,  $E$ , are calculated and reported to indicate interface bonding. The third test implements the principles of fracture mechanics in a pressurized circular blister test. The apparatus is specifically designed to conduct the test for bituminous crack sealant, asphalt binder, or other bitumen-based materials. In this test, a fluid is injected at a constant rate at the interface between the substrate (aggregate or a standard material) and the adhesive (crack sealant) to create a blister. The fluid pressure and blister height are measured as functions of time; the data is used to calculate Interfacial Fracture Energy (IFE), which is a fundamental property that can be used to predict adhesion. The stable interface debonding process makes this test attractive. This test may also provide a means to quantify other factors, such as the moisture susceptibility of a bond. In addition, the elastic modulus of the sealant and its residual stresses can be determined analytically. While the direct adhesion test is proposed as part of a newly developed performance-based guideline for the selection of hot-poured crack sealant, the blister test can be used to estimate the optimum annealing time and installation temperature.

KW - Adhesion

KW - Adhesion tests

KW - Bonding

KW - Fracture mechanics

KW - Laboratory tests

KW - Pavement cracking

KW - Pavement maintenance

KW - Sealing compounds

KW - Surface energy

KW - Test procedures

UR - <http://ntl.bts.gov/lib/31000/31000/31014/ICT-08-026.pdf>

UR - <https://trid.trb.org/view/901839>

ER -

TY - SER

AN - 01142063

JO - Civil Engineering Studies, Illinois Center for Transportation Series

PB - University of Illinois, Urbana-Champaign

AU - Al-Qadi, Imad L

AU - Yang, Shih-Hsien

AU - Elseifi, Mostafa A

AU - Dessouky, Samer H

AU - Loulizi, Amara

AU - Masson, Jean-Francois

AU - McGhee, Kevin K

AU - University of Illinois, Urbana-Champaign

AU - Federal Highway Administration

AU - Virginia Department of Transportation

**TI - Characterization of Low Temperature Creep Properties of Crack Sealants Using Bending Beam Rheometry**

PY - 2008/11

IS - 08-029

SP - 81p

AB - Crack sealing has been widely used as a routine preventative maintenance practice. Given its proper installation, crack sealants can extend pavement service life by three to five years. However, current specifications for the selection of crack sealants correlate poorly with field performance. The purpose of this research was to develop performance guidelines for the selection of hot-poured bituminous crack sealants at low temperature. In this part of the research, the creep behavior of crack sealant at low temperature is measured and performance criteria for material selection were developed. Because various pavement and State agencies are well acquainted with and own the Bending Beam Rheometer (BBR), which was developed during the Strategic Highway Research Program (SHRP), an attempt was made to utilize the same setup to test hot-poured bituminous-based crack sealants. Testing conducted in this research project indicated that the standard BBR was inappropriate for testing soft bituminous-based hot-poured crack sealant, even at  $-40^{\circ}\text{C}$ . The measured deflection exceeded the BBR limit, for some sealants, after only a few seconds of loading. To address this issue, the moment of inertia of the tested beam was increased by doubling its thickness (from 6.35mm to 12.7mm). For the new beam dimensions, it was found that only 4% of the beam center deflection is due to shear, a value deemed acceptable for sealant evaluation and comparison. In an effort towards developing a robust testing procedure, 15 sealants from various manufacturers were included in the study and tested between  $-4^{\circ}\text{C}$  and  $-40^{\circ}\text{C}$ . In addition, five sealants, which have known field performance, were tested to validate the laboratory results and establish specification thresholds for the selection guidelines. Since stiffness calculation in the BBR test method requires that measurements be made within the linear region of viscoelastic behavior, validation of this theory was conducted for crack sealants. This was found to be generally the case with crack sealants, which allowed for the use of the time-temperature superposition. If the temperature-superposition principle is applied, the stiffness at 240s at a given temperature can be used to predict the stiffness after 5hr of loading at a temperature that is  $6^{\circ}\text{C}$  lower. With the assumption of linear viscoelastic behavior, sealants performance can be characterized through stiffness, average creep rate, and dissipated energy ratio. Stiffness was found to be sensitive to temperature changes and could be used to differentiate between sealants. The measurements of the average creep rate and the dissipated energy ratio were also found to be valuable in differentiating between sealants. In addition, numerical modeling was used to simulate the mechanical response of

crack sealants at low temperatures. Parameters that may be used for evaluating crack sealant cohesive performance using the crack sealant BBR (CSBBR) are the stiffness at 240s, average creep rate, and the dissipated energy ratio. For simplicity, the first two parameters, stiffness at 240s and average creep rate, are recommended for implementation in the sealant performance grade. The recommended thresholds are maximum stiffness of 25MPa and minimum average creep rate of 0.31.

KW - Bituminous materials

KW - Creep properties

KW - Low temperature

KW - Pavement cracking

KW - Pavement maintenance

KW - Rheometers

KW - Sealing compounds

UR - <http://ntl.bts.gov/lib/31000/31000/31017/ICT-08-029.pdf>

UR - <https://trid.trb.org/view/902006>

ER -

TY - SER

AN - 01142043

JO - Civil Engineering Studies, Illinois Center for Transportation Series

PB - University of Illinois, Urbana-Champaign

AU - Al-Qadi, Imad L

AU - Yang, Shih-Hsien

AU - Masson, Jean-Francois

AU - McGhee, Kevin K

AU - University of Illinois, Urbana-Champaign

AU - Federal Highway Administration

AU - Virginia Department of Transportation

**TI - Characterization of Low Temperature Mechanical Properties of Crack Sealants Utilizing Direct Tension Test**

PY - 2008/11

IS - 08-028

SP - 71p

AB - Crack sealing has been widely used as a routine preventative maintenance practice. Given its proper installation, crack sealants can extend pavement service life by three to five years. However, current specifications for the selection of crack sealants correlate poorly with field performance. The purpose of this research was to develop performance guidelines for the selection of hot-poured bituminous crack sealants at low temperature. This was accomplished by measuring the mechanical properties of crack sealant at low temperature and then developing performance criteria for material selection. The modified direct tension test (DTT), crack sealant direct tension test (CSDTT), simulates the in-situ loading behavior of crack sealants in the laboratory. A modified dog-bone specimen geometry, which allows specimens to be stretched up to 95%, is recommended. This new specimen geometry also facilitates sample preparation. Tensile force is applied to the dog-bone specimen, with its effective gauge length of 20.3mm, and is pulled at a deformation rate of 1.2mm/min. Fifteen sealants were tested at various temperatures, and three performance parameters are suggested as indicators of sealant performance: extendibility, percent modulus reduction, and strain energy density. Extendibility, which is used to assess the degree of deformation undergone by a sealant at low temperature before it ruptures or internal damage is observed, is recommended as a measured parameter to be included in the performance-based guidelines for the selection of hot-poured crack sealants. Extendibility thresholds were defined as function of low service temperatures. The CSDT is conducted at +60C above the lowest in service temperature because of the relatively high test loading rate compared to in-situ crack sealant movement rate.

KW - Low temperature

KW - Mechanical properties

KW - Pavement cracking

KW - Pavement maintenance

KW - Sealing compounds

KW - Tension tests

UR - <http://ntl.bts.gov/lib/31000/31000/31016/ICT-08-028.pdf>

UR - <https://trid.trb.org/view/902011>

ER -

TY - RPRT

AN - 01144013

AU - REBBECHI, J

AU - ALDERSON, A

AU - Austroads

**TI - Guide to pavement technology: part 4K: seals**

SN - 9781921551499

PY - 2009/07

IS - AGPT4K/09

SP - 44P

AB - This document provides a guide to selection and design of thin bituminous surfacings.

Bituminous surfacings include seals and reseals, slurry surfacings, primes and primer seals and geotextile seals. The binders covered in the guide include conventional bitumen, polymer modified binders and emulsions. Reference is also made to other sources of information. (a)

KW - Binder

KW - Binders

KW - Building materials

KW - Chippings

KW - Cold coated material

KW - Cold coated materials

KW - Material (constr)

KW - Pavement

KW - Pavement design

KW - Pavements

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Surface dressing

KW - Surfacing

UR - <https://trid.trb.org/view/904755>

ER -

TY - SER

AN - 01145108

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

**TI - Maintenance and Management of the Infrastructure**

SN - 9780309126250

PY - 2009

IS - 2108

SP - 134p

AB - These 13 papers are concerned with maintenance management of culverts and roads, pavement preservation and maintenance, maintenance and evaluation of bridges, and roadside maintenance. Specific topics discussed are as follows: a culvert information management system; opportunistic behavior in road maintenance markets; evaluating pavement interventions; performance indicators for the service life of thin hot-mix asphalt overlays; life-cycle costing of pavement surface retexturing with shot blasting; performance-based uniformity coefficient of chip seal aggregate; chip seal maintenance; crack sealant material and reservoir geometry of bituminous overlays; wooden bridge preservation treatment; penetrating sealers for reinforced concrete bridge decks; underwater bridge inspection practices; infrared imaging of subsurface of concrete bridges; and rolled erosion control products for roadside maintenance.

KW - Asphalt pavements

KW - Bituminous overlays

KW - Bridge decks

KW - Bridge substructures

KW - Chip seals

KW - Concrete bridges

KW - Crack geometry

KW - Culverts

KW - Erosion control

KW - Highway maintenance

KW - Infrared imagery

KW - Life cycle costing

KW - Maintenance management

KW - Markets

KW - Pavement maintenance

KW - Pavement preservation

KW - Performance indicators

KW - Roadside

KW - Rolled erosion control products

KW - Sealing compounds

KW - Service life

KW - Shotblasting

KW - Texturing (Pavement maintenance)

KW - Underwater inspection

KW - Wood preservatives

KW - Wooden bridges

UR - <https://trid.trb.org/view/905374>

ER -

TY - JOUR

AN - 01145992

JO - Journal of Materials in Civil Engineering

PB - American Society of Civil Engineers

AU - Soliman, Haithem

AU - Shalaby, Ahmed

**TI - Characterizing the Low-Temperature Performance of Hot-Pour Bituminous Sealants Using Glass Transition Temperature and Dynamic Stiffness Modulus**

PY - 2009/11

VL - 21

IS - 11

SP - pp 688-693

AB - Joint and crack sealants exposed to cold climates experience high tensile stresses. Sealants should have the ability to dissipate these stresses to perform their function properly. In cold climates, the state of sealing materials may change from rubbery to solid state due to low in-service temperatures. As a result, sealants become stiffer and less capable of dissipating the induced tensile stresses. This paper introduces a laboratory characterization method for joint sealants based on dynamic testing at low-temperatures. The dynamic mechanical analyzer test was conducted on seven hot-pour bituminous sealants in the temperature-sweep mode to characterize the stiffness-temperature behavior of sealants. Glass transition temperature, which is the boundary temperature between rubbery and solid states, was estimated for each sealant. Glass transition temperature and low-temperature stiffness can be used to predict the field performance of sealants, and to evaluate the compatibility of a sealant to a certain environment.

KW - Atmospheric temperature

KW - Bitumen

KW - Bituminous binders

KW - Cold weather

KW - Glass transition temperature

KW - Hot-pour sealants

KW - Low temperature materials

KW - Materials tests

KW - Pavement joints

KW - Pavements

KW - Sealing compounds

KW - Stiffness

UR - <https://trid.trb.org/view/906310>

ER -



TY - RPRT

AN - 01146798

AU - Evert, Kyle

AU - Richter, Jeff M

AU - North Dakota Department of Transportation

**TI - Sawing and Sealing Joints in Bituminous Pavement to Control Cracking**

PY - 2007/01//Final Evaluation Report

SP - v.p.

AB - The purpose of this project is to evaluate the ability of placing joints to control random asphalt pavement cracking. Asphalt pavements are subjected to thermal stresses due to extreme low temperatures in the northern climate. Sawing joints into new asphalt pavements at regular intervals may help control the location of thermal cracking in flexible pavements. Sawed joints are easier to fill initially and maintain in the future. Early sawing and sealing joints into the pavement controls the infiltration and reduces the stripping of asphalts. The objectives of this study are to: (1) determine the effectiveness of sawing and sealing joints in bituminous paving to control random cracking; (2) determine the optimum spacing of the sawed joints; (3) evaluate the sealant; and (4) evaluate the construction practices used in the sawing and sealing.

KW - Bituminous pavements

KW - Evaluation

KW - Joint sealing

KW - Pavement cracking

KW - Pavement joints

KW - Paving

KW - Sawing

KW - Spacing

UR - <https://trid.trb.org/view/907052>

ER -

TY - JOUR

AN - 01152239

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Yang, Shih-Hsien

AU - Al-Qadi, Imad L

AU - McGraw, Jim

AU - Masson, J-F

AU - McGhee, Kevin K

**TI - Threshold Identification and Field Validation of Performance-Based Guidelines to Select Hot-Poured Crack Sealants**

SN - 9780309142816

PY - 2010

IS - 2150

SP - pp 87-95

AB - Hot-poured bituminous crack sealing has been widely accepted as a routine preventative maintenance practice. With proper installation, the sealing is expected to extend pavement service life by 3 to 5 years. However, current specifications for selection of crack sealants correlate poorly with field performance; hence, a set of new testing methods, based on sealant rheological and mechanical properties, was developed recently. Measurements of the mechanical properties of crack sealant at low temperatures are among the criteria introduced as part of the developed performance-based guidelines. The main purpose of this study was to identify and validate the low-temperature selection thresholds for the newly developed performance-based guidelines for selecting hot-poured bituminous crack sealants. In this study, selection criteria for crack sealant bending beam rheometer (CSBBR) and crack sealant direct tension tester (CSDTT) tests were identified. Two performance parameters for CSBBR test were used for the selection criteria: stiffness at 240 s and average creep rate (ACR). Both parameters were identified by comparing laboratory testing results with known sealant field performance, obtained from a long-term study in Canada. The selection criterion for the CSDTT test was extendibility, on the basis of field values reported in the literature. The recommended selection criteria were used to predict the field performance of 12 sealants evaluated by the National Transportation Product Evaluation Program (NTPEP). Results showed good correlation between the proposed selection thresholds and NTPEP field sealant performance.

KW - Crack sealants

KW - Creep

KW - Direct tension tests

KW - Field performance

KW - Hot pour sealants

KW - Laboratory tests

KW - Mechanical properties

KW - Pavement maintenance

KW - Performance based specifications

KW - Rheological properties

KW - Rheometers

KW - Sealing compounds

KW - Service life

KW - Stiffness

UR - <http://dx.doi.org/10.3141/2150-11>

UR - <https://trid.trb.org/view/909575>

ER -

TY - JOUR

AN - 01155694

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Hoyt, Denise

AU - Martin, Amy Epps

AU - Shuler, Scott

**TI - Surface Performance-Grading System to Grade Chip Seal Emulsion Residues**

SN - 9780309142816

PY - 2010

IS - 2150

SP - pp 63-69

AB - The performance-graded (PG) asphalt binder specification was developed to characterize asphalt binder properties that are directly related to the performance of hot-mix asphalt concrete in pavements. However, the PG specification cannot be applied directly to binders for use in chip seals. To address this need, the surface performance grading (SPG) specification was developed with the same equipment required for the PG system but with different limiting values for test parameters at high and low pavement surface design temperatures. NCHRP Project 14-17 used the PG and the SPG systems to grade base binders and recovered residues from five laboratory emulsions and from recovered residues for three emulsions for chip seal construction projects. Two residue recovery methods were used and compared: hot oven evaporation with nitrogen blanket and stirred can with nitrogen purge. Researchers compared the grades from the PG and the SPG systems and found that the grades were similar for the two residue recovery methods but slightly different from the base binder. On the basis of these results, a strawman specification for emulsion residues in chip seals is recommended for use with the stirred can recovery method. The current limiting values in the SPG system were developed for the Texas Department of Transportation. Limiting criteria should be developed for other regions and climatic conditions.

KW - Asphalt emulsions

KW - Bituminous Binders

KW - Chip seals

KW - Emulsion recovery methods

KW - Performance grade

KW - Specifications

UR - <http://dx.doi.org/10.3141/2150-08>

UR - <https://trid.trb.org/view/911196>

ER -

TY - CONF

AN - 01155549

AU - Kim, Y Richard

AU - Adams, Javon M

AU - Transportation Research Board

**TI - Mean Profile Depth Analysis of Field and Laboratory Traffic-Loaded Chip Seal Surface**

**Treatments**

PY - 2010

SP - 16p

AB - This paper presents a laboratory and field study to evaluate the mean profile depth (MPD) parameter that represents the surface texture of chip seal pavements. The 3-D laser profiler is used to determine the MPD values from field pavement sections and field samples tested in the laboratory by the third-scale Model Mobile Loading Simulator (MMLS3). Data obtained from five different field-constructed chip seal sections are used to evaluate the effects of different factors on the MPD of chip seal pavements, including aggregate type, emulsion application rate, field versus MMLS3 traffic loading, and traffic volume. The results presented in this paper suggest: (1) that the chip seal pavements constructed using lightweight aggregate have larger initial MPD values and faster reduction in the MPD as a function of number of wheel passes than those constructed using granite 78M aggregate; (2) that the MPD values from the dryer section drops faster initially and more significantly, resulting in a much smaller ultimate MPD value; (3) that in general the MPD values under the MMLS3 loading are similar to those under the field traffic loading, thus allowing the translation of the laboratory MMLS3 data to the field response; and (4) that the shorter rest periods in the higher traffic volume road retards the recovery of the binder and therefore greater permanent changes in the MPD.

U1 - Transportation Research Board 89<sup>th</sup> Annual Meeting Transportation Research Board  
Washington, DC, United States StartDate:20100110 EndDate:20100114 Sponsors: Transportation  
Research Board

KW - Aggregates

KW - Asphalt pavements

KW - Bituminous materials

KW - Chip seals

KW - Concrete curing

KW - Granite

KW - Mean profile depth

KW - Seal coats

KW - Surface course (Pavements)

KW - Surface treatments

KW - Traffic loads

KW - Traffic volume

UR - <https://trid.trb.org/view/911293>

ER -

TY - CONF

AN - 01149403

AU - MARKS, P

AU - CAUTILLO, C

AU - TAM, KK

AU - MCINNIS, S

AU - Polyscience Publications

**TI - Enhancing Longitudinal Joint Performance in Flexible Pavements**

PY - 2009

SP - p. 323-346

AB - While deterioration due to wear and tear of traffic and aging is inevitable, pavement failure due to premature deterioration associated with the poor construction of joints is preventable. One significant area of premature pavement deterioration is along the centerline joint, typically due to the lower density and poor bond at the cold joint as a result of a delay in paving of adjacent lanes, or because construction practices that lead to better joints were not employed. Paving in echelon or in tandem is the most effective method of eliminating longitudinal cold joints, but sometimes neither option is feasible. In cases where cold joints cannot be eliminated, the quality of the joint can be improved in several ways. This paper documents work carried out since 1997 to investigate the opportunities related to improving the quality and performance of longitudinal joints, including what can be done during the different stages of a project development, materials, methods and other considerations to enable the construction of good joints. This paper also covers the Ministry's findings from trials constructed since 1997 and discusses some of the research completed on non-destructive testing of the joint quality. (A)

U1 - PROCEEDINGS OF THE FIFTY-FOURTH ANNUAL CONFERENCE OF THE CANADIAN TECHNICAL ASPHALT ASSOCIATION (CTAA); MONCTON, NB NOVEMBER, 2009 StartDate:00000 EndDate:00000

KW - Bitumen

KW - Canada

KW - Conferences

KW - Construction management

KW - Durability

KW - Field tests

KW - Joint sealing

KW - Joints (Engineering)

KW - Longitudinal

KW - Mix design

UR - <https://trid.trb.org/view/911725>

ER -

TY - RPRT

AN - 01152879

AU - Shuler, Scott

AU - Colorado State University, Fort Collins

AU - Colorado Department of Transportation

AU - Federal Highway Administration

**TI - Short-Term Crack Sealant Performance and Reducing Bumps and Transverse Cracking in New Hot Mix Asphalt Overlays over Crack Sealants**

PY - 2009/11//Interim Report

SP - 33p

AB - This interim report is intended to provide preliminary information regarding the performance of crack sealants produced by three manufacturers during a two-year period in service in three pavements in Colorado. In addition, preliminary conclusions have been developed regarding the propensity of three of these sealants to contribute to bumps in new overlay hot mix asphalt. Results of performance evaluations made, to date, indicate that the crack sealants failed at a surprising rate after only one winter. However, subsequent performance surveys after twelve months and twenty-one months indicate a tendency for the sealants to heal. Routing the cracks prior to filling appears to provide the best performance when the filler is over banded, and filling the cracks to within ¼ inch of the surface instead of flush with the surface or over banding produced the poorest performance. Bumps accompanied by transverse cracking occurred over the crack sealants when a new hot mix overlay was placed after the crack sealants had been in service two years. The bumps and transverse cracks were exacerbated by utilizing steel rollers with vibration on breakdown of the hot mix asphalt overlay. The number of passes of the vibrating steel rollers further exacerbated the presence of the bumps and cracks. The same rollers used in static mode reduced the effect, and pneumatic rollers used for breakdown eliminated it. The ambient temperature and temperature of the substrate pavement during construction appears to have had little effect, as the same bumps and cracking occurred during vibratory breakdown after a small rain shower moistened the substrate pavement surface prior to the overlay hot mix asphalt placement. Concerning implementation, the use of vibratory steel rollers during breakdown compaction of hot mix asphalt overlays on asphalt pavements containing crack sealants appears to exacerbate the presence of bumps and transverse cracks in the new asphalt directly over and in front of the cracks. These bumps and cracking may be mitigated by the use of pneumatic rollers on breakdown.

KW - Bituminous overlays

KW - Bumps

KW - Colorado

KW - Pavement cracking

KW - Pneumatic tire rollers

KW - Routing (Cracks)

KW - Sealing compounds

KW - Steel-drum rollers (Compactors)

KW - Transverse cracking

KW - Vibratory rollers

UR - <http://www.coloradodot.info/programs/research/pdfs/2009/cracksealants/view>

UR - <https://trid.trb.org/view/914448>

ER -

TY - RPRT

AN - 01153484

AU - Moses, Ren

AU - Florida A&M University, Tallahassee

AU - Florida Department of Transportation

AU - Federal Highway Administration

**TI - Civil Engineering Support for Telemetered Traffic Monitoring Sites**

PY - 2010/01//Final Report

SP - 166p

AB - This project was aimed at providing various civil engineering support services for the telemetered traffic monitoring sites operated by the Statistics Office of the Florida Department of Transportation. This was a companion project to the one that provided electrical engineering support services for the same sites. The results of two major tasks undertaken in this project are reported herein. The first main task was aimed at conducting field evaluation of loop sealants and piezo grouts at Site 352 on Interstate 10 and Site 112 on Interstate 75. The evaluation will continue for another one year but preliminary results are discussed herein. The secondary task of this project was to evaluate the traffic data collection accuracy of two classifiers installed at Site 352. This task has been completed and the results show that there is no significant difference between the two classifiers in daily traffic volume data collection.

KW - Civil engineering

KW - Grout

KW - Loop detectors

KW - Sealing compounds

KW - Telemetry

KW - Traffic surveillance

UR - [http://www.fdot.gov/research/Completed\\_Proj/Summary\\_PL/FDOT\\_BDK83%20977-04\\_rpt.pdf](http://www.fdot.gov/research/Completed_Proj/Summary_PL/FDOT_BDK83%20977-04_rpt.pdf)

UR - <https://trid.trb.org/view/914921>

ER -



TY - CONF

AN - 01158669

AU - Yildirim, Yetkin

AU - Yurttas, Yusuf

AU - Boz, Ilker

AU - California Department of Transportation

AU - Federal Highway Administration

AU - Foundation for Pavement Preservation

**TI - Service Life of Crack Sealants**

PY - 2010

SP - pp 377-392

AB - Crack sealing is vital for the preservation of a pavement and has long been regarded as a necessary annual procedure. However, with limited maintenance budgets and increasing labor and material costs, it is essential that pavement preservation agencies make the most efficient treatment decisions. Road agencies must consider the service life for the crack sealant material that is to be applied if the cost-saving potential of this treatment is to be fully realized. Evaluating the service life of potential crack sealant materials gives these local agencies the ability to choose the most cost-effective preservation treatment for their particular roadway. A study conducted by the Texas Pavement Preservation Center at the University of Texas at Austin measured the service life of hot pour and cold pour crack sealants which are the most commonly used ones by the Texas Department of Transportation (TxDOT). Over the course of three years, the study tested seven different types of sealants: three cold pour sealants and four hot pour sealants, on 33 test sections. The treatment effectiveness of these sealants was measured with regard to the percent failure of the sealed crack. If the treatment effectiveness fell below 80%, the sealant had “failed” and reached the end of its service life. The cold-poured crack sealants used in this study showed a service life of 10 – 16 months, while the hot-poured crack-sealants used in this study demonstrated a service life of 26 – 42 months based on an 80% effectiveness threshold.

U1 - First International Conference on Pavement Preservation California Department of Highway Administration Foundation for Pavement Preservation Newport Beach, CA, United States

StartDate:20100413 EndDate:20100415 Sponsors: California Department of Transportation, Federal Highway Administration, Foundation for Pavement Preservation

KW - Cost effectiveness

KW - Crack sealants

KW - Pavement maintenance

KW - Pouring

KW - Preservation

KW - Sealing compounds

KW - Service life

KW - Texas

UR - [https://www.pavementpreservation.org/icpp/paper/19\\_2010.pdf](https://www.pavementpreservation.org/icpp/paper/19_2010.pdf)

UR - <https://trid.trb.org/view/919218>

ER -

TY - CONF

AN - 01158712

AU - Yut, Iliya

AU - Nener-Plante, Derek

AU - Zofka, Adam

AU - California Department of Transportation

AU - Federal Highway Administration

AU - Foundation for Pavement Preservation

**TI - Case Study on Perpetual Flexible Pavement in Connecticut**

PY - 2010

SP - pp 519-532

AB - Route 82 in Connecticut received a 2007 Perpetual Pavement Award from the Asphalt Pavement Alliance (APA). This paper presents a comprehensive look at this pavement, including the construction details from 1971, historical and current traffic volumes, up-to-date performance, and preservation activities applied since the original construction. Pavement performance is shown in terms of the annual trends for cracking collected by the Automatic Road Analyzer (ARAN). The historical trends in pavement deterioration are analyzed and compared with those of similar pavement sections in Connecticut (Route 9) to determine the major factor(s) that contributed the most to the long-lasting service of Route 82. Special emphasis is made on the pavement preservation techniques and their timing.

U1 - First International Conference on Pavement Preservation California Department of Transportation Federal Highway Administration Foundation for Pavement Preservation Newport Beach, CA, United States StartDate:20100413 EndDate:20100415 Sponsors: California Department of Transportation, Federal Highway Administration, Foundation for Pavement Preservation

KW - Benefit cost analysis

KW - Case studies

KW - Connecticut

KW - Crack sealing

KW - Flexible pavements

KW - Hot mix asphalt

KW - Overlays (Pavements)

KW - Pavement performance

KW - Perpetual pavements

KW - Service life

UR - <http://geotechnpedia.com/Publication/Show/2530/CASE-STUDY-ON-PERPETUAL-FLEXIBLE-PAVEMENT-IN-CONNECTICUT>

UR - <https://trid.trb.org/view/919244>

ER -

TY - CONF

AN - 01158697

AU - Shirazi, Hamid

AU - Carvalho, Regis L

AU - Ayres, Manuel

AU - Selezneva, Olga I

AU - California Department of Transportation

AU - Federal Highway Administration

AU - Foundation for Pavement Preservation

**TI - Statistical Analysis of LTPP SPS-3 Experiment on Preventive Maintenance of Flexible Pavements**

PY - 2010

SP - pp 533-546

AB - This paper describes the evaluation of preventive treatments in mitigating the rate of distress propagation in flexible pavements. The analysis was based on data from preventive maintenance treatments data collected in the Long Term Pavement Performance (LTPP) program. Data were obtained from 81 sites across the United States and Canada that was part of the specific pavement experiments (SPS-3). SPS-3 was designed to monitor the performance of four treatments: thin overlay, chip seal, crack seal and slurry seal under different design conditions. Design conditions considered were precipitation, temperature, traffic, subgrade materials and pavement condition prior to applying preventive treatment. Fatigue cracking, rutting and longitudinal roughness data collected during the LTPP program were used to compare the overall performance of different treatments. A weighted average index was defined to represent the overall performance of the sections over the years. Statistical techniques were used to compare the effectiveness of each treatment in relation to others and the control section, which did not receive any treatment. Conclusions from the analyses indicated that thin overlay and chip seal are effective treatment options for most design conditions with respect to fatigue cracking. Thin overlay outperforms other treatments in most design conditions with respect to rutting and in some cases with respect to roughness. The difference between the performance of crack seal, slurry seal and control section was not found to be statistically significant with respect to any distress type and design factor.

U1 - First International Conference on Pavement Preservation California Department of Transportation Federal Highway Administration Foundation for Pavement Preservation Newport Beach, CA, United States StartDate:20100413 EndDate:20100415 Sponsors: California Department of Transportation, Federal Highway Administration, Foundation for Pavement Preservation

KW - Chip seals

KW - Crack sealing

KW - Data collection

KW - Flexible pavements

KW - Long-Term Pavement Performance Program

KW - Overlays (Pavements)

KW - Pavement performance

KW - Preventive maintenance

KW - Rutting

KW - Slurry seals

KW - Statistical analysis

KW - Subgrade (Pavements)

UR - [https://www.pavementpreservation.org/icpp/paper/110\\_2010.pdf](https://www.pavementpreservation.org/icpp/paper/110_2010.pdf)

UR - <https://trid.trb.org/view/919245>

TY - JOUR

AN - 01163938

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - McLeod, Mark

**TI - The Dollars and Sense of Sealer Additives**

PY - 2010/03

VL - 25

IS - 3

SP - pp 26, 28-29

AB - This article discusses the benefits of sealer additives. Contractors often need to put additives into their sealer mix in order to handle other post-added ingredients such as sand and aggregates. The additives serve to encapsulate and suspend the sand in the tank and in the sealer film. Different sealers require different additives depending on the circumstances of the job. Factors that can affect additive choice include ambient temperature, humidity, pavement temperature, vehicular stress, porosity of the pavement, sand load, and type of sealer. Using the correct additive can mean the difference between a top quality job and a substandard job. The bottom layer in the sealer film is of most concern as it is the final layer to cure. Using additives allows new pavements to be opened to traffic sooner and eliminates re-emulsification of the sealer once down on the pavement. Additives will help cure the sealer on hot days and when the surface temperature is extreme, and additive use also extends the paving season, a benefit in both spring and fall. Some additives use Nano cure technology, in which molecular-generated heat dries the sealer from the bottom up opposed to the traditional top to bottom drying process. Nanotechnology can also reduce severe cutting or tracking of the sealer. A cost analysis shows that additive cost is insignificant compared to the potential benefits.

KW - Additives

KW - Cost effectiveness

KW - Mix design

KW - Nanotechnology

KW - Seal coats

KW - Sealing compounds

UR - <http://www.forconstructionpros.com/print/Pavement/Features/The-Dollars-and-Sense-of-Sealer-Additives/3FCP15399>

UR - <https://trid.trb.org/view/924334>

ER -

TY - JOUR

AN - 01166955

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Heydorn, Allan

**TI - You Can Benefit by Working with Your Sealer Supplier**

PY - 2010/05

VL - 25

IS - 4

SP - pp 28-29

AB - The relationship between seal coating contractors and their material suppliers is critical. This article discusses, from the perspective of the supplier, how contractors can get more out of this relationship. Improving communication, both in terms of quantity and quality, should be the first step. Feedback, both positive and negative, can give suppliers the opportunity to solve issues before they become serious problems. Other suggestions for contractors include: stay current on their account; follow the manufacturer's specifications; know who to contact at the supplier; use and market the material the supplier is providing; work with the supplier (or manufacturer) on a fair warranty for both parties; and buy in bulk.

KW - Communication

KW - Contractors

KW - Customer service

KW - Customer supplier relationship

KW - Seal coating

KW - Sealing compounds

KW - Suppliers

UR - <http://www.forconstructionpros.com/print/Pavement/Features/You-Can-Benefit-by-Working-with-Your-Sealer-Supplier/3FCP16014>

UR - <https://trid.trb.org/view/925020>

ER -

TY - JOUR

AN - 01165514

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Dickens, Rod

**TI - How to Make Cracksealing a Profit Center for Your Business**

PY - 2010/06

VL - 25

IS - 5

SP - pp 30, 33-36

AB - Crack sealing can be very profitable for contractors. How much revenue contractors bring in depends on the size of their operation, the scope of the work, and built-in efficiencies. To be profitable, however, crews need to be outfitted correctly, with the type of equipment that will deliver optimum performance for the job at hand. This article discusses how contractors can start a crack sealing operation, highlighting their equipment options. Before setting up a crew, contractors should define their purpose, considering whether they plan to work on highways and other larger projects or focus on driveways and small projects. Once the contractor has determined how many linear feet of cracks they anticipate sealing in a day, then they can decide on a preparation tool, melting kettle, application system, and a reliable truck and trailer. An infrared unit is expensive but necessary for sealing wide cracks. It also gives contractors the ability to open up an entirely new profit center, such as repairing potholes and performing other maintenance tasks.

KW - Crack sealing

KW - Maintenance equipment

KW - Pavement cracking

KW - Pavement maintenance

KW - Sealing (Technology)

UR - <http://www.forconstructionpros.com/print/Pavement/Departments/How-to-Make-Cracksealing-a-Profit-Center-for-Your-Business/3FCP16622>

UR - <https://trid.trb.org/view/925653>

ER -

TY - ABST

AN - 01174273

AU - OLIVER, J

AU - CHOI, Y

AU - MARTIN, T

AU - Austroads

**TI - Asphalt and seal life prediction models based on bitumen hardening**

SN - 9781921709227

PY - 2010/05

IS - AP-T160/10

SP - 12P

AB - This report documents the surface life prediction models that have evolved from the long term sampling of the bitumen in sprayed seals and thin asphalt surfaces. The estimation of surface life is predicated on the basis of the mechanism of bitumen hardening to a point where its viscosity causes brittleness and cracking of the bitumen. This mechanism is highly dependent on climatic conditions rather than traffic load and the underlying state of the pavement. Other mechanisms, such as structural inadequacy, can cause reduced surface life due to deformation or distress within the pavement base. However, the surface life prediction models documented in this report do not consider these mechanisms. (a)

KW - Bitumen

KW - Bituminous mixture

KW - Bituminous mixtures

KW - Concrete hardening

KW - Durability

KW - Forecast

KW - Forecasting

KW - Hardening

KW - Mathematical model

KW - Mathematical models

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Surface dressing

UR - <https://trid.trb.org/view/934971>

ER -

TY - JOUR

AN - 01226676

JO - Journal of Materials in Civil Engineering

PB - American Society of Civil Engineers

AU - Al-Qadi, Imad L

AU - Dessouky, Samer

AU - Yang, Shih-Hsien

**TI - Linear Viscoelastic Modeling for Hot-Poured Crack Sealants at Low Temperature**

PY - 2010/10

VL - 22

IS - 10

SP - pp 996-1004

AB - To understand the behavior of hot-poured bituminous-based crack sealants at low service temperatures and to predict their field performance, a constitutive stress-strain relationship must be described. This would allow predicting in situ crack sealant response to both thermal and traffic loading. The authors note that pavement crack sealing, considered to be cost-effective in providing routine maintenance, may also be a determinant to increasing service life by preventing water from entering the pavement system. This paper verifies the linear viscoelastic behavior of crack sealants. Ten sealants having high polymer contents were tested at  $-4$  to  $-40^{\circ}\text{C}$  using a Crack Sealant Bending Beam Rheometer (CSBBR). The convolution integral principle was used to obtain relaxation moduli from measured creep compliance data. A Prony series viscoelastic model was used to characterize mechanical behavior of crack sealant at low temperatures. The sealant's linear response was checked by implementing two conditions of linearity described by Marasteanu and Anderson. Simulation for the sealant linear viscoelastic deflection response during the loading and unloading was conducted using a three-dimensional finite-element model. This study concludes that mechanical behavior of crack sealants may be accurately described by a linear viscoelastic model at low service temperatures.

KW - Finite element method

KW - Low temperature

KW - Maintenance

KW - Materials tests

KW - Mathematical models

KW - Mathematical prediction

KW - Mechanical properties

KW - Pavement cracking

KW - Sealing compounds

KW - Service life

KW - Simulation

KW - Viscoelasticity

UR - <https://trid.trb.org/view/981849>

ER -



TY - RPRT

AN - 01226620

AU - Freeman, Thomas J

AU - Button, Joe W

AU - Estakhri, Cindy K

AU - Texas Transportation Institute

AU - Texas Department of Transportation

AU - Federal Highway Administration

**TI - Effective Prime Coats for Compacted Pavement Bases**

PY - 2010/08//Technical Report

SP - 150p

AB - Prime coats have long been used to seal the surface pores in the base, thus reducing the migration of moisture and absorption of the first application of surface treatment binder, strengthen the granular base near its surface by binding the finer particles of aggregate, help protect the base from inclement weather and limited vehicular traffic before the next pavement layer is constructed, and promote adhesion between a granular base and a subsequently applied bituminous surface by precoating the surface of the base and by penetrating the voids near the surface. The main objective of this research project was to evaluate the effectiveness of prime coats and determine which combinations of methods and materials provide the most benefit to TxDOT. Testing methods and equipment were developed to measure the penetration of the prime coat into the base course and to determine the increase in adhesion and cohesion at the surface of the base course provided by the prime coat.

KW - Base course (Pavements)

KW - Compaction

KW - Paving

KW - Prime coats

KW - Primers (Materials)

KW - Road construction

KW - Sealing compounds

UR - <http://tti.tamu.edu/documents/0-5635-1.pdf>

UR - <https://trid.trb.org/view/984416>

ER -

TY - JOUR  
AN - 01225682  
JO - Texas Transportation Researcher  
PB - Texas Transportation Institute  
**TI - Varying seal-coat asphalt rates across the roadway**  
PY - 2009  
VL - 45  
IS - 1  
SP - p. 13 : ill.  
KW - Maintenance and repair  
KW - Roads  
KW - Sealing compounds  
KW - Texas  
UR - <http://tti.tamu.edu/2009/03/01/improving-our-infrastructure/>  
UR - <https://trid.trb.org/view/986830>  
ER -

TY - CONF

AN - 01334125

AU - Hu, Xiaodi

AU - Zhou, Fujie

AU - Hu, Sheng

AU - Scullion, Tom

AU - Transportation Research Board

**TI - Development of New Overlay Tester-Based Crack Sealant Adhesion Test and Associated Specification**

PY - 2011

SP - 14p

AB - Crack sealing is a practice used for routine and preventive maintenance. Most current crack sealants, however, have been reported to have a very short life mainly due to adhesive failures. Therefore, it is critical to evaluate the potential adhesive failure of crack sealant in the laboratory. This paper first presents the development of a new Overlay Tester-based crack sealant adhesion test. In this study 13 sealants were evaluated following the proposed test protocol. The results clearly indicated that the Overlay Tester-based crack sealant adhesion test can effectively differentiate the poor sealants from the good ones. Furthermore, based on these test results, a draft crack sealant specification was proposed. This is different from the current specification in Texas, which is mainly based on crumb rubber content. The main factor considered in the proposed specification is the result of the new adhesion test. Additionally, other complementary factors such as flash point, softening point, and viscosity have been included in the proposed specification. In the proposed specification, the sealants are classified as: Type A (min. 100 cycles to failure at 45°F), Type B (min. 400 cycles to failure at 45°F), and Type C (min. 400 cycles to failure at 33°F). Finally, an experimental test plan was developed to validate the proposed specification.

U1 - Transportation Research Board 90<sup>th</sup> Annual Meeting Transportation Research Board  
Washington, DC, United States StartDate:20110123 EndDate:20110127 Sponsors: Transportation Research Board

KW - Adhesion

KW - Crack sealing

KW - Crumb rubber

KW - Laboratory tests

KW - Overlays (Pavements)

KW - Preventive maintenance

KW - Sealing compounds

KW - Specifications

KW - Tests

KW - Texas

UR - <https://trid.trb.org/view/1091489>

ER -

TY - CONF

AN - 01337499

AU - Mandiartha, I Putu

AU - Duffield, Colin F

AU - Thompson, Russell George

AU - Wigan, Marcus Ramsay

AU - Transportation Research Board

**TI - Developing a Transition Probability Matrix as a Measure of Road Network Pavement Maintenance Effectiveness**

PY - 2011

SP - 20p

AB - This paper presents a study that assesses the effectiveness of road network maintenance based on historical costs and road roughness progression. The study is intended to measure the effectiveness of routine maintenance and a combination of routine and periodic maintenance. The study analysis is based on a database developed from the State of Victoria consisting of 898 low volume sealed road sections. A new effectiveness measure is introduced based whether road sections remain in the same state condition or move to next worst condition based on a predefined roughness value. Analysis shows that under routine maintenance (without periodic maintenance), the probability of road sections remaining in the same condition exhibit a declining tendency from good to worst state of conditions in comparison with a result when the maintenance budget is spent on a combination of routine and periodic maintenance. Following this, a stochastic prediction model is developed by converting the results into transition probability matrices. These results demonstrate a new and important rationale for road authorities to optimize the selection of appropriate maintenance measures.

U1 - Transportation Research Board 90<sup>th</sup> Annual Meeting Transportation Research Board  
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KW - Condition surveys

KW - Low volume roads

KW - Maintenance practices

KW - Pavement maintenance

KW - Periodic maintenance

KW - Roughness

KW - Routine inspection

KW - Sealing compounds

KW - Test sections

KW - Transition Probability Matrix (TPM)

KW - Victoria (Australia)

UR - <https://trid.trb.org/view/1091907>

ER -

TY - CONF  
AN - 01337505  
AU - Holmes, Jonathan F  
AU - Daley, Wayne D R  
AU - Grullon, Sergio  
AU - Holcombe, Wiley  
AU - Jared, David Mark  
AU - Robertson, Steven D  
AU - Usher, Colin T  
AU - Transportation Research Board

**TI - Automated Pavement Crack Sealing System Development**

PY - 2011

SP - 18p

AB - Pavement crack sealing operations remain predominantly manual due to the challenges associated with automation. The research performed by the Georgia Tech Research Institute in conjunction with the Georgia Department of Transportation has proved in many ways that a commercial-scale automated crack sealing system is viable. Solutions related to the high-speed firing of nozzles, automated crack detection, and navigation in a real-time system have been demonstrated on a limited-scale system. Additional work remains on the testing of longitudinal crack sealing solutions, and fine tuning of crack detection algorithms. Once these issues have been properly addressed, the remaining tasks will primarily be associated with scaling the system from 12" of width to a full-lane width. The future of automated crack sealing operations is promising as this research has demonstrated that the technical barriers to commercialization have been addressed, thus opening the door for increases in productivity and worker safety.

U1 - Transportation Research Board 90<sup>th</sup> Annual Meeting Transportation Research Board  
Washington, DC, United States StartDate:20110123 EndDate:20110127 Sponsors: Transportation Research Board

KW - Automated crack detection systems

KW - Automation

KW - Commercialization

KW - Crack sealing

KW - Georgia

KW - Maintenance practices

KW - Pavement maintenance

KW - Productivity

KW - Real time control

KW - Testing

UR - <https://trid.trb.org/view/1091959>

ER -

TY - CONF

AN - 01337179

AU - Senadheera, Sanjaya P

AU - Tubb, Andrew

AU - Transportation Research Board

**TI - Laboratory Investigation of the Influence from Aggregate and Climate on Stiffness**

**Development in a Seal Coat Emulsion**

PY - 2011

SP - 21p

AB - This research studied the rate of residue formation of an emulsified asphalt over time, with respect to four different aggregate substrates and five different curing conditions. Samples were prepared for testing by pouring an asphalt emulsion directly on an aggregate substrate and then cured within an environmental chamber. The stiffness gain within the emulsion was measured by a dynamic shear rheometer using a strain-sweep test at specified time intervals.

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KW - Aggregates

KW - Asphalt emulsions

KW - Climate

KW - Curing agents

KW - Dynamic shear rheometry

KW - Laboratory studies

KW - Seal coats

KW - Stiffness

KW - Substrates

KW - Testing

UR - <https://trid.trb.org/view/1091982>

ER -

TY - CONF

AN - 01337422

AU - Galehouse, Larry

AU - Wang, Duanyi

AU - Xiaoting, Chen

AU - Chaoxu, Lei

AU - Transportation Research Board

**TI - Quantitative Evaluation of Fog Seals on Pavement Skid Resistance with Indoor Accelerated Loading Tests**

PY - 2011

SP - 24p

AB - Fog seal is a simple and easily applied preventive maintenance treatment that has a positive role in protecting existing asphalt mixtures from oxidation, sealing small surface cracks and preventing pavements from raveling. However, the decline of pavement skid resistance after applying a fog seal treatment often limits its usage. This paper discusses the development of an accelerated loading system as a test platform to quantitatively evaluate the progression of pavement skid resistance on two common fog seal practices. The findings of this research can be used to further guide the placement of fog seal treatments.

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KW - Accelerated tests

KW - Asphalt mixtures

KW - Crack sealing

KW - Fog seals

KW - Load tests

KW - Oxidation

KW - Pavement maintenance

KW - Preventive maintenance

KW - Quantitative analysis

KW - Skid resistance

KW - Stripping (Pavements)

UR - <https://trid.trb.org/view/1092245>

ER -

TY - CONF

AN - 01337421

AU - Morian, Dennis A

AU - Wang, Guangming

AU - Frith, Douglas

AU - Reiter, Joe B

AU - Transportation Research Board

**TI - Analysis of Completed Monitoring Data for SPS-3 Experiment**

PY - 2011

SP - 17p

AB - The Specific Pavement Study-3 (SPS-3) of the Long Term Pavement Performance (LTPP) program continued for almost 20 years. The performance monitoring of maintenance treatments constructed as a part of the SPS-3 experiment, namely thin overlay, slurry seal, crack sealing, and chip seal has been ongoing since the experiment construction in 1990. In this study, the treatment life and structural contribution of the treatments in the SPS-3 experiment were assessed to determine ultimate performance. A survival analysis was first conducted to estimate the life expectancy of the treatments, and the results indicated that sections with good conditions always perform better than both fair and poor conditions for all treatments. Thin overlay performs best at high survival probability while chip seal performs best at low survival probability. The life expectancies for thin overlay, slurry seal, crack sealing, and chip seal were 10.0, 8.6, 7.4 and 10.8 years, respectively, at a 50% survival probability. A Friedman Test was then performed to assess whether the treatments have affected the structural stiffness of the pavements, measured as the deflection response to Falling Weight Deflection (FWD) testing. Results indicated that all treatments make a statistically significant contribution to the pavement structural capacity as compared with the control section, except for crack sealing. The thin overlay provides the greatest contribution, followed by slurry seal and chip seal treatments.

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KW - Chip seals

KW - Crack sealing

KW - Falling weight deflectometers

KW - Long-Term Pavement Performance Program

KW - Maintenance

KW - Overlays (Pavements)

KW - Pavement performance

KW - Performance monitoring

KW - Service life

KW - Slurry seals

KW - Specific Pavement Studies (LTPP)

UR - <https://trid.trb.org/view/1092512>

ER -



TY - CONF

AN - 01336709

AU - Islam, Md Shahidul

AU - Hossain, Mustaque

AU - Transportation Research Board

**TI - Evaluation of Lightweight Aggregates in Chip Seal**

PY - 2011

SP - 17p

AB - Chip seal, also known as seal coat, is widely used as a low-cost, thin surface treatment in preventive maintenance of asphalt pavements. Loosening of aggregate particles from chip-sealed pavement and associated windshield damage of vehicle is a common problem. Thus Kansas Department of Transportation uses lightweight aggregates as cover materials for chip seals. Although this has decreased wind shield damage problems, extensive chip loss on seal-coated pavements in the state has been reported. In this project, lightweight aggregates were studied in the laboratory to determine the effect of moisture content and electrical charge on chip loss. Results indicate that retention of aggregated depends upon the prevailing charges of aggregate and emulsion particles. Moisture condition of the aggregates does not have any effect on chip loss. A new sweep test machine has been developed to assess chip loss and it was found to be better than the sweep test recommended by the American Society for Testing and Materials (ASTM).

U1 - Transportation Research Board 90<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20110123 EndDate:20110127 Sponsors: Transportation Research Board

KW - Asphalt pavements

KW - Chip seals

KW - Damage prevention

KW - Kansas

KW - Lightweight aggregates

KW - Moisture content

KW - Preventive maintenance

KW - Seal coats

KW - Surface course (Pavements)

KW - Windshields

UR - <https://trid.trb.org/view/1092577>

ER -

TY - JOUR

AN - 01333327

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Wilson, Bryan T

AU - Guthrie, W Spencer

**TI - Strength and Deformation Characteristics of a Cement-Treated Reclaimed Pavement with a Chip Seal**

SN - 9780309167260

PY - 2011

IS - 2212

SP - pp 100-109

AB - The objective of this research was to analyze the strength and deformation characteristics of a cement-treated base (CTB) constructed with full-depth reclamation, microcracked, and then surfaced with a single chip seal. In this field study, strength characteristics of the CTB layer were determined at the time of construction, and both strength and deformation characteristics were evaluated after 9 months of low-volume, heavy truck traffic. Observed distresses at 9 months included transverse cracking, rutting, and chip seal joint failure. The loss of the chip seal was caused by poor chip seal construction practices and not a deficiency in the CTB layer. The average ride qualities in and out of the wheel path were in the fair ride category; the roughness was not likely caused by trafficking but probably resulted from construction or climatic factors. Structural testing performed after 9 months of service indicated that CTB stiffness and modulus were greater than the values measured after microcracking at the time of construction, indicating continued strength gain. However, trafficking over the 9 months had caused significantly lower stiffness in the wheel paths than between the wheel paths. The average unconfined compressive strength (UCS) of the cores tested at 9 months did not differ significantly from the average UCS of the field-compacted specimens tested at 6 weeks. Recommendations for improved CTB performance include the use of a thicker, stiffer, or both, CTB layer to ensure a smooth CTB surface during construction and application of a double chip seal or equivalent.

KW - Cement treated bases

KW - Cement treated soils

KW - Chip seals

KW - Compressive strength

KW - Deformation

KW - Full-depth reclamation

KW - Microcracking

KW - Modulus of elasticity

KW - Reclaimed asphalt pavements

KW - Ride quality

KW - Roughness

KW - Rutting

KW - Stiffness

KW - Transverse cracking

UR - <http://dx.doi.org/10.3141/2212-11>

UR - <https://trid.trb.org/view/1092707>

ER -

TY - CONF

AN - 01333309

AU - Tsai, Yichang (James)

AU - Kaul, Vivek

AU - Yezzi, Anthony

AU - Transportation Research Board

**TI - Automating the Crack Map Detection Process for Machine Operated Crack Sealer**

PY - 2011

SP - 16p

AB - Crack sealing is a very important maintenance technique that is used to prevent water and debris from entering the pavement and to extend pavement life by minimizing crack growth. Manual crack sealing is an expensive procedure that is labor intensive and hazardous. Automating the crack sealing will improve work efficiency and decreases labor cost. There are four main components of a crack sealing machine: image acquisition, crack map detection, path planning, and sealant application. Automation of crack map detection for the crack sealing machine has been a challenge. In contrast to the requirements for pavement-distress-survey systems, automated crack-sealing machinery must accurately locate individual crack segments so that they can be processed effectively. Secondly, many crack map detection algorithms are not suited for the automatic crack sealers because these algorithms give crack map outputs that are not continuous paths. This makes it harder to use the crack map directly for the optimal path planning process. In this paper, we illustrate the use of a geodesic minimal path based method for generating the crack map suitable for the path planning process. The user can detect continuous cracks that extend over several miles by just providing the starting point on a crack as input to the algorithm. The algorithm can also detect transverse cracks by giving a single point on the crack. The continuous crack map generated can be utilized very efficiently to generate the optimal path for the crack sealer. Extensive qualitative and quantitative evaluation on real pavement images was done to show the usefulness of the algorithm. The algorithm is also computationally fast and efficient. We hope that this work will be useful for the efficiency and automation of the crack sealing process.

U1 - Transportation Research Board 90<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20110123 EndDate:20110127 Sponsors: Transportation Research Board

KW - Automation

KW - Crack sealing

KW - Detection and identification technologies

KW - Labor costs

KW - Pavement distress

KW - Pavement maintenance

KW - Sealing compounds

KW - Service life

UR - <https://trid.trb.org/view/1093093>

ER -

TY - SER

AN - 01333836

JO - NCHRP Report

PB - Transportation Research Board

AU - Shuler, Scott

AU - Lord, Anthony

AU - Epps-Martin, Amy

AU - Hoyt, Denise

**TI - Manual for Emulsion-Based Chip Seals for Pavement Preservation**

SN - 9780309155397

PY - 2011

IS - 680

SP - 108p

AB - This report presents a manual for the use of emulsion-based chip seals for pavement preservation. The manual addresses the factors affecting chip performance, discusses design and construction considerations, and identifies procedures for selecting the appropriate chip seal materials. The report also contains recommended test methods for use in the design and quality control of chip seals. The test methods are presented in AASHTO format to facilitate incorporation into the AASHTO "Standard Specifications for Transportation Materials and Methods of Sampling and Testing." The material contained in the report should be of immediate interest to state maintenance engineers and others involved in the maintenance and preservation of flexible pavements.

KW - AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing

KW - Asphalt emulsions

KW - Chip seals

KW - Construction management

KW - Design methods

KW - Flexible pavements

KW - Manuals

KW - Materials selection

KW - Pavement maintenance

KW - Pavement preservation

KW - Quality control

KW - Test procedures

UR - <http://www.trb.org/Publications/Blurbs/164090.aspx>

UR - <https://trid.trb.org/view/1097297>

ER -

TY - JOUR

AN - 01334554

JO - Road and Transport Research

PB - ARRB Group Limited

AU - HERRINGTON, P

AU - Ball, G

AU - Bremmer, D

AU - Martin, M

AU - PATRICK, J

**TI - Aquatic ecotoxicity of bitumen emulsions used in chip sealing**

PY - 2010/12

VL - 19

IS - 4

SP - 3-12

AB - The ecotoxicities of four representative New Zealand chip sealing bitumen emulsions were measured using a freshwater crustacean (*Daphnia magna*) and an algal species (*Pseudokirchneriella subcapitata*). The results are discussed in terms of the New Zealand Environmental Risk Management Authority (ERMA) classification system. On the basis of the tests carried out, it is predicted that cationic bitumen emulsions used in chip sealing would fall under the ERMA classifications of either 9.1D (slightly harmful to the aquatic environment) or 'not classified'.

KW - Bitumen

KW - Bituminous materials

KW - Chip seals

KW - Emulsions

KW - New Zealand

KW - Pollution

KW - Road materials

KW - Sealing coat (on top of the surfacing)

KW - Toxicity

KW - Water

KW - Water pollution

UR - <https://trid.trb.org/view/1097860>

ER -

TY - JOUR

AN - 01337018

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - LeHuray, Anne

**TI - New Studies Defend Use of Refined Tar-Based Sealers**

PY - 2011/01

VL - 26

IS - 1

SP - pp 10, 12-13

AB - This article reports on studies sponsored by the Pavement Coatings Technology Council (PCTC) that have concluded that refined tar-based sealants are not the main source of polycyclic aromatic hydrocarbons (PAH's) in the environment. The findings from the PCTC studies refute the findings of 2005 studies conducted in Austin, Texas, which showed that refined tar-based sealant contain PAHs and that soil or sediment samples taken next to a sealed parking lot sometimes contain high levels of PAHs. This proposed link between the PAHs in refined tar-based sealant and PAHs in rivers, streams, and lakes has resulted in regulatory challenges and bans of sealers in some locations. The city of Austin banned the use of refined tar-based sealant as of January 1, 2006. The PCTC study examined sediment samples collected from Austin's streams before the ban in October 2005, and again after the ban in April 2008. Findings showed that total concentrations of PAHs in sediments before and after the ban did not change. If sealers were the principal source of PAHs in sediments, then PAH concentrations should have declined once the ban was in place. PAHs in the Austin samples were also evaluated using environmental forensics techniques. PAH fingerprinting of sediments collected before and after the ban did not identify any marked changes. When all the data available in Austin is considered, it appears that refined tar-based sealant is not a major source of PAH in sediments downstream of the immediate area of a seal coated lot. Although PAHs are found in sealers, they can also be found in used motor oil, grilled meats and vegetables, exhaust from internal combustion engines, products made from coal and petroleum, and emissions from fossil fuel power plants and forest fires.

KW - Austin (Texas)

KW - Coal tars

KW - Concentration (Chemistry)

KW - Environmental forensics

KW - Environmental impact analysis

KW - Hydrocarbons

KW - Ordinances

KW - Parking lots

KW - Pavement Coatings Technology Council

KW - Pollutants

KW - Polycyclic aromatic hydrocarbons

KW - Research

KW - Runoff

KW - Seal coats

KW - Sealing compounds

KW - Sediments

KW - Water pollution

UR - <http://www.forconstructionpros.com/print/Pavement/Features/New-Studies-Defend-Use-of-Refined-Tar-based-Sealers/3FCP19102>

UR - <https://trid.trb.org/view/1098798>

ER -

TY - JOUR

AN - 01335578

JO - INTERNATIONAL SPRAYED SEALING CONFERENCE, 2<sup>ND</sup>, 2010, MELBOURNE, VICTORIA, AUSTRALIA

PB - ARRB Group Limited

AU - VAN DER GRYP, A

AU - HENDERSON, M G

AU - VAN ZYL, G D

**TI - Methodology used for identifying reseal projects in the Western Cape**

SN - 1876592648

PY - 2010/10

SP - 16P

AB - The Western Cape Provincial Administration, South Africa, uses a pavement management system (PMS) to assist in managing their paved road network. Standardized visual assessments are carried out annually on each surfaced road segment to describe the condition of the road network and to identify the need for remedial action. The need for reseal and priority thereof are based on a calculated reseal condition index (RCI), making use of the degree and extent of observed distress. The RCI and the method for identifying recommended types of seal are given in the paper. This paper provides some background to the Western Cape Road Network, the Administration's Pavement Management System and the annual visual assessment methodology used. Thereafter, the principles and process of calculating the reseal need and the method used for selecting the most appropriate reseal type are discussed. Additional information is provided regarding the expected life of each seal type and the results of an in-depth study of the actual life obtained for seals based on historical data. (a) For the covering entry of this conference, please see ITRD abstract no. E220163.

KW - Administration

KW - Conference

KW - Evaluation

KW - Evaluation (assessment)

KW - Maintenance

KW - Management

KW - Method

KW - Methodology

KW - Networks

KW - Pavement

KW - Pavement management system

KW - Pavement management systems

KW - Pavements

KW - Road network

KW - Road networks

KW - Roads

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

UR - <https://trid.trb.org/view/1099188>

ER -



TY - JOUR

AN - 01335580

JO - INTERNATIONAL SPRAYED SEALING CONFERENCE, 2<sup>ND</sup>, 2010, MELBOURNE, VICTORIA, AUSTRALIA

PB - ARRB Group Limited

AU - MOFFETT, A

AU - SAMBO, I

AU - PRETORIUS, D F

**TI - The impact of cold weather and high night-time traffic on aggregate stripping of a single seal: a case study at Beaufort West, South Africa**

SN - 1876592648

PY - 2010/10

SP - 12P

AB - The R61 is a major road link between the Western Cape and the Eastern Cape. During the reseal of a portion of this road premature stripping of the single seal aggregate from the modified binder tack coat occurred. Although the average daily traffic is fairly low, the road caters for the high volumes of high-speed bus and minibus traffic over weekends for those commuters travelling to the Eastern Cape. This high weekly differential of speed and volumes, in conjunction with sudden low nighttime's temperatures and sensitive modified binder, resulted in stripping of the aggregate from the seal on some sections of the road. The narrow road widths and resultant channelized traffic flow patterns also contributed to the lack of embedment of the aggregate between the wheel tracks. This paper investigates the causes, repair methods and recommends preventative actions and procedures to limit future recurrences of these failures. (a) For the covering entry of this conference, please see ITRD abstract no. E220163.

KW - Aggregate

KW - Aggregates

KW - Conference

KW - Durability

KW - Load

KW - Loads

KW - Pavement

KW - Pavements

KW - Performance

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Stripping (binder)

KW - Stripping (Pavements)

KW - Temperature

UR - <https://trid.trb.org/view/1099190>

ER -

TY - SER

AN - 01335632

JO - INTERNATIONAL SPRAYED SEALING CONFERENCE, 2<sup>ND</sup>, 2010, MELBOURNE, VICTORIA, AUSTRALIA

PB - ARRB Group Limited

**TI - 2<sup>nd</sup> International Sprayed Sealing Conference, 10-12 October 2010, Melbourne, Victoria: proceedings**

SN - 1876592648

PY - 2010/10

SP - 1 CD ROM

AB - For the records of the papers (or relevant papers) presented, please refer to ITRD abstract nos E220103 to E220117.

KW - Binder

KW - Binders

KW - Bitumen

KW - Conference

KW - Construction management

KW - Construction method

KW - Durability

KW - Pavement

KW - Pavement design

KW - Pavements

KW - Performance

KW - Seal coats

KW - Surface dressing

UR - <https://trid.trb.org/view/1099242>

ER -

TY - JOUR

AN - 01345049

JO - Journal of Materials in Civil Engineering

PB - American Society of Civil Engineers

AU - Fini, Elham H

AU - Al-Qadi, Imad L

**TI - Development of a Pressurized Blister Test for Interface Characterization of Aggregate Highly Polymerized Bituminous Materials**

PY - 2011/05

VL - 23

IS - 5

SP - pp 656-663

AB - Bituminous crack sealants are commonly used for pavement maintenance. While cracks in pavement are inevitable, sealing the cracks helps maintain the integrity of the pavement by preventing water and debris from entering the structure. Sealing cracks increases pavement service life up to 5 years, and this can lead to significant cost savings for the U.S. highway system. Crack sealing is a cost-effective maintenance approach, provided that the right sealant is selected and properly installed. However, sealant selection is difficult because of the lack of a rheology-based standard test that correlates with field performance. To address this drawback, performance-based guidelines for the selection of hot-poured crack sealants have been developed by a research team, including the writers. To complement these guidelines, this paper describes a recently developed adhesion test procedure that predicts interface bonding based on a fundamental property of the interface, interfacial fracture energy (IFE). This recently developed pressurized blister test is a fracture test. The principle of the test is to break the interface bonding by pressurizing the interface between the adhesive and adhered. The amount of pressure and the deformation of the adhesive before and during the debonding period are used to calculate the IFE. The test variation is acceptable because its average coefficient of variation is 8.7%. This paper describes the test apparatus and procedure and discusses the adhesion of several hot-poured bituminous sealants to aluminum, limestone, quartzite, and granite.

KW - Adhesion

KW - Bituminous materials

KW - Fracture tests

KW - Guidelines

KW - Interfaces

KW - Materials tests

KW - Pavement cracking

KW - Pavement maintenance

KW - Polymerization

KW - Sealing compounds

KW - Test procedures

UR - <https://trid.trb.org/view/1105265>

ER -

TY - RPRT

AN - 01343560

AU - Arampamoorthy, H

AU - PATRICK, J

AU - New Zealand Transport Agency

**TI - Potential of the Wehner-Schulze test to predict the on-road friction performance of aggregate**

SN - 9780478371918

PY - 2011/04

IS - 443

SP - 33p

AB - The specification for aggregates for use on New Zealand roads includes the British polished stone value (PSV) test. This test and the acceptance criteria were adopted in New Zealand in the 1990s, based on British experience that they were the best available method of predicting the on-road friction performance of aggregate. However, research performed by a number of people in New Zealand has shown that the prediction of performance by the PSV test is extremely variable. The Wehner-Schulze (WS) test method, developed in Germany in the 1960s and commonly used there, can test samples taken from the road. This research, which was carried out between December 2009 and August 2010, aimed to assess the potential of the WS test for predicting chip seal surface friction. The chip seal samples taken from New Zealand roads could not be used for testing because their very high texture imposed too much stress on the equipment. Therefore, hand-placed chips were tested (a specified variation in the test method). Six New Zealand quarry aggregates, covering a range of on-road friction performance, were used to assess the WS test. The test results showed that PSV and WS test results on the hand-placed samples were highly correlated. Therefore, in this form the test is not a better predictor of on-road friction than the PSV test.

KW - Aggregates

KW - Chip seals

KW - Friction

KW - Materials technology (asphalt/bitumen/concrete)

KW - New Zealand

KW - Pavement technology

KW - Pavement testing

KW - Pavements

KW - Polished stone value

KW - Polishing

KW - Sealing coat (on top of the surfacing)

KW - Specifications

KW - Test procedures

UR - <http://www.nzta.govt.nz/resources/research/reports/443/>

UR - <https://trid.trb.org/view/1105629>

ER -

TY - RPRT

AN - 01345011

AU - Holmes, Jonathan F

AU - Holcombe, Wiley

AU - Daley, Wayne

AU - Usher, Colin

AU - Robertson, Steven

AU - Georgia Institute of Technology, Atlanta

AU - Georgia Department of Transportation

AU - Federal Highway Administration

**TI - Development of an Automated Pavement Crack Sealing System**

PY - 2010/12//Final Report

SP - 125p

AB - Pavement crack sealing operations remain predominantly manual due to the challenges associated with automation. The research performed by the Georgia Tech Research Institute in conjunction with the Georgia Department of Transportation has proved in many ways that a commercial-scale automated crack sealing system is viable. Solutions related to the high-speed firing of nozzles, automated crack detection, and navigation in a real-time system have been demonstrated on a limited-scale system. Additional work remains on the testing of longitudinal crack sealing solutions, and fine tuning of crack detection algorithms. Once these issues have been properly addressed, the remaining tasks will primarily be associated with scaling the system from 12" of width to a full-lane width. The future of automated crack sealing operations is promising as this research has demonstrated that the technical barriers to commercialization have been addressed, thus opening the door for increases in productivity and worker safety.

KW - Automation

KW - Crack sealing

KW - Pavement cracking

KW - Pavement maintenance

KW - Sealing (Technology)

UR - <http://www.dot.ga.gov/BuildSmart/research/Documents/2047.pdf>

UR - <https://trid.trb.org/view/1106013>

ER -

TY - RPRT

AN - 01343990

AU - Oliver, J

AU - Austroads

**TI - Cutter contents for PMB seals**

SN - 9781921709791

PY - 2011/06

SP - 14p

AB - Recent field experience has suggested that PMB seals have failed because of insufficient wetting of aggregate particles by the binder, and this may be because of insufficiently high cutter levels.

Reanalysis of data in a published report resulted in the development of a cutter chart with substantially higher cutter levels than those currently recommended. Laboratory testing does not take into account a number of field variables so it is likely that the laboratory developed cutting chart for PMBs will need to be modified to incorporate field experience.

KW - Binders

KW - Bitumen

KW - Cutter

KW - Laboratory (not an organization)

KW - Laboratory tests

KW - Materials technology (asphalt/bitumen/concrete)

KW - Mix design

KW - Mixtures

KW - Polymers

KW - SEALING COAT

KW - Sealing coat (on top of the surfacing)

KW - Tests

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T180-11>

UR - <https://trid.trb.org/view/1106421>

ER -

TY - RPRT

AN - 01343994

AU - BUSUTTIL, R

AU - Sharp, K

AU - Neaylon, K

AU - Austroads

**TI - Review of primes and primerseal design**

SN - 9781921709807

PY - 2011/06

SP - 28p

AB - A review of Australian and international prime and primer seal design practice was undertaken to determine what further work is required to improve current design and selection procedures. It was found that design methods currently in place for primes appear adequate. However, a number of recommendations are made regarding current practice and the need for further research.

KW - Bituminous mixtures

KW - Bituminous pavements

KW - Design guide

KW - Materials technology (asphalt/bitumen/concrete)

KW - Pavement design

KW - Pavement technology

KW - Pavements

KW - SEALING COAT

KW - Sealing coat (on top of the surfacing)

KW - SPECIFICATION (STANDARD)

KW - Specifications

KW - Surfacing

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T179-11>

UR - <https://trid.trb.org/view/1106425>

ER -

TY - RPRT

AN - 01343996

AU - HOLTROP, W

AU - Neaylon, K

AU - Austroads

**TI - Performance requirements for bitumen sprayers**

SN - 9781921709784

PY - 2011/06

SP - 13p

AB - For a consistent and high quality of sprayed sealing work to be undertaken, and for sprayed sealing to remain a viable surfacing option in the face of increasing traffic levels, the achievement of well-defined and controlled application rates of binder and aggregate are very important factors. The spraying of the binder at the correct design rates of application depends on the design, manufacture and maintenance of the bitumen sprayer, appropriate calibration method, and the operating procedures and skills and competency of the operator. The proposed performance requirements in this report apply to purpose built mechanical bitumen sprayers for the application of hot and/or cold bituminous materials commonly used in sprayed sealing, but does not apply to spraying equipment used exclusively for hand sprayed work or where the pressure source is compressed air and pressurized tank.

KW - Binders

KW - Bitumen

KW - Construction

KW - Construction equipment

KW - Equipment

KW - Materials technology (asphalt/bitumen/concrete)

KW - Pavement performance

KW - Pavement technology

KW - Pavements

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T181-11>

UR - <https://trid.trb.org/view/1106427>

ER -



TY - CONF

AN - 01344004

AU - Whitehead, D

AU - DONBAVAND, J

AU - MITCHELL, J

**TI - Developing an objective measure for flushing**

PY - 2011/05

SP - 16p

AB - As chip seals age in service they lose texture and can reach a condition described as flushed. Flushing can lead to a dramatic lowering of the skid resistance available to vehicles, and effect the safety of the road network. Consequently, it is important that an objective measure be identified, so that: the extent of flushing can be quantified; areas of flushing can be located; quantitative targets for flushing can be established; strategies to reduce the amount of flushing on the network can be quantitatively evaluated; the remaining life of chip seals to provide adequate skid resistance can be predicted. The objective of this study was to establish: a limiting texture threshold; appropriate texture values that could be set as a level of service to maintain the skid resistance and hence safety on the highway.

U1 - International Surface Friction Conference, 3<sup>rd</sup>, 2011Gold Coast, Queensland, Australia

StartDate:20110515 EndDate:20110518

KW - Chip seals

KW - Highway safety

KW - Pavement performance

KW - Road networks

KW - Safe systems (roads)

KW - Safety

KW - Sealing coat (on top of the surfacing)

KW - Skidding resistance

KW - Texture

UR - <http://saferroadsconference.com/conference-papers-2011/>

UR - <https://trid.trb.org/view/1106435>

ER -

TY - CONF  
 AN - 01350065  
 AU - Zohrabi, M  
 AU - CRC Press/Balkema  
**TI - A Review of the Influence of Chalk on Pavement Performance in the South East of England, UK**  
 SN - 9780415871990  
 PY - 2009///e-book ISBN 9780203865286  
 SP - pp 991-1000  
 AB - This paper aims to investigate if there is a direct correlation between the presence of chalk in the foundation level and the bearing capacity of roads where there is disintegration and cracking of the asphalt surface. Limited evidence has shown that the ingress of water through the surface cracks has resulted in premature failure of roads that are built on chalk substrate. Deflectograph surveys do not represent a valid method of assessing the residual life expectancy as the deflections will depend on the moisture impact on the chalk (i.e. long residual life when dry but no or negative life when chalk softens). The assessment methods and maintenance strategies for pavements resting on chalk will be different to that on other granular foundations. The main aim would be to seal the road surface from moisture ingress. This is particularly relevant to modern (porous) surfaces in comparison to conventional dense surfaces.  
 U1 - Bearing Capacity of Roads, Railways and Airfields. 8<sup>th</sup> International Conference (BCR2A'09)University of Illinois, Urbana-Champaign Champaign, IL, United States  
 StartDate:20090629 EndDate:20090702 Sponsors: University of Illinois, Urbana-Champaign  
 KW - Asphalt  
 KW - Bearing capacity  
 KW - Chalks  
 KW - Cracking  
 KW - Foundation soils  
 KW - Highways  
 KW - Maintenance  
 KW - Moisture content  
 KW - Sealing compounds  
 KW - Service life  
 KW - Subgrade (Pavements)  
 KW - Surface course (Pavements)  
 UR - <https://trid.trb.org/view/1107867>  
 ER -

TY - CONF

AN - 01350347

AU - Wang, X

AU - Zhang, X

AU - Tan, Yi-qiu

AU - CRC Press/Balkema

**TI - Seal Courses for a Soft Asphalt Pavement with Semi-Rigid Base in Cold Regions**

SN - 9780415871990

PY - 2009///e-book ISBN 9780203865286

SP - pp 1073-1078

AB - As a typical structure of roads, asphalt pavement with base course of cement stabilized aggregates, which is usually called semi-rigid base course can be found everywhere in China. Research experiences show that the semi-rigid base course is often more susceptible to moisture and frost or less sufficient for moisture and frost stability. Such designs more frequently lead to reflected cracks, with more extensive low temperature cracking. As more water is penetrating down into the base course through the cracks, the bearing capacity will decrease and deterioration of the road increase. To make an improvement, especially in developing a soft binder asphalt pavement with larger void content of the mix for low volume roads, the author tries to use seal coat as a functional course. This course, in between wearing and base courses, and around 10 mm thick of mixture of asphalt binder and fine aggregates, is specially designed for moisture separation and/or mitigation of reflected cracks. In recent years, test roads consisting of seal courses were constructed in north China's Heilongjiang and Gansu Provinces, where environmental conditions differ largely in temperature, precipitation, geology and others. Some details of design, construction and performance of the seal course based on laboratory and in-situ experiments as well the test roads constructed are presented in this paper.

U1 - Bearing Capacity of Roads, Railways and Airfields. 8<sup>th</sup> International Conference (BCR2A'09)University of Illinois, Urbana-Champaign, IL, United States StartDate:20090629

EndDate:20090702 Sponsors: University of Illinois, Urbana-Champaign

KW - Asphalt pavements

KW - Base course (Pavements)

KW - Bearing capacity

KW - Binders

KW - Cement

KW - China

KW - Environmental impacts

KW - Fine aggregates

KW - Moisture content

KW - Pavement cracking

KW - Pavement design

KW - Precipitation (Meteorology)

KW - Sealing compounds

KW - Temperature

KW - Thermal stresses

UR - <https://trid.trb.org/view/1107875>

ER -

TY - JOUR

AN - 01350718

JO - Progressive Railroading

PB - Trade Press Publishing Corporation

AU - Shuler, Scott

AU - Hessling, Jason

**TI - Elevation, Deicer Impacts Crack Sealant Performance**

PY - 2011

VL - 5

IS - 1

SP - p 17, 35

AB - This article will discuss how the authors measured the performance of two different crack sealants over a period of four years, and the authors found significant differences in performance after only one winter season. The authors also found that the application of magnesium chloride (MgCl) deicer to the pavements prior to crack sealing had a significant negative effect on performance of both crack sealants at the higher elevation test section, but not at the lower elevation test section. Crack sealants prevent moisture and debris intrusion into pavements and the length of time that crack sealants are effective is important to highway agencies. Many of these agencies utilize MgCl solutions to prevent snow and ice accumulation on roadway surfaces. Some maintenance engineers have reported that MgCl solution leaves a residue inside unfilled cracks in asphalt pavements and this affects the performance of crack sealants. If this is true, MgCl should not be applied prior to scheduled crack sealing operations. Unfortunately, snow and ice events can be very unpredictable. This makes planning sealing activities more complicated than they already are. Therefore, a full scale experiment was designed to measure the effect of MgCl on crack sealant performance in Colorado.

KW - Asphalt pavements

KW - Colorado

KW - Cracking

KW - Magnesium chloride

KW - Moisture damage

KW - Sealing compounds

KW - Test sections

KW - Winter maintenance

UR - <https://trid.trb.org/view/1114545>

ER -

TY - JOUR

AN - 01350779

JO - World Highways/Routes du Monde

PB - Route One Publishing Limited

AU - Kercher, Alan S

**TI - The Preservation Toolbox**

PY - 2011

SP - pp 20-21

AB - This second article of a three-part series on pavement preservation discusses the different techniques that can be utilized as part of the preservation toolbox. The article shows how an agency should utilize a comprehensive preservation toolbox that includes various techniques, which can be applied to specific needs. There is no one technique that will cost-effectively address all pavement problems. However, there are many preservation techniques that can provide an agency with the ability to cost-effectively extend pavement life. The specific type of technique selected will vary depending on a variety of factors, including condition of the pavement and functional requirements such as skid resistance, noise level and/or ride comfort, as well as local constraints such as available equipment and suitable materials. Although preservation applies to all types of pavements, this article focuses on flexible (asphalt concrete) pavements. The preservation toolbox is made up of: (1) routine maintenance; (2) crack sealing; (3) patching; (4) preventive maintenance; (5) chip seals; (6) slurry seal; (7) microsurfacing; and (8) functional rehabilitation.

KW - Asphalt concrete pavements

KW - Chip seals

KW - Cracking

KW - Flexible pavements

KW - Pavement maintenance

KW - Preservation

KW - Preventive maintenance

KW - Sealing compounds

KW - Slurry seals

UR - <http://www.worldhighways.com/features/article.cfm?recordID=4698>

UR - <https://trid.trb.org/view/1114614>

ER -

TY - RPRT

AN - 01354104

AU - Shuler, Scott

AU - Colorado State University, Fort Collins

AU - Colorado Department of Transportation

AU - Federal Highway Administration

**TI - Investigating Crack Sealant Performance and Causes of Bumps in New Hot Mix Asphalt Overlays over Crack Sealants**

PY - 2011/07//Final Report

SP - 32p

AB - This final report is intended to provide information regarding the performance of crack sealants supplied and installed by three manufacturers for experimental use in a three-year evaluation of in-service pavements on three Colorado highways. In addition, preliminary conclusions have been developed regarding the propensity of three of these sealants to contribute to bumps in new overlay hot mix asphalt. Results of performance evaluations made, to date, indicate that the crack sealants failed at a surprising rate after only one winter. However, subsequent performance surveys after an additional twenty-four months indicate a tendency for the sealants to heal. Routing the cracks prior to filling appears to provide the best performance when the filler is over banded, and filling the cracks to within ¼ inch of the surface instead of flush with the surface or over banding produced the poorest performance. Bumps accompanied by transverse cracking occurred over the crack sealants when a new hot mix overlay was placed after the crack sealants had been in service for two years in one of the test pavements. The bumps and transverse cracks were exacerbated by utilizing steel rollers with vibration on breakdown of the hot mix asphalt overlay. The number of passes of the vibrating steel rollers further exacerbated the presence of the bumps and cracks. The same rollers used in static mode reduced the effect, and pneumatic rollers used for breakdown eliminated the effect. The ambient temperature and temperature of the substrate pavement during construction appears to have had little effect, as the same bumps and cracking occurred during vibratory breakdown after a small rain shower moistened and cooled down the substrate pavement surface prior to the overlay hot mix asphalt placement. The use of vibratory steel rollers during breakdown compaction of hot mix asphalt overlays on asphalt pavements containing crack sealants appears to exacerbate the presence of bumps and transverse cracks in the new asphalt directly over and in front of the cracks. These bumps and cracking may be mitigated by the use of pneumatic rollers on breakdown.

KW - Asphalt pavements

KW - Bituminous overlays

KW - Bumps

KW - Cracking

KW - Defects

KW - Hot mix asphalt

KW - Performance

KW - Pneumatic equipment

KW - Rehabilitation (Maintenance)

KW - Road rollers

KW - Sealing compounds

KW - Vibratory compaction

UR - <http://www.coloradodot.info/programs/research/pdfs/2011/cracksealants2.pdf/view>

UR - <https://trid.trb.org/view/1115810>

TY - JOUR

AN - 01352546

JO - Asphalt

PB - Asphalt Institute

AU - Davis, John

**TI - Preventing and Repairing Potholes and Pavement Cracks**

PY - 2011

VL - 26

IS - 2

SP - pp 35-41

AB - This article reviews the basics of preventing and repairing potholes and pavement cracks in asphalt pavements. The author uses information from "MS-16 Asphalt in Pavement Preservation and Maintenance" to provide practical information about methods, procedures, and terminology for properly sealing cracks and patching potholes. Specific topics include hairline cracks; small, medium, and large cracks; crack sealing materials; crack sealing procedures; patching; the importance of providing firm support; surface patching; spray-injection patching; infrared heater patching; and cold weather emergency patching. The author reiterates the importance of scheduling and performing asphalt maintenance tasks as soon as the problems become apparent.

KW - Asphalt pavements

KW - Cracking of asphalt concrete pavements

KW - Hot mix asphalt

KW - Maintenance

KW - Patching

KW - Patching mortar

KW - Potholes (Pavements)

KW - Sealing compounds

UR - <https://trid.trb.org/view/1116850>

ER -

TY - RPRT

AN - 01357375

AU - Waters, J

AU - New Zealand Transport Agency

**TI - Investigating the contribution of sealing chip application rates to the early failure of chipseals**

SN - 9780478380000

PY - 2011/06

IS - 445

SP - 85p

AB - Chip sealing is the predominant resurfacing used on the state highway network in New Zealand. An important component of chip seals is the sealing chip layer that is applied to protect the binder layer and provide surface texture and surface friction. There are a number of specifications written to ensure that the sealing chip used is the correct size and shape, and that it has the appropriate 'polished stone value' (PSV), but no specifications on chip application rates exist. Early-life failures of chip seals are generally attributed to the binder, the binder application rate, or the weather; however, the sealing chip application rate may also contribute significantly to these early failures. The objectives of this research, which was carried out between July 2006 and December 2009, were to: 1. determine the effect of variations in chip application rate by constructing several seals with varied chip application rates, and monitoring the performance of the seals for two years; 2. assess the effect of the time of sealing (in terms of season and weather) with chip application rates and the success rate of the chip seals; 3. develop a pictorial and quantitative guideline for the correct application rate for sealing chip in New Zealand. This report documents the performance, over the first two years after construction, of chip seals that were constructed using different chip application rates.

KW - Chip seals

KW - Chippings

KW - Failure

KW - Maintenance

KW - New Zealand

KW - Pavement maintenance

KW - Pavement performance

KW - Pavement technology

KW - Pavements

KW - SEALING COAT

KW - Sealing coat (on top of the surfacing)

UR - <http://www.nzta.govt.nz/resources/research/reports/445/>

UR - <https://trid.trb.org/view/1122911>

ER -



TY - RPRT

AN - 01357376

AU - Henderson, R J

AU - Cenek, P D

AU - Jamieson, N J

AU - Wilson, D J

AU - New Zealand Transport Agency

**TI - The influence of binder rise in reducing tyre-road friction**

SN - 9780478380057

PY - 2011/06

IS - 447

SP - 45p

AB - Research undertaken between 2007 and 2009 examined the influence of binder rise in reducing tyre-road friction of chip seal surfaces. The emphasis was on the most extreme form of binder rise when the binder is level or above the sealing chip, resulting in the formation of a black, slick surface. This condition is referred to as flushing. The aims of the research were to: 1. identify the best statistic to detect flushing from two-dimensional (2D) road surface profiles measured with lasers; 2. establish whether the dynamic friction tester (DFT) can sufficiently simulate high-speed locked-wheel braking (LWB) performance to enable its use for investigating friction characteristics of flushed sections of chip seal roads; 3. quantify the reduction in dry and wet road friction of chip seal road surfaces caused by the presence of flushing. The experimental Programme involved two distinct elements: 1. a statistical study, which investigated the degree of correlation of various measures of surface texture with visual ratings of flushing; 2. on-road tests performed on the Manfield Race Circuit and chip seal surfaced public roads involving texture profile and friction measurements. Both LWB with an instrumented vehicle and the DFT were employed for the friction measurements.

KW - Binders

KW - Chip seals

KW - Chippings

KW - Field tests

KW - Friction

KW - New Zealand

KW - Pavement performance

KW - Pavement technology

KW - Sealing coat (on top of the surfacing)

KW - Skidding resistance

KW - Statistical analysis

KW - Tires

KW - Vehicle pavement interaction

UR - <http://www.nzta.govt.nz/resources/research/reports/447/>

UR - <https://trid.trb.org/view/1122912>

ER -

TY - JOUR  
AN - 01358504  
JO - TRANSPORTATION PROFESSIONAL  
PB - BARRETT, BYRD ASSOCIATES  
AU - Byrd, Ty  
**TI - "You lay it thinner and it goes much further!"**  
PY - 2011/12  
SP - p. 23-24  
AB - 'Less is more' sums up a new ultra durable, ultra thin surfacing gaining ground in the north east of England. And the product is ultra sustainable too. Ty Byrd reports.  
KW - Asphalt pavements  
KW - Maintenance  
KW - Sealing compounds  
KW - United Kingdom  
UR - <https://trid.trb.org/view/1123960>  
ER -

TY - RPRT

AN - 01358660

AU - Rajagopal, Arudi

AU - Infrastructure Management and Engineering, Incorporated

AU - Ohio Department of Transportation

AU - Federal Highway Administration

**TI - Effectiveness of Crack Sealing on Pavement Serviceability and Life**

PY - 2011/06//Final Report

SP - 81p

AB - This report presents the details of a study to evaluate effectiveness of Ohio Department of Transportation's (ODOT's) prevailing crack sealing program. Evaluation was performed through field monitoring a large number of crack sealed and control sections. Field monitoring included collection of performance data over the five year period after crack sealing. The data collected were used to address the following specific issues: Do existing crack sealing practices within ODOT enhance pavement performance? What is the optimum timing of the treatment? Does crack sealing extend pavement life? Is crack sealing a cost effective treatment? The analysis revealed that crack sealed pavements, in general, performed better than the control sections on a 5-year cycle. Regardless of pavement type, aggregate type used in the surface layer, and the prior pavement condition, crack sealing always results in performance gain. Maximum performance gain can be achieved by treating pavements with Pavement Condition Rating (PCR) ranging from 66 to 80. The performance prediction models indicate crack sealing treatment can extend the service life of pavements by up to 3.6 years. The cost analysis using a common metric such as the Net Present Value illustrates that crack sealing, as a maintenance strategy, is economically viable for pavements in the prior PCR range of 66 to 70. From a practical point of view, it is hereby recommended that ODOT develops a policy to allow crack sealing as a strategy for pavement preventive maintenance for all pavements in the prior PCR range of 66 to 80.

KW - Cost effectiveness

KW - Data collection

KW - Net present value

KW - Pavement condition rating

KW - Pavement cracking

KW - Pavement performance

KW - Preventive maintenance

KW - Sealing (Technology)

KW - Service life

KW - Serviceability

UR - <http://worldcat.org/oclc/781944998/viewonline>

UR - <https://trid.trb.org/view/1124281>

ER -

TY - JOUR

AN - 01358997

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Schmitt, Kimberley

**TI - How to Winterize Sealcoating Equipment**

PY - 2011/10

VL - 26

IS - 7

SP - pp 20, 22-23

AB - When the weather turns cool, sealcoating equipment must be properly winterized before storage. This article describes the importance of winter maintenance and provides some guidelines on how to best protect equipment for years of service. Contractors should keep and follow any maintenance instructions that were provided by the manufacturer. Beyond that, experienced contractors suggest that any remaining sealant should be depleted or stored near the end of the season. After the excess sealant is stored, contractors should power wash the inside and outside of the equipment. Next, the tank should be flushed of any residual sealant. The contractor should ensure that all water is drained from the tank and nothing is left in the piping. The hose should be removed and stretched out so that any remaining water will not gather and freeze. Once the equipment has been thoroughly cleaned, the pump should be flushed and inspected for air leaks. Antifreeze or windshield wiper fluid should be run through the plumbing as part of the winterization process. Along with properly cleaning the tank of the sealcoating equipment, it is also essential to complete standard maintenance on other parts of the unit such as tires, brakes and hoses. The engine, carburetor and filter pot should also be checked. Contractors should follow these steps to winterize their sealcoating equipment because the damage from improperly stored equipment can cost thousands of dollars, especially if sealant is allowed to freeze in the tank. Another benefit to checking the equipment thoroughly is finding what repairs are needed before the start of the busy spring season.

KW - Components

KW - Construction equipment

KW - Equipment maintenance

KW - Guidelines

KW - Maintenance practices

KW - Seal coating

KW - Sealing compounds

KW - Winter maintenance

UR - <http://www.forconstructionpros.com/article/10361513/how-to-winterize-sealcoating-equipment>

UR - <https://trid.trb.org/view/1124347>

ER -

TY - CONF

AN - 01360468

AU - UZAROWSKI, L

AU - HENDERSON, V

AU - HENDERSON, M

AU - KIESSWETTER, B

AU - Transportation Association of Canada

**TI - Innovative Infrared Crack Repair Method**

PY - 2011

SP - 11 p.

AB - Conventionally cracks in asphalt pavements are repaired by milling the pavement around the crack and placing and compacting new Hot Mix Asphalt (HMA) material. An innovative crack repair method has been developed that includes heating the area surrounding the crack using an infrared system and removing the material immediately adjacent to the crack. A fine asphalt mix that is rich in asphalt cement is then used to fill the area where material has been removed. The area is overfilled and then finally compacted, leaving a patch that is well bonded to material below and adjacent and flush with the remainder of the pavement. Initially infrared technology was used successfully in hot in-place recycling and longitudinal joint construction and has now also been applied to crack repairs with success. The Region of Waterloo and the City of Cambridge have used the infrared crack repair method on both binder and surface course layers. Using infrared technology, it was possible to repair significant cracks and provide a quality pavement. Examples of these projects are included in this paper. The effectiveness of using this technology has been evaluated and monitored through surface smoothness evaluations, density measurements and extracting core samples. The results and findings from these tests are presented in the paper. Details of this maintenance process and the associated costs in comparison to using conventional methods are described. For the covering abstract of this conference see record control number 201111RT334E.

U1 - 2011 CONFERENCE AND EXHIBITION OF THE TRANSPORTATION ASSOCIATION OF CANADA. TRANSPORTATION SUCCESSES: LET'S BUILD ON THEM. 2011 Congress et Exhibition de l'Association des Transports du Canada. Les Success en Transports: Une Tremplin vers l'AvenirTransportation Association of Canada Edmonton, Canada StartDate:20110911 EndDate:20110914 Sponsors: Transportation Association of Canada

KW - Benefit cost analysis

KW - Bitumen

KW - Canada

KW - Conference

KW - Cost benefit analysis

KW - Cracking

KW - Field (test)

KW - Field tests

KW - Heat

KW - Infrared

KW - Infrared radiation

KW - Joint sealing

KW - Repair

KW - Repairing

KW - Surfacing

UR - [http://conf.tac-atc.ca/english/annualconference/tac2011/english/papers\\_by\\_title.htm](http://conf.tac-atc.ca/english/annualconference/tac2011/english/papers_by_title.htm)

UR - <https://trid.trb.org/view/1125258>

TY - CONF

AN - 01372815

AU - Li, Feng

AU - Huang, Songchang

AU - Transportation Research Board

**TI - Performance Evaluation and Physical Requirements of Sealants for Asphalt Pavements in China**

PY - 2012

SP - 13p

AB - Sealing or filling cracked asphalt pavements to prevent the intrusion of water into the pavement structure has been an accepted practice in China recently. In order to evaluate the performance of hot-applied type crack sealants for asphalt pavements, Chinese sealant and filler conditions and performance requirements were analyzed, five test methods include cone penetration, softening point, flow, resilience and bond respectively determined by reference of ASTM D5329, operated on fifteen samples of sealants which were generally used in China, and defined five relevant performance evaluation indices and their physical requirements. Test results shows the softening points of fourteen samples are over 80jæ, the flow units of thirteen samples are under 5 mm, and only four samples pass three cycles at 50% extension in bond tests. It indicated that the sealants used in China have good high temperature performance, but have poor characteristics at low temperature.

U1 - Transportation Research Board 91<sup>st</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20120122 EndDate:20120126 Sponsors: Transportation Research Board

KW - Asphalt pavements

KW - Bonding

KW - China

KW - Performance evaluations

KW - Resilience (Materials)

KW - Sealing compounds

KW - Softening point

UR - <https://trid.trb.org/view/1131011>

ER -

TY - JOUR

AN - 01363932

JO - Road and Transport Research

PB - ARRB Group Limited

AU - Hussain, J

AU - Wilson, D

AU - Henning, T

AU - Alabaster, D

**TI - What happens when it rains? Performance of unbound flexible pavements in accelerated pavement testing**

PY - 2011/12

VL - 20

IS - 4

SP - 3-15

AB - Surface dressings (chip seals) over unbound granular pavements are used extensively in most southern hemisphere countries with low population densities and therefore relatively low-volume roads in comparison to more dense European and northern hemisphere countries. It has been thought for many years that chip seals provide a waterproof barrier to the underlying unbound granular basecourse which is the main structural layer in unbound flexible pavements. The stimulus for this research is that some chip seal surfacings in New Zealand in recent years have not lasted their minimum expected design life for a combination of relatively high traffic volumes and wet climatic areas. Therefore, more regular and intensive maintenance is required thereby increasing the maintenance budget for maintaining minimum levels of service for road networks. A research project was conducted in the Canterbury Accelerated Pavement Testing Indoor Facility (CAPTIF) in Christchurch, New Zealand, to determine the suitability of the previously used prime coat in chip seal technology as a means to compare, for the same loading regime, chip seal surfaces that were applied with and without a prime coat. Prior to this research project, the CAPTIF facility excluded environmental factors including water in the accelerated pavement loading process. The relative change in moisture in unbound layers as water seeps through the surface chip seals was monitored during the research project. In this research project, water was allowed to flow over the sealed pavement sections with accelerated loading, water entering only from the surface and not the sides of the pavement. The research results demonstrated very dramatically under no loading. Furthermore, the sections with medium-graded basecourse with and without a prime coat lasted significantly longer under wet conditions with standard axle loading than the coarse-graded and fine-graded basecourses. Results also showed that the addition of a prime coat to the chip seal significantly extended the life of unbound pavements. With the recent development of emulsion seals that are much safer to construct than earlier 'cut back' bitumen prime coats, it is expected that prime coats will be able to be reintroduced where appropriate during sealing construction to better waterproof basecourse layers prior to chip sealing.

KW - Accelerated testing

KW - Chip seals

KW - Chippings

KW - New Zealand

KW - Pavement performance

KW - Pavement properties

KW - Pavement technology

KW - Pavements

KW - Rain

KW - Sealing coat (on top of the surfacing)

KW - Test procedures

KW - Waterproofing

UR - <https://trid.trb.org/view/1132733>

ER -



TY - RPRT  
AN - 01363952  
AU - Cenek, P D  
AU - Herrington, P K  
AU - Henderson, R J  
AU - Holland, B J  
AU - McIver, I R  
AU - Walton, D K  
AU - New Zealand Transport Agency

**TI - High-stress corners**

SN - 9780478380873

PY - 2011/12

IS - 466

SP - 57p

AB - A programme of research was undertaken to better understand chip loss on curves with the aim to improve chip seal design and selection practices. The research involved on-road measurements and computer simulation of tyre forces during cornering maneuvers; correlation analysis using road surface, road geometry and traffic variables contained in the NZ Transport Agency's RAMM database; and finite element analysis of pavement surface stresses induced by a cornering truck. The key findings were: 1. There was not a particular chip seal type more prone to chip loss than others. 2. It was determined from the finite element modelling that even at lateral accelerations five times the level normally expected for properly designed curves, the stresses generated in single coat chip seals were insufficient to cause failure of the binder in large enough areas to cause chip loss. 3. The RAMM variable that correlated the strongest with chip loss on curves was the NZ Transport Agency administration region suggesting climate, sealing properties or construction practices as being the main drivers not lateral acceleration. These findings support previous research that it is not seal design but construction practices, notably the use of controlled traffic to bed the sealing chips, which have the largest influence on mitigating chip loss.

KW - Bend (road)

KW - Chip seals

KW - Chippings

KW - Construction management

KW - CURVE

KW - Failure

KW - Finite element method

KW - Lorry

KW - New Zealand

KW - Pavement design

KW - Pavement performance

KW - Pavement technology

KW - Sealing coat (on top of the surfacing)

UR - <http://www.nzta.govt.nz/resources/research/reports/466/>

UR - <https://trid.trb.org/view/1132753>

ER -

TY - RPRT

AN - 01366045

AU - Wilde, W James

AU - Johnson, Ed N

AU - Minnesota State University, Mankato

AU - Minnesota Department of Transportation

**TI - Predicting the Occurrence of Bumps in Overlays**

PY - 2010/08//Final Report

SP - 79p

AB - This report presents the results of two field evaluations in rural Minnesota counties to investigate the development of bumps in asphalt overlays. The primary objective was to identify crack sealant types, reservoir geometries, and construction methods that provide a higher probability of avoiding the occurrence of bumps in an asphalt overlay. One field site evaluated various crack sealant methods and materials while holding construction methods constant, and the other site evaluated different construction practices intended to prevent bumps while utilizing constant crack sealant methods and materials, as well as other overlay preparation methods. The results of this research indicate that there are specific types of sealant materials and methods (type of sealant, reservoir geometry) as well as specific construction activities (rolling pattern, roller type, mat temperature at rolling) that can have great impact on the formation (and prevention) of bumps in asphalt overlays.

KW - Bituminous overlays

KW - Bumps

KW - Construction management

KW - Road rollers

KW - Sealing compounds

KW - Smoothness

UR - <http://www.lrrb.org/pdf/201031.pdf>

UR - <https://trid.trb.org/view/1134982>

ER -

TY - CONF

AN - 01368670

AU - KUCHARÉK, A S

AU - MOORE, T

AU - LINTON, P

AU - DAVIDSON, J K

AU - PHILLIPS, T

AU - Canadian Technical Asphalt Association

**TI - Optimizing the Effectiveness of High Performance Chip Seals in Ontario**

SN - 9780986914102

PY - 2011/11

SP - 243-64

AB - Chip seals have been used in Ontario for preventive maintenance for many years. However their utilization was always limited to secondary roads. The apparent unsuitability for using chip seals on high traffic roadways resided in early stage binder-aggregate adhesion problems, which created loose chip hazards. Other problems existed, such as a lack of resistance to snow ploughing and susceptibility to flushing in the high-stress areas. During the early 2000's, the Ontario Ministry of Transportation (MTO), in cooperation with the industry, started implementing a superior type of chip seals, capable of performing under the high stresses of heavy trafficked roadways. The first Ontario project was designed and executed during 2006, with more being constructed during the following years. This paper presents the use of high-performance chip seals in Ontario over the last five years. A number of key projects are reviewed, with emphasis on design, construction, and performance, as well as specific discussions on lessons learned, including late season application, repair and re-application of centreline sections damaged by snow ploughs, and repair of flushed areas using water blasting techniques. A summary of the general performance in the field over the five years is assessed, with specific distresses and specific accomplishments. // Les enduits superficiels ont servi en Ontario pour l'entretien preventif pendant de nombreuses annees. Cependant leur utilisation a toujours ete limitee aux routes secondaires. L'inaptitude apparente pour l'utilisation des enduits superficiels sur les routes a grande circulation residait dans les problemes d'adherence liant-granulats au stade precoce, ce qui a cree les dangers de granulats laches. D'autres problemes existent, comme le manque de resistance au denoigement et la susceptibilite au ressuage dans les zones de contrainte elevee. Au debut des annees 2000, le Ministere des Transports de l'Ontario (MTO), en collaboration avec l'industrie, a debute la mise en oeuvre d'un type superieur d'enduits superficiels capables de performer sous les fortes contraintes de routes a trafic lourd. Le premier projet de l'Ontario a ete conçu et execute au cours de 2006, et d'autres mis en construction lors des annees suivantes. Cet article presente l'utilisation des enduits superficiels a haute performance en Ontario au cours des cinq dernieres annees. Un certain nombre de projets cles sont passes en revue, en mettant l'accent sur la conception, la construction et la performance, ainsi que sur des discussions specifiques sur les lecons apprises, y compris l'application en fin de saison, les reparations et la re-application de la ligne de centre des sections endommagee par les charrues et la reparation des endroits de ressuage a l'aide de techniques de projection de l'eau. Un resume de la performance generale en chantier sur une periode de cinq ans est donne, avec les defauts specifiques et les realisations particulieres.

U1 - The Fifty-sixth Annual Conference of the Canadian Technical Asphalt Association Canadian Technical Asphalt Association Quebec, Quebec, Canada StartDate:20111100 EndDate:20111100

Sponsors: Canadian Technical Asphalt Association

KW - Canada

KW - Chippings

KW - Conference  
KW - Durability  
KW - Evaluation  
KW - Evaluation (assessment)  
KW - Field (test)  
KW - Field tests  
KW - High strength  
KW - Maintenance  
KW - Pavement  
KW - Pavements  
KW - Seal coats  
KW - Sealing coat (on top of the surfacing)  
KW - Strengthening (Maintenance)  
KW - Strengthening (pavement)  
UR - <https://trid.trb.org/view/1137286>  
ER -

TY - CONF

AN - 01368674

AU - MARJERISON, B

AU - ANTHONY, A

AU - CROTEAU, J M

AU - GAREAU, M

AU - DECHKOFF, C

AU - Canadian Technical Asphalt Association

**TI - Evaluation of a Fibre-Reinforced Sandwich Chip Seal in Saskatchewan**

SN - 9780986914102

PY - 2011/11

SP - 369-90

AB - Chip seal systems are important methods of pavement preservation as they offer quick and cost effective ways of maintaining roadways. In 2010, Saskatchewan's Ministry of Highways and Infrastructure (MHI) put forth a technical innovation strategy initiative to investigate various chip sealing technologies that would benefit in the preservation of highways in Saskatchewan. Several of these treatments were applied on various roadways to assess their effectiveness. As part of this study, Highway 312 exhibited a binder rich surface as well as potholing prior to treatment. A fibre-reinforced sandwich chip seal was applied to this highway to mitigate these distresses and to restore the serviceability of the road. The standard approach to treat this type of defect would have been to apply a graded-aggregate seal coat to improve the surface frictional properties. However, historically this approach has had limited success when applied to this type of roadway surface. The paper provides an overview of the problematic surface conditions identified on Highway 312, which are relatively common in Saskatchewan. The paper also provides a review of the placement operation as well as the performance of the fibre-reinforced sandwich chip seal and the adjoining graded-aggregate seals, after one winter. // Les systemes d'enduits superficiels sont des moyens importants de preservation de la chaussee parce qu'ils offrent des moyens rapides et rentables d'entretien des routes. En 2010, le Ministere de la Voirie et des Infrastructures de la Saskatchewan (MVI) a mis de l'avant une initiative de strategie d'innovation technique pour enquerir sur diverses techniques d'enduits superficiels qui profiteraient a la preservation des routes en Saskatchewan. Plusieurs de ces traitements ont ete appliques sur les differentes routes afin d'evaluer leur efficacite. Dans le cadre de cette etude, l'autoroute 312 a montre une surface riche en liant ainsi que des nids de poule avant le traitement. Un enduit superficiel en sandwich renforce de fibres a ete applique a cette route pour attenuer ces defauts et retablir le fonctionnement de la route. L'approche standard pour traiter ce type de defaut aurait ete d'appliquer un enduit superficiel de granulats classes pour ameliorer les proprietes de friction de la surface. Toutefois, historiquement, cette approche a connu un succes mitige lorsqu'elle est appliquee a ce type de surface de chaussee. Le document donne un aperçu des conditions de surface problematiques identifiees sur l'autoroute 312, qui sont relativement communes en Saskatchewan. Le document fournit egalement un examen de l'operation de pose ainsi que le rendement de l'enduit superficiel en sandwich renforce de fibres et des enduits superficiels en granulats classes attenants, apres un hiver.

U1 - The Fifty-sixth Annual Conference of the Canadian Technical Asphalt Association Canadian Technical Asphalt Association Quebec, Quebec, Canada StartDate:20111100 EndDate:20111100 Sponsors: Canadian Technical Asphalt Association

KW - Canada

KW - Chippings

KW - Conference

KW - Fibers

KW - Fibre  
KW - Field tests  
KW - Friction  
KW - In service behavior  
KW - In situ  
KW - Pothole  
KW - Potholes (Pavements)  
KW - Reinforcement (in mater)  
KW - Reinforcing materials  
KW - Seal coats  
KW - Sealing coat (on top of the surfacing)  
KW - Vehicle performance  
UR - <https://trid.trb.org/view/1137290>  
ER -

TY - JOUR

AN - 01368726

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

**TI - How to Crackseal Effectively**

PY - 2012/02

VL - 27

IS - 2

AB - Crack seal is a preventive maintenance application to seal pavement cracks. This article presents guidelines on how to provide quality crack sealing to protect asphalt pavement. A survey of the current pavement condition that identifies pavement distresses is the first step in crack sealing. The first distress that will develop in new pavement usually is longitudinal, transverse or block cracking. Cracks should be sealed whenever they have an opening of ¼ inch or more. An elastomeric material, which will expand and contract with the pavement from exposure to temperature changes, should be used as the crack seal material. Different geographical areas will require material with different softening points. Several types and grades of crack seal materials are available and may be hot or cold applied. A crack must be properly prepared before the sealer is applied to allow proper adherence of the material on either side of the crack. If a crack less than ¼ inch wide is scheduled to be crack sealed it should be routed to open the crack to ¼ inch. Compressed air should be used to blow out debris from the crack. Cracks should then be sealed with a crack seal material. The crack sealing material can be either cold poured or hot poured. Hot-poured sealant is applied to the cracks from pour pots or from an onsite hot pot, through a hose and wand applicator under pressure. Cold-poured sealant is applied by pour pot only. A hand squeegee or a stationary foot on the pour pot can be used to band the crack seal material on either side of the crack after application of the crack seal material. This banding completes the crack sealing process and aids in keeping water from entering the crack.

KW - Asphalt pavements

KW - Crack sealing

KW - Guidelines

KW - Pavement cracking

KW - Pavement maintenance

KW - Sealing (Technology)

UR - <https://trid.trb.org/view/1137439>

ER -

TY - JOUR

AN - 01372582

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - LeHuray, Anne

**TI - PCTC Fights for Refined Tar-Based Sealer**

PY - 2012/03

VL - 27

IS - 3

SP - pp 10-11

AB - This article discusses recent research sponsored by the Pavement Coatings Technology Council (PCTC). Their research contradicts data published by the U.S. Geological Survey (USGS) that linked polycyclic aromatic hydrocarbons (PAHs) in sediments to refined tar-based sealers. Instead, PCTC research suggests that refined tar-based sealers cannot be identified as the source of PAHs using the USGS analysis method. In another study, a before-and-after analysis shows that the amount of PAHs has remained unchanged since a 2006 ban on the use of refined-tar based sealers in Austin, Texas. In addition to continuing to study refined tar-based sealer in the environment, the PCTC is leading an effort to challenge bans on the use of refined tar-based sealers.

KW - Before and after studies

KW - Data quality

KW - Environmental protection

KW - Hydrocarbons

KW - Pavement Coatings Technology Council

KW - Research

KW - Sealing compounds

KW - Tar

KW - United States Geological Survey

UR - <http://www.forconstructionpros.com/article/10628260/pctc-fights-for-refined-tar-based-sealer>

UR - <https://trid.trb.org/view/1141008>

ER -



TY - JOUR

AN - 01372577

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Schmitt, Kimberley

**TI - How to Add Cracksealing to Your Services**

PY - 2012/03

VL - 27

IS - 3

SP - pp 22-27

AB - Crack sealing can be a valuable new service that contractors can offer their existing clients to generate additional revenue at a relatively low start-up cost. This article provides an overview of the equipment and knowledge that a contractor needs to get started in the crack sealing business. Before purchasing crack sealing equipment contractors must make several key decisions. First, they must know what type of work they want to pursue—driveways, parking lots, or roads. Next, they should set a budget based on the type of work they will complete. Then, they can consider what features they want to achieve the optimal comfort, safety and performance. Contractors must also develop a local source of good quality crack sealing material. After they have chosen their equipment and found their suppliers, contractors must learn the proper procedures for prep work and how to avoid common mistakes such as overheating material. With some effort and forethought, contractors can succeed in their new business venture.

KW - Contractors

KW - Equipment

KW - Materials

KW - Pavement cracking

KW - Pavement maintenance

KW - Sealing (Technology)

KW - Sealing compounds

UR - <http://www.forconstructionpros.com/article/10624064/how-to-add-cracksealing-to-your-services>

UR - <https://trid.trb.org/view/1141011>

ER -

TY - RPRT

AN - 01375849

AU - Medina, J Alberto

AU - Clouser, Tyson R

AU - Pennsylvania Department of Transportation

AU - Federal Highway Administration

**TI - Evaluation of RePlay Soy-Based Sealer for Asphalt Pavement**

PY - 2009/07//Final Report

SP - 23p

AB - BioSpan Technologies has developed a product named RePlay. The product is a soy derivative and has been marketed to drastically reduce the infiltration of air and water into pavement. The company further claims that the oils increase the flexibility of aged, brittle pavement, deterring reflective cracking. The product contains approximately 15% polymers, which the company claims increase the resistance to raveling, rutting, and cracking. This research project will evaluate RePlay's effectiveness at reducing permeability without unacceptably reducing durability or skid resistance.

KW - Asphalt pavements

KW - Evaluation

KW - Pavement maintenance

KW - Pavement performance

KW - Permeability

KW - Sealing compounds

KW - Soy based materials

UR -

[ftp://ftp.dot.state.pa.us/public/pdf/BPR\\_PDF\\_FILES/Documents/Research/Complete%20Projects/New%20Products%20&%20Innovations/RePlay%20Soy-Based%20Sealer,%20Evaluation%20of%202008-035.pdf](ftp://ftp.dot.state.pa.us/public/pdf/BPR_PDF_FILES/Documents/Research/Complete%20Projects/New%20Products%20&%20Innovations/RePlay%20Soy-Based%20Sealer,%20Evaluation%20of%202008-035.pdf)

UR - <https://trid.trb.org/view/1142268>

ER -

TY - RPRT

AN - 01379013

AU - Tsai, James

AU - Wang, Zhaohua

AU - Purcell, Roger C

AU - Georgia Institute of Technology, Atlanta

AU - Georgia Department of Transportation

**TI - Improving GDOT's Highway Pavement Preservation**

PY - 2010/02/22/Final Report

SP - 408p

AB - The objective of this research project is to perform analyses and to develop applications and functions to enhance Georgia Department of Transportation's (GDOT's) pavement preservation. The project-level analyses explore why some pavements have a short resurfacing life while others last very long, what are the contributing factors, and can the pavements in Georgia last longer. GDOT is responsible for preserving and managing 18,000-centerline miles of state maintained roadways. More than 95% of these roadways are constructed of asphalt. Therefore, the analyses performed in this study focus on asphalt pavement. GDOT has conducted its asphalt pavement condition evaluation using the Pavement Condition Evaluation System (PACES) since 1986. PACES has been further refined as the Computerized Pavement Condition Evaluation system (COPACES), developed by Georgia Tech, and utilized successfully by GDOT since 1998. This vast reserve of statewide, historical asphalt pavement performance evaluation data is available to support this study of pavement preservation which in turn requires a statewide pavement life study. With the funding shortfall and escalating construction costs, GDOT has the need to: a) forecast statewide long-term pavement performance, b) scientifically justify the highway pavement preservation funding needed to the legislature, c) perform "what-if" analyses to evaluate the impacts of different funding levels and pavement preservation strategies, and d) quantify the impact of escalating construction costs on GDOT long-term pavement preservation needs. Crack sealing and filling, one of the most popular pavement preservation methods used by GDOT, was also studied in this project. An intensive literature review was performed and supplemented by PACES data analyses to answer the following questions: 1) Is crack sealing a cost-effective pavement preservation method? 2) Can the benefits of using crack sealing be quantified? 3) What is the optimal timing (e.g. rating and distresses, etc.) to apply crack sealing? The authors also compare the characteristics of both project-level and segment-level PACES data and explore the use of segment-level data to support pavement preservation operations and management.

KW - Asphalt pavements

KW - Crack filling

KW - Crack sealing

KW - Georgia Department of Transportation

KW - Literature reviews

KW - Pavement Condition Evaluation System (PACES)

KW - Pavement cracking

KW - Pavement maintenance

KW - Pavement performance

KW - Preservation

KW - Resurfacing

UR - <http://www.dot.ga.gov/BuildSmart/research/Documents/05-19b.pdf>

UR - <https://trid.trb.org/view/1144060>

ER -

TY - CONF

AN - 01379123

JO - Transportation Research E-Circular

PB - Transportation Research Board

AU - Cheng, DingXin

AU - Lane, Lerosé

AU - Hicks, R Gary

**TI - Improvements in Asphalt Rubber Chip Seal Application with Warm-Mix Technology**

PY - 2012/07

IS - E-C163

SP - pp 13-23

AB - Asphalt rubber (AR) chip seals are normally more capable of resisting reflective cracking and more durable than conventional seal coat. However, the AR chip seal has very high production and construction placement temperatures. The temperature of mixing binder with crumb rubber modifiers ranges from 350°F to 425°F. The binder application temperatures are normally more than 350°F. The odor from tire rubber and emissions is also high. Adding warm-mix additives to the AR for the spray application can result in many advantages, including reduced odors, decreased emissions, and potential fuel savings. In 2010, three AR chip seal with warm-mix projects were placed in northern, central, and southern California, respectively. The binder placement temperatures were lowered about 45°F to 60°F, which significantly reduced emission, smoke, and odor. In California, the use of a warm-mix additive also eliminates the requirement of a special hood for conventional AR chip seal application required to meet U.S. Environmental Protection Agency emission regulations. The long-term performance of adding warm-mix additive to the AR chip seal application still needs to be evaluated. After 1 year of study, the initial results of using AR chip seal with warm-mix additives are promising. Several more AR chip seals with warm-mix additive projects were placed in California in 2011, and it is expected more will be placed again in 2012.

U1 - 2012 AASHTO–TRB Maintenance Management Conference Transportation Research Board American Association of State Highway and Transportation Officials (AASHTO) Federal Highway Administration Seattle, WA, United States StartDate:20120715 EndDate:20120719 Sponsors: Transportation Research Board, American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration

KW - Asphalt rubber

KW - California

KW - Chip seals

KW - Emissions control

KW - Pavement maintenance

KW - Pollutants

KW - Warm mix paving mixtures

UR - <http://www.trb.org/Publications/Blurbs/167500.aspx>

UR - <https://trid.trb.org/view/1146681>

ER -

TY - RPRT

AN - 01381455

AU - Herrington, P R

AU - Gribble, M

AU - Bentley, S

AU - New Zealand Transport Agency

**TI - Multigrade bitumen for chipsealing applications**

SN - 9780478380675

PY - 2011/11

IS - 460

SP - 44p

AB - Research was undertaken in 2009-2011 to evaluate the potential benefits of multigrade bitumen's in chip sealing in New Zealand. A field trial demonstrated that multigrade bitumen seals could be constructed without significant modifications to existing practice except that higher spraying temperatures are required and adhesion agent choice is limited. Experimental measurements of bitumen-tyre adhesion temperatures were made using a rolling wheel apparatus. The cohesive energy of bitumen in artificial seals at 60 degrees Celsius under impact loading was studied using a pendulum device. In both tests, the results for multigrade bitumen's were found to be similar to standard bitumen's of similar 25 degrees Celsius penetration even though the 60 degrees Celsius viscosity of the multigrade materials was 2-3 times higher.

KW - Bitumen

KW - Chip seal

KW - Chip seals

KW - Chippings

KW - Load

KW - Loads

KW - Material (constr)

KW - Material testing

KW - Materials technology (asphalt/bitumen/concrete)

KW - Materials tests

KW - New Zealand

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Temperature

KW - Tests

UR - <http://www.nzta.govt.nz/resources/research/reports/460/>

UR - <https://trid.trb.org/view/1149373>

ER -

TY - CONF

AN - 01381746

AU - Yin, S K

**TI - Emulsion sealing**

PY - 2009/11

SP - 7p (session 5)

AB - Sprayed sealing in New South Wales has traditionally used hot cutback bitumen. However, bitumen emulsions if applied correctly can provide an alternative delivery system (a way of carrying bitumen to the sealing site) with advantages in several areas including a reduction in the use of hydrocarbon cutter oils, an improved occupational health and safety to workers and the potential to extend the sprayed sealing work into the colder months. The main obstacle to the increased use of bitumen emulsion in sprayed sealing has been the cost, skinning of bitumen emulsion at adverse pavement temperatures, extended curing time needed, lack of technical information and appropriate guidelines to assist practitioners with the selection and application of emulsion sealing.

U1 - RTA Pavements Conference, 1<sup>st</sup>, 2009, Sydney, New South Wales, Australia StartDate:00000  
EndDate:00000

KW - Bituminous pavement

KW - Bituminous pavements

KW - Construction management

KW - Construction method

KW - Emulsion

KW - Emulsions

KW - New South Wales

KW - Pavement design

KW - Pavement technology

KW - Seal coats

KW - Sealing coat

KW - Sprayed seal

UR - <https://trid.trb.org/view/1149665>

ER -

TY - JOUR  
AN - 01382051  
JO - Better Roads  
PB - James Informational Media, Incorporated  
AU - Kuennen, T  
**TI - Thin is in [hot mix asphalt]**  
PY - 2010/01  
VL - 80  
IS - 1  
SP - 22-31  
KW - Asphalt  
KW - Bituminous pavements  
KW - Hot mix  
KW - Hot mix asphalt  
KW - Materials technology (asphalt/bitumen/concrete)  
KW - Overlay  
KW - Overlays (Pavements)  
KW - Pavement maintenance  
KW - Pavement technology  
KW - Ride quality  
KW - Riding quality  
KW - Seal coats  
KW - Sealing coat  
KW - Temperature  
KW - Thickness  
KW - Usa  
UR - <http://www.betterroads.com/road-science-thin-is-in/>  
UR - <https://trid.trb.org/view/1149970>  
ER -

TY - RPRT

AN - 01383698

AU - Asphalt Academy

**TI - The use of modified bituminous binders in road construction**

SN - 97807988-55723

PY - 2007/11//2<sup>nd</sup> ed

IS - TG1

SP - 100p

AB - This technical guideline covers the requirements for generic classes of homogenous (thermoplastic polymers) and non-homogenous (bitumen-rubber) modified binders for use in hot mix asphalt, surface seals and crack sealing applications. It includes recommendations related to the appropriate selection criteria, product property requirements and quality control measures for the procurement and application of modified binders. Methods for the sampling, preparation and common test procedures of these products have been included as an Appendix to the document. The intention is that these tests will be incorporated into the South African National Standards (SANS) standard test methods for compliance with South African National Accreditation Systems (SANAS) requirements. It should be noted that aggregate selection, mix design, final product composition and construction limitations are not addressed here. However, the scope of this document has been extended to include requirements for special applications related to fuel resistance, bond coats, high modulus asphalt and microsurfacing. These were not previously covered under the generic specification framework. Furthermore a protocol for conducting a field evaluation for introducing new modified binder products is also provided as a guideline. Similarly, proprietary products offering enhanced performance criteria above that of the generic classes proposed in this document are also not covered.

KW - Asphalt

KW - Binder

KW - Binders

KW - Bituminous binders

KW - Bituminous pavements

KW - Hot mix

KW - Hot mix asphalt

KW - Polymer modified binder

KW - Quality control

KW - Seal coats

KW - Sealing coat

KW - South Africa

KW - Specifications

KW - Test method

KW - Test procedures

UR - [http://www.asphaltacademy.co.za/Documents/tg1\\_A5\\_lowres.pdf](http://www.asphaltacademy.co.za/Documents/tg1_A5_lowres.pdf)

UR - <https://trid.trb.org/view/1151461>

ER -



TY - CONF

AN - 01384827

AU - Yardley, M

**TI - Crack sealing: a waste of time or pavement maintenance budget savior**

PY - 2009/10

SP - 6p (day 2, session 4)

AB - The sealing of cracks in asphalt pavements and joints in concrete pavements has been a maintenance and construction function for many years. Until recent years, the sealing approach was accepted as a menial maintenance task, with the value being seen as a short-term direction. Yet, others declaring no value in preserving their pavements with crack sealing deleted this task from their maintenance and construction programs altogether. Today's technology has improved with better performing types of sealing material and methods for sealing cracks/joints. At the same time, the demand for a cost effective preventative maintenance technique is required to extend the life of our roadway and pavement system. The current recognition that prompts corrective action to seal crack/joints before they begin to contribute to accelerated pavement deterioration will pay dividends. The investment that any State Road Authority, City or Shire has in pavement-in-place is far too great to even consider replacing at today's prices. The most cost effective form of pavement preservation is early intervention with best practice crack sealing.

U1 - AAPA International Flexible Pavements Conference, 13<sup>th</sup>, 2009, Surfers Paradise, Queensland, Australia  
StartDate:000000 EndDate:000000

KW - Cost effectiveness

KW - Cracking

KW - Joint sealing

KW - Pavement maintenance

KW - Pavement management

KW - Pavement management systems

UR - <https://trid.trb.org/view/1152590>

ER -

TY - SER  
AN - 01384939  
JO - Public Works Engineering  
AU - Holtrop, W  
**TI - How does Australian sealing practice compare to the best**  
PY - 2007/12  
SP - 64,66  
KW - Asphalt  
KW - Australia  
KW - Bituminous pavements  
KW - Pavement layer  
KW - Pavement layers  
KW - Pavement performance  
KW - Pavement strengthening  
KW - Pavement technology  
KW - Seal coats  
KW - Sealed road  
KW - Sealing coat  
KW - Strengthening (Maintenance)  
UR - <https://trid.trb.org/view/1152698>  
ER -

TY - JOUR  
AN - 01384978  
JO - Journal of Transportation Engineering  
PB - American Society of Civil Engineers  
AU - Gransberg, D D  
**TI - Using a New Zealand performance specification to evaluate US chip seal performance**  
PY - 2007/12  
VL - 133  
IS - 12  
SP - 688-95  
KW - Chip seal  
KW - Chip seals  
KW - Pavement components  
KW - Pavement layer  
KW - Pavement layers  
KW - Pavement materials  
KW - Pavement performance  
KW - Pavement technology  
KW - Pavement testing  
KW - Pavements  
KW - Rural highways  
KW - Rural road  
KW - Seal coats  
KW - Sealing coat  
KW - Specifications  
KW - Tests for suitability, service and quality  
KW - Texas, USA  
UR - <https://trid.trb.org/view/1152737>  
ER -

TY - SER  
AN - 01384989  
JO - ASPHALT REVIEW  
PB - Australian Asphalt Pavement Association  
AU - Holtrop, W  
AU - Alderson, A  
**TI - Improved sprayed seal design**  
PY - 2007/02  
VL - 26  
IS - 1  
SP - 40,2  
KW - Australia  
KW - Pavement design  
KW - Pavement technology  
KW - Seal coats  
KW - Sealing coat  
KW - Sprayed seal  
UR - <https://trid.trb.org/view/1152748>  
ER -

TY - RPRT  
AN - 01386028  
AU - South African National Roads Agency  
**TI - Design and construction of surfacing seals**  
PY - 2007/05//Version 1.5  
IS - TRH3 2007  
SP - 258p  
KW - Binder  
KW - Binders  
KW - Construction management  
KW - Construction method  
KW - Design guide  
KW - Seal coats  
KW - Sealing coat  
KW - South Africa  
KW - Surface course (Pavements)  
KW - Surfacing  
UR - <http://www.nra.co.za/content/Blogin/04.pdf>  
UR - <https://trid.trb.org/view/1153788>  
ER -

TY - JOUR  
AN - 01387176  
JO - Public Works Engineering  
AU - Tabensky, W  
**TI - Strategic plan to optimise road construction and maintenance**  
PY - 2007/08  
SP - 42-7  
KW - Baw Baw Shire, Victoria  
KW - Dust  
KW - Highway maintenance  
KW - Highway operations  
KW - Local government  
KW - Maintenance practices  
KW - Periodic maintenance  
KW - Prevention  
KW - Road construction  
KW - Road design and management  
KW - Road maintenance  
KW - Road management  
KW - Seal coats  
KW - Sealing coat  
UR - <https://trid.trb.org/view/1154940>  
ER -

TY - RPRT

AN - 01394332

AU - American Association of State Highway and Transportation Officials (AASHTO)

**TI - June 2012 Edition – AASHTO Provisional Standards**

SN - 9781560515296

PY - 2012/06//16<sup>th</sup> Edition

SP - v.p.

AB - This sixteenth edition of the American Association of State Highway and Transportation Officials (AASHTO) Provisional Standards includes a complete set of current protocols containing a total of 62 Provisional Standards. A chronology of the year-to-year status of the Provisional Standards during the past eight years is included immediately following the Table of Contents. Subjects covered by these Provisional Standards are as follows: Aggregates; Bituminous materials; Box culvert, culvert pipe, and drain tile; Concrete; Metallic materials and coatings for bridges; Miscellaneous (sealers for Portland cement concrete; detectable warning systems); Painting and traffic marking and signing (glass beads); Pavement structures; Pavement surface characteristics; Quality assurance; and Soils (fly ash for embankments; deep foundation elements).

KW - AASHTO Provisional Standards

KW - Aggregates

KW - Bituminous materials

KW - Box culverts

KW - Bridges

KW - Concrete

KW - Culvert pipe

KW - Deep foundations

KW - Fly ash

KW - Glass beads

KW - Pavements

KW - Protective coatings

KW - Provisional standards

KW - Quality assurance

KW - Reinforcing bars

KW - Reinforcing steel

KW - Sealing compounds

KW - Standards

KW - Warning devices for persons with disabilities

UR - <https://trid.trb.org/view/1160661>

ER -

TY - RPRT

AN - 01443822

AU - Lawson, William D

AU - Leaverton, Michael

AU - Senadheera, Sanjaya

AU - Texas Tech University, Lubbock

AU - Texas Department of Transportation

AU - Federal Highway Administration

**TI - Maintenance Solutions for Bleeding and Flushed Pavements Surfaced with a Seal Coat or Surface Treatment**

PY - 2007/02//Technical Report

SP - 152p

AB - This report summarizes the findings of research directed at identifying maintenance solutions for bleeding and flushed asphalt pavements surfaced with seal coats or surface treatments. Although the basic mechanism associated with both bleeding and flushing has to do with excess asphalt binder filling the voids between aggregate particles, the terms are different — “flushed” is past tense; whereas, “bleeding” is an active verb. Factors that contribute to bleeding and flushed pavements include aggregate issues, binder issues, traffic issues, environmental issues, and construction issues. There is no better advice for dealing with bleeding and flushed pavements than to avoid the problem from the outset. Bleeding is an immediate maintenance problem that must be addressed using corrective, or in some cases, emergency maintenance. The basic approaches used to treat bleeding either (a) bridge over the liquid asphalt by applying aggregate of various types and gradations, (b) cool off the pavement surface by applying water with or without additives, or (c) remove the bleeding asphalt and rebuild the pavement seal. Flushed asphalt pavement, in contrast to bleeding, is typically not a maintenance problem that must be addressed immediately. The basic approaches used to treat flushed pavements either (a) re-texture the existing flushed pavement surface or (b) add a new textured surface over the flushed pavement. The research suggests that the use of polymer modified and other binders has improved seal coat and surface treatment performance such that bleeding and flushing problems are becoming less common. Three promising areas for further research and implementation relative to bleeding/flushing solutions include (a) use of lime water, (b) ultra high pressure water cutting, and (c) use of the racked-in seal at intersections.

KW - Aggregates

KW - Asphalt pavements

KW - Bituminous binders

KW - Bleeding (Pavements)

KW - Chip seals

KW - Pavement maintenance

KW - Preventive maintenance

KW - Seal coats

UR - [http://www.depts.ttu.edu/techmrtweb/reports/complete\\_reports/5230-1.pdf](http://www.depts.ttu.edu/techmrtweb/reports/complete_reports/5230-1.pdf)

UR - <http://ntl.bts.gov/lib/45000/45700/45750/5230-1.pdf>

UR - <https://trid.trb.org/view/1211609>

ER -



TY - ABST

AN - 01450896

AU - Neaylon, K

AU - Austroads

**TI - The effects of heavy vehicle single, tandem and triaxle groupings on sprayed seal wear: stage 1**

SN - 9781921991448

PY - 2012/09

SP - 18p

AB - The majority of sprayed seal design methods around the world are based on the work of Hanson, published in 1935. To this day, Hanson's work forms the basis of seal design methods in New Zealand, Australia, South Africa, and parts of the USA. However, there are growing weaknesses in current sprayed seal design models. Traffic loads have increased, particularly in both the number of heavy vehicles, and the loads that individual prime movers are now hauling. An explanation of quantitative and qualitative aspects of the wear (defined here as reduction in surface texture) effects of single axle, tandem axle and triaxle groups on seal performance should assist in improving the way that the effect of heavy vehicles is incorporated into the current Australian seal design method. In September 2008 a test pavement consisting of unbound granular basecourse with a double/double sprayed seal was constructed at the current Accelerated Loading Facility (ALF) site in Dandenong South, Melbourne. This pavement is being repetitively loaded with varying combinations of single axle, tandem axle and triaxle loading cycles, whilst surface texture measurements are being recorded. Analysis of the surface texture reduction supports the hypothesis that axles of the same loadings but in clustered groupings cause a significantly different reduction in surface texture than in smaller groupings. The analysis also supports the hypothesis that the pavement design concept of equivalent standard axles is not applicable to sprayed seal design.

KW - Accelerated loading facilities

KW - Accelerated loading facility (ALF)

KW - Australia

KW - Axle group

KW - Axle load

KW - Axle loads

KW - Flexible pavements

KW - Heavy vehicle

KW - Heavy vehicles

KW - Lorry

KW - Pavement design

KW - Pavement technology

KW - Quick

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surface texture

KW - Test procedures

KW - Texture

KW - Trucks by number of axles

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T207-12>

UR - <https://trid.trb.org/view/1218565>

ER -

TY - RPRT

AN - 01450897

AU - Urquhart, R

AU - Austroads

**TI - Aggregate wetting experiments and effects on recommended polymer modified binder cutter levels**

SN - 9781921991455

PY - 2012/09

AB - Cutting solvents have been traditionally added to binders used in sprayed sealing to ensure that effective adhesion occurs between binder and aggregate. Recent polymer modified binder (PMB) sealing failures, which have been caused by aggregate stripping after construction, have suggested that the recommended cutter levels for some PMBs need to be increased. Use of a published experimental method in combination with the results of aggregate wetting experiments (where the degree of aggregate coating was assessed after binder and aggregate were in contact for 20 hours) yielded recommended cutter levels for Class 170 bitumen, S10E and S20E binders that were considered to be inappropriate for use in practical applications. Recommended cutter levels for S10E and S20E binders that appeared to be suitable for future use were calculated by determining the amounts of cutter needed in these PMB binders in order for them to show the same initial aggregate wetting characteristics as binders containing C170 bitumen, and then directly substituting the matched cutter values obtained for the PMB binders for the recommended cutter values for C170 bitumen which are listed in AP-T39/05. No correlations were found between the contact angle of water on films containing Class 170 bitumen, S10E, S20E and S35E binders and aggregate wetting characteristics. Preliminary experiments were also conducted to investigate the aggregate wetting behavior of a cationic rapid setting (CRS) emulsion.

KW - Aggregate

KW - Aggregates

KW - Binders

KW - Bitumen

KW - Bituminous binders

KW - Cut back bitumen

KW - Cutter

KW - Materials technology (asphalt/bitumen/concrete)

KW - Moisture content

KW - Moisture sensitivity

KW - Polymer modified binder

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T208-12>

UR - <https://trid.trb.org/view/1218566>

ER -

TY - RPRT

AN - 01450906

AU - Uquhart, R

AU - Austroads

**TI - Aggregate wetting and initial adhesion of sprayed sealing binders**

SN - 9781921991486

PY - 2012/10

SP - 31p

AB - Cutting solvents have been traditionally added to binders used in sprayed sealing in Australia and New Zealand to ensure that effective adhesion occurs between binder and aggregate. Recent polymer modified binder (PMB) sealing failures, which have been caused by aggregate stripping shortly after construction, have suggested that higher cutter levels than those currently used for PMBs are needed. Aggregate wetting experiments were conducted with C170, S10E, S20E and S35E binders using a published experimental method in order to determine whether changes to recommended PMB cutter levels were required. Use of the published method gave recommended cutter levels that are likely to be too high to be used in practical applications. Modifications to the published method have been proposed so that PMB cutter levels that are appropriate for use in the field can be determined. Investigations were also conducted into the effects of binder-aggregate contact time and aggregate precoating on the wetting of aggregate by C170, S10E, S20E and S35E binders.

KW - Adhesion

KW - Aggregate

KW - Aggregates

KW - Binder

KW - Binders

KW - Bituminous Binders

KW - Cut back bitumen

KW - Cutter

KW - Materials technology (asphalt/bitumen/concrete)

KW - Moisture content

KW - Pavement distress

KW - Polymer modified binder

KW - Polymers

KW - Sealing coat (on top of the surfacing)

KW - Solvents

KW - Stripping of binder

KW - Test method

KW - Test procedures

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T210-12>

UR - <https://trid.trb.org/view/1218575>

ER -

TY - JOUR

AN - 01454690

JO - Asphalt

PB - Asphalt Institute

AU - Walker, Dwight

**TI - Asphalt Emulsions 101**

PY - 2012

VL - 27

IS - 1

SP - pp 7-10

AB - This article provides basic information about asphalt emulsions, defined as a stable dispersion of asphalt cement droplets in water. These emulsions can be pumped, stored, and mixed with aggregates. When the emulsion is mixed or sprayed, it breaks and cures, a process in which the water separates from the asphalt. After breaking and curing, the asphalt residue has the adhesion, durability, and water-resistance properties of the original base asphalt. Emulsions can be used for tack coats, fog seals, chip seals, micro-surfacing, recycling, and cold mixes. The author describes the classifications and additives used for asphalt emulsions; storage, handling, and testing of these mixes; and applications. Readers are advised where to find more information about asphalt emulsions and their uses. The author concludes by stressing that asphalt emulsions offer the environmental advantages of low emissions and reduced energy usage, as well as safety benefits.

KW - Aggregates

KW - Asphalt emulsions

KW - Pavements

KW - Recycled materials

KW - Seal coats

KW - Sealing compounds

KW - Surface course (Pavements)

UR - <https://trid.trb.org/view/1222955>

ER -

TY - JOUR

AN - 01454686

JO - Asphalt

PB - Asphalt Institute

AU - Davis, John

**TI - Fuel-Resistant Asphalt Makes Airport Pavements More Spill-Resistant**

PY - 2012

VL - 27

IS - 1

SP - pp 29-32

AB - This article describes fuel-resistant asphalt (FRA) that can be used as a viable alternative to coal tar sealers for airport aprons and alleys. Fuel spills and oil-based leaks can cause softening of asphalt binders, resulting in deterioration of the asphalt pavement surface. The author briefly reviews the history of the use of FRA, then outlines a recent test project at an airport in Crestview, Florida, designed to rehabilitate the surface course of the north apron by milling the surface and replacing it with FRA. The FRA mix design that has evolved includes highly modified polymer asphalt, a ½ inch P-401 mix, 50-blow Marshall design, and low air voids. One sidebar briefly summarizes how the use of FRA can result in cost savings as well.

KW - Airport runways

KW - Aprons (Airports)

KW - Asphalt mixtures

KW - Asphalt pavements

KW - Aviation fuels

KW - Durability

KW - Fuel resistant surfacings

KW - Mix design

KW - Sealing compounds

KW - Service life

KW - Specifications

KW - Surface course (Pavements)

UR - <https://trid.trb.org/view/1222959>

ER -

TY - CONF

AN - 01455590

AU - Herrington, P R

AU - Ball, G F

AU - Patrick, J E

AU - Towler, J I

**TI - Aggregate breakdown as a cause of chip seal flushing**

PY - 2012/09

SP - 12p

AB - Flushing in chip seals is one of the main factors affecting seal lifetimes in New Zealand. This paper explores the hypothesis that a major cause of flushing in chip seals is the build-up of fine aggregate material in the seal layer, largely produced by surfacing aggregate breakdown and abrasion under traffic. The volume of fine aggregate particles and bitumen present, together eventually exceed the void volume available resulting in a flushed surface. Results of calculations based on measured void volumes in very dense aggregate particle packing configurations and 'textbook' bitumen application rates, showed that multiple seal layers should not in theory flush. Dense packing of various aggregate grades and combinations showed that void volume of approximately 40 per cent would be expected in heavily trafficked (compacted) seals - more than sufficient to accommodate the bitumen used in sealing. Data from volumetric measurements made on a large number of cores taken from flushed multiple layer seals showed the presence of significant quantities of aggregate material passing a 4.75 mm sieve (material which in theory should not be present). The volume of bitumen and fine material present was close to the 40 per cent value predicted at which flushing of well compacted seal layers should occur.

Measurements made of two cores showed that the contribution of tyre rubber and other non-aggregate particulates to the fine material was negligible. Data from cores taken both in the wheel tracks and on the shoulder, at the same site, indicated that breakdown of aggregate due to over chipping during construction may be a significant contributor to fines generation. This contention is supported by preliminary laboratory experiments to measure breakdown under a loaded tyre.

U1 - ARRB Conference, 25<sup>th</sup>, 2012, Perth, Western Australia, Australia StartDate:00000

EndDate:00000

KW - Aggregate

KW - Aggregates

KW - Binders

KW - Chip seal

KW - Chip seals

KW - Chippings

KW - New Zealand

KW - Pavement distress

KW - Pavement performance

KW - Pavement technology

KW - Sealing coat (on top of the surfacing)

KW - Stripping (binder)

KW - Stripping of binder

UR - <http://arrbknowledge.com>

UR - <http://www.arrb.com.au/ARRB-Conferences/Conference.aspx?id=3>

UR - <https://trid.trb.org/view/1224036>

ER -

TY - CONF

AN - 01455633

AU - Neaylon, K

**TI - The effects of single, tandem and tri-axles on sprayed seal wear**

PY - 2012/09

SP - 13p

AB - The majority of sprayed seal design methods around the world are based on the work of Hanson, published in 1935. To this day, Hanson & rsquo's work forms the basis of seal design methods in New Zealand, Australia, South Africa, and parts of the USA. However, there are growing weaknesses in current sprayed seal design models. Traffic loads have increased, particularly in both the number of heavy vehicles, and the loads that individual prime movers are now hauling. An explanation of quantitative and qualitative aspects of the wear (defined here as reduction in surface texture) effects of single axle, tandem axle and triaxle groups on seal performance should assist in improving the way that the effect of heavy vehicles is incorporated into the current Australian seal design method. In September 2008 a test pavement consisting of unbound granular basecourse with a double/double sprayed seal was constructed at the current Accelerated Loading Facility (ALF) site in Dandenong South, Melbourne. This pavement is being repetitively loaded with varying combinations of single axle, tandem axle and triaxle loading cycles, whilst surface texture measurements are being recorded. Analysis of the surface texture reduction supports the hypothesis that axles of the same loadings but in clustered groupings cause more rapid reduction in surface texture than the same loadings in smaller groupings. The analysis also supports the hypothesis that the pavement design concept of equivalent standard axles is not applicable to sprayed seal design.

U1 - ARRB Conference, 25<sup>th</sup>, 2012, Perth, Western Australia, Australia StartDate:00000

EndDate:00000

KW - Australia

KW - Axle load

KW - Axle loads

KW - Design (overall design)

KW - Heavy vehicle

KW - Heavy vehicles

KW - Lorry

KW - Pavement evaluation

KW - Pavement performance

KW - Pavement technology

KW - Pavements

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Tests for suitability, service and quality

UR - <http://arrbknowledge.com>

UR - <http://www.arrb.com.au/ARRB-Conferences/Conference.aspx?id=3>

UR - <https://trid.trb.org/view/1224079>

ER -

TY - CONF

AN - 01455640

AU - Patrick, S

**TI - Austroads PMB sprayed seal trials**

PY - 2012/09

SP - 17p

AB - The proportion of polymer modified binder (PMB) treatments used in sprayed bituminous seals is increasing. Where funding restraints lead to increased intervals of reseal applications, existing surface conditions more often require PMB seals to address cracking and other pavement distress. PMBs are also more often being used in lieu of pavement rehabilitations and reconstruction. Previous research for Austroads into the relative performance of PMBs used in sprayed seals commenced in 1994, with the information subsequently used in formulating AP-T42/06 Guide to the selection and use of polymer modified binders and multigrade bitumen's. As such, the document is based on the PMBs available some 15 years ago, whereas current generation products, and the raw materials and manufacturing techniques used have developed significantly since. The latest Austroads PMB specification framework AGPT/T190 has revised PMB classifications, and includes a new grade. This paper will describe and report on field trials of these PMB binders conducted in 2011/12, which will be monitored in the long term in order to validate the performance of current generation PMBs. This will enable practitioners to make appropriate PMB selections, enabling longer seal lives and reduced maintenance costs.

U1 - ARRB Conference, 25<sup>th</sup>, 2012, Perth, Western Australia, Australia StartDate:00000

EndDate:00000

KW - Australia

KW - Binders

KW - Bituminous binders

KW - Design (overall design)

KW - Pavement design

KW - Pavement performance

KW - Pavement technology

KW - Pavements

KW - Polymer modified binder

KW - Polymers

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

UR - <http://arrbknowledge.com>

UR - <http://www.arrb.com.au/ARRB-Conferences/Conference.aspx?id=3>

UR - <https://trid.trb.org/view/1224086>

ER -



TY - RPRT

AN - 01455720

AU - Sharp, K

AU - Patrick, S

AU - Thananjeyan, A

AU - Simpson, C

AU - Austroads

**TI - Field validation of warm mix asphalt pavements**

SN - 9781921991561

PY - 2012/11

SP - 40p

AB - This report describes the planning and conduct of a validation trial of three warm mix asphalt surfacings (chemical additive, polymer additive, foaming) and a hot mix asphalt control surfacing at a site in Melbourne, Australia. Issues addressed include the establishment of the validation site, the experimental design, a description of the site, details of the mixes tested, the condition parameters monitored, and the performance of the surfacings after two years of trafficking. Performance after two years of trafficking was excellent and also independent of asphalt mix type, type of warm mix asphalt, and the per cent age of RAP (0-50 per cent) incorporated into the mix. Details of the laboratory testing program, the results and an interpretation of the data are the subject of a companion report.

KW - Additives

KW - Admixture

KW - Admixtures

KW - Asphalt

KW - Australia

KW - Bitumen

KW - Bituminous pavements

KW - Field test

KW - Field tests

KW - In situ

KW - Materials technology (asphalt/bitumen/concrete)

KW - Melbourne, Victoria

KW - Pavement performance

KW - Pavement performance

KW - Pavement technology

KW - Sealing coat (on top of the surfacing)

KW - Surface course (Pavements)

KW - Surfacing

KW - Tests

KW - Warm mix

KW - Warm mix paving mixtures

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T214-12>

UR - <https://trid.trb.org/view/1224166>

ER -

TY - RPRT

AN - 01473846

AU - Bennett, Duane

AU - Velinsky, Steven A

AU - University of California, Davis

AU - California Department of Transportation

**TI - Development of the Sealzall Machine - Upgrade to the TTLS (Pavement Crack Sealer)**

PY - 2009/10/31/Final Report

SP - 56p

AB - The Sealzall Machine development project is the latest version of a line of successful longitudinal crack sealing machine prototypes developed and deployed with the California Department of Transportation (Caltrans) on state highways. The program's key technical element has been the application of automation technologies and custom engineering solutions to achieve increased sealing efficiencies and to eliminate the workers' exposure to highway traffic. The Sealzall machine is a rebuilt, upgraded version of a prototype sealing application vehicle developed previously. The most significant upgrade was the addition of an electrically heated sealant hose and application wand assembly on the front of the application machine to support manual in-lane crack sealing capabilities. The Sealzall machine retains the continuous 2-5 mph moving lane closure longitudinal sealing functionality of the earlier sealer with the additional features of compressed air blast crack cleaning and hot sealant recirculation.

KW - Maintenance equipment

KW - Pavement cracking

KW - Sealing (Technology)

UR - [http://www.dot.ca.gov/research/researchreports/reports/2009/2009-10\\_maintenance.pdf](http://www.dot.ca.gov/research/researchreports/reports/2009/2009-10_maintenance.pdf)

UR -

[https://merritt.cdlib.org/object?group=ucb\\_transportation\\_studies\\_library&object=ark%3A%2F13030%2Fm508664p](https://merritt.cdlib.org/object?group=ucb_transportation_studies_library&object=ark%3A%2F13030%2Fm508664p)

UR - [http://ntl.bts.gov/lib/46000/46400/46473/2009-10\\_maintenance.pdf](http://ntl.bts.gov/lib/46000/46400/46473/2009-10_maintenance.pdf)

UR - <https://trid.trb.org/view/1225409>

ER -

TY - RPRT  
 AN - 01458040  
 AU - Shuler, Scott  
 AU - Lord, Anthony  
 AU - Epps-Martin, Amy  
 AU - Hoyt, Denise  
 AU - American Association of State Highway and Transportation Officials (AASHTO)  
**TI - Manual for Emulsion-Based Chip Seals for Pavement Preservation**  
 SN - 9871560515302  
 PY - 2012/09//First Edition  
 SP - v.p.  
 AB - This manual addresses the factors affecting chip performance, discusses design and construction considerations, and identifies procedures for selecting the appropriate chip seal materials. It provides highway agencies with the information necessary for designing and constructing long-lasting chip seals and preserving pavements. The material contained in the report should be of immediate interest to state maintenance engineers and others involved in the maintenance and preservation of flexible pavements.  
 KW - Asphalt emulsions  
 KW - Chip seals  
 KW - Construction management  
 KW - Design methods  
 KW - Flexible pavements  
 KW - Materials selection  
 KW - Pavement maintenance  
 KW - Preservation  
 UR - <https://trid.trb.org/view/1226162>  
 ER -

TY - RPRT

AN - 01470543

AU - Colson, Stephen

AU - Maine Department of Transportation

**TI - Saw & Seal, Airport Pavement**

PY - 2009/05//Final Report

SP - 8p

AB - Due to extreme cold temperatures, hot bituminous pavements on Maine's airports are subject to transverse or thermal cracking. This can lead to poorly performing pavement structure causing heaving and settlement problems. Studies have shown that sawing transverse joints in new hot bituminous pavements and filling with hot poured sealant on highways is effective in minimizing effects of thermal cracks. This project will investigate the effects of sawing and sealing joints in a hot bituminous pavement along an airport runway.

KW - Airport runways

KW - Bituminous pavements

KW - Blowup (Pavements)

KW - Cold weather

KW - Joint sealing

KW - Maine

KW - Sawed joints

KW - Transverse cracking

UR - <http://ntl.bts.gov/lib/54000/54500/54565/report9721f.pdf>

UR - <https://trid.trb.org/view/1238121>

ER -

TY - CONF

AN - 01473230

AU - Li, Feng

AU - Shi, Xiaopei

AU - Zeng, Wei

AU - Xu, Jian

AU - Transportation Research Board

**TI - Laboratory Evaluation and Field Investigation of Asphalt Pavement Crack Seal Band**

PY - 2013

SP - 12p

AB - Crack sealing and filling is one of the most successful treatments for asphalt pavement preventive maintenance. The traditional crack seal materials, such as bituminous sealant or silicone sealant, unfortunately, cannot meet the requirements for open to traffic rapidly because of high volume traffic in China. Thus, a new seal material called seal band began to be applied to crack filling recently. Three test methods include penetration cone, softening point and modified bond were proposed to evaluate seal band. Then, installation configuration and field performance of seal band were investigated. The field studies indicate the treatment does not require melter, pumps or routing cracks for installation, applying seal band is as simple as blowing the pavement making sure the surface is clean and dry, unrolling and applying it to the surface. Failure investigation shows seal band can fail in three modes, included cohesion failure, adhesion failure and pullout. The investigation also discovers seal band shows better field performance than silicone sealant and hot-applied sealant. Properly installed, seal band prevents water intrusion and the deterioration it causes to the pavement.

U1 - Transportation Research Board 92<sup>nd</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20130113 EndDate:20130117 Sponsors: Transportation Research Board

KW - Adhesion

KW - Asphalt pavements

KW - China

KW - Cohesion

KW - Cracking

KW - Field tests

KW - Preventive maintenance

KW - Pull out test

KW - Sealing compounds

UR - <https://trid.trb.org/view/1240476>

ER -

TY - CONF

AN - 01473058

AU - Yi, Junyan

AU - Feng, Decheng

AU - Yang, Shih-Hsien

AU - Yu, Fei

AU - Transportation Research Board

**TI - A Preliminary Analysis on Determination of Optimum Crack Sealing Time for Asphalt Pavement**

PY - 2013

SP - 15p

AB - Crack is one of the major causes of failure in asphalt pavements, and it also accelerates the severity of other distresses. Crack sealing is one of the main methods of preventive maintenance. However, until now, there has no standard procedure based on rigorous scientific approach to determine the best sealing time of the cracks. Therefore, this study aimed to establish a preliminary crack opening model for northeast region of China. Generally, it is found that the absolute change value for crack width in one year is much higher than that in one day. Therefore the following preliminary crack opening model was built based on the year round observation data for unsealed asphalt pavement. The 20×20 mm square reservoirs for crack sealing was selected to discuss the effect of sealing time on the crack sealing performance. The approximate analysis has shown that the unreasonable sealing time will induce the premature failure for sealant and sealant-crack system. Especially, at low temperature, the sealant needs to have a good ductility to prevent the fracture itself. Finally, a polynomial function was proposed to describe the crack opening distance. The model was then used to preliminary determine the appropriated crack sealing timing of the year. It is recommended to select the average temperature between the two inflexions in polynomial function as the sealing temperature, and the corresponding time as the sealing time. It is also noticed that this time varies for different regions.

U1 - Transportation Research Board 92<sup>nd</sup> Annual Meeting Transportation Research Board

Washington, DC ,United States StartDate:20130113 EndDate:20130117 Sponsors: Transportation Research Board

KW - Asphalt pavements

KW - China

KW - Cracking

KW - Data collection

KW - Ductility

KW - Pavement distress

KW - Preventive maintenance

KW - Sealing compounds

UR - <https://trid.trb.org/view/1240938>

ER -

TY - RPRT

AN - 01472909

AU - Choi, Y

AU - Austroads

**TI - Development of long-term ageing test method for sprayed sealing binders**

SN - 9781921991738

PY - 2013/01

SP - 31p

AB - This report presents the results of a laboratory study to investigate development of a new durability test method that is acceptable for use in Australia. The study aimed to develop a more robust long-term ageing test method and resolve the issues associated with the current Australian durability test method which include equipment sustainability and testing time duration. Research into the development of a new durability test included the use of two new devices (the pressure ageing vessel (PAV) and the dynamic shear rheometer (DSR)). The PAV was found to be an ideal alternative device to the ageing oven used in the current durability test method. It appears the DSR is a suitable replacement for the Shell sliding plate micro-viscometer used in the current durability test. During this study an Australian PAV ageing protocol was developed for bitumen binders. Preliminary experiments were also conducted to investigate the visco-elastic property changes that occurred when PMB binders were subjected to the Australian PAV ageing protocol.

KW - Ageing

KW - Aging (Materials)

KW - Australia

KW - Binder

KW - Binders

KW - Durability

KW - Laboratory test

KW - Laboratory tests

KW - Materials technology (asphalt/bitumen/concrete)

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Test method

KW - Test procedures

KW - Viscoelasticity

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T225-13>

UR - <https://trid.trb.org/view/1243940>

ER -

TY - CONF

AN - 01475865

AU - Neaylon, K L

AU - Urquhart, R

AU - ARRB Group Ltd

**TI - The 1<sup>st</sup> Sprayed Sealing Alliance workshop: international best practice (Perth)**

SN - 1876592710

PY - 2013/02

IS - ARR 381

SP - 18p

AB - The inaugural Sprayed Sealing Alliance international best practice workshop was held in conjunction with the 25<sup>th</sup> ARRB Conference in Perth in September 2012, and attended by approximately 35 sprayed sealing practitioners from Australia, New Zealand, South Africa and Asia. The topics discussed included: aggregate rolling; polymer modified binder specifications; winter (cold weather) sealing; aggregate precoating; and risks associated with the low maintenance of sprayed seals.

U1 - Sprayed Sealing Alliance Workshop, 1<sup>st</sup>, 2012, Perth, Western Australia, Australia

StartDate:00000 EndDate:00000

KW - Aggregate

KW - Aggregates

KW - Asia

KW - Australia

KW - Binders

KW - Bituminous binders

KW - Maintenance

KW - Maintenance management

KW - Materials technology (asphalt/bitumen/concrete)

KW - New Zealand

KW - Pavement technology

KW - Polymer modified binder

KW - Polymers

KW - Seal coats

KW - Sealing coat

KW - Sealing coat (on top of the surfacing)

KW - South Africa

KW - Sprayed seal

UR - <http://arrbknowledge.com>

UR - <http://www.arrb.com.au/admin/file/content13/c6/ARR381.pdf>

UR - <https://trid.trb.org/view/1245947>

ER -



TY - RPRT

AN - 01478711

AU - Montana Department of Transportation

**TI - Evaluation of Crack-Sealing Milled Pavement in the Effort to Reduce Transverse Cracking**

PY - 2013///Annual Report

SP - 13p

AB - The objective of this report was to determine if crack sealing milled pavement prior to overlay will deter the migration of transverse cracking, or have an effect on pavement performance, when compared to an adjacent milled pavement that receives no crack sealing treatment. In August 2005, two 1000 ft. sections were delineated during construction in the I-15 northbound lanes at approximately milepost 312 in Teton County, Montana. One section (north) received the normal crack seal procedure and the second section (south) received no treatment. A 100 ft. transition zone separates the two sections. An ongoing crack map of the sections is included in this report to compare the progression of cracks to both sites.

KW - Asphalt pavements

KW - Montana

KW - Pavement cracking

KW - Pavement performance

KW - Recycled materials

KW - Sealing compounds

KW - Test sections

KW - Transverse cracking

UR - [http://www.mdt.mt.gov/other/research/external/docs/epsI/dutton/eval\\_apr13.pdf](http://www.mdt.mt.gov/other/research/external/docs/epsI/dutton/eval_apr13.pdf)

UR - <https://trid.trb.org/view/1247806>

ER -

TY - RPRT

AN - 01481628

AU - Newcomb, David

AU - Lenz, Russel

AU - Estakhri, Cindy

AU - Texas A&M Transportation Institute

AU - Texas Department of Transportation

AU - Federal Highway Administration

**TI - Seal Coat Binder Specification**

PY - 2013///Project Summary

SP - 2p

AB - In 2012, Texas Department of Transportation (TxDOT) allocated approximately \$336.68 million for preventive maintenance work throughout the state. These contracts predominantly utilize seal coats to treat roadways selected by district staff. The roadways selected to receive a seal coat treatment are determined by evaluating the current Pavement Management Information System data along with visual inspections and recommendations of maintenance supervisors and area engineers. A prioritized list of projects including corresponding project cost estimates is typically developed and compared to the preventive maintenance funding allocated to the district. This research project evaluated the success of this system to date by 1) identifying districts with chip seal projects accomplished under this system; 2) interviewing TxDOT personnel, material suppliers, and contractors with experience under this system; 3) summarizing the experience of the various parties; 4) analyzing the information; and 5) reporting the results.

KW - Bituminous binders

KW - Materials selection

KW - Pavement maintenance

KW - Preventive maintenance

KW - Seal coats

KW - Specifications

KW - Texas Department of Transportation

UR - <http://library.ctr.utexas.edu/hostedPDFs/txdot/psr/0-6798-s.pdf>

UR - <https://trid.trb.org/view/1250298>

ER -

TY - JOUR

AN - 01484299

JO - Journal of Materials in Civil Engineering

PB - American Society of Civil Engineers

AU - Lin, Juntao

AU - Guo, Peida

AU - Xie, Jun

AU - Wu, Shaopeng

AU - Chen, Meizhu

**TI - Effect of Rejuvenator Sealer Materials on the Properties of Aged Asphalt Binder**

PY - 2013/07

VL - 25

IS - 7

SP - pp 829-835

AB - The maintenance of asphalt pavement has become recognized as a critical issue in China. The objective of this study is to investigate the influence of using rejuvenator sealer materials on aged asphalt by means of laboratory analysis. First, asphalt binder first aged by rolling thin-film oven test and ultraviolet light. This aged asphalt was treated by two kinds of rejuvenator sealer materials. The performances of both aged binder and rejuvenator treated binder were evaluated by means of viscosity, temperature sweep, creep recovery, fatigue, and component analysis tests. The results indicated that both rejuvenator sealer materials can significantly decrease the viscosity and complex modulus of aged asphalt. Moreover, applying rejuvenator sealer materials can balance the asphaltene–maltene ratio of aged asphalt to some degree. Aged asphalt can be efficiently softened with the rejuvenator materials, which proves that rejuvenator sealer materials can be used for maintenance to improve the performance of existing pavements.

KW - Aging (Materials)

KW - Asphalt pavements

KW - Binders

KW - China

KW - Pavement management systems

KW - Properties of materials

KW - Rejuvenator sealers

KW - Sealing compounds

UR - [http://dx.doi.org/10.1061/\(ASCE\)MT.1943-5533.0000702](http://dx.doi.org/10.1061/(ASCE)MT.1943-5533.0000702)

UR - <https://trid.trb.org/view/1252408>

ER -

TY - RPRT  
 AN - 01483753  
 AU - Rebbechi, J  
 AU - Austroads  
**TI - Guide to the selection and use of polymer modified binders and multigrade bitumens**  
 SN - 9781921925037050  
 PY - 2013/05  
 SP - 44p  
 AB - This document provides a guide to the selection of modified binders including multigrade bitumen's for different treatments and service conditions, and to assist in the use and interpretation of the Austroads Specification Framework for Polymer Modified Binders and Multigrade Bitumen's (AGPT/T190).  
 KW - Asphalt  
 KW - Australia  
 KW - Binders  
 KW - Bitumen  
 KW - Bituminous binders  
 KW - Bituminous pavements  
 KW - Materials technology (asphalt/bitumen/concrete)  
 KW - Polymer modified binder  
 KW - Polymers  
 KW - Sample  
 KW - Samples  
 KW - Seal coats  
 KW - Sealing coat (on top of the surfacing)  
 KW - SPECIFICATION (STANDARD)  
 KW - Specifications  
 KW - Sprayed seal  
 KW - Test method  
 KW - Test procedures  
 UR - <https://www.onlinepublications.austroads.com.au/items/AP-T235-13>  
 UR - <https://trid.trb.org/view/1252599>  
 ER -

TY - ABST

AN - 01483754

AU - HOLTROP, W

AU - Busuttil, R

AU - Esnouf, J

AU - Jones, J

AU - Neaylon, K

AU - Patrick, S

AU - Austroads

**TI - Update of double/double design for Austroads sprayed seal design method**

SN - 9781925037067

PY - 2013/05

SP - 18p

AB - This document is an update of the design procedure for double/double sprayed seal surfacing. The information supersedes that in Update of the Austroads Sprayed Seal Design Method, and replaces Sections 6, 7 and 8 in that document. These are based on the philosophy of filling voids in the aggregate matrix with binder to a depth of about one half to two thirds the height of the aggregate when lying on its least dimension. Adjustments and allowances are incorporated in the procedures to cater for aggregate shape, traffic level, embedment, existing surface texture, hardness of existing surfaces and absorption of binder by either aggregates or the existing substrate. The design procedures cover double/double seals with Class 170 bitumen, Class 320 bitumen, multigrade binder, polymer modified binder and emulsions. A preliminary sprayed seal selection table is also included.

KW - Aggregates

KW - Australia

KW - Binder

KW - Binders

KW - Bituminous binders

KW - Design guide

KW - Pavement design

KW - Pavement technology

KW - Polymer modified binder

KW - Polymers

KW - Porosity

KW - Seal coats

KW - Sealing coat

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T236-13>

UR - <https://trid.trb.org/view/1252600>

ER -

TY - RPRT

AN - 01485137

AU - ASTM International

**TI - Annual Book of ASTM Standards 2013, Section Four: Construction. Volume 04.03: Road and Paving Materials; Vehicle-Pavement Systems**

SN - 9781622043231

PY - 2013

SP - 1723p

AB - The 2013 Annual Book of ASTM Standards consists of 82 volumes, divided among 16 sections, of which this volume is one. It contains approved American Society for Testing and Materials (ASTM) standards and related material. The subjects covered in this volume relate to road and paving materials and to vehicle-pavement systems. Among the road and paving materials subjects covered are aggregates, bituminous materials, asphalt, deicing chemicals, sealants for joints and cracks, traffic marking materials, preformed joint fillers and sealers, bridge and structure materials, testing and sampling, quality control and road tar. Among the vehicle-pavement systems addressed are tire pavement friction, pavement roughness, pavement management, pavement testing and evaluation, tire pavement slip resistance, traffic monitoring devices (weigh-in-motion, traffic sensors), and vehicle roadside communication systems.

KW - Aggregates

KW - Asphalt

KW - Bituminous materials

KW - Deicing chemicals

KW - Friction

KW - Materials tests

KW - Road marking materials

KW - Rolling contact

KW - Roughness

KW - Sealing compounds

KW - Sensors

KW - Specifications

KW - Standards

KW - Tar

KW - Telecommunications

KW - Vehicle detectors

KW - Vehicle to infrastructure communications

KW - Weigh in motion

UR - <https://trid.trb.org/view/1253837>

ER -

TY - CONF  
 AN - 01485636  
 JO - Procedia - Social and Behavioral Sciences  
 PB - Elsevier  
 AU - Sangiorgi, Cesare  
 AU - Bitelli, Gabriele  
 AU - Lantieri, Claudio  
 AU - Irali, Federico  
 AU - Girardi, Fabrizio  
**TI - A Study on Texture and Acoustic Properties of Cold Laid Microsurfacing**  
 PY - 2012/10/03  
 VL - 53  
 SP - pp 223-234  
 AB - Slurry microsurfacing is an economical maintenance intervention that provides effective skid resistance and surface evenness in a thin layer, thus improving the road safety. Researchers aimed to develop an innovative application of slurry seal, capable of gathering in a single material some technical solutions for various functional and environmental aspects. The purposes of this intervention are: restoring skid resistance, sealing surface cracking, reducing tire/pavement noise, adding crumb rubber from tires as a recycling material and reducing atmospheric emissions using the cold technique. A 3D laser scanner device has been used to evaluate the surface texture and analyze the roughness parameters.  
 U1 - SIIV-5<sup>th</sup> International Congress - Sustainability of Road Infrastructures 2012 Società Italiana Infrastrutture Viarie (SIIV) Rome, Italy StartDate:20121029 EndDate:20121031 Sponsors: Società Italiana Infrastrutture Viarie (SIIV)  
 KW - Cold mix paving mixtures  
 KW - Crack sealing  
 KW - Crumb rubber  
 KW - Laser scanners  
 KW - Micro surfacing (Surface treating)  
 KW - Roughness  
 KW - Skid resistance  
 KW - Slurry seals  
 KW - Texture  
 KW - Tire/pavement noise  
 UR - <http://dx.doi.org/10.1016/j.sbspro.2012.09.875>  
 UR - <http://www.sciencedirect.com/science/article/pii/S1877042812043376>  
 UR - <https://trid.trb.org/view/1253883>  
 ER -

TY - JOUR

AN - 01486562

JO - European Roads Review

AU - Deneuvillers, Christine

AU - Harnois, Stephane

AU - Priez, Christophe

**TI - Pavement preservation : Cape Seal treatments**

PY - 2013/01/01

IS - 21-22

SP - pp. 9-15

AB - The Cape Seal technique has the dual quality of reinstating and rehabilitating pavement surfaces. It was invented in South Africa (in Capetown, which explains its name) and originally consisted of a chip seal that was covered several weeks later by a slurry seal. It is extremely widely used throughout the world, particularly in the United States. This technique aroused the interest of Colas's French subsidiaries, and the company's Scientific and Technical Campus (CST) has modified it to suit the French context in terms of traffic conditions, climate, binders and aggregate. A number of experimental projects have been run, culminating in the validation of a two-layer system that is perfectly suited to the maintenance and repair of French pavements, i.e. a chip seal that is covered by a microsurfacing less than 48 hours later.

KW - Cold coated material

KW - Cold coated materials

KW - Grout

KW - Gussasphalt

KW - Maintenance

KW - Mastic asphalt

KW - Repair

KW - Repairing

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - South Africa

KW - Wearing course

KW - Wearing course (Pavements)

UR - <https://trid.trb.org/view/1254938>

ER -



TY - JOUR  
 AN - 01485931  
 JO - Proceedings of the Institution of Civil Engineers - Transport  
 PB - Institution of Civil Engineers  
 AU - TERZI, S  
 AU - Karasahin, M  
 AU - Saltan, M  
 AU - YILMAZ, A  
 AU - Saplioglu, M  
 AU - Ertem, S  
 AU - Ozgungordu, M  
 AU - Taciroglu, M V  
**TI - Physical properties of multi-layer seal surfacing in Turkey**  
 PY - 2013/06  
 VL - 166  
 IS - TR3  
 SP - 137-43  
 KW - Pavement design  
 KW - Pavement layer  
 KW - Pavement layers  
 KW - Pavement properties  
 KW - Pavement technology  
 KW - Physical properties  
 KW - Seal coats  
 KW - Sealing coat  
 KW - Turkey  
 UR - <http://dx.doi.org/10.1680/tran.10.00033>  
 UR - <https://trid.trb.org/view/1255492>  
 ER -

TY - RPRT

AN - 01487831

AU - Newcomb, David

AU - Lenz, Russel

AU - Estakhri, Cindy

AU - Texas A&M Transportation Institute

AU - Texas Department of Transportation

AU - Federal Highway Administration

**TI - Evaluation of the Texas Tier System for Seal Coat Binder Specification**

PY - 2013/07//Technical Report

SP - 36p

AB - The Texas Department of Transportation (TxDOT) instituted a change in their seal coat binder specification in 2010 which allowed districts to select multiple binders within specified traffic levels or tiers for the purposes of allowing contractors to bid the work with the most economical binder available to them. Known as the tier system, it is estimated that this approach has saved TxDOT over \$33 million in the 2.5 years that it has been used. While this savings is substantial, it was recognized that refinements to the tier system were needed to address specific performance problems. This research project was initiated to poll TxDOT district personnel, contractors, and chip seal binder suppliers to ascertain how the tier system was working, what modifications could be made to improve performance, and what other issues needed to be addressed. Although the tier system is generally working as intended, there are opportunities for improvement. These include an expanded education effort for all levels of TxDOT personnel involved in chip seal construction, changing traffic requirements to reflect cumulative and truck characteristics, keeping the tier system for district wide chip seal programs, updating the current chip seal manual, developing standards for pavement preparation ahead of sealing, allowing more flexibility for selecting binders for individual projects, developing generic chip seal binder specifications, removing aggregate requirements from the current tier system, initiate research into the development of a good winter binder, and initiate research into the development and application of seal coat test methods.

KW - Bituminous binders

KW - Chip seals

KW - Contractors

KW - Materials selection

KW - Pavement maintenance

KW - Seal coats

KW - Specifications

KW - Texas Department of Transportation

UR - <http://tti.tamu.edu/documents/0-6798-1.pdf>

UR - <https://trid.trb.org/view/1256675>

ER -

TY - RPRT

AN - 01489854

AU - Patrick, S

AU - Khoo, K Y

AU - Neaylon, K

AU - Austroads

**TI - Polymer modified binder sprayed seal trials: construction report**

SN - 9781925037142

PY - 2013/07

SP - 110p

AB - This report describes the planning and construction of Australian field trials which will measure of the relative performance of polymer modified binders (PMBs) used in strain alleviating membranes in sprayed bituminous sealing. Issues addressed in the report include evaluating and selecting test sites, observing and measuring their existing condition, design, sampling and testing of materials, and a plan for ongoing monitoring. The latest Austroads PMB specification framework AGPT/T190 has revised PMB classifications and includes the introduction of a new grade that is yet to be produced and field validated. Field validation of the performance of these current generation PMBs will ensure appropriate binder selection enabling longer seal life and reduced maintenance costs. Nationally conducted trials will also avoid costly duplication of effort that would otherwise occur by conducting individual trials in various jurisdictions, thereby reducing both jurisdictional and industry costs, and reducing time delays in introducing improved binders into periodic reseal programs around Australia.

KW - Australia

KW - Binders

KW - Bituminous binders

KW - Durability

KW - Field test

KW - Field tests

KW - Material testing

KW - Materials technology (asphalt/bitumen/concrete)

KW - Materials tests

KW - Pavement performance

KW - Pavement technology

KW - Pavements

KW - Polymer modified binder

KW - Polymers

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Specifications

KW - Sprayed seal

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T242-13>

UR - <https://trid.trb.org/view/1259291>

ER -

TY - RPRT

AN - 01492324

AU - Mallen, John

AU - Morandeira, Angel

AU - Jahren, Charles T

AU - Iowa State University, Ames

AU - Iowa Department of Transportation

AU - Federal Highway Administration

**TI - Training Development for Pavement Preservation**

PY - 2013/05//Final Report

SP - 275p

AB - This research project strives to help the Iowa Department of Transportation (DOT) fully achieve the full benefits of pavement preservation through training on proper selection, design, and application of pavement preservation treatments. In some cases, there is a lack of training when conducting one of these steps and the objective of applying pavement preservation techniques is compromised. Extensive amounts of literature on pavement preservation exist, but a structured approach on how to train staff in selecting, designing, and applying pavement preservation techniques is lacking. The objective of this project was to develop a training-oriented learning management system to address pavement preservation treatments (chip seals, fog seals, slurry systems, and crack seals and fills) as they are dealt with during the phases of selection, design, and construction. Early in the project, it was critical to identify the staff divisions to be trained and the treatments to be included. Through several meetings with the Iowa DOT, three staff divisions were identified: maintenance staff (in charge of selection), design staff, and construction staff. In addition, the treatments listed above were identified as the focus of the study due to their common use. Through needs analysis questionnaires and meetings, the knowledge gap and training needs of the agency were identified. The training modules developed target the gap from the results of the needs analysis. The concepting (selection) training focuses on providing the tools necessary to help make proper treatment selection. The design training focuses on providing the information necessary on the treatment materials (mostly binders and aggregates) and how to make proper material selection. Finally, the construction training focuses on providing equipment calibration procedures, inspection responsibilities, and images of poor and best practices. The research showed that it is important to train each division staff (maintenance, design, and construction) separately, as each staff division has its own needs and interests. It was also preferred that each treatment was covered on an individual basis. As a result of the research, it is recommended to evaluate the performance of pavement preservation treatments pre- and post-training continuously to compare results and verify the effectiveness of the learning management system.

KW - Best practices

KW - Chip seals

KW - Crack filling and sealing

KW - Fog seals

KW - Iowa

KW - Iowa Department of Transportation

KW - Pavement maintenance

KW - Pavement preservation

KW - Seal coating

KW - Slurry seals

KW - Training

UR - [http://www.intrans.iastate.edu/research/documents/research-reports/pvmt\\_preservation\\_lms\\_w\\_cvr.pdf](http://www.intrans.iastate.edu/research/documents/research-reports/pvmt_preservation_lms_w_cvr.pdf)  
UR - <https://trid.trb.org/view/1261140>  
ER -

TY - RPRT

AN - 01492965

AU - Choi, Y

AU - Austroads

**TI - Investigation of long-term ageing characterisation test methods for sprayed sealing binders**

SN - 9781925037166

PY - 2013/08

SP - 46p

AB - This report presents the results of a literature review and laboratory study which was conducted as part of the development of a new-long term ageing (durability) test for bituminous binders used in sprayed seals in Australia. The literature review of existing low-temperature binder characterization tests identified a number of test methods that were suitable for use as part of the new durability test method. Preliminary experimental investigations were conducted to assess the ability of the tests selected during the literature review to characterize the properties of aged bitumen and polymer modified binders. Two methods known as the dynamic shear rheometer (DSR) flow test and the extensimeter critical tip opening displacement (CTOD) test were identified as being the most appropriate for future use. It has been proposed that further research work be conducted using these two test methods to determine which is most suitable for use in a future long-term ageing test method.

KW - Ageing

KW - Aging (Materials)

KW - Australia

KW - Binder

KW - Binders

KW - Bitumen

KW - Literature review

KW - Materials technology (asphalt/bitumen/concrete)

KW - Rheology

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Test method

KW - Test procedures

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T244-13>

UR - <https://trid.trb.org/view/1262389>

ER -

TY - JOUR

AN - 01494620

JO - Pavement Preservation Journal

PB - Naylor, LLC

AU - Payne, Ellie

**TI - Charleston County melds preservation with PMS**

PY - 2013

VL - 6

IS - 3

SP - pp 20-24

AB - Charleston County, located in eastern South Carolina and encompassing the City of Charleston, is following the trend of governments across the country who are viewing pavement preservation as a crucial component of modern pavement management systems (PMS). Charleston County is adopting a proactive preservation approach in order to maintain and advance its PMS, as detailed in this article. Included in the discussion are the topics of reallocating funds and evaluating techniques, such as ultrathin lift asphalt overlays, crack sealing, asphalt rejuvenation, fog sealing and micro surfacing.

KW - Bituminous overlays

KW - Case studies

KW - Charleston County (South Carolina)

KW - Financing

KW - Microsurfacing

KW - Pavement management systems

KW - Preservation

KW - Sealing (Technology)

UR - <http://www.nxtbook.com/naylor/FPPQ/FPPQ0313/index.php?startid=15#/20>

UR - <https://trid.trb.org/view/1263469>

ER -

TY - JOUR

AN - 01495855

JO - International Journal of Pavement Engineering

PB - Taylor & Francis

AU - Ionnides, Anastasios Michael

AU - Tallapragada, Pavan Kumar

**TI - An overview and a case study of pavement performance prediction**

PY - 2013/10

VL - 14

IS - 7

SP - pp 629-644

AB - This study reviews methods for the development of performance prediction expressions for flexible and rigid pavements, and the application of performance estimation routines for planning and maintenance. Using Pavespec 3.0, 200 simulations are completed, using as-constructed pavement system data from the Ohio Route 50 project as inputs. Observed distress data trends are used for calibration, and simulations for the service life of the test pavement are generated. It is found that determining the long-term performance of a pavement using observations spanning over a small fraction of its design life and a set of purely statistical/empirical algorithms poses significant engineering interpretation challenges. Nonetheless, it is found that the test pavement may be expected to fail due to transverse cracking long before it exhibits objectionable extents of spalling, or even before it becomes too rough. Neither the existence nor the type of sealant treatment used is likely to influence the progression of cracking.

KW - Case studies

KW - Flexible pavements

KW - Mathematical prediction

KW - Ohio

KW - Pavement performance

KW - PaveSpec 3.0 (Software)

KW - Rigid pavements

KW - Sealing compounds

KW - Service life

UR - <http://dx.doi.org/10.1080/10298436.2012.715644>

UR - <https://trid.trb.org/view/1264290>

ER -



TY - CONF

AN - 01495600

AU - Jansz, R

**TI - Innovative graded aggregate surfacings review**

PY - 2013/08

SP - 17p

AB - Most of Australia's road network is made of unbound granular material without a sealed surface. With changing climate and urban expansion, these pavements suffer from higher levels of erosion and deterioration than before. Re-sheeting and watering are often increased against a desire for sustainability technology and environment friendly solutions. Additionally, unsealed roads have to cope with road-user demand for the amenity of higher level facilities including good skid resistance, no dust, reduced noise, less wear and tear of vehicles and safe passage. This has led to a closer look at ways to slow deterioration and reduce intervention while justifying whole of life cost. A solution that has emerged is the graded aggregate sprayed surfacing. It uses graded aggregates instead of single sized stone common with other sprayed surfacing and little or no upgrade is needed to the existing granular base before application. No prime is required; no aggregate pre-coat is required; and, the treatment can be applied all year round using standard spray equipment. Use of the treatment in the rehabilitation of previously sealed surfaces is also covered. The paper provides a cost comparison of graded aggregate sprayed surfacings against routine maintenance and gives a history of its use worldwide.

U1 - International Public Works Conference, 2013, Darwin, Northern Territory, Australia

StartDate:000000 EndDate:000000

KW - Aggregate

KW - Aggregates

KW - Australia

KW - Costs

KW - Gravel roads

KW - Highway maintenance

KW - Highway operations

KW - Low cost roads

KW - Maintenance

KW - Maintenance costs

KW - Road design and asset management

KW - Road maintenance

KW - Road management

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Unpaved roads

KW - Unsealed road

UR - <https://trid.trb.org/view/1265339>

ER -

TY - CONF

AN - 01495610

AU - Pidwerbesky, B

**TI - Innovative surfacing technology: performance on the road**

PY - 2013/08

SP - 7p

AB - Constrained budgets limiting resurfacing treatment lengths has encouraged substantial investment by industry in new developments and innovation, in order to extend the road maintenance budget. This paper discusses recent innovations, new technology and current projects that are specifically targeted at the next generation of pavements, for a wide range of areas covering environmental (e.g. emulsions, low-noise surfacings, and greater use of recycled materials), developments in surfacing materials, maintenance and construction practices, and other related topic areas. Modern computer-controlled sprayers have been developed to apply bitumen at rates that vary transversely across the lane width and are being used when sprayed seal surfaces have insufficient macrotexture in the wheel tracks as well as a preventative measure for binder rise in the future. Ultra-high-pressure water cutting has been adapted for use on road surfaces, to improve both macrotexture and micro texture of surfacings, to rejuvenate the surface to that of a near new surfacing. Quieter surfacings have been developed that substantially reduce the noise generated at the tyre-road interface. This paper presents results from initial research into these surfacing treatments as well as in-service performance results from 10 years monitoring of other innovative treatments discussed in the paper. Combining the wide range of state-of-the-art surfacing treatments described in this paper with best practice in asset management in a cost effective sealing and maintenance programme has resulted in significant improvements in road safety, while also ensuring the required performance of the pavements. The paper concludes with the author & rsquo;s vision of the next generation of cost effective, smarter pavements.

U1 - International Public Works Conference, 2013, Darwin, Northern Territory, Australia

StartDate:000000 EndDate:000000

KW - Costs

KW - Field test

KW - Field tests

KW - Highway maintenance

KW - Highways

KW - Maintenance

KW - New Zealand

KW - Pavements

KW - Road costs

KW - Road design and asset management

KW - Road maintenance

KW - Road surface properties

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surface course (Pavements)

KW - Surfacing

KW - Wearing course

UR - <https://trid.trb.org/view/1265349>

ER -

TY - CONF

AN - 01521687

AU - Li, Feng

AU - Huang, Songchang

AU - American Society of Civil Engineers

**TI - Laboratory Evaluation of Hot-Applied Sealant for Asphalt Pavement**

SN - 9780784412442

PY - 2012/08

SP - pp 3277-3288

AB - Crack sealing and filling is one of the most successful treatments for asphalt pavement preventive maintenance. In order to evaluate the performance of hot-applied crack sealants for asphalt pavement, five test methods including cone penetration, softening point, flow, resilience and bond were proposed respectively by the reference of ASTM D5329, then, fifteen samples of hot-applied sealants which was generally used in China were tested. Based on the test results, five evaluation indices and their physical requirements were presented. The results showed the softening points of fourteen sealants are higher than 80°C, and the flow values of thirteen sealants are lower than 5 mm, however, only four sealants passed three cycles at 50% extension in the bond tests. It indicated that the sealants used in China have good high temperature performance, but most of them have poor performance at low temperature.

U1 - Twelfth COTA International Conference of Transportation Professionals American Society of Civil Engineers Transportation Research Board Beijing, China StartDate:20120803 EndDate:20120806

Sponsors: American Society of Civil Engineers, Transportation Research Board

KW - Asphalt pavements

KW - China

KW - Laboratory tests

KW - Pavement cracking

KW - Pavement maintenance

KW - Performance tests

KW - Sealing compounds

UR - <http://dx.doi.org/10.1061/9780784412442.334>

UR - <https://trid.trb.org/view/1274521>

ER -

TY - CONF

TY - SER

AN - 01500255

JO - NCHRP-IDEA Program Project Final Report

PB - Transportation Research Board

AU - Cho, Yong K

**TI - Advanced Cleaning Device to Remove Debris and Chemicals for Crack/Joint Sealing in Pavement**

PY - 2013/05//Final Report

SP - 33p

AB - The aims of this Innovations Deserving Exploratory Analysis (IDEA) project were to improve and retrofit the design of a pavement crack cleaning device (CCD) developed in the previous IDEA Type I project (NCHRP-148), to make it more practical and functional by adding functions such as routing, hot air blasting and vacuuming. As an outcome of the previous research, a conceptual prototype of a crack cleaning device was innovatively designed, utilizing pneumatic power for air blasting and abrasive wire brushing to simultaneously remove debris or de-icing chemicals which were used in cold winter and remained in cracks. In the current project, a router, an electric heat lance and a vacuum system have been incorporated as possible options for the CCD. An electrical heat lance has been designed to properly warm the pavement and expel moisture to promote bond adhesion. In addition, a vacuum system has been developed as a means of collecting debris and dust to remove road hazards and improve operator safety while conforming to OSHA and EPA guidelines. Routing and saw cutting functions have been added to the CCD as well. For validation of the CCD in the field and to gain industry acceptance of the CCD technology, several industry demonstrations and field tests have been conducted. Multiple CCD units have been provided to the Nebraska Department of Roads (NDOR) for use during the full sealing season in 2012-2013, which was financially supported by NDOR. Also, demonstrations have been conducted at the Crafcro Inc. manufacturing facility in Chandler, Arizona and at the City of Omaha, Nebraska, road maintenance division. Productivity data along with the crews' feedback were collected during the field tests. The analyzed results showed that the CCD design concepts have been well received by all participating industries, who expect the CCD will positively impact highway road maintenance by improving productivity, safety and maintenance cost. Commercialization efforts currently are underway. If successful in commercialization and industry adoption, utilizing the CCD for crack and joint preparation would lead to an increase in overall quality of pavement maintenance, increase the useful life of pavements, and reduce costs toward rehabilitation or new construction of roadways.

KW - Blast cleaning

KW - Chemicals

KW - Cleaning equipment

KW - Debris removal

KW - Demonstration projects

KW - Equipment characteristics

KW - Equipment design

KW - Field tests

KW - Joint sealing

KW - Pavement cracking

KW - Pavements

KW - Prototypes

KW - Surface preparation

UR -

[http://onlinepubs.trb.org/Onlinepubs/IDEA/FinalReports/Highway/NCHRP159\\_Final\\_Report.pdf](http://onlinepubs.trb.org/Onlinepubs/IDEA/FinalReports/Highway/NCHRP159_Final_Report.pdf)

UR - <https://trid.trb.org/view/1278444>

ER -

TY - SER

AN - 01500234

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

**TI - Maintenance and Preservation 2013, Volume 2**

SN - 9780309286817

PY - 2013

IS - 2361

SP - 121p

AB - This issue contains 13 papers concerned with maintenance and preservation. Specific topics addressed include: the development of maintenance and preservation programs; using performance targets and budget constraints to identify optimal highway asset maintenance; a cross-asset resource allocation framework for achieving performance sustainability; public opinions of roadway assets; performance-based maintenance methods; and the development of an enhanced Alaska pavement preservation program and strategy selection guide. Additional topics considered include: prioritizing infrastructure maintenance and rehabilitation activities under various budgetary scenarios; chip seal adhesion performance with modified binders in cold climates; the effects of curing and oxidative aging on raveling in emulsion chip seals; asphalt emulsion spray ability and drain-out characteristics in chip seals; fog seal field testing with polymer-modified emulsions; a joint resealing project at Fairchild Air Force Base, Washington; and corrosion by chloride deicers on highway maintenance equipment.

KW - Aging (Materials)

KW - Alaska

KW - Asset management

KW - Chip seals

KW - Fairchild Air Force Base

KW - Joint sealing

KW - Maintenance

KW - Maintenance equipment

KW - Pavements

KW - Performance measurement

KW - Preservation

KW - Rehabilitation (Maintenance)

KW - Resource allocation

KW - Seal coating

UR - <http://www.trb.org/Main/Blurbs/169819.aspx>

UR - <https://trid.trb.org/view/1278450>

ER -

TY - RPRT

AN - 01500753

AU - Patrick, S

AU - Urquhart, R

AU - Choi, Y

AU - Austroads

**TI - PMB sprayed seal trials: 12 month summary report**

SN - 9781925037272

PY - 2013/10

SP - 118p

AB - This report details of the performance of polymer modified binder (PMB) trial sites in South Australia and New South Wales after 12 months service life. It includes related information such as the seal designs, binder testing in the laboratory, site inspections, surveys and photographic records. The trials are part of an Austroads project which aims to provide a measure of the relative performance of current PMBs used in strain alleviating membranes (SAMs) in sprayed bituminous sealing. The binders were selected according to the latest Austroads PMB specification framework AGPT/T190 which has revised PMB classifications and includes the introduction of a new grade that is yet to be produced and field validated. Field validation of the performance of these current generation PMBs by means of these trials will ensure appropriate binder selection enabling longer seal life and reduced maintenance costs. Nationally conducted trials will also avoid costly duplication of effort that would otherwise occur by conducting individual trials in various jurisdictions, thereby reducing both jurisdictional and industry costs, and reducing time delays in introducing improved binders into periodic reseal programs around Australia and New Zealand.

KW - Australia

KW - Binders

KW - Bituminous binders

KW - Durability

KW - Field test

KW - Field tests

KW - Materials technology (asphalt/bitumen/concrete)

KW - New Zealand

KW - Pavement performance

KW - Pavement technology

KW - Polymer modified binder

KW - Polymers

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Specifications

KW - Sprayed seal

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T253-13>

UR - <https://trid.trb.org/view/1279238>

ER -

TY - CONF

AN - 01503269

AU - Patrick, S

AU - Urquhart, R

AU - Choi, Y

AU - Neaylon, K

**TI - The Austroads/AAPA PMB sprayed seal field trials: one year on**

PY - 2013/09

SP - 18p

AB - The current Austroads PMB specification framework AGPT/T190 has revised PMB classifications and includes banded properties. It also includes a new PMB grade which has not previously been produced or field validated. In 2011/12 Austroads arranged and laid a sprayed seal PMB field trial program at two locations: Coober Pedy SA; and north of Cooma NSW. The objective of these trials is to validate and rank the performance of the current generation of Australian PMB sprayed seal binders. In a cooperative arrangement with AAPA, several proprietary PMB products selected by the industry were laid at the trial sites adjacent to the Austroads binders. The performance of PMBs is to be investigated in both the field and in the laboratory by 1) as a crack inhibitor & ndash; determined by crack growth measurement; 2) as a seal & ndash; including examination and adjustment of the PMB factor & ndash; determined by sand patch depth testing and visual assessment of the height of the binder up the stone, over time; and 3) by laboratory binder characterization tests PMBs sampled at the point of manufacture and delivery, and after one and two years & rsquo; service on the road. This paper describes the information gained after one year.

U1 - AAPA International Flexible Pavements Conference, 15<sup>th</sup>, 2013, Brisbane, Queensland, Australia  
StartDate:00000 EndDate:00000

KW - Australia

KW - Binders

KW - Bituminous binders

KW - Bituminous materials

KW - Field studies

KW - Field study

KW - Laboratory studies

KW - Laboratory study

KW - Material properties

KW - New South Wales

KW - Pavement technology

KW - Polymer modified binder

KW - Polymers

KW - Properties of materials

KW - Sealing coat (on top of the surfacing)

KW - South Australia

UR - <http://www.aapaq.org/docs/FPC2013/AAPA15FPC-Proceedings-v6-1.pdf>

UR - <https://trid.trb.org/view/1285328>

ER -



TY - CONF

AN - 01503288

AU - Let, A L

AU - Distin, T

**TI - Development of a low temperature crumb rubber binder for spray sealing**

PY - 2013/09

SP - 10p

AB - Bitumen modified with crumb rubber recovered from used vehicle tyres has been used very successfully in spray applications for many years in Australia. The presence of the rubber improves the properties of the binder and the natural rubber component increases the binder's ability to hold aggregate in place. However one of the major draw backs of using crumb rubber binder in spray sealing applications is the degradation of the binder properties at high application temperatures. In this paper bitumen modified with crumb rubber and special additives have been studied to improve the storage stability of the rheological properties of the modified binder. The paper also sets out to demonstrate that with special additives crumb rubber can be used in a more environmental friendly and safer manner as a modifier by enabling the binder to be blended and sprayed at a lower temperature without compromising the performance of the seal.

U1 - AAPA International Flexible Pavements Conference, 15<sup>th</sup>, 2013, Brisbane, Queensland, Australia  
StartDate:00000 EndDate:00000

KW - Additives

KW - Admixture

KW - Admixtures

KW - Australia

KW - Binder

KW - Binders

KW - Bituminous materials

KW - Crumb rubber

KW - Materials technology (asphalt/bitumen/concrete)

KW - Pavement design

KW - Pavement performance

KW - Pavements

KW - Rubber

KW - Temperature

UR - <http://www.aapaq.org/docs/FPC2013/AAPA15FPC-Proceedings-v6-1.pdf>

UR - <https://trid.trb.org/view/1285347>

ER -

TY - RPRT

AN - 01505829

AU - Daniel, Jo Sias

AU - Mallick, Rajib B

AU - Mogawer, Walaa S

AU - University of New Hampshire, Durham

AU - New England Transportation Consortium

AU - Federal Highway Administration

**TI - Evaluation of a Field Permeameter as a Longitudinal Joint Quality Indicator**

PY - 2007/04/20/Final Report

SP - 83p

AB - Premature distress along the longitudinal construction joint in asphalt pavements occurs when adequate density or tightness is not achieved during construction. The objective of this research project was to evaluate a field permeameter as a tool to evaluate the quality of longitudinal joints. As part of the study, a field permeameter that can simultaneously test three locations; along the joint and one foot into both mats, was developed. The permeameter was used to test longitudinal construction joints on pavement projects around New England. Pavements that were tested as part of the study had nominal maximum size aggregate (NMSA) ranging from 9.5 mm to 25 mm; base, binder, and surface courses were tested, and various joint construction techniques were used, including infrared heating and various joint sealants. Field cores at most test sites were taken for air void and strength testing in the laboratory and performance of the joints over the course of the project was monitored for several sites. Results of the study show that a permeability or infiltration criterion for longitudinal joint quality is promising. However, more refinements need to be made to the permeameter to reduce the variability in test results. The research team suggests returning to a single standpipe permeameter (air or water) to improve variability. The study also shows that improved construction techniques, such as joint sealants or use of a joint heater, improve the short term performance of the longitudinal joint.

KW - Air voids

KW - Asphalt pavements

KW - Joint sealing

KW - Longitudinal joints

KW - New England

KW - Permeability

KW - Permeameters

UR - [http://www.uvm.edu/~transctr/pdf/netc/netcr64\\_03-5.pdf](http://www.uvm.edu/~transctr/pdf/netc/netcr64_03-5.pdf)

UR - <https://trid.trb.org/view/1287026>

ER -

TY - CONF

AN - 01515441

AU - Alvarado, Alejandro

AU - Howard, Isaac L

AU - Transportation Research Board

**TI - Investigation into Compatibility of Chip Seal Aggregates and Emulsions**

PY - 2014

SP - 15p

AB - Surface treatments have gained popularity due to their performance and cost-effectiveness for maintaining paved roads. Chip sealing typically consists of spraying asphalt emulsion, spreading cover aggregate, and compacting the surface upon completion. Chip seal performance can be affected by a lack of bonding between the emulsion and aggregate early in its service life, causing traffic delays, vehicular damage, or reduced pavement life. The focus of this paper is to characterize the early life of chip seals and investigate the compatibility of varying emulsion and aggregate combinations. Chip seals were characterized by sweeping and also by monitoring moisture loss. Characterization focused on determining the optimum cure time needed to prevent excessive mass loss, evaluating moisture loss over a range of curing times, and investigating mass loss and moisture loss interactions. The data presented strongly correlates mass loss and moisture loss, and suggests that both response variables provide insight towards chip seal aggregate retention. This paper found significant material interaction in terms of mass loss and moisture loss, and strongly suggests the use of favorable emulsion-aggregate combinations to prevent chip seal distresses and enhance performance. Practically speaking, the data suggests chip seal systems should be designed as a system as opposed to solely relying on independently specified aggregate and emulsion properties.

U1 - Transportation Research Board 93<sup>rd</sup> Annual Meeting Transportation Research Board

Washington, DC StartDate:20140112 EndDate:20140116 Sponsors: Transportation Research Board

KW - Aggregates

KW - Asphalt emulsions

KW - Chip seals

KW - Pavement maintenance

KW - Pavement performance

KW - Surface treating

UR - <https://trid.trb.org/view/1287679>

ER -

TY - JOUR

AN - 01515664

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Ozer, Hasan

AU - Solanki, Pranshoo

AU - Yousefi, Seyed Saleh

AU - Al-Qadi, Imad L

**TI - Field Validation of Laboratory-Predicted Low-Temperature Performance of Hot-Poured Crack Sealants**

SN - 9780309295178

PY - 2014

IS - 2431

SP - pp 57–66

AB - When properly installed, hot-poured crack sealants are widely accepted as a cost-effective, routine preventive maintenance practice that extends pavement service life by 3 to 5 years. However, current ASTM specifications for selection of crack sealants correlate poorly with field performance. Therefore, an improved sealant specification and selection system is urgently needed. Recently, performance-based guidelines were developed by the pooled-fund North American Consortium expert group for selecting hot-poured bituminous crack sealants. The work proposed a sealant grade system for selecting hot-poured crack sealant on the basis of environmental conditions. A special effort was made to use the equipment originally developed by SHRP, which was used to measure binder rheological behavior as part of the performance grade system. The equipment and testing procedures used for performance grading of binders were modified in accordance with crack sealant behavior. The main objective of this study was to validate the low-temperature selection thresholds for the newly developed performance-based guidelines for selecting hot-poured crack sealants. Thresholds for the crack sealant bending beam rheometer, crack sealant direct tension test, and crack sealant adhesion test were validated. Nine hot-poured crack sealants were installed in four test sites experiencing low temperatures. The field performance of crack sealants was evaluated for 2 consecutive years by detailed field surveys. The field database consisted of 40 sections containing 647 cracks. Overall, results showed good correlation between the proposed selection thresholds and sealant performance in the field.

KW - Adhesion

KW - Bituminous materials

KW - Field tests

KW - Guidelines

KW - Low temperature tests

KW - Pavement performance

KW - Rheological properties

KW - Sealing compounds

KW - Tension tests

KW - Validation

UR - <http://dx.doi.org/10.3141/2431-08>

UR - <https://trid.trb.org/view/1288587>

ER -

TY - CONF

AN - 01519277

AU - Cao, Liping

AU - Hou, Xiangchen

AU - Xue, Hengxiao

AU - Lei, Xuotong

AU - Transportation Research Board

**TI - Development of a New Low Temperature Performance Testing Device of Asphalt Pavement Crack Sealant**

PY - 2014

SP - 12p

AB - Crack sealing is one of the most common treatments for asphalt pavement preventive maintenance. Proper crack sealing is supposed to prolong the service life of the road for 3 to 5 years. But in some cold areas in China, most kinds of crack sealant failed 1 year after it was installed. How to evaluate the low temperature performance of crack sealant is a critical issue in cold areas in China. Therefore, the prospective of this paper is to develop an effective crack sealant testing device. Firstly, a new low-temperature performance testing device of asphalt pavement crack sealant (called "the Device") was developed. The Device has high test efficiency and precision, low test resistance of the loading system and allows three parallel specimens. The Device consists of four parts: the loading system, the power system, the temperature controlling system and the data collecting system. Two types of specimens were designed to test the adhesive and cohesive properties respectively. The data collecting system can collect the stress and deformation data of crack sealant in the real time. Secondly, the influence of loading rate, temperature and specimen size on low-temperature performance of crack sealant was investigated. The results show that the specimen size of 2.4cm x 2.4cm (width x depth) is proper considering the rubber crumbs effect. The failure deformation approaches the minimum value at the rate of 100mm/h. The sealant specimen is very sensitive to temperature when the temperature is below -20°C.

U1 - Transportation Research Board 93<sup>rd</sup> Annual Meeting Transportation Research Board

Washington, DC StartDate:20140112 EndDate:20140116 Sponsors: Transportation Research Board

KW - Adhesives

KW - Asphalt pavements

KW - China

KW - Cracking

KW - Frigid regions

KW - Preventive maintenance

KW - Sealing compounds

KW - Service life

KW - Testing equipment

UR - <https://trid.trb.org/view/1289153>

ER -

TY - CONF

AN - 01518080

AU - Chan, S

AU - Lee, S B

AU - Kazmierowski, T

AU - Lee, W

AU - Canadian Technical Asphalt Association

**TI - Quantifying the Sustainable Benefits of Preserving Ontario's Flexible Pavement Assets**

PY - 2013

SP - p. 1-14

AB - The Ministry of Transportation Ontario (MTO) is dedicated to maintaining quality roadways in a sustainable manner. MTO has implemented numerous innovative pavement preservation strategies in recent years to maximize cost savings in repair operations and extend pavement life. Flexible pavement preservation treatments are considered sustainable as they improve pavement quality and durability, and extend pavement service life, while reducing energy consumption and Green House Gas (GHG) emissions. This paper outlines the various flexible pavement preservation treatments utilized by MTO to achieve sustainability. These preservation treatments include: crack sealing, slurry seal, micro-surfacing, chip seal, ultra-thin bonded friction course, fibred-modified chip seal, thin hot mix and warm mix asphalt overlays, and Hot In-place Recycling (HIR). The sustainable benefits of flexible pavement preservation are quantified by comparing the energy consumption and GHG emissions generated using the PaLATE software for various flexible pavement preservation strategies against a conventional rehabilitation treatment on a life cycle basis. The results indicate that these innovative pavement preservation strategies significantly reduce energy use, GHG emissions, and contribute to material conservation when compared to traditional treatments. An innovative environmental rating system to promote sustainable preservation of road assets is also discussed. (A) For the covering abstract of this conference see ITRD record number 201402RT334E.

U1 - PROCEEDINGS OF THE FIFTY-EIGHTH ANNUAL CONFERENCE OF THE CANADIAN TECHNICAL ASPHALT ASSOCIATION (CTAA): ST. JOHN'S, NEWFOUNDLAND AND LABRADOR, NOVEMBER 2013

StartDate:000000 EndDate:000000

KW - Bituminous mixture

KW - Bituminous mixtures

KW - Canada

KW - Chippings

KW - Cold coated material

KW - Cold coated materials

KW - Conference

KW - Cracking

KW - Emission

KW - Energy

KW - Evaluation

KW - Evaluation (assessment)

KW - Field tests

KW - Flexible pavement

KW - Flexible pavements

KW - Greenhouse effect

KW - In situ

KW - Joint sealing

KW - Maintenance

KW - Pollutants  
KW - Recycling  
KW - Recycling (mater)  
KW - Repair  
KW - Repairing  
KW - Seal coats  
KW - Sealing coat (on top of the surfacing)  
KW - Strengthening (Maintenance)  
KW - Strengthening (pavement)  
KW - Sustainability  
KW - Sustainable development  
UR - <https://trid.trb.org/view/1301869>  
ER -

TY - CONF

AN - 01518086

AU - GORSUCH, C

AU - HOGENDOORN, S

AU - Daranga, C

AU - MCKAY, J

AU - Canadian Technical Asphalt Association

**TI - Measuring Surface Tackiness of Modified Asphalt Binders and Emulsion Residues using a Dynamic Shear Rheometer**

PY - 2013

SP - p. 121-38

AB - Non-tracking tack coats, primes and fog seals have been developed to minimize pick up of the binder by the tires of traffic or construction vehicles. The binders can be hot-applied but more often are applied as emulsion. The properties of the emulsion residues for trackless recipes are typically characterized by penetration and softening point in state DOT specifications. These traditional measurements may not fully predict the performance of trackless products in the field, especially at extremes of road surface temperature and with polymer-modified or unconventional binders. A simple method to compare the tackiness of different binders would be useful in designing these non-tracking materials and has the potential to predict the maximum road temperatures for which a particular formulation is suited. We previously reported our application of the Dynamic Shear Rheometer (DSR) to measure the "tackiness" of asphalt binders. In this paper we describe improvements to the DSR method, and report on the tackiness of modified and unmodified asphalt binders and emulsion residues covering a range of softening points and penetrations. A proposed ASTM standard procedure has been developed from this work, including a potential test specification pass-fail parameter. (A) For the covering abstract of this conference see ITRD record number 201402RT334E.

U1 - PROCEEDINGS OF THE FIFTY-EIGHTH ANNUAL CONFERENCE OF THE CANADIAN TECHNICAL ASPHALT ASSOCIATION (CTAA): ST. JOHN'S, NEWFOUNDLAND AND LABRADOR, NOVEMBER 2013

StartDate:00000 EndDate:00000

KW - Binder

KW - Binders

KW - Bituminous materials

KW - Canada

KW - Conference

KW - Dynamics

KW - Emulsion

KW - Emulsions

KW - In service behavior

KW - In service behavior

KW - Instruments for measuring fluid properties or phenomena

KW - Properties

KW - Properties of materials

KW - Rheological properties

KW - Rheometer

KW - Rheometers

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Shear



KW - Shear strength

KW - Test

KW - Tests

KW - Vehicle performance

UR - <https://trid.trb.org/view/1301875>

ER -

TY - CONF

AN - 01518099

AU - ANTHONY, AM

AU - DECHKOFF, C

AU - GAREAU, M

AU - CROUTEAU, JM

AU - Canadian Technical Asphalt Association

**TI - Three Year Evaluation of Fibre-Reinforced Chip Seal Systems in Saskatchewan**

PY - 2013

SP - p. 379-401

AB - The Saskatchewan Ministry of Highways and Infrastructure (MHI) relies on graded aggregate seals for the maintenance of the provincial highway network. These types of seals are a good option for a large part of the network, however, their effectiveness is greatly reduced on higher volume roads. MHI was interested in the development of more robust sealing treatments to preserve pavements. A pilot project of fibred reinforced engineered chip seals was designed and constructed in partnership with Colas Canada Inc. and ACP Applied Products in 2010. The seals were constructed in the Saskatoon and North Battleford maintenance areas, and they included single, racked-in, and sandwich chip seals with and without the use of fibred reinforcement. To evaluate the performance of the chip seals, graded aggregate seal sections were constructed by MHI immediately adjacent to the chip seals. Test sections were set up for each of the different types of sealing systems used. This paper provides an overview of the pilot project, including a discussion on the proposed chip sealing selection/design approach used to decide on the various systems, a summary of the placement operations, as well as a three year performance review of the test sections. (A) For the covering abstract of this conference see ITRD record number 201402RT334E.

U1 - PROCEEDINGS OF THE FIFTY-EIGHTH ANNUAL CONFERENCE OF THE CANADIAN TECHNICAL ASPHALT ASSOCIATION (CTAA): ST. JOHN'S, NEWFOUNDLAND AND LABRADOR, NOVEMBER 2013

StartDate:00000 EndDate:00000

KW - Canada

KW - Chippings

KW - Conference

KW - Evaluation

KW - Evaluation (assessment)

KW - Fibers

KW - Fibre

KW - Method

KW - Methodology

KW - Reinforcement (in mater)

KW - Reinforcing materials

KW - Repair

KW - Repairing

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Strengthening (Maintenance)

KW - Strengthening (pavement)

KW - Surfacing

KW - Test track

KW - Test tracks

UR - <https://trid.trb.org/view/1301888>

TY - RPRT

AN - 01518424

AU - Khoo, K Y

AU - Austroads

**TI - Towards incorporating heavy vehicles into the Austroads sprayed seal design method**

SN - 9781925037517

PY - 2014/02

SP - 30p + appendices

AB - There has been a continual increase in the number of large heavy vehicles nationwide since the review of the Austroads sprayed seal design method in 2001. This report aims to refine the traffic adjustment factor by updating and reanalyzing the loading effect of heavy vehicles on the seal surfacings. Two seal design factors for heavy vehicles are devised: damage factor (DF) and equivalent heavy vehicle based on the definition that a Class 4 (3 axle truck) was the standard vehicle (EHVDF) (cf. existing definition of EHV that is based on the annual average daily traffic data). A total of 126 million weight-in-motion (WIM) data from the rural regions obtained during the period from 2007 to 2011 were provided by Australian jurisdictions. The analysis process used in the report could be adapted to data derived from specific locations or across a particular state. A proportional distribution of vehicle fleet composition was derived from the WIM data for each jurisdiction. DF and EHVDF for each vehicle class in relation to a Class 4 vehicle were also derived for each jurisdiction.

KW - Australia

KW - Axle load

KW - Axle loads

KW - Damage

KW - Damages

KW - Design (overall design)

KW - Heavy vehicle

KW - Heavy vehicles

KW - Lorry

KW - Moving

KW - Pavement design

KW - Pavement technology

KW - Pavements

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Weigh in motion

KW - Weight

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T260-14>

UR - <https://trid.trb.org/view/1302398>

ER -

TY - RPRT

AN - 01518425

AU - Khoo, K Y

AU - Austroads

**TI - Literature review of the adhesion mechanisms in emulsion seals**

SN - 9781925037524

PY - 2014/02

SP - 27p

AB - There has been renewed interest in emulsion seals in Australia, but an impediment to their widespread adoption has been perceived as adhesion problems. This study looks at adhesion test procedures and means of improving emulsion seal performance. Three key mechanisms are initial adhesion, development of cohesive binder strength (green strength), and resistance to stripping in the presence of water. Initial adhesion and resistance to stripping can be evaluated for emulsion binders using tests developed for neat bitumen. Green strength can be measured by a number of international tests which could be adopted for routine Australian use. Improvements in materials and construction practices may have reduced the likelihood of green strength failure. Arrangement of a series of road trials utilizing international and local expertise could be considered to test this presumption.

KW - Adhesion

KW - Australia

KW - Binders

KW - Emulsion

KW - Emulsions

KW - Literature review

KW - Literature reviews

KW - Materials technology (asphalt/bitumen/concrete)

KW - Pavement performance

KW - Pavement technology

KW - Seal coats

KW - Sealing coat

KW - Sealing coat (on top of the surfacing)

KW - Strength

KW - Strength (mater)

KW - Strength of materials

KW - Test method

KW - Test procedures

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T261-14>

UR - <https://trid.trb.org/view/1302399>

ER -

TY - ABST

AN - 01518426

AU - Holtrop, W

AU - Patrick, S

AU - Austroads

**TI - Performance requirements for bitumen sprayers**

SN - 9781925037531

PY - 2014/02

SP - 13p

AB - This document sets out the performance requirements expected of bitumen sprayers operating in Australia and New Zealand. For a consistent and high quality of sprayed sealing work to be undertaken, and for sprayed sealing to remain a viable surfacing option in the face of increasing traffic levels, the achievement of well-defined and controlled application rates of binder and aggregate are very important factors. The spraying of the binder at the correct design rates of application depends on the design, manufacture and maintenance of the bitumen sprayer, appropriate calibration method, and the operating procedures, skills and competency of the operator. The proposed performance requirements apply to purpose-built mechanical bitumen sprayers for the application of hot and/or cold bituminous materials commonly used in sprayed sealing, but do not apply to spraying equipment used exclusively for hand sprayed work or where the pressure source is compressed air and pressurized tank.

KW - Australia

KW - Binder

KW - Binders

KW - Bitumen

KW - Construction equipment

KW - Equipment

KW - Materials technology (asphalt/bitumen/concrete)

KW - New Zealand

KW - Pavement performance

KW - Pavement technology

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Spreading

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T262-14>

UR - <https://trid.trb.org/view/1302400>

ER -

TY - JOUR

AN - 01526094

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Stoikes, Jessica

**TI - The Possibilities of Pavement Preservation**

PY - 2014/02

VL - 29

IS - 2

SP - pp 16-18

AB - This article outlines a number of surface treatment options intended to ensure long-term pavement preservation. The highlighted treatments are: crack sealing and filling; chip sealing; slurry sealing; micro surfacing; fog sealing; thin lift overlays; and fine texture milling.

KW - Chip seals

KW - Milling

KW - Overlays (Pavements)

KW - Pavement maintenance

KW - Preservation

KW - Sealing compounds

KW - Slurry seals

KW - Surfacing

UR - <http://www.forconstructionpros.com/article/11293516/what-surface-treatment-option-best-suits-your-pavement-maintenance-needs>

UR - <https://trid.trb.org/view/1305125>

ER -

TY - CONF

AN - 01525974

AU - Mullin, Anthony

AU - Liu, Juanyu

AU - McHattie, Robert

AU - American Society of Civil Engineers

**TI - Field Evaluation of Crack Sealing of AC Pavements in Alaska**

SN - 9780784413326

PY - 2014/04

SP - pp 39-51

AB - Sealing cracks in asphalt concrete (AC) pavements is a widely used preventive maintenance strategy, and has long been regarded as a necessary annual procedure in most of the United States and other countries. However, many years of careful observations in Alaska have conjectured that certain thermal crack types may sometimes be ignored, i.e., left completely unsealed, for the life of the pavement with no negative effects. This paper presents a recently completed field study on evaluating crack sealing of thermal cracks in older AC pavements in northern and central Alaska. Two distinct types of thermal cracks, differentiated as 1) lesser thermal cracks and 2) major transverse thermal cracks, were formally recognized and assessed using a special thermal crack evaluation (STCE) method. Based on field data collection, analysis, and interpretation, it was concluded that significant maintenance funds can be saved or redirected by not sealing or by reduced sealing of certain types of thermal cracks in AC pavements. The study recommends that lesser thermal cracking receive no maintenance except on delaminating pavements. Maintenance treatment of major transverse thermal cracks can be greatly reduced based on inexpensive, long-term assessments following new pavement construction.

U1 - International Symposium of Climatic Effects on Pavement and Geotechnical Infrastructure

2013American Society of Civil Engineers Fairbanks, Alaska, United States StartDate:20130804

EndDate:20130807 Sponsors: American Society of Civil Engineers

KW - Alaska

KW - Asphalt pavements

KW - Climate change

KW - Concrete pavements

KW - Cracking

KW - Delamination

KW - Field tests

KW - Preventive maintenance

KW - Thermal degradation

UR - <http://dx.doi.org/10.1061/9780784413326.005>

UR - <https://trid.trb.org/view/1306354>

ER -

TY - RPRT

AN - 01525320

AU - Testa, Dean M

AU - Hossain, Mustaque

AU - Kansas State University Transportation Center

AU - Kansas Department of Transportation

**TI - Kansas Department of Transportation 2014 Chip Seal Manual**

PY - 2014/03//Final Report

SP - 175p

AB - 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.

KW - Asphalt pavements

KW - Best practices

KW - Chip seals

KW - Kansas

KW - Manuals

KW - Pavement maintenance

KW - Preventive maintenance

KW - Surface treating

UR - <http://idmweb.ksdot.org/PublicLib/publicDoc.asp?ID=003833259>

UR - <https://trid.trb.org/view/1307319>

ER -



TY - JOUR  
AN - 01526218  
JO - Pavement Maintenance & Reconstruction  
PB - Cygnus Business Media  
AU - LeHuray, Anne  
**TI - Understanding Sealer Basics**  
PY - 2014/03  
VL - 29  
IS - 3  
SP - pp 24-25  
AB - Sealcoating extends the life of asphalt parking lots by protecting the pavement from sunlight, water and debris in addition to giving the pavement a clean, uniform look. This article examines the differences between refined coal tar sealer and asphalt-based sealer, the two main sealcoating options.  
KW - Parking lots  
KW - Paving  
KW - Seal coating  
KW - Sealing compounds  
UR - <http://www.forconstructionpros.com/article/11318461/refined-tar-sealer-vs-asphalt-based-sealer>  
UR - <https://trid.trb.org/view/1309926>  
ER -

TY - JOUR  
AN - 01528963  
JO - Pavement Maintenance & Reconstruction  
PB - Cygnus Business Media  
AU - Tattershall, Randy  
**TI - Why Viscosity is Important to Your Sealcoating Business**  
PY - 2014/03  
VL - 29  
IS - 3  
SP - pp 26, 27-28  
AB - This article discusses three key elements required to ensure successful sealcoating: viscosity of the sprayed material, force applied to the liquid, and the size of the spray orifice. The author describes the role that each of these elements play in the any machine's ability to spray and offers recommendations for evaluating each the elements.  
KW - Construction and maintenance equipment  
KW - Properties of materials  
KW - Seal coating  
KW - Sealing compounds  
KW - Viscosity  
UR - <http://www.forconstructionpros.com/article/11317349/measuring-sealer-viscosity>  
UR - <https://trid.trb.org/view/1309927>  
ER -

TY - JOUR

AN - 01529118

JO - Pavement Maintenance & Reconstruction

PB - Cygnus Business Media

AU - Humphrey, Colby

**TI - What's the Future of Pavement Maintenance?**

PY - 2013/03

VL - 29

IS - 3

SP - p 14

AB - This article takes a brief look at the challenges that the asphalt industry may face as a result of government rules and regulations. The author highlights challenges to the labor side from the areas of safety and health compliance and health care reform, and challenges to the material side through bans and restrictions on refined coal tar sealant. Also discussed are potential impacts of government actions on equipment, particularly in terms of purchasing decisions.

KW - Asphalt pavements

KW - Construction and maintenance equipment

KW - Labor

KW - Pavement maintenance

KW - Paving

KW - Policy, legislation and regulation

KW - Sealing compounds

UR - <http://www.forconstructionpros.com/article/11317389/future-of-pavement-maintenance-from-npe-2014>

UR - <https://trid.trb.org/view/1311200>

ER -

TY - CONF

AN - 01531795

AU - Solanki, Pranshoo

AU - Ozer, Hasan

AU - Yousefi, Seyed Saleh

AU - Al-Qadi, Imad L

AU - American Society of Civil Engineers

**TI - Effect of Installation Parameters on Performance of Hot-Poured Crack Sealants**

SN - 9780784413586

PY - 2014/05

SP - pp 142-152

AB - A field study was conducted to evaluate the effect of different installation parameters, namely, rout geometry, crack treatment type (rout & seal, clean & seal), over banding, installation temperature and pre-installation pavement condition rating on the performance of crack sealants. Eight hot-poured crack sealants were installed in three test sites that experience low temperatures. The field performance of crack sealants was evaluated for two consecutive years by conducting detailed field surveys. The field database consisted of 38 sections containing a total of 487 cracks. The collected field survey data were used to assign a performance index (PI) to each sealant in this study. According to the preliminary results obtained from the field surveys within two years after installation, crack sealants installed in smallest rout geometry exhibited best acceptable performance among all the rout geometries. Sealants that were installed by the clean & seal method showed poor performance compared with their rout & seal counterparts on the same test section. On the other hand, over banding showed improvement in the performance of crack sealants. Traffic volume and overheating of sealants appeared to deteriorate performance of sealants. Underheating of sealants and pre-installation pavement condition rating of pavement showed no clear trend on the performance of sealants.

U1 - Second Transportation & Development Congress 2014 American Society of Civil Engineers  
Orlando, Florida, United States StartDate:20140608 EndDate:20140611 Sponsors: American Society of Civil Engineers

KW - Crack sealing

KW - Cracking of asphalt concrete pavements

KW - Evaluation and assessment

KW - Field tests

KW - Installation

KW - Pavement maintenance

KW - Pavement performance

KW - Sealing (Technology)

KW - Sealing compounds

UR - <http://dx.doi.org/10.1061/9780784413586.014>

UR - <https://trid.trb.org/view/1311272>

ER -

TY - RPRT

AN - 01539624

AU - Asphalt Institute

**TI - Asphalt in Pavement Preservation and Maintenance**

SN - 9781934154588

PY - 2009///Fourth

SP - 155p

AB - The fourth edition of this manual features practical information on equipment, terminology, and methods that apply to asphalt maintenance as used in all types of pavement structures. Some of the topics that are addressed include the following: rehabilitation treatments; types of maintenance; pavement management systems; pavement evaluation; analysis systems; materials; distresses; surface treatments; asphalt maintenance of Portland Cement Concrete pavements; crack sealing/filling; and patching.

KW - Asphalt

KW - Patching

KW - Pavement distress

KW - Pavement maintenance

KW - Pavement management systems

KW - Portland cement concrete

KW - Preservation

KW - Sealing (Technology)

KW - Surface treating

UR - <https://trid.trb.org/view/1312197>

ER -

TY - RPRT

AN - 01528132

AU - Lim, A

AU - Hore-Lacy, W

AU - ALDERSON, A

AU - Bodin, D

AU - Austroads

**TI - Characterisation and performance evaluation of granular bases project: pavement construction report**

SN - 9781925037708

PY - 2014/05

SP - 100p

AB - A new rut resistance approach based on the wheel-tracking test for unbound granular materials has been developed. The objective of the Austroads project TT1819 is to validate the wheel-tracker laboratory approach against large-scale Accelerated Loading Facility (ALF) pavement performance results. A major component of the research project involves collecting permanent deformation data under accelerated loading. This report details the construction of the test pavements. Four unbound granular pavements were constructed at the ALF in Dandenong, Melbourne. Each pavement comprised an unbound granular base of 300 mm nominal thickness supported by a 150 mm thick cement-treated subbase to isolate the deformation in the top layer. Each of the four pavements was built from different road base materials anticipated to provide contrasts in rut resistance. For each material three, 12m long possible ALF testing sites have been prepared. Thickness and density data have been collected during the construction process indicating that the four pavements are uniform and appropriate to be tested under ALF trafficking. The testing program will be based on pavement surface permanent deformation monitoring under a given axle load.

KW - Accelerated loading facilities

KW - Accelerated loading facility (ALF)

KW - Axle load

KW - Axle loads

KW - Base course (Pavements)

KW - Basecourse

KW - Loads

KW - Materials technology (asphalt/bitumen/concrete)

KW - Pavement design

KW - Pavement technology

KW - Pavement testing

KW - Pavements

KW - Road base

KW - Rutting

KW - Rutting (wheel)

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Test procedures

KW - Tests for suitability, service and quality

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T267-14>

UR - <https://trid.trb.org/view/1312397>

TY - JOUR

AN - 01531716

JO - Asphalt

PB - Asphalt Institute

AU - Walker, Dwight

**TI - The Importance of Preserving Pavements**

PY - 2013

VL - 28

IS - 1

SP - pp 7-10

AB - This article brings readers up-to-date on the modern methods used for pavement preservation, an important concern for managing pavements that are deteriorating due to traffic, weather, and the passage of time. This article, the first in a series about pavement preservation, gives an overview, including a definition of pavement preservation, a brief description of some of the types of treatments available, and resources for additional information. The term "Pavement Preservation Programs and Activities" is defined in federal legislation as programs and activities employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety, and meet road user expectations. Pavement preservation techniques include crack sealing and crack filling; fog seals and asphalt rejuvenators; seal treatments, including scrub, sand, chip, and cape; slurry seal and micro-surfacing; and overlays, including thin, ultra-thin, and bonded wearing courses. The author briefly describes each of these techniques. Readers are referred to the National Center for Pavement Preservation ([www.pavementpreservation.org](http://www.pavementpreservation.org)) and FP2 Inc, formerly known as the Foundation for Pavement Preservation ([www.fp2.org](http://www.fp2.org)).

KW - Bituminous overlays

KW - Chip seals

KW - Cost effectiveness

KW - Overlays (Pavements)

KW - Pavement maintenance

KW - Pavement performance

KW - Preservation

KW - Seal coats

KW - Sealing compounds

KW - Slurry seals

KW - Surface course (Pavements)

UR - <https://trid.trb.org/view/1314923>

ER -

TY - JOUR

AN - 01531710

JO - Asphalt

PB - Asphalt Institute

AU - Walker, Dwight

**TI - Choosing a Pavement Preservation Technique**

PY - 2013

VL - 28

IS - 2

SP - pp 7-12

AB - This article, from a series of articles on pavement preservation, walks readers through the process of choosing a pavement preservation technique. The author first defines pavement preservation as a proactive approach to protecting and maintaining existing pavements. The author presents the approach used by Maryland Department of Transportation (DOT), stresses that there is some basic information necessary before an appropriate technique can be chosen. Having a good understanding of the current pavement condition is essential, with a focus on the type and severity of existing problems. The author recommends the manual that came from the Long Term Pavement Performance (LTPP) study as a good distress identification manual. Engineers should also know the amount and type of traffic traveling the pavement under consideration, as well as the types of contractors who may be available to help with pavement preservation. The remainder of the article defines and describes different types of pavement treatment options, including crack sealing and filling, chip seals, micro-surfacing and slurry seals, and thin overlays.

KW - Bituminous overlays

KW - Chip seals

KW - Maintenance

KW - Overlays (Pavements)

KW - Pavement distress

KW - Pavement performance

KW - Preservation

KW - Project management

KW - Sealing compounds

KW - Slurry seals

KW - Traffic loads

UR - <https://trid.trb.org/view/1314927>

ER -



TY - JOUR

AN - 01531229

JO - Journal of Materials in Civil Engineering

PB - American Society of Civil Engineers

AU - Rizzutto, Shawn J

AU - La Bar, J

AU - Johannes, P T

AU - Bahia, H U

**TI - Use of a Variable Rate Spray Bar to Minimize Wheel Path Bleeding for Asphalt-Rubber Chip Seal Applications**

PY - 2015/03

VL - 27

IS - 3

SP - Content ID 04014121

AB - Chip seals constructed in areas with a combination of high truck traffic volume and high climatic temperatures are susceptible bleeding in the wheel paths and raveling in nonwheeled path areas. These failures arise from inherent differences in traffic loading in the two areas. Addressing this problem calls for the binder application rate for the two regions to be varied and using asphalt binders with a high stiffness at high temperatures to prevent bleeding. No well-established design methods that yield a different binder application rate exists. Although equipment for applying variable binder rates exists, there is limited performance data, and no guidelines for calibrating the equipment in the field exist. This paper presents the findings of field studies in which both uniform and variable application rates were used to construct asphalt-rubber chip seals in California. The results show that using different binder application rates in and out of wheel paths can mitigate bleeding and raveling. The paper also presents a new field calibration test method for both conventional and variable rate distributor spray bars.

KW - Asphalt rubber

KW - Binders

KW - Bleeding

KW - California

KW - Chip seals

KW - Field studies

KW - Stripping (Pavements)

KW - Temperature

KW - Traffic loads

KW - Truck traffic

UR - <http://ascelibrary.org/doi/abs/10.1061/%28ASCE%29MT.1943-5533.0001035>

UR - <https://trid.trb.org/view/1316000>

ER -

TY - CONF

AN - 01537208

AU - Marina, Vysotskaya

AU - Svetlana, Rusina

AU - American Society of Civil Engineers

**TI - Developing Effective Nanoarmirovannoy Mastic**

SN - 9780784478554

PY - 2014/06

SP - pp 84-89

AB - The annual road building objects-load increase causes a strengthening requirement for used materials and construction. Therefore, it is necessary to find new compositions satisfying all modern requirements that are nonpolluting and cost effective. One of the main tasks is creating new types of sealing materials; this task can be implemented by using raw materials changing the product damp proof ability. So currently the state-of-the-art sealing materials of the new generation: polymer-bitumen mastics have the lead. The presentational work is focused on developing efficient hydraulic insulating mastic based on a nanomodified polymer-bitumen binder with fine-dispersion filler. Such mastic can be used in constructional engineering in automobile and airport road surface building, in expansion joints making, as a water seal for water supply pipes, and for other artificial structures and is an efficient compound for road composites.

U1 - Geo-Hubei 2014 International Conference on Sustainable Civil Infrastructure China Three Gorges University American Society of Civil Engineers Yichang, Hubei, China StartDate:20140720 EndDate:20140722 Sponsors: China Three Gorges University, American Society of Civil Engineers

KW - Mastic asphalt

KW - Nanostructured materials

KW - Polymer asphalt

KW - Sealing compounds

UR - <http://dx.doi.org/10.1061/9780784478554.011>

UR - <https://trid.trb.org/view/1316783>

ER -

TY - SER

AN - 01537266

JO - NCHRP Report

PB - Transportation Research Board

AU - Decker, Dale S

**TI - Best Practices for Crack Treatments for Asphalt Pavements**

SN - 9780309307932

PY - 2014

IS - 784

SP - 44p

AB - Crack sealing and crack filling are widely used treatments for maintenance of asphalt pavements. However, successful crack sealing and crack filling applications continue to be viewed as an art. When not properly applied, these pavement preservation treatments can result in early failures and costly corrective maintenance for highway agencies. Although much research has been performed in the United States and abroad on the materials, techniques, and designs for crack sealing and crack filling, variability in the current state of the practice regarding construction techniques and the resulting effectiveness of crack sealing and crack filling have not been investigated. This report presents best practices for crack treatments for asphalt pavements developed through a critical review of the current states of the art and practice. The research included a critical review of the worldwide literature on crack sealing and filling, with emphasis on identifying current best practices. A survey of state, local, and provincial highway agencies was then conducted to fill gaps in the results of the literature review. This report fully documents the research and includes chapters on the current states of the art and practice that support the chapter discussing the selected best practices. It will be of interest to engineers in public agencies and industry with responsibility for construction and maintenance of asphalt pavements.

KW - Asphalt pavements

KW - Best practices

KW - Cracking

KW - Pavement maintenance

KW - Repairing

KW - Sealing (Technology)

KW - State of the art

UR - <http://www.trb.org/Publications/Blurbs/171266.aspx>

UR - <https://trid.trb.org/view/1322488>

ER -

TY - RPRT

AN - 01537383

AU - Choi, Y

AU - Urquhart, R

AU - Austroads

**TI - Post-ageing characterization of sprayed sealing binders: a laboratory study**

SN - 9781925037753

PY - 2014/08

SP - 43p

AB - This report presents the results of a laboratory study that was conducted as part of the development of a new-long term ageing (durability) test for bituminous binders used in sprayed seals in Australia. Among the number of test methods reviewed and assessed in earlier studies, a test method known as the dynamic shear rheometer (DSR) flow test was found to be the most appropriate and was used to characterize binders that were ageing treated using a pressurized ageing vessel (PAV). Chemical analysis tests known as Fourier transform infrared spectroscopy (FTIR) and gel permeation chromatography (GPC) were also conducted to provide information about the chemical processes that occurred during PAV ageing treatment. The results obtained during this study will provide an important database for a field performance correlation study (using a field trial site where the tested binders have been placed), which is scheduled for 2014-15.

KW - Australia

KW - Binder

KW - Binders

KW - Chemical analysis

KW - Data banks

KW - Database

KW - Databases

KW - Durability

KW - Materials technology (asphalt/bitumen/concrete)

KW - Rheology

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Test method

KW - Test procedures

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T270-14>

UR - <https://trid.trb.org/view/1323041>

ER -

TY - SER

AN - 01539593

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

**TI - Maintenance and Preservation 2014**

SN - 9780309295178

PY - 2014

IS - 2431

SP - 104p

AB - This issue contains 12 papers concerned with maintenance and preservation. Specific topics addressed in this issue include: pavement performance measures; budget-constrained pavement preservation strategies; enhanced econometric techniques for verifying the service life of asset interventions; Michigan Department of Transportation's capital preventive maintenance program; the performance of pavements treated with thin hot-mix asphalt overlays; flushing of chip seal surfaces; asphalt pavement pothole patching methods; laboratory-predicted low-temperature performance of hot-poured crack sealants; anchor rod tightening of high-mast light poles; forecasting the cost of sustaining a set of bridge connections; selection of appropriate material, construction technique, and structural system of bridges by use of a multicriteria decision-making method; and defect-based condition assessment of concrete bridges.

KW - Bridges

KW - Chip seals

KW - Condition surveys

KW - Maintenance

KW - Michigan Department of Transportation

KW - Overlays (Pavements)

KW - Pavement performance

KW - Performance measurement

KW - Potholes (Pavements)

KW - Preservation

KW - Sealing compounds

KW - Service life

KW - Structural connection

KW - Utility poles

UR - <http://www.trb.org/Main/Blurbs/171445.aspx>

UR - <https://trid.trb.org/view/1324125>

ER -

TY - JOUR

AN - 01545376

JO - Journal of Japan Society of Civil Engineers, Ser. E1 (Pavement Engineering)

PB - Japan Society of Civil Engineers

AU - KONNO, Michito

AU - OGURI, Naoyuki

AU - MARUYAMA, Kimio

AU - ABE, Ryuji

**TI - A STUDY ON IMPROVED PERFORMANCE AND EVALUATION OF DEVELOPED CRACK SEALING MATERIAL FOR A COLD REGION**

PY - 2013

VL - 69

IS - 3

SP - pp I\_75-I\_80

AB - In the case of applying crack sealing materials in a cold region, it is important to evaluate the stress relaxation performance and deformation characteristics at the low temperature range. From this reason, authors have devised a new test method to evaluate the performance. Then developed crack sealing material that has superior performance at the low temperature range, is evaluated the performance in laboratory and in field trials. This paper includes the validity of the new devised test method and the performance of developed crack sealing material for a cold region.

KW - Cracking

KW - Deformation

KW - Frigid regions

KW - Performance

KW - Sealing compounds

KW - Stresses

UR - [http://dx.doi.org/10.2208/jscejpe.69.I\\_75](http://dx.doi.org/10.2208/jscejpe.69.I_75)

UR - <https://trid.trb.org/view/1325444>

ER -

TY - RPRT

AN - 01540135

AU - Toole, T

AU - Hillier, P

AU - Austroads

**TI - Good practice in reseal programming**

SN - 9781925037814

PY - 2014/09

SP - 51p

AB - This report provides asset managers with practical guidance in the development and delivery of effective resealing programs. It builds on accumulated experience of previous studies and a review of sprayed seal performance throughout Australasia. While an extensive body of sprayed seal knowledge and experience exists, there are significant issues which have serious consequences for the state and sustainability of road surfacings, and pavement assets, and ultimately their safe and efficient use. Examples of good practice do exist and road agencies are encouraged to review their procedures and the capabilities of their systems and human resources, with a view to adopting good practice and building capability.

KW - Asset management

KW - Australia

KW - Durability

KW - Maintenance

KW - Maintenance management

KW - Maintenance planning

KW - New Zealand

KW - Planning

KW - Road authority

KW - Road design and asset management

KW - Seal coats

KW - Sealing coat

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surfacing

KW - Sustainability

KW - Transportation departments

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T273-14>

UR - <https://trid.trb.org/view/1326911>

ER -

TY - RPRT

AN - 01540137

AU - Patrick, S

AU - Wright, B

AU - Austroads

**TI - Initial field trials with surface wear rig**

SN - 9781925037845

PY - 2014/09

SP - 28p

AB - A mobile pavement surface wear rig has been constructed, which aims to gain an improved understanding of the failure mechanisms that are particular to the pavement surfacing layer - as distinct from the structural layers - that may be caused by changing axle configurations and the loadings applied by freight vehicles to a pavement surface. An experiment was conducted replicating a full-scale heavy vehicle tyre, under low-cycle loading conditions on a sprayed seal surface. This report summarizes the testing activities and findings.

KW - Australia

KW - Axle load

KW - Axle loads

KW - Durability

KW - Failure

KW - Heavy vehicle

KW - Heavy vehicles

KW - Lorry

KW - Pavement technology

KW - Pavement testing

KW - Pavements

KW - Rolling contact

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surfacing

KW - Tests for suitability, service and quality

KW - Tires

KW - Tyre

KW - Vehicle pavement interaction

KW - Vehicles

KW - Wearing course

KW - Wearing course (Pavements)

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T274-14>

UR - <https://trid.trb.org/view/1326914>

ER -



TY - RPRT

AN - 01540138

AU - Patrick, S

AU - Austroads

**TI - Double/double primerseal inspections**

SN - 9781925037869

PY - 2014/10

SP - 31p

AB - This report describes inspections conducted on double/double primer seals constructed in Victoria. It is not typical practice to use two-layer primer seals, or polymer modification in primer seals, and methods to do so are not described by Austroads specification or guidance documents. The double/double seals were found to be performing well, and providing a viable option for an initial seal over a pavement where stresses can be expected to be higher than ideal for a typical single/single primer seal.

KW - Australia

KW - Binders

KW - Bituminous binders

KW - Chip seal

KW - Chip seals

KW - Durability

KW - Pavement performance

KW - Pavement technology

KW - Pavements

KW - Polymer modified binder

KW - Polymers

KW - Seal coats

KW - Sealing coat

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surfacing

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T276-14>

UR - <https://trid.trb.org/view/1326915>

ER -

TY - RPRT

AN - 01540139

AU - Patrick, S

AU - Austroads

**TI - Inspections of sprayed seal trials**

SN - 9781925037852

PY - 2014/10

SP - 67p

AB - This report details the findings from visual inspections conducted on two Austroads sprayed seal field trials: a non-modified binders trial near Gisborne, Victoria; and a polymer modified binder (PMB) trial near Coober Pedy, South Australia and Cooma, New South Wales. Austroads has established a project to monitor, interpret and report on the long-term performance of the Gisborne non-modified binder trial established under Austroads project TT1357 and the early life performance of the Austroads PMB sprayed seal trials established under TT1665. After seven years of life, seals at the Gisborne non-modified binder trial were performing well. After two years the PMB trials were performing well in all cases at the Coober Pedy site, but showing signs of distress in some sections at Cooma.

KW - Australia

KW - Bitumen

KW - Bituminous binders

KW - Chip seal

KW - Chip seals

KW - Deterioration

KW - Field test

KW - Field tests

KW - New South Wales

KW - Pavement technology

KW - Polymer modified binder

KW - Polymers

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - South Australia

KW - Sprayed seal

KW - Surfacing

KW - Victoria

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T277-14>

UR - <https://trid.trb.org/view/1326916>

ER -

TY - RPRT

AN - 01541480

AU - Ali, Hesham

AU - Mohammadafzali, Mojtaba

AU - Florida International University

AU - Louisiana State University, Baton Rouge

AU - Southeast Transportation Consortium

**TI - Asphalt Surface Treatment Practice In Southeastern United States**

PY - 2014/07//Final Report

SP - 87p

AB - It costs less to maintain roads in good condition than in poor condition. Pavement preservation is a set of activities to extend pavement life, improve safety, and meet road user expectations. Surface treatments are pavement preservation treatments applied to the whole surface of the road. This synthesis summarizes surface treatments' state of practice in the United States, especially southeastern states. Eleven pavement preservation techniques were addressed: fog seal, rejuvenator seal, chip seal, sandwich seal, scrub seal, slurry seal, microsurfacing, cape seal, thin overlays, ultrathin bonded wearing course and crack sealing/filling. Recent work on surface treatments has been reviewed and summarized. To research surface treatments' state of practice, a survey was designed and distributed to Southeastern Association of State Highway and Transportation Officials (SASHTO) agencies. Nineteen participants from Florida, Georgia, Louisiana, Virginia, West Virginia, North Carolina, and Arkansas participated in the survey. The electronic survey consisted of three questionnaires asking administrative, technical, and research-related questions. Results showed that thin overlays, crack repairs, microsurfacing, chip seal, and fog seal are the most common preventative maintenance practices. In this report, each chapter is dedicated to one surface treatment technique. Chapters start with a description of the technique, its applications, features, material and equipment requirements, and construction procedures. This is followed by a summary of recent work and implementation status, as obtained from the survey.

KW - Asphalt pavements

KW - Pavement maintenance

KW - Preventive maintenance

KW - Sealing compounds

KW - Southeastern United States

KW - State of the practice

KW - Surface course (Pavements)

KW - Surface treating

KW - Surveys

UR - [http://www.ltrc.lsu.edu/pdf/2014/fr\\_515.pdf](http://www.ltrc.lsu.edu/pdf/2014/fr_515.pdf)

UR - <https://trid.trb.org/view/1327646>

ER -

TY - RPRT

AN - 01541857

AU - Jones, Colin

AU - Reeves, Sarah

AU - TRL Limited

**TI - Review of Joint Repair Techniques for Thin Surface Course Systems**

SN - 9781910377093

PY - 2014/09/15

SP - 39p

AB - This project was undertaken to review and identify products, techniques and machinery that are currently available for repairing joints in Thin Surface Course Systems (TSCSs). Established and prototype systems used both in the United Kingdom and internationally were reviewed. Since crack and joint repairs often use similar methods, crack repair techniques were included in the review. Information was obtained from published literature, manufacturers' websites and Highway Authority Product Approval Scheme (HAPAS) certificates, as well as interviews and discussions with product manufacturers and contractors.

KW - Construction joints

KW - Joint sealers

KW - Joint sealing

KW - Longitudinal cracking

KW - Longitudinal joints

KW - Pavement cracking

KW - Repairing

KW - Sealing compounds

KW - Surface course (Pavements)

UR - [http://www.trl.co.uk/umbraco/custom/report\\_files/PPR708%20-%20Review%20of%20joint%20repair%20techniques%20for%20thin%20surface%20course%20systems.pdf](http://www.trl.co.uk/umbraco/custom/report_files/PPR708%20-%20Review%20of%20joint%20repair%20techniques%20for%20thin%20surface%20course%20systems.pdf)

UR - <https://trid.trb.org/view/1328426>

ER -

TY - RPRT

AN - 01544641

AU - Scullion, Tom

AU - Wilson, Bryan T

AU - Estakhri, Cindy

AU - Texas Transportation Institute

AU - Texas Department of Transportation

AU - Federal Highway Administration

**TI - Construction and Monitoring of Thin Overlay and Crack Sealant Test Sections at the Pecos Test Track**

PY - 2014/10

SP - 51p

AB - In this project, several crack sealant sections were constructed at the Pecos RTC. Six different sealants were applied in routed and non-routed configurations on both older and newer pavement. The following summer, the sections were reevaluated including simulated heavy traffic testing. The sealants were also tested in the lab with a sealant adhesion test. Also in this project three different thin overlays were constructed at the test track, these being the fine-graded permeable friction course (PFC), fine stone matrix asphalt and a crack attenuating mix. The fine PFC used at Pecos was also placed on Loop 338 around Odessa. These new thin overlays and crack sealant demonstration projects will be evaluated in coming years for future research projects. The researchers recommend applying more test sections on regularly trafficked pavements using a standard sealant (Texas Department of Transportation (TxDOT) Class A or B), and the two best performing sealants (AR Plus and Roadsaver 203). These should be applied to pavements with different levels of traffic and different amounts of crack movement. The thin overlays first demonstrated in these test section have now become widely used around Texas. They are now included in the most several specification (SS 3228 and Item 347) and sections constructed in at least half of the Texas Districts.

KW - Bituminous overlays

KW - Fine aggregates

KW - Friction course

KW - Pavement performance

KW - Performance tests

KW - Sealing compounds

KW - Test sections

KW - Texas

UR - <http://tti.tamu.edu/documents/9-1529-2.pdf>

UR - <https://trid.trb.org/view/1329324>

ER -

TY - RPRT

AN - 01544525

AU - Tremblay, Jason

AU - Sanborn, Devon

AU - Vermont Agency of Transportation

AU - Federal Highway Administration

**TI - Assessment of ASTM D 6690-12 Type II and Type IV Joint Sealers**

PY - 2014/11//Final Report

SP - 31p

AB - To address the issue of water infiltration and debris retention, bituminous crack sealers and fillers have been developed to help prevent premature pavement distress. If applied appropriately, crack sealers and fillers can significantly extend the life of a pavement. To utilize crack sealers and fillers properly, one must understand that sealers and fillers differ in application and material types. Crack sealers are typically used on cracks that move more than one-eighth inch, with the intention to prevent water and debris from entering the pavement structure. The rigorous installation process involves thorough crack preparation followed by placement of high elongation material in a specific configuration. Crack fillers generally use a stiffer material than crack sealers and are typically used on non-working cracks. The purpose of this study was to examine and evaluate the constructability, overall performance and cost effectiveness of American Association of State Highway and Transportation Officials (AASHTO) M324-12 Type II versus IV Joint Sealers. Research personnel assessed each product's durability at each location. Cracks were filled according to the project plans. Efforts were made to provide a comparative analysis with regard to performance and cost of both material types by minimizing application variations in weather conditions, equipment used, and application crewmembers by applying material on the same day and/or conditions. Over a three-year span and six data collection timeframes, the type IV material resulted in an average of a 10% less allowance of water passage through the length of a filled crack. A ten percent better performance of a material over a comparable alternative is considerable and should not be ignored, and results in approximately 2 feet less of compromised length of a full width transverse crack.

KW - Costs

KW - Durability

KW - Infiltration

KW - Joint sealers

KW - Joint sealing

KW - Pavement cracking

KW - Pavement maintenance

KW - Vermont

UR - [http://vtransplanning.vermont.gov/sites/aot\\_policy/files/2014%20-%2008%20Assessment%20of%20ASTM%20D%206690-12%20Type%20II%20and%20Type%20IV%20Joint%20Sealers.pdf](http://vtransplanning.vermont.gov/sites/aot_policy/files/2014%20-%2008%20Assessment%20of%20ASTM%20D%206690-12%20Type%20II%20and%20Type%20IV%20Joint%20Sealers.pdf)

UR - <https://trid.trb.org/view/1331771>

ER -

TY - RPRT

AN - 01545217

AU - Herrington, P R

AU - Bagshaw, S A

AU - New Zealand Transport Agency

**TI - Epoxy modified bitumen chip seals**

SN - 9780478419832

PY - 2014/10

IS - 558

SP - 49p

AB - The research investigated aspects of the use of epoxy modified bitumen for construction of chip seals. Changes in the shear modulus, needle penetration and cohesive energy of the epoxy bitumen were used to monitor changes in the material as it cured at 35 degrees C and 45 degrees C and after accelerated ageing at 85 degrees C for 177 days. Wheel-tracking tests were used to determine the ability of the material to resist chip embedment and flushing. The adhesion to aggregate and resistance to water-induced stripping was also measured. Epoxy bitumen curing rates would enable seal construction within timeframes used with conventional binders. However, although the ultimate strength of the materials was satisfactory, the curing rate would be too slow for epoxy bitumen's to be useful as a lower cost substitute for commercially available high-friction surfacing binders. Epoxy bitumen demonstrated good resistance to water stripping without added adhesion agents. Epoxy bitumen seals were highly effective in resisting chip embedment into a soft substrate and potentially might be a means of controlling or eliminating flushing in the field. The materials used in this study were prototype formulations that may need to be optimized for low temperature flexibility. Further investigation is needed to properly characterize low temperature behavior.

KW - Binders

KW - Bitumen

KW - Bituminous Binders

KW - Chip seal

KW - Chip seals

KW - Material properties

KW - Materials technology (asphalt/bitumen/concrete)

KW - Mix design

KW - Pavement technology

KW - Polymer modified binder

KW - Polymers

KW - Properties of materials

KW - Sealing coat (on top of the surfacing)

KW - Temperature

UR - <http://www.nzta.govt.nz/resources/research/reports/558/>

UR - <https://trid.trb.org/view/1332683>

ER -

TY - RPRT

AN - 01548620

AU - Sunkari, Srinivasa R

AU - Scullion, Tom

AU - Songchitruksa, Praprut

AU - Estakhri, Cindy

AU - Wilson, Bryan T

AU - Texas A&M Transportation Institute

AU - Texas Department of Transportation

AU - Federal Highway Administration

**TI - Low-Cost Safety Solutions, Pavement Preservation, and Maintenance Practices for Rural Highways**

PY - 2014///Project Summary

SP - 2p

AB - This project included two tasks. The objective of task one was to develop and demonstrate innovative low-cost solutions to improve safety at stop-controlled intersections. Preliminary directives from the project panel were to focus on treatments on the minor street approach and not necessarily on the major street approach, and to investigate solutions that are active in nature, i.e., have beacons come on when a vehicle arrives or when a vehicle is not slowing down. The focus of task two was to demonstrate the latest pavement preservation and maintenance treatments in a controlled environment, and then apply the best-performing products in demonstration projects. The focus of these treatments included: thin hot-mix asphalt (HMA) overlays (dense graded, gap graded, and open graded) and modified and unmodified crack sealants.

KW - Bituminous overlays

KW - Hot mix asphalt

KW - Intersections

KW - Pavement maintenance

KW - Rural highways

KW - Sealing compounds

KW - Texas

KW - Traffic control devices

KW - Traffic safety

UR - <http://tti.tamu.edu/documents/9-1529-S.pdf>

UR - <https://trid.trb.org/view/1333146>

ER -



TY - CONF

AN - 01547988

AU - Bagshaw, S

**TI - Preliminary investigations of epoxy bitumen for resilient and sustainable chipseal (sprayed seal) road surfaces**

PY - 2014/10

IS - 1.1

SP - 12p

AB - A laboratory study into possible benefits of epoxy bitumen in chip seals has suggested several that may result in reduced on-going costs due to improved performance of the chipseal. Using epoxy bitumen as the binder in a chip seal produces strong chip-binder adhesion (bond) that is resistant to water infiltration and may reduce the incidence of chip stripping. The epoxy bitumen binder layer has significant integral strength producing self-support, which may allow the thin chip seal layer to resist chip embedment. The epoxy bitumen layer has high internal cohesion which may resist bitumen pick-up and tracking and will ultimately resist chip seal flushing. This project sought to determine if epoxy bitumen can be used to effectively construct long-life, high-grip chip seal surfaces that are resistant to flushing, chip stripping and embedment.

U1 - ARRB Conference, 26<sup>th</sup>, 2014, Sydney, New South Wales, Australia StartDate:00000

EndDate:00000

KW - Binders

KW - Bitumen

KW - Bituminous Binders

KW - Chip seal

KW - Chip seals

KW - Materials technology (asphalt/bitumen/concrete)

KW - Pavement distress

KW - Pavement technology

KW - Polymer modified binder

KW - Polymers

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Stripping (binder)

KW - Stripping of binder

UR - <http://arrbknowledge.com>

UR - <https://trid.trb.org/view/1335588>

ER -

TY - CONF

AN - 01547989

AU - CHAKRABARTI, S

AU - Foulsham, D

**TI - Design and construction of nonconventional sprayed bituminous surfacing for a remote road network in Western Australia**

PY - 2014/10

IS - 1.1

SP - 10p

AB - This paper describes the design and construction of sprayed bituminous surfacing for a 30 km remote road network on Barrow Island (BWI) for the largest Liquid Natural Gas (LNG) project in Western Australia (WA). Stringent environmental conditions did not allow construction of temporary bypass roads during seal application on existing unsealed roads. Sprayed bitumen prime on the basecourse was not acceptable due to potential disruption of regular large heavy vehicle movements. Conventional primer seal using aggregate of up to 10 mm size was also not considered suitable for large heavy vehicle movements. A nonconventional 14 mm primer seal followed by a 7 mm single/single seal was selected. Class 320 bitumen was used as the binder. Design of the sprayed seal, i.e. binder application rate and aggregate spread rates was undertaken based on fundamental concepts, Austroads methods and local experience in Western Australia. Based on the above constraints and design issues, the 14 mm and 7 mm seal combination was adopted for the entire 30 km road network. Design and construction of the 14 mm primer seal and 7 mm single/single seal and the performance of this combination are described in detail in this paper.

U1 - ARRB Conference, 26<sup>th</sup>, 2014, Sydney, New South Wales, Australia StartDate:00000

EndDate:00000

KW - Australia

KW - Binder

KW - Binders

KW - Heavy vehicle

KW - Heavy vehicles

KW - Lorry

KW - Pavement technology

KW - Road design and asset management

KW - Road network

KW - Road networks

KW - Rural highways

KW - Rural road

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Types of roads by network

KW - Western Australia

UR - <http://arrbknowledge.com>

UR - <https://trid.trb.org/view/1335589>

ER -

TY - CONF

AN - 01547990

AU - Khoo, K Y

**TI - A review of the loading impacts of heavy vehicles on the Austroads sprayed seal design method**

PY - 2014/10

IS - 1.1

SP - 16p

AB - The Australian freight task has grown fourfold since the 1970s, and is anticipated to double again over the next two decades. The risk of damage to sprayed seal surfacings through increased heavy vehicle loading thus represents a serious challenge for the Australian road network. ARRB was commissioned by Austroads to determine how the loading impacts of heavy vehicles could best be incorporated into the Austroads sprayed seal design method. Heavy vehicles have a large effect on the aggregate packing and performance of sprayed seals. This effect could be expressed through a damage factor (DF) which relates to the reduction in surface texture as measured by mean profile depth. An associated measure is equivalent heavy vehicles based on the damage factor (EHVDF). Weigh-in-motion (WIM) data from rural regions totaling 126 million vehicles, obtained during the period from 2007 to 2011, were provided by Australian jurisdictions. These data were analyzed using procedures developed in an earlier survey, and errors associated with incorrect classification were identified and eliminated. It was found, as anticipated, that the trends in annual average mass, DF and EHVDF were strongly intercorrelated. The EHVDF was determined for the 12 vehicle classifications used by Austroads. The concept presented in this paper has not been adopted by Austroads at this time. However, the procedure could be readily applied in a future review of the Austroads sprayed seal design method. It would assist in focusing the future direction of the design method on the loading impacts of heavy vehicles rather than passenger cars.

U1 - ARRB Conference, 26<sup>th</sup>, 2014, Sydney, New South Wales, Australia StartDate:00000

EndDate:00000

KW - Australia

KW - Axle load

KW - Axle loads

KW - Data collection

KW - Design (overall design)

KW - Heavy vehicle

KW - Heavy vehicles

KW - Lorry

KW - Pavement design

KW - Pavement technology

KW - Pavements

KW - Rolling contact

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Vehicle pavement interaction

KW - Weigh in motion

UR - <http://arrbknowledge.com>

UR - <https://trid.trb.org/view/1335590>

ER -

TY - CONF

AN - 01548011

AU - Griffin, J

AU - Denneman, E

AU - Petho, L

AU - Beecroft, A

**TI - Heavy-duty unbound granular pavements: an example of best practice in Queensland**

PY - 2014/10

IS - 5.1

SP - 15p

AB - A significant portion (around 70%) of the Australian road network is composed of unbound granular pavement layers with a sprayed bituminous seal. The widespread provision of unbound granular structures results from the relatively low establishment cost as compared to bound pavements. However, the risk of premature failure is greater for unbound granular pavements, particularly in heavy traffic and/or high loading intensity applications. An alternative 'heavy-duty' unbound granular pavement incorporating high-standard basecourse can provide increased reliability at a fraction of the cost of bound structures. A heavy-duty unbound granular pavement was recently provisioned in southwest Brisbane as part of the duplication of an inter-regional route. The technology has been successfully implemented in other Australian states, as well as internationally. However, the unsatisfactory performance of a previous trial has restrained general implementation in Queensland. Evaluation and monitoring of the current demonstration was undertaken to ascertain the viability of heavy-duty unbound granular pavements as cost-effective alternatives for heavily trafficked routes in Queensland. Preliminary findings suggest project specifications can facilitate the supply and construction of the requisite high-quality pavement layers, but careful attention to material production and construction practice is also required to realize the improved reliability characteristic of heavy-duty unbound granular pavements.

U1 - ARRB Conference, 26<sup>th</sup>, 2014, Sydney, New South Wales, Australia StartDate:00000

EndDate:00000

KW - Australia

KW - Base course (Pavements)

KW - Basecourse

KW - Cost effectiveness

KW - Costs

KW - Field test

KW - Field tests

KW - Granular

KW - Granular soils

KW - Heavy duty pavement

KW - In situ

KW - Pavement technology

KW - Pavements

KW - Queensland

KW - Reliability

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

UR - <http://arrbknowledge.com>

UR - <https://trid.trb.org/view/1335611>

TY - CONF

AN - 01548012

AU - Neaylon, K

**TI - Managing the risks of using seawater for pavement construction**

PY - 2014/10

IS - 5.1

SP - 14p

AB - A 2 km long runway was constructed at Onslow, on the remote Pilbara coast of Western Australia, in 2013. The project required the compaction of nearly 400,000 m<sup>3</sup> of earthworks and pavement material, which in turn required approximately one million liters of water per day. A reliable supply of surplus potable water of this quantity was not available anywhere within the region. By necessity, seawater was used for the earthworks construction/compaction, whilst the option of using seawater for the runway subbase and base course was carefully investigated. Existing literature on this topic was reviewed, highlighting possible risk mitigation measures for consideration. The highest risk identified was that of salt crystals forming under the bituminous surfacing, causing de-bonding, blistering, and eventual disintegration of the runway surface. Following this investigation, the use of seawater continued right through until the completion of the basecourse. This paper details the risk analysis undertaken, the risk mitigation measures used, the careful attention to construction timing and detail, and the unexpected bituminous sealing issues that were encountered and overcome during construction. This paper should be of interest to many remote communities in Australia and elsewhere, where the demand for engineering development and construction exceeds the communities supply of any potable water that is surplus to its own needs.

U1 - ARRB Conference, 26<sup>th</sup>, 2014, Sydney, New South Wales, Australia StartDate:00000

EndDate:00000

KW - Airport runways

KW - Australia

KW - Construction

KW - Earthwork

KW - Earthworks

KW - Onslow, Western Australia

KW - Pavement

KW - Pavement technology

KW - Pavements

KW - Risk

KW - Risk assessment

KW - Runway

KW - Rural area

KW - Rural areas

KW - Salt (chem)

KW - Sea

KW - Seal coats

KW - Sealing coat

KW - Seas

KW - Supply

KW - Water

UR - <http://arrbknowledge.com>

UR - <https://trid.trb.org/view/1335612>

TY - RPRT

AN - 01548113

AU - Bagshaw, S

AU - New Zealand Transport Agency

**TI - Reduced bitumen application rates using bitumen emulsions**

SN - 9780478419856

PY - 2014/11

IS - 560

SP - 48p

AB - This research project investigated the differences in cohesive energies of model chip seal samples prepared from bitumen emulsions, the base binders, and the kerosene cutback base binder. The aim was to determine if it was possible to construct chip seals by using a lower residual bitumen application rate whilst still retaining adequate performance. Analysis of the NZTA RAMM (Road Asset and Maintenance Management) database indicated that chip seals are indeed being prepared using emulsions at lower residual bitumen application rates than cutback binders. But also that emulsion seals have neither yet seen sufficiently long service, nor in sufficient numbers, to determine any differences in lifetimes compared with cutback seals. Laboratory results from Opus Research, Petone 2014 have indicated that cohesive energies of the bitumen layer in single layer chip seals prepared from cutback binders are lower than those prepared from emulsions of the same base binder, which are lower than those prepared from the base binders themselves. The suggestion, based on the balance of the data, is that viable chip seals may well be possible at lower bitumen application rates when applied as emulsions (provided the emulsified bitumen was not itself cutback).

KW - Binder

KW - Binders

KW - Bitumen

KW - Bituminous materials

KW - Chip seal

KW - Chip seals

KW - Durability

KW - Emulsion

KW - Emulsions

KW - Materials technology (asphalt/bitumen/concrete)

KW - New Zealand

KW - Pavement performance

KW - Pavement technology

KW - Pavements

KW - Seal coats

KW - Sealing coat

KW - Sealing coat (on top of the surfacing)

UR - <http://www.nzta.govt.nz/resources/research/reports/560/>

UR - <https://trid.trb.org/view/1335713>

ER -

TY - RPRT

AN - 01548135

AU - Meuleners, L

AU - Hendrie, D

AU - Curtin-Monash Accident Research Centre

**TI - An evaluation of the effectiveness and cost-effectiveness of sealed shoulders and audible edge lines on Albany Highway, 2000-2004**

PY - 2009/07

SP - 54p

AB - This report presents the results of an evaluation of Black Spot sites on Albany Highway that were treated with sealed shoulders and audible edge lines during 2000 to 2004 in Western Australia. The purpose of this report is to evaluate the effectiveness of the treatments in terms of reduction in crash frequency (presented for all-reported crashes including property damage only (PDO) and casualty crashes) for all crash types and non-collision crashes only and the net economic worth of these treatments. Fourteen sites were treated with either sealed shoulders, audible edge lines or a combination of both treatments, but one site was removed due to no crashes recorded at the site. Treatment costs, after removal of this site, were \$1.3 million. The average length of follow up exposure crash data post treatment for all treated sites was 58.9 months (SD=2.576) with a minimum of 53 months and a maximum of 60 months. The results showed the sealed shoulders and audible edge lines have been effective overall, reducing all-reported crash frequencies for all crash types by 58% and casualty crash frequencies by 79%. The estimated crash cost savings over the expected life of the treated sites were \$51.9 million for all reported crashes, of which \$51.4 million were attributable to the reduction in casualty crashes. This will result in an overall net cost savings to the community of \$50.6 million after subtracting the capital costs of providing treatments. The benefit cost ratio (BCR) across all treatment sites was 40.3. The results provide Main Roads Western Australia and other road safety organizations with reliable, objective information about the potential role of shoulder sealing and audible edge lines in contributing towards reducing road trauma in Western Australia

KW - Australia

KW - Benefit cost analysis

KW - Cost benefit analysis

KW - Cost effectiveness

KW - Crash black spot

KW - Crash costs

KW - Evaluation (assessment)

KW - High risk locations

KW - Road shoulders

KW - Roadside

KW - Rumble strip

KW - Rumble strips

KW - Seal coats

KW - Sealing coat

KW - Sealing coat (on top of the surfacing)

KW - Shoulder

KW - Western Australia

UR - [http://c-marc.curtin.edu.au/local/docs/C-MARC\\_Blackspot\\_report\\_Alban\\_Highway.pdf](http://c-marc.curtin.edu.au/local/docs/C-MARC_Blackspot_report_Alban_Highway.pdf)

UR - <https://trid.trb.org/view/1335735>

TY - JOUR

AN - 01551935

JO - Transportation Research Record

PB - Transportation Research Board

AU - Li, Feng

AU - Li, Li

AU - Li, Tinggang

**TI - Viscosity Evaluation Index of Hot-Applied Sealant for Asphalt Pavement**

SN - 9780309369145

PY - 2015

IS - 2481

SP - pp 83–89

AB - The relationship of viscosity to temperature is one of the most important factors in the application of hot-applied sealants. However, the present evaluation system cannot fully reflect the field performance of the sealants, given the lack of consideration of application conditions. A rotational viscometer and Rotor SC4-27 were used in this study to test the viscosity of hot-applied sealants, with viscosity at 50% torsional moment taken as the apparent viscosity. Nine kinds of sealants were tested in the temperature range of 160°C to 200°C. Analysis also was conducted to evaluate the correlation of the viscosity index with other indexes. The results showed no obvious correlation between them. Thus the viscosity index proposed in this study could be included in the present evaluation system in which the recommended pour temperature is 190°C, and the rotational viscosity is in the range of 1 to 3 Pa-s.

KW - Asphalt pavements

KW - Correlation analysis

KW - Evaluation

KW - Pour point

KW - Sealing compounds

KW - Viscosity

UR - <http://dx.doi.org/10.3141/2481-11>

UR - <https://trid.trb.org/view/1337401>

ER -



TY - CONF

AN - 01552133

AU - Cao, Liping

AU - Li, Xiaoyu

AU - Lei, Xuetong

AU - Transportation Research Board

**TI - Preliminary Investigation of Adhesion Failure Mechanisms of Crack Sealant to Pavement Crack Walls**

PY - 2015

SP - 14p

AB - Crack sealing is one of the most common pavement preventive maintenance treatments in China and other countries. It can prevent the water into pavement structure, hence extend pavement service life. However, crack sealant often fails prematurely due to the bad adhesion. There are many factors influencing the adhesion of crack sealant to crack walls. But the adhesion failure mechanisms are still not clear now. Hence, this study analyzes the adhesion failure mechanisms of crack sealant to crack walls based on the new developed low temperature performance tester of asphalt pavement crack sealant. First, this study designs a new test fixture and corresponding test method to measure adhesion failure stress/strain at different conditions. Second, this paper uses AC-13 asphalt concrete with virgin asphalt, AC-13 asphalt concrete with rubber asphalt, SMA-16 asphalt concrete and aluminum as substrates to imitate crack walls. The bonding surface properties was analyzed using IPP (Image-Pro Plus) software. The void area percentage, asphalt mastic area percentage and aggregate area percentage were calculated for each debonding surface. Then this study built the relationship between the bonding surface properties and failure stress/strain. The effect of bonding surface type on the adhesion was investigated also. Finally this paper explains adhesion failure mechanism of crack sealant to crack walls based on weak boundary theory. Four typical failure modes were summarized according to test results.

U1 - Transportation Research Board 94<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20150111 EndDate:20150115 Sponsors: Transportation Research Board

KW - Adhesion

KW - Asphalt pavements

KW - Bond strength (Materials)

KW - Deformation curve

KW - Failure

KW - Low temperature tests

KW - Pavement cracking

KW - Pavement maintenance

KW - Sealing compounds

UR - <https://trid.trb.org/view/1338478>

ER -

TY - JOUR

AN - 01553431

JO - Transportation Research Record

PB - Transportation Research Board

AU - Ozer, Hasan

AU - Yousefi, Seyed Saleh

AU - Al-Qadi, Imad L

AU - Elizalde-Castro, Guillermo

**TI - Field Aging and Development of Aging Model for Hot-Poured Crack Sealants**

SN - 9780309369145

PY - 2015

IS - 2481

SP - pp 90–99

AB - An investigation was conducted to evaluate the long-term field aging effects of hot-poured crack sealants by differential aging testing. An analysis of rheological and mechanical properties to implement two performance-based tests was used to characterize aging of sealants. A set of eight types of crack sealants was exposed to approximately 2 years of weathering conditions. Aging mechanisms were investigated by a comparison of the critical properties with those obtained at the time of installation inside a small kettle. Samples were collected every 6 months after installation for laboratory characterization. Laboratory characterization included low-temperature stiffness, cohesion, adhesion, and viscosity. According to the results of the experimental program, a consistent increase was observed in the low-temperature stiffness of crack sealants as a result of weathering. The study showed that the low- and high-temperature properties of the surface portion were significantly influenced by weathering effects even within a short period of time. A superposition rule analogous to time–temperature superposition for viscoelastic materials was applied to develop master curves. A phenomenological aging model was developed as a function of aging time and represented shift factors used in the master curve development. Sealants were categorized as Type A, B, or C on the basis of increasing aging potential.

KW - Aging (Materials)

KW - High temperature

KW - Hot-pour sealants

KW - Low temperature

KW - Mechanical properties

KW - Pavement cracking

KW - Rheological properties

KW - Sealing compounds

KW - Stiffness

KW - Weathering

UR - <http://dx.doi.org/10.3141/2481-12>

UR - <https://trid.trb.org/view/1339230>

ER -

TY - CONF

AN - 01557059

AU - Lamarre, Ahmed

AU - Yeargin, Ryan

AU - Fini, Elham H

AU - Aflaki, Sassan

AU - Transportation Research Board

**TI - Investigating Effects of Water Conditioning on Adhesion Properties of Crack Sealant**

PY - 2015

SP - 15p

AB - Even though sealants are commonly used to insulate crack and joints preventing water from entering the underlying structure, extended exposure of sealants to water has shown to negatively impact sealants properties causing gradual degradation of its performance. However, sealants show different degradation rates when exposed to water depending on their chemical composition and environmental conditions. While there have been many studies on characterizing sealant performance in dry conditions, there has been no comprehensive experimental test to evaluate crack sealants' water susceptibility based on a fundamental material property. As such this paper investigates the effect of water exposure on three different crack sealants commonly used in cold, moderate and hot climates. It is hypothesized that water penetrates into the interface between crack sealant and substrates causing progressive adhesion failure and that the rate of failure varies depending on the sealant's surface chemistry as related to its interaction with water molecules in different environmental conditions. Accordingly, this paper measures the change in a sealant's adhesion strength and surface energy before and after water conditioning. To study adhesion strength and its change due to water conditioning, three different types of sealant were tested using Direct Adhesion Tester (DAT). It was found that the adhesion strength of all three crack sealants reduces due to water exposure. In addition, to evaluate the surface properties and water phaticity of each sealant, the contact angle between a droplet of water and sealant surface was measured before and after conditioning at different temperatures. The objective of the latter experiment was to determine whether sealants' susceptibility to water would vary with pavement surface temperature. To do so, a sessile drop method utilizing FTA-1000 was used to determine the contact angle for each of the aforementioned water-sealant pairs at different temperatures. The results obtained were further used to calculate the work of adhesion at each scenario to be correlated to mechanical adhesion strength measured with DAT.

U1 - Transportation Research Board 94<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20150111 EndDate:20150115 Sponsors: Transportation Research Board

KW - Adhesion

KW - Adhesive strength

KW - Moisture susceptibility

KW - Pavement cracking

KW - Pavement joints

KW - Sealing compounds

KW - Surface energy

KW - Surface temperature

UR - <https://trid.trb.org/view/1339486>

ER -

TY - CONF

AN - 01555504

AU - Yeargin, Ryan

AU - Lamarre, Ahmed

AU - Fini, Elham H

AU - Aflaki, Sassan

AU - Transportation Research Board

**TI - Effect of Water Conditioning on Crack Sealant's Cohesive Properties**

PY - 2015

SP - 12p

AB - The effect of water on crack sealant is a major cause of cohesive failure. Sealants shows different degradation rate when exposed to water depending on their chemical composition and environmental conditions. While there have been many studies on characterizing sealant performance in dry conditions, there has been no comprehensive experimental test to evaluate crack sealants water susceptibility based on a fundamental material property. This is when prior studies have shown that water leads to the deterioration of sealant polymeric structure and negatively impacts its bulk performance. This paper studies how conditioning crack sealant in water will progressively soften and deteriorate crack sealant's bulk properties. Understanding interaction mechanisms between water and polymeric structure of sealant can help understand how mechanical and physiochemical properties of crack sealant change in humid areas with high annual precipitation. To do so, an experimental plan was developed to investigate the effect of water conditioning on crack sealant rheological properties utilizing Dynamic Shear Rheometer and Rotational Viscometer tests. The analysis of the experimental results showed that after water conditioning crack sealant became initially more elastic but at longer conditioning time it started to gradually loose its elasticity indicating water gradually penetrated into the sealant structure deteriorating its mechanical properties.

U1 - Transportation Research Board 94<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20150111 EndDate:20150115 Sponsors: Transportation Research Board

KW - Cohesion

KW - Moisture damage

KW - Pavement cracking

KW - Rheology

KW - Sealing compounds

KW - Shear modulus

KW - Water

UR - <https://trid.trb.org/view/1339570>

ER -

TY - JOUR

AN - 01552712

JO - Bulletin CRR = OCW mededelingen

AU - BOONEN, E

AU - BEELDENS, A

AU - Lybaert, Maryn

**TI - Evaluation of test sections with innovative joint filling materials on the OCW site in Sterrebeek, Belgium: new pre-normative research on performance requirements (PREVOSTRAT)**

T2 - Evaluatie van proefvakken met innovatieve voegvullingsmaterialen op het OCW-terrein in Sterrebeek : nieuw prenormatief onderzoek rond prestatie-eisen (PREVOSTRAT)

PY - 2014/12

IS - 101

SP - pp. 5-9

AB - The BRRC trial parking, used for the completed research on weed control on pavements with small elements was cleaned completely in the autumn of 2013 and the joints were filled up again with various innovative joint fillings. In addition a visual monitoring was carried out in the time, to monitor the effect on the growth of weeds over time. Because some joint fillings were designed for water permeable pavements, a number of measurements were carried out using the double-ring method to determine the water permeability. Hereafter, the evaluation of these trial zones after approximately one year (November 2013 to September 2014) are highlighted . Furthermore, the recently launched pre-normative research to performance requirements for these innovative joint fillings in pavements with small elements (PREVOSTRAT) is described

KW - Belgium

KW - Joint filler

KW - Joint sealing

KW - Parking area

KW - Parking facilities

KW - Permeability

KW - Test track

KW - Test tracks

UR - <https://trid.trb.org/view/1340722>

ER -

TY - JOUR

AN - 01552713

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Cox, Ben C

AU - Howard, Isaac L

**TI - Vacuum Sealing-Based Volumetric Density Measurement Approach for Cold In-Place Recycling**

SN - 9780309295369

PY - 2014

IS - 2444

SP - pp 11-19

AB - Recent economic limitations have fostered increased use of pavement rehabilitation methods such as cold in-place recycling (CIR). CIR could be more appealing to departments of transportation provided variability were lower and performance were more predictable. Because of the nature of the materials and construction processes, CIR is likely to be more variable than plant-mixed asphalt, and it is believed that the performance variability of CIR can be reduced through enhanced density control. The many density control methods described in the literature for CIR are often vague. This study used ASTM D6857 vacuum sealing to obtain the maximum theoretical specific gravity ( $G_{mm}$ ) of reclaimed asphalt pavement (RAP) and a gravity-proportioning equation to estimate CIR  $G_{mm}$  (specific gravity after cement, emulsion, or a combination is mixed with RAP). Vacuum sealing was also used to obtain the bulk specific gravity ( $G_{mb}$ ) of compacted CIR (AASHTO T 331). In all, 240  $G_{mm}$  and 156  $G_{mb}$  tests were conducted. D6857 and AASHTO T 209 detect differences between RAP and hot-mix asphalt  $G_{mm}$ , but the differences led to manageable errors for CIR density control that should still allow for some improvements over many current practices. The equation developed in the study estimated CIR  $G_{mm}$  with reasonable error, and T 331 suitably characterized CIR  $G_{mb}$  at the often high air void levels that were observed. The findings show that CIR  $G_{mm}$  and  $G_{mb}$ , as determined by vacuum sealing and the gravity-proportioning equation, constitute a reliable, convenient, and implementable approach to controlling density and likely reducing performance variability.

KW - Asphalt pavements

KW - Cold in-place recycling

KW - Density

KW - Equations

KW - Gravity

KW - Pavement performance

KW - Reclaimed asphalt pavements

KW - Recycled materials

KW - Vacuum sealing method

KW - Volume

UR - <http://dx.doi.org/10.3141/2444-02>

UR - <https://trid.trb.org/view/1342389>

ER -

TY - RPRT

AN - 01560486

AU - Alabaster, D

AU - PATRICK, J

AU - Hussain, J

AU - Henning, T

AU - New Zealand Transport Agency

**TI - Effects of water on chipseal and basecourse on high-volume roads**

SN - 9780478419979

PY - 2015/03

IS - 564

SP - 126p

AB - The objectives of this study were to investigate the relationship between permeability of chip seals, water film thickness, basecourse moisture sensitivity, heavy traffic volumes, and premature pavement failure following construction through the use of accelerated pavement testing at CAPTIF. The research has produced some surprising results in that the traditional M/4 basecourse was the worst performer in all cases. However, it must be borne in mind that this research can only be considered applicable to first coat seals, with high water film thicknesses at very high traffic volume. The recommendations resulting from the research are to: 1. prime all new pavements before first-coat sealing to reduce the risk of early failure; 2. condition new seals before they are loaded in wet conditions, ie avoid the practice of sealing just before it rains as this is likely to increase the probability of failure; 3. avoid geometric designs that generate large water film thicknesses; 4. not delay in placing second-coat seals on high-volume roads; 5. use unsaturated hydraulic models for modelling moisture movement in pavements; 6. review first-coat seal failures for the factors observed in this report; 7. undertake field trials of lower permeability M/4 alternatives.

KW - Accelerated testing

KW - Accelerated tests

KW - Base course (Pavements)

KW - Basecourse

KW - Chip seal

KW - Chip seals

KW - Loads

KW - Moisture content

KW - Moisture sensitivity

KW - New Zealand

KW - Pavement technology

KW - Permeability

KW - Quick

KW - Seal coats

KW - Sealing coat

KW - Sealing coat (on top of the surfacing)

KW - Test procedures

KW - Traffic

KW - Traffic load

KW - Traffic loads

UR - <http://www.nzta.govt.nz/resources/research/reports/564/index.html>

UR - <https://trid.trb.org/view/1350520>

TY - JOUR  
 AN - 01561412  
 JO - Roads & Bridges  
 PB - Scranton Gillette Communications  
 AU - Miler, R Todd  
**TI - Making it last**  
 PY - 2015/03  
 VL - 53  
 IS - 3  
 SP - pp 36, 38, 40  
 AB - Despite a funding crunch, pavement preservation techniques in Missouri are innovational, with the Missouri Department of Transportation (MoDOT) maintaining more than 77,000 lane-miles of road in the 7<sup>th</sup>-largest highway system in the United States. The state also has the 46<sup>th</sup> lowest state revenue per paved mile, primarily funded by a fuel tax, which is diminishing as a funding source. Severe winters add to the costs of road maintenance, with snow and ice-removal efforts eating into the state's budget for maintenance, as well as damage sustained by the harsh weather. To help meet the challenge of preserving Missouri's pavements, several innovations have been implemented, including scratch and seal, next-generation microsurfacing and rumble strip surface sealing.  
 KW - Budgeting  
 KW - Financing  
 KW - Innovation  
 KW - Micro surfacing (Surface treating)  
 KW - Missouri  
 KW - Missouri Department of Transportation  
 KW - Pavement maintenance  
 KW - Preservation  
 KW - Sealing (Technology)  
 UR - <http://www.roadsbridges.com/making-it-last>  
 UR - <https://trid.trb.org/view/1351097>  
 ER -



TY - JOUR

AN - 01560801

JO - International Journal of Pavement Research and Technology

PB - Chinese Society of Pavement Engineering

AU - Li, Feng

AU - Zhou, Yuan

AU - Li, Tinggang

AU - Zeng, Wei

AU - Wang, XianGuo

**TI - Experimental Study and Numerical Simulation of Tension and Stress Relaxation of Hot-Applied Sealant for Asphalt Pavement**

PY - 2015/03

VL - 8

IS - 2

SP - pp 131-141

AB - Low temperature performance of hot-applied bituminous crack sealant is a key factor which influences the effect of asphalt pavement crack filling and sealing. In order to describe the constitutive stress-strain relationship at low temperature, experimental tests of extension and stress relaxation of crack sealants, are presented in this paper. The generalized Maxwell model is chosen for curve-fitting to determine the material model. Comparison of fitted curve and experimental results proves that the generalized Maxwell model in Prony series is well suited for describing the experiment process. Moreover, finite element analysis method with material model defined by the generalized Maxwell model in Prony series is introduced for numerical solution of tension and stress-relaxation of crack sealants. By comparing the results of the numerical analysis and the tests, the conclusion can be made that the tension and the stress-relaxation of crack sealants may be accurately depicted by the generalized Maxwell model.

KW - Asphalt pavements

KW - Curve fitting

KW - Finite element method

KW - Low temperature materials

KW - Pavement cracking

KW - Relaxation (Mechanics)

KW - Sealing compounds

KW - Tension tests

KW - Viscoelasticity

UR - [http://dx.doi.org/10.6135/ijprt.org.tw/2015.8\(2\).131](http://dx.doi.org/10.6135/ijprt.org.tw/2015.8(2).131)

UR - <http://www.ijprt.org.tw/reader/pdf.php?id=473>

UR - <https://trid.trb.org/view/1351198>

ER -

TY - RPRT

AN - 01563051

AU - NEAYLON, K

AU - Austroads

AU - ARRB Group Limited

**TI - Towards incorporating heavy vehicles into sprayed seal design: stage 2**

SN - 9781925294378

PY - 2015/04

AB - Traffic loadings on Australia's extensive sprayed seal network have increased, particularly with freight efficiency resulting in longer and heavier loads being transported by prime movers. This report details the development of a model to describe how different axle loads and axle groupings combine to cause surface texture decay on a sprayed seal. Development of the model relied on experimental data generated by the Australian linear accelerated loading facility. The model was then validated using another set of data generated by the New Zealand Canterbury Accelerated Pavement Testing Indoor Facility. From the data, a load damage exponent of 1 for sprayed seal wear was calculated based on analysis of a dual tyre tandem axle traversing a sprayed seal. This suggests that the load damage to a sprayed seal is linear as opposed to the power function model currently used in pavement design. The research findings can be used to investigate if the Austroads seal design method needs refinement in terms of equivalent heavy vehicles calculation.

KW - Accelerated testing

KW - Accelerated tests

KW - Australia

KW - Axle load

KW - Axle loads

KW - Design (overall design)

KW - Heavy vehicle

KW - Heavy vehicles

KW - Lorry

KW - Mathematical models

KW - Modelling

KW - New Zealand

KW - Pavement design

KW - Pavement technology

KW - Pavements

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surface texture

KW - Tests

KW - Texture

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T292-15>

UR - <https://trid.trb.org/view/1354159>

ER -

TY - RPRT

AN - 01563768

AU - Mahoney, Joe P

AU - Slater, Megan

AU - Keifenheim, Chris

AU - Uhlmeier, Jeff

AU - Moomaw, Tim

AU - Willoughby, Kim

AU - University of Washington, Seattle

AU - Washington State Transportation Center

AU - Washington State Department of Transportation

AU - Federal Highway Administration

**TI - WSDOT Chip Seals—Optimal Timing, Design and Construction Considerations**

PY - 2014/12//Research Report

SP - 93p

AB - The Washington State Department of Transportation (WSDOT) does not have sufficient pavement preservation funding to keep up with inflation and pavement needs. This has caused WSDOT to emphasize in its preservation program lower-cost options such as chip seals. The study was conducted on several aspects of WSDOT chip seals including (1) the optimum timing for alternating chip seals (or Bituminous Surface Treatments (BSTs)) with hot mix asphalt (HMA) overlays, (2) design of chip seal application rates, and (3) a range of construction and performance factors. The research incorporated surveys, literature reviews, and five BST meetings that were held between 2006 and 2011. All of these activities are summarized in this report. WSDOT has continuously changed both policy and specifications as new information became available for improving their chip seal performance. In recent years, a policy change resulted in using chip seals on roadways with up to 10,000 annual daily traffic (ADT). As such, a secondary factor examined in this study was maximum ADT levels which provide for sensible chip seal construction.

KW - Annual average daily traffic

KW - Bituminous overlays

KW - Chip seals

KW - Hot mix asphalt

KW - Literature reviews

KW - Pavement maintenance

KW - Surveys

KW - Washington (State)

UR - <http://www.wsdot.wa.gov/research/reports/fullreports/837.1.pdf>

UR - <https://trid.trb.org/view/1354249>

ER -

TY - RPRT

AN - 01567431

AU - Martin, Amy Epps

AU - Texas A&M Transportation Institute

AU - Texas Department of Transportation

AU - Federal Highway Administration

**TI - Statewide Implementation of the Surface Performance-Graded (SPG) Specification for Seal Coat Binders in Service. Products -P1, -P4, & -P5**

PY - 2015

SP - v.p.

AB - This project includes three documents. (1) Seal Coat Binder Performance Specifications, 87<sup>th</sup> Annual Transportation Short Course, October 2013, 3p., PowerPoint slides covering objective, history, recommended Surface Performance Grading (SPG) specification, and implementation project. (2) SPG Specification for 2015 Implementation, 8p. (3) Texas Seal Coat Binder Utilization maps for 2013 and 2014, 4p.

KW - Bituminous binders

KW - Implementation

KW - Pavement performance

KW - Performance based specifications

KW - Seal coats

KW - Texas

UR - <http://tti.tamu.edu/documents/5-6616-01-P1.pdf>

UR - <http://tti.tamu.edu/documents/5-6616-01-P4.pdf>

UR - <http://tti.tamu.edu/documents/5-6616-01-P5.pdf>

UR - <https://trid.trb.org/view/1354420>

ER -

TY - CONF

AN - 01568830

AU - Tsai, Yichang

AU - Wang, Zhaohua

AU - Jiang, Chenglong

AU - Mahfood, Bob

AU - Rone, John

AU - American Society of Civil Engineers

**TI - Innovative Crack Sealing Analysis and Cost Estimation for Airport Runway Shoulders Using 3D Laser Technology and Automatic Crack Detection Algorithms**

SN - 9780784479216

PY - 2015/06

SP - pp 652-661

AB - To accurately estimate the cost for crack sealing on airport runway shoulders, an automatic approach using 3D line laser imaging technology, automatic crack detection, and width measurement algorithms is proposed. Based on their widths, cracks can be categorized in terms of the routing depths. Then, accurate cost estimation can be made according to the total length in each crack category using different routing depths. Other than the cost estimation, the detected crack maps and the crack classification information can also be used to guide construction operations and provide a means for agencies' quality checking. Using the proposed method, a case study has been performed on a 30.5-m (100-ft) runway shoulder at Hartsfield-Jackson Atlanta International Airport. The results show that the proposed method is very promising for providing an automatic approach that cost-effectively and reliably generates categorized crack maps with different crack sealing methods and accurately estimates crack sealing cost.

U1 - Airfield and Highway Pavements 2015 American Society of Civil Engineers Miami, Florida, United States StartDate:20150607 EndDate:20150610 Sponsors: American Society of Civil Engineers

KW - Airport runways

KW - Algorithms

KW - Automated crack detection systems

KW - Case studies

KW - Cost estimating

KW - Crack sealing

KW - Hartsfield-Jackson Atlanta International Airport

KW - Laser imaging

KW - Paved shoulders

KW - Pavement cracking

UR - <http://dx.doi.org/10.1061/9780784479216.058>

UR - <https://trid.trb.org/view/1356776>

ER -

TY - JOUR

AN - 01566869

JO - International Journal of Pavement Research and Technology

PB - Chinese Society of Pavement Engineering

AU - Cheng, DingXin

AU - Lane, Lerosé

AU - Vacura, Peter

**TI - Performance Evaluation of Fog and Rejuvenating Seals on Gap and Open Graded Surfaces by Caltrans**

PY - 2015/05

VL - 8

IS - 3

SP - pp 159-166

AB - California Department of Transportation (Caltrans) has been using fog or rejuvenating seals on shoulders and highways through maintenance activities. To safely and effectively utilize more fog or rejuvenating seals on the mainline of its highways, Caltrans placed a series of pilot projects during the past five years. This paper documents the laboratory and field findings from the fog or rejuvenating seal pilot studies on gap graded and open graded surfaces. Caltrans placed test sections in 2009 with six different fog or rejuvenating seal products on gap- and open-graded surfaces.

Through field and laboratory studies on these products, Caltrans quantified the benefits and performance of the fog or rejuvenating seal products commonly used in California. After reviewing the positive results from these test sections, Caltrans placed another 12 pilot projects in 2012 and 9 pilot projects in 2013 under various surface types, locations, climates, and traffic levels. The California Pavement Preservation Center (CP2 Center) monitored the pilot projects and wrote project reports to document the surface texture, application rates, product performance, and skid resistance for these pilot projects. This paper presents the performance benefits and skid characteristics of the fog or rejuvenating seals.

KW - California

KW - California Department of Transportation

KW - Hot mix asphalt

KW - Pavement maintenance

KW - Pavement performance

KW - Seal coating

KW - Seal coats

KW - Sealing compounds

KW - Skid resistance

KW - Texture

UR - [http://dx.doi.org/10.6135/ijprt.org.tw/2015.8\(3\).159](http://dx.doi.org/10.6135/ijprt.org.tw/2015.8(3).159)

UR - <http://www.ijprt.org.tw/reader/pdf.php?id=479>

UR - <https://trid.trb.org/view/1358449>

ER -

TY - RPRT

AN - 01570268

AU - Truschke, Carrie

AU - Peshkin, David

AU - Smith, Kelly L

AU - Smith, Kurt D

AU - Applied Pavement Technology, Incorporated

AU - Colorado Department of Transportation

AU - Federal Highway Administration

**TI - Colorado Department of Transportation Hot-Mix Asphalt Crack Sealing and Filling Best Practices Guidelines**

PY - 2014/10//Final Report

SP - 173p

AB - Crack sealing and filling on hot mix asphalt (HMA) pavements are cost-effective pavement preservation techniques that improve pavement performance and extend the life of existing pavements. If performed in a timely and effective manner, crack sealing can extend the life of HMA pavements. The Colorado Department of Transportation (CDOT) supports the sealing of cracks on HMA pavements. Under Study No. 11.40, CDOT Pavement Crack Seal and Fill Best Management Practices, CDOT sponsored this study to update its procedures and guidelines for crack sealing and filling of HMA pavements. The draft Guidelines included in this report reflect CDOT experience, current state-of-the-practice, and the most recent research findings, and address where and when to perform crack sealing and filling, material selection, installation methods, construction inspection, and follow-up evaluation. Three primary tasks were undertaken to meet the project objective including a literature review and survey of agencies, a draft of recommended best practices guidelines, and recommended procedures for monitoring, evaluating, and documenting the effectiveness of crack sealing and filling methods and materials. Once the final guidelines are developed, CDOT will broadly communicate the existence of the new guidance, highlighting any changes and how they will contribute to improved performance. Developing and presenting a 2- to 4-hour workshop and training session on improved crack sealing practices would also benefit all maintenance crews engaged in the activity.

KW - Best practices

KW - Colorado Department of Transportation

KW - Guidelines

KW - Hot mix asphalt

KW - Literature reviews

KW - Pavement cracking

KW - Sealing (Technology)

KW - Sealing compounds

KW - State of the practice

KW - Surveys

UR - <https://www.codot.gov/programs/research/pdfs/2014/cdot-hot-mix-asphalt-crack-sealing-and-filling-best-practices-guidelines/view>

UR - <https://trid.trb.org/view/1360226>

ER -

TY - JOUR

AN - 01571502

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Pinard, Michael I

AU - Paige-Green, Philip

AU - Hongve, Jon

AU - Mukandila, Estimé

**TI - New Approach for Upgrading Gravel Roads to a Low-Volume Sealed Standard Based on the Use of the Dynamic Cone Penetrometer**

SN - 9780309295727

PY - 2015

IS - 2473

SP - pp 136-143

AB - Over the years, and under traffic loading and wetting and drying cycles, unpaved roads achieve a significant degree of compaction. Sustainable upgrading of these roads to a paved standard is best accomplished by making use of in situ conditions to provide a sound foundation for the new road.

This usually reduces the need to import large quantities of virgin material. The dynamic cone penetrometer (DCP) device can be used to quickly and cheaply assess the in situ conditions, including material quality and moisture regimes at selected test positions, as well as to determine the suitability of imported materials for incorporation into the new road pavement. The information obtained from the in situ testing can then be used to identify uniform sections along the road alignment. By comparing the in situ layer strength profiles of each of these uniform sections with the required design strength profiles for a particular design loading, the required layer needs for the new pavement can be determined. The paper describes the use of the DCP for the environmentally optimized design of low-volume roads, including the manner of characterizing the in situ road conditions and the selection and specification of borrow pit materials. The use of the DCP for compaction quality control is outlined. Data from various road sections in several countries in southern Africa are used to support the approach.

KW - Africa

KW - Cone penetrometers

KW - Gravel roads

KW - Low volume roads

KW - Modernization

KW - Paving

KW - Sealing (Technology)

KW - Sustainable development

UR - <http://dx.doi.org/10.3141/2473-16>

UR - <https://trid.trb.org/view/1360295>

ER -



TY - JOUR

AN - 01571631

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Leta, Nkululeko

AU - Geddes, Robert

**TI - Route from Research into Practice: Outcomes of the Africa Community Access Programme  
Phase 1**

SN - 9780309295734

PY - 2015

IS - 2474

SP - pp 48-55

AB - The Africa Community Access Programme (AFCAP) is a research program in the rural transport sector in Africa. AFCAP supports sharing of knowledge between participating countries to enhance the uptake of appropriate, proven, and fit-for-purpose solutions for rural access. The AFCAP theory of change is based on a virtuous cycle of research that demonstrates best practices and leads to uptake of research findings. Uptake of research outcomes includes capacity development for undertaking further research. Under AFCAP, an efficient route from research into practice has been provided. The demonstration of innovative standards for low-volume roads (LVRs) has been an important step in achieving wider acceptance of those standards. It has been necessary to convince not only practitioners and road agencies but also political decision makers and community representatives. In general, the acceptance levels have been high, which has increased demand for the sealing of LVRs. The reduced construction costs of LVRs that result from a more optimal design approach will allow governments and road agencies to meet the demand more effectively. The sustainability of AFCAP achievements depends on building local research capacity in African countries. AFCAP has created an awareness of the value of research and has provided some of the tools needed by governments to establish their own research programs. The recruitment and retention of suitably qualified and experienced researchers will remain a considerable challenge for the foreseeable future and will require long-term support. However, now that the benefits of research are more apparent and a route from research into practice has been defined, there is a strong determination in African countries to succeed.

KW - Africa

KW - Communities

KW - Implementation

KW - Low volume roads

KW - Research

KW - Road construction

KW - Rural transportation

KW - Sealing (Technology)

UR - <http://dx.doi.org/10.3141/2474-06>

UR - <http://trrjournalonline.trb.org/doi/abs/10.3141/2474-06>

UR - <https://trid.trb.org/view/1360313>

ER -

TY - JOUR

AN - 01571460

JO - Transportation Research Record: Journal of the Transportation Research Board

PB - Transportation Research Board

AU - Rivera, Felipe

AU - Chamorro, Alondra

AU - Lucero, Robinson

AU - Aravena, Claudio

**TI - Development of Condition Indicator for Managing Sealed Rural Road Networks**

SN - 9780309295734

PY - 2015

IS - 2474

SP - pp 90-97

AB - Rural roads may be defined as low-volume roads that provide access and mobility to rural populations. In developing countries they commonly represent 80% of the total road network length and play a key role in economic and social development. Rural roads are divided into unsealed (gravel and earth) and sealed roads (roads with thin bituminous surfaces and stabilized roads). Network management methods recommend the use of objective condition evaluations, such as the pavement condition index and the unpaved roads condition indicator, to assist in decision making. However, none of these indicators properly apply to sealed rural roads; the performance of these roads is different because of climate and traffic demands. The lack of an objective indicator specially calibrated for sealed rural roads was addressed in this study. The main goal was to calibrate a condition indicator for managing sealed rural road networks. As a result of the study, a condition indicator that was preliminarily developed for double treatment surfaces was successfully validated for thin bituminous surfaces. In addition, a stabilized roads condition index (SRCI) was developed on the basis of field evaluations of various surface distresses observed in stabilized roads, which were contrasted with the evaluations of an expert panel. Two forms of the SRCI were calibrated: with and without roughness. Finally, a qualitative scale ranging from very good condition to very poor condition was defined for thin bituminous surfaces and stabilized roads, on the basis of the effect of three types of climates and roads hierarchy.

KW - Asphalt pavements

KW - Developing countries

KW - Low volume roads

KW - Rural highways

KW - Sealing (Technology)

KW - Surface course (Pavements)

UR - <http://dx.doi.org/10.3141/2474-11>

UR - <http://trrjournalonline.trb.org/doi/abs/10.3141/2474-11>

UR - <https://trid.trb.org/view/1360318>

ER -

TY - CONF

AN - 01573492

AU - Liu, Jenny

AU - McHattie, Robert

AU - Zhao, Sheng

AU - Zhang, Xiong

AU - American Society of Civil Engineers

**TI - Field Evaluation of Precut Thermal Cracks in an AC Pavement in Alaska**

SN - 9780784479285

PY - 2015/07

SP - pp 95-103

AB - Thermal cracking is a natural feature of most of Alaska's asphalt concrete (AC) pavements that influences long term maintenance costs and drivers' perception of road performance. Major transverse thermal cracks penetrate through not only the pavement layer itself but usually extend several feet into the aggregate materials below. A significant portion of Department of Transportation (DOT) Maintenance and Operations budget has been allocated to crack sealing and associated work. However, Alaska researchers are beginning to understand that the inevitable thermal cracking can be significantly controlled by making simple changes to new road designs. Past research in Alaska and elsewhere found that thermal cracks can be controlled if properly spaced saw cuts are made in the pavement surfaces of newly built pavement structures. Research presented in this paper looks at the different case of whether precutting can influence thermal cracking when only the top few inches of an old, thermal cracked, pavement structure have been reconditioned and repaved. Two years of monitoring show that precutting exerts significant control on thermal cracking of the new pavement surface even if most of the previously-cracked underlying aggregate pavement structure was left in place. However, precutting is most effective when the saw cuts are made at or very near the locations of the old thermal cracks.

U1 - International Symposium on Systematic Approaches to Environmental Sustainability in Transportation American Society of Civil Engineers Fairbanks, Alaska, United States

StartDate:20150802 EndDate:20150805 Sponsors: American Society of Civil Engineers

KW - Alaska

KW - Asphalt concrete pavements

KW - Cutting

KW - Highway design

KW - Pavement performance

KW - Protection against environmental damage

KW - Resurfacing

KW - Sealing (Technology)

KW - Thermal degradation

KW - Transverse cracking

UR - <http://dx.doi.org/10.1061/9780784479285.009>

UR - <https://trid.trb.org/view/1363537>

ER -

TY - CONF

AN - 01573427

AU - Mullin, Anthony P

AU - Zhao, Sheng

AU - Liu, Jenny

AU - McHattie, Robert

AU - American Society of Civil Engineers

**TI - Crack Surveying Methods to Evaluate Sealing Practice in Alaska**

SN - 9780784479285

PY - 2015/07

SP - pp 120-131

AB - It has long been suggested that a much more economical and sustainable approach be developed to address crack sealing effectiveness in Alaska. The development of a new method named special thermal crack evaluation (STCE) in a previous study served to directly and efficiently guide the crack sealing practices as opposed to the other nationally-used pavement surveying methods, including Long Term Pavement Performance (LTPP) and Pavement Surface and Evaluation Ratings (PASER) . However, no or little research has been found to compare and correlate STCE with the other two methods. This paper presents a study to fulfill this research need. Further data interpretation showed that STCE was capable of guiding the decision-making on crack sealing practices, while the other two methods provided quantitative measurements and general rating of the sealed or non-sealed cracks. In addition, the correlation between STCE and the other two methods recommended that STCE better be used along with the other two methods for a better and more complete guidance on current or potential crack sealing practices.

U1 - International Symposium on Systematic Approaches to Environmental Sustainability in Transportation American Society of Civil Engineers Fairbanks, Alaska, United States

StartDate:20150802 EndDate:20150805 Sponsors: American Society of Civil Engineers

KW - Long-Term Pavement Performance Program

KW - Alaska

KW - Pavement maintenance

KW - Pavement performance

KW - Sealing (Technology)

KW - Structural health monitoring

KW - Surface course (Pavements)

KW - Thermal degradation

UR - <http://dx.doi.org/10.1061/9780784479285.011>

UR - <https://trid.trb.org/view/1363539>

ER -

TY - RPRT

AN - 01573514

AU - Choi, Y

AU - Austroads

**TI - Development of a durability test method for sprayed sealing binders: a field validation study**

SN - 9781925294507

PY - 2015/07

SP - 69p

AB - This report presents the results of a field validation study that was conducted as part of the development of a new long-term ageing (durability) test for bituminous binders used in sprayed seals in Australia. The field validation study of the new durability test method was conducted using field property information collected from a sprayed sealing trial site constructed at Coober Pedy in South Australia. Analysis of the results from dynamic shear rheometer (DSR) flow tests and Fourier transform infrared spectroscopy (FTIR) tests found a reasonable similarity between the ageing process simulated using the pressure ageing vessel (PAV) for a short time (e.g. 30 hours) and the ageing process which occurred in the field for a certain service period (e.g. 3 years). The validation study suggested that PAV treatment is able to produce artificially aged binders which are quite similar to field aged binders that have been in service for a long time. Due to this, PAV treatment of binders appears to be a suitable approach for ageing binders in the new durability test method.

KW - Ageing

KW - Aging (Materials)

KW - Australia

KW - Binder

KW - Binders

KW - Durability

KW - Field test

KW - Field tests

KW - In situ

KW - Materials technology (asphalt/bitumen/concrete)

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Temperature

KW - Test method

KW - Test procedures

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T298-15>

UR - <https://trid.trb.org/view/1366712>

ER -

TY - RPRT

AN - 01576119

AU - de León Izeppi, Edgar

AU - Morrison, Akyiaa

AU - Flintsch, Gerardo W

AU - McGhee, Kevin K

AU - Virginia Center for Transportation Innovation and Research

AU - Virginia Tech Transportation Institute

AU - Virginia Department of Transportation

AU - Federal Highway Administration

**TI - Best Practices and Performance Assessment for Preventive Maintenance Treatments for Virginia Pavements**

PY - 2015/08//Final Report

SP - 60p

AB - Preventive maintenance has the potential to improve network condition by retarding future pavement deterioration. This report outlines guidelines for implementing a preventive maintenance policy for bituminous pavements. Preventive maintenance treatments currently being used in Virginia include chip seal, slurry seal, microsurfacing, and thin hot mix asphalt overlays. Historical pavement condition data were obtained from the Virginia Department of Transportation's Pavement Management System for these treatments, and treatment performance models were developed. A district-level treatment selection tool was developed to facilitate the district-level decision-making process. A prioritized list of pavement sections was generated, maximizing the cost-effectiveness of the selected treatments subject to budgetary constraints set by the Central Office. As a pilot implementation, the treatment selection tool was then run for each pavement classification in each district. The results of this pilot suggest that this selection tool has the potential to be a practical decision support tool.

KW - Best practices

KW - Cost effectiveness

KW - Decision making

KW - Implementation

KW - Overlays (Pavements)

KW - Pavement maintenance

KW - Performance measurement

KW - Preventive maintenance

KW - Sealing compounds

KW - Virginia

UR - [http://www.viriniadot.org/vtrc/main/online\\_reports/pdf/16-r3.pdf](http://www.viriniadot.org/vtrc/main/online_reports/pdf/16-r3.pdf)

UR - <https://trid.trb.org/view/1367951>

ER -

TY - JOUR  
 AN - 01576626  
 JO - Journal of Materials in Civil Engineering  
 PB - American Society of Civil Engineers  
 AU - Li, Feng  
 AU - Li, Hui  
 AU - Li, Tinggang  
**TI - Evaluation of Premature Failures of Asphalt Pavement Crack Sealing Bands**  
 PY - 2016/03  
 VL - 28  
 IS - 3  
 SP - Content ID 04015149  
 AB - Compared to conventional hot-applied asphalt sealant, the new cold-applied crack seal bands have outstanding advantages such as high installation efficiency, fewer secondary failures, and more environmentally friendly. However, some new failure modes happen during field application. Based on field investigation and laboratory testing, the short-term and long-term failure modes of seal bands were identified in this study. The laboratory testing methods were then developed to evaluate the short-term or premature failures and explore the causes of the short-term failures of installation failure or bending, unevenness, and stripping. The strategies to prevent and reduce the short-term failures of crack sealing bands were recommended regarding material selection and construction control.  
 KW - Asphalt pavements  
 KW - Bending  
 KW - Cracking  
 KW - Failure  
 KW - Laboratory tests  
 KW - Sealing compounds  
 KW - Stripping (Pavements)  
 UR - [http://dx.doi.org/10.1061/\(ASCE\)MT.1943-5533.0001434](http://dx.doi.org/10.1061/(ASCE)MT.1943-5533.0001434)  
 UR - <https://trid.trb.org/view/1368912>  
 ER -

TY - RPRT

AN - 01578444

AU - Urquhart, R

AU - Aguiar, L

AU - Khoo, K Y

AU - Austroads

**TI - Seal design improvement for low volume roads**

SN - 9781925294682

PY - 2015/09

SP - 59p

AB - The current version of the Austroads sprayed seal design method was published in 2006 and has been in use for the last nine years. During recent times, a number of sprayed sealing practitioners have indicated that the basic voids factor for single/single seals in the current Austroads sprayed seal design method is too high for low volume roads. To address these concerns, a questionnaire was initially distributed to jurisdictions and local councils to determine the extent of the concerns. The results obtained during a literature review of the derivation of Austroads basic voids factor for single/single seals, and the equivalent factor in the New Zealand seal design method, were used as a basis to propose changes to the Austroads basic voids factor. The responses to the questionnaire indicated that the main issue associated with the Austroads sprayed seal design method was that the basic voids factor for single/single seals was too high for low volume roads. The results obtained during the literature review indicated that the Austroads basic voids factor has developed empirically over time based on observations by sealing experts and practitioners, while the current New Zealand equivalent factor is based on quantitative measurements obtained during an extensive series of road trials. As the New Zealand equivalent of the basic voids factor was based on quantitative measurements, the New Zealand seal design approach was used to propose changes to the Austroads basic voids factor. A new version of the Austroads basic voids factor has been proposed for single/single seals which will require lower basic voids factors to be used for low volume roads. The new version of the Austroads basic voids factor was compared with recent Australian seal data/observations in order to investigate whether its use would result in issues with sprayed seals. Based on these comparisons, it appears unlikely that use of the new version of the Austroads basic voids factor will result in issues with sprayed seals.

KW - Australia

KW - Design (overall design)

KW - Interviews

KW - Low traffic road

KW - Low volume roads

KW - New Zealand

KW - Pavement design

KW - Pavement technology

KW - Pavements

KW - Porosity

KW - Questionnaire

KW - Seal coats

KW - Sealing coat

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surface texture

KW - Texture



UR - <https://www.onlinepublications.austroads.com.au/items/AP-T302-15>

UR - <https://trid.trb.org/view/1372585>

ER -

TY - RPRT

AN - 01578448

AU - Herrington, P R

AU - Koddipily, S

AU - Henning, T F

AU - New Zealand Transport Agency

**TI - Flushing in chipseals**

SN - 9780478445299

PY - 2015/09

IS - 576

SP - 101p

AB - This report details research carried out from 2012 to 2015 into chip seal flushing. The physical mechanisms causing flushing were investigated and a model was developed to predict the growth of flushing over the New Zealand state highway network. Factors making a major contribution to flushing are: 1. aggregate abrasion and breakdown; 2. compaction and reorientation of the seal layer under traffic; 3. water venting and sub-surface stripping in seal layers. Factors having no or making only a minor contribution to flushing are: 1. thermal expansion of the bitumen; 2. excess bitumen application; 3. binder viscosity. Further work is needed to quantify the significance of chip embedment into the basecourse. A two-part model using parameters in the NZ Transport Agency Long-Term Pavement Performance database was developed. The first part uses a logistic model to predict the onset of flushing and an accuracy of 74% when used to predict the initiation of flushing on a separate data set. The second part uses a linear model to predict the rate of flushing progression. First-coat seals, and second and higher generation seals were modelled separately. The linear model was statistically strong (R2 of 0.445 for first-coat seals and 0.628 for second and higher generation seals).

KW - Binders

KW - Bleeding (bitumen)

KW - Bleeding (concrete/bitumen)

KW - Bleeding (Pavements)

KW - Chip seal

KW - Chip seals

KW - Chippings

KW - Deterioration

KW - Mathematical models

KW - Modelling

KW - New Zealand

KW - Pavement distress

KW - Pavement technology

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Stripping (binder)

KW - Stripping of binder

KW - Surface course (Pavements)

KW - Surfacing

UR - <http://www.nzta.govt.nz/resources/research/reports/576/>

UR - <https://trid.trb.org/view/1372589>

TY - JOUR

AN - 01580838

JO - Road and Transport Research

PB - ARRB Group Limited

AU - Nataadmadja, A D

AU - Wilson, D J

AU - Costello, S B

AU - Do, M -

**TI - The application of a skid resistance deterioration model to various New Zealand aggregates**

PY - 2015/06

VL - 24

IS - 2

SP - 14-25

AB - A number of studies have been undertaken to help predict infield long-term skid resistance performance. The Polished Stone Value (PSV) test is the oldest and the most common test used worldwide to rank the skid resistance performance of road surfaces. Due to certain limitations of the PSV test, other laboratory test methodologies have been developed as potential alternatives. One of the limitations of the PSV test is that it only provides end of test results, whereas it is desirable to observe the skid resistance deterioration trend during the polishing process, in particular for research applications. This paper discusses the application of a mathematical model, originally developed for asphaltic concrete surfaces, to predict the skid resistance deterioration trend under polishing for a range of New Zealand chip seal aggregates. A laboratory skid resistance testing device, known as the Wehner/Schulze device, was used for this study since the model was originally derived based on test results obtained using this type of device. It was found that the model was capable of replicating the skid resistance deterioration trend under laboratory polishing of the chip seal aggregates used in this research. It was also found that the model coefficients were dependent on aggregate geological types, and thus suggested that a set of coefficients obtained for a specific aggregate source may be able to provide information on infield skid resistance performance of that specific aggregate type, if the model is found to be capable of replicating skid resistance deterioration trends in the field as well. As part of future research, the model will be calibrated against infield skid resistance.

KW - Chip seal

KW - Chip seals

KW - Mathematical models

KW - Modelling

KW - New Zealand

KW - Pavement components

KW - Pavement design

KW - Pavement materials

KW - Pavement performance

KW - Pavement technology

KW - Pavement testing

KW - Pavements

KW - Sealing coat (on top of the surfacing)

KW - Skid resistance

KW - Skidding resistance

KW - Test procedures

KW - Tests for suitability, service and quality

UR - <https://www.arrb.com.au/Information-services/Publications/Issue.aspx?id=55>

UR - <https://trid.trb.org/view/1375117>

ER -

TY - JOUR  
AN - 01586014  
JO - Texas Transportation Researcher  
PB - Texas Transportation Institute  
**TI - Seal coats : sharing lessons learned, testing new methods**  
PY - 2015  
SP - pages 8-9  
AB - Sidebar: Implementation of new specification for asphalt binders in seal coats.  
KW - Asphalt pavements  
KW - Maintenance  
KW - Overlays (Pavements)  
KW - Pavements  
KW - Texas  
UR - <https://trid.trb.org/view/1387409>  
ER -

TY - JOUR

AN - 01588339

JO - Journal of Testing and Evaluation

PB - ASTM International

AU - Li, Feng

AU - Li, Tinggang

**TI - Field Investigation and Laboratory Evaluation of Asphalt Pavement Crack Seal Band**

PY - 2015/01

VL - 43

IS - 1

SP - pp 123-132

AB - Crack sealing and filling are two of the main traditional techniques of asphalt pavement preventive maintenance. However, these techniques have the shortcomings of low operating efficiency and poor performance such as secondary cracking and edge failure. In this paper, the investigation results of field performance of crack seal band are presented. The seal band is a promising material of crack repair because it results in fewer secondary cracks and greater operating efficiency (two to four times more efficient than crack sealing). However, the field investigation also revealed four major failure modes of seal band, namely, unevenness, cohesion failure, adhesion failure, and pullout that provide the demand to carry out laboratory studies on the properties of seal band material. The following standards are referenced in the studies: (1) standard of hot-applied sealant, (2) standard of building waterproof roll, and (3) standards of related enterprises. Six evaluating test methods are put forward based on the laboratory studies, including: thickness meterage, width meterage, cone penetration test, softening point test, pullout test, and bond test. Fifteen seal band samples are tested in a laboratory evaluation. Based on the field investigation and test results, the technical requirements of different seal bands used in different areas are proposed.

KW - Adhesion

KW - Asphalt pavements

KW - Cohesion

KW - Cracking

KW - Laboratory tests

KW - Preventive maintenance

KW - Pullout tests

KW - Sealing compounds

KW - Waterproofing

UR - <http://dx.doi.org/10.1520/JTE20130196>

UR - <https://trid.trb.org/view/1391878>

ER -

TY - CONF

AN - 01592506

AU - Ghosh, Debaroti

AU - Turos, Mugurel

AU - Johnson, Ed

AU - Marasteanu, Mihai

AU - Transportation Research Board

**TI - Rheological Characterization of Asphalt Binders Treated with Biosealants for Pavement Preservation**

PY - 2016

SP - 12p

AB - Pavement preservation is playing an increasingly significant role in maintaining our aging pavement infrastructure under severe budget constraints. One important component is the use of surface treatments based on application of sealants. Recently, a number of new products, called bio sealants, have been used to treat aging pavement surfaces. The objective of this study is to investigate rheological properties of the binders treated with these materials to understand the mechanism by which they may improve pavement performance. One plain asphalt binder and four types of sealants, two oil-based and two water-based, were used in the experimental work. The results obtained using a dynamic shear rheometer and a bending beam rheometer were used to determine the changes in rheological properties and the change in performance grade. It was observed that the oil-based sealants have a significant softening effect of the control binder compared to the water-based sealants.

U1 - Transportation Research Board 95<sup>th</sup> Annual Meeting Transportation Research Board  
Washington, DC, United States StartDate:20160110 EndDate:20160114 Sponsors: Transportation Research Board

KW - Asphalt pavements

KW - Biosealants

KW - Bituminous binders

KW - Pavement preservation

KW - Rheological properties

KW - Sealing compounds

KW - Surface treating

UR - <https://trid.trb.org/view/1394046>

ER -

TY - CONF

AN - 01593517

AU - Lamarre, Ahmed

AU - Fini, Ellie

AU - Aflaki, Sassan

AU - Transportation Research Board

**TI - Impact of Water Conditioning on Crack Sealant Properties**

PY - 2016

SP - 14p

AB - Sealants are commonly used to insulate cracks and joints preventing water from entering the underlying structure. However, extended exposure of sealants to water has shown to negatively impact sealant properties causing gradual degradation of sealant performance. In addition, sealants show different degradation rates when they are exposed to water depending on their chemical composition and environmental conditions. While there have been many studies on characterizing sealant performance in dry conditions, there has been no comprehensive experimental tests to evaluate crack sealant water susceptibility based on a fundamental material property. This paper introduces four laboratory tests to investigate the effect of water exposure on different crack sealants commonly used in cold, moderate and hot climates. The first test examines crack sealants' rheological properties and relaxation time using a Dynamic Shear Rheometer (DSR). The relaxation time, which is the time it takes for the stress to disappear when a constant strain is applied on the crack sealant, is calculated to determine how fast the recovery takes place before and after water conditioning. It is hypothesized that it will take longer for the stress to disappear after the sealant is exposed to water for extended time. The second test uses the Bending Beam Rheometer (BBR) machine to measure the crack sealant's ability to resist low temperature cracking. The third test implements Direct Adhesion Tester (DAT) to determine the load required to cause the sealant's adhesion failure before and after water exposure. The fourth test identifies the chemical functional groups in sealants using the Fourier Transform Infrared (FTIR). The FTIR shows the presence of oxygen bond after water conditioning indicating increased extent of aging. Six different hot-poured crack sealants were investigated in this study. A ranking of the sealant's physical and chemical qualities is performed based on the DSR, BBR and DAT.

U1 - Transportation Research Board 95<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20160110 EndDate:20160114 Sponsors: Transportation Research Board

KW - Adhesion

KW - Aging (Materials)

KW - Cracking

KW - Hot pour sealants

KW - Laboratory tests

KW - Low temperature

KW - Moisture damage

KW - Moisture susceptibility

KW - Rheological properties

KW - Sealing compounds

UR - <https://trid.trb.org/view/1394247>

ER -



TY - CONF

AN - 01588862

AU - Sullivan, B

AU - Deller, M

**TI - Incorporation experience and knowledge into spray seal design**

PY - 2015/09

SP - 11p

AB - The principal surfacing treatment used in Australia is a spray sealed surface. When applied correctly, spray sealed surfaces offers an economical all weather solution for low and medium volume roads. The appropriate design of spray seals requires careful, selection of the appropriate treatment for the conditions, correct base preparation and a mix of engineering and experience. The design of spray seals in Australia is commonly undertaken using the Austroads spray seal design manual. The Austroads procedure allows the design of spray seals with significant variation in both binder application rates and aggregate spread rates, the adjustment of these rates is undertaken based on both experience and field trials, however little guidance is given on how and when to apply adjustments and in the past was based off local experience. With changes in procurement methods, this local experience is diminishing and more emphasis is being placed on the design method over experience, as such the design procedure is being applied as a rule rather than a starting point. Their overreliance on the seal design procedure instead of experience and proper construction methodologies is leading to significant issues with poor performance of spray seal surfacing. This paper recommends a complete approach to the design of spray seals by incorporating experience and knowledge into the design procedure, by: undertaking an assessment of the past performance of spray seals for the local, environment, traffic loading and base conditions and adjusting the Austroads design approach. The paper also presents common issues which continue to appear in seal design and performance, such as: embedment, inadequate design strategies, poor surface preparation and lack of field calibration procedures. By undertaking this approach significant improvements in the performance of spray seals should be expected.

U1 - AAPA International Flexible Pavements Conference, 16<sup>th</sup>, 2015, Gold Coast, Queensland, Australia  
StartDate:00000 EndDate:00000

KW - Aggregate

KW - Aggregates

KW - Australia

KW - Binder

KW - Binders

KW - Design (overall design)

KW - Design guide

KW - Pavement design

KW - Pavement technology

KW - Pavements

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Standardization

UR - <https://trid.trb.org/view/1396414>

ER -

TY - CONF

AN - 01588863

AU - Esnouf, J

AU - Hogan, B

**TI - Hamlet treatments: innovative road surfacing treatment for township areas**

PY - 2015/09

SP - 7p

AB - Road surfaces in small rural towns are generally sprayed seals, and these seals are often exceeding the limits of their performance. When the time comes for periodic maintenance of the roads in these locations the selection of new road surface treatment is often difficult. This is because the application of a new sprayed seal may no longer be appropriate in many cases, and the pavements are often too weak and/or variable to support an asphalt surfacing successfully. In the Northern Region of VicRoads there are many arterial roads in small townships that require periodic maintenance treatments, and an innovative treatment type suitable for these townships has been developed. The treatment utilizes some of the advantages of sprayed seals, as well as advantages of an asphalt surfacing to provide a smooth, flexible, and waterproof surfacing that is suitable for through traffic, local traffic, pedestrians and cyclists – all of whom share the road in these townships.

U1 - AAPA International Flexible Pavements Conference, 16<sup>th</sup>, 2015, Gold Coast, Queensland, Australia  
StartDate:00000 EndDate:00000

KW - Australia

KW - Highway maintenance

KW - Highway operations

KW - Highways

KW - Maintenance

KW - Pavement technology

KW - Road maintenance

KW - Road management

KW - Road network

KW - Road networks

KW - Rural area

KW - Rural areas

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Types of roads by network

KW - Victoria

UR - <https://trid.trb.org/view/1396415>

ER -

TY - CONF

AN - 01588864

AU - Tuxworth, J

AU - Kilpatrick, R

AU - White, A

**TI - Investigation of spray seal pavement failure at Caloundra Tennis Centre**

PY - 2015/09

SP - 6p

AB - Built Environment Collective was commissioned to provide Civil consulting services for the Caloundra Tennis Centre Redevelopment. The project involved a 580 square meter car park extension. A two-coat spray seal pavement was determined appropriate with respect to budget requirements and infrequent light vehicle usage. Three months into the on-maintenance period the new car park pavement exhibited significant aggregate stripping. The performance of the two-coat spray seal as-constructed was reviewed to determine suitability and method of failure. Response was also provided to the sub-contractor's claims that: 2-coat seal should not be employed for use in a carpark; the pavement performance (and failure) was indicative of a two-coat seal application. This paper compares the as-constructed two-coat spray seal with: the nominated Sunshine Coast Regional Council Specification; Austroads Guidelines; industry best practice.

U1 - AAPA International Flexible Pavements Conference, 16<sup>th</sup>, 2015, Gold Coast, Queensland, Australia  
StartDate:000000 EndDate:000000

KW - Australia

KW - Caloundra, Queensland

KW - Car park

KW - Contractor

KW - Contractors

KW - Failure

KW - Fatigue (mater)

KW - Fatigue (Mechanics)

KW - Material fatigue

KW - Parking

KW - Parking facilities

KW - Pavement technology

KW - Pavements

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

UR - <https://trid.trb.org/view/1396416>

ER -

TY - CONF

AN - 01588874

AU - Clayton, R A

AU - Jansz, R

**TI - A new era in sustainable road construction using asphalt in Western Australia**

PY - 2015/09

SP - 13p

AB - Great Eastern Highway upgrade in Western Australia was constructed with sustainability as one of its significant key performance indicators and strong focus on infield asphalt characteristics, in particular, permeability, against a backdrop of stripping issues in earlier Perth works. In the design phase there was significant co-operation to establish practical inputs into the pavement design based on production mix data, while the opportunity for delivering novel technologies was canvassed. Concerns about asphalt stripping were dealt with by applying a spray seal to asphalt layers and mandating that any asphalt exposed to rain before sealing was to be removed and replaced. This paper refers to the range of measures taken to control moisture ingress and therefore avoid removal of new asphalt in support of sustainable practice. All pavement elements, from subgrade to final asphalt wearing course, were constructed using a sustainable material or technology. Both recycled asphalt and warm mix asphalt were introduced with instrumentation installed in strategically positioned locations to study field performance. The paper discusses how discoveries from these trials would drive change in all future projects as evident in the current Gateway Project which continues to build on innovative practices. The project delivery model was vital to close collaboration between the Client, Designer, Contractor and Suppliers and delivery of these benefits. Lessons and technologies used also fitted the cultural values and economic sense of sustainability and recycling that can allow Western Australia to appreciate much earlier benefits over the state wide road network.

U1 - AAPA International Flexible Pavements Conference, 16<sup>th</sup>, 2015, Gold Coast, Queensland, Australia  
StartDate:000000 EndDate:000000

KW - Asphalt

KW - Australia

KW - Bituminous materials

KW - Bituminous pavements

KW - Durability

KW - Pavement performance

KW - Pavement technology

KW - Pavements

KW - Polymer asphalt

KW - Polymer modified asphalt

KW - Polymers

KW - Road network

KW - Road networks

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Sustainability

KW - Sustainable development

KW - Types of roads by network

KW - Western Australia

UR - <https://trid.trb.org/view/1396426>

TY - RPRT

AN - 01588945

AU - Brown, D N

AU - Henning, T F

AU - Herrington, P R

AU - Wu, J P

AU - New Zealand Transport Agency

**TI - Chip seal cracking**

SN - 9780478445374

PY - 2015/11

IS - 579

SP - 100p

AB - The fatigue cracking behavior of laboratory prepared chip seal beams and beams cut from field samples was studied using a four-point bending test method. Preliminary results indicate that chip seal fatigue lives at 5°C are up to eight times greater than those of estimated values for asphalt mix under the same loading conditions. The results suggest binder oxidation was not the dominant factor in seal cracking and that cracking in the field may be primarily due to very high, localized deformations. Such deformations may arise through weak basecourse patches formed during construction or more likely, from water damage (to both the basecourse and seal structure itself) arising from leaking seals. Data from long-term pavement performance sites show that overall, the average number of cracks initiated per site increased approximately linearly from the time of crack initiation. The average annual increase in crack length is approximately half the crack length, so as the crack grows the rate of crack growth in mm/year increases. A brief analysis was carried out for two sites that showed an approximately three-year lag between crack initiation and pothole formation. The report proposes practice guidelines and the outline of a performance-based specification for the crack repair of chip seals.

KW - Chip seal

KW - Chip seals

KW - Chippings

KW - Cracking

KW - Deterioration

KW - Fatigue (mater)

KW - Fatigue (Mechanics)

KW - Laboratory test

KW - Laboratory tests

KW - Material fatigue

KW - Mathematical models

KW - Modelling

KW - New Zealand

KW - Pavement performance

KW - Pavement technology

KW - Pavements

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

UR - <http://www.nzta.govt.nz/resources/research/reports/579>

UR - <https://trid.trb.org/view/1396545>

TY - CONF

AN - 01591537

AU - Decker, DS

AU - Canadian Technical Asphalt Association

**TI - State-of-the-Practice for Crack Treatments for Asphalt Pavements**

PY - 2014

SP - pp. 31-60.

AB - Treating cracks in asphalt pavements is a major part of every maintenance engineer's work. The objective of any crack treatment is to minimize the intrusion of water into underlying layers of the pavement structure. Such water infiltrates the base layers of the pavement and may lead to pavement structural failures. Crack treatments fall into two broad categories - crack sealing and crack filling. Crack sealing is generally performed on "working" cracks (e. g. cracks that are more than 1/8" (3 mm) in summer and significantly larger in the winter), although crack sealing can be successfully used for all crack types. Crack filling is generally performed on cracks that do not open and close due to environmental conditions. Much research has been performed on the materials and designs for crack sealing and crack fillings for flexible pavements; however, little is known about variability in the current state-of-the-practice regarding construction techniques and the resulting effectiveness of crack sealing and crack filling. This report summarizes the current state-of-the-practice of crack sealing and crack filling. This report is limited to crack treatments of asphalt pavements, and does not consider joint filling on concrete pavements, reflective cracking retardation techniques, joint construction techniques, or other related issues.

U1 - Proceedings of the Fifty-Ninth Annual Conference of the Canadian Technical Asphalt Association (CTAA): Winnipeg, Manitoba StartDate:00000 EndDate:00000

KW - Bituminous mixture

KW - Bituminous mixtures

KW - Canada

KW - Conference

KW - Cracking

KW - Flexible pavement

KW - Flexible pavements

KW - Joint sealing

KW - Repair

KW - Repairing

KW - State of the art report

KW - State of the art reports

UR - <https://trid.trb.org/view/1399555>

ER -

TY - CONF

AN - 01591713

AU - Goodman, SN

AU - McCann, T

AU - Canadian Technical Asphalt Association

**TI - Field Evaluation of Pavement Preservation Treatments Incorporating Stress Absorbing Membrane Interlayer Technologies**

PY - 2015

SP - pp. 467-480

AB - In 2011, the County of Lanark constructed a series of pavement preservation treatments along a 4.7 km section of Scotch line Road in Perth, Ontario. Unlike traditional practice however, three different Stress-Absorbing Membrane Interlayer (SAMI) technologies were placed upon the pavement surface and covered with micro-surfacing. SAMI treatments placed under Hot Mix Asphalt (HMA) have been used in the past to retard reflective cracking, however the use of SAMI technology with thin preservation treatments may provide additional benefit as compared to un-reinforced systems. The SAMI technologies included i) fibred-reinforced micro-surfacing, ii) fabric-reinforced chip seal, and iii) Fibremat, while a control section received two layers of un-reinforced micro-surfacing. The purpose of the experiment was to directly compare the performance of each individual treatment over time from a preservation perspective, as well as to determine whether any of the treatments provide cost-effective retardation/prevention of reflective cracking from the underlying pavement. After three years in service, significant differences in performance have been observed. This paper discusses the SAMI treatment technologies, observed performance, and the overall cost effectiveness under the conditions of the experiment. Recommendations are also provided to guide agencies wishing to incorporate SAMI technologies into their pavement preservation program

U1 - Proceedings of the Sixtieth Annual Conference of the Canadian Technical Asphalt Association (CTAA): Winnipeg, Manitoba StartDate:00000 EndDate:00000

KW - Absorption

KW - Bituminous mixture

KW - Bituminous mixtures

KW - Canada

KW - Chippings

KW - Conference

KW - Cracking

KW - Durability

KW - Evaluation

KW - Evaluation (assessment)

KW - Field tests

KW - In situ

KW - Layer

KW - Load

KW - Loads

KW - Membrane

KW - Membranes

KW - Micro

KW - Pavement layers

KW - Reinforcement (in mater)

KW - Reinforcing materials

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Surfacing

UR - <https://trid.trb.org/view/1399735>

ER -



TY - SER

AN - 01593941

JO - Transportation Research Synthesis

PB - Minnesota Department of Transportation

**TI - Alternatives to Seal Coats**

PY - 2016/02

IS - TRS 1602

SP - 44p

AB - Seal coats are one of many techniques commonly used for asphalt pavement preservation and chip seals are the most commonly used in Minnesota. In some applications, chip seals are not the best surface treatment alternative, such as in areas with frequent or high stress turning movements like cul-de-sacs or intersections, and can suffer chip loss and/or bleeding. The purpose of this Transportation Research Synthesis (TRS) was to summarize current seal coat practices and identify alternatives that provide pavement protection, extend pavement life similar to chip seals, and avoid the identified problems. Other surface treatment techniques used around the country include fog seals, bio seals, sand seals, sandwich seals, slurry seals, and micro surfacing and include many proprietary or brand name products. Essentially this TRS provides current practices providing the following for city and county engineers: (1) Description of the suite of surface treatment alternatives available on the market, and including material properties, costs, and typical life cycles when available. The term 'life cycle' is intended to include typical application frequency and the anticipated increase in pavement service life. (2) General guidelines to identify current practices and the technique(s) that are best suited for a particular project, including existing pavement condition factors and timing of initial sealing. (3) Provide current practices around expected outcomes of the various treatment methods and suggested measurement tool(s) that agencies can use to track surface treatment performance.

KW - Alternatives analysis

KW - Asphalt pavements

KW - Costs

KW - Literature reviews

KW - Minnesota

KW - Pavement maintenance

KW - Performance measurement

KW - Seal coats

KW - Service life

KW - State of the practice

KW - Surface treating

UR - <http://www.dot.state.mn.us/research/TRS/2016/TRS1602.pdf>

UR - <https://trid.trb.org/view/1400753>

ER -

TY - RPRT

AN - 01596748

AU - Johnson, Eddie

AU - McGraw, Jim

AU - Minnesota Department of Transportation

AU - Minnesota Department of Transportation

**TI - Recommended Practices for Crack Sealing HMA Pavement**

PY - 2008/02//Final Report

SP - 7p

AB - This report is intended to present the conclusions from LRRB 822 Tasks 1-3 in combination with several other pertinent sources including: Chapter 4 of the Best Practices Handbook on Asphalt Pavement Maintenance (2000-04), the Guidelines for Sealing and Filling Cracks in Asphalt Concrete Pavement - Best Practice by the National Guide to Sustainable Municipal Infrastructure (NRC-CNRC, 2003), and Special Provision 2331, Bituminous Pavement Crack Treatment (Mn/DOT-Revised 2/7/2008). Contents include: types of crack repair treatments commonly used in Minnesota; material specifications; crack sealant selection; rout and seal treatment; and crack filling treatment.

KW - Best practices

KW - Hot mix asphalt

KW - Minnesota

KW - Pavement cracking

KW - Pavement maintenance

KW - Sealing compounds

KW - Specifications

UR - <http://www.lrrb.org/media/reports/200854.pdf>

UR - <https://trid.trb.org/view/1403072>

ER -

TY - CONF

AN - 01597082

AU - van Zyl, G D

AU - van der Gryp, A

**TI - Correlation between mean profile depth estimated macro texture depth**

PY - 2015/08

SP - 6p

AB - The surfaced rural road network in South Africa consists mainly of surface dressings comprising single seals, double seals, sand seals, Cape seals and slurry seals. Macro texture on surfaced roads plays an important role in selecting and prioritizing remedial actions, as part of Pavement Management Systems, as well as for the selection of appropriate seal types and binder application rate design. High speed profilers, used on a regular basis for road network surveillance, provide accurate and repeatable data, which could replace subjective visual evaluation and time consuming manual macro texture measurements such as volumetric sand patch tests. As per ISO 13473 guide, the Mean Profile Depth (MPD) value from laser measurements may be transformed to an Estimated Texture Depth (ETD) by applying the transformation equation of  $ETD = 0.2 \text{ mm} + 0.8MPD$ . However, several measurements executed on different surfacing types, with texture depths varying between 0.5 mm and 5.5 mm, indicated a good correlation between MPD and volumetric texture measurement results, but different to the recommended transformation equation. Due to this controversy, a formal study was launched to obtain data on a wide spectrum of macro texture and surfacing types for comparison. This paper provides some background to the need for macro texture data, discusses the experimental design and outcome of comparative testing and highlights problems and variation using different material i.e. sand and glass beads with different grading.

U1 - Conference on Asphalt Pavements for Southern Africa (CAPSA15), 11<sup>th</sup>, 2015, Sun City, South Africa  
StartDate:000000 EndDate:000000

KW - Highway maintenance

KW - Pavement evaluation

KW - Pavement testing

KW - Pavements

KW - Road design and asset management

KW - Road maintenance

KW - Road surface properties

KW - Seal coats

KW - Sealing coat

KW - South Africa

KW - Surface course (Pavements)

KW - Surface texture

KW - Tests for suitability, service and quality

KW - Texture

UR - <https://trid.trb.org/view/1404793>

ER -

TY - CONF

AN - 01597115

AU - Milne, T I

**TI - Overview of enhancements to road surfacing seal design methodologies through seal system and materials modelling**

PY - 2015/08

SP - 12p

AB - Under the SANRAL South African Road Design System (SARDS) Project, research has been undertaken in the field of Thin Surfacing, specifically the road surfacing seal system. The purpose of the seal project is to enhance road surfacing seal design, within the SARDS system. Towards achieving this advance, the seal system has been modelled using finite element methods, and the full system has been developed to model different seal types, on differing pavement types, with variation in environment and traffic. As input to the model, materials research using the Dynamic Shear Rheometer (DSR) has enabled the response and damage modelling of the various bituminous seal binders, under different temperature and ageing regimes, and the seal system simulated using a finite element analysis platform. This paper provides insight into the evolution of the seals component of the SARDS project, and the current road seal design processes, through various stages to the current proposals regarding enhancing seal design, that includes performance assessment and modelling, and its potential contribution in enhancing SARDS.

U1 - Conference on Asphalt Pavements for Southern Africa (CAPSA15), 11<sup>th</sup>, 2015, Sun City, South Africa StartDate:00000 EndDate:00000

KW - Binder

KW - Binders

KW - Pavement design

KW - Pavement performance

KW - Road design and asset management

KW - Seal coats

KW - Sealing coat

KW - South Africa

UR - <https://trid.trb.org/view/1404826>

ER -

TY - CONF

AN - 01597123

AU - van Zyl, G

AU - Jenkins, K

**TI - Overview of long term seal performance**

PY - 2015/08

SP - 13p

AB - Bituminous surfacing seals are used on a high percentage of the southern African road network to protect the mostly granular pavement base layers and to provide wet weather skid resistance, appropriate for the conditions at hand. A study has been designed to empirically model crack initiation and texture loss to assist with the development and calibration of a Finite Element Model (FEM) for seals. Thirty five road sections have been selected throughout South Africa covering different seal and binder types (Single seals, multiple stone seals and Cape seals), age of seal, traffic volume and climatic region for performance investigation. Two samples were taken from each site (In the wheel-path and outside the wheel-path) to also evaluate the effect of traffic on ageing of the binder. In addition to this the performance of different seals on more than six hundred road sections, over a period of fourteen years, has been evaluated to quantify the effect of binder type and film thickness on crack reflection. A synthesis of the key performance variables has led to the development of survivor curves for different seal types, which is a strategic output of the study. This paper provides an overview of findings related to the long term performance of seals in the South African environment. Conclusions are drawn regarding the contribution of different factors influencing crack initiation and texture loss.

U1 - Conference on Asphalt Pavements for Southern Africa (CAPSA15), 11<sup>th</sup>, 2015, Sun City, South Africa  
StartDate:00000 EndDate:00000

KW - Binder

KW - Binders

KW - Cracking

KW - Field studies

KW - Field study

KW - Pavement evaluation

KW - Pavement performance

KW - Pavements

KW - Road design and asset management

KW - Seal coats

KW - Sealing coat

KW - South Africa

KW - Tests for suitability, service and quality

UR - <https://trid.trb.org/view/1404834>

ER -

TY - CONF

AN - 01597127

AU - van Zyl, G D

AU - Fourie, H G

**TI - Key aspects of good performing Cape Seals**

PY - 2015/08

SP - 9p

AB - The Cape Seal originated in the Western Cape Province of South Africa and typically consists of a single seal with the voids between the aggregate filled with slurry. Good performance under most conditions, which include urban and rural environments, low maintenance capability and cold weather construction, resulted in this seal type being selected as the preferred initial seal type on many roads. However, increase in traffic volume and load, availability of new binder types and variations in the seal structure and construction process, have led to some premature failures in recent years in the form of early cracking, bleeding and/or raveling. Information and conclusions drawn from seven investigations, as well as laboratory testing results, have provided significant insight into the causes and mechanisms of failure. This paper summarizes the findings related to various case studies and relevant testing and provides recommendations regarding the selection of appropriate binders for different conditions, design and construction processes to ensure good-performing Cape Seals.

U1 - Conference on Asphalt Pavements for Southern Africa (CAPSA15), 11<sup>th</sup>, 2015, Sun City, South Africa  
StartDate:00000 EndDate:00000

KW - Aggregate

KW - Aggregates

KW - Binder

KW - Binders

KW - Fatigue (Mechanics)

KW - Material fatigue

KW - Pavement design

KW - Pavement performance

KW - Pavement technology

KW - Seal coats

KW - Sealing coat

KW - Western Cape Province, South Africa

UR - <https://trid.trb.org/view/1404838>

ER -

TY - CONF

AN - 01597131

AU - Henderson, M

AU - van der Gryp, A

AU - Crocker, S

AU - van Zyl, G

**TI - A systematic approach to managing the planning and design of spray seals in the Western Cape Province using an expert system**

PY - 2015/08

SP - 7p

AB - The programme of waterproofing the surfaced road network in the Western Cape Province is the foundation for maintaining the roads in a good condition and preventing moisture accelerated distress. Reseal projects are identified and prioritized through the system of visual surveys, the Branch's pavement management system and finally panel inspections. The reseal projects are built on contract and by the district municipalities. SealPro, a software tool, is used to manage the process control on site. The new seal planning and design software system (SPADS) was developed to fill the gap between project identification and process control with SealPro. SPADS comprises two stages, firstly, the planning stage and secondly the design stage. A rigorous methodology was followed in during the development of SPADS and its performance will be assessed after it has been in use for a cycle of use. The planning stage of SPADS was introduced as it was perceived that the rigorous assessment of road conditions to determine the most suitable seal and preparatory treatment is essential to achieving the appropriate results. The seal design is based on TRH3: Design and Construction of Surface Seals (2007), and also includes the latest research subsequent to publication. SPADS is a system that provides the Branch's definitive, methodical approach to providing a design for the most cost effective seals that satisfies all the functional attributes required by any road in the Western Cape Province. A library of projects that have performed well is also provided to benchmark the results of each design.

U1 - Conference on Asphalt Pavements for Southern Africa (CAPSA15), 11<sup>th</sup>, 2015, Sun City, South Africa  
StartDate:00000 EndDate:00000

KW - Highway maintenance

KW - Maintenance management

KW - Material properties

KW - Properties of materials

KW - Road design and asset management

KW - Road maintenance

KW - Seal coats

KW - Sealing coat

KW - Waterproofing

KW - Western Cape Province, South Africa

UR - <https://trid.trb.org/view/1404842>

ER -

TY - CONF

AN - 01597138

AU - O'Connell, J

AU - Mturi, G A

AU - Bredenhann, S

**TI - Properties of cutback binders used for sealing during cold temperatures in South Africa**

PY - 2015/08

SP - 8p

AB - The high demand for bitumen during the South African summer season and the inability of local refineries to consistently meet the national demand for bitumen has resulted in project delays for major sealing contracts. One solution is the introduction of winter seal work. However, lower winter temperatures have long been associated with temperature related adhesion failures of surfacing seals. This problem may be overcome with the introduction of low temperature-friendly binders, often in the form of binders that have been cut back with low or high flash point solvents. Although cutback binders can promote early adhesion at lower temperatures, the effect of excessive cutter on seal performance may be seen as flushing and/or shoving of the seal, with the attendant loss of skid resistance. This paper describes the properties of four original binders (70/100 penetration grade bitumen, SBR – and SBS – modified bitumen, as well as S-R1 crumb rubber modified bitumen) and their cutback forms in terms of Softening Point, Brookfield Viscosity, Complex Modulus and Gas Chromatographic analysis. The results were analyzed and employed to ascertain the effect of the cutter on the original binder and detect any negative effects on the binder properties at an early stage, as well as use the properties of the cut-back binder to tentatively propose a cutback binder specification.

U1 - Conference on Asphalt Pavements for Southern Africa (CAPSA15), 11<sup>th</sup>, 2015, Sun City, South Africa  
StartDate:00000 EndDate:00000

KW - Binder content

KW - Bitumen

KW - Demand management

KW - Materials technology (asphalt/bitumen/concrete)

KW - Pavement performance

KW - Scheduling

KW - Season

KW - Seasons

KW - South Africa

KW - Travel demand management

UR - <https://trid.trb.org/view/1404849>

ER -



TY - CONF

AN - 01597139

AU - O'Connell, J

AU - Mturi, G A

AU - van Zyl, G

AU - Bredenhann, S

**TI - A rapid evaluation of the rate of curing of winter seals**

PY - 2015/08

SP - 10p

AB - Binder that has been cut back can promote early adhesion at lower temperatures, during so-called "winter sealing". However, the effect of excessive cutter on seal performance may be seen as flushing and/or shoving of the seal. The ideal situation to strive for would be the presence of sufficient cutter in the winter to promote adhesion, followed by the loss of volatile components, so that sufficient loss of cutter by summer would result in a minimal risk of flushing, bleeding or shoving. The conventional method of evaluating the level of cutters present in the in situ seal binders is through monitoring the change in softening point (ring and ball) of those binders. This would require the recovery of the binders. However, such an approach faces a number of difficulties, including that the conventional method of recovery would result in the loss of volatile components, affecting the results. Other specialized, time-consuming recovery methods are required, and they are beyond the capabilities of most standard laboratories. Moreover, sampling for softening point analysis is difficult because large samples are required for binder recovery, involving labour intensive sample collection which results in damage to the seal surface; and when a seal is placed on top of an older seal or asphalt surface, it is difficult to remove the upper seal binder selectively. This paper investigates the use of gas chromatography in assessing the rate of dissipation of volatile components from cutback binders used in winter seals. Such a method is demonstrated to be a rapid and effective indicator of the level of volatile components remaining in the winter seal. After investigating a number of sites and seal types, results indicate that, for the trials investigated, most volatile components have dissipated after the first summer season had passed.

U1 - Conference on Asphalt Pavements for Southern Africa (CAPSA15), 11<sup>th</sup>, 2015, Sun City, South Africa  
StartDate:00000 EndDate:00000

KW - Adhesion

KW - Binder content

KW - Pavement evaluation

KW - Pavement performance

KW - Pavements

KW - Road design and asset management

KW - Seal coats

KW - Sealing coat

KW - Season

KW - Seasons

KW - Tests for suitability, service and quality

UR - <https://trid.trb.org/view/1404850>

ER -

TY - CONF

AN - 01597154

AU - Theron, P

**TI - Experience with Winter Cape Seal construction in the Karoo: a case study**

PY - 2015/08

SP - 5p

AB - The pre-coating of surfacing aggregates can promote the early adhesion of the aggregate to the binder at lower temperatures. This case study investigate the performance of pre-coated versus untreated surfacing aggregate for the construction of a 19 mm Cape Seal on National Route projects with winter grade binders. The economic justification of pre-coating aggregate, dealt with briefly in the paper relates to reduced implementation time and time cost saving associated to it. This study further focus on the flux content of these binders and how it impacts on the lifespan of the seal. Since the introduction of the principle of using unfluxed binders in construction processes during winter periods, these are being accepted at face value on construction sites and any testing to determine possible fluxing derivatives are neglected. Possible fluxing content of these binders were later investigated and confirmed by means of laboratory testing. This adds some complexity as to how many controlling factors need to be consistently checked so that positive experiences are gained from the use of binders outside the embargo period.

U1 - Conference on Asphalt Pavements for Southern Africa (CAPSA15), 11<sup>th</sup>, 2015, Sun City, South Africa  
StartDate:000000 EndDate:000000

KW - Binder content

KW - Cold

KW - Costs

KW - Life cycle analysis

KW - Life cycle assessment

KW - Low temperature

KW - Maintenance

KW - Maintenance costs

KW - Maintenance management

KW - Materials technology (asphalt/bitumen/concrete)

KW - Road design and asset management

KW - Seal coats

KW - Sealing coat

KW - South Africa

UR - <https://trid.trb.org/view/1404865>

ER -

TY - CONF

AN - 01597156

AU - Mukandila, E M

AU - Loots, H

AU - Dlamini, P

**TI - Principle of dynamic shear rheometer testing of non-standard samples for cohesion and adhesion of bituminous road seal materials**

PY - 2015/08

SP - 8p

AB - The Dynamic Shear Rheometer (DSR), is an equipment that tests rheological properties, such as the complex modulus and the phase angle of material. The DSR has gained popularity in testing bitumen binder and was recently introduced in South Africa for this purpose. The most common testing setup used for DSR is the "parallel plate" configuration. In the "parallel plate" configuration, the bitumen is placed between two parallel plates, one that is fixed (stator) and the other that oscillates (rotor). The oscillation of the rotor, around its own axis, creates a shear within the bitumen binder and the resulting response, such as strain/stress, are measured. The performance prediction for road seals can be evaluated by the investigation of seal failure parameters. Among these failure parameters the following can be mentioned: cracking due to low temperature and ageing of binder, which is referred to as cohesion failure within the binder; adhesion failure or stripping, which happens between the seal stone and binder. The DSR was utilized as a testing device in the investigation of cohesion (fatigue damage within the seal binder) and adhesion (fatigue damage between seal stone and binder). The outcome of these tests were fatigue damage expressed in terms of stiffness complex modulus reduction. Special testing setups were required in order to perform cohesion and adhesion tests using the DSR. These testing setups were based on the Lifetime Optimization Tool (LOT) research programme from the Laboratory of Geoscience - Road and Railway Engineering, Delft University of Technology (TU Delft), Netherlands. This paper presents the testing setups used for cohesion and adhesion of bituminous road seal materials. The testing principle and protocols are also discussed. The testing challenges of the special testing setups will be highlighted.

U1 - Conference on Asphalt Pavements for Southern Africa (CAPSA15), 11<sup>th</sup>, 2015, Sun City, South Africa  
StartDate:00000 EndDate:00000

KW - Binder

KW - Binders

KW - Fatigue (Mechanics)

KW - Material fatigue

KW - Materials technology (asphalt/bitumen/concrete)

KW - Pavement testing

KW - Pavements

KW - Rheology

KW - Seal coats

KW - Sealing coat

KW - South Africa

KW - Tests for suitability, service and quality

UR - <https://trid.trb.org/view/1404867>

ER -

TY - RPRT

AN - 01599192

AU - Tsai, Yichang (James)

AU - Wang, Zhaohua

AU - Georgia Institute of Technology

AU - Georgia Department of Transportation

AU - Federal Highway Administration

**TI - Next Generation Crack Sealing Planning Tool for Pavement Preservation**

PY - 2016/03//Final Report

SP - 89p

AB - As one of the most popular preventive maintenance methods, crack sealing and filling (CS/CF) has been widely used by state highway agencies. Due to stringent highway budgets and the lack of work forces in state highway agencies, it is urgent that CS/CF, as well as other types of pavement preservation methods, be incorporated in a pavement management system (PMS). For this purpose, this research project proposed a systematic framework to study the cost-effectiveness of CS/CF and incorporate CS/CF planning in a PMS. Three key research objectives have been investigated: 1) to propose an accurate workload estimation method using 3D laser data and automatic crack detection and crack width measurement method, 2) to propose a quantitative methodology to objectively evaluate CS/CF effectiveness, and 3) to propose a Fisher-clustering-algorithms-based pavement segmentation method to partition a pavement network into individual CS/CF projects. The proposed methodology has been evaluated using different case studies and has demonstrated promising results. It is hoped this research project will advance the state-of-good-repair practices for asphalt pavement crack sealing into the next generation to prolong the life of pavements.

KW - Case studies

KW - Cost effectiveness

KW - Evaluation

KW - Flaw detection

KW - Methodology

KW - Pavement cracking

KW - Pavement maintenance

KW - Pavement management systems

KW - Preventive maintenance

KW - Sealing (Technology)

KW - Workload

UR - [http://g92018.eos-intl.net/eLibSQL14\\_G92018\\_Documents/14-37.pdf](http://g92018.eos-intl.net/eLibSQL14_G92018_Documents/14-37.pdf)

UR - <https://trid.trb.org/view/1407012>

ER -

TY - RPRT

AN - 01599108

AU - Herrington, P R

AU - Wu, J P

AU - BENTLEY, G

AU - New Zealand Transport Agency

**TI - Bitumen performance tests**

SN - 9780478445930

PY - 2016/04

IS - 587

SP - 69p

AB - Aspects of bitumen performance in chip seals related to the development of a New Zealand performance-based specification for chip seal binders were investigated. Compatibility with kerosene: Differences due to the base (unmodified) viscosity were far greater than those produced by small differences in kerosene compatibility showing that this requirement is probably unnecessary in the new specification. Adhesion to aggregate: Acid number and a 'wetting test' based on the MSCR test (AASHTO T 350-14) at 25 degrees C were suggested for inclusion in the new specification. Such tests provide protection against likely poorly performing bitumen's and help ensure batch to batch consistency. The tests would be carried out in conjunction with Vialit plate tests. Chip retention: Bitumen cohesive energy as a control property for chip retention was investigated. The measured cohesive energy is strongly affected by the viscoelastic properties of the binder. A tensile test at low temperatures is a better alternative with a minimum yield (rupture), stress and strain specified. At high temperatures tensile tests are impractical and damage through large non-recoverable deformations of the binder below the yield strain must also be controlled for. Instead the MSCR test with a maximum creep compliance and a minimum percent recovery would be used.

KW - Bitumen

KW - Chip seal

KW - Chip seals

KW - Material testing

KW - Materials technology (asphalt/bitumen/concrete)

KW - Materials tests

KW - New Zealand

KW - Sealing coat (on top of the surfacing)

KW - Specifications

KW - Strength (mater)

KW - Tensile strength

KW - Test method

KW - Test procedures

KW - Viscosity

UR - <http://www.nzta.govt.nz/resources/research/reports/587/>

UR - <https://trid.trb.org/view/1408106>

ER -

TY - CONF

AN - 01608226

JO - Transportation Research Procedia

PB - Elsevier

AU - Gnatenko, Roman

AU - Tsyrukunova, Kateryna

AU - Zhdanyuk, Valeriy

**TI - Technological Sides of Crack Sealing in Asphalt Pavements**

PY - 2016

VL - 14

SP - pp 804-810

AB - Cracks are one of the most widespread modes of deterioration of asphalt concrete road pavements in Ukraine. The main cause of cracking in asphalt pavements is tensile stress due to loads from vehicles as well as abrupt temperature decrease and its significant gradients in winter.

Observations indicate that joint influence of the above-mentioned factors results in cracking in relatively thin asphalt overlays (5 to 10 cm), placed on existing pavement surface with cracks in wearing course, during the first year of performance. Most extensively cracks appear in spring and autumn, and open in winter. Cracks have different length, width and depth. At high temperatures in summer period "young" minor cracks can partly be rolled by wheels of vehicles at wheel path due to bitumen softening in asphalt concrete. Practice of repair works shows that crack sealing at early stage of their initiation allows us to avoid premature pavement deterioration and increase its service life. Particular significance has crack sealing prior to beginning of precipitations in autumn as moisture penetration in pavement layers through cracks in surface layer and then in subgrade soil accelerates premature deterioration of the whole structure. In severely continental climate of Ukraine surface of asphalt pavements in summer can have a temperature up to 60 – 65 °C, and up to minus 30 °C in winter, which requires from materials for crack sealing special properties as heat resistance and flexibility at low temperatures. In Ukraine sealing of cracks with polymer modified bitumen sealants and hot applied mastics in asphalt pavements is applied, allowing block access of moisture to lower pavement layers and increase its durability. Petroleum road bitumen, modified with plasticizer, is used as base for production of bitumen-polymer sealants. Combination of plasticized bitumen and SBS-type polymer, and cationic polymer latex allows to obtain sealant characterized by both high elasticity, flexibility at low temperatures and heat resistance. Addition of mineral filler to the composition of bitumen-polymer sealant gives us bitumen-polymer mastic. Results of research of different filler influence on heat resistance, elasticity, flexibility and performance of polymer modified mastics at low temperatures have been highlighted in the paper. Influence of temperature of asphalt pavement on strength of adhesive interaction with polymer modified mastic has been determined. Experience of practical implementation of techniques of crack sealing in asphalt pavements on motor road network in Ukraine indicates that technique of filling of beforehand prepared "reservoir" with hot bitumen-polymer sealant or mastic with over band on the surface of asphalt pavement results in the highest impermeability of crack, compared to flush filling of "reservoir". To increase durability it is important that the "reservoir" created by milling of asphalt pavement had square or rectangular cross-section and passed through crack. Technological sides of practical implementation of techniques of crack sealing in asphalt pavements are covered in the paper.

U1 - 6<sup>th</sup> Transport Research Arena (TRA2016)European Commission Conference of European Directors of Roads Warsaw, Poland StartDate:20160418 EndDate:20160421 Sponsors: European Commission, Conference of European Directors of Roads

KW - Cracking of asphalt concrete pavements

KW - Pavement maintenance  
KW - Pavement performance  
KW - Polymer asphalt  
KW - Sealing compounds  
KW - Temperature  
KW - Tensile strength  
KW - Traffic loads  
KW - Ukraine  
KW - Wearing course (Pavements)  
UR - <http://dx.doi.org/10.1016/j.trpro.2016.05.028>  
UR - <http://www.sciencedirect.com/science/article/pii/S235214651630028X>  
UR - <https://trid.trb.org/view/1413935>  
ER -

TY - CONF

AN - 01609720

AU - Hu, Chichun

AU - Ma, Jiexian

AU - Jiang, Hong

AU - Zhao, Jianying

AU - Chen, Zhiwu

AU - American Society of Civil Engineers

**TI - Study on Exhaust Degradation Material for Asphalt Pavement**

SN - 9780784480052

PY - 2016

SP - pp 38-44

AB - Many researches have focused on the application of titanium dioxide (TiO<sub>2</sub>) to the asphalt pavement to achieve the function of degrading automobile exhaust. Due to the good compatibility, high fluidity and strong bonding strength of waterborne epoxy resin, it is selected as the carrier of Nano-titanium dioxide (TiO<sub>2</sub>). Therefore, in this study the feasibility of TiO<sub>2</sub> waterborne epoxy resin as fog seal and exhaust degradation material was evaluated in asphalt pavement. To achieve this goal, laboratory photocatalytic performance, mechanical property and skid resistance tests were performed on waterborne epoxy resin with different content of nano-TiO<sub>2</sub>. The results showed that nano-TiO<sub>2</sub> waterborne epoxy resin not only decomposes NO pollutant efficiently, but also maintains the skid resistance of the pavement.

U1 - Fourth Geo-China International Conference Shandong University Shandong Department of Transportation University of Oklahoma Chinese National Science Foundation American Society of Civil Engineers Shandong, China StartDate:20160725 EndDate:20160727 Sponsors: Shandong University, Shandong Department of Transportation, University of Oklahoma, Chinese National Science Foundation, American Society of Civil Engineers

KW - Asphalt pavements

KW - Epoxy resins

KW - Exhaust gases

KW - Sealing compounds

KW - Skid resistance

KW - Titanium

UR - <http://dx.doi.org/10.1061/9780784480052.005>

UR - <https://trid.trb.org/view/1417256>

ER -



TY - RPRT

AN - 01608561

AU - Lee, Jusang

AU - Hastak, Makarand

AU - Ahn, Hyung Jun

AU - Purdue University

AU - Indiana Department of Transportation

AU - Federal Highway Administration

**TI - Crack Sealing and Filling: Best Practices**

SN - 9781622603831

PY - 2015/10//Final Report

SP - 53p

AB - This study investigated the current state of practice for crack sealing/filling. In addition, the Indiana Department of Transportation (INDOT) crack sealing/filling practice was experimentally evaluated for the effectiveness of crack sealing/filling, the effectiveness of routing, the performance of the different types of crack sealants and fillers, the validity of sealant performance grade system, and the crack sealing/filling equipment performance. The key findings from an extensive literature review and nationwide/statewide survey performed in 2012 are the following: 1) 65% of the responses indicated that the routing is required for the crack sealing/filling application; 2) ASTM D 6690 Type II was the most widely used sealant type and only Missouri and Indiana included emulsions in their specifications as crack sealing/filling materials; and 3) crack sealing/filling equipment availability and their maintenance were the biggest concerns. Based on the two-year experimental investigation, the crack sealing/filling was determined to be effective in preventing the occurrence of pavement surface crack distress. The crack sealing/filling was concluded to be effective in maintaining crack integrity and resisting sealant and filler deformations due to the seasonal crack movement. The routing was not determined to be effective in terms of the pavement performances. However, Adhesive/Cohesive/Spalling (ACS) failure results showed that the routed sections significantly outperformed the non-routed sections. In addition, the test results indicated that the ASTM 6690 Type II crack sealants performed relatively well in terms of pavement and crack performance. The correlation between the sealant performance grades and the pavement and crack performances with different types of sealants and fillers were poor and insignificant. The mixed results regarding the effectiveness of the routing were obtained from the literature review and the field evaluation. As a result, it was recommended from the SAC meeting that routing in the 2090 Activity be limited to a single transverse crack (reflective cracks) on asphalt concrete over concrete pavements. INDOT currently uses the ASTM Type II crack sealants, which showed an overall good pavement and crack performances in the evaluation. Therefore, the current INDOT crack sealant material selection process (ASTM Type II) is concluded to be adequate. The experimental results showed that the cracks on wet pavement treated with hot air lance (HAL) had significantly higher bonding between the materials and asphalt pavement surface than the cracks treated with the conventional air compressor. Therefore, the incorporation of a hot air lance in the wet condition is recommended to extend the operable time and seasonal availability for crack filling and sealing construction (2070 and 2090 Activities).

KW - Best practices

KW - Indiana Department of Transportation

KW - Literature reviews

KW - Pavement cracking

KW - Pavement maintenance

KW - Pavement performance

KW - Sealing (Technology)

KW - Sealing compounds

KW - State of the practice

KW - Surveys

UR - <http://dx.doi.org/10.5703/1288284316008>

UR - <https://trid.trb.org/view/1419100>

ER -

TY - RPRT

AN - 01608680

AU - Ghosh, Debaroti

AU - Turos, Mugur

AU - Marasteanu, Mihai

AU - University of Minnesota, Twin Cities

AU - Minnesota Department of Transportation

AU - Minnesota Department of Transportation

**TI - Evaluation of Bio-Fog Sealants for Pavement Preservation**

PY - 2016/06//Final Report

SP - 86p

AB - Pavement preservation is playing an increasingly significant role in maintaining aging pavement infrastructure. One important component is the application of sealants to the pavement surface. In a joint study between Minnesota Department of Transportation (MnDOT) and the University of Minnesota, the field performance and mechanical properties of asphalt mixtures from pavement sections treated with a number of new products, called bio sealants, is investigated. The objective of the study is to obtain relevant properties of treated asphalt materials to understand the mechanism by which sealants improve pavement performance. Laboratory testing was performed on treated asphalt binder and mixtures. For binders, a dynamic shear rheometer and a bending beam rheometer were used to obtain rheological properties of treated and untreated asphalt binders. Field cores from both untreated and treated sections were collected and thin beam specimens were prepared from the cores to compare the creep and strength properties of field-treated and laboratory-treated asphalt mixture. It is observed that the oil-based sealants have a significant softening effect on the control binder compared to the water-based sealants. For asphalt mixtures, different trends are observed for the field samples compared to the laboratory prepared samples. Similar to binder results, significant differences are observed between the asphalt mixtures treated with oil-based and water-based sealants, respectively. From the analysis performed on the bending creep and strength results at low temperature, it is concluded that the application of sealants in the field have no significant effect on these properties. Fourier transform infrared spectroscopy (FTIR) analysis showed that the sealant products could not be detected in mixture samples collected from the surface of the treated section.

KW - Asphalt mixtures

KW - Bituminous binders

KW - Evaluation and assessment

KW - Field studies

KW - Laboratory tests

KW - Pavement maintenance

KW - Pavement performance

KW - Rheological properties

KW - Sealing compounds

KW - Spectroscopic analysis

UR - <http://www.lrrb.org/media/reports/201620.pdf>

UR - <https://trid.trb.org/view/1420002>

ER -

TY - RPRT

AN - 01607889

AU - Patrick, S

AU - Hore-Lacy, W

AU - Choi, Y

AU - Austroads

**TI - Effect of heavy vehicle traffic in sprayed seal design**

SN - 9781925451160

PY - 2016/07

SP - 50p

AB - The principal aim of this work was to examine the effect of heavy vehicle loading on sprayed seals, in order to incorporate such loading impacts into the Austroads sprayed seal design method. The current sprayed seal design method uses an equivalent heavy vehicle factor (EHV(%)) to account for the effects of heavy traffic on sprayed seals which is calculated using a simple equation using information from traffic counts. The seal design results obtained using the simple equation were compared to those obtained when EHV(%) values were determined using a detailed analytical method that utilized weigh-in-motion (WIM) data and seal deterioration models. WIM data was obtained from rural areas of Australia between 2007 and 2011. Four seal design examples were used to compare the different EHV(%) calculation methods. There was either none or very little variation in EHV(%) values when the different methods of calculation were used. This resulted in either none or insignificant variations to the design binder application rates determined by the method (if expected construction tolerances were considered). Considering the increased complexity associated with the WIM-based methods, it appears that the current simple equation to determine EHV(%) will yield results which are suitable for use in the Austroads sprayed seal design method. A comparison of the results obtained using the simple equation to calculate EHV(%), and a commonly used alternative interpretation also indicated that the use of either method had minimal effects on design binder application rate.

KW - Accuracy

KW - Australia

KW - Axle loads

KW - Design (overall design)

KW - Errors

KW - Heavy vehicle

KW - Heavy vehicles

KW - Lorry

KW - Pavement design

KW - Pavement technology

KW - Pavements

KW - Rolling contact

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Traffic count

KW - Traffic counts

KW - Vehicle pavement interaction

KW - Weigh in motion

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T307-16>

UR - <https://trid.trb.org/view/1420569>

TY - RPRT

AN - 01607890

AU - Patrick, S

AU - Austroads

**TI - Selection and design of initial treatments for sprayed seal surfacings**

SN - 9781925451191

PY - 2016/07

SP - 17p

AB - This document is an update of the design of initial treatments for sprayed seal surfacing. The information contained within this document supersedes that found in Austroads AP-T68-06 Update of the Austroads Sprayed Seal Design Method (Austroads 2006b), and replaces Section 12 in that document. The terminology used to describe applying sprayed seals directly onto a pavement basecourse has also been updated. Previously there has been no formal design method used for initial sealing. The typical seal design method may be used for this purpose, with specific adjustments based on the requirements of applying a seal directly to a pavement basecourse.

KW - Australia

KW - Base course (Pavements)

KW - Basecourse

KW - Binder

KW - Binders

KW - Design (overall design)

KW - Design guide

KW - Pavement design

KW - Pavement technology

KW - Pavements

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surface course (Pavements)

KW - Surfacing

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T310-16>

UR - <https://trid.trb.org/view/1420570>

ER -

TY - RPRT

AN - 01607891

AU - Patrick, S

AU - Dias, M

AU - Austroads

**TI - Permeability of sprayed seals: literature review**

SN - 9781925451214

PY - 2016/07

SP - 27p

AB - This report describes a literature review on the permeability of sprayed seal surfacing. This review work was conducted to explore the permeability limits of sprayed seal surfacing, and to determine the influencing factors which allow seals to remain sufficiently waterproof. The testing methods and related equipment that may be used to determine permeability were also investigated. The findings indicate that water ingress is possible through a sprayed seal under atmospheric conditions, and is exacerbated by the presence of higher pressures and dynamic loading, like that caused by passing vehicle tyres. A number of factors (e.g. treatment types, quality of work/maintenance) greatly influence the waterproofing capabilities of sprayed seals. Conducting permeability testing on sprayed seals is complicated by their typically coarse texture, which makes generating a watertight seal between the equipment and the surface very difficult. These interface problems and lack of proper sample collection and/or preparation techniques appear to be the main barriers to conducting routine assessment of the permeability of sprayed seals. Large scale accelerated loading facilities may be utilized for testing permeability of sprayed seal surfacing as these provide realistic pavements and sprayed seals. These also enable intensive monitoring and data collection that would not be readily possible on an in-service road.

KW - Accelerated testing

KW - Accelerated tests

KW - Bituminous pavement

KW - Bituminous pavements

KW - Continuous

KW - Design (overall design)

KW - Literature review

KW - Literature reviews

KW - Moisture content

KW - Moisture sensitivity

KW - Monitoring

KW - Pavement technology

KW - Pavement testing

KW - Pavements

KW - Permeability

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surveillance

KW - Test procedures

KW - Tests for suitability, service and quality

UR - <https://www.onlinepublications.austroads.com.au/items/AP-T311-16>

UR - <https://trid.trb.org/view/1420571>

TY - JOUR

AN - 01611138

JO - Journal of Testing and Evaluation

PB - ASTM International

AU - Lee, J H

AU - Ahn, H J

AU - Shields, T

AU - Harris, D

AU - Li, S E

**TI - Calibration of Seal Coat Application Rate Design**

PY - 2013/03

VL - 41

IS - 2

SP - 10p

AB - This paper presents seal coat performance evaluations of various emulsion and aggregate application rates using three different evaluation methods: International Roughness Index (IRI), friction test, and visual evaluation. Then, considering the seal coat failure criteria, correction factors for seal coat application equipment are introduced. This study confirms the lack of relevance between seal coat application and IRI values because of the thickness of a seal coat. In addition, friction improvements caused by seal coat applications were confirmed within the range of seal coat rates applied. Overall, IRI, friction, and visual inspection did not reveal distinct differences in seal coat performance in terms of application rates in the testing range. Accordingly, seal coats with rates based on the McLeod method showed acceptable performance. The aggregate application rate should be high enough to protect the seal coat from immediate failure during construction but low enough to avoid unacceptable levels of accumulated fines content. Furthermore, immediate failure occurring locally during construction because of incorrect application rate (e.g., insufficient aggregate rate) can cause total failure of a seal coat road because of a chain reaction. However, discrepancies between designed rates and applied rates were observed in the study even after the seal coat equipment was calibrated prior to operation. The equipment factor for aggregate can compensate for rate discrepancies between the target and actual application rates. It was found that the designed emulsion application rate does not need to be corrected for the emulsion distributor because the emulsion rate discrepancy has an insignificant impact on a seal coat's performance.

KW - Bituminous construction

KW - Calibration

KW - Emulsions

KW - Fines (Materials)

KW - Friction course

KW - International Roughness Index

KW - Seal coating

KW - Surface course (Pavements)

UR - <http://dx.doi.org/10.1520/JTE20120021>

UR - <https://trid.trb.org/view/1422932>

ER -

TY - RPRT

AN - 01616876

AU - Fini, Elham (Ellie) H

AU - Lamarre, Ahmed

AU - Nezhad, Shahrzad Hossein

AU - North Carolina A&T State University

AU - Center for Highway Pavement Preservation

AU - Research and Innovative Technology Administration

**TI - Developing a Test Method to Investigate Water Susceptibility of Joint and Crack Sealants**

PY - 2016/10/31/Final Project Report

SP - 65p

AB - Sealants are commonly used to insulate cracks and joints preventing water from entering the underlying structure. However, extended exposure of sealants to water has shown to negatively impact sealants properties causing gradual degradation of sealant performance. While there have been many studies on characterizing sealant performance in dry conditions, there has been no comprehensive experimental tests to evaluate crack sealants water susceptibility based on a fundamental material property. This study introduces five laboratory tests to investigate the effect of water exposure on different crack sealants commonly used in cold, moderate and hot climates. Sealants were acquired in collaboration with University of Illinois Urbana-Champaign. Experimental plan includes several thermo-mechanical and surface characterization tests. Crack sealants' rheological properties and relaxation time was measured using a Dynamic Shear Rheometer (DSR). Sealants' creep compliance was measured using an extended Bending Beam Rheometer (BBR). In addition, a direct adhesion test was incorporated using a Direct Adhesion Test (DAT) machine to determine the load required to bring sealant specimen to adhesion failure. Surface tension was measured using a Goniometer. A higher reduction in surface tension indicates sealant has more susceptibility to water. Chemical structure and formation of any new functional groups was tracked using Fourier Transform Infrared (FTIR) spectroscopy. The extent of change in aforementioned sealant properties before and after water conditioning was used as indicators of sealant susceptibility to water. The experiments results were compared against sealants' field performance data obtained through the Pooled-Fund Crack Sealant Consortium led by the University of Illinois at Urbana Champaign.

KW - Adhesion

KW - Before and after studies

KW - Laboratory tests

KW - Moisture content

KW - Permeability

KW - Relaxation (Mechanics)

KW - Sealing compounds

KW - Surface tension

KW - Test procedures

UR - <http://www.chpp.egr.msu.edu/wp-content/uploads/2014/04/CHPP-Report-NCAT1-2016.pdf>

UR - <http://ntl.bts.gov/lib/60000/60400/60407/CHPP-Report-NCAT1-2016.pdf>

UR - <https://trid.trb.org/view/1429190>

ER -



TY - CONF

AN - 01628573

AU - Cox, Ben C

AU - Howard, Isaac L

AU - Transportation Research Board

**TI - Points of Consideration for Obtaining Cold In-Place Recycling Theoretical Maximum Specific Gravity**

PY - 2017

SP - 15p

AB - Cold in-place recycling (CIR) is a flexible-pavement rehabilitation technique which is becoming more heavily utilized. Since in-place density contributes to performance, accurate density measurements are important. While traditional asphalt concrete density measurement concepts have been soundly established, they have varied considerably for CIR. Recently, a volumetrics-based (i.e. maximum and bulk specific gravity ( $G_{sub\ mm}$  and  $G_{sub\ mb}$ )) density measurement method utilizing vacuum sealing (i.e. CoreLok®) was investigated with promise for CIR treated with bituminous and/or cementitious binders. Therein, CIR  $G_{sub\ mm}$  (focus of this paper) was estimated using reclaimed asphalt pavement (RAP)  $G_{sub\ mm}$  measured via vacuum sealing (ASTM D6857) alongside binder dosages and gravities as inputs in a gravity-proportioning equation. This paper builds on previous work with two objectives: evaluate reliability-based D6857 replication guidance and evaluate cement hydration effects on cement-treated CIR  $G_{sub\ mm}$ . In all, 242  $G_{sub\ mm}$  results are presented. Similar reliability was obtained with D6857 with as many or fewer replicates than AASHTO T209. Cement-treated  $G_{sub\ mm}$  was sensitive to physical state and cement content; cure time and cement hydration inconsistently affected  $G_{sub\ mm}$ . The overall cement-treated CIR  $G_{sub\ mm}$  recommendation is that a value of 0.15 (in place of the previously-recommended 0.10) is more appropriate for the term accounting for cement hydration in the gravity-proportioning equation.

U1 - Transportation Research Board 96<sup>th</sup> Annual Meeting Transportation Research Board  
Washington, DC, United States StartDate:20170108 EndDate:20170112 Sponsors: Transportation Research Board

KW - Cement content

KW - Cold in-place recycling

KW - CoreLok

KW - Density

KW - Equations

KW - Flexible pavements

KW - Hydration

KW - Maximum specific gravity

KW - Measurement

KW - Reclaimed asphalt pavements

KW - Rehabilitation (Maintenance)

KW - Vacuum sealing method

UR - <https://trid.trb.org/view/1437468>

ER -

TY - CONF

AN - 01627646

AU - Li, Feng

AU - Du, Yuchuan

AU - Li, Li

AU - Transportation Research Board

**TI - Laboratory Evaluation of Short and Long Term Performance of Hot-Poured Sealants**

PY - 2017

SP - 17p

AB - Hot-poured sealants are commonly applied to repair cracks on asphalt pavements. However, existing methods of performance evaluation do not fully reflect the performance of hot-poured sealant for pavement application. Therefore, this article proposes different tests, melting point and melt flow index of packing films, sealant viscosity, segregation, thermal aging performance, and bond after water immersion, to specifically address identified problems and evaluate the short and long term performance of hot-poured sealant. A sealant performance ranking system was proposed based on the tests of nine sealants. The indicators of current performance evaluation, installation performance and weatherability were weighted in this system. Different test results were classified and scored and then nine sealants were ranked quantitatively. The proposed system provides a more comprehensive evaluation of field performance of hot-poured sealant compared to existing performance evaluation methods, and correctly ranks the sealants in terms of their practical performance. Therefore, the proposed tests can be employed to complement current performance evaluation indicators.

U1 - Transportation Research Board 96<sup>th</sup> Annual Meeting Transportation Research Board  
Washington, DC, United States StartDate:20170108 EndDate:20170112 Sponsors: Transportation  
Research Board

KW - Aging (Materials)

KW - Laboratory tests

KW - Melting point

KW - Performance measurement

KW - Sealing compounds

KW - Viscosity

UR - <https://trid.trb.org/view/1437542>

ER -

TY - CONF

AN - 01622426

AU - Shuler, Scott

AU - Transportation Research Board

**TI - Factors Related to the Appearance of Transverse Bumps in Asphalt Overlays Placed Over Crack Sealant**

PY - 2017

SP - 9p

AB - Crack sealants are often utilized as a preservation tool in asphalt pavements. These sealants are placed in cracks to prevent water intrusion into the pavement foundation. By reducing water intrusion, the strength of foundation layers is maintained and acceptable pavement performance is extended. However, when a hot mix asphalt overlay is placed on top a pavement containing crack sealants, a bump and additional transverse cracks sometimes occur in the new overlay asphalt. These bumps and sometimes, transverse cracks are initiated during breakdown rolling and become progressively more severe upon further compaction. This paper presents results of a five year study designed to identify factors that relate to the appearance of these bumps and consequent cracks. Results of the study indicate that vibratory breakdown rolling, pavement gradient, sealant geometry, tack coat application rate and tack coat adhesivity are factors that contribute most to the occurrence of bumps and transverse cracks during asphalt overlay construction over crack sealants. Observations suggest that transverse bumps and consequent cracks occur in proportion to the size of the 'bow wave' of asphalt concrete present immediately in front of the breakdown roller. The increase in the 'bow wave' size is dependent on asphalt mixture properties, breakdown roller size, speed, vibration characteristics and pavement gradient. Three pavement test sections also indicate that tack coat application rate has an effect on reducing the appearance of transverse bumps.

U1 - Transportation Research Board 96<sup>th</sup> Annual Meeting Transportation Research Board  
Washington, DC, United States StartDate:20170108 EndDate:20170112 Sponsors: Transportation Research Board

KW - Bituminous overlays

KW - Bumps

KW - Compaction

KW - Pavement cracking

KW - Sealing compounds

KW - Tack coats

KW - Test sections

UR - <http://docs.trb.org/prp/17-01354.pdf>

UR - <https://trid.trb.org/view/1437580>

ER -

TY - CONF

AN - 01622842

AU - Pérez, Rea Maria de la Luz

AU - Hernandez, Padron Genoveva

AU - Reyes, Uzarraga Gustavo

AU - Transportation Research Board

**TI - Characterization of Material Sealant for Cracks in Flexible Pavements**

PY - 2017

SP - 11p

AB - The flexible pavement is the most used for the coating of roads due to its numerous advantages. However, the main disadvantage is the appearance of cracks on the surface, which if they are not treated in a timely manner can cause damage to the infrastructure and reduce the efficiency of the same. Therefore, the cracks should be treated effectively. The method of sealing of cracks is highly used in flexible pavements, but has some difficulties, which is why sealing materials must present characteristics of adhesion, hardness, and resistance to water filtration. The present paper shows the development of a sealant based resin epoxy, which was placed on a stretch of test and subjected to weathering, allowing to know in this way its behavior. The results obtained show that in the conditions of weathering to which was submitted the sealer, this has an acceptable behavior, decreasing by 20% the intrusion of water to layers underlying, besides a null loss of groups functional present.

U1 - Transportation Research Board 96<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20170108 EndDate:20170112 Sponsors: Transportation Research Board

KW - Epoxy resins

KW - Flexible pavements

KW - Pavement cracking

KW - Sealing compounds

KW - Test sections

KW - Weathering

UR - <https://trid.trb.org/view/1437858>

ER -

TY - CONF

AN - 01626228

AU - Sawalha, Mohammed

AU - Ozer, Hasan

AU - Al-Qadi, Imad L

AU - Xue, Hengxiao

AU - Transportation Research Board

**TI - Development of a Modified Adhesion Test for Hot-Poured Asphalt Crack Sealants**

PY - 2017

SP - 18p

AB - Crack sealing is one of the commonly used maintenance technique used in cracks and joints to prevent moisture infiltration into pavements. Crack sealing materials should possess adequate adhesive and cohesive properties to remain intact in the cracks and/or joints depending on the environment and pavement conditions they are installed in. Adhesion failure is the most common failure mechanism, occurring mostly due to poor adhesion capacity of sealants as well as the installation quality. Various standard laboratory tests are currently used to evaluate adhesive properties of sealants to predict their field performance. These tests, however, either lack correlation with the field performance or have not yet been validated. This paper introduces the development of an adhesive prediction test—the modified crack sealant adhesion tester (Modified CSAT). The modified CSAT is an improved version of the existing crack sealant adhesion tester standard (AASHTO TP89) test; it shows consistent results between specimens with sufficient repeatability. In addition, it was also shown that the modified CSAT was successful in capturing the effect of temperature changes and aging on adhesion capacity of sealants. The adhesion test results were compared with the performance of the same sealants installed in different test sites. It was shown that the correlation between the adhesion loads obtained in the laboratory is consistent with the sealant field performance.

U1 - Transportation Research Board 96<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20170108 EndDate:20170112 Sponsors: Transportation Research Board

KW - Adhesion

KW - Adhesion failure

KW - Adhesion tests

KW - Aging (Materials)

KW - Crack sealing

KW - Field tests

KW - Laboratory tests

KW - Pavement cracking

KW - Sealing compounds

KW - Temperature

UR - <https://trid.trb.org/view/1439222>

ER -

TY - CONF

AN - 01627734

AU - Islam, Readul Mohammad

AU - Arafat, Shams

AU - Wasiuddin, Nazimuddin M

AU - Transportation Research Board

**TI - Quantification of Reduction in Hydraulic Conductivity and Skid Resistance Due to Fog Seal in Low Volume Roads**

PY - 2017

SP - 18p

AB - Fog seal increases pavement life and postpones major rehabilitation. The reduction of permeability due to fog sealing will reduce moisture induced damage, but this benefit comes with a temporary loss of surface friction. However, quantifying the effectiveness of fog seal by measuring the permeability is a difficult task. While fog seal may be a good low-cost maintenance option for low volume roads, the rate of recovery of the friction may be very slow due to less rubbing action between fog sealed surface and tire. Four low volume parish roads in Caddo parish, LA have been selected for this study. Two emulsions, namely CSS-1H and E-fog, with three different application rates, were used to evaluate the reduction in hydraulic conductivity and to assess the characteristics of friction over time. Results show that fog seal is expected to be fully cured within 2.5 to 3.5 hours for 0.2-0.4 gal/yd<sup>2</sup> application rate. The same field-cores were tested before and after fog sealing to exactly quantify the reduction in hydraulic conductivity. It was observed that fog seal has significant potential to reduce the hydraulic conductivity. Considering all four pavements and application rates of 0.1-0.22 gal/yd<sup>2</sup>, the average reduction in hydraulic conductivity was 38.5%. Reduction in hydraulic conductivity shows very slight sensitivity to the application rate. Irrespective of road type, emulsion and application rate, fog seal causes a sudden drop in the International Friction Index parameter F60 by 20 to 40%. Fog sealed surface does not return to the original level of friction after three months, however, the rate of recovery was the highest for the busiest of the observed Caddo parish roads.

U1 - Transportation Research Board 96<sup>th</sup> Annual Meeting Transportation Research Board  
Washington, DC, United States StartDate:20170108 EndDate:20170112 Sponsors: Transportation Research Board

KW - Coefficient of friction

KW - Fog

KW - Louisiana

KW - Permeability

KW - Sealing compounds

KW - Skid resistance

KW - Surface course (Pavements)

UR - <http://docs.trb.org/prp/17-06735.pdf>

UR - <https://trid.trb.org/view/1439698>

ER -

TY - CONF

AN - 01627785

AU - Stagg, Daniel

AU - Arafat, Shams

AU - Wasiuddin, Nazimuddin M

AU - Transportation Research Board

**TI - A Parametric Study to Understand the Adhesion Failure Mechanism of Asphalt Sealant**

PY - 2017

SP - 17p

AB - Although adhesive failure is the predominant distress responsible for early sealant failure in asphalt pavement, there is hardly any study available on variation of adhesive strength of sealant-asphalt concrete with temperature change. This study was performed to investigate the adhesive strength of sealant by utilizing a new test setup developed from modification of Texas overlay test. This test method applies direct tension to sealant-substrate assembly, uses reasonable large scale asphalt concrete substrate, performs tests on easily prepared specimens and most importantly does not require any specialized sealant testing machine. In this study, type I and type IV sealants were tested at four temperatures on two different thicknesses to evaluate the adhesive strength. A general conclusion obtained from this study is that sealant recommended for low temperature use (type IV) fails in adhesion irrespective of temperature or thickness. In addition, it follows a good correlation ( $R^2$  value of 0.93) with the elongation at failure. A correlation between shear modulus and adhesive strength for both the sealants at each thickness were also established in this paper having  $R^2$  values over 0.90 for every cases. A general trend on the effect of thickness was observed and was explained by proposing a hypothesis that there exists a certain modulus for each sealant type at which the bond strength remains same irrespective of its thickness. Also, in this study, it was clearly demonstrated that water conditioning of sealant joints reduces adhesive strength significantly by changing failure pattern from cohesive or mix mode to fully adhesive.

U1 - Transportation Research Board 96<sup>th</sup> Annual Meeting Transportation Research Board

Washington, DC, United States StartDate:20170108 EndDate:20170112 Sponsors: Transportation Research Board

KW - Adhesion

KW - Asphalt concrete

KW - Sealing compounds

KW - Shear modulus

KW - Temperature

KW - Thickness

UR - <https://trid.trb.org/view/1439703>

ER -

TY - JOUR

AN - 01627073

JO - KSCE Journal of Civil Engineering

PB - Korean Society of Civil Engineers

AU - Yoo, Hyun-Seok

AU - Kim, Young-Suk

**TI - Development of a Crack Recognition Algorithm from Non-routed Pavement Images Using Artificial Neural Network and Binary Logistic Regression**

PY - 2016/05

VL - 20

IS - 4

SP - pp 1151-1162

AB - Road pavements require periodic maintenance and repair, which as a national infrastructure facility requires an enormous annual. The crack sealing method has been widely used in the implementation of pavement repair and maintenance. Developed countries have recognized the importance of the crack sealing method and have continuously pursued research on the development of automated crack sealing equipment such as ARMM (Automated Road Maintenance Machine), OCCSM (Operator Controlled Crack Sealing Machine), and TTLS (Transfer Tank Longitudinal Sealer) since the early 1990s. In 2004, APCS (Automated Pavement Crack Sealer), which seals routed cracks on the road, was developed in Korea, and since 2009, the development of ACSTM (Automated Crack Sealer with Telescopic Manipulator) for the sealing of non-routed cracks has been underway. Because the non-routed crack is characterized by a very narrow width of 2~3 mm, in comparison to the routed crack, it is necessary to use high-resolution pavement images of over five million pixels in order to detect non-routed cracks. Moreover, it is very effective to employ intelligent algorithms that can distinguish cracks and noise from the high-resolution images using the morphological characteristics of non-routed crack. The purpose of this study is to develop an intelligent algorithm, which can distinguish crack and noise by eliminating the noise, to enable the ACSTM equipment in easy detection of the non-routed cracks. This study subjects the binary high-resolution images of the non-routed cracks to artificial neural network and binary logistic regression analysis for this purpose of intelligently discerning the crack images from the noise. Actual pavement images have been used to compare and verify the accuracy of the proposed algorithm in identifying cracks.

KW - Algorithms

KW - Automated road maintenance machine

KW - Cracking

KW - Korea

KW - Logistic regression analysis

KW - Neural networks

KW - Pavement maintenance

KW - Pavement performance

KW - Preventive maintenance

KW - Sealing compounds

UR - <http://dx.doi.org/10.1007/s12205-015-1645-9>

UR - <https://trid.trb.org/view/1446162>

ER -



TY - CONF

AN - 01622952

AU - Neaylon, K

**TI - Are more road trains good for sprayed seals?**

PY - 2016/11

SP - 14p

AB - Road trains in Australia have a predominance of triaxle groupings. This study suggests that triaxles may have the advantage of prolonging the useful life of a sprayed seal's surface texture. This advantage could be used to either to gain a better periodic maintenance coverage of the network for any given budget, or to maintain the existing periodic maintenance coverage with a reduced budget. It is postulated that when multiple axle groupings are loaded such that they cause equal unbound-granular pavement damage as each other (I.e. equal standard axle repetitions), they do not cause equal sprayed seal damage. This paper reports the implications that this postulation has on chip seal performance under various multiple axle groupings and concludes that, for axle groups travelling in a straight line and not applying tractive motion forces: 1. When comparing total freight task, whilst single axles and tandem axles cause similar surface texture reductions for a given load, a triaxle grouping causes 10% less chip seal surface wear. Triaxles may assist in prolonging macrotexture life. 2. When comparing standard axle repetitions, for a given freight task triaxial groups and quad axle groups may cause between 10 and 20% less chip seal surface wear than single axles and tandem axles. Having more trailing (not driven) triaxles on the chip seal network, in straight line travel situations, has the potential to cause less chip seal wear than the equivalent freight task carried by single axles or tandem axles.

U1 - ARRB Conference, 27<sup>th</sup>, 2016, Melbourne, Victoria, Australia StartDate:00000 EndDate:00000

KW - Australia

KW - Axle group

KW - Axle loads

KW - Chip seal

KW - Chip seals

KW - Deterioration

KW - Lorry

KW - Pavement technology

KW - Pavements

KW - Road train

KW - Rolling contact

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surface texture

KW - Texture

KW - Tractor trailer combinations

KW - Trucks by number of axles

KW - Vehicle pavement interaction

UR - <http://arrbknowledge.com>

UR - <https://trid.trb.org/view/1446677>

ER -

TY - CONF

AN - 01622961

AU - Yeo, R

AU - Wallis, M

**TI - The use of insoluble dry powder polymer and marginal material on a mining haul road from a design and construction perspective**

PY - 2016/11

SP - 15p

AB - This paper outlines some of the design and construction processes and methodologies adopted in the upgrade of approximately 51.5 km of existing haul road to an 80km/hr. design speed for a mine site, which uses a combination of triple and quad road train haulage vehicles. The road was designed and constructed late 2015 using stabilized marginal material with a two-coat spray seal surface. The entire road building materials used on the project were sourced from within 100m either side of the existing road alignment. The works were completed with the mine still in operation with operational vehicles running on adjacent temporary side tracks beside the works. The site is located approximately 135 kilometers north-northwest of Mount Isa, and is exposed to extreme weather conditions including flooding. The pavement was designed to carry a design traffic loading of 5 x 10<sup>6</sup> ESA's over a design period of 8 years, allowing for very wet and dry conditions. This catered for a total haulage volume of approximately 13Mt of minerals over the life of the mine as well as other operations. The work also involved identifying, sourcing, and processing the road base gravel from within the road reserve, which consisted of a 100m limit either side of a pre-existing access track.

U1 - ARRB Conference, 27<sup>th</sup>, 2016, Melbourne, Victoria, Australia StartDate:00000 EndDate:00000

KW - Australia

KW - Base course (Pavements)

KW - Design (overall design)

KW - Gravel

KW - Gravel roads

KW - Materials technology (asphalt/bitumen/concrete)

KW - Mines

KW - Mining road

KW - Pavement components

KW - Pavement design

KW - Pavement materials

KW - Pavement technology

KW - Pavements

KW - Polymer

KW - Polymers

KW - Queensland

KW - Roadbase

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

UR - <http://arrbknowledge.com>

UR - <https://trid.trb.org/view/1446686>

ER -

TY - RPRT

AN - 01630099

AU - Von Quintus, Harold L

AU - Raghunathan, Deepak

AU - Applied Research Associates, Incorporated

AU - Ohio Department of Transportation

AU - Federal Highway Administration

**TI - Effectiveness of Asphalt Penetrating Sealers in Extending New Asphalt Pavement Life**

PY - 2017/01//Final Report

SP - 109p

AB - Numerous methods are being employed for asphalt pavement preservation, including rejuvenator emulsions, asphalt emulsion fog seals, and a variety of non-structural surface treatments (including slurry and micro surfacing technologies). To make the most of maintenance budgets, some agencies are using asphalt penetrating sealers as an alternative to reduce the detrimental impact of weathering or aging of wearing surfaces for older and new asphalt pavements or overlays of existing flexible pavements. Applying a penetrating sealer to a new surface within a few weeks after it has been placed has several benefits to the hot mix asphalt (HMA) wearing surface. It can restore the original asphalt properties that were lost during the production process and seal the pavement for improving on the durability of the surface course, reducing the permeability at the surface. Asphalt penetrating sealers have been used by Federal, State, county, and municipal agencies over the past 15 years, and their use has been based on past performance. However, there are diverse opinions regarding the success of this technology. Once a product has been used, a pavement engineer's opinion can vary from the project being totally successful or completely ineffective. Little data exists based on quantitative data from multiple projects. The issue or gap in the technology, especially in Ohio, is quantifying the cost-effectiveness on the use of these materials. Thus, the purpose of this project was to collect the data to quantify the cost-effectiveness of these asphalt penetrating sealers. In other words: Are these surface treatments or penetrating sealers cost-effective? The purpose of this report is to document the surface condition of test and control sections along four projects before and immediately after application of three penetrating sealer products, as well as over a four year monitoring period to determine the added service life, if any, between treated and untreated surfaces.

KW - Before and after studies

KW - Cost effectiveness

KW - Durability

KW - Hot mix asphalt

KW - Ohio

KW - Pavement performance

KW - Permeability

KW - Sealing compounds

KW - Service life

KW - Surface course (Pavements)

KW - Test sections

UR - <http://cdm16007.contentdm.oclc.org/cdm/ref/collection/p267401ccp2/id/14597>

UR -

[https://ntl.bts.gov/lib/60000/60800/60887/Effectiveness\\_of\\_asphalt\\_penetrating\\_sealers\\_in\\_extending\\_new\\_asphalt\\_pavement\\_life.pdf](https://ntl.bts.gov/lib/60000/60800/60887/Effectiveness_of_asphalt_penetrating_sealers_in_extending_new_asphalt_pavement_life.pdf)

UR - <https://trid.trb.org/view/1455414>

TY - RPRT

AN - 01627497

AU - NEAYLON, K L

**TI - The effects of heavy vehicle single, tandem and tri-axes on sprayed seal wear in Australia**

PY - 2017/01

SP - 350p

AB - Freight efficient vehicles today introduce significantly more tandem, triaxle axle and quad axle group loadings to pavement surfacings. However, the effects of differing axle groupings and axle loadings has never been thoroughly considered in sprayed seal design, because these effects had not been isolated and studied. A model has now been developed to predict surface texture deterioration based on the effect of axle groupings and loadings. This generalized model could contribute to a refinement of sprayed seal design, specifically in the category of heavy vehicle seal design. The results may be used to improve the consideration of abnormal traffic affects in seal design of mine haul roads, or national freight routes.

KW - Axle group

KW - Axle load

KW - Axle loads

KW - Design (overall design)

KW - Heavy vehicle

KW - Heavy vehicles

KW - Lorry

KW - Mathematical models

KW - Modelling

KW - Pavement design

KW - Pavement technology

KW - Pavements

KW - Rolling contact

KW - Seal coats

KW - Sealing coat (on top of the surfacing)

KW - Sprayed seal

KW - Surface texture

KW - Texture

KW - Trucks by number of axles

KW - Vehicle pavement interaction

KW - Vehicles

UR - <http://arrbknowledge.com>

UR - <https://trid.trb.org/view/1458004>

ER -

TY - RPRT

AN - 01630146

AU - Shuler, Scott

AU - Colorado Department of Transportation

AU - Colorado State University, Fort Collins

AU - Federal Highway Administration

**TI - Preventing Transverse Bumps and Cracks in New Asphalt Overlays over Crack Sealants (Bumps over Crack Sealants)**

PY - 2017/01//Final Report

SP - 18p

AB - Crack sealants are often utilized as a preservation tool in asphalt pavements. These sealants are placed in cracks to prevent water intrusion into the pavement foundation. By reducing water intrusion, the strength of foundation layers is maintained and acceptable pavement performance is extended. However, when a hot mix asphalt overlay is placed on top a pavement containing crack sealants, a bump and additional transverse cracks sometimes occur in the new asphalt overlay. These bumps and sometimes, transverse cracks are initiated during breakdown rolling and become progressively more severe upon further compaction. This paper presents results of a five-year study designed to identify factors that relate to the appearance of these bumps and consequent cracks. Results of the study indicate that vibratory breakdown rolling, pavement gradient, sealant geometry, tack coat application rate and tack coat adhesivity are factors that contribute most to the occurrence of bumps and transverse cracks during asphalt overlay construction over crack sealants. Observations suggest that transverse bumps and consequent cracks occur in proportion to the size of the 'bow wave' of asphalt concrete present immediately in front of the breakdown roller. The increase in the 'bow wave' size is dependent on asphalt mixture properties, breakdown roller size, speed, vibration characteristics and pavement gradient. Four pavement test sections also indicate that tack coat application rate and adhesive properties also have an effect on reducing the appearance of transverse bumps. The results of the findings are to be presented to the Colorado Department of Transportation (CDOT) Study Panel and to the Materials Advisory Committee (MAC) for review and approval for implementation in the construction of asphalt overlay projects. Since the tack coat application rate is found to have the greatest impact in the formation of bumps in the asphalt overlay, CDOT construction personnel will be advised by respective Region Materials personnel to ensure that the relevant current standard special provisions which already address this issue are enforced strictly in all asphalt overlay construction projects. The MAC will communicate with the Colorado Asphalt Pavement Association (CAPA) to alert the industry about the research findings and the need to follow the required tack coat application procedure more rigorously. CDOT materials, construction and inspection personnel will be asked to coordinate with contractors more closely during asphalt paving operations to ensure that tack coats are applied diligently and accurately in accordance with the specified levels.

KW - Bituminous overlays

KW - Colorado

KW - Hot mix asphalt

KW - Paving

KW - Rollers

KW - Sealing compounds

KW - Tack coats

KW - Test sections

KW - Transverse cracking

UR - <https://www.codot.gov/programs/research/pdfs/2017-research-reports/2017-02/view>

UR - <https://trid.trb.org/view/1459005>

ER -

TY - RPRT

AN - 01628954

AU - Neaylon, K L

AU - Harrow, L

AU - New Zealand Transport Agency

**TI - Lessons to be learned from 15-year-old second-coat seals and reseals**

SN - 9781988512150

PY - 2017/02

IS - 612

SP - 65p

AB - The purpose of this research was to isolate and identify the reasons why some reseals have very long lives, and to identify which of these factors could economically be applied to reseals in future contracts, thus leading to a reduction in whole-of-life costs of chip sealing and pavement maintenance. The life of a seal can be influenced by the seal design, quality of workmanship at time of construction, and material properties such as bitumen, aggregate and the pavement. This study of the New Zealand road asset maintenance management database has found a long-life seal is most likely to be: 1. a single-coat seal; 2. a large chip size; 3. a 180/200 pen bitumen; 4. under less than 2,000 ADT; 5. on a good quality, strong, durable, well-drained pavement; 6. in a lower skid resistance demand category. The aggregate mosaic is also usually flat and tightly packed, suggesting good quality of workmanship at the time of laying. It was interesting to find long-life seals can be applied in any temperature extreme, in any rainfall category and in any degree of sunshine hours.

KW - Durability

KW - Life cycle costing

KW - Life cycle costs

KW - LIFE-CYCLE

KW - Maintenance

KW - Maintenance management

KW - Material properties

KW - New Zealand

KW - Pavement performance

KW - Pavement technology

KW - Pavements

KW - Properties of materials

KW - Road design and asset management

KW - Seal coats

KW - Sealing coat

KW - Sealing coat (on top of the surfacing)

UR - <http://www.nzta.govt.nz/resources/research/reports/612/>

UR - <https://trid.trb.org/view/1459823>

ER -