City and County Pavement Improvement Center (CCPIC)

By
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July 22, 2020

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- Sponsored by League of California Cities, County Engineers Association of California, and California State Association of Counties
- Chartered 28 September 2018

www.ucprc.ucdavis.edu/ccpic

Agenda

- Welcome and Introductions
- CCPIC
  - Mission and Vision, Scope, Organization
  - Certificate Program
  - Planned Certificate Curriculum and New Course Development
  - Deliverables
- Technical Presentation- MTI Manual for Cape Seals
  - Free Tech Brief (https://transweb.sjsu.edu/sites/default/files/1845C-RB-Cheng-Cape-Seal-Manual.pdf)
  - Free Report (https://transweb.sjsu.edu/sites/default/files/1845C-Cheng-Cape-Seal-Manual.pdf)
- Questions and Answers

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CCPIC Mission and Vision

- Mission
  - CCPIC works with local governments to increase pavement technical capability through timely, relevant, and practical support, training, outreach, and research
- Vision
  - Making local government-managed pavements last longer, cost less, and be more sustainable

Academic Partners

- University of California Partners
  - University of California Pavement Research Center (lead), administered and funded by ITS Davis
  - UC Berkeley ITS Tech Transfer, administered and funded by ITS Berkeley
- California State University Partners
  - CSU-Chico, CSU-Long Beach, Cal Poly San Luis Obispo
  - Funding partner: Mineta Transportation Institute, San Jose State University

CCPIC Organization

- Governance:
  - Chartered by League of California Cities, California State Association of Counties, County Engineers Association of California, also provide staff support
  - Governance Board consisting of 6 city and 6 county transportation professionals
- Current Funding
  - Seed funding for CCPIC set up and initial activities from SB1 funding through the ITS at UC Davis and UC Berkeley, and Mineta Transportation Institute at San Jose State University

CCPIC Scope

- Provide technology transfer through on-line and in-person training, peer-to-peer exchanges, and dissemination of research results and best practices in a variety of formats for a variety of audiences (e.g., policy makers, engineers, planners, community members)
- Develop technical briefs, guidance, sample specifications, tools, and other resources based on the latest scientific findings and tested engineering solutions for local government pavement engineers, managers, and the consultants who support them

CCPIC Scope

- Establish a pavement engineering and management certificate program for working professionals through UC Berkeley ITS Tech Transfer
- Serve as a resource center for up-to-date information, regional in-person training, pilot study documentation, and forensic investigations
- Conduct research and development that produces technical solutions that respond to the pavement needs of both urban and rural local governments

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Deliverables

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CCPIC Training: Certificate Program

- Pavement Engineering and Management Certificate Overview
  - For engineers, asset managers, upper-level managers, technicians and construction inspectors
  - 92 hours of training
    - 60 hours in core classes, 32 hours elective
    - Majority of classes to be offered online
  - In four categories:
    - Pavement Fundamentals
    - Pavement Management
    - Pavement Materials and Construction
    - Pavement Design

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CCPIC Training: Certificate Program

- Status
  - Plan finalized, pending announcement and launch
  - Initial classes being delivered, including updated TechTransfer classes and newly developed classes

CCPIC Training: Certificate Curriculum

	Fundamentals	Hrs	Management	Hrs	Materials and Construction	Hrs	Design	Hrs
CORE 60 required	CCA-01 Introduction to Pavement Engineering and Management	10	CCB-01 Life Cycle Cost Analysis	4	CCC-01 Asphalt Concrete Materials and Mix Design	8		
	CCA-02 Pavement Sustainability	6	CCB-02 Pavement Management Systems and Preservation Strategies	16	CCC-02 Pavement Preservation Materials and Treatments	8		
					CCC-03 Pavement and Hardscape Construction Specifications and Quality Control Management	8		
	Fundamentals, CORE	16	**Management, CORE**	20	**Materials and Construction, CORE**	24	**Design, CORE**	0
ELECTIVE 32 required 106 offered			CCB-21 Financing and Cash Flow for Pavement Networks	4	CCC-21 Concrete Materials	8	CCD-21 Asphalt and Concrete Pavement and Rehabilitation Structural Design	16
			CCB-22 Integrated Asset Management	8	CCC-22 In-Place Recycling	8	CCD-22 Design of Integrated Hardscape Assets	8
					CCC-23 Gravel Roads Engineering, Construction, and Management	8		
					CCC-24 Asphalt and Concrete Pavement Construction Processes and Scheduling	6		
					CCC-25 Construction Inspection	16		
					CCC-26 Pavement and Hardscape Construction Inspection	8		
					CCC-27 Asphalt Pavement Maintenance Construction	8		
					TS-10 Work Zone Safety	8		
	Fundamentals, ELECTIVE	0	**Management, ELECTIVE**	12	**Materials and Construction, ELECTIVE**	70	**Design, ELECTIVE**	24
TOTAL	**Fundamentals**	16	**Management**	32	**Materials and Construction**	94	**Design**	24

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CCPIC Training

www.techtransfer.berkeley.edu/training/pavement-courses

- So far, 10 classes held and over 600 people trained, at just $75 per person
- Most classes offered online to save agency personnel time and money
- CCPIC has developed an all new training curriculum and certificate program for pavement engineering and management. New classes rolling out in 2019-2021.

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CCPIC Training-New Course Development

Code	Title	Instructor(s)	Expected	Format	Duration
CCA-01	Introduction to Pavement Engineering and Management	Harvey	Completed	Online	10 hours
CCA-02	Pavement Sustainability	Harvey	Summer 2020	Online	6 hours
CCB-01	Pavement Life Cycle Cost Analysis	Hicks, Cheng	Completed	Online	4 hours
CCB-02	Pavement Management Systems and Preservation Strategies	Yapp, Signore	Completed Spring 2021	Classroom Online	16 hours TBD
CCC-01	Asphalt Concrete Materials and Mix Design		Summer 2021	Online	8 hours
CCC-02	Asphalt Pavement Preservation Materials and Treatments	Hicks, Cheng	Late Fall 2020	Online	8 hours
CCC-03	Pavement and Hardscape Construction Specifications and Quality Control Management		Fall 2021	TBD	8 hours
CCC-23	Gravel Roads Engineering, Construction, and Management	Jones	Spring 2021	Online	8 hours

Best Practices

- Current
  - Asphalt Compaction Sample Specifications
  - Concrete Specs for Durability and Sustainability
  - LCCA pilot project
  - Unpaving to Create Affordable, Safe, Smooth Gravel Roads
- Expected Completion Dates-later this summer

Best Practices

- Planned
  - Pavement Condition Index (PCI)
    - A technical brief describing how PCI is measured, what it doesn't measure, and how similar or same PCI may have different implications for pavement preservation and pavement rehabilitation strategies.
  - Superpave Lite
    - Lead the development of specifications in Caltrans and Greenbook format for a Superpave specification for use by local agencies.
    - Act as the liaison to the Greenbook Committee's Asphalt Concrete Task Force initiative to convert current Hveem mixes to Superpave.

Best Practices

- Planned
  - Converting Hveem to Superpave
    - The Greenbook ACTF has initiated “round-robin” testing of three different Hveem mixes to equate the number of gyrations needed to produce a mix with 3% air voids.
    - Essentially, a simplified conversion from Hveem to Superpave. Results to date have been inconsistent.
  - CCPIC Support:
    - Review test protocols and procedures. Make recommendations for changes as necessary.
    - Review and interpret test results.
    - Provide guidance and recommendations throughout the process.

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Best Practices

- Local Agency Survey
  - Working through LOCC/CEAC, conduct a survey of local agencies on the use of Superpave, interest in a Superpave specification, RAP, warm mix, and other subjects. Develop a contact list of each Agency's "go to" person. Results will provide insight and serve as a basis for future CCPIC initiatives.
- **Interested** in being on the "Go to" list? Send an email to: **eupdyke@ucdavis.edu**

Tools Developed

- Life Cycle Cost Analysis (LCCA) Comparison Spreadsheet
- Unpaved Road Chemical Treatment Selection
- Asphalt Paving Compaction Temperatures

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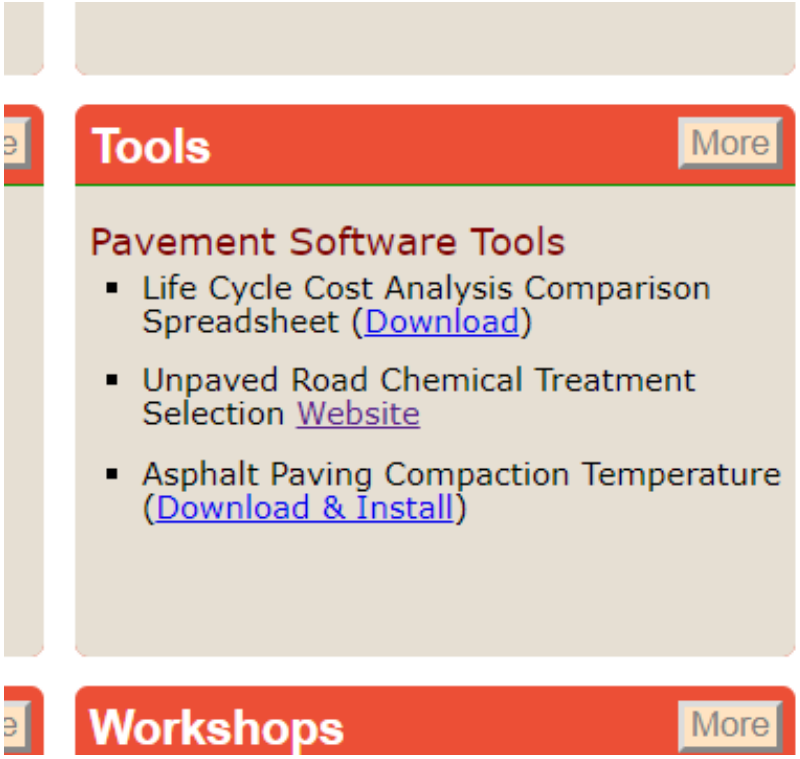
CCPIC LCCA Excel Tool

- Excel tool to calculate Net Present Value, Salvage Value and Equivalent Uniform Annual Cost
- Can compare 3 scenarios side by side
- Can choose and edit the list and sequence of treatments



Download at: http://www.ucprc.ucdavis.edu/ccpic/
or Google "CCPIC UCPRC"

Cost-Effective Strategies: Use PMS Data And Life Cycle Cost Analysis

- Understanding performance of your pavements is key to good pavement management and life cycle cost analysis (LCCA)
  - Performance estimates are typically in terms of pavement condition index (PCI)
  - Agencies need to go one step behind PCI to understand performance, can do this themselves

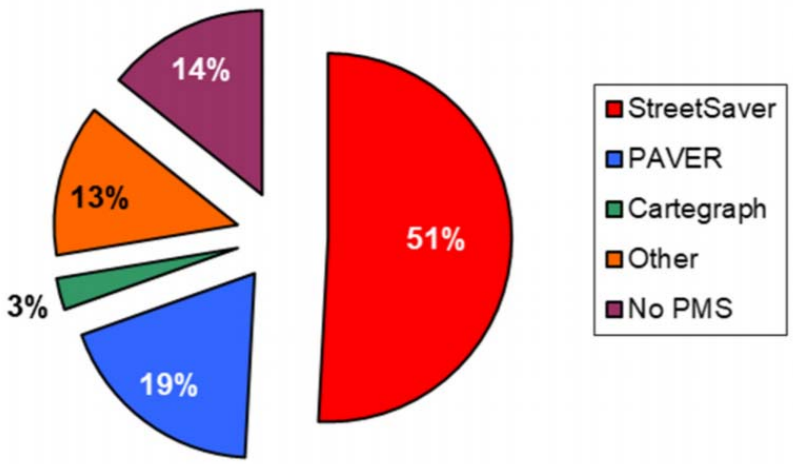


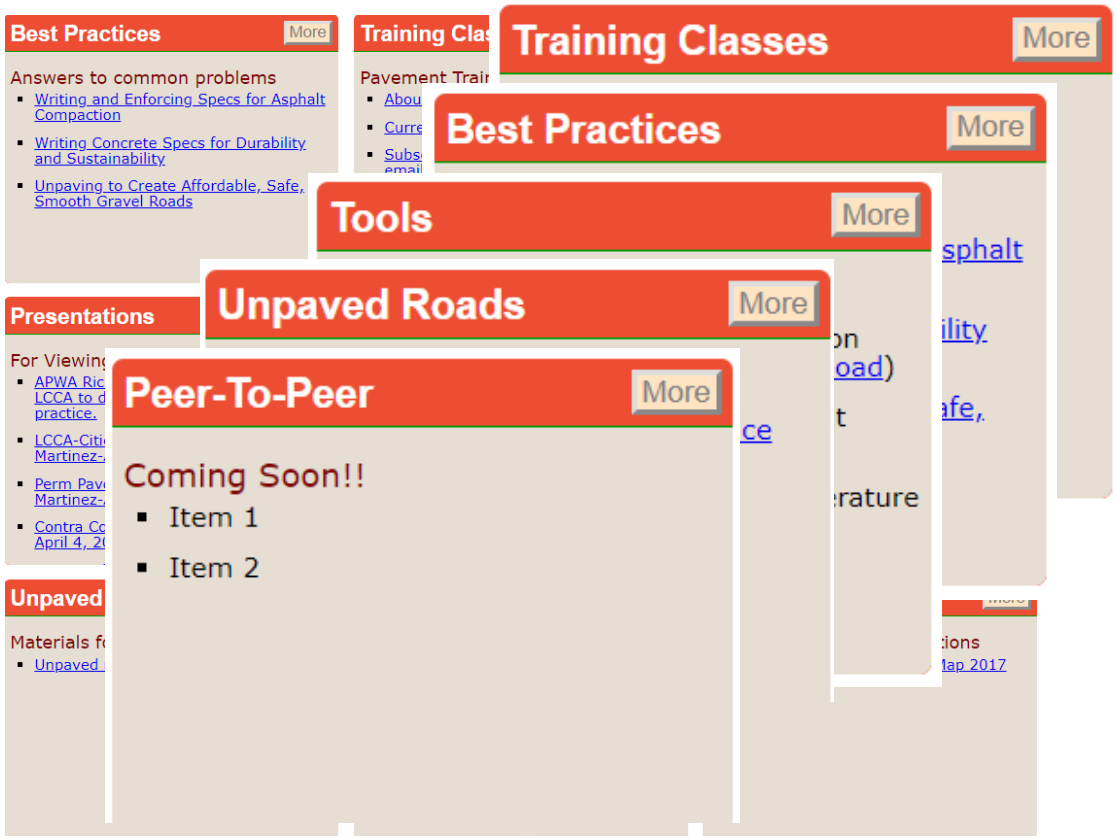
Figure B.4 PMS Software Used By Cities And Counties

Local Streets and Roads 2018

Outreach

- Several presentations in local agency settings already and more planned
- Peer-to-peer network being developed
- Regional centers for resources
  - Northern California- CP2 Center at CSU Chico
  - Central California- San Luis Obispo
  - Southern California-Long Beach State

CCPIC Website
www.ucprc.ucdavis.edu/ccpic



- Pavement training
- Best practices technical briefs
- Tools
- Unpaved roads
- Peer-to-peer

How to Get Involved?

- Get your organization to take training
- Host in-person training classes
- Read the tech briefs and see if your agency can benefit
- Get involved with governance board
- Start a peer-to-peer chat group
- Take a look at the tools on the website

Any Questions

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Manuals for Surface Treatments Commonly Used by Local Agencies

- Completed in 2019 and available on MTI's website
  - Chip Seals
  - Slurry Surfacings
  - Cape Seals
- Thin Asphalt Overlays (soon to be published)
- These manuals are designed to be the "Go To" for local agencies from project selection through construction.

California State University
Transportation Consortium

Cape Seal Surfacing
A Guideline

California Pavement Preservation Center, CSU, Chico

July 30, 2020

SJSU SAN JOSÉ STATE UNIVERSITY

FRESNO STATE Discovery. Diversity. Distinction.

CALIFORNIA STATE UNIVERSITY Chico

CALIFORNIA STATE UNIVERSITY LONG BEACH

What Are Cape Seals?

- Developed originally in Capetown and they consist of two layers
- The first layer consists of an emulsion chip seal or a hot applied chip seal
- The emulsion binders can be conventional or polymer modified. The hot binders are generally asphalt rubber, but could also be a rubberized asphalt or terminal blend
- The chips are generally ½ to ⅜ inch rock, of uniform size and good quality

What Are Cape Seals?

- The second layer is a slurry surfacing mixture of graded aggregate and asphalt emulsion binder with fillers and additives to make a cold emulsion mixture which cures quickly to a hard wearing surface.
- It can be either a micro surfacing or slurry seal

Project Selection

- **Why use them?**
  - **A thin, cost effective preventative maintenance treatment.**
  - **Extends the life of the pavement**
- **Where to use them?**
  - **Normally on asphalt pavement, but have been used on concrete pavements showing some distresses.**
  - **They also trigger ADA work**

Project Selection

When to use them?

- **Correct/improve**
  - **Raveling and weathering**
  - **Skid resistance**
  - **Small non-load related cracks and voids for emulsion cape seals**
  - **Load related cracks in a stable pavement for AR cape seals**
- **Prevent/reduce**
  - **Oxidation of asphalt concrete**
  - **Surface water infiltration**
  - **Pavement degradation due to the elements**
- **Usually a daytime application for slurry seal as a top layer, or may be nighttime for microsurfacing**

Project Selection

- **Selection of a cape seal project is based on the structural soundness of a pavement and the types of distress that are present. Cape seals provide:**
  - **Improved Skid Resistance: Cape seals provide good skid resistance.**
  - **Good Durability: They wear well and can have long service lives.**
- **Cape seals are typically constructed rapidly and cause less disruption to the traveling public than HMA overlays that take longer.**

Project Selection

- **Don't use on severely distressed pavement**
  - **Potholes**
  - **Severe alligator problems- can be treated with only AR cape seals over stable pavement**
  - **Structurally deficient pavements**
  - **Severe rutting**
  - **Significant profile or cross-slope corrections**
- **These problems require repair work prior to cape seal surfacing.**

Project Selection

- **What kind of distresses can Cape seals fix?**
  - **An AR cape seal can handle more severe distresses than a single chip seal or a single slurry surfacing.**

After 8-years this AR cape seal is still performing.

This is a cape seal at the City of Lompoc, CA

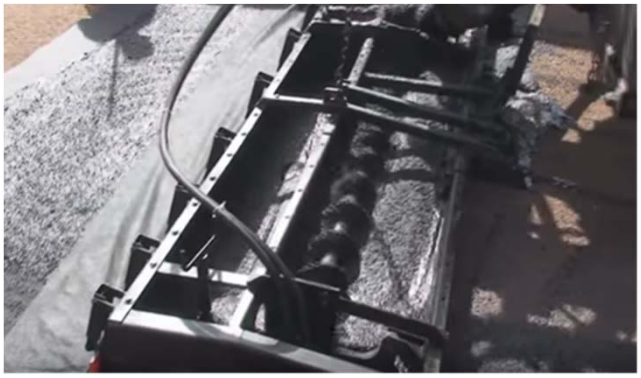
Preventing Poor Pavement Performance

- Proper project selection
- Trained personnel with experience
- Equipment
  - Good condition
  - Calibrated
- Materials and mix design
  - Meets specifications
  - Testing with accredited laboratory and certified testers
- Good workmanship

Design and Construction

Devel

Placing Microsurfacing Final Lift for Cape Seal



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Design-Project Management

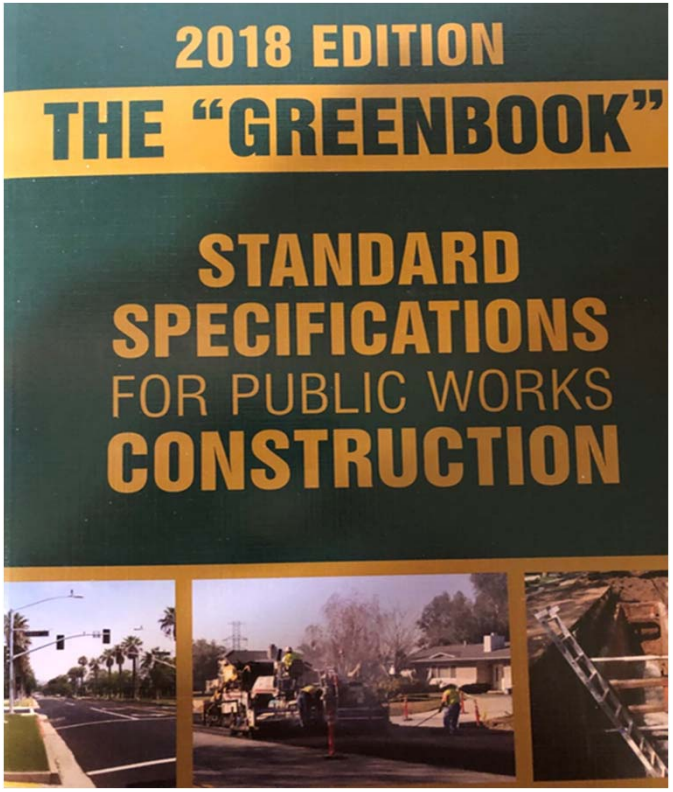
- Scope, Cost, and Schedule
  - Repair costs prior to treatment
  - Estimate cost of project
  - Project limits cleared environmentally
  - Water pollution control plan
  - Timing for businesses (work hours)
  - Public meeting for work hours
- Who is the project manager for your agency

Design- Plans, Specifications, and Cost Estimate

- After project selection
  - Expected life of project
  - Budget
  - Project scope and limits
  - Pavement management system (PMS) plan
  - Condition of pavement until construction time
  - Scheduling
  - Plans, specifications, and cost estimate (PS & E)
  - Bid and award to contractor

Design-Specifications

- Caltrans, Greenbook, and local agency
  - Differences in materials specifications
  - Greenbook speaks of warranties
- If the Agency is short on inspectors, a warranty may be a good item to consider in the specifications.



Design/Construction-Award

- **Advertise**
- **Contractor selection**
  - **Experience requirement?**
  - **Lowest bidder?**
- **Contract Award**
  - **How long before work starts?**
  - **Notification of public and businesses**

Construction Process

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Construction Process and Schedule

- What are the various steps in each construction process?
  - Repair existing HMA/ Crack sealing, patching, dig-out
  - Chip seal
  - Slurry seal or microsurfacing
- When and where will each process be undertaken and completed?
  - Timing between chip seal and slurry surfacing
  - Sweeping and collection of excess materials from slurry surfacing
- When does the contractor need to be off the road for each treatment?

Quality Control Plan (QCP)

- **Contractor is responsible for quality control (QC) sampling, testing, and documentation and needs to submit a QCP.**
- **QCP shall include sampling, testing, inspection, monitoring, documentation and submittals, and corrective action procedures during transport, stockpiling, placement, and sweeping/cleanup operations.**
- **QCP shall detail the Contractor's QC program that meets the requirements of the specifications.**

Equipment Calibration

- **Chip seal**
  - **General**
    - Contractor to provide proof of calibration of the distributor truck and the aggregate spreader.
    - Calibration to be repeated once per week or after five full days of chip seal operations have been completed. (This may vary per agency)
  - **Distributor truck**
    - Application rates-transverse and longitudinal
    - Overlap- triple
    - Edge nozzle-at right angle
  - **Aggregate spreader**
    - Application rates-transverse and longitudinal

Equipment Calibration

- **Slurry surfacings**
  - **Perform calibration and submit data for all slurry seal trucks in accordance with Section 37-3.01C(3)(f)**
  - **Calibrate the mix paver to be used for the placement of slurry seal in the presence of the Engineer**
  - **Ensures compliance with the approved mix design/job mix formula**
  - **Each unit shall be calibrated prior to the beginning of the project for each aggregate type.**

Chip Seal Construction

Sweeping (before and after)

Hot AR Binder Application

Aggregate Application

Rolling

Slurry Seals and Microsurfacing

A mixture of graded aggregate and asphalt emulsion binder with fillers and additives to make a cold mixed material that cures quickly to a hard wearing surface.

Slurry Emulsion—Caltrans 2018 Spec

Property	Test Method	Value
Saybolt Furol Viscosity @25° C	AASHTO T 59	15-90 Seconds
Sieve test, max	AASHTO T 59	0 to 0.3%
Settlement, 5 days, max	ASTM D 244	5%
Storage stability, 1 day, max	AASHTO T 59	1%
Residue by evaporation, min	California Test 331	60%

b

Microsurfacing Emulsion
Caltrans 2018

Property	Test Method	Value
Saybolt Furol Viscosity @25° C	AASHTO T 59	15-90 Seconds
Sieve test, max	AASHTO T 59	0 to 0.3%
Settlement, 5 days, max [a]	ASTM D 244	5%
Storage stability, 1 day, max	AASHTO T 59	1%
Residue by evaporation, min	California Test 331	62%

Slurry Surfacing Gradation
Caltrans 2018

Percent passing by aggregate type	
Sieve sizes	**Type II**
3/8”	100
No. 4	94-100
No. 8	65-90
No. 16	40-70
No. 30	25-50
No. 200	5-15

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Slurry Mix Design Tests

Quality Characteristic	ISSA Test Method	Requirement
Consistency, max in mm	TB 106	30
Wet Stripping	TB 114	Pass
Compatibility	TB 115	Pass*
Cohesion Test**, within 1 hour (min, kg-mm	TB 139	200
Wet Track Abrasion, max g/m2	TB 100	810 for Caltrans 540 for Lompoc

*Mixing test must pass max expected air temp on the site

**Using project materials

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Microsurfacing Mix Design Tests

Quality Characteristic	ISSA Test Method	Requirement
Wet Cohesion (set)	TB 139 at 30 min	120 kg-mm, min.
Wet cohesion (traffic)	TB 139 at 60 min (traffic)	200 kg-mm min
Excess asphalt using loaded wheel test	TB 109	540 g/m2 max
Wet Stripping	TB 114	Pass (90%) min
Wet Track Abrasion, max g/m2	TB 100	810 for Caltrans 540 for Lompoc
Displacement	TB 147 Lateral, Max % Sp. Gr. after 100 cycles	 5 2.10
Compatibility	TB 144	(AAA,BAA), 11 grade points min
Mix time @25 C	TB 113	120 seconds min

Construction Procedures

- Proper surface preparation
- Do not apply more than 0.12’ thick layer at a time
- Allow mat time to cure , 2-3 hours.
- Mix must be black before traffic
- Roll the compacted mix and sweep

Applying Slurry Seal

- Allow slurry seal to cure. About 2- 3hr.
- Roll slurry seal
- Sweep the slurry seal after rolling.
- Open to traffic after initial sweeping.
- Sweep for 4 days after opening
- Sweep again after 2 weeks
- Quantify the sweepings each day

Construction-Applying Microsurfacing

- Allow microsurfacing to cure. About 1 hr.
- Roll microsurfacing
- Sweep the microsurfacing after rolling
- Open to traffic after initial sweeping.
- Sweep for 4 days after opening
- Sweep again after 2 weeks
- Quantify the sweepings after each day

Agency Inspection and Field Testing

- **Essential items for inspector to document and detail**
  - Workmanship
  - Weather—temperatures, wind conditions
  - Any problems
  - Sampling per required frequencies for each material
  - Issues to watch for with each material
  - Spread rates and temperatures of materials

Post Slurry Application Inspection

- **Minimum aggregate loss**
- **Correct any workmanship issues**
- **Cleanup**
- **Striping**
- **Opening to traffic**

Thank You

Questions

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