# City and County Pavement Improvement Center (CCPIC)

By
R. Gary Hicks, P.E.
Program Manager, CP2 Center
Presented to
Maintenance Superintendents Association (MSA)
May 21, 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 surface treatment manuals
  - Chip seals
  - Slurry Surfacings
  - Cape Seals
  - Thin Asphalt Overlays (coming soon)
- Questions and Answers

# 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

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# 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
- Develop technical briefs, guidance, sample specifications, tools, and other resources based on the latest scientific findings and tested engineering solutions for local agencies to use.

# CCPIC Scope

- 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

# Deliverables

# 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 Curriculum

| | Fundamentals | | Hrs | Management | | Hrs | Materials and Construction | | Hrs | Design | | Hrs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CORE**<br>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**<br>32 required<br>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

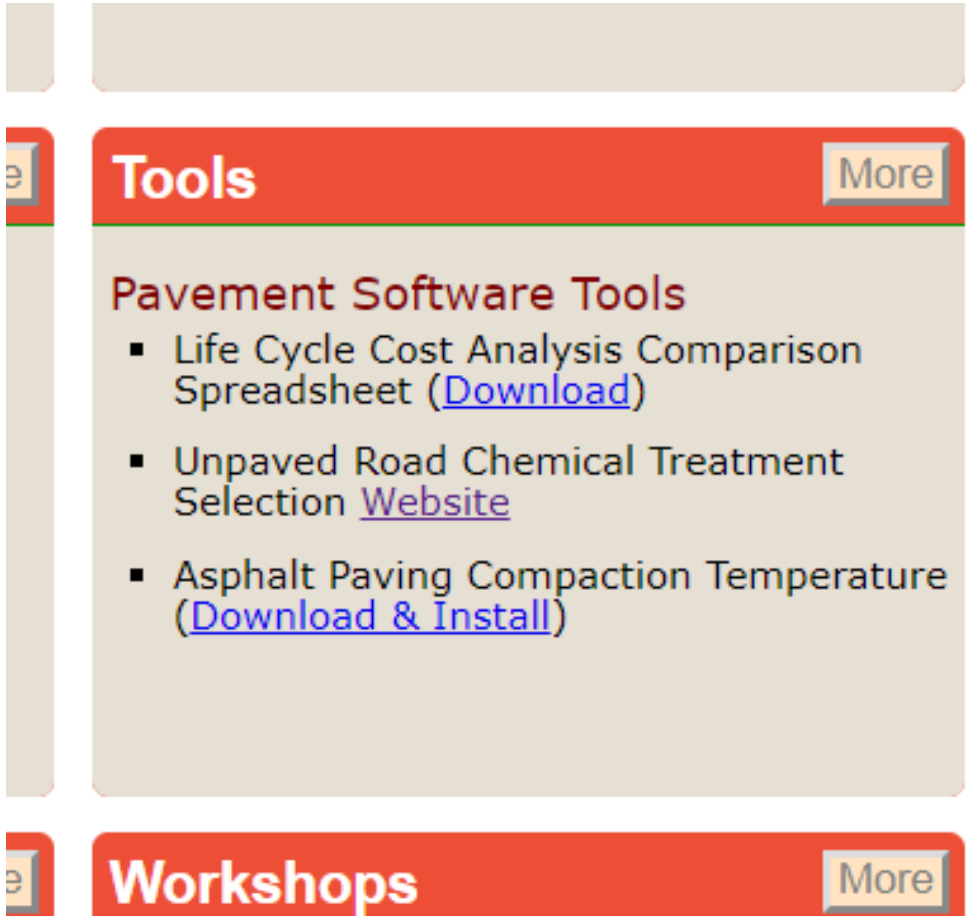
- Local Agency Survey
  - Working through LOCC/CEAC, conduct a survey of local agencies on the use of Superpave, interest in a Superpave specification, RAP, warm mix, and other subjects. Develop a contact list of each Agency's "go to" person. Results will provide insight and serve as a basis for future 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

# 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

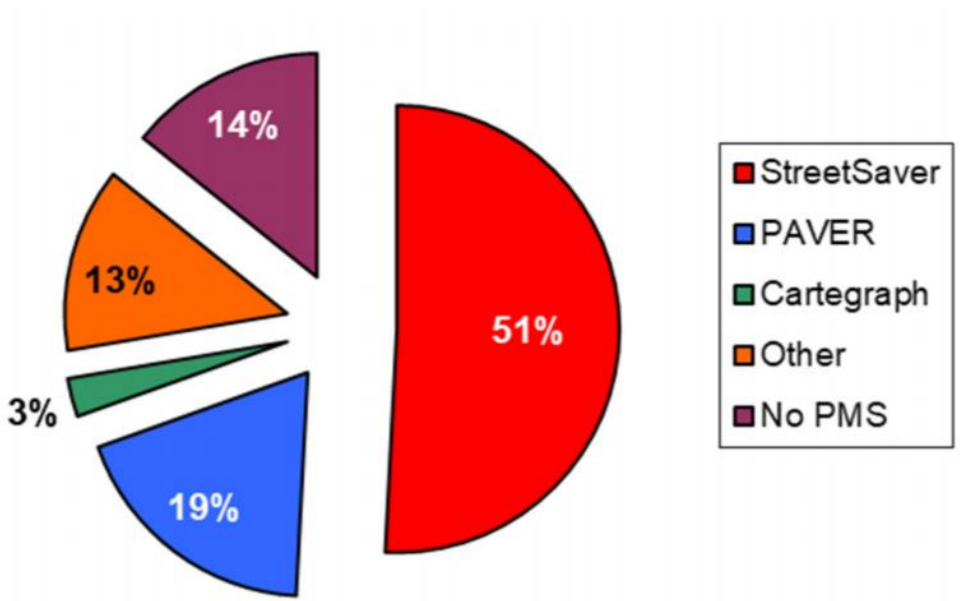


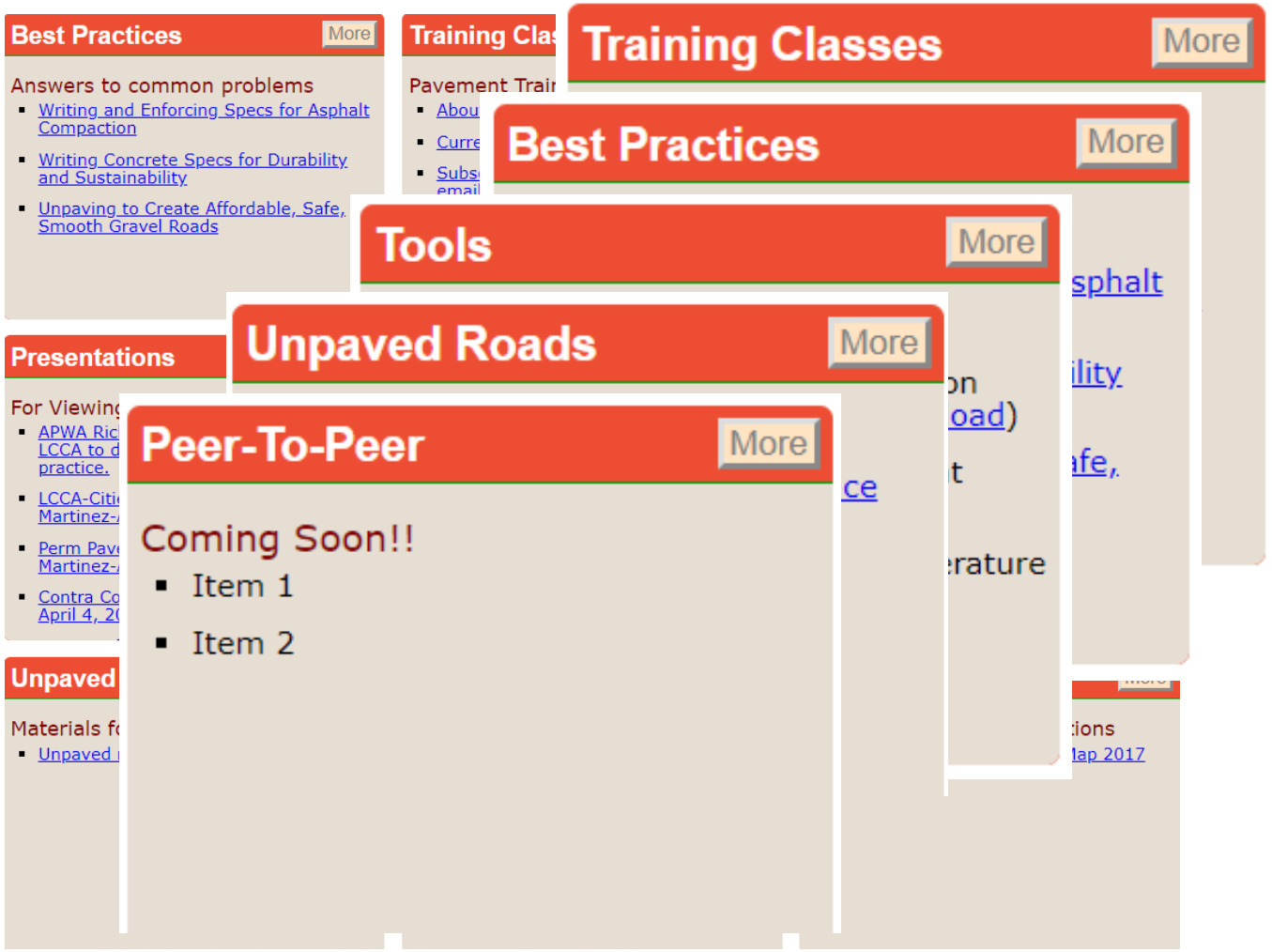

Figure B.4 PMS Software Used By Cities And Counties

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

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# 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

R. Gary Hicks: rghicks40@outlook.com

John Harvey: jtharvey@ucdavis.edu

Laura Melendy: melendy@berkeley.edu

http://www.ucprc.ucdavis.edu/ccpic/

# Manuals for Surface Treatments Commonly Used by Local Agencies

- ➢ Completed in 2019 and available on MTI's website
  - Chip Seals
  - Slurry Surfacings
  - Cape Seals
- ➢ Final Draft Under Review (May 2020)
  - Thin Asphalt Overlays (soon to be published)
- ➢ These manuals are designed to be the "Go To" for local agencies from project selection through construction.

# Chip Seal Manual

- Contents
  - Project selection
  - Types of chip seals
  - Design process
  - Construction
  - Quality Assurance
  - Troubleshooting
- Presentations
  - I hour
  - 3 hours
- https://transweb.sjsu.edu/sites/default/files/1845A-Chip-Seal-Manual.pdf

# What is Chip Seal?

- Application of an asphalt binder on existing pavement followed by a layer of aggregate chips.
- Treatment is then rolled to embed the aggregate into the binder.
- This may be followed by a emulsion flush coat.

# Why Use Chip Seals

- **Performance**
  - **Typical treatment life: 4 to 7 years or more**
- **Typical cost**
  - **$2.50 to $5.00/yd$^2$ or more**
  - **Depends on the type**

# Where to Use Chip Seals?

- Surface for light to medium traffic (ADT<30,000)
- Waterproofing layer
- Skid resistant surface
- Restores weathered surface
- Defines shoulders

# When NOT to Use!

- Structurally deficient pavements
- Cracks >1/4 in wide
- Large number of potholes
- Over a bleeding pavement
- Rutting >1/2 in
- Very rough surface
- Areas of high bicycle traffic

# Chip Seal Variations

- **Applications**
  - **Single chip seals**
  - **Double or triple chip seals**
  - **Cape seals**
  - **Geotextile reinforced chip seals (GRCS)**
  - **Scrub seals**
- **Asphalt Binder Types**
  - **Polymer modified emulsion (PME)**
  - **PMA (Hot applied)**
  - **AR (Hot applied)**
  - **Terminal blends (Hot applied). Not currently available**

# Chip Seal Variations: Fabric and Chip Seals

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# Chip Seal Variations: Scrub Seal


Uses PMRE as binder to help “heal” small cracks

# Slurry Surfacing Manual

- Contents
  - Project selection
  - Types of Slurry Surfacings
  - Design process
  - Construction
  - Quality Assurance
  - Troubleshooting
- Presentations
  - I hour
  - 3 hours
- https://transweb.sjsu.edu/sites/default/files/1845B-Cheng-Manual-Slurry-Surfacing.pdf

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# What are They?
# Slurry Seals and Microsurfacing

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

# Why Use Them?

- They are a thin, cost effective preventative maintenance treatment.
- They are used on asphalt pavement or concrete pavement that are showing distresses.

Slurry Surfacing

Completed Project

# Project Selection for Slurry Seals

- Correct/improve
  - Raveling and weathering
  - Skid resistance
  - Small Cracks and voids
  - Aesthetics
- Prevent/reduce
  - Oxidation of asphalt concrete
  - Surface water infiltration
  - Pavement degradation due to the elements
- Usually a daytime application

# Project Selection for Microsurfacing

- **Correct/improve**
  - Raveling and weathering
  - Skid resistance
  - Aesthetics
  - Fill minor rutting
  - Small Cracks and voids
- **Prevent/reduce**
  - Aging/oxidation of asphalt concrete
  - Surface water infiltration
  - Pavement degradation due to the elements
  - Can be day or night application

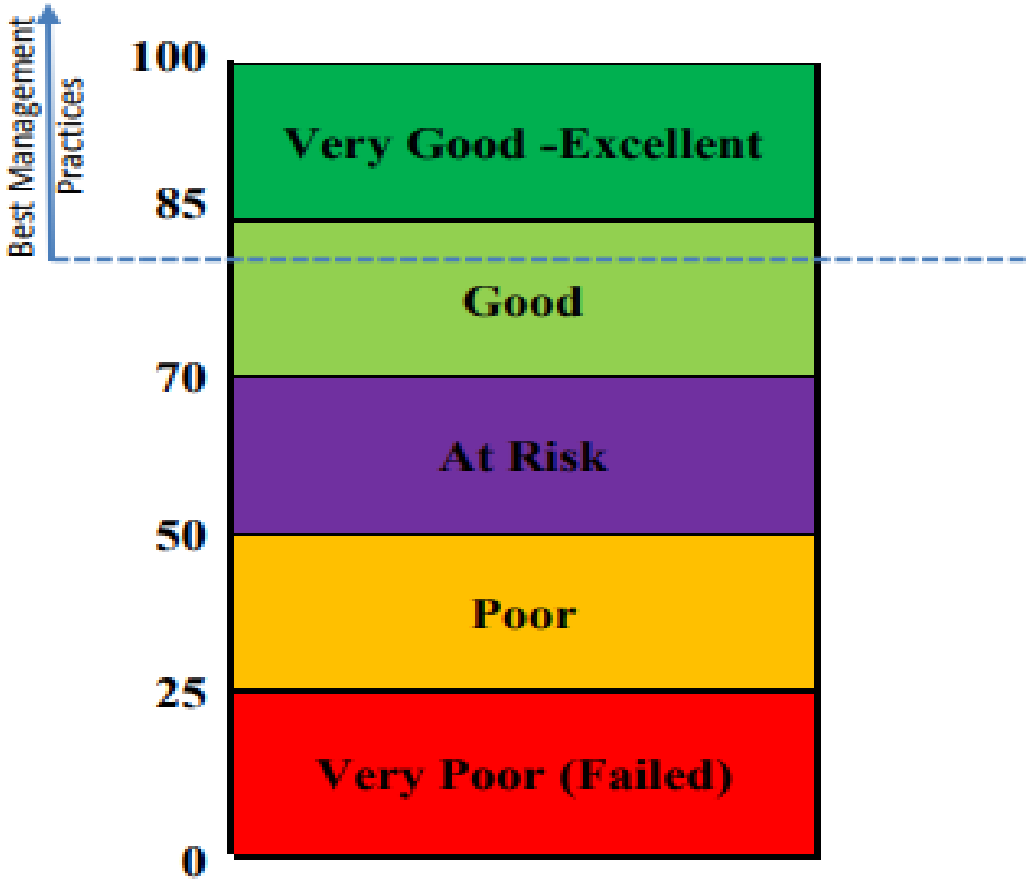
# Project Selection
# When not to Use Them?

- Don't use on severely distressed pavements
  - Potholes
  - Severe alligator problems
  - Structurally deficient pavements
  - Severe rutting
  - Significant profile or cross-slope corrections
- These problems require repair work prior to slurry surfacing
  - Dig out and repair potholes and severe alligator problems
  - Pre-level severe rutting and cross-slope corrections
  - Crack seal

# Project Selection, Best Practice

**Place a slurry surfacing treatment prior to the pavement reaching a PCI of less than 80.**

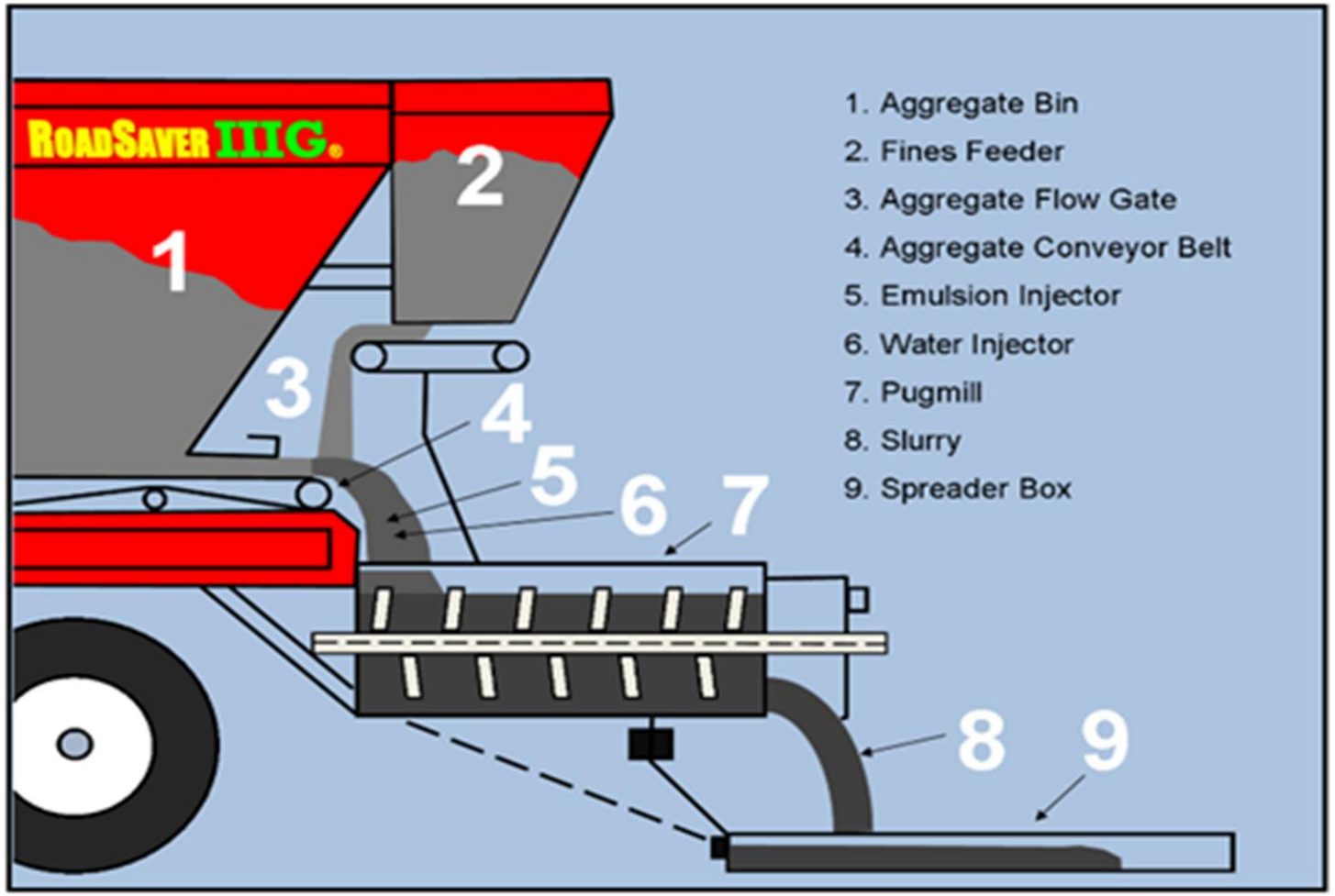
**Pavement Condition Index Classifications**



# Slurry Surfacing Materials

**Designed mixture using:**

- Asphalt Emulsion
- Aggregate
- Additives and fillers
- Water



# Cape Seal Manual

- Contents
  - Project selection
  - Types of Cape seals
  - Design process
  - Construction
  - Quality Assurance
  - Troubleshooting

- Presentations
  - I hour
  - 3 hours
- https://transweb.sjsu.edu/sites/default/files/1845C-Cheng-Cape-Seal-Manual.pdf

# 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
- 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

# Completed Cape 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 may 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

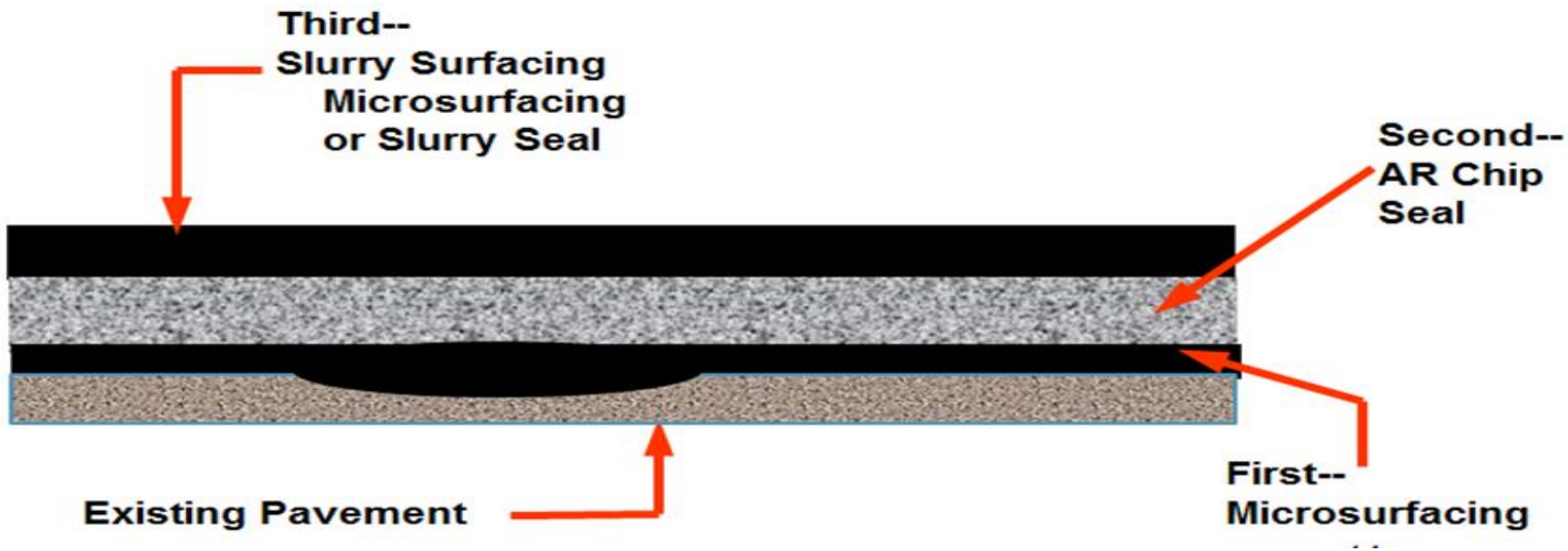
- **What kind of distresses can Cape seals fix?**
  - **An AR cape seal can handle more severe distresses than a single chip seal or a single slurry surfacing.**

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

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

# Cape Seal Variations

**Microsurfacing Can Be Used As A Scratch Coat For Rut Filling. Figure Shows A Multi-layer Cape Seal With Rut Filling.**



# Thin Asphalt Overlay Manual: Coming Soon

- Contents
  - Project selection
  - Types of thin overlays
  - Design process
  - Construction
  - Quality Assurance
  - Troubleshooting

- Presentations
  - I hour
  - 3 hours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# Thank You

# Questions

R. Gary Hicks
rghicks40@outlook.com
530-588-4446

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