CP² Center News

Newsletter of the California Pavement Preservation Center

No. 64 December 2022

CP² Center Celebrates 16 Years

By Ding Cheng, R. Gary Hicks, and Roger Smith, CP² Center

Dr. Ding Cheng Director of CP² Center

The California Pavement Preservation Center (CP² Center) was established at Chico State University by Caltrans on July 1, 2006. The purpose of the Center is to support the needs for pavement preservation for both governmental agencies and industry. The Center has been receiving funding from Caltrans since early 2007. The Center's Director is Dr. Ding Cheng and supported by a group of knowledgeable and well-known staff including Gary Hicks, Lerose Lane, Roger Smith, and Erik Updyke.

There are generally four major tasks identified by Caltrans: Task 1, providing technical assistance on pavement preservation issues; Task 2, investigating new and innovative pavement preservation technologies; Task 3, promoting effective pavement preservation practices; and Task 4, providing training and education.

Over the years, the Center has also worked with multiple clients including CalRecycle, Metropolitan Transportation Commission (MTC) of the San Francisco Bay Area, FHWA, City and County Pavement Improvement Center (CCPIC), and Industry.

Research

The Center has worked on many research projects for Caltrans in the past 16 years. The following are some highlights on the recent projects that the Center has worked on.

During the 2021 and 2022, the Center has worked on the asphalt rubber chip seal pilot project of 21.7 miles constructed in Caltrans District 2, on SR 139 Modoc County PM 34.0/50.7 and Siskiyou County PM 0.0/5.0. In California, the asphalt rubber binder (AR) used in Asphalt Rubber Chip Seal is typically a field blended asphalt rubber binder Type II, which consists of asphalt base binder, asphalt modifier, and crumb rubber modifier (scrap tire crumb rubber and high natural crumb rubber). This pilot project was constructed to evaluate the performance of asphalt rubber Type II in comparison to a new asphalt rubber (AR) Type III. For AR Type III, the High Natural Rubber is replaced with a Polymerized Tire Rubber. Both the AR Type II and AR Type III were placed as single chip seals by contractor American Pavement Systems, Inc. Figure 1 shows the construction of asphalt rubber chip seal on SR 139 near Newell.

Figure 1. Construction of Asphalt Rubber Chip Seal on SR 139, CA

On the job site, CP² Center also measured the macrotexture and surface profile of the asphalt rubber chip seals using a laser texture measurement device. Figure 2 shows the Center's staff measuring the texture of chip seal surface, while Figure 3 Continued, next page

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shows the surface texture and measured surface profile generated by the laser device. The measured data was used to obtain Mean Profile Depth (MPD), Mean Texture Depth (MTD), as well as Embedment Depth.

Figure 2. Measuring Surface Texture of Chip Seals on Site

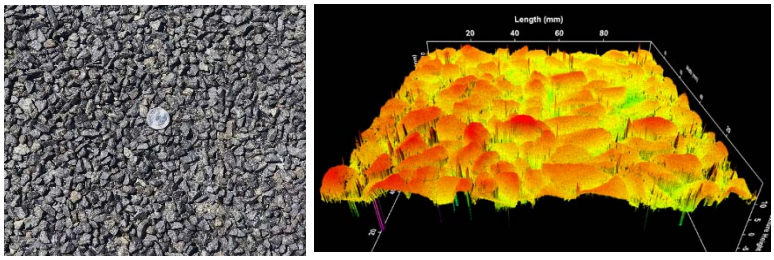

Figure 3. The Texture and Profile of Chip Seal Surface

CP^2 Center then conducted laboratory testing on the samples collected from the field. The chip retention was measured using the Vialit test. A Vialit test sample is shown in Figure 4. The results show both AR Type II and Type III have excellent chip retention without rock loss during the test.

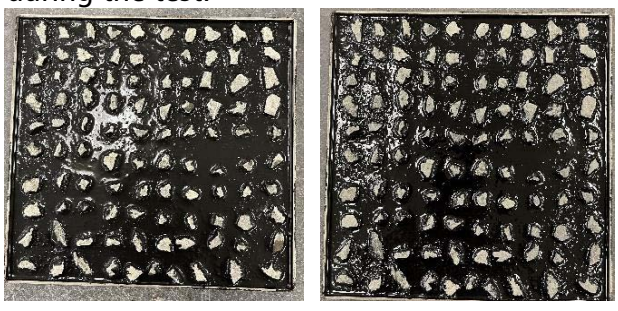

Figure 4. Vialit Test Sample (before & after)

The Center also conducted conventional cone penetration, resilience, ring and ball tests on asphalt rubber binder. The AR Type III has higher resilience and lower penetration than AR Type II for the SR 139 job. In addition, the Center conducted DSR and BBR tests on the AR and base binders. The high temperature grade of binder was increased from PG 58 to PG 88 while the low temperature grade was similar as the -22^0 C.

To further compare the performance of AR Type III with AR Type II, Caltrans District 2 (Redding) also constructed another asphalt rubber chip seal project on SR 299 near Canby. This pilot project used the same 3/8-inch coated chips but with a different base binder. The SR 299 project's base binder for asphalt rubber is PG 64-16 comparing to PG 58-22 used in SR 139. For the SR 299 pilot project, the AR Type III has lower resilience and higher penetration than AR Type II based on CP^2 Center's lab testing results.

During 2021 and 2022, CP^2 Center also worked on a **Cold In-place Recycling (CIR)** - now referred to as **Partial Depth Recycling (PDR)** - pilot project for Caltrans in District 3 (Marysville) on SR 162 near Willows. The conventional PDR project generally has high air voids and this pilot project, designed by the UC Pavement Research Center, tried two new techniques. One method was to replace the top 1.5 inch of existing asphalt concrete with Class 2 Aggregate Base (AB) before the recycling as shown in Figure 5. The other method was to replace 3/4 inch of existing asphalt concrete with 1/4 inch-minus aggregates as shown in Figure 6. The Center's laboratory testing results showed that 1/4 inch-minus aggregates improved the indirect tension strength for both dry and wet conditioned samples compared to the conventional PDR approach.

Figure 5. Replacing 1.5 in. of Asphalt pavement with Class 2 AB before PDR

Figure 6. Replacing 3/4 in. of Asphalt Pavement with 1/4 in. Minus Aggregate

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Another project that the Center worked on for Caltrans was to study the laboratory performance of **Ocean Plastic Waste** additives in asphalt mixes. In this study, the Center conducted Superpave performance testing, including Superpave Gyratory Compaction, Hamburg Testing, as well as new performance tests such as IDEAL-CT and IDEAL-RT tests for cracking and rutting evaluations. Figure 7 shows the Ocean Plastic Waste Samples.

Figure 7. Using Ocean Plastic Waste Additives for Asphalt Concrete

The Center has also developed a technology of using a **Small Unmanned Aircraft System (Drone)** to conduct **pavement condition surveys**. The Center started using this technique on SR 139 and SR 299 projects with some lessons learned, and then in late 2021 and early 2022, the Center successfully conducted a pavement condition survey on SR 36 using the drone technology with traffic control from Caltrans District 2 (Redding). Figure 8 shows a snapshot of a drone survey on SR 36 near Paynes Creek. The mapped distresses can be marked and summarized using an online mapping software.

Figure 8. Using Drone Technology to Conduct Pavement Condition Survey

Besides the studies on asphalt pavement, the Center has also worked on several task orders for Caltrans involving portland cement concrete (PCC) pavement.

In 2020, the Center conducted some field and lab studies on **Performance Engineered Design** of PCC pavement in District 7 (Los Angeles).

During 2021-2022, the Center conducted a study to utilize **fibers in Rapid Strength Concrete (RSC)**. There were five types of fibers and two different types of cements (Type III and Calcium Sulfoaluminate Cement) evaluated in this study. Figure 9 shows the mixing and sample molding at the Center's lab. The best practices for mixing, and a draft specification using fiber in RSC were developed and submitted to Caltrans.

Figure 9. Using Fiber in Rapid Strength Concrete in California

Education

Another big achievement of the Center was the development and delivery of the Pavement Preservation Academy (PPA) sponsored by the SB 1 fund managed by Mineta Transportation Institute (MTI) in San Jose State University. Starting in 2019 and ending in 2022, the Center developed five pavement preservation training manuals, which have been published on the MTI website. These manuals are free to the public and downloadable using the following links:

- Asphalt Pavement Repair and Resurfacing Preparation: https://scholarworks.sjsu.edu/mti_publications/414/
- Chip seals: https://transweb.sjsu.edu/sites/default/files/1845A-Chip-Seal-Manual.pdf
- Slurry surfacing: https://transweb.sjsu.edu/sites/default/files/1845B-Cheng-Manual-Slurry-Surfacing.pdf
- Cape seals: https://transweb.sjsu.edu/sites/default/files/1845C-Cheng-Cape-Seal-Manual.pdf
- Thin asphalt overlays: https://transweb.sjsu.edu/sites/default/files/1906-RB-Cheng-Manual-Thin-Asphalt-Overlay.pdf

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The Center has successfully conducted two online PPAs, and the third online PPA will be offered April 3-7, 2023. The registration site is open at the CP2 Center's website: https://www.csuchico.edu/cp2c/educational-opportunities/pp-academy.shtml

Finally, an important tool for raising awareness of pavement preservation methods and benefits has been the Center's quarterly **Newsletter**, with over 5000 subscribers from public agencies and industry. The Newsletter also keeps readers aware of upcoming educational opportunities in the field of pavement technology.

Pavement preservation is an ever-evolving technology, and the CP2 Center has been a valuable resource for conducting pavement research and for helping public agencies with resources for preserving their biggest investment – their pavement.

If you need more information regarding the CP2 Center, please contact Dr. Ding Cheng at dxcheng@csuchico.edu, or visit: https://www.csuchico.edu/cp2c/

CalAPA Update

By Russell Snyder, Executive Director, CalAPA

ASPHALT PAVEMENT NEWS

The California Asphalt Pavement Association's (CalAPA) 13th annual **Fall Asphalt Pavement Conference**, held Oct. 26-28 Sacramento, was filled nearly to capacity in both content and attendees, with a rich and diverse program that proved popular with CalAPA members and public agency personnel alike.

Newly appointed **Caltrans Director Tony Tavares**, a well-known and respected leader fluent in all things asphalt, kicked off the Oct. 27 General Session by highlighting the foundational principles guiding the department as it works to convert record high levels of funding for infrastructure into projects that will protect and enhance the transportation system, communities and the environment. Tavares said Caltrans delivered about $3.1 billion worth of projects during the last fiscal year that ended June 30, and that this year the department's goal is to deliver $5.4 billion worth of projects. He said that figure should increase to about $7 billion next year and continue at that level for several years. The CalAPA Board of Directors formally recognized Caltrans for its award-winning work on deploying the Long-life Asphalt Pavement design strategy across California.

Caltrans Director, Tony Tavares

The Fall Conference then included a special "Balanced Mix Design Symposium" led by **Randy West**, Director and Research Professor of the National Center for Asphalt Technology (NCAT) at Auburn University. He was joined by **Fan Yin**, Assistant Director and Assistant Research Professor at NCAT.

During the conference, numerous 'breakout sessions' allowed attendees to customize their conference experience. **DingXin Cheng**, Director of the California Pavement Preservation Center (CP2C) at Chico State University, presented on best practices in asphalt pavement compaction, and **Ashley Batson**, of Ingevity, presented on the latest research and developments with regard to Warm Mix Asphalt technology. **John Harvey**, Director of the University of California Pavement Research Center (UCPRC) and also the City & County Pavement Improvement Center (CCPIC), presented on the topic of pavement management. **Kevin McNeil** with Graniterock gave a presentation on proper sample preparation, **Jackie Wong** and **Guadalupe Magana** from Caltrans gave an update on recent changes to the department's test methods, and **Maurice Arbelaez** with InstroTek presented on the technology behind pavement density measurement via their non-contacting radar scanning technology.

Other presentations included the latest on Environmental Product Declarations (EPD), by **Jeremy Peterson-Self** and **Dominika Ercolini** with Caltrans' Materials Engineering & Testing Services (METS), and **Cathrina Barros** providing an update on Caltrans Long-life Asphalt Pavement design strategy. **Todd Mansell** with Caterpillar delved into the use of new and existing technologies to improve

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paving quality and efficiency, and **Doug Ford**, president of Paving Coatings, presented on the use of RAP materials in surface treatments such as slurry seals and chip seals.

Another popular breakout session was titled, "Using Existing Roadway Materials for Pavement Rehabilitation," highlighted various forms of pavement recycling. Co-presenters were **Allen King** with Caltrans, **Frank Farshidi** with the City of San Jose, **Marco Estrada** with Pavement Recycling Systems (PRS) and **Dennis McElroy** with Graniterock. McElroy is President of the newly formed Recycling and Stabilizing Association (RSA).

Cathrina Barros, P.E., Caltrans

Vendor area of the Fall Conference

Attendees also benefitted from interacting with the many vendor displays, and important aspect of the Conference.

Graduate engineering students from the University of California Davis (UCD) also attended the conference complements of the CalAPA event sponsors, supporting CalAPA's workforce development mission.

All registered attendees of the conference will receive links to electronic copies of all presentations delivered at the conference as well as other helpful resources.

Save the dates for the CalAPA Spring Asphalt Pavement Conference & Equipment Expo, which will be held March 23-24 in Ontario. For more information go to www.calapa.net.

AASHTO ETF Update

By Colin Franco (RI DOT) and DingXin Cheng (CP^2 Center)

The American Association of State Highway and Transportation Officials (AASHTO) TSP2 - **Emulsion Task Force (ETF)** had an in-person meeting at the Heritage Group Innovation Center and Research Lab on November 30 – December 1. ETF continues to work on developing national material specifications, design criteria, best practices, and quality assurance (QA) specifications and construction guides for emulsion preservation treatments. It is now refocusing its efforts to create a National Certification Program for Pavement preservation that will include education, training, and outreach based on consensus and consistency of syllabus for all preservation treatments.

Brain Pfeifer (Illinois DOT) and Larry Ilg (Oregon DOT) gave updates on the status of guide construction specifications from the AASHTO Committee on Materials and Pavements (COMP). Dr. Andrew Braham (University of Arkansas) gave a presentation on NCHRP 14-44, *Construction Guide Specifications for Slurry Seals, Scrub Seals, and Tack Coats*, and updated the status on NCHRP 14-48, Construction Guide *Specifications for Sand Seals and Ultra-thin Bonded Wearing Courses*. NCHRP 9-63A *Calibrated and Validated National Performance-Related Specification for Emulsified Asphalt Binder* received new funding and is in the process of revising the asphalt residue testing standards. All the AASHTO activities, including both completed and planned, are summarized in Table 1.

Several people gave presentations on various

Table 1. **AASHTO Standards and Guide Construction Specs for Emulsion Treatments**

	AASHTO STANDARDS			Guide Construction
Emulsion Treatments	**M / MP**	**R**	**W/ COMP**	**Specs**
Chip Seal	MP27-16	PP82-16		✓ NCHRP 14-37
Microsurfacing	MP28-17	PP83-16		✓ NCHRP 14-37
Fog Seal	MP33-17	PP88-17		✓ NCHRP 14-37
Cold Recycled Mixtures	MP31-17	PP86-17	2022	✓ NCHRP 14-43 / NCHRP 9-62
Tack Coat	MP36-18	PP93-18	2022	✓ NCHRP 14-44
Scrub Seal	MP43-20	PP91-18	2022	✓ NCHRP 14-44
Slurry Seal	MP32-17	PP87-17	2022	✓ NCHRP 14-44
Sand Seal	MP34-18	PP90-18		NCHRP 14-48
Ultra-Thin Bonded Wearing Courses	MP44-20	PP100-20		NCHRP 14-48
Foam Asphalt Stabilization	MP38-18			
Specifications for Rejuvenating Seals				NCHRP 10-114
Embedment of Chip Seal Aggregate				NCHRP 10-124
Emulsion Binder Standards	**M / MP**	**R**	**W/TRB**	
Emulsified Asphalt	M140-16			
Cationic Emulsified Asphalt	M208-16			
Polymer-Modified Cationic Emulsified Asphalt	M316-16			
Emulsion/Surface Performance Grades (E/SPG)				NCHRP 9-63

Legend: M=Material Specs, T=Test Methods, R=Design Practices, P=Provisional

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topics related to pavement preservation. Jerry Geib (MnDOT) presented the findings of pavement preservation treatments on MN Road test sections, while Travis Walbeck (NCAT) showed the performance evaluation results of pavement preservations on NCAT test sections. Antonio Nieves (FHWA) gave an update on the work from FHWA. Larry Tomkins (Ergon) Matt Teto (Indus) and Bobby Betsold (All State) gave an update on the demonstration pilot projects for NCHRP 20-44 (26) Implementing Guide Specifications for the Construction of Chip Seals and Micro surfacing.

The theme of this ETF meeting is training, education, and certification. As shown in Figure 2, Franco mentioned a need to provide nationwide unified training and certification, since national standards are being developed on design, materials specification, construction guides, and best practices. Tom Harmon (FHWA) outlined the National Highway Institute (NHI) training course development and announced that web-based training will be free after the New Year. Dan Brodeur (NETTCP) gave an overview of Northeast Transportation Training and Certification Program. **Ding Cheng** gave a presentation on the research work by the **California Pavement Preservation Center** and on the development and implementation of **Pavement Preservation Academy**. Rex Eberly presented the NCPP training and work plan to pursue the unified training and certification effort.

During the meeting, a special tribute was given to Larry Galehouse, former director, and founder of NCPP, for his long and dedicated service to the Center and Pavement preservation. (As shown in Figure 2.)

All the presentations and the minutes of the meeting can be found at the ETF website located at: http://tsp2-etf.org/meetings-and-presentations/.

For more information, please contact Colin Franco at colin.franco@dot.ri.gov.

Figure 1 Colin Franco leading the group

Figure 2. Franco and Lubbers Gave Tribute to Galehouse

PDR (CIR) of RHMA

By Hamed Baha, PE (Caltrans)

A Cold-In-Place / Partial Depth Recycling (CIR/PDR) Pilot Project is underway in Caltrans - District 11 (San Diego) on SR 78 near Glamis with Hazzard Construction Co. and PRS, Inc. The project involves support from Caltrans HQ and the UC Pavement Research Center at UC Davis.

Why is this a Pilot?: The usage of PDR (formerly called CIR) pavement strategy is currently limited to 25% rubberized HMA. But the existing pavement for this location contains about 60% rubber due to several rubberized HMA (RHMA) overlays and chip seals containing rubberized binder over the years. Since Caltrans is now mandated to specify RHMA for most wearing surfaces, the restriction of 25% rubber limits future PDR opportunities. If this pilot project provides an acceptable, long-lasting pavement, it could open up further opportunities for PDR.

Background & Challenges This project is located in the sand dunes of Glamis, CA, a desert region with extreme climate conditions, and very high summer temperatures. This is a Class 2 two-lane highway. The existing pavement exhibits thermal cracking. Several previous maintenance projects have attempted to provide long-lasting service life, however, the thermal cracking continues to develop, and the District 11 field maintenance staff have to continually crack seal the pavement.

Goal and Scope of the PDR Project Due to the

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deep and wide thermal cracking, we wanted to try a different strategy that was different than the standard thin mill and fill to address the existing pavement issues. The PDR strategy was discussed with the Caltrans HQ Pavement Program staff and other statewide subject experts. Despite the fact that this proposed project did not meet Caltrans' current PDR criteria, we decided to take a calculated risk and to proceed with the project. The scope of work is to recycle 0.25' of the existing HMA in-place, and place a 0.15' of RHMA-G wearing course on top.

Thermal Cracking on SR78 - Glamis

Testing: In collaboration with PRS, Inc, core samples were tested during the design phase for compaction, to predict the success of the compaction in the field to overcome high rubber content in the recycled material.

Construction: The project is currently in in the final stages of construction. The CIR/PDR operation has been completed; they are now paving the RHMA-G wearing course. The project is expected to be completed within this month.

PDR Surface

Conclusion: Caltrans will follow up on this pilot effort to evaluate the performance of the pavement and possibly refine their policies for using CIR/PDR on pavements containing rubberized asphalt materials. Stay tuned for our findings.

For more information please contact Hamed Baha at: hamed.baha@dot.ca.gov

Caltrans PCC Grinding & NGCS Performance

PCC PAVEMENT NEWS

From "Pavement Preservation Journal" Fall 2022

The California Department of Transportation (Caltrans) constructed a pilot project on portland cement concrete (PCC) pavement I-5 near Solana Beach, using various ground surfaces. This project demonstrated the benefits namely, improved smoothness, reduced noise emissions, increased surface friction, and increased texture of **conventional diamond ground (CDG)** and **next-generation concrete surface (NGCS)** techniques installed on existing pavements.

On most high-volume, high-speed roadways, noise emissions are predominantly caused by the interaction between the vehicle tires and the pavement surface, and the resulting noise levels can be irritating to both vehicle occupants and the communities surrounding the roadway facility, reports the FHWA in *Concrete Surface Texturing Pilot Project in California* (March 2021).

To further advance the use of grinding techniques, Caltrans constructed a pilot project that featured CDG as well as NGCS, a relatively new surface texture that was of interest to Caltrans because of its demonstrated effectiveness in significantly reducing noise emissions to an even greater extent than CDG.

CDG is a versatile technique that has been used to restore functionality of older pavements, bring newer pavements into smoothness compliance through "spot grinding," and as an overall treatment of newly constructed pavements to establish exceptional functional surface characteristics (improved smoothness and reduced noise).

The NGCS is an innovative surface texture that was developed primarily as a means of reducing noise levels on high-volume roadways, but can be used on both new

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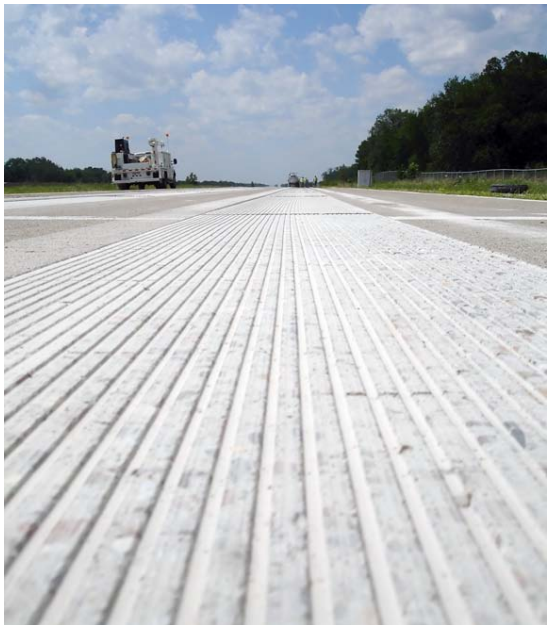
and existing PCC pavements. The NGCS features a combination of flush grinding and also grooving to create a manufactured surface that exhibits reduced noise emissions.



NGCS features a combination of flush grinding and grooving to create a manufactured surface that exhibits reduced noise emission. (International Grooving & Grinding Association)

Caltrans specifies that the NGCS be constructed in a two-pass method: the first pass is a profile (flush) grind to improve the ride quality and microtexture, and the second pass creates grooves to provide macrotexture. For this project, Caltrans specified that the grooves be between 0.15 and 0.187 inches deep and spaced 0.50 to 0.625 inches apart.

Caltrans applied CDG on a 10-mile segment of I-5 (both directions, all lanes) in 2010. The NGCS was installed in 2012 over 1-mile test segments of various concrete pavements originally constructed in the 1960s, 1970s, and 2000s.

- The project showed that both CDG and NGCS techniques were effective in improving the functional surface characteristics of older concrete pavements (ranging in age from 10 to 40+ years) that are otherwise in good structural condition.
- Both CDG and NGCS significantly reduced pavement roughness and the average roughness values for both techniques have remained relatively stable over a six-year period. This resulted in improved rider comfort, reduced damage to vehicles and goods, and improved vehicle fuel efficiency reducing emissions.
- CDG when applied alone reduced the project average noise levels by 2 dBa, whereas the NGCS when applied alone reduced it by 4.5 dBa.
- Both CDG and NGCS were found to provide textures that exceeded typical minimum requirements for high-speed facilities, providing a safe surface for the traveling public.
- A limited cost-effectiveness evaluation conducted for this project found that CDG had a higher 'impact factor' (cost per unit of improvement) than NGCS, even though the NGCS provided a smoother and quieter surface. However, these results may not accurately reflect long-term trends as the unit costs for NGCS were high because the procedure was relatively new at the time and the project size was relatively small.

Both techniques provided substantial functional improvement to the existing PCC pavements at a relatively low cost - without the addition of new materials to the pavement surface.

For more information got to: www.igga.net or www.naylornetwork.com/fpp-nxt

Concrete Conference Focuses on Carbon Footprint

By Roger Smith, CP^2 Center

Concrete is the second most used commodity in the world - second only to water! That bold claim got people's attention at the Nevada Infrastructure Concrete Conference (NICC) held November 2 in Reno.

Over 200 concrete users, producers and researchers from Nevada, California and other parts of the US gathered under this year's theme, "Sustainable Infrastructure for Nevada". The event was hosted by the Nevada Department of Transportation (NDOT), FHWA, the Southwest Concrete Pavement Association (SWCPA) and the California Nevada Cement Association (CNCA).

The central theme of 'sustainability' acknowledged greenhouse gases' (GHG) effect on global warming, and recognized concrete's large 'carbon footprint' and its contribution - estimated to be over 5% of GHG production globally – considering the

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immense volume of it that's used worldwide.

Various solutions to this problem include reducing the sheer amount cement use by substituting 'supplemental cementitious materials' (SCM) - like portland limestone cement (PLC), fly ash, slag and other 'waste materials' – or by changing the traditional aggregate gradations used in concrete mixes. But it was generally believed that the real 'low-hanging fruit' for reducing long-term GHG emissions would be making concrete applications - like pavements and bridges - last longer (i.e., be more durable). It's simple logic – longer service lives mean less concrete use and reduced carbon emissions on a long-term basis.

Long-term GHG contributions can be quantified using Life Cycle Analyses (LCA) of GHG and using Environmental Product Declarations (EPD) for various concrete materials. These EPD's are akin to nutrition labels for food. FHWA now has an online tool for LCA assessment.

So the development of accurate EPD's for building materials, including concrete, was a major focus of the presentations at the Conference. California's perspective and progress on this was outlined by Jackie Wong of Caltrans. Currently, EPD's are required for only four construction materials in California, including structural steel and rebar, but not yet for concrete.

Caltrans will be working with suppliers to develop EPD's for concrete, asphalt and aggregate base products.

Presentation topics included research on alternative SCM's, the use of recycled concrete aggregate, and improving concrete strength for longer life through better curing. The UC Pavement Research Center (at UC Davis) reported on their research on concrete overlays of asphalt pavement and the use of recycled fiber reinforcement for improved performance.

With so much happening in the world of concrete, it's hoped that a similar conference will be held in California. For more information go to www.swcpa.org or contact Charles Stuart, Executive Director of SWCPA, at: cstuart@swcpa.org

Jackie Wong, Caltrans

CCPIC Update

By John Harvey (UCPRC), Erik Updyke (UCPRC), Laura Melendy (UC Berkeley, Tech Transfer), and Gary Hicks (CP² Center)

City and County Pavement Improvement Center

GENERAL NEWS

The City and County Pavement Improvement Center (CCPIC) was officially formed in 2018 to work with local governments to increase pavement technical capability through timely, relevant, and practical support, training, outreach and research. The vision for the Center is to make local government-managed pavements last longer, cost less, and be more sustainable. CCPIC is currently supported by SB-1 (fuel tax) funds provided to the University of California, and to the California State Universities. Campuses involved include UC Davis, UC Berkeley, CSU Chico, CSU Long Beach, Cal Poly San Luis Obispo, and funding partners CSU San Jose (Mineta Transportation Institute), UCLA and UC Irvine.

TRAINING

Pavement Engineering and Management Certificate. The CCPIC *Pavement Engineering and Management Certificate* and the courses to complete it are offered through UC Berkeley's TechTransfer Program. CCPIC training is currently partially subsidized for local and state agencies through SB1 funding, reducing the cost. Registration and other information are available at: https://www.techtransfer.berkeley.edu/training/pavement-courses

The core courses for the Pavement Engineering and Management (PEM) Certificate have been developed and are now being offered at least once per year. Several elective courses are also being offered now. New elective courses will be posted as CCPIC builds out the certificate program. Many new courses will

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be available as self-paced online training modules. Watch for these in 2023.

Classes currently open for enrollment include:

- CCB-01 Pavement Life Cycle Cost Analysis: The Basics, December 13-14, 2022 (online)
- CCA-02 Pavement Sustainability, February 13-15, 2023
- CCc-01 Asphalt Concrete Materials and Mix Design, February 27-March 2, 2023
- CCC-03APavementAConstruction Specifications and Quality Assurance, March 13-21, 2021
- CCA-01 Introduction to Pavement Engineering and Management, May 1-10, 2023

New Pavement Construction Inspection (PCI) Certificate. The CCPIC governance board, made up of city and county representatives with responsibilities for pavement programs, has also requested development of a new Pavement Construction Inspection (PCI) Certificate. This new certificate program will include some of the pavement engineering and management classes as well as adding new classes to ensure agencies are able to properly inspect all types of pavement projects. The first course to be offered in this program is as Fundamentals of Inspection Practice, January 25-26, 2023. Other classes for the 2023 calendar year will be posted soon.

New 'Package Pricing' TechTransfer now offers a streamlined way for agencies to purchase CCPIC certificate training packages for employees. Agencies can purchase a prepaid training 'package' for employees to complete an entire certificate program for $2,110 per person. For more information, check out the following link https://www.techtransfer.berkeley.edu/news/prepaid-training-packages

TECHNICAL GUIDANCE AND TOOLS

Information, guidance and technical tools are downloadable from the CCPIC website at www.ucprc.ucdavis.edu. Some of the key topics include the following.

Superpave for Local Governments Specification

The 'Superpave' hot mix asphalt (HMA) specification can be found here: http://www.ucprc.ucdavis.edu/ccpic/pdf/HMA-LG%20Specification%20(9-13-21)%20for%20posting.docx, or search on the CCPIC website at www.ucprc.ucdavis.edu/ccpic

Best Practices for Pavement

- Writing and enforcing specifications for asphalt compaction
- Writing concrete mix specifications
- 'Unpaving' to Create Affordable, Safe, Smooth Gravel Roads
- Pavement Condition Index: There's More (and Less) to the Score

Tools and Model Specifications

- Pavement life Cycle Cost Analysis Spreadsheet Software
- Asphalt Compaction Model Specification Language
- Concrete Pavement Model Specification Language
- Tack Coat Model Special Provisions
- Superpave for Local Government Model Specification Language (HMA-LG)

Other technical guidance efforts completed or currently underway include:

- Site Investigation guidance manual
- Recycling Guidance for Cold In-place (CIR) and Cold Central Plant (CCPR)
- Economic analysis of improvements in pavement practices
- Environmental life cycle assessment tool
- Interlocking concrete pavement specifications
- Soil Stabilization Guidance
- Catalog of pavement designs based on CalME software
- Guidance on pavements for bike and walking paths

Let us know if you have other ideas we should consider by sending an email to: eupdyke@ucdavis.edu .

CCPIC Technical Topics Event for Your Agency? The CCPIC has numerous presentations on topics like: how to get maximum value from condition survey data used in pavement management systems, the importance of asphalt compaction and tack coats on pavement life and specifics on how to get maximum value out of investments in asphalt treatments. These sessions have been hosted by selected agencies and attended by city or county agencies. A total of 24 agencies and 286 attendees have participated in these events. If your agency

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is interested in hosting a session, whether in-person or by web meeting, please contact eupdyke@ucdavis.edu. Attendance by multiple agencies at each session from the region around the hosting agency is welcomed and encouraged.

'Help Desk' for Local Agencies CCPIC has also expanded its services to include a 'Help Desk' for local agencies. This year it has helped agencies including the Town of Paradise, the City of Lincoln, Napa County, and Santa Clara County with specific pavement related problems. If interested in getting help from the Center, please contact either John Harvey or Erik Updyke.

GOVERNANCE BOARD RECRUITMENT

The Center is looking forward to filling four City seats on the Governance Board. If interested in the City Board seats, please contact Damon Conklin at: dconklin@calcities.org. The work required from a Board member is minimal, consisting of participating in 2 meetings per year and encouraging other agencies to improve their pavement practices.

For more information on the CCPIC activities please go to our website at: http://www.ucprc.ucdavis.edu/ccpic/ or email us at: eupdyke@ucdavis.edu

MSA Conference Revived In San Diego

By Roger Smith, CP^2 Center

After a few cancellations due to COVID, the big Maintenance Superintendants Association (MSA) Statewide Conference was welcomed back by over 300 registered guests from various public road agencies across the State – including Cities, Counties and Caltrans personnel. The Conference was also supported by almost 50 venders with equipment and product displays filling the inside and outdoor areas of the San Diego's Town & Country Hotel. A big event with lots to see, the Conference brings together the various Chapters from around California and also Arizona.

Presentations addressed many of the hot topics these agencies want to hear about related to maintaining their various infrastructure elements, including their biggest asset – pavements. To that end, Roger Smith of our CP^2 Center gave two presentations: 1) an overview of crack sealing do's & don't's, and 2) an overview of pavement management and the role surface treatments play as pavement preservation strategies.

There was also an 'Orange Shirt Day' with an equipment 'rodeo' competition involving backhoe / excavator skills, and a wheelbarrow obstacle course. All in all the Conference was a huge success.

The 2023 Conference is planned for September 25-29 in Fantasy Springs, CA (near Palm Springs, CA) sponsored by the Inland Empire / Desert Chapters of MSA.

For more information go to: www.mainsupt.com

PPRA Webinar: Emulsions - what are they good for?

By Gary Hicks (CP^2 Center), Larry Tomkins (Ergon) and Jason Dietz (FHWA-RC)

Emulsions are widely used in products other than for asphalt pavement preservation treatments. Emulsions are also used in many products that we touch, use or consume every day. This seminar, part of the FHWA/PPRA series, was delivered by Larry Tomkins of Ergon on October 20th.

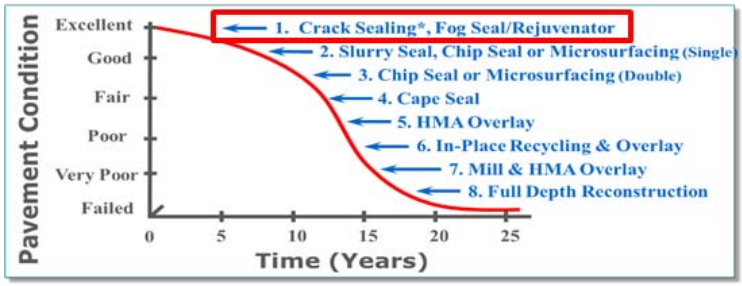

Figure 1. Treatments commonly used as a function of pavement condition

In asphalt pavements, emulsions are highly adaptable and flexible in that they can be optimized, enhanced, can be used in a variety of conditions, and, being water-based, are safe and environmentally friendly. Asphalt emulsions can also be used I pavement recycling. The major uses of emulsions in roadway applications are shown in Figure 1.

When the pavement is in good condition, special modified emulsions can be used for 'cold pour' crack sealing or filling. Crack seal normally requires a high-quality material while crack filling can use lower

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quality materials. Both have the capability of extending pavement life.

FIGURE 2. CRACK SEALING VS. CRACK FILLING

Emulsion-based fog and/or rejuvenating seals can also be used on good pavements to protect the pavement structure from moisture intrusion, help prevent oxidation, and raveling. Fog seals are generally applied earlier than rejuvenating seals. Both treatments have been shown to extend pavement life.

FIGURE 3. FOG AND REJUVENATING SEALS

Slurry and Microsurfacing are mixtures of an asphalt emulsion, aggregate, and water, but micosurfacing involves special additives, polymers and cement. They are both are placed using a special slurry machine as shown in Figure 4. They are used to prevent oxidation and raveling, prevent moisture and air intrusion into the pavement and improve skid resistance. Slurry seals cannot be used for rut filling, but microsurfacing can. Slurries cannot be placed at night, but micros can. A finished slurry surfacing is shown in Figure 5.

FIGURE 4. CONTINUOUS SLURRY PAVING MACHINE

FIGURE 5. FINISHED SLURRY SURFACING

Chip seals are widely used preservation treatments that combine a layer of emulsion with a layer of embedded aggregate. Figure 6 shows the application of the emulsion followed by the application of the aggregate. The chips are then rolled into the emulsion to embed them. It provides and all-weather surface, seals small cracks, waterproofs the road, improves surface friction and extends pavement life. Some agencies also use a fog seal on top of the chip seal to improve contrast and rock retention. This is known in California as a 'flush coat'.

FIGURE 6. APPLICATION OF THE EMULSION FOLLOWED BY APPLICATION OF CHIPS

Cape seals combine a chip seal with a slurry seal or micro surfacing. These treatments can be used on pavements in fair condition or a roadway that needs to be sealed due to cracking. Figure 7 illustrates a completed Cape seal on the right side of the roadway.

FIGURE 7. COMPLETED CAPE SEAL

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Scrub seals are the application of sand or small-sized aggregate on a broomed layer of polymer-modified asphalt emulsion, usually containing rejuvinator. The purpose of this treatment to fill and seal cracks, enrich the oxidized or hardened asphalt, or possibly as the preparation for another treatment such as a Cape seal. It is usually applied to a road where chip seal isn't a viable option anymore. Figure 8 shows the application of a scrub seal and the types of pavements for which scrub seals are used.

FIGURE 8. SCRUB SEAL TREATMENT

Other uses of emulsions include tack coats for hot mix asphalt, cold in-place recycling, full depth reclamation, and tack coats for patching or mill-and-fill operations. For more information on these treatments, please contact Larry Tomkins at larry.tomkins@ergon.com or Jason Dietz at jason.dietz@dot.gov . A recording of the presentation is available at: https://connectdot.connectsolutions.com/p99aidna7t95/

WRAPP Update

By Matthew Conorroe, Western Emulsions - WRAPP President

The Western Region Association for Pavement Preservation (WRAPP) is pleased to announce that registration is now open for the 2023 WRAPP Pavement Preservation Workshop being held in Long Beach February 1-2, 2023. The Workshop will feature a Keynote presentation from **Sergio Aceves**, Chief – Caltrans Division of Maintenance. Additional presenters will include **Dr. Andrew Braham** (U. of Arkansas), **Cathrina Barros** (Caltrans / Women of Asphalt), Jason Dietz (FHWA) and **Dingxin Cheng**, PH.D., P.E. (California Pavement Preservation Center).

Technical presentations will address: specification updates, bid documentation and specifications, distress identification, inspection, quality aggregate characteristics, polymer modification of slurry seals, fog seals, RAP as aggregates for pavement preservation, ARAM cape seals, and multi-layered systems.

Prior to the Workshop, WRAPP will be hosting the 2023 WRAPP Golf Tournament on Jan 31st at Skylinks Golf Club in Long Beach with a noon shotgun start. Details and registration can be found at the WRAPP website: www.wrapp.org

On November 10th, 2022, the WRAPP Board met with Caltrans in Sacramento to discuss upcoming training opportunities for Caltrans staff. It was decided that training would resume in 2023 and cover topics ranging from specifications to pavement preservation tools in the toolbox. Trainings will be held both virtually and in-person, and at the direction of Caltrans.

Also on the agenda for the meeting was discussion of the Caltrans / Industry Pavement Materials Partnering Committee (PMPC) 'bin list' items. Current work includes updating the fog seal specifications. Future bin list items include updates of Section 37 to meet FHWA concerns, RAP aggregate for slurry and chip seal, clarification of multi-layered systems, and minor updates to current specifications. We were also informed that Caltrans is looking into updating the Maintenance Technical Advisory Guides (MTAG's).

For more information please go to: www.wrapp.org

WRAPP WESTERN REGIONAL ASSOCIATION for Pavement Preservation

FHWA Update

By Chu Wei, FHWA Sacramento

FHWA Climate Challenge

FHWA's Climate Challenge announced that it has issued more than 35 projects from 27 agencies, providing $7.1 million to 25 states. These participants will receive training and work to implement projects that quantify the environmental impacts of pavement using life cycle assessment (LCA) and environmental product decelerations (EPDs). Caltrans was awarded three Climate Challenge Grants with an amount of $312,000. The Continued, next page

three projects are listed below:

Project 1: Provide Concrete, Asphalt, and/or Aggregate plants access to EPD Tool(s).

Project 2: Reduced Temperature Production and Chemical Warm Mix Asphalt.

Project 3: Exploring the Effects of High Reclaimed Asphalt Pavement (RAP) Rejuvenated Asphalt on Pavement Performance and Greenhouse Gas Emissions using EPDs and Balanced Mix Design Principles.

For more information, please visit: https://www.fhwa.dot.gov/infrastructure/climatechallenge/projects/index.cfm

Pavement Management Roadmap Documents 2022

FHWA just released the the updated Pavement Management Roadmap to reflect current and forward-thinking proficiencies and practices. The FHWA's update to its Pavement Management Roadmap helps to identify the steps that will address current gaps in pavement management and to establish research initiatives and priorities. Initial gaps were identified based on a literature review, project team knowledge, and a satisfaction survey of Federal, State, and local pavement management practitioners. They were grouped according to four themes: Theme 1 – Data, Theme 2 – Pavement Management Analysis Tools and Other Applications, Theme 3 – Workforce and Organization Issues, and Theme 4 - Technological Advancements – New Tools, Methodologies, and Technology. For more information visit:

Pavement Management Roadmap Executive Summary (FHWA-HIF-22-055)

FHWA now has an online InfoMaterials portal, which offers research data collected through FHWA, State and other national efforts. Data sets include Asphalt Binder Testing, HMA fracture testing, pavement friction measurement, and from the Mobile Concrete Technology Center.

Find more information at: https://infomaterials.fhwa.dot.gov/content/documents/brochure.html

For more information on FHWA resources contact Chu Wei at: chu.wei@dot.gov

MTC Update

By Sui Tan, Metropolitan Transportation Commission (MTC)

Improve Pavement Condition and Increase Your Budget In 5 Years?

Seeing your agency's pavement condition getting worse and worse? Want to help but don't know how to start? Don't despair, help is on the way.

99% of the time there is the lack of funding for road maintenance. So how do you acquire the needed funds to maintain your streets and roads? The success formula is straightforward using a three-pronged approach. This method has been tried and tested by many agencies from Pima County, the second-most populous county in Arizona, to a small Bay Area bedroom community like the city of Orinda, California.

1. Effective use of a pavement management software

You are already on the right path if your agency is using a pavement management software (PMS). However, you must regularly assess the pavement conditions, and update the work history and cost data used in the decision tree. Having a up to date PMS will help you to find out the current condition of your pavement network, predict future conditions, identify candidate projects for maintenance and rehabilitation (M&R), and generate budget requirements for planning purposes. To be effective, your task is to learn how to run budget analyses based on "what-if" policy questions. For example, if you are asked to achieve a target Pavement Condition Index (PCI) of 75 in 5 years, your PMS should be able to tell you the required budget is for each year, and generate a list of candidate M&R projects for each year.

2. Be a pavement preservation champion

Pavement preservation is doing the right treatment, at the right time, and at the right place. When you integrate a pavement preservation strategy into your PMS, you will be using preservation treatments on roads when they are still 'good', and in the long run, they'll cost less to maintain. It doesn't mean you have to be the guru of pavement preservation. However, you need to understand why it is important to integrate pavement preservation into your PMS - and be the person that advocates and promotes pavement preservation. Besides relying on your maintenance crews, consultants, contractors, and material suppliers, you need to get familiar with the overview of

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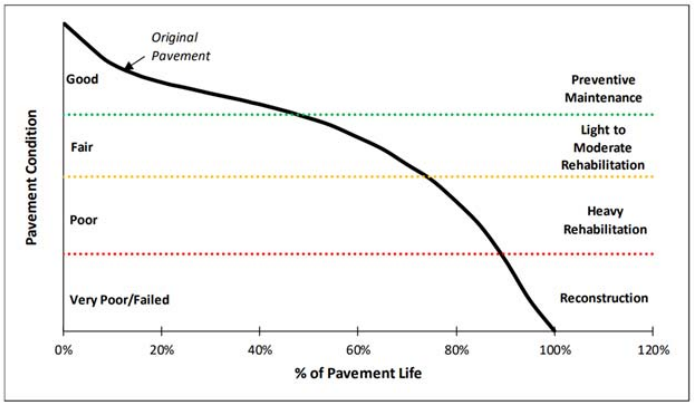
treatment strategies, materials and design, specifications, construction, and quality assurance. Here are some useful resources to get you started:

- Pavement Preservation & Recycling Alliance (PPRA) – roadresource.org
- California Pavement Preservation Center (CP2C) - csuchico.edu/cp2c/
- National Center for Pavement Preservation (NCPP) – pavementpreservation.org
- Federal Highway Administration (FHWA) - fhwa.dot.gov/preservation/

Below is a general, but not exhaustive list of M&R 'tools' available to local agencies:



3. Get buy-in from the top

According to the National League of Cities' annual report, infrastructure ranked in the top five important issues facing cities, according to their mayors. Once you're armed with the knowledge of PMS and pavement preservation strategies, it is time to work with upper management and elected officials. To get elected officials' buy-in, you need to provide, at a minimum, an annual 'state of the pavement' update. You need to understand what their pain points are and engage in a "What's in it for me?" conversation. They are usually on a short-term mission and they need to be responsive to constituents' requests and complaints, so one of the bullet-proof approaches is to set aside some minor (but dedicated) discretionary funding for them. With these funds, they can now satisfy their constituents requests, which should help them get re-elected.

With this three-pronged approach, you should be able to provide data-driven results to show to upper management and elected officials to help convince them to increase your pavement budget - for a smoother ride.

For more information contact Sui Tan at: stan@bayareametro.gov

Early Preventative Maintenance Extends Asphalt Pavement Life

By Greg Harder, P.E., Asphalt Institute

As asphalt pavements age, the asphalt binder that glues the aggregates together oxidizes, making the pavements more brittle and susceptible to cracking and other deterioration. To help mitigate this process, many agencies will apply preventive maintenance products such as chip seals.

Most agencies, for various reasons, wait to place their chip seals until the onset of cracking or some other deterioration. However, the states of Montana, North Dakota and South Dakota typically place their chip seals within one year from the time of pavement construction.

If someone puts new cedar siding on their home, would they wait until it starts to rot before staining it? The answer is no.

We began a study to look at the benefits (life extension or the postponement of the onset of cracking) achieved through the early application of a chip seal on a newly constructed pavement. The application of a chip seal very early in the pavement's life should help to preserve the quality of the binder in the pavement and should reduce the environmental aging (hardening) of the binder and ultimately improve crack resistance. A similar study was conducted in Minnesota and the results imply that to mitigate or slow the damage from environmental aging, sealing should occur within the first two years of the pavement's life.

NYSDOT Route 11, just north of Homer, New York was selected as the test site for the study. Suit-Kote constructed this section of roadway beginning in 2019 with 3-4 inches of cold in-place recycling followed by a hot mix asphalt scratch course of ¾ - 1" to get the pavement through the winter. In 2020 they placed a 1 ½" wearing course of 9.5 mm hot mix asphalt using a PG 64V-22 polymer modified binder. Three weeks later, a chip seal was placed on a 1,000 ft. section of this new pavement with subsequent sections to be sealed in future years (see layout below).

Cores have been and will continue to be taken annually from each of the sections for testing. Recovered binder testing,

Continued, next page

as well as mixture testing for this study, will continue at the Asphalt Institute lab in Lexington, Kentucky.

Once the chip seal material has been removed from the cores, mix slices are taken with the binder recovered from the top ½" and the next ½" of the cores. The recovered binder is tested for low-temperature stiffness (S) and relaxation (m) using the bending beam rheometer (BBR). Mix testing to determine the cracking potential of the mixture is also being done on the top 1 ½" (wearing course) using the indirect tensile test to determine the CT (Cracking Tolerance) index value.

Test results from each section are leading to similar conclusions as those found in the Minnesota study in that early sealing of the pavement appears to greatly slow the rate of hardening of the binder in the mix. While these are preliminary results, they clearly show a trend that early preventative maintenance will extend pavement life. Plans are to continue with this study with more sections to be sealed and cores to be taken annually until cracking appears on the roadway.

Greg Harder is an Asphalt Institute Senior Regional Engineer based in New York.

This is an abridged version of an article that appeared in "Asphalt" magazine – Summer 2022.

To read the entire article go to: asphaltmagazine.com/early-preventative-maintenance-extends-asphalt- pavement life/

Coming Events – Mark Your Calendar!

By Roger Smith, CP² Center

COMING EVENTS

TECH TRANSFER

U.C. Berkeley Technology Transfer Courses

These courses were developed in partnership with the City and County Pavement Improvement Center (CCPIC) and funded by California Senate Bill 1, the Road Repair and Accountability Act of 2017.

Classes currently open for enrollment are

- Pavement Sustainability (CCA-02) February 13-15, 2023
- Asphalt Concrete Materials & Mix Design (CCC-01) February 27- March 2, 2023
- Pavement Construction Specifications and quality Assurance (CCC-03) March 13-21
- Introduction To Pavement Engineering & Management (CCA-01) May 1-10, 2023

Registration information is at: https://www.techtransfer.berkeley.edu/

WRAPP

WRAPP Workshop: February 1-2, 2023 (Long Beach)

The 2023 Pavement Preservation Workshop will feature informative presentations by Industry experts on pavement preservation systems proven to extend pavement life - as well as presentations on specifications and preservation strategies used by multiple agencies.

For more information go to: www.wrapp.org

Nevada Asphalt Conference: February 15-16, 2023 (Reno)

A new event, The Nevada Asphalt Conference, will be held February 15-16 in Reno. The theme is "Advancing Innovative Asphalt Practices". Plan on two days loaded with informative speakers on timely subjects. 2023 Nevada Asphalt Conference – Agenda – Nevada Local Technical Assistance Program (nvltap.com)

CalAPA Spring Conference: March 23-24 (Ontario)

The California Asphalt Pavement Association (CalAPA) Spring Conference will feature speakers on timely important topics and numerous vendor displays.

For more information got to: www.calapa.net

U.S. Department of Transportation
Federal Highway Administration

PPRA

FHWA / PPRA Webinars: Various Dates (Online)

FHWA will continue to team up with the Pavement Preservation and Recycling Association (PPRA) to offer short webinars on various popular pavement maintenance treatments, including crack sealing, slurry surfacing, chip seals, Cape seals, and proper handling of asphalt emulsion products.

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Registration is at:

https://connectdotcqpub1.connectsolutions.com/content/connect/c1/7/en/events/catalog.html?folder-id=1296478025&from-origin=connectdot.connectsolutions.com

Find more information and dates contact: Jason.Deitz@dot.gov

Nevada LTAP Center Classes: Various Dates (Online)

The Nevada center for the Local Technical Assistance Program (NV-LTAP) regularly offers classes on a variety of pavement maintenance topics.

For more information go to: https://nvltap.com/

RMWPPP Annual Meeting: September 2023 / NCPP

The Rocky Mountain West Pavement Preservation Partnership (RMWPPP) is a regional forum of pavement professionals from State and Provincial Agencies, Contractors, Suppliers, Academia, Local and Federal Government Officials. For more information got to:

https://tsp2pavement.pavementpreservation.org/rocky-mountain-west-rmwppp/

The Asphalt Institute and NAPA Webinars (Online)

The Asphalt Institute offers national training on pavement design, asphalt binders, nix design and asphalt construction. They now offer an online *Paving Inspector Certification (PIC)* program, an ideal orientation course for employees new to asphalt, and a great refresher course for more experienced personnel. For more information on The Asphalt Institute go to; http://www.asphaltinstitute.org/training/seminars/

The National Asphalt Pavement Association (NAPA) offers webinars on various asphalt pavement topics. For current listings go to: https://www.asphaltpavement.org/programs/napa-webinars

The National Center for Pavement Preservation (NCPP) Training (Online)

NCPP was established by Michigan State University and FP2, Inc. to lead collaborative efforts in the advancement of pavement preservation through education, research and outreach. Training is an integral part of any Pavement Preservation Program. Courses are offered periodically throughout the year and are advertised at: www.pavementpreservation.org

Caltrans established the California Pavement Preservation (CP^2 Center) at CSU, Chico in July 2006, and fully funded the Center in January 2007. Dr. DingXin Cheng is the current Director of the Center. Mr. Rukesh Maharjan is the current Contract Manager of Caltrans.

The purpose of the Center is to provide pavement preservation support services to Caltrans and other public agencies, and to industry. Unique services include developing educational programs in pavement preservation, providing training and staff development opportunities, providing needed technical assistance to public agencies and industry, and managing/conducting research and outreach services, such as this newsletter.

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