



CP2 CENTER NEWS

Newsletter of the California Pavement Preservation Center

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Plastic Bottles? Recycled Into Asphalt Pavement?

By Roger Smith, CP² Center

Over the years asphalt pavement has been the repository for a lot of 'refuse' materials under the banner of recycling. Crushed glass bottles, sulfur from refineries, sandblast grit from shipyards, and even old crushed toilets are some of the more exotic ones. And of course, ground tire rubber and reclaimed asphalt pavement (RAP) are now a routinely recycled component in many California asphalt pavements.

But Caltrans recently completed a test project incorporating post-industrial recycled plastic into a cold in-place recycling (CIR) project in northern California near the town of Oroville.



Type 1 Plastic Bottles

"This pilot project underscores the department's commitment to embracing innovative and cost-effective technologies while advancing sustainability and environmental protection efforts," Caltrans Director Toks Omishakin said in a news release.

The location of this experimental asphalt CIR pavement work was a 1,000-foot section of Highway 162 near Oroville, a semi-rural community in Butte County about 70 miles north of Sacramento. Caltrans estimates that a one-mile segment of pavement using post-industrial recycled plastic is equivalent to the weight of 150,000 plastic bottles, which are reformed into a liquid polymer binder. The plastic is what's known as 'PET' – the initials stand for polyethylene terephthalate – a Type 1 plastic. The liquefied PET binder is mixed, in place, into the CIR millings.



CIR Paving Train



Rolling the TechniSoil CIR

The \$3.2 million paving project covered a stretch of Highway 162 between the Feather River and Christian Avenue near Oroville. Lamon Construction Company, Inc. of Yuba City was the prime contractor, with the pavement work subcontracted to Pavement Recycling Systems (PRS).

Continued, next page

IN THIS ISSUE

- 1 Plastic Bottles? Recycled Into Asphalt Pavement?

ASPHALT PAVEMENT NEWS

- 2 Fiber-Reinforced HMA In Napa County
- 4 Placer County Tries New Surface Sealer
- 4 GRCS Test Sections In Santa Barbara
- 6 San Joaquin County Chip Seal Program
- 6 Porous Asphalt Pavement Webinar
- 7 AASHTO ETF Update

PCC PAVEMENT NEWS

- 8 PCC Pavement Preservation Training
- 9 Concrete Preservation Training

GENERAL NEWS

- 10 Pavement Preservation "Tech Briefs"
- 10 Pay-Per-Mile
- 11 PPRA and FHWA Webinar
- 12 CCPIC Update
- 13 Good, Fair, and Poor?
- 14 FHWA Update
- 15 Coming Events

Using new technology developed by TechniSoil Industrial of Redding, Calif., a recycling train of equipment from PRS grinds up the top 3 inches of pavement and then mixes the grindings with a liquid plastic (Type 1) polymer binder, which includes post-industrial recycled plastic. The binder content on this project was 4.2% by weight of the milled RAP aggregate.

The new 100% reclaimed material is then placed via a paving machine as the top surface of the roadway, eliminating the need for trucks to bring in new hot mix asphalt (HMA) material for paving a cap layer. Caltrans has long history of doing CIR projects, but have used new HMA as the final cap layer. By eliminating the cap layer, the need to haul in any new material from the outside goes away. Caltrans believes this process may also significantly cut greenhouse gas emissions.

"We're excited about introducing a new sustainable technology and helping pave the way for utilization of recycled plastics throughout the state," Caltrans District 3 Director Amarjeet Benipal said in the Caltrans press release. "This process is better for the environment because it keeps plastic bottles out of landfills and helps reduce greenhouse gas emissions and reliance on fossil fuels." Tom Pyle, Office Chief of Asphalt Pavement of Caltrans Headquarter, stated "The plasticized pavement is being investigated to understand the construction, material and environmental characteristics that could make it a specialized tool in the department's options to repair pavements,"

TechniSoil President, Sean Weaver anticipates other Caltrans work saying, "We are pleased to work with Caltrans on more sustainable and higher performing pavements that will deliver

more value for California taxpayers."

At the national level, recently, the National Asphalt Pavement Association (NAPA), successfully lobbied for the inclusion of \$800,000, in a federal appropriations bill, to fund a Transportation Research Board study on the use of recycled plastic in asphalt.

But according to The Oroville Mercury Register (July 31), environmentalists aren't rushing to embrace the new technology just yet. Some have raised concerns that the roadway may leach bits of micro-plastic into the environment, something TechniSoil Industrial says tests show does not happen. Skeptics also say it may not be the best use for PET plastic.

"We have no objection to a pilot project for recycling plastic beverage bottles," said Mark Murray, Executive Director of Californians Against Waste, a leading recycling advocacy group. "But these PET bottles currently are being successfully recycled in California into other bottles, and have a very high demand." Murray noted that about 75% of plastic beverage bottles - which have #1 on the bottom of the container - are being recycled already in California, a higher rate than glass bottles. "Putting these materials into one-way paving material may not be their highest and best use," he said. Instead, an asphalt process that uses other types of plastics - like #3, #4 or #5, which have very low rates of recycling - would be a better fit, he said.

More information is available at: <https://dot.ca.gov/news-releases/news-release-2020-024>

or <https://technisoilind.com/>

(Note: Information for this article was borrowed from a Caltrans Press Release, the CalAPA Insider and The Oroville Mercury-Register)



Fiber-Reinforced HMA In Napa County

By Brandon Gasser, Pacific GeoSource

In July 2020, Napa County completed an overlay project on roughly 1.5 miles of Zinfandel Lane, in the form of a 2.5" mill-and-fill using Caltrans' Rubberized Hot Mix Asphalt (RHMA-G) with FORTA-FI fiber reinforcement. Zinfandel Lane is a heavily trafficked county road (ADT 2898) that is a major collector between Silverado Trail and Highway 29 at the south end of the City of St. Helena. Prior to the overlay, the road condition

was poor (PCI 28), with moderate to severe alligator cracking and age-related distress due to traffic loads, including heavy trucking. With an average thickness of 9.5" of HMA over 4" of aggregate base, Zinfandel Lane was theoretically designed for a Traffic Index (TI) of approximately 8. No significant rutting or base failure was observed.



Paving Zinfandel Lane in Napa Valley

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Zinfandel Lane Prior To Overlay

Since the existing road elevations needed to be maintained due to flood plain considerations, the initial proposed rehabilitation for Zinfandel Lane included paving fabric in combination with the RHMA-G as part of a 2.5" grind and inlay, as well as localized dig-outs of 4-6" for areas of significant distress. This strategy was expected to add 20 years of service life to Zinfandel Lane. Ultimately, Napa County engineers decided to incorporate FORTA-FI into the RHMA-G mix instead of using a paving fabric, with the expectation of achieving greater than 20 years of service life. FORTA-FI is reported to delay the onset of top-down fatigue cracking, thus providing a greater window of time until future preventative maintenance applications.



Fibers in RHMA-G mix

At similar cost to paving fabric (11% of asphalt cost; approx. \$15/ton of mix), FORTA-FI is expected to mitigate reflective cracking while also providing additional benefits. Since the fibers were added to the HMA at the production facility, the installation time of paving fabric was eliminated, and construction time on the project was reduced.

FORTA-FI, dosed at 1 lb/ton, provides 19 million individual $\frac{3}{4}$ -in 'aramid' fibers within a ton of asphalt. Aramid, a high tensile strength fiber, is 5X stronger than steel. These fibers provide needed tensile strength to a material that often fails in tension, significantly mitigating cracking and rutting. FORTA-FI can be added at any plant, in any mix, for any application. It does not require changes to asphalt content or mix design and does not impact construction laydown operations. Its effect has been significant in mitigating cracking, reducing maintenance needs, and extending the life of asphalt overlays.

This was evident in a recent side-by side comparison in Los Angeles County. After an in-service age of 2-years, Pavement Engineering Inc.

conducted a condition survey on Davenport Rd. They found that the 2" mill and overlay with FORTA-FI experienced 74% less cracking as compared to the opposite side, which used the same asphalt mix without FORTA-FI.



Davenport Rd – LA County, cracks in control section vs. FORTA-FI section after 2 years

"In our analysis of reinforcement strategies, we determined that there is an upside to utilizing fiber reinforcement, as opposed to adding paving fabric

to the project," said Sonja El-Wakil, Napa County Project Engineer. "Not only do fibers eliminate the fabric stage of paving, and therefore reduce construction time, but the advertised added life extension benefits of FORTA-FI will preserve future maintenance budget, and ultimately save the county money. Fiber asphalt reinforcing is new for Napa County, especially in combination with RHMA-G. We have seen no impact to constructability and good interim testing results for paving. I am pleased with the outcome of this project."

Stephen J. Stangland, Napa County Public Works Superintendent added, "After seeing how the fibers lock together hanging off the paving machine, shovels and trucks, and the stability this product affords our roads, I'm very confident we will see a great reduction in reflective cracking. I'm very happy to have this in my toolbox."

Ghilotti Construction was the low bidder on the Napa County project, paving a total of 3500 tons of RHMA-G with fibers. "We've paved with fibers a few times now, both with and without rubber. As far as the material placement & compaction goes, our crews aren't burdened by it or required to do much different than a normal operation," said Troy Miles, Ghilotti Construction Project Manager.

FORTA-FI fibers have been used in 75+ paving projects by over 30 public agencies in California since 2012, and over 2500 projects nationwide.

For more information on FORTA-FI and other innovative pavement solutions, go to: <https://www.pacificgeosource.com/> or follow Pacific GeoSource on LinkedIn.





Placer County Tries New Surface Sealer

By Roger Smith, CP² Center

Placer County's Department of Public Works hosted the trial of a new Tire Rubber Modified Surface Sealer (TRMSS) on July 23 on Kemper Road near Auburn. The project was coordinated by the County's Corinne Allen working with Wade Miller of the GuardTop Company.

The treatment involves the spray application of GuardTop's special clay-stabilized asphalt emulsion containing fully digested ground tire rubber. According to Miller, this fog seal process, called "surface sealing", has been in use in Arizona for over 10 years, but is rather new to California. Caltrans has used it as a flush coat on some large chip seal projects, including I-8 in San Diego, and they have also demonstrated its use as 'texture seal' (with aggregate) on US395 with near Bishop. One of the earliest adapters is the City of Santa Maria, now in its third season of TRMSS, as well as pilot projects with Madera County and City of San Jose.

Used on a conventional HMA surface, or as a flush coat on chip seals, it's intended to extend service life by providing increased protection against UV oxidation, while providing superior adhesion and retaining its black color. Its harder base asphalt is also reported to reduce tracking – an important aesthetic consideration. Each lane-mile of TRMSS contains 20-27 recycled tires.



Spray application of TRMSS – without the common brown-to-black color change. The distributor

In Auburn, the product was placed on Kemper Road directly over painted striping, and temporary plastic lane markers were used. The application rate on the older chip sealed surface was 0.14 gal/sy. It's interesting to note that the liquid emulsion product is sprayed black

truck, from Talley Oil out of Madera, was modified with larger spray nozzles, which were easily cleaned with a water soak after use.

Asphalt emulsion products, being water based, rely on evaporation of the water element for drying /curing. With an air temp of 80F and a light breeze, the Auburn roadway was ready for traffic in less than 2 hours, drying to a uniform black matte color.



TRMSS cure stages (L at 20 min; C at 10 min; R at 5 min.)

According to the County's Corinne Allen, "This product shows promise as a pavement preservation tool. We like its look and the ease of application, and we'll be watching its performance

with the possibility of adding it to our toolbox. We also like its 'green' aspect – the recycling of old tires. I really am looking at it as a tool to possibly extend the life of some of our chip seals, and as a cape seal type element in some of our more rural communities. The flexibility, drying time and lack of shedding make it a very attractive alternative."

GuardTop recommends this surface sealer as a pavement 'preservation' tool to be applied on pavement still in good condition.

As GuardTop expands their pavement services, their other newer products include a less visible crack sealer product for improved aesthetics, and a "cool" (lighter colored) pavement sealcoat product.

For more information go to: www.guardtop.com



GRCS Test Sections In Santa Barbara County

By Ray Myers (AIA)

Geosynthetic Reinforced Chip Seals (GRCS) consist of a double chip seal over an interlayer. GRCS systems have been installed for over 30 years with great success in providing a new wearing course, a waterproofing interlayer membrane and the mitigation of crack propagation. In the early installations, and for many years following, the interlayer used was a 4.1 oz/sy polypropylene paving fabric. In recent years, however, geosynthetic manufacturers have developed a new class of interlayers designated paving mats. The paving mat group of products is made of a fiberglass-polyester

blend. The group was developed to be higher in tensile strength and lower in shear than polypropylene, hence more millable and recyclable. Several recent GRCS projects have been accomplished with paving mats.

The Asphalt Interlayer Association (AIA) wished to quantify the relative benefit of each of the products it represents, so organized a test project with the cooperation of the Santa Barbara County Department of Public Works on San Leandro Lane in Santa Barbara.

Continued, next page



**Rolling of geosynthetic interlayer
prior to chip seal**

AIA manufacturing members provided eight current interlayer products they offer. Included were the original 4.1 oz/sy polypropylene fabric, a 6 oz/sy version of polypropylene fabric, and the new Petromat 'Enviro' fabric. In addition, there were five paving mat products installed. The paving mat products vary in strength from 6kN to 50 kN. All of the products have specific tack coat requirements, as recommended by their respective manufacturers. All tack coat binder for the interlayers was a PG 64-16 neat asphalt, spray applied.

For GRCS treatments the AIA has always recommended a double conventional chip seal to be placed over the interlayers. The first layer was a 3/8" chip placed at approximately 24 lbs/sy with PMCRS2 emulsion at a rate of 0.31 gal/sy. The second chip was a 1/4" installed at a rate 18 lbs/sy with the same emulsion at a rate of 0.27 gal/sy. The second chip locks in the larger first chip layer. Therefore, a smoother finish results, acceptable for bikes and skateboards. A fog seal (flush coat) is only placed if a black color is desired, since this increases heat gain of the surface and the underlying asphalt. Rolling and sweeping was standard.

Santa Barbara was instrumental in selecting San Leandro Lane, a roadway section of reasonably uniform distress throughout, and of sufficient length to incorporate all the products. The individual



Original pavement condition

sections were 200' long by 12.5' wide. Therefore, the total single lane test section was 1800 feet in length. One 'control' section within the project limits was left without an interlayer – i.e., with only a double chip seal. The opposing lane of San Leandro Lane will be a Polymer Modified Rejuvenating Emulsion (PMRE) Cape seal. Therefore, a total of 10 maintenance strategies will be able to be evaluated. The distress conditions of each test section were documented prior to the placement of the treatments in accordance with ASTM D4633.

AIA members, Pacific Northwest Oil and Pavement Coatings Co. went above and beyond in terms of their cooperation and donations to provide equipment, materials, expertise and manpower to make this test possible. AIA has for many years been able to show the enhanced performance of maintenance treatments placed over interlayers. In this particular case the use of multiple available interlayers will provide the manufacturers, as well as the Association, the opportunity to exhibit the benefits of various products having different properties. Representatives from the County of San Luis Obispo, City of Santa Barbara, City of Buellton, F&A Engineering as well as multiple department representatives from the host County of Santa Barbara were on hand for the test. "Santa Barbara County wants to thank AIA and its partners for choosing our agency for this very important pilot project. Santa Barbara has long been a leader in pavement preservation, and we have excelled at choosing proven, cost-effective strategies to make our limited financial resources go further to maintain our transportation system," said Scott McGolpin, P.E. Director of Public Works.

Other County staff involved were Mostafa Estaji, Ph.D., Pavement Design Lead, and Richard Navarro, Maintenance Superintendent.

For more information contact Ray Myers, AIA Executive Director, at:

800.650.2342 or rmroads@gmail.com



San Joaquin County Chip Seal Program

By Derrick Deckwa, VSS

During the summer of 2019, San Joaquin County constructed its County-wide chip seal project. The contract was awarded to VSS International, Inc. in the amount of

\$2,279,000.00. With all of agriculture in the area there is always a need to make sure the roadways can handle not only the agricultural traffic, but take care of the needs of the people that call San Joaquin County home. All of this caused scheduling concerns for this contract. It was important to

schedule the work before the end of July so that the lane closures would not interfere with the harvesting operations.

This project called for a 1/4" chip seal to approximately 140 lane miles of roadway throughout the county. It involved first spraying a layer of a polymer asphaltic emulsion, PMCRS2h, followed by a layer of 1/4"

aggregate "chips". The asphaltic emulsion covers the roadway sealing the existing asphalt. The chips are then embedded in the emulsion to protect the asphalt layer and add a skid resistant wearing course. Additionally, the specifications called for the aggregate to be black in color. This has the result of making

the road look like it was just paved, leaving the road always looking black, instead of 'greyed-out' like most roads. During this project VSS International placed almost 1000 tons of PMCRS2h and 7500 tons of 1/4" aggregate chips.

Before VSS could begin the chip seal process, they had to make sure the roads had been prepared. Beginning with patch paving, any areas of failing asphalt were ground out and repaired. This was followed by installing a crack seal on the roadways. One of the advantages of a chip seal is the speed at which it is applied to the road, and the minimal inconvenience

to the traveling public. This project had a very tight time frame for completion. VSS

International had to have the roads finished by the end on July, so that the roads would be open for the grape



harvest. If the County were to overlay any of the sections of roadway that were included in this project, the traveling public would experience consistent long-term delays. VSS International was able to safely keep traffic consistently moving through the work zones with a pilot car and minimal wait times. Once the roads were properly prepared, the 140 lane-miles of chip seal were placed.

"Chip Sealing is a cost effective way to respond to our aging roads without draining our resources, but it does come with its own challenges. The chips are not supposed to be totally encapsulated in the oil, so some shedding occurs. San Joaquin County includes contract requirements that address regular sweeping and warning signs that alert drivers of this condition. It was a great experience to work with VSSI in completing this project on time and within budget because they were able to accommodate changes in scheduling and work limits," reported Miguel Aguirre, Engineer III, San Joaquin County Public Works Department.

For more information go to: www.slurry.com



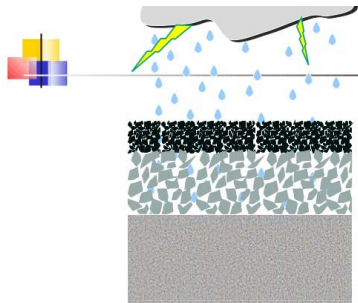
Porous Asphalt Pavement Webinar

By Roger Smith, CP² Center

On July 20 the Asphalt Pavement Alliance (APA) presented a webinar offering an update on porous asphalt pavement technology. Porous asphalt pavement is a stormwater management solution that reduces stormwater runoff, improves water quality, and reduces the footprint for stormwater management systems.

Porous pavement is intended to allow the drain-through of surface water into a designed water storage bed beneath the paved surface. Of course, this reduces surface runoff, and if the soil infiltration is adequate, the need for tying into a storm drain system or constructing large detention basins on site can

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be eliminated. Porous pavement is typically only used on parking lots or other low-load pavements such as auto malls, storage lots, playgrounds and even bike trails. In most cases, overall costs are reduced and the need for expensive acreage for detention basins is eliminated.

Most people in northern California are familiar with open graded friction course (OGFC) used extensively by Caltrans for wet weather safety on higher speed routes. Porous pavement has a similar 'open' matrix, but involves asphalt mix with even higher air voids or porosity.

These pavements must be designed as a 'system'. General details of the underlying structure include first placing a geotextile (fabric) on the uncompacted subgrade, followed by a course of 1/2" rock, then an open 'storage' layer, 18" – 36" thick, of larger rock (1 1/2" x 3" size), followed

by a 'choker stone' layer to run the paver on, and a final surfacing of a very open / porous HMA mix. This final HMA should be more 'open' than conventional OGFC, and should involve a very hard asphalt binder (e.g. PG 76-22), which usually will require polymer modification.

It should be noted that on these parking areas, no sealcoat products or sanding should ever be applied. They must remain 'open' for drainage. Vacuum cleaning a few times a year is recommended.

More information on Porous Pavement can be found on the CalAPA website at: <http://calapa.net/stormwater.html> or

via the National Asphalt Pavement Association (NAPA) at: <https://member.asphaltpavement.org/Shop/Product-Catalog/Product-Details?productid={33A571B7-7701-EA11-A811-000D3A4DBF2F}>



AASHTO ETF Update

By Colin Franco (RI DOT) and R. Gary Hicks (CP2C)

The American Association of State Highway and Transportation Officials (AASHTO) -TSP2, (Transportation System Preservation Technical Services Program) Emulsion Task Force (ETF) held a virtual meeting on August 18, 2020, to review accomplishments and plans for developing AASHTO standards (i.e. material specifications, design practices, and quality assurance and construction guides) for emulsion-based pavement preservation treatments. Many of the materials specifications and design practices have already been developed and published by AASHTO, and the construction guides for chip seals, microsurfacing, and fog seals have been submitted to AASHTO for balloting. Other guides will be developed as a part of new NCHRP Projects 14-43 (Cold Central Plant Recycling and Cold In-Place Recycling), to be performed by NCAT, and 14-44 (scrub seals, slurry seals, and tack coats) to be performed by the University of Arkansas. In addition, two new initiatives were discussed, which included the use of rejuvenators in emulsions, and how to best message and implement the new AASHTO standards and guides. All the activities (completed or planned) are summarized in Table 1.

NCHRP project 9-63 is also underway to develop performance graded (PG) specifications for asphalt emulsions. This will involve developing

an asphalt recovery method for emulsion residues, and then a suite of tests which relate to the performance of emulsion treatments like chip seals, slurry surfacings and more. This project is now underway by the Asphalt Institute (AI) and NCAT under the leadership of Mike Anderson of the AI. A Phase 1 report was submitted. Issues being addressed in Phase 2 include the recovery method for the asphalt residue, the low and intermediate temperature properties for the residue that relate to performance, and the effects of polymer in the binder.

Another ETF effort underway is the development of quality assurance (QA) guides for chip seals and slurry surfacings. These were developed and submitted to AASHTO for balloting. Comments were received from the states and it is expected these guides will be voted on by AASHTO members this fall.

Also discussed was a new 36-month NCHRP Project [20-44(26)] Implementing Guide Specifications for the Construction of Chip Seals and Microsurfacing, designed to implement and facilitate the use of the new specifications and guides by State Dot's and Local Public Works Agencies. The contract will be performed by Larry Galehouse of the NCPP, and the AASHTO ETF will provide technical support to DOT's and Local Agencies who will

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be constructing demonstration projects using the new Guides. Caltrans Districts and Local agencies are encouraged to participate in the Demo projects ,and apply for technical assistance from the PI (NCPP) and ETF in utilizing and adopting the AASHTO Construction Guide Specs.

Finally, future research topics were briefly discussed, as there is an urgent need to develop

new construction-focused test methods to support the new AASHTO standards in the areas of materials compliance, mixture performance and workmanship quality.

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



Table 1. Status of AASHTO Standards and Construction Guide Specs for Emulsions

	AASHTO STANDARDS			
Emulsion Treatments	M / MP	R	W/ COMP	Construction Guide Specs
Chip Seal	MP27-16	PP82-16		Completed in NCHRP 14-37
Microsurfacing	MP28-17	PP83-16		Completed in NCHRP 14-37
Tack Coat	MP36-18	PP93-18		To be done in NCHRP 14-44
Fog Seal	MP33-17	PP88-17		Completed in NCHRP 14-37
Scrub Seal	⚙	PP91-18	2019	To be done in NCHRP 14-44
Sand Seal	MP34-18	PP90-18		Problem Statement to TRB in 2020
Slurry Seal	MP32-17	PP87-17		To be done in NCHRP 14-44
Foam Asphalt Stabilization		MP38-18		
Bonded Surface Treatments (Nova Chip)	⚙	⚙	2018	Problem Statement to TRB in 2020
Cold Recycled Mixtures	MP31-17	PP86-17		NCHRP 9-62 /14-43
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)				Ongoing in NCHRP 9-63

Legend:

M=Material Specs, T=Test Methods, R=Design Practices, P=Provisional, ⚙=Draft w/AASHTO COMP

PCC Pavement Preservation Training

By Larry Scofield, ACPA, IGGA

On August 19, the Transportation Research Board Conducted a Webinar on Preserving Concrete Pavements. The 1.5 hr webinar consisted of three twenty minute presentations followed by a 25 minute question and answer session. The webinar, which attracted 425 participants, consisted of presentations on diamond grinding, partial depth repairs, and joint resealing. Larry Scofield of the IGGA/ACPA provided the diamond grinding presentation

while APtech consultants Prashant Ram and Kurt Smith provided presentations on partial depth repairs and joint resealing, respectively. The TRB webinar presentations are available at the link below: <http://onlinepubs.trb.org/onlinepubs/webinars/200819.pdf>

For more information contact Larry Scofield at: lscofield@acpa.org



Concrete Pavement Preservation Training

By Larry Scofield, IGGA/ACPA

The National Concrete Pavement Technology Center (CP Tech Center) recently hosted a four-part webinar series on concrete pavement preservation. Each of the webinars consisted of two, 25-minute presentations. The series and their descriptions are indicated below, along with the link to this webinar series for online viewing:

- Concrete Pavement Management and Preservation
 - o Concrete Pavement Management and Preservation: Larry Scofield of the IGGA/ACPA discusses the roots of pavement management including some of the original PMS concepts provided by Drs. Haas and Hudson's pavement management book. He further makes a distinction between flexible and rigid pavement management systems and discusses the circle of life concept.
 - o Douglas County, Colorado PMS: Angela Folkstead of the CO/WY ACPA provided a local community pavement management case study which indicated how the community manages their network and programs their maintenance and construction activities. Douglas County has developed their own pavement distress guide and conducts their own annual distress surveys. The success of their PMS system and preservation program has allowed an increased in program funding.
- Concrete Pavement Evaluation and Preservation Strategy Selection:
 - o Concrete Pavement Evaluation: Steve Tritsch of the CP Tech Center provides an overview of concrete pavement evaluation and showcased the recently completed Concrete Pavement "Distress Assessment and Solutions Manual" recently prepared by the CP Tech Center. The presentation provided an overview of concrete distress types, distress evaluation equipment, and possible solutions to the various distress types.
 - o Concrete Pavement Evaluation for Restoration: John Donahue of the Missouri DOT provides an overview on how MoDOT considers PCC pavement evaluations and selects and constructs various concrete strategies. He provided case examples regarding the performance of the various strategies.
- Concrete Pavement Preservation Treatment Construction (including in-field case studies):
 - o Concrete Pavement Preservation Treatment Construction: John Roberts of the IGGA provides a review of seven different concrete preservation treatments, which include subsurface rehabilitation, cross stitching longitudinal cracks, partial-depth repairs, dowel-bar-retrofit, diamond grinding, and joint and crack resealing.
 - o Concrete Pavement Preservation Phoenix Diamond Grind Story: Randy Everett of the Arizona DOT provides a case history of how the Phoenix Area PCCP came to be covered with asphalt rubber, its performance over time, and associated costs to continually replace the overlay and its implications to ADOT's network. The Central District (Phoenix Area) has recently constructed several projects removing the existing asphalt rubber and diamond grinding the pavement as the final riding surface.
- Concrete Pavement Repair/Preservation Best Practices & Performance:
 - o Dr. Michael Darter provided a review of a national survey to gauge the experiences of State DOTs and Contractors with several concrete pavement repair/preservation techniques, with emphasis on design, specifications, construction practices, inspection/acceptance, and performance. The six strategies evaluated were full depth repairs, partial depth repairs, dowel bar retrofit, cross stitching and slab stabilization. The project prepared a report entitled "Concrete Repair Best Practices: A Series of Case Studies 2017", six tech briefs and training presentation on each strategy. The products of that project are available at : <https://spexternal.modot.mo.gov/sites/cm/CORDT/>

All the four-part series presentations are available at: <https://cptechcenter.org/webinars-and-videos/>

Pavement Preservation “Tech Briefs” Available

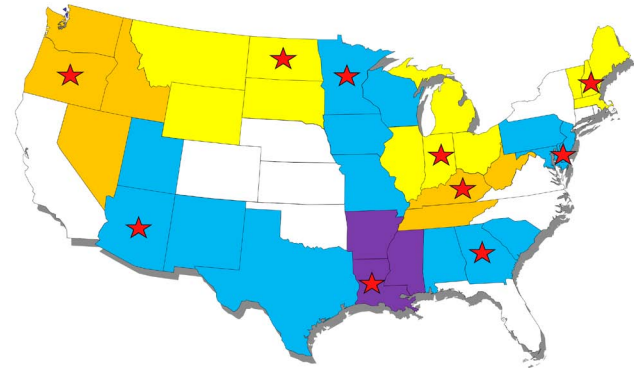
By Roger Smith, CP² Center

The FHWA Every Day Counts (EDC-4) Program created a Pavement Preservation “HOW” peer exchange project dedicated to improving specifications and construction quality and ultimately the use of pavement preservation strategies to extend pavement life. The FHWA HOW project contracted with the Concrete Pavement Tech Center (CPTC), who enlisted the International Grooving and Grinding Association (IGGA) to help facilitate the concrete pavement portion, and the National Center for Pavement Preservation (NCP) to facilitate the asphalt pavement portion. The project conducted ten regional peer-to-peer exchanges, each of which involved three to four participating states. Thirty-seven states participated in the peer exchanges with a total of 330 participants. For each of the peer exchanges, a “Tech Brief” was prepared to document the activities and to promote the lessons learned from each event.

Mr. Antonio Nieves was the FHWA’s project manager, and Steve Tritsch, P.E. of the CP Tech

Center the contract project manager. Larry Galehouse, P.E. of NCCP and Larry Scofield, P.E. of IGGA/ACPA were the facilitators for the peer exchanges.

The FHWA Tech Briefs are now available at: <https://www.fhwa.dot.gov/preservation/library.cfm>



Color Groupings Indicate States Participating in Regional Peer Exchanges—Stars Indicate Host States



Pay-Per-Mile Alternative for Transportation Funding

Excerpts from Caltrans’ “Mile Marker” Newsletter

Road Charge May Prove a More Sustainable Alternative to the Gas Tax

The Road Repair and Accountability Act of 2017 (Senate Bill 1) is providing a much-needed boost to California’s transportation system, but efforts to explore a long-term funding alternative - such as a mileage-based fee to replace the gas tax - are still needed to account for more fuel-efficient vehicles, those that don’t use gasoline, and residents who choose to rely on other modes of transportation.

In 2014, the Legislature passed SB 1077, which created the Road Charge Technical Advisory Committee to provide expert advice and recommendations to the California State Transportation Agency on a pilot program to explore the potential of a ‘road charge’.

Following the conclusion of the successful California Road Charge Pilot program — the nation’s largest to date — California continues to investigate the feasibility of fee-based highway financing system. This ‘pay-per-mile’ methodology could eventually augment and ultimately replace the existing fuel tax and ensure that all vehicle users of California’s roads contribute to the upkeep of those roads.

The nine-month pilot program enlisted more than 5,000 volunteer drivers to track the mileage of their vehicles using methods that ranged from low tech — writing down odometer readings — to using a plug-in that charted their mileage automatically. More than 37 million miles were logged through all reporting methods. The final report on the pilot program showed that 73 percent of its participants judged a road charge to be fairer than a gas tax.



Some state drivers used this fob to record their vehicle’s mileage in an earlier road charge demonstration.

California has been awarded almost \$3.8 million in grant funding from the Federal Highway Administration to explore straightforward and approachable methods for users to pay a road charge.

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This new demonstration project will test the technical feasibility of collecting a road charge at the gas pump, just as people pay the gas tax now. It will also study how a road charge could be collected through other emerging technologies and industries, including usage-based insurance, transportation network companies such as Uber and Lyft, and autonomous vehicles.

These methods all have the potential for

creating a very simple user experience as well as reducing administrative costs. The project is currently in design with a live demonstration targeted for the first half of 2021 and a final report expected in summer 2022.

Is paying by the mile, rather than the gallon, a more sustainable and fair approach to highway financing? Share your thoughts with us at: Road.Charge.Pilot.Program@dot.ca.gov.



PPRA and FHWA Webinar Series for 2020

By Jason Dietz, FHWA and R. Gary Hicks, CP² Center

The Pavement Preservation and Recycling Alliance (PPRA) in conjunction with FHWA since February 2020, has been offering free pavement preservation webinars for anybody interested in ‘keeping good roads good’ and preserving their investment in roadways, enhancing safety, extending pavement life, improving functional performance, and contributing to increased user satisfaction. Topics have included Crack Treatments, Emulsion 101, Engineered Emulsions, Slurry Systems and Site Selection, Milling Best Practices, Hot In-place Recycling, and more. The August monthly seminar was given by Larry Tomkins of Ergon, and was titled “Introduction to Chip Seals: project selection, materials and chip seal design”. Topics covered during the webinar included:

- Types of treatments(single, double and triple chip seals)
- Benefits and limitations of chip seals
- Good and poor candidates for chip seals
- Pavement preservation concept
- Material selection
 - o Aggregates – function, gradation, particle shape, cleanliness, toughness and soundness, absorption
 - o Binders (including emulsions and hot applied), functions and characteristics of each binder types, when to use each binder type, storage and handling and loading and transporting issues)
- Chip seal design
 - o Use of past experience vs. engineering method
 - o Simply a starting point for application rates
 - o Be prepared to deviate from design
 - o Two common methods (links for addi-

tional information)

-McLeod Method

-Modified Kearby Method (AASHTO Method)

- Site Selection – Best Practice

Also discussed briefly were scrub seals, cape seals, seals which include fabric layers, and helpful links.

Chip seals are an effective preservation program addresses pavements in ‘fair’ to ‘good’ conditions, and if applied at the right time, the pavement is restored to an almost new condition. Preservation treatments have been used for preventive, corrective and reactive maintenance to keep pavements of all ages operational until more funding becomes available.

FHWA also has pavement preservation check lists for chip seals, as well as Peer-to-Peer exchange ‘Tech Briefs’ for other pavement preservation treatments. These can be downloaded from: www.fhwa.dot.gov/pavement/preservation/resources.cfm & <https://www.fhwa.dot.gov/preservation/library.cfm>

Finally, PPRA has also developed an excellent website with lots of information on a variety of asphalt preservation treatments at: www.road-resource.org.

A link to the September 17 webinar on cold recycling webinar is shown below <https://collaboration.fhwa.dot.gov/dot/fhwa/WC/Lists/Seminars/DispForm.aspx?ID=2449>



Figure 1. Chip seal operation



CCPIC Update

By John Harvey (UCPRC), Laura Melendy (UC Berkeley Tech Transfer), and Gary Hicks (CP2C)



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 at Davis and Berkeley, and to the California State Universities through the Mineta Transportation Institute. UC Davis, UC Berkeley, CSU Chico, CSU Long Beach, and Cal Poly San Luis Obispo, and the Mineta Transportation Center are all involved with CCPIC. The following provides an update on CCPIC activities.

Training. CCPIC training activities include:

- The Pavement Engineering And Management Curriculum And Certificate Program was approved in August 2019. The proposed curriculum consists of 92 hours of core classes and electives.
- 2020 classes, all online, included and will include:
 - o CCB-01 Pavement Life Cycle Cost Analysis (May 26-28)
 - o CCA-02 Pavement Sustainability (July 22-23)
 - o CCC-02 Asphalt Pavement Preservation Treatments, Materials, Construction and Quality Assurance (November 16-19)
- New classes under development include:
 - o CCB-02 Pavement Management and Preservation Strategies (spring 2020)
 - o CCC-23 Gravel Roads Engineering, Construction, and Management (spring 2021)
 - o CCC-01 Asphalt Concrete Materials and Mix Design (summer 2021)
 - o CCC-03 Pavement and Hardscape Construction Specifications and Quality Control Management (fall 2021)

Technical guidance and tools. Efforts underway will address the following topics:

- Construction specifications for HMA compaction. CSU Long Beach and Cal Poly SLO have developed specifications for local agencies (modeled after the Greenbook for southern California, and Caltrans specifications for northern and central California). These are completed and posted on the CCPIC website
- Specifications for concrete (PCC) pavement mix design. CSU Chico has been working on this with industry. The final version is undergoing review and should be posted to the CCPIC website soon.
- Life cycle cost analysis (LCCA). The scope of the project is to build performance models for predicting crack growth due to loads and the environment, and to use the LCCA process to optimize decision trees in an agency's pavement management system. A spreadsheet tool has been developed and is posted on the CCPIC website. A guide will be developed to help local agencies be able to develop their own models. It should be completed in the fall of 2020
- Develop a Pavement Condition Index (PCI) Best Practices Tech Brief describing appropriate PCI measurements. It would include information on what PCI doesn't measure, and how the same PCI value may have different implications for pavement strategies. The brief is expected to be posted during the fall of 2020
- Develop 'Superpave Lite' specifications in Caltrans and Greenbook format for use by local agencies. A draft is going through review, and CCPIC is looking for agencies who would like to participate in pilot projects aiming for early 2021.
- Develop Tech Topics/Pavement Technology Updates by reviewing ITS publications from 1998 through 2011, and prioritize them for editing, updating, and posting on the CCPIC web site. This will be an ongoing effort
- Surveys of LOCC and CSAC agency contacts to identify agency needs. The CCPIC is also working to develop a contact list of people responsible for pavement in the cities and counties in the state.

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The list will be used to provide targeted information regarding upcoming training and other activities and gather input regarding technical information. To get on the list send an email to ccpic@ucdavis.edu with the subject "Pavement Contact Person" and a short note about what your pavement responsibilities are.

Resource Centers. Three CCPIC 'Resource Centers' continue to be active in reaching out to local agencies through APWA, MSA, ASCE and other venues. The following provides a summary of some of the recent activities:

- Central California (Cal Poly SLO)
- Virtual meeting with Central Coast Chapter of APWA - May 28, 2020
- Virtual meeting with Santa Maria City DPW - July 23, 2020
- Virtual meeting with Transportation Agency for Monterey County scheduled for September 03, 2020.

- Southern California (CSU Long Beach)
- Virtual Meeting with APWA Ventura County Chapter - May 14, 2020
- Virtual Meeting with the City and County Engineer's Association in Los Angeles area - June 4, 2020
- Virtual Meeting with Orange County - July 22, 2020
- Northern California (CSU Chico)
- Virtual meeting with MSA (San Francisco Bay area Chapter) May 21, 2020
- Virtual meeting with APWA Northern California Chapter - May 28, 2020
- Virtual meeting with ASCE Feather River Section - July 22, 2020

For more information on the CCPIC go to: <http://www.ucprc.ucdavis.edu/ccpic/> or email ccpic@ucdavis.edu .

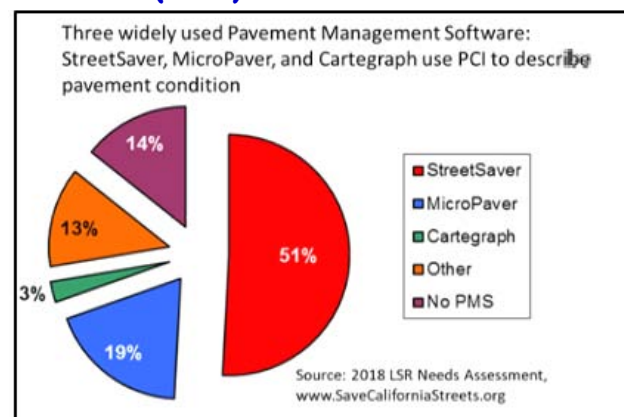


Good, Fair, and Poor? Whose Numbers to Rely on for Pavement Conditions?

By Sui Tan, Metropolitan Transportation Commission (MTC)

Performance-based management is a crucial aspect of the Fixing of America's Surface Transportation (FAST) Act. State departments of transportation (DOT) have historically been required to report progress on pavement condition metrics based on the Highway Performance Monitoring System (HPMS) Field Manual, but these requirements have now been expanded to coordinate target-setting with relevant Metropolitan Planning Organizations (MPO) and Regional Transportation Planning Agencies (RTPA) as well. State DOT's must report pavement conditions for the Interstate Highway System and non-Interstate National Highway System (NHS). To make target-setting and reporting complicated, Caltrans owns and maintains about 52% of the non-Interstate NHS, while the remaining 48% are owned and maintained by cities and counties.

Caltrans is collecting pavement condition data on the all non-Interstate NHS and assessing the results in accordance with the HPMS Field Manual with four condition metrics: International Roughness Index (IRI), cracking percent, rutting, and faulting. However, the HPMS Field Manual condition assessment is often not comparable to cities and counties procedures.



Different Condition Metrics

Cities and counties collect and assess pavement condition in accordance with the ASTM D6433 standard to calculate a Pavement Condition Index (PCI). More than 70% of the cities and counties use PCI, as shown in the pie chart above. The calculated PCI for every pavement section is used in the local agency's pavement management system (PMS) to make decisions regarding the best use of their taxpayers' money in maintenance and rehabilitation (M&R) of the pavement asset. The local agency PMS will prioritize M&R projects to improve the overall network-level PCI; and this does not necessarily coincide with an improvement in the condition metrics reported

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according to the HPMS Field Manual. As a result, the use of pavement condition metrics that satisfy HPMS reporting at the national level may not reflect local conditions in California.

To illustrate the issue, Figure 1 shows the discrepancies between HPMS pavement condition metrics and the PCI in the MTC region. There are discrepancies of over 20% in the mileage reported for 'Good' and 'Fair' conditions. Although the difference is small (about three percent) for 'Poor' condition, the PCI rating shows 57% less 'Poor' condition than using the four-condition HPMS metrics.

Condition based on PCI vs IRI & 3 Metrics								
MPO		Lane Miles			Percentage			
MTC	Road Miles	Total	Good	Fair	Poor	Good	Fair	Poor
PCI	963	3,068	723	2,208	137	24%	72%	4%
IRI +	945	2,986	65	2,714	207	2%	91%	7%
DIFF						~ 20%	~ 20%	~ 3%

Figure 1. Discrepancies in pavement conditions on locally-owned NHS

A local NHS Mid Performance Period Progress Report is due to Caltrans on September 17, 2020. Our MTC region will continue to face discrepancies due to different condition metrics used by Caltrans to set 2- and 4-year targets on local pavement conditions. For California Senate Bill 1 (SB1)'s accountability, PCI is required by the Streets and Highways Code. As required by SB1, cities and counties will continue to report to the California Transportation Commission (CTC) their pavement conditions in terms of PCI, while Caltrans will continue to report to the CTC using HPMS reporting requirements based on smoothness (IRI), cracking percent, rutting, and faulting.

So, whose metrics should the California voters rely on for their local NHS pavement condition? Caltrans'? Or the PCI from cities and counties? This article is meant to raise awareness for cities and counties. If you think the numbers are misleading, then you should bring them up to your MPOs and RTPAs.

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



FHWA Update

Caltrans' Quality Assurance Program's Independence Assurance Element

The Federal Highway Administration's (FHWA) Code of Federal Regulation defines the purpose of the quality assurance program as "To prescribe policies, procedures, and guidelines to assure the quality of materials and construction in all Federal-aid highway projects on the National Highway System". The quality assurance program consists of the six core elements: contractor quality control, agency acceptance, independent assurance, dispute resolution, personal qualification, and laboratory qualification. Let's take a closer look at the Independent Assurance element.

The Independent Assurance (IA) Program is important to ensure that sampling and testing is performed correctly, and that the testing equipment used in the program is operating correctly and remains calibrated. According to the Regulation 23 CFR 637, the following is a summary of the elements of the IA program:

1. Establish IA sampling and testing frequencies
2. Evaluate testing equipment by using one or more of the following: calibration checks split samples, or proficiency samples
3. Evaluate testing personnel by observations

By Chu Wei, FHWA – Sacramento

and results from testing split samples or proficiency samples

4. Prompt comparison and documentation of test results obtained by the tester being evaluated and the IA tester
5. Develop guidelines including tolerance limits for the comparison of test results
6. Provide an annual report to the FHWA when the 'system' approach is used.

The IA Program can be set up on a 'project' basis, which is the traditional approach, or on a 'system' basis. California Department of Transportation (Caltrans) adopted a 'system' approach in 1994. The IA program is an important part of their Quality Assurance Program, which is managed through Materials Engineering & Testing Services (METs) at Caltrans. The regulation requires those States that use a 'system' approach to prepare and submit an annual report to the FHWA Division Office.

Based on the 2019 IA program annual report, the following is a summary of the 2019 achievements of the Caltrans IA program:

1. Certifying a total of 1,856 testers and accrediting a total of 188 laboratories
2. Centralizing the IA program in August

Continued, next page

2019

3. Performing inter-laboratory studies through the Reference Sample Program
4. Continuing to improve the Joint Training and Certification Program (JTCP).

In summary, in the 2019 calendar year, the Caltrans IA program improved significantly. The continuation of implementing and improving the Statewide Independent Assurance Database, and the Data Interchange for Materials Engineering (DIME) is very important for storing and sharing materials data.

Caltrans hopes to make further improvements to their IA program in calendar year 2020. By working together within a well-defined IA program, as part of the overall Quality Assurance program, Caltrans and its contactors can meet the goal of delivering high quality materials to highway projects for the traveling public.

For more information contact Chu Wei of FHWA (Sacramento) at: chu.wei@dot.gov



COMING EVENTS - Mark Your Calendar!

By Roger Smith, CP2C



***"Project Bundling" via Nevada LTAP
September 23 (online)***

This workshop is being held September 23, 9:00–10:00 am with a live instructor, and introduces project bundling, a method of awarding a single contract for several preservation, rehabilitation, or replacement projects. You may have heard about bundling's impact on large-scale projects and bridge bundles; but be assured that bundling is an effective means for local agencies to reduce costs, optimize available funding, speed project delivery, and attract qualified contractors.

To register go to:

https://events-na10.adobeconnect.com/content/connect/c1/1467504075/en/events/event/shared/default_template_simple/event_registration.html?connect-session=na10breezwa2x3vou3x85g4gi&co-id=1573323631&_charset=utf-8



**City and County
Pavement Improvement Center**

***Asphalt Pavement Preservation Treatments:
Materials, Construction and Quality
Assurance via UC Berkeley T2 Center
November 16-19 Subsidized by CCPIIC (online)***

Asphalt pavement is a major component of our transportation system. Transportation agencies

at the city and county level can maximize the value of their huge investment in streets and roads by using proper pavement preservation strategies. This course provides a solid working knowledge of the most common asphalt pavement maintenance and preservation practices. Common preservation treatments, basic principles, best field practices and quality assurance issues are covered.

<https://registration.techtransfer.berkeley.edu/CourseStatus.awp?&course=202CCC021116>

NATIONAL CENTER FOR PAVEMENT PRESERVATION

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***NCPP Webinars
September – December (online)***

The National Center For Pavement Preservation has announced the 2020 AASHTO TSP-2 Pavement Preservation Webinar Series. These webinars are offered FREE to all on a first-come,

Continued, next page

first-served basis. This series offers an excellent opportunity to learn about current topics and issues in each of the four TSP-2 partnership regions. All webinars will begin at 2pm ET (11am PT). Specific information for each TSP-2 webinar is as follows:

- Rocky Mountain West September 29th
Registration link: <https://attendee.gotowebinar.com/register/3603048335917839118>
- Midwestern October 21st
Registration link: <https://attendee.gotowebinar.com/register/384871260260534540>
- Southeast November 9th
Registration link: <https://attendee.gotowebinar.com/register/912614703075414375>
- Northeast December 1st
Registration link: <https://attendee.gotowebinar.com/register/7453818432209174796>

For more information contact: ncpp@egr.msu.edu



"Constructing Quality Asphalt Pavements" via The Asphalt Institute
ONE-DAY IN-PERSON SEMINARS Attendees will learn the basics of quality asphalt pavement construction including selection of the right component materials, how best to combine the materials in the mix design, how asphalt mixture is produced and hauled to the project, best practices for preparing the

underlying layer for paving and the placement/laydown and compaction principles and best practices of asphalt mixtures. \$295 per student • 7.5 PDHs

October 15 - Fontana

November 10 - Reno

November 12 - Bakersfield

For more information go to: http://www.asphaltinstitute.org/training/seminars/constructing-quality-asphalt-pavements/?_cldee=cmRzbWl0aDIwMDIAZ21haW-wuY29t&recipientid=contact-180126fc2f43e81180d002bfc0a80172-73c5d067dd6e4659be26263e8013a38b&esid=9a4886e1-5bde-ea11-80e5-000d3a0ee4ed

Airport Pavement Maintenance Class via Nevada LTAP September 29-30 (Online)

Nevada LTAP Center will present a 2-day workshop (8-11 am both days) which introduces the different techniques for maintaining and rehabilitating both asphalt and concrete-surfaced airfield pavements. The workshop concludes with a discussion of ways to improve an airport's pavement program.

For more information go to: <https://nvltap.com/event/airport-pavement-maintenance-online/>



Disclaimer: Caltrans does not endorse any industry products or services, and the contents of newsletter articles reflect the views of the authors and do not necessarily reflect the official views or policies of Caltrans, the CP² Center, or the State of California.

Caltrans established the California Pavement Preservation (CP² 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. Hector Romero 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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