



CP2 CENTER NEWS

Newsletter of the California Pavement Preservation Center

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Caltrans Names New State Pavement Engineer

By CalAPA Insider

On October 22, the latest name to head the Office of Pavements, Division of Maintenance, will be **Sergio Aceves**. This position is also known as 'State Pavement Engineer'.



Sergio Aceves, State Pavement Engineer

He will only be the second person to receive an official appointment into the position since August of 2014 when **Amarjeet Benipal** left to take the top job at District 3 in Marysville. For most of the last year the job was held in an acting capacity by **Mark Suchanek**, on temporary assignment from District 1 in Eureka until his retirement last month. Although only filling in, Suchanek's tenure saw the official reorganization of how the Department and the construction industry interact in specification reviews, a revision in the specification related to the use of recycled asphalt in pavement mixes, and substantial work on a revised pavement smoothness specification, which is expected to be unveiled later this year.

Aceves began his Caltrans career in District 3 Construction, working as a resident engineer for eight years. He was promoted to senior transportation engineer as district estimator in 2006 and also covered the duties of office engineer for six months. In the years since, he has worked in several positions in planning, project management, traffic management, maintenance, permits. For the past six months he also has been on a temporary assignment as deputy district director over Maintenance & Traffic Operations at Caltrans District 3.

The State Pavement Engineer oversees asphalt and concrete pavement maintenance and specification development. The State Pavement Engineer also sits on the joint Caltrans-industry Pavement & Materials Partnering Committee (formerly known as the Rock Products Committee), which vets changes in materials specifications and testing requirements. That

committee is sponsored by **Karla Sutliff**, Deputy Director for Project Delivery and the Chief Engineer, and **Steve Takigawa**, Deputy Director for Maintenance & Operations.

Aceves reports to the Division Chief of Maintenance, who until last month was **Tony Tavares**. As reported previously by Asphalt Insider, Tavares was named permanently as Director of District 4, covering the nine-county San Francisco Bay Area. Tavares' position is being filled temporarily by **Amer Bata**.

Aceves will have his work cut out for him as there also has been a large amount of turnover among the rank-and-file in the Division of Pavements. He told Asphalt Insider: "I look forward to working with both internal and external stakeholders to maximize the performance and accountability of the pavement program for the traveling public."

Overall, Caltrans says, about 54 percent of its workforce is age 50 or older -- a phenomenon often referred to within the department as the "silver tsunami." There were 877 employees who left the department, many through retirements, in fiscal-year 2016-17, and another 1,023 in 2017-18. The department reports it has about 18,500 permanent full-time

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employees, and has embarked on a major recruiting effort to fill the vacancies.

Funding from SB 1, which survived the Proposition 6 challenge, will keep road-repairs happening around the state, but it takes planners, engineers and administrators to convert

those dollars into projects. So recruiting and training the next generation of pavement experts will be a daunting challenge for all public agencies in California for the foreseeable future, just as it is for private industry.

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CalAPA Fall Conference

Opportunities for networking and learning are important in any industry, and for asphalt people in California, the California Asphalt Pavement Association (CalAPA) provides this through its Spring and Fall Conferences.

Over 200 people from both industry and public road agencies turned out for the Fall Conference October 24-25 at the DoubleTree Hotel in Sacramento. A host of informative vendors were also displaying their latest products.

Executive Director **Russell Snyder** welcomed the group to a full program created with the help of Technical Director, **Brandon Milar** and CalAPA staff.



The CalAPA Crew (L to R): Kerry Hoover, Sophie You, Russell Snyder and Brandon Milar

Dr. Ding Cheng of the California Pavement Preservation Center (CP² Center) at CSU, Chico, described work done for Riverside County to determine how best an agency might use its additional funding from SB 1. Using the "Street Saver" pavement management program, different scenarios were analyzed to identify the most effective use of those funds from an 'Equivalent Annual Cost' basis. Recommendations were made to change the County's 'toolbox' and assign roughly 30% of the new funding to pavement preservation, with a goal of increasing their current average PCI of 71 and reducing the deferred maintenance.

The use of recycled asphalt shingles (RAS) is a

By Roger Smith, CP² Center



Dr. Ding Cheng addressed optimal funding for local agencies

hot topic nationally and a lead researcher in that arena is **Dr. Amy Epps Martin** of Texas A&M presented an overview of her research findings on the use of rejuvenating/recycling agents to soften the very hard asphalt inherent in old asphalt shingles. The goal is to develop criteria for how RAS, along with RAP, might be engineered into an asphalt mix. A general goal is that the resulting binder blend meet the high temperature PG grade specified. Caltrans currently does not allow the use of RAS or the use of recycling agents in its mixes containing RAP. Another topic that will need to be addressed is the possible use RAS in asphalt rubber mixes. The Conference also included several smaller 'break-out' sessions on hot technical topics.



Dr. Amy Epps Martin of Texas A&M addressed RAS use in HMA

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Frank Farshidi described the City of San Jose's very successful use of cold-in-place recycling (CIR) since their first jobs in 2011. They rely heavily on private labs for special advance testing (GPR, FWD) and mix design work with lab-foamed asphalt. In 2017 they did 38 lane-miles of CIR using 2.5 - 3.0% foamed binder (PG64-10) with 2 - 3% water and 1% cement. They primarily use the single machine 'mill & mix' approach. They compact to 98% Marshall using a combination of steel drum rollers and a 25-ton rubber-tired roller. Finally, they cap the CIR with a 1.5" to 2" HMA overlay. **Dennis McElroy** of Granite Rock also provided an overview of their various options for CIR and highlighted projects they've done for Marin County and City of Pleasanton.

One of the hottest topics in Caltrans asphalt paving is the completion of a revised specification for pavement smoothness on new paving projects. **Tom Pyle** of Caltrans and **Don Mathews** of PRS outlined the elements of the new spec which involves IRI measurement by an inertial profiler – with pay incentives and disincentives. The concept of "opportunities" for achieving smoothness is recognized in the new specification. Caltrans will be providing training as they rollout this out.

Other key speakers included:

- **Dr. Dragos Andrei**, Cal Poly, Pomona on research developing a method for comparing the "green" aspects of various pavement rehab strategies, based in part on their sustainability
- **Dan Speer**, Caltrans State Materials Engineer on the latest challenges facing Caltrans in the arena of asphalt pavements, including the hiring and training of new people
- **Amy Miller** National Director of the Asphalt Pavement Alliance (APA) on technical resources available nationally, including the "PaveExpress" pavement design software and a new class on parking lot paving.

A special feature of this year's Conference was a "Women of Asphalt" panel discussion featuring women who are leaders in the asphalt industry. Discussion topics included how they got into the industry, challenges faced by women in a mostly male industry, the importance of mentors, and actions employers could take to further the recruitment and retention of female employees. More information on this emerging group can be found at: WomenOfAsphalt.com

For more information on the CalAPA Fall Conference go to: www.calapa.net

Watch for the Spring Conference coming in April 2019!



Western States Group Meets in Portland

By R. Gary Hicks, CP²Center

Over 120 attended a meeting of the Rocky Mountain West Pavement Preservation Partnership (RMWPPP) in Portland, September 11-13, 2018, with the theme of addressing pavement preservation quality. Public agencies (FHWA, state, and local), industry, and academia from the 13 western states were well represented.

John Colplantz (ODOT), chair of the group for this meeting, welcomed all and introduced opening speakers **Paul Mather** (ODOT), and **Tom Goldstein** (FHWA - Oregon). Paul talked about the ODOT story and the need for a quality work force (recruit-retain) as shown in <https://www.oregon.gov/ODOT/Planning/Documents/Rough-Roads-Ahead-1.pdf>. He also discussed their new funding source provided by HB2017. (<https://www.oregon.gov/ODOT/Pages/HB2017.aspx>). **Tom Goldstein** discussed some of FHWA policies, MAP-21, EDC-4, and the FHWA aid program.



Judy Corley Lay,
Director of the NCPP

Judy Corley Lay, Director of the National Center for Pavement Preservation (NCPP) in Michigan, then discussed how the AASHTO TSP2 study

is addressing pavement preservation 'quality'. Pavement performance measures used by Oregon DOT, Montana DOT, Idaho DOT, and Washington DOT were discussed. Most of the states indicated that they keep two sets of data - one to make pavement preservation decisions and one to report to the FHWA. All states indicate that they collect the same data for each report, but because the FHWA performance measures are different, the states are getting higher pavement ratings with the federal approach.

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Each of the states and local agencies then reported on the efforts undertaken to improve pavement preservation quality. In the first session, reports were provided by Washington, Oregon, Alaska, Washoe County (NV), and the City of Denver. **Jason Lampley** of Intermountain Surfacing ended the day by discussing industry's focus on pavement preservation quality. He discussed what associations such as ISSA, WRAPP, and the PPRA are doing in the way of providing educational opportunities for both industry and agency personnel.

On the morning of the second day, the state reports continued with presentations by Idaho DOT, Arizona DOT, Montana DOT and British Columbia MOT. A business meeting followed, at which a new Chair was selected - **Kevin Robertson** (Arizona DOT), and Salt Lake City was chosen as the site of the 2019 meeting.

The next session focused on best practices on construction quality. **Greg Sharp** of Crafcro discussed best practices for crack sealing and filling, and **Scott Shuler** of Colorado State University discussed the findings and challenges of the NCHRP 14-37 project on construction guides for chip seals and microsurfacing. **Dr. Gary Hicks** and **Jim Moulthrop** (FP2) concluded the session by discussing the AASHTO ETF work on chip seals and microsurfacing material specifications, design practices and QA programs.

The following session included presentations by **Darrell Randall** (Oregon LTAP) and **Tyler Palmer** (City of Moscow, ID) on what these groups are doing to improve quality.

Two of the other pavement preservation partnerships (PPP) provided overviews of the work they have been doing. **Stephanie Weigel** of North Dakota and the Midwest PPP and **Jim Chisholm** of Nova Scotia and the Northeast PPP discussed the members, board, task forces and work plan of their partnerships. The last presentation of the day was on the national training/certification programs for pavement preservation workers, and was given by **Neal Galehouse** of the National Center for Pavement Preservation (NCCP).

The final day included more state reports from Utah DOT, Nevada DOT, and New Mexico DOT. **Michael Robson** of Fugro then discussed the data quality management program his firm follows to ensure accurate and repeatable data collected using automated vehicles. **Erdem Coleri** of Oregon State University provided an overview of his research program on pavements and pavement preservation. **Larry Scofield** (IGGA) gave the last presentation on concrete pavement life extension.

Chairman **Kevin Robertson** of Arizona DOT, wrapped up the conference and invited all to attend the next meeting in Salt Lake City in the fall of 2019.

All presentations can be found at:
(<https://tsp2pavement.pavementpreservation.org/rocky-mountain-west-rmwppp/>).

Videos of all the presentations can be found at :
<https://tsp2pavement.pavementpreservation.org/rocky-mountain-west-rmwppp/annual-meetings/2018-2/>.



'PG+X' for Use of Ground Tire Rubber?

By Roger Smith, CP² Center

On October 10 Caltrans hosted a meeting with industry in Marysville to discuss their goals of increasing the use of ground tire rubber (GTR) in asphalt pavement. The meeting was hosted by **Tom Pyle**, Chief, Office of Asphalt Pavement, who opened the meeting by emphasizing that the use of GTR in pavements has been a "demonstrated success in California".

But Caltrans is seeking more ways to help them comply with a legislative mandate to use GTR in pavement work. Caltrans has long been the national leader with their RHMA-G process that cooks 20% GTR into the hot binder for hot mix asphalt. This RHMA-G mix is now required by Caltrans in most of their surfacelift paving. But simpler, faster methods are being explored for

meeting their mandate. One such proposal is to simply allow a smaller percentage of GTR to be used in all asphalt mixes. One approach might be to allow a smaller quantity of GTR (say 5% -10%) to be added to all hot asphalt binders. This approach has come to be known as the 'PG+X' proposal. Another simple approach might be to add small percentages of GTR "dry" to the HMA as it's being mixed at the hot plant.

The University of California Pavement Research Center (UCPRC) was enlisted to do some initial evaluation of these approaches and their initial findings - presented by **Dr. John Harvey** - indicate these approaches show promise, but research work will continue.


Other 'simple' approaches for increasing rubber

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use were suggested by industry representatives. They included:

- Add greater than 20% GTR to binder via the current process
- Use thicker lifts of RHMA-G; move away from the 0.10' thin lifts

- Do more asphalt-rubber chip seals
- Use GTR in slurry seals
- Use finely-ground rubber 'dry' in conventional HMA

Caltrans plans to form a Task Group to explore all options. 

Cape Seals Save Lompoc Streets

Ten years ago the City of Lompoc needed to implement a less expensive alternative to restore and preserve the useful life of its low-volume streets. Its street maintenance crew struggled to keep up with potholes, and the cost of traditional overlays and mill-and-fill approaches were much more than the City could afford.



Microsurfacing (Far Lane) Filling Large Cracks and Voids

Following a helpful visit to similar projects in the City of Watsonville and a one-block demonstration in Lompoc, in the summer of 2010 the City constructed its first "3-Step" and cape seal project. Because Lompoc wanted to resurface low-volume (<3,000 ADT) streets with pavement condition index (PCI) values down to the single digits, it utilized a 3-layer system (which it called "3-Step") for those highly deteriorated streets, which made up about 43% of the project area.

3-Step (Microsurfacing + AR Chip Seal + Slurry Seal)

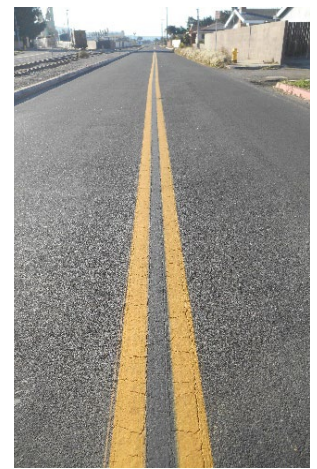
The first layer of the "3-Step" system was a Type III microsurfacing, which was also placed in localized areas to fill significant ruts and local depressions prior to spreading it over the full street width. The microsurfacing filled the voids and cracks and provided some minor leveling so the chip seal could be placed on a smooth and uniform surface. The second layer was a 3/8" hot asphalt-rubber chip seal, as a

By Craig Dierling, P.E., City of Lompoc

moisture membrane. The third layer and wearing course was a Type II polymer modified slurry seal, which strengthened and protected the chip seal from chip loss and provided a smooth finished surface. Detailed special provisions tailored to the City's project, and Caltrans Standard Specifications were used for all products.



1070 E. Laurel Avenue
Pre-Project



1070 E. Laurel Avenue
8+ Years after 3-Step

Cape Seal (AR Chip Seal + Slurry Seal)

Instead of a 3-Step approach, only a cape seal was placed over approximately 40% of the project area, where the streets had fewer voids and depressions than the ones pictured earlier. However, some PCI's were as low as 30. Those cape seal only streets had no microsurfacing beneath the chip seal.



Laurel Avenue Pre-Project

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Laurel Avenue 8+ Years after Cape Seal

Commercial & Industrial Streets

The City included several commercial and industrial streets in the 2010 project, which now likely have traffic volumes exceeding 3,000 vehicles per day and also have higher percentages of truck traffic. Those streets received the 3-Step treatment. L Street, pictured below, serves a large shopping center and various other commercial and industrial businesses. In 2013 a bustling vegetable cooling and shipping facility was constructed on L Street, which greatly increased the large truck traffic in those blocks.



1500 N. L Street Pre-Project



1500 N. L Street 8+ Years after Cape Seal

Project Size and Cost Efficiency

In order to make its 3-Step and cape seal projects cost-efficient, Lompoc found it needed to include at least two full days of chip seal

work in addition to several days of microsurfacing work and several days of slurry seal work. Its 2010 3-Step and cape seal project included approximately 88,500 SY of asphalt-rubber chip seal, 46,200 SY of microsurfacing, and 61,000 SY of slurry seal (which included approximately 18,600 SY of slurry seal only areas). The construction unit cost of the 3-Step portion of the project was approximately 3 times less than that of a typical 2" mill & fill used in Lompoc, and the cape seal portion of the project had a construction unit cost approximately 4 times less than a 2" mill & fill. That meant 3 to 4 times more streets were restored and have remained in good condition for over 8 years, to the delight of many residents.



320 G. Street Pre-Project



320 G. Street 8+ Years after 3-Step

Continued Refinement & Broadened Application

Based on the excellent performance of these 2010 treatments, the City has now constructed three additional cape seal projects in which it continued to refine its approach and broaden its application to higher-volume streets. Lompoc's 2015 and 2018 cape seal projects included arterial streets, which have also performed well, though those higher-volume streets were in much better condition than these pictured low-volume streets were prior to the 2010 project.

For more information contact **Craig Dierling** at: C_DIERLING@ci.lompoc.ca.us



Bay Area Pothole Report

Building on the foundation established by Metropolitan Transportation Commission's (MTC) original 2000 Pothole Report, and then by a 2011 update, this 2018 Pothole Report includes both a primer on the cost and life cycle of pavement and a comprehensive look at the current state of the Bay Area's local streets and roads network. It features a jurisdiction-by-jurisdiction ranking of average pavement condition index (PCI) scores among the region's nine counties and 101 cities.



The analysis also spotlights the myriad pavement-management challenges facing Sonoma County and its vast network of roadways in unincorporated portions of the county. It also illuminates the impact voter approval of Proposition 6 would have had on cities' and counties' pavement maintenance programs.

By far the largest recipient of SB 1 dollars is a newly-established 'Road Maintenance and Rehabilitation Program' estimated to receive \$3.7 billion annually, and through which half the funds are dedicated to local agencies' city streets and county roads, with the other half going to state highway maintenance. In the nine-county Bay Area, SB 1 is expected to generate more than \$200 million for city streets and county roads each year. The prospect that this revenue stream may have been eliminated by Proposition 6 called for an updated analysis of the Bay Area's local street and road network.

The condition of the Bay Area's local streets and roads has improved since the turn of the 21st century, primarily as a result of targeted local investment and continually improving pavement maintenance practices. Yet the typical stretch of asphalt still shows serious wear and is likely to require rehabilitation soon. At 67 out of a possible 100 points, the region's average pavement condition index (PCI) score has climbed four points over the past 15 years. It remains much closer to the 60-point threshold at which deterioration accelerates rapidly, and the need for major rehabilitation becomes more likely than it does to the 85-point mark used by MTC to indicate a state of good repair. While years of work by MTC and the region's

From the MTC "2018 Pothole Report"

local governments have forestalled a steep decline, overall conditions on our 43,374 lane-miles of city streets and county roads remain no better than "fair."

Questions about funding are at the heart of the streets and roads issue. Money for roadway maintenance typically comes from a range of sources, including not just the state gasoline tax but also county sales taxes, and local sources such as city or county general funds, bonds and traffic impact fees. But as the need for maintenance has grown as the Bay Area roadway network ages, available funding in most cities and counties effectively had been shrinking — and maintenance backlogs swelling — until last year's enactment of SB 1. To help cities and counties get the biggest bang for their buck, MTC has long advocated for pavement preservation. A municipality that spends \$1 on timely maintenance to keep a section of roadway in good condition would have to spend \$5 to restore the same road if the pavement is allowed to deteriorate to the point where major rehabilitation is necessary. All 109 Bay Area jurisdictions — and hundreds of other



public agencies nationwide — now use MTC's StreetSaver® pavement management software to inventory their street networks, determine maintenance needs and devise maintenance programs based on available revenues.

MTC estimates that achieving a regional state of good repair for pavement would require an investment of more than \$700 million each year, or a total of some \$17 billion through 2040. This level of investment is 20 percent higher than the current \$602 million spent annually by all sources on roadway maintenance.

Even though California voters voted down Proposition 6 and secured the future of SB 1, fixing this fiscal pothole will be an ongoing challenge for MTC and local governments alike as we move toward development and adoption of Plan Bay Area 2050, the comprehensive regional plan to guide Bay Area transportation investment through 2050.

To view the MTC 2018 Pothole Report go to:
https://mtc.ca.gov/sites/default/files/Pothole%20Report%20III_September%202018.pdf



Concrete Pavement Forum Held

Concrete pavement and other infrastructure was the topic of the day at the Nevada Infrastructure Concrete Conference (NICC), October 23, in Reno. Almost 200 infrastructure specialists gathered to hear about the latest issues and major projects involving the building material that dates to the Roman times, but today involves complex issues like admixtures, special mixes and placing equipment. Breakout sessions offered specialty



speakers on bridges and other structures in addition to pavements.

The Conference was organized by the Sierra Nevada Cement Association (SNCA), the California Nevada Concrete Association (CNCA), the Southwest Concrete Pavement Association (SWCPA), with strong support from Nevada DOT and FHWA.



Charles Stuart, SWCPA and Tom Tietz, CNCA

Two very large Nevada projects were highlighted - the 'Project Neon' to revamp the Las Vegas freeway system, and the planned Interstate 11 which will create a corridor from Phoenix to Las Vegas and points north. Both will involve extensive use of concrete pavement and structures. The Neon project is well underway and will include 20 miles of continuous HOV lanes through the city and extensive landscaping and artwork to soften the extensive concrete. It will use concrete pavement 10 – 12 inches thick with a 2-inch asphalt rubber overlay for noise reduction.

Another highlight of the Conference was the unveiling of a comprehensive online program for concrete pavement design developed by the American Concrete Pavement Association (ACPA). Known as "Pavement Designer", it will

By Roger Smith, CP² Center

follow common design concepts, but in a simplified, user-friendly form for use on local streets and roads, parking areas and secondary highways. It offers options software intended for new construction on various bases, as well as concrete overlay design. It can be accessed at PavementDesigner.org, and CNCA engineers are the California-based support users. "PavementME" is the more extensive solely for major highways and freeways.

The challenges of constructing urban freeway pavement were presented by **Jason Simmons**, Utah DOT's State Pavement Engineer. Since the 2002 Olympics, Utah has been on an aggressive program of concrete freeway renewal in the Salt Lake City area – requiring some amazing construction innovations to keep traffic flowing. Utah uses only plain (unreinforced) jointed concrete slab pavement, very similar to what Caltrans has historically used.

An issue of particular concern to the concrete industry is the future availability of domestic fly ash, a common supplemental cementitious material (SCM) in mixes. This is due to the fact that coal-fired power plants are becoming fewer in the U.S.. **Dr. Larry Sutter** of Michigan Tech presented an overview of the fly ash issue, and stressed that imported material and substitutes like pozzolans and ground slag - and even waste ash recovered from landfills - will have to be relied on in the future.

Tom Yu with FHWA talked extensively about agencies using a more comprehensive way of evaluating their pavement decisions. The concept of lane-mile-years was discussed. This idea centers around agencies determining the best value for their buck through determining the expected years of service for a given lane mile. This allows you to use the state-of-the-art design software (which predicts performance) to attach useful service life to your pavement projects and better compare the cost/value of pavement alternatives on an even playing field.

Other Conference topics included common misconceptions about concrete vs. asphalt pavements including cost, complexity of construction and equipment, smoothness attainable and tire noise levels.

The Conference also included an array of vendor booths featuring admixtures, coatings, colors, fiber additives, sealers and engineering services.

For more information go to:

<https://nicc2018.com/>



I-5 Gets Major Rehabilitation

By Nicole Mallory, PE – Caltrans Resident Engineer

In a harsh climate in Northern California with heavy truck traffic and routine winter chain control requirements, Caltrans is taking a significant step in reducing annual maintenance costs.



Caltrans RE, Nicole Mallory

Caltrans is in the process of using several pavement rehabilitation methods on a project on I-5 near the town of Mt. Shasta, 60-miles north of Redding, CA. This project is noteworthy as it involves long-life pavement design with the use of continuously reinforced concrete pavement (CRCP). Long-life pavement designs are intended to provide long-term performance benefits in terms of a life-cycle cost analysis, which in turn provide a good return on taxpayer dollars. The CRCP on this project has a 40-year design life and a lower life-cycle cost than the alternative 20-year hot mix asphalt (HMA) design.

The job will rehabilitate 21 lane-miles of existing pavement using three strategies:

1. Full-depth reconstruction with 1.10' CRCP over a 0.25' HMA bond breaker on 0.50' of aggregate base.
2. Partial-depth reconstruction with 1.10' CRCP over a 0.25' – 0.55' HMA bond breaker / leveling course on existing 0.82' cracked-and-sealed jointed plain concrete pavement (JPCP)
3. Cold-planing (milling) and repaving 0.33' HMA on the on- and off-ramps.

Of particular interest is the use of CRCP pavement, as this is a departure from Caltrans' long-standing practice of using unreinforced JPCP or

HMA. The benefits of using CRCP instead of the other pavement types include a smoother and quieter ride in comparison to JPCP, and a surface that is more resistant to chain wear and fluctuations in temperature in comparison to HMA. CRCP also requires less maintenance compared to both JPCP and HMA. All CRCP used epoxy-coated rebar.



Paving over Epoxy-coated Rubber



Paving CRCP

The project, which began in the summer of 2018 and is expected to be completed in late 2019, was awarded to J.F. Shea Construction, Inc. at a bid amount of just under \$57 million.

After seeing extensive pavement maintenance performed on this section of I-5 almost every year, Caltrans expects this project to be a worthwhile investment. For more information contact **Nicole Mallory** at: nicole.mallory@dot.ca.gov



Reducing Chain Wear on Pavements

By David Lim, Caltrans

Caltrans continues to battle tire chain wear on corridors subjected to high truck volumes and frequent, heavy snowfall, as is common in the high Sierra passes such as the Interstate 80 corridor. In 2017, polyester concrete inlays were constructed on Portland cement concrete (PCC) pavements on I-80 near Truckee, California. Within the project limits, four experimental sections having different polyester binder and aggregate types were built and evaluated for their wear progressions over time. This article provides a summary of the performance of these experimental sections over their first winter after the construction. It is an excerpt from the performance evaluation report prepared by NCE.

Test Sections

Polyester polymer concrete (PPC) inlays were constructed in October 2017 along the wheel paths of truck lane on I-80 westbound between PM 12.30 and PM 21.06 in Nevada County. Performance of the PPC inlays were evaluated at four experimental test sections selected within the project limits. The four experimental sections have different combinations of polyester binders and aggregate gradations as shown in Table 1. Figure 1 shows the locations of the test sections. PPC type M1 was used for the rest of the project.

Table 1. PPC Inlay Test Sections

Section (PPC Type)	Materials	PM (NEV 80 West- bound)		Section Length (mile)
		Begin	End	
G1	Polymer Resin Type 1, 3/8" Granite Aggregate	17.83	18.15	0.32
M1	Polymer Resin Type 1, No. 4 Monterey Sand	17.36	17.83	0.47
M2	Polymer Resin Type 2, No. 4 Monterey Sand	17.00	17.30	0.30
G2	Polymer Resin Type 2, 3/8" Granite Aggregate	15.70	16.05	0.35

Materials

The PPC inlays consisted of a polyester resin binder and dry aggregate. Two types of polyester binder were used. Type 1 was a urethane-modified, vinyl ester-based, unsaturated

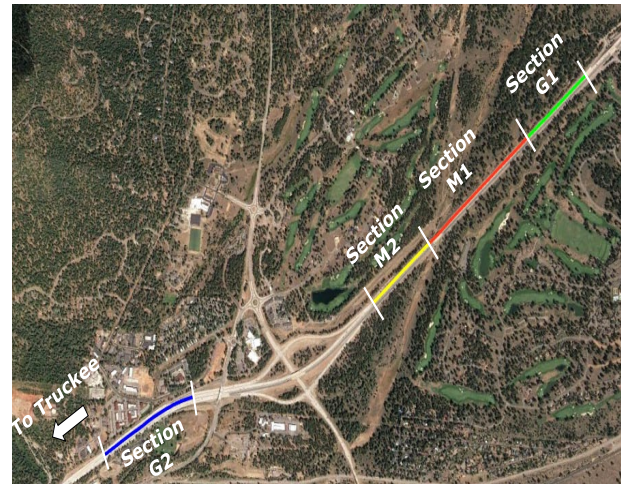


Figure 1. PPC Inlay Test Sections on I-80 Near Truckee

isophthalic polyester-styrene copolymer. Type 2 was an unsaturated isophthalic polyester-styrene copolymer. The work involved pre-milling the wheel path 0.06' deep and 3' wide to form a trough to receive the PPC inlay.

Specifications for the aggregate and the polyester concrete mixture were as follows:

- Coarse aggregate: Aggregate retained in No. 8 sieve must be at least 75%. Mohs Hardness value must be greater than 7.
- Monterey sand: Aggregate must be clean and kiln-dried. Aggregate retained in No. 8 sieve must have a maximum of 45% crushed particles (California Test 205).
- Fine aggregate must be natural sand.
- Weighted average absorption must not exceed 1% (California Tests 206 and 207).
- Polyester concrete must have a minimum compressive strength of 1,250 psi at 3 hours and 30 minutes (California Test 551 or ASTM C109).

Performance Evaluation

Pavement transverse profiles were measured using a Laser Measurement System (LMS), mounted on a Dynatest Multi-Function Vehicle (MFV) (Figure 2). The LMS measures continuous transverse profiles of the pavement (13 feet wide) while traveling at highway speed.

Figure 2. Dynatest Multi-Function Vehicle (MFV)



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A Face Dipstick® Profiler (Figure 3) was also used to collect transverse profile measurements on the PPC inlay sections. The Long-Term Pavement Performance (LTPP) data collection procedure was followed, and data were collected at three longitudinal points along a slab (3, 7, and 11 feet from the approach joint). Transverse profiles were determined at five slabs within each test section. Rut depths were estimated using a 4-foot simulated straight edge.



Figure 3. Transverse Profile Measurements by Dipstick

Test Results

Figure 4 and Figure 5 provide an example of PPC inlays after construction in October 2017 and after the first winter in June 2018, respectively. These figures show section M1 as this treatment was used for most of the project. In general, the inlays exhibit slight surface wear with the surface tining being worn away in some cases.



Figure 4. Example PPC Inlay Section after Construction



Figure 5. Example PPC Inlay Section after One Winter (Seciton M1 in June 2018)

Average rut depth measurements by the MFV for all sections of the polyester concrete inlay sections are presented in Figure 6. As shown, rut depth for all sections was greater in Lane 2 than Lane 1. The change in average rut depth between 2017 and 2018 (all sections) in Lane 1 ranged from 0.00 – 0.01 inch, and 0.03 – 0.10 inch in Lane 2. Sections M1 and M2 (Lane 2), showed the highest increase in rut depth with a change of 0.05 and 0.10 inch respectively. In comparison, the average changes in rut depth in sections G1 and G2 (Lane 2) were 0.03 inch and 0.06 inch, respectively.

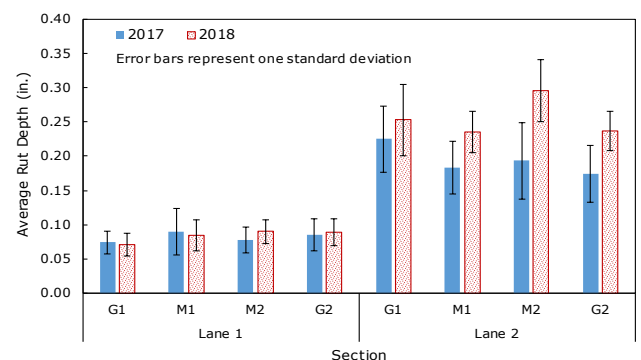


Figure 6. Comparison of Average Rut Depths Measured by MFV from 2017 - 2018

Using the Dipstick, transverse profile measurements data were obtained in October 2017 and again in June of 2018. From these transverse profiles, rut depths were calculated using a 4-foot simulated straight edge. Rut depths were calculated in the right and left wheel path inlays. Figure 7 graphically shows the average rut depths (left or right wheel path) for each location. As shown, the change

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in transverse profile between 2017 and 2018 was minimal for all test sections (<0.08 inch). The overall performance of all test sections was similar with no clear difference in change of transverse profile between wheel paths or across test sections.

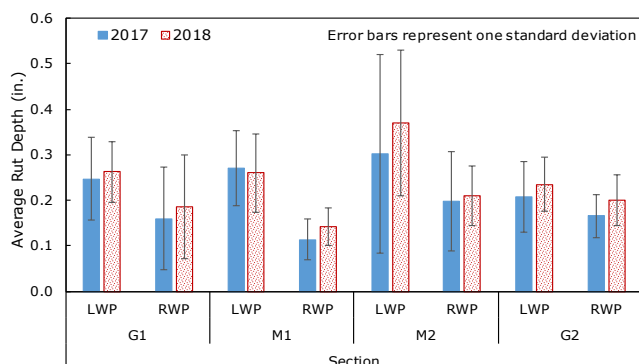


Figure 7. Comparison of Change in Rut Depths Measured by Dipstick from 2017 - 2018 Chain Control Analysis

Estimated truck traffic and chain control data were used in conjunction with the rutting data to gain a better understanding of the effect of chained trucks on the rutting progression. There is a chain control location on westbound NEV 80 in the upstream of test sections in Boca at PM 22.4. Based on the chain control records, there was a total of 153 hours of effective chain control period in 2017-2018 winter season at Boca chain-up location. Using Caltrans traffic survey data and estimated monthly and hourly distributions of truck traffic, the number of chained trucks was estimated by correlating truck traffic and chain control hours. Table 2 shows the estimated chained trucks at the test sections. For this estimation, it is assumed that the traffic pattern in volume and hourly distribution did not change during the chain control period.

Table 2. Estimated Number of Chained Trucks on Test Sections over 2017 - 2018 Winter Season

Test Section	Estimated Chained Trucks
G1, M1, M2	10,517
G2	11,549

* Section G2 is located after SR267 JC while other three sections are before the JC.

Rutting rate was determined for each section by dividing the lane average rut depth by estimated number of chained trucks on the respective sections. Table 3 shows these rutting rates in thousandths of an inch (mils) per 1,000 trucks and the estimated number of trucks to

reach 0.1 in. of rut depth. A value of 0.1 in. was chosen to represent the surface paste and fins from grinding that are likely to wear away quicker. The control section data shown in Table 3 was obtained from another study conducted in 2015-2016 winter season at a nearby conventional concrete pavement section. The control section received a surface grinding operation in 2015. The first winter rutting rate of the control section was estimated based on the rut depth measurements taken over the 2015-2016 winter season. As shown, PPC inlays exhibit higher resistance to chain wear than control section pavement. Especially, the wear resistance of PPC inlays with Type 1 binder are 3 to 5.6 times higher than that of control section.

Table 3. Estimated Rutting Rates of the PPC Test Sections

Section	Change in rut depth (in.)	First winter rutting rate (mils/1,000 chained trucks)	Estimated number of chained trucks to reach 0.1 in. rutting
G1	0.03	2.74	36,500
M1	0.05	5.10	19,500
G2	0.06	5.46	18,500
M2	0.10	10.15	10,000
Control	0.12	16.02	6,500

Conclusions

Based on exposure to estimated chained trucks during the 2017 – 2018 winter, the following conclusions are drawn for the polyester inlay experiment:

- The PPC inlays performed well after the first winter (2017 – 2018). The change in average rut depth was 0.10 inch or less.
- Of the four experimental sections, Section G1 exhibited the smallest change, with a rut depth of 0.03 inch.
- After one winter, data suggested that Resin Type 1 performed better than Resin Type 2, and aggregate type "G" performed better than type "M" when Resin 1 binder was used. This initial finding needs to be confirmed with rut measurements taken after future winters.



For more information contact **David Lim** of Caltrans at: s.david.lim@dot.ca.gov





CCPIC Update

By Dr. John Harvey, UCPRC

The Governance Board for the City and County Pavement Improvement



City and County Pavement Improvement Center

Center (CCPIC) held their first meeting on September 28 in Davis. Attending were **Jay Spurgin** (City of Thousand Oaks), **Girum Awoke** (City of Gilroy), **Jonathan Smith** (City of Menifee), **Roger Lee** (City of Cupertino), **Steve Hartwig** (City of American Canyon), **Matt Tuggle** (Solano County), **Todd Riddiough** (Yolo County), **Howard Dashiell** (Mendocino County), **Randy Breault** (City of Brisbane), **Casey Carlson** (Santa Cruz County), **Chris Hooke** (Ventura County), and **David Mendoza** (San Joaquin County). Also attending were representatives of the League of California Cities, California State Association of Counties, California Engineers Association of California, University of California Pavement Research Center, ITS Berkeley Tech Transfer, California Pavement Preservation Center at CSU Chico, CSU Long Beach and CalPoly, San Luis Obispo.

At the meeting, **Randy Breault** was elected Chair, and **Chris Hooke** was elected vice-Chair. The charter for CCPIC was reviewed and approved, the annual work plan was approved, and discussions were held regarding training priorities. ITS Berkeley is leading the CCPIC team on putting together a plan for training that will be reviewed by the Board of Governors before the next progress meeting in February. Requests for regional in-place recycling training have been received in response to the CP² Center newsletter and are being incorporated into the planning.

New information regarding CCPIC governance will be loaded to the CCPIC website in the next weeks, and we expect to be putting up information about new training in the coming months.

For more information on CCPIC, visit the CCPIC website at: www.ucprc.ucdavis.edu/ccpic.



WRAPP UPDATE

By Sallie Houston, VSS

The Western Region Association for Pavement Preservation (WRAPP) 2019 Workshop is fast approaching! There will be two fact-filled days, February 7 - 8, 2019, at the Doubletree Conference Center, Hazard Center, San Diego, CA. The theme for this year's Workshop is "Assess/Plan/Execute - The Pavement Preservation Way".

There will be a variety of presentations on topics and tools important to our industry. These include an in-depth look at the FHWA

"EveryDay Counts" initiative that covers training, and a group exercise on how to evaluate types of distresses and choose the right pavement preservation treatments. Attendees will also hear about the Pavement Preservation and Recycling Alliance (PPRA) and their excellent



new website: www.roadresource.org.

WRAPP strives to offer the best forum to update agency and industry on advancements and changes in the pavement preservation industry by bringing an agenda filled with experts from industry, academia and agencies. They strive to help agencies utilize the very best techniques to maintain cost effective, long lasting roads.



Workshop registration is open at: www.wrapp.org. Discount hotel rates close on January 15th. Special registration and room rates apply to government agency employees. This is also a great opportunity to set up a booth and reach numerous end users.



AASHTO ETF Meets in Indianapolis

By Colin Franco (Rhode Island) and R. Gary Hicks (CP² Center) Sacramento

The AASHTO Emulsion task force (ETF) met at the Heritage Group facilities on November 28-29, 2018. The agenda and most of the presentations can be found on the following link <http://tsp2-etf.org/>. The current status of emulsion treatment standards is on slide 21 of Colin Franco's presentation. The mission of this group is to:

- Develop improved specifications for asphalt emulsions
- Develop materials specifications and design practices for several preservation treatments
- Develop new test methods for preservation treatments
- Develop QA protocols for preservation treatments
- Promote research topics for preservation treatments
- Promote the use of emulsions

Accomplishments to date have included the following:

- Developed new specifications for emulsions in 2015
- Developed of new materials specs and design practices for chip seals, microsurfacing, fog seals, sand seals, slurry seals and cold recycled mixtures (2016-17). Drafts for tack coats and thin bonded wearing

courses have been submitted (2018)

- Developed QA protocols for chip seals. Now working on one for microsurfacing
- Working on improved emulsion spec using Superpave testing principles.
- Initiated several NCHRP research projects including 14-37 on construction guides for chip seals and microsurfacing, 9-62 on cold recycled mixtures, and 9-63 on emulsion performance grading.



ETF Meeting at Heritage Group facility

Colin Franco of Rhode Island and Chris Lubbers of Kraton are the co-chairs of this group. The next meeting will be held in about 6 months at a venue to be determined. For more information on the ETF, please contact Colin Franco at colin.franco@dot.ri.gov.



COMING EVENTS

Coming Events: Mark Your Calendar!

Asphalt Pavement 101" Class **December 18 (Las Vegas, NV)**

CalAPA's popular "Asphalt Pavement 101" class will be offered for the first time in Nevada. This half-day class offers an overview of the basics of asphalt pavement including materials and pavement construction.

For more information go to: www.calapa.net.

2019 TRB Annual Meeting **January 13-17 (Washington D.C., VA)**

The Transportation Research Board will be hosting its annual meeting at the Walter E. Washington Convention Center. There will be promotional opportunities to:

- Support TRB by becoming a member.
- Purchase an exhibit space
- Sponsor events
- Become a recruiter for the Careers in Motion Job Fair

By Roger Smith, CP² Center

- Inform via TRB Live! theater in the exhibit hall.
- Advertising in the Final Program

For more information, please contact **Bradley Eubank** at Bradley.Eubank@Spargoinc.com or visit: <https://events.jspargo.com/TRB19/Public/Enter.aspx>

ISSA Slurry Systems Workshop **January 21-24 (Las Vegas, NV)**

The Slurry Systems Workshop is a study course offering a challenging and informative program on slurry seal, micro surfacing, chip seals and crack treatments with "hands-on" operation demonstrations and workshop-type discussions. Highly qualified Pavement Preservation Specialists will cover topics on the above listed processes, including materials and equipment, specifications, hand mixes, calibration, quality control, and inspection.

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**Certification Exams Offered
January 25 (Las Vegas, NV)**

The National Center for Pavement Preservation (NCP) will again offer the AASHTO TSP2 Certification Exams following the Slurry Systems Workshop in Las Vegas. Exams will be available for the following preservation treatments: chip seal, slurry systems, and crack treatment. Exams are 50 questions for agency personnel and 80 questions for contractor personnel, and are closed book.

For more information about the certification process, please visit: <https://www.tsp2.org/certification-information/>

**WRAPP Pavement Preservation Workshop
February 6-7 (San Diego, CA)**



The Western Regional Association for Pavement Preservation (WRAPP) will hold its annual 2-day pavement preservation workshop for public works professionals, pavement engineering firms,

and industry representatives, at the Concord Hilton. Get the latest in asphalt pavement preservation technology from presentations by experts. Vendor displays are also a popular part of the event.

For more information go to: www.wrapp.org

**AMAP Conference & Workshop
February 5-7 (Fort Lauderdale, FL)**

The Association of Modified Asphalt Producers (AMAP) Conference & Workshop promises to be an outstanding opportunity for networking about modified asphalt products. Learn more about the latest technology and materials used to improve the performance and life-cycle cost-benefits associated with modified asphalt.

For more information go to: <https://mail.google.com/mail/u/0/#search/AMAP/>



**CaAPA Spring Conference and
Equipment Expo
March 20-21 (Ontario, CA)**

The California Asphalt Pavement Association (CaAPA) will hold its "Spring Conference and Equipment Expo" at the DoubleTree Hotel in Ontario. The Conference will feature speakers from industry, government agencies and academia, as well as vendor displays – both indoor and outdoor.

For more information go to: www.calapa.net

"Pavement Maintenance For Local Agencies" (IDM-04), a popular class taught by pavement-consultant, **Roger Smith**, for the Tech Transfer Program at U.C. Berkeley, will be offered periodically. The 1-day class provides a solid working knowledge of the most common pavement maintenance and preservation practices. Topics include pavement management system concepts, pavement distress types and causes, asphalt materials, maintenance vs. rehabilitation concepts, repair options and common pavement maintenance/preservation strategies.

For information on scheduled classes go to: <https://registration.techtransfer.berkeley.edu/wconnect/CourseStatus.awp?&course=142IDM041203>

The **CP² Center's Patrons Meeting** will be in the **spring of 2019 - date TBD**. Companies that are not already Patrons but have an interest in supporting the Center and knowing more about the Patrons program are encouraged to attend.

For more information contact **Ding Cheng** at: dxcheng@csuchico.edu.



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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