



CP2 CENTER NEWS

Newsletter of the California Pavement Preservation Center

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Caltrans Constructs Asphalt Rubber Double Chip Seal Test

Sections By Lerosé Lane, and Ding Cheng, CP² Center, and John Fox, Caltrans

Caltrans has been using hot asphalt rubber (AR) chip seals as a pavement preservation strategy or as an interlayer for pavement overlay (rehabilitation) projects since the 1970s. In California, the AR binder used in chip seals has typically been a field-blended Type II, which consists of asphalt binder, extender oils, and crumb rubber modifier (scrap tire crumb rubber and high natural crumb rubber). In an effort to explore the use of special chip seals to expand the toolbox of the pavement preservation strategies, Caltrans is looking into the performance of non-standard chip seal strategies with several pilot projects.



The latest pilot project, on US395 near Bishop, is an effort to determine the value of double chip seals. Figure 1 shows John Fox of the Caltrans District 9 maintenance engineer discussing the project at the job site. The first layer was an AR chip seal, which used 3/8-inch pre-coated, hot-applied chips. The second layer, was a polymer modified emulsion (PME) chip seal using 1/4-inch chips. Caltrans standard is to finish the chip seal with a flush coat consisting of a fog seal and sand. For this double chip the fog seal was applied at 0.11-0.12 gal/yd² and the surface course of 1/4" chip helped to lock in the 3/8" chip. The finished chip with the fog seal provided a new uniform black surface for great striping contrast and a uniform apparent high friction surface texture. Part of the benefit being investigated is improved smoothness and a quieter ride with the smaller 1/4-inch chips. Objectives of this project include:

- Determine if the double chip seal, compared with a single chip seal, has a longer lasting wearing surface with better crack resistance.
- Evaluate performance factors through laboratory and field testing.
- Evaluate best construction practices for AR chip seals.



Figure 1. John Fox (left) Talking with Riley de Wit of CP² Center

Although the project had two locations, the California Pavement Preservation (CP²) Center was only tasked with monitoring and evaluating Location 2, which was the southbound No. 1, and No. 2 lanes on US 395 from PM 100.8 to PM 113.0. (The Location 1 was the southbound

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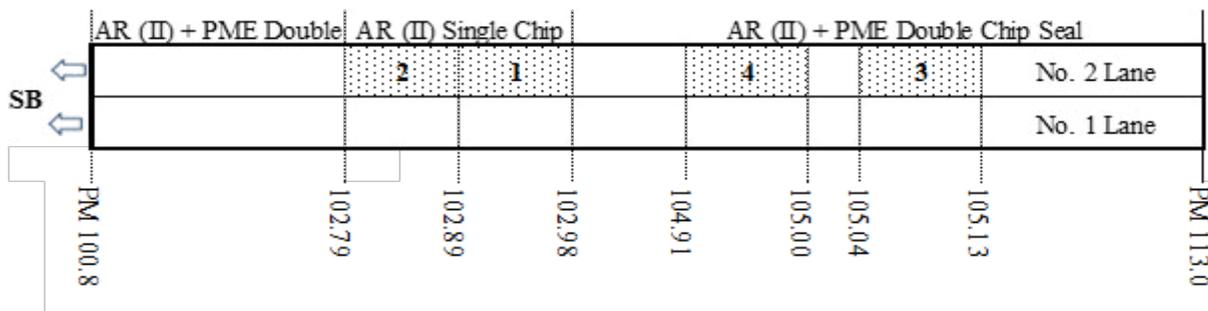
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lanes from PM 11.8 to PM 20.5.) Construction started on July 18 and ended on July 26, 2017. All of Location 1 was constructed as an AR (Type II) single chip seal. Location 2 was constructed as a double chip seal with the exceptions of Pavement Evaluation Sections (PESs) 1 and 2, located directly south of PM 103.0.

Test Section Layout

This pilot project includes the construction of multiple test sections. Within each test section, two PES's were established for performance monitoring. Each PES is 500 feet long. PES 1 and 2 were constructed as AR (Type II) single chip seal for comparison with PES 3 and 4, which received double chip seals. The Post Miles (PM) of the PESs are shown in Figure 2. The existing condition of each PES section was evaluated by the CP² Center for cracking, rutting, stripping and other distresses prior to construction.



Performance Evaluation Section (500 feet, NOT TO SCALE)

AR (II) = Asphalt rubber Type II

AR (II) + PME = Asphalt Rubber Type II with Polymer Modified Emulsion Double Chip Seal

Figure 2. Layout for US395 Chip Seal Test Sections

The Caltrans Resident Engineer for the project was Damon Cherenzia and the prime contractor was American Pavement Systems, Inc. (APS). The polymer modified binder was a PMCRS-2H, which was provided by Western Emulsions. The AR (Type II) was produced by APS using PG 64-16 paving asphalt. The prime contractor, APS, applied AR (Type II), with their hooded distributor trucks and the hot pre-coated 3/8 inch chips. They also applied the PME with the 1/4 inch chips.

Asphalt Rubber (Type II) Single Chip Seal

The construction started on the morning of July 18, 2017, from PM 100.8 at the south end of the project Location 2 in the No. 2 southbound lane. The temperature for the binder was between 385 and 395°F, with a target application rate between 0.53 and 0.58 gal/yd². Target



Figure 3. AR (Type II) Being Applied at Approximately 395°F

application rates for the 3/8" hot applied chip were 32-34 lbs/yd². These target values were used throughout Location 2. Figure 3 shows the application of AR (Type II) at the beginning of the project.

Double Chip Test Section Construction

Placement of the double chip test sections was done on the afternoon of July 20th and the morning of July 21, 2017. The PES's were constructed in the No. 2 southbound lane with the PME chip seal following the AR (Type II) chip seal. The temperature for the PME binder was approximately 140 to 150°F, with a target application rate of 0.25 to 0.27 gal/yd². Target application rates for the 1/4" chip were 16 to 17 lbs/yd². Figure 4 shows the application of 1/4 inch chip over the PME at PES 3.



Figure 4. 1/4 Inch Chips Being Applied over PME

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Testing and Evaluation

Both Caltrans and the CP² Center will perform tests to determine various properties of the binders used on this pilot project. Representatives from Caltrans and APS were on site to observe construction. Beside Caltrans Construction personnel, John Fox, Caltrans Maintenance Engineer, was also onsite during most of the project.



Figure 5. Vialit Test Plate with PME Chip Seal (no fog seal)

As part of this pilot project, a modified field Vialit test was performed to evaluate chip retention. Figure 5 shows a Vialit test specimen from the PME seal coat application. Modified field Vialit tests were also performed for the AR (Type II) single chip seal, and for the double AR (Type II) with the PME chip seal layer. In addition, laboratory Vialit testing will be performed by the CP² Center.



Figure 6. Completed US 395 Double Chip Seal

Figure 6 shows the finished double chip seal. The double chip seal does appear much smoother than the single chip seal and was measured to be slightly quieter using a Google smart phone applications program.

CP² Center personnel provided technical support and will continue to support Caltrans in various phases of the project, including post construction evaluation and laboratory testing. Caltrans Construction Division and the CP² Center have collected all of the submittals and the results of the tests that were performed. The CP² Center is currently developing a detailed construction report.

For more information contact John Fox of Caltrans District 9 at john.fox@dot.ca.gov or Ding Cheng of CP² Center at dxcheng@csuchico.edu.



RAP Mixes and Testing In California

By Brandon Milar, CalAPA

The asphalt pavement industry has demonstrated through research and decades of field experience the ability to utilize reclaimed asphalt pavement (RAP) in new asphalt mixes. Many asphalt paving projects across the nation successfully utilize mixes with higher percentages of RAP (some greater than 30 percent of total mix content).

But in some cases, mixes with high percentages of RAP can prematurely fail due to fatigue or low temperature cracking. There are several procedures, technologies and tests that are available to address this concern that have proven successful. The California Department of Transportation (Caltrans) and the asphalt paving industry (through the Caltrans-industry Rock Products Committee's "RAP/RAS Sub-Task Group") are working together to develop a

specification and testing protocol that would allow an increased RAP contents - above 15 percent.

The current Caltrans specification does allow RAP usage up to 25 percent, but only with the use of special lab tests and "blending charts". However, the testing procedures require the use of a chemical-based process that extracts and recovers the asphalt binders (virgin and RAP) from the mix for testing. The chemicals used in this process can pose a health risk for lab personnel if not properly handled, and require a hazardous-waste disposal protocol. Also, these binder rests may not accurately indicate the final HMA mix performance. So the group is considering various tests on the final mix that could be used in lieu of special binder tests that require binder extraction and

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RAP Stockpile

recovery. After discussions with asphalt technology experts from across the country, the group is narrowing their focus on a semi-circular bend (SCB) test –possibly using an SCB testing protocol currently under evaluation at the University of California Pavement Research Center (UCPRC).

The SCB test utilizes a lab (gyratory)-compacted sample that is cut to a specific thickness, then cut in half diametrically, and notched. The sample is placed in an apparatus that supports the ends of the cut face from below and applies a

point load at the top of the curved edge of the sample. As the load is applied to the specimen, gages read the change in width of the notch gap and measure the force applied over time. The amount of energy required to propagate the crack from the notch through the specimen determines the mix's resistance to cracking.

On June 22, the UCPRC hosted a meeting at their facility on the campus of U.C. Davis. The meeting was attended by the UCPRC team, the California Pavement Preservation Center (CP2), Caltrans personnel from the divisions of Pavements, Construction, and Materials Engineering & Testing Services (METS), and asphalt industry representatives from across the state. Dr. John Harvey provided an overview of the UCPRC effort with the SCB and insight into the various SCB efforts across the nation.

The group is interested in pursuing further evaluation of the SCB test, and has identified the necessary steps to move forward. If the evaluation is positive, eventually pilot projects will be used to identify issues related to large-scale production, and finally, the development of an SCB specification for implementation.

For additional information contact: BMilar@calapa.net



Keeping Things Hot on the Jobsite

By Jessica Stoikes, Pavement Maintenance & Reconstruction Magazine

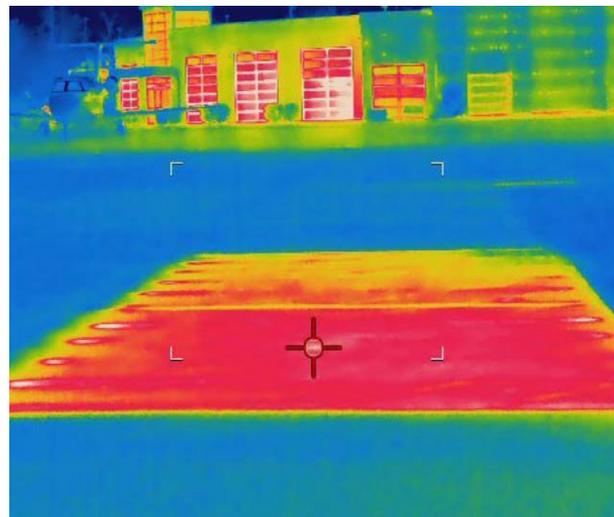
A new 'smartphone' attachment can map asphalt temperatures instantaneously.

We all know that temperature is the key to a successful asphalt paving job. When there are extreme differences in temperature and the mix gets cold, you're likely to have mat failure. However, it can be difficult to know just how hot the asphalt being put down is when you're in the middle of paving.

New infrared camera technology has been developed to help contractors to see temperature differences in the mix, but some of those cameras can cost over \$15,000. In comparison, a new smartphone camera attachment from Seek Thermal costs as little as \$250 and is changing the game of temperature monitoring for asphalt contractors.

On some jobs, it's inevitable that mix sits in the bed of the truck, or multiple trucks lined up, for longer than it should before it's dumped into the paver. At that point, the temperature of the mix could already be compromised, making it hard to achieve an end-quality mat.

According to Marc Okicich, director of sales in the Americas for Seek Thermal, "The camera can be used anywhere where you're looking to measure temperature: when the mix is delivered, temperature of the mat, ambient temperature, etc."



Paving Mat Temperature Variation Infrared Image

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Quick to connect and detect, The Seek Thermal Compact or CompactPro use advanced infrared technology to let you see thermal images day or night. The smartphone attachment is designed to work with both iPhone and Android top models, in conjunction with the smartphone app that contractors can download once they purchase the camera.

“With this device, you can quickly identify cold spots in the pavement,” Okicich says. “At that time, you are able to proactively do something to fix the problem before it’s too late.”

You can also use the camera to monitor just those objects that are above a certain temperature. For example, if you know something is supposed to be at or above a certain temperature, you can set a range to see only images of those times with temperatures above 200 °F.

Logging Temperatures

Just as you document density on a jobsite for

proof of work, these cameras can be used to document and log temperatures. The camera can be used to get a spot temperature, take a photo, time stamp it, date stamp it and give a location. The data can be stored in your phone and then emailed or transferred to a hard drive. By doing this, contractors can have documented proof that the mix was delivered at the desired temperature for optimal laydown and compaction.

Video can also be recorded while you’re moving. This allows you to record temperatures coming out of the truck on a consistent basis. Video can also show the hottest and coldest spots on the mat for documentation and pavement performance review purposes.

SeekThermal has devices that range from \$250 to \$700 and can be used in many different applications. For more information visit:

www.thermal.com.



Rubberized Pavement Grant Program Application Deadline

Extended By Nate Gauff, CalRecycle

CalRecycle has extended the deadline for the Rubberized Pavement Grant (Fiscal Year 2017-18) application to October 5, 2017. The original deadline was September 14, 2017.

The Department of Resources Recycling and Recovery (CalRecycle) administers a program to provide opportunities to divert waste tires from landfill disposal, prevent illegal tire dumping, and promote markets for recycled-content tire products. CalRecycle also issues grants to local agencies for rubberized asphalt concrete hot-



mix overlays and rubberized chip seal annually. The Rubberized Pavement Grant Program is designed to promote markets for recycled-content surfacing products derived from only California-generated waste tires. It is aimed at encouraging first-time or limited users of rubberized pavement in two project types – Rubberized Asphalt Concrete Hot-Mix and Rubberized Chip Seals.

But a few things have changed, In order to make this program more beneficial and more accessible, CalRecycle has improved a few program aspects:

- Higher reimbursement rates in certain areas of the state to reflect the regional cost differences for rubberized asphalt.
- The maximum grant amount has been increased from \$250,000 to \$350,000 for individual applicants and from \$400,000 to \$500,000 for regional applicants of two or more agencies.
- Regional Grants will be awarded full RAC - 1 reimbursement rate, regardless of prior grant funding.

Eligible applicants and projects include:

- Local Governments
- Special Districts
- Joint Powers Authority (where all JPA members are also otherwise eligible applicants)
- Qualifying Indian Tribes

Funding is as follows:

- \$7,750,000 available for fiscal year (FY) 2017–18
- \$350,000 maximum for Individual Application. If applying for a regional application, the maximum grant award shall not be greater than \$500,000. The Lead or a participating jurisdiction is limited to no more than \$350,000 of the grant award.
- One or more projects can be combined into a single grant.

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- The funding of project(s) is based on the amount of rubberized pavement material proposed and number of previous CalRecycle RAC/Pavement grants received.
- The award amount is based on a particular reimbursement rate depending on geographic area, the project type and category.

For information regarding the eligibility, grant amount, application, and more, please visit the Rubberized Pavement Grant Program website at: <http://www.calrecycle.ca.gov/Tires/Grants/Pavement/FY201718/default.htm>

For more information regarding accessing the online application, go to: <http://www.calrecycle.ca.gov/Funding/GMS/>



Long-Life Asphalt Pavement Planned On I-5

By Russell Snyder, CalAPA

Caltrans plans to advertise their fourth major 'long-life' asphalt pavement project in Northern California early next year as part of a rehab/reconstruction project on Interstate 5 from Elk Grove to the American River, north of downtown Sacramento. The Long Life Pavement (LLP) design strategy utilizes special performance testing of materials and the latest asphalt pavement design methods to produce pavements that will last at least 40 years with only minor surface maintenance.

The Sacramento project builds on the first successful LLP project on the 710 Freeway in Long Beach in 1996. Since then, successful projects were completed on two additional segments of the 710, Interstate 5 in Weed, Interstate 5 in Red Bluff, and on Interstate 80 in Solano County, between Sacramento and the San Francisco Bay Area.

Caltrans was awarded a "Pavement Pioneer" Award from the national Asphalt Pavement Alliance in 2013 for deploying innovative long-life asphalt pavement strategies in delivering projects with an expected design life of 40-years or more. In 2015, the \$31 million, 14.5-mile Red Bluff LLP on Interstate 5 was recognized with a Caltrans "Excellence in Transportation Facilities" award.

In June, Caltrans hosted a meeting at the District 3 offices in Marysville as part of the ramp-up for the Sacramento-area LLP project. The meeting focused on an overview of the project and the sharing of information and lessons learned from previous LLP projects. The meeting included representatives from Caltrans District 3 Construction, Design, and Materials with Caltrans Headquarters Design, the University of California Pavement Research Center (UCPRC), the Asphalt Institute, CalAPA, and contractors from the Sacramento region and Southern California.

The UCPRC shared updates to the performance

testing requirements for LLP mix designs. Previous projects used a cumbersome performance testing protocol on plant-produced HMA materials that significantly increased the amount of lab time needed to complete a mix design. To help with this problem, the UCPRC has been able to reduce the required fatigue testing time from 3 weeks down to 2 weeks.



North Red Bluff Long Life Pavement Project

Contractors on the other projects shared concerns related to the required 55-hour freeway closures, and strategies to handle paving edge drop-offs that are exposed to traffic. The other LLP projects had cited the pre-bid meeting as a significant contributor to project success.

Caltrans will conduct pre-bid meetings to discuss the intricacies of the project as well as the structural design and mix design requirements.

CalAPA will continue to work with Caltrans to address any technical questions that may arise during the finalization of the specifications. Also, the Association will assist Caltrans with any training needs related to LLP.

For more information visit:

www.calapa.net



Crack Sealing and Patching 'Quick Tips'

By Roger Smith, CP² Center

Two of the most common asphalt pavement maintenance / repair practices are crack sealing and patching. These tasks are often assigned to an agency's in-house crews or they may be done by contractors – perhaps as part of a larger overlay contract. In any case, here's a checklist of 'quick tips' for best results:

Crack Sealing (Figure 1)

Seal only linear cracks wider than 1/4". Don't try to seal 'alligator' cracking.

'Rout' linear cracks in the more severe climate areas (say, above 3000' elev.).

Clean crack with compressed air. (Use a hot lance in cool, damp conditions.)

Select proper sealant grade for the climate (Consult supplier.)

Consider cold-pour sealants for smaller, isolated, warm-weather repairs.

Minimize "overbanding" of sealant.

Knock down sealant with a 'squeegee' tool to prevent a bump; avoid excess smearing.

Consider applying sand to make the seal 'disappear' and help with aesthetics (sweep prior to traffic!)

Let rubberized sealants "cure" (long-term) prior to placing a thin overlay.



Figure 1. Applying hot crack sealer

Patching

Make permanent full-depth 'dig-out' patches with hot mix asphalt (HMA) when weather permits, as follows:

Mark cut lines 1 foot beyond the visible cracking.

Mark cut lines 1 foot beyond the visible cracking.

Use straight cut lines and square corners.

For larger patches, use a digout wider than the width of your roller.

Sawcut or jackhammer on the cut lines.

Make digout & patch 50% thicker than the old asphalt layer that failed.

Apply emulsion tack coat to vertical cut faces.

Re-compact the base 'floor' of the digout (no tack coat needed).

Use an HMA mix type appropriate for the traffic loading.

Keep patching mix hot (>200°F).

For patches thicker than 6 inches, place in 2 or more lifts.

Place an extra thickness (25%?) of "loose" asphalt mix to allow for compaction.

Don't over-rake the edges.

Make at least 3 repeat roller passes.

Patch surface should become flush only after rolling 3 – 4 roller passes.

Use static (not vibratory) rolling when roller is contacting the old (cold) pavement!

Leave no hump or depression; check with a straightedge.

Keep heavy vehicles (inc. buses) off the patch until it cools to 150°F.

Consider fog sealing the surface of the new patch.

"Quick patch" cold mix products should be used for immediate, 'emergency' repair of smaller potholes – even in cooler, wet weather.



Figure 2. Raking loose mix in 'dig-out' patch

Terminal Blend Chip Seal Project - Performance Update

By Ray Myers, AIA

Even though the Los Angeles County Public Works Department has an annual budget of over \$2.3B, the asset they must preserve is just as huge. Some 7400 lane-miles of roads must be maintained in a range of climatic conditions. This project was located in the arid location of the high desert near Lake Los Angeles (don't look for the lake) near Palmdale. In an effort to find a maintenance treatment that required minimal preparation, Los Angeles County Senior Civil Engineer, Erik Updyke, chose a terminal blend rubberized (TRB) chip seal for a demonstration project for Cal Recycle. It was constructed in 2009.

The Asphalt Interlayer Association (AIA) applied for a permit to add 3600 lineal feet of Geosynthetic Reinforced Chip Seal (GRCS) as an additional test section within the project limits. This involved placing a 10-foot wide, 4.1 oz/sy polypropylene paving fabric (often called Petromat) under the chip seal. The fabric was Tencate/Mirafi MPV 400.

The project included both Avenue O and J, but this article will focus only on Ave. J west of 170th Street, where the GRCS test section was placed. Avenue J has become a bypass for many vehicles, specifically trucks, wishing to circumvent the City of Palmdale. Typical daily truck counts are very high, in addition to automobiles. The speed limit is 55 mph, which seems to be the minimum, not the maximum, as homes are approximately 1 mile apart. The normal low temperature in January is 10°F, while the normal high occurs in August at 107°F. Annual rainfall is 5.5".



Condition of Old Pavement - Avenue J

The County chose to place a "skim coat" of blade-laid (by motor grader) fine asphalt mix to fill the largest cracks. The All American Asphalt company provided the equipment to install the paving fabric per AIA specifications (www.aia-us.org) using a PG 70-10 unmodified hot asphalt tack coat. When the fabric is correctly saturated with the asphalt tack coat, it is able to withstand the hot rubber chip binder.



Placing GRCS on Avenue J

The chip seal application was done by All American Asphalt. Paramount Petroleum (now Alon) supplied the PG 76-22TR chip seal binder, which included 15% minimum ground rubber binder. It was placed at approximately 0.38 gal/sy at temperature between 330-375°F. The 3/8" chips were pre-coated with PG 70-10 asphalt and preheated to be at a minimum of 220°F at time of placement. Specifications called for application rate to be at 18-20 lbs/sy. Pneumatic rolling met Caltrans Section 37-1.07 requirements for "Finishing". A Caltrans 'flush coat' was applied to the final chip surface.

Now after 8 years, the improvement of the performance of the chip seal with the addition of the interlayer is very evident.



GRCS in far lane - TBR chip seal in near lane, after 8 years

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Some cracks in the test section have reappeared, however, the interlayer is still intact to serve as a water barrier. With less than 6" of annual rainfall, water intrusion is not as critical as it would be on other projects, where the 'waterproofing' value of a GRCS benefit would even be greater.

Properly installed Interlayers have led to improved performance of the maintenance

treatment under which they are placed. Current pictures from this project are testimony to the benefit of the interlayer when applied in conjunction with a TBR chip seal.

For more project specifics please contact Ray Myers, rmroads@gmail.com or Erik Updyke, eupdyke@ladpw.org



I-10 Concrete Pavement Diamond Grinding for Its 70th Anniversary

By Larry Scofield, P.E., ACPA, IGGA

On August 18th of this year in Ontario, California, a celebration was held commemorating 70 years of service life for the concrete roadway which today, as part of Interstate 10, connects Los Angeles County to San Bernardino County. Originally constructed in 1947 as a 4 lane facility, it was later widened to 8 lanes.



1947 Concrete Pavement Soon after Opening to Traffic - Photo courtesy of Caltrans District 8

Many of the original 4 lane sections, however, are still serving after 70 years of traffic, withstanding the test of time and increasing traffic.

Although the celebration event was to honor the 70th anniversary of this roadway, it should also be remembered that this section heralded in the use of diamond grinding on existing concrete pavements. Sections of this I-10 corridor were the first sections of in-service concrete pavement diamond ground in California and presumably the first anywhere on the US highway system.

Recently in 2016, these sections of pavement were diamond ground for the 4th time since the 1947 construction. "This is a significant testament to the sustainability of properly maintained concrete highways," says Charles Stuart, Executive Director of the Southwest Concrete Pavement Association. "This original 1963 discovery and recent 70-year, long-life milestone represents pavement innovation at its best where Caltrans and the pavement industry

partnered together to improve the highways creating great benefits to California's transportation network."

The circumstances leading up to the first use of this innovative preservation technique are detailed in a 1965 report describing the condition of the 1947 sections as follows: "Step-offs became noticeable a number of years ago, and recordings were made progressively and found to be increasing at a steady high rate. This progressive worsening condition of the pavement was a matter of grave concern. California standard profilograph readings made two years ago [in 1963] indicated that the readings on the outside edge were then in the category of 25 inch per mile. This far exceeds California allowable index of 7 inch per mile for new pavement."

"A detailed analysis of the individual profilograms reveal these facts. The roughness is due to upward curling of the two to three feet of the end of each individual slab, plus step-off of the approach end of the adjacent slab. The curling of the slabs has remained virtually unchanged, while the step off has increased with time."



1965 Grinding Operation Pass - Photo Courtesy of Caltrans District 8

"Step-off, therefore, has been the major factor in the increasing profile index. The magnitude of the difference in elevation between the curled end of each slab and the stepped

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approach end of the adjacent slab increased from an average of 0.10 inches in 1957 to 0.15 inches in 1961.”

At the time of construction in 1947 the California Division of Highways (now Caltrans) had specified in some section for the top three inches of the subgrade to be stabilized with liquid asphalt to minimize future ‘pumping’ of base fines at the joints. From the 1965 report it was evident that this design feature was not entirely successful for the 15 foot joint spacing.



*Early Concut Diamond Grinding Equipment -
Photo courtesy of IGGA*

As a result of the I-10 roughness issue, in 1963 some experimental diamond grinding was done on a section of the original 1947 construction. Eighty-eight transverse joints in one lane were diamond ground with conventional ‘bump grinding’ equipment in use at the time to remedy roughness on newly constructed PCCP. Equipment in use at the time provided a 20 inch grinding width using 90 concrete saw blades. Although diamond grinding equipment was in use in California for bump grinding on newly constructed concrete, it had not been used for grinding in-service concrete roadways.

The original plan was to grind only the last two to three feet of each slab end, to remove the curl of the slab. However, it was soon determined that grinding the entire slab would not pose a significant increase in cost, and the entire lane was then ground for the test using the equipment previously described.

Profilograms were obtained before and after the grinding. The pre-grind roughness in the outside wheelpath was 24.6 inch per mile, while the post grind was 1.0 inch per mile. The inside wheelpath was 14.4 inch and 0 inch per mile, respectively. The test sections were checked again in November of 1965 and no measurable increase in roughness had occurred.

As a result of the success of the experimental test sections, two sections of I-10 were established for construction contracts to make the concrete pavement smooth again. The equipment for the 1965 grinding projects was a machine produced by the Concut Corporation, which used a 12 ft wheelbase. This wheelbase was chosen to match the State’s specification for grinding which was based on a 12-foot straightedge. The wheelbase could be extended to 25 feet by using a detachable extension, which then matched the State’s truck-mounted profilograph wheelbase of 25 feet. The cutting head, mounted in the center of the machine, consisted of 190 concrete saw blades and had an overall width of 38 inches.

This machine was the beginning of the diamond grinding industry for concrete pavement preservation, and it all happened on I-10 in 1965. Since the first grind in 1965, I-10 was ground three more times receiving the fourth diamond grinding just prior to its 70th anniversary. Pretty amazing for a pavement that was only constructed 8 inches thick. The original design was innovative in that it included tie-bars in the longitudinal joints and in transverse “contact” joints located at 60 feet intervals, however it did not include any dowels in the pavement. Weakened plane transverse joints – with no tie-bars – were installed every 15 feet.



*Eastbound Interstate 10 in Ontario California,
2017 - Photo courtesy of Southwest
Concrete Pavement Association*

Today, this section of I-10 has an average daily traffic of 280,000 vehicles per day, a far cry from the original 1945 design for an 8 inch thick, non-doweled, concrete pavement. Although the reasons for the long life of the 70 year old concrete pavement are no doubt many, the use of diamond grinding four times during its life, has been a major factor.

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





North Counties Workshop – ‘What Works For Us’

By R. Gary Hicks, CP² Center and Scott Dmytrow, Telfer Pavement Technologies

Nearly 70 personnel from over 10 County Agencies attended a workshop in Yuba City on June 22, 2017, organized by the a North Counties Road Superintendents Group under their theme, ‘What Works For Us.’

The event featured presentations by Telfer Pavement Technologies and Ergon Asphalt and Emulsions. Topics covered in the morning workshop included the following:

- Pavement preservation concepts (Austin Cantalini – Telfer)
- Chip seals - application and quality (Scott Dmytrow – Telfer)
- Multi- layer treatments (Scott Dmytrow – Telfer)
- Innovations and various new products (Scott Metcalf – Ergon)
- Bonded wearing courses (Cesar Lara – Telfer)

After lunch, round table discussions were held that addressed many of the morning topics, but also:

- Proposed SB1 funding information
- 2016-17 storm damage
- Discussion of what each County was doing and what their challenges were

Overall, the event was considered a great success. ‘Takeaways’ from the workshop, which were many, including:

- The importance of preserving pavements, including cost savings and more, were stressed.

- New technologies for preserving pavements were introduced.
- A number of case histories using various preservation treatments were reported on.
- All Counties attending the event had the opportunity to discuss the various treatments they were using.



Various Event Speakers

For more information on these topics contact:

Scott Dmytrow at scott.dmytrow@telferpavements.com

Cesar Lara at Cesar.Lara@telferpavements.com

Austin Cantalini at austin.cantalini@telferpavements.com



WRAPP Update

By Sallie Houston, VSS - WRAPP President

The Western Regional Association for Pavement Preservation (WRAPP) is busy preparing for their annual 2018 Workshop to be held at the Hilton Concord in the East Bay area February 6 -7. In addition to presentations on traditional pavement preservation topics, the focus this year will be on the mega fund Senate Bill 1 (SB1) Road Maintenance and Rehabilitation Program. The WRAPP board is working with Caltrans to understand what this surge in funding will mean for pavement preservation. We are also working together to develop strategic guidelines on the use of various pavement preservation treatments including when / where to use them. This is a critical time for the pavement preservation industry, and using our skills



to deliver the highest quality work and material will set the stage for pavement preservation for years to come. Caltrans is excited to have the funding that will enable them to implement a true pavement preservation strategy. We are equally excited for what this means for our industry and our roads at every agency level throughout the state.

For more information visit the WRAPP website at: www.wrapp.org



It's Time for Accountability and Performance Tracking (Part 2)

By Sui Tan, Metropolitan Transportation Commission (MTC)

In the June newsletter I talked about use of the Key Performance Index (KPI) for cities and counties under SB1, even though they are not required, to track the efficient use of their pavement funding. I would like to continue to discuss why it is ever more important to properly manage your pavement assets and introduce other KPI's to track your progress.

Importance of Asset Management

As compared to other states, local agencies in California are revolutionary in using different technologies in maintaining their streets and roads. The passage of SB1 is the validation from voters that they want to drive on good roads. However, local agencies shouldn't just pave the worst streets without knowing the best ways to get them to the state of good repair. By taking an asset management approach, a pavement management system will be able to answer questions as to:

- Existing pavement condition?
- Amount of maintenance dollars currently invested?
- Investment needed to achieve the state of good repair?
- Effectiveness of pavement preservation efforts?

In order to gauge the success of your pavement management program, I would like to introduce two more key performance indices (KPI).

1. Minimum % of Good Condition - Maximum % of Poor Condition

The first one is related to setting performance targets of the minimum percent of pavement in good condition and maximum percent of poor condition. This is by no means just figuring out what pavement is in good and poor conditions. To find the attainable targets, you will need to run several investment analyses based on current funding compared to the state of good repair funding, which is based on maintenance needs. Each of the budget scenarios can be displayed in the chart in Figure 1.

For local agencies that use the MTC's 'StreetSaver' pavement management program, the 'Target Driven Scenario' will make this investment analysis even easier. They just need to set their targets for good and poor conditions, and the program will project how much money is needed to achieve those targets.

2. Asset Sustainability Index

The Asset Sustainability Index is by far the most important performance measure to track. You want to be able to track if your pavement management program is sustainable - in perpetuity. To calculate this index, you will need to figure out the actual average annual costs of the last three years of maintenance and rehabilitation (M&R) projects, and spread these costs over the total lane miles. Then you will calculate the

KPI: Max. % in Poor Condition/ Min. % in Good or Very Good

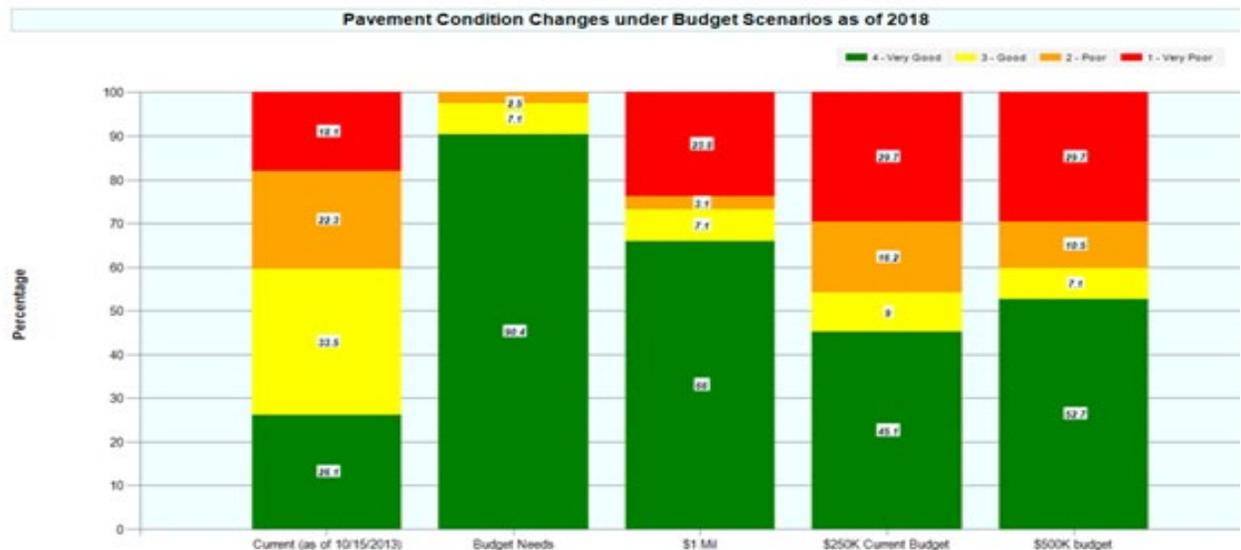


Figure 1. Percent in Very Poor, Poor, Good, and Very Good Conditions for Various Budget Scenarios

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average annual cost of maintenance 'needs' to achieve the state of good repair in 10 years, and spread it over the total lane miles. To find the Asset Sustainability Index, you will divide the 'actual' M&R by the 'needs' M&R. A 100 percent finding will indicate that you can sustain the maintenance program perpetually. As shown in Figure 2 below, in Alameda County, only the city of Dublin had achieved this (113%) based on their 2012 PCI of 83.



In summary, performance measures of pavement condition should not be limited to just knowing the current condition in terms of 'good' and 'poor' standings. It should incorporate other important KPI's that provide information on how successful your overall pavement management program is.

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



KPI: Sustainability Index = $\frac{\text{Actual M\&R}}{\text{Annualized 10-Year Needs}}$

County	Jurisdiction	Network PCI	Actual M&R /Lane Mile	Needs/ Lane Mile	Sustainability Index
Regional Benchmarks		66	\$10,400	\$27,000	39%
Alameda	ALAMEDA	66	\$9,800	\$26,900	36%
	ALAMEDA COUNTY	71	\$3,600	\$16,200	22%
	ALBANY	58	\$12,700	\$29,800	43%
	BERKELEY	58	\$11,600	\$32,400	36%
	DUBLIN	87	\$6,300	\$5,600	113%
	EMERYVILLE	75	\$0	\$16,100	0%
	FREMONT	63	\$11,900	\$29,100	41%

Figure 2. Asset Sustainability Index

FHWA Update

By Steve Healow, FHWA, Sacramento

During the 2016 presidential campaign, you may recall the President advocating for spending \$1 Trillion on infrastructure (\$200 Billion in federal funds, \$800 Billion in private) over the next decade. As recently as June 8 in Cincinnati, the President announced he would unveil his trillion-dollar infrastructure plan this fall. Since then the President's agenda has changed. We'll most likely see the infrastructure proposal in 2018, and it has taken a back seat to the overhaul of healthcare, the tax code, immigration and raising the debt ceiling.



Two Senate committees (Commerce, Science and Transportation, and Environment & Public Works) have drafted infrastructure bills and held related hearings. How does Congress plan to pay for the federal share of the proposed infrastructure plan? Among the options being considered are tolls on interstate routes. For the private share, the administration proposes to lure private investors to public-private partnerships with tax credits and tax-exempt bonds. If you need information regarding the selection of pavement preservation treatments which are most appropriate for bicycle routes, consider this paper from the U.C. Pavement Research Center: <http://www.ucprc.ucdavis.edu/PDF/UCPRC-RR-2016-02.pdf>. The authors interviewed scores of cyclists on local streets and roads and state highways. In addition to the interviews, their conclusions are based on International Roughness Index measurements, macrotexture, ride quality and rolling resistance data.

If you're looking for pavement preservation alternatives which achieve high marks for sustainability and produce a stable base for your structural section, you might consider the new 100-page "Guide to Full-Depth Reclamation (FDR) with Cement", published earlier this year

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by the Concrete Pavement Technology Center at Iowa State University. The guide is available online at <http://www.cptechcenter.org/technical-library/documents/guide-to-full-depth-rec-lamation-with-cement.pdf>.

Also noteworthy is this accelerated loading study from the U.C. Pavement Research Center, which compares the performance of FDR using cement stabilization, with separate sections of FDR using foamed asphalt stabilization. See <http://www.ucprc.ucdavis.edu/PDF/UCPRC-RR-2014-03.pdf>. Researchers confirmed that both stabilization strategies worked well and were resistant to rutting and cracking under ac-

celerated loading. Advocates for achieving target density in asphalt pavement construction will refer to this study published by the NCAT at Auburn University entitled "Demonstration Project for Enhanced Durability of Asphalt Pavements Through Increased In-Place Pavement Density". Based on their literature search and data from ten pilot projects constructed in 2016, the authors conclude that a 1% improvement in density will improve pavement performance in fatigue and rutting and extend service life. You can see the study at: <http://eng.auburn.edu/research/centers/ncat/files/technical-reports/rep17-05.pdf>



FP² Update

By Jim Moulthrop, FP²

In May, members of the national Foundation for Pavement Preservation (FP²), the Western Regional Association for Pavement Preservation (WRAPP) and the Asphalt Recycling and Reclaiming Association (ARRA) attended the Washington D.C. fly-in and visited many legislative offices discussing the benefits of pavement preservation. Of concern is how FP² can get more engaged at the local city-county level, where most of the streets and highways in the US are located. In addition to meeting with several House staffers, we also met with folks from the National League of Cities, the US Chamber, and TRIP. We now also have contacts with the National Association of County Engineers (NACE), which we intend to pursue moving forward.

On the research front, we see the need for organizing the performance data and information coming from the Lee County, Alabama, Road 159 test areas, which were constructed 5 years ago. A concise 2-page document will be prepared indicating the life-extending benefits to date from the Lee Road pavement preservation research. This could be especially useful to industry.

Other pavement preservation research will involve continued performance monitoring of the experimental test sections in Alabama and Minnesota. Monitoring will consist of measuring the distress conditions that develop.

For more information contact Jim Moulthrop at: jmoulthrop@fugro.com



CEAC Northern California 'Bedroll Conference'

By Rick Tippett, Trinity County and Pat DeChellis, CEAC

Nearly 60 people 'roughed it' at the 38th Annual County Engineers Association of California (CEAC) 'Bedroll Conference' held at Lake Almanor on August 16-18, 2017. This popular event was organized by Scott DeLeon of Lake County and facilitated by Rick Tippett of Trinity County. The event brings together Public Works Directors, industry and academia from northern California to discuss new and challenging issues faced by local agencies. The program consisted of several speakers and roundtables addressing topics such as;

- Latest Developments on National Specifications for Emulsions and Pavement Preservation Treatments (Gary Hicks, CP² Center)
- Alternative Bridge Project Delivery (Rick Tippett, Trinity County)

- CEAC Update (John Presleigh, CEAC President)
- Methods for Rehabilitating Damaged or Defective Culverts (Cullom Walker, Precision Pipe Products)
- Run off the Road Accidents (Ken Kochevar, FHWA, and Rick Tippett, Trinity County)
- Job Order Contracting (Paul Burns, Gordian)
- Legislative Update (Chris Lee, California State Association of Counties)
- Local Assistance Update (John Hoole, Caltrans)
- CEAC and Affiliate Roundtable Discussion of information for Northern California Counties

Some of the key 'takeaways' from the Conference included:

Continued, next page

- New national specifications for emulsions and preservations treatments are becoming available. For some of the treatments, construction guides are in progress, as well
- New delivery systems for projects
- Key issues that are important related to SB1 deadlines and implementation.



Figure 1. Salmon Dinner Wednesday night

Most of the presentations can be found at the following link: <http://www.ceaccounties.org/resources/past-conference-presentations/>



Figure 2. Friday morning Cleanup Crew

As usual, everyone at this unique 'camp' event had a great time with networking and learning new ways of doing business.



Pavement Preservation Meeting Planned

By R. Gary Hicks, CP² Center

The Rocky Mountain West Pavement Preservation Partnership (RMWPPP) is a regional forum of pavement professionals working together to promote the benefits of Pavement Preservation through information sharing, education and innovation. The western 13 states will hold the annual meeting of the RMWPPP in Seattle, October 23-25, 2017. This is one of four pavement preservation partnerships throughout the United States, and includes some of the Canadian Provinces. The group includes members from federal, state and local agencies, the construction industry, pavement consultants, and academia. David Luhr of the Washington DOT is the current Chair, and members of the Board from California include Jason Lampley (ISS) and Gary Hicks (CP² Center).



Here's a look at the impressive line-up of speakers planned:

- Dr. Judith Corley, Director of the NCPP - the top 10 world class pavement preservation programs
- Jason Dietz, FHWA - FHWA initiatives and Policies
- Gonzalo Rada, AMECFW - NCHRP project 14-33 update
- Scott Metcalf, Ergon - new technologies

- Chris Luebbers, Kraton - AASHTO Emulsion Task Force specifications for preservation treatments
- Jason Lampley, ISS - chip seal do's and don'ts
- Larry Galehouse, NCPP - training & certification programs for pavement preservation
- Nick Jones, Utah LTAP - resources for pavement preservation
- Jesse Bhullar, Caltrans - MAP-21, State/Local Agency coordination
- Kyle McKeon, WSDOT - local programs in Washington state
- Ryan Miles, City of Vancouver, WA - Pavement Preservation Tool Box
- Jim Powell, ACPA Washington State - rapid concrete repair/preservation
- Elie Hajj, UNR - timing of preservation treatments
- Jim Weston, WSDOT - High Friction Surface Treatments (HFST)

There will also be individual state reports on 'triggers' used for pavement preservation, vendor displays, and a business meeting with task group reports. Next year's (2018) meeting will be in Portland.

For information on the full agenda, registration, the hotel, and other details, please go to: <https://tsp2pavement.pavementpreservation.org/rocky-mountain-west-rmwppp/annual-meetings/2017-2/>





Mark Your Calendar (Coming Events)



CalAPA Fall Asphalt Conference & Equipment Show, October 25-26 (Sacramento)

- Hear from top policy-makers and respected experts from across the country on topics that will directly impact your business or your agency now and in the future.
- Topics will include: best practices in Hot Mix Asphalt design; specifications; testing; paving; future trends; research projects. Updates on legislation and funding for road construction and maintenance will also be included. In conjunction with the Conference, the popular class, "Asphalt Pavement 101", will also be offered. For more information go to: www.calapa.net

"Asphalt Pavement 101" Classes October 24 (Redding), October 25 (Sacramento)

Two sessions of CalAPA's popular "Asphalt Pavement 101" class will be offered in northern California. This 4-hour class provides an overview of asphalt pavement design, materials, equipment, construction, and inspection basics. It's great introductory training for new hires and provides a solid refresher and update for more experienced personnel. For more information go to: www.calapa.net

APWA Public Works Conference November 8-9 (Richmond)

The northern California Chapter of the American Public Works Association (APWA) will hold its annual Public Works Conference on November 8-9 at the Memorial Auditorium Richmond. This event includes educational forums and vendor exhibits. For more information go to: <http://northernca.apwa.net/EventDetails/11780>

Asphalt Pavement Maintenance and Rehabilitation Class December 7, 2017 (Costa Mesa)

Transportation agencies at the city and county level can maximize the value of their huge investment in streets and roads by using proper pavement maintenance strategies. This course provides a solid working knowledge of the most common pavement maintenance and rehabilitation practices. Basic principles, best field practices and safety issues are covered. Learn more at:

<https://registration.techtransfer.berkeley.edu/wconnect/ShowSchedule.awp?&Mode=GROUP&Group=PAVE&Title=Pavement+Design+and+Maintenance>



RPUG Conference November 14-16 (Denver)

The Roadway Profile Users Group (RPUG) 2017 Conference will be held November 14-16 in Denver. The 2016 Conference in San Diego attracted over 120 technologists from across the US and as far away as Australia, Sweden and Asia. (There is a separate RPUG for Europe.) Over 20 State DOTs were represented, as well as FHWA, consultants and equipment vendors. This event will offer the latest thinking on pavement smoothness measurement and specifications. For more information go to:

www.rpug.org



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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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