CP2 Center News

Newsletter of the California Pavement Preservation Center

No. 40 December 2016

National Pavement Preservation Conference

By R. Gary Hicks, CP2 Center

Nearly 750 people attended the 2nd National Conference on Pavement Preservation on October 11-14, 2016, in Nashville, Tennessee. The Conference was attended by agency personnel, industry, academia and others, and featured nearly 50 vendor exhibits.

Figure 1. Jeff Uhlmeyer, Gary Hicks (Moderator for the Research Session), Charles Swartz, and James Bryce

The Conference, organized and hosted by the National Center on Pavement Preservation, offered an excellent venue for pavement preservation technology transfer, offering preservation practitioners across the country an opportunity to hear from experts in the preservation field, and to observe live field demonstrations of the placements of several types of pavement preservation treatments.

California was well represented with people from Caltrans, MTC, CP2 Center, UCPRC, and industry participating as speakers, moderators, or in the planning of the conference. California speakers included: Gary Hicks (CP2 Center), Robert Hogan (Caltrans), Sui Tan and Theresa Romell (MTC), John Harvey (UCPRC), Scott Metcalf (Ergon), Don Mathews (PRS) and Kevin Donnelly (Western Emulsions).

Partnership Meetings

Tuesday morning featured meetings of the Midwestern, Northeast, Rocky Mountain West, and Southeast 'Pavement Preservation Partnerships'.

This was followed by a panel of experts which featured Butch Waidelich, FHWA Executive Director, Brian Stacey, National Association of County Engineers, and the regional Pavement Preservation Partnership chairs, Francis Todey, Iowa DOT; Derek Nener-Plante, Maine DOT; Mary Gayle Padmos, Montana DOT; and Jon Wilcoxson, Kentucky Transportation Cabinet.

Concurrent Sessions

Four concurrent sessions were held Wednesday morning dealing with the following:

- Pavement Preservation Basics
- Environmental Impacts of Pavement Preservation
- Emerging Technologies Asset Management and Pavement Performance Measures

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An industry plenary session on Workforce Development in Today's Marketplace followed, moderated by Rod Birdsall, President, Foundation for Pavement Preservation (FP2), with Peter Grass, President, The Asphalt Institute, and a panel that included representatives from other national pavement organizations, including AEMA, ARRA, IGGA, ISSA, and NAPA.

Field Demonstrations

Wednesday afternoon, field demonstrations of pavement preservation techniques took place at Nissan Stadium, home to the NFL Tennessee Titans. This popular segment included live applications of a fog seal, scrub seal, micro-surfacing, thin HMA overlay, and crack sealing treatments. Rigid pavement technologies, such as dowel bar load transfer retrofits and diamond grinding also were demonstrated. The field demonstrations were one of the highlights of the meeting.

Figure 2. Field Demonstration Overview

Equipment displays included a micro-surfacing machine, cold milling machine, chip seal aggregate spreader, asphalt emulsion distributor, in-place recycling machine, crack router, and sealant melter. All of the equipment and the demonstrated treatments were in a secure, protected area, thereby avoiding need for traffic control, and affording the delegates maximum movement, flexibility, and opportunities to have questions answered.

Multiple Tracks, Sessions

Thursday was very busy, with multiple tracks and concurrent presentations all day. Kicking off the morning were sessions on:

- Pavement Preservation Best Practices
- Sustainable Case Studies
- Research dealing with the SPS-2 concrete study and NCHRP projects 9-53 and 14-33
- Pavement Condition Data for Preservation

Late morning concurrent sessions included ones on:

- Safety Initiatives
- Recycling & Reuse
- Certification and Accreditation
- New Measurement Technologies

Thursday afternoon sessions addressed:

- Quality Measurement
- Economics
- LTAP Efforts to Advance Preservation
- Pavement Management: Putting the Data to Work
- Advancing the Technologies
- Societal Benefits & Implications
- Research at NCAT, MnROAD, and the FHWA LTPP program
- Decision Making

The Friday morning plenary sessions included Pavement Preservation Partnership meeting summaries, and an engaging panel discussing pavement preservation for local agencies. The session closed with some of the key take-aways for the conference. These take-aways and all presentations can be found at the following website: http://nationalpavement2016.org/presentations/

Overall, it was a great Conference. Thanks to the organizers and sponsors for putting on the Conference and to the presenters and discussers for stimulating talks and questions. Let's hope we all learned something which can be applied to the work in our organizations.

ASPHALT PAVEMENT NEWS

CalAPA Conference Highlights

By Roger Smith, CP^2 Center

The California Asphalt Pavement Association (CalAPA) continues to advance the concepts of joint (industry-agency) communication and education related to asphalt pavement. Over 200 people turned out for their Fall Conference and Equipment Expo at the Doubletree Hotel in Sacramento on October 26 & 27.

Figure 1. Vendor Booth Activity

In a room ringed by exhibitor booths and displays, attendees were treated to an educational program and an opportunity to rub shoulders with other representatives of various local agencies, Caltrans and the pavement industry.

After welcome remarks by Russell Snyder, CalAPA Executive Director, and Board Member Mike Herlax (Syar Industries), the group received updates on the all-important topic of transportation funding by Will Kempton (Transportation California). Most hopes at this late stage are that a special session of the California Legislature could still convene to hammer out legislation for a funding package. Several county-level ballot measures recently approved will create sales tax revenue dedicated to transportation projects.

The Conference program went on to provide a full agenda of 'hot topics' relating to asphalt pavement. Here are a few highlights:

HMA for Low Volume Roads
(Paul Curren, P.E., Consultant) A new 'Superpave Lite' HMA specification for low-volume roads is being developed primarily for use by local agencies. This effort was covered in our September 2016 newsletter. A draft will be available via the CalAPA website.

Pavement Research & Applications
(Dr. John Harvey, UCPRC) Dr. Harvey addressed topics such as PG' grading for asphalt rubber binders, the Caltrans "PG+5%" proposal by Caltrans, RAP effects on HMA mixes, pavement texture for bicycle riders, and the new Environmental Product Declarations (EPD) for asphalt products.

Technician Training & Certification Update
(Al Ochoa, Caltrans, and Shadi Saadeh, CSU, Long Beach) The Caltrans-Industry Joint Training & Certification Program (JTCP) for field samplers and testers, is moving forward. Phase I: Curriculum Development is almost complete and Phase 2: Implementation & Delivery will begin in 2017. Roughly 3,000 technicians statewide will be involved in this huge program.

RAP and RAS Effects On HMA
(Dr. Adam Hand, University of Nevada, Reno)
As increased amounts of reclaimed materials like RAP & RAS are used in HMA mixes, we must be sure there is not excessive hardening of the resulting binder blend. Caltrans now requires the use of binder blending charts for RAP contents greater that 15%, and limits have been placed on the amount of asphalt binder that is replaced by introducing reclaimed materials.

Rubberized HMA Mix Design
(Jack Van Kirk, George Reed, Inc) As Caltrans and other agencies strive to use more asphalt rubber, it must be remembered that mix design work for rubberized HMA mixes is not 'business as usual.' Aggregate gradations are different, binder contents are higher (7.5% min.) and laboratory criteria for using the gyratory compactor are different. Mix testing via the Hamburg Wheel Tracker is also more stringent.

Figure 2. Steve Healow (FHWA) Poses a Question

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HMA Compaction

(Mike Robinson, Consultant) Research has shown that a 1% change in pavement air voids can lead to a 10% change in service life. So getting proper density is all important. Lift thickness should be 3 times the maximum aggregate size, so smaller aggregate mixes may often be better. Adhering to the old proven rules like slowing the paver and roller down and 'rolling hot' still work. For better accuracy, density gages should be correlated to cores.

Pavement Smoothness

(Don Mathews, PRS) A pavement smoothness 'working group' is developing a practical specification for acceptance of new paving. The draft specification considers the number of "opportunities" a contractor has to make smoothness. Pre-planning / milling is sometimes not effective for pre-smoothing if it simply follows the old profile or causes delamination. Most overlays can produce about a 30% increase in smoothness via IRI. The PROVAL software for managing profiler data and calculating IRI values is also being evaluated.

A panel discussion on Partnering was also part of the program.

"The goal of this conference is to provide the latest information on asphalt pavement standards, technology, best-practices and trends for the industry and our agency partners, and provide a forum for effective relationship-building," said Mike Herlax of Syar Industries, a member of the CalAPA Executive Committee.

Plans are already being made for the Spring 2017 Asphalt Pavement Conference, to be held April 12-13, in Ontario, California. So 'mark your calendar'!

All presentations are available on the CalAPA website: *www.calapa.net*

Blending Charts for Using RAP in HMA with More than 15% RAP

By Byron J. Berger, P.E., and Ward Jenkins, Caltrans District 2

For several years, Caltrans limited the use of reclaimed asphalt pavement (RAP) in dense-graded hot mix asphalt (HMA) mixes to 15 percent by weight of aggregate. In 2013, Caltrans began allowing contractors to use mixes with up to 25 percent RAP.

However, earlier this year FHWA warned state transportation agencies that it had noticed some early cracking in HMA pavements with more than 15 percent RAP. They encouraged these state agencies to re-evaluate their mix design procedures for incorporating RAP into HMA.

As a result of these concerns, Caltrans Revised Standard Specifications, Section 39-2.02A, were changed to include a requirement that the contractor use 'blending charts' for HMA with more than 15% RAP. Blending charts involve recovering and testing the binder from the RAP to determine what grade of virgin asphalt binder should be used to result in the proper PG grade.

The primary concern in mix designs with RAP is to what degree the aged binder in the RAP fraction mixes with the virgin asphalt binder to provide a homogeneous binder for coating all the aggregate. According to the Asphalt Institute, some mixing of the two binders occurs, but likely not total blending to achieve a homogeneous binder. A second concern is the properties of the binder in the RAP. With time, the binder in the RAP oxidized, and became much stiffer and more brittle, so it will have a hardening effect on the virgin binder.

In mixes with lower percentages of RAP, the effects of hardening and non-homogeneity can usually be ignored. But as RAP percentages increase, these concerns must be taken into account. Historically, this has been done in two ways. First, blending charts were used. Blending charts refer to the testing of the RAP binder and graphical representation of the testing. Basically, the properties of the RAP binder and its interaction with the virgin binder are studied. The end result is a need to use a softer virgin binder than initially specified to account for the blending of the oxidized RAP binder. Over time, and with blending charts performed on thousands of mixes, it was determined that for RAP mixes over 15 percent (up to 20 or 25 percent), the use of a virgin binder one grade softer would be appropriate. For example, if the original selected binder was PG 64-22, a PG 58-28 would be used.

With blending charts, however, the actual grade of the final binder blend is determined. For those interested in the detailed procedure outlining the testing and calculations used to produce the blending charts, see the Asphalt Institute's MS-2 Asphalt Mix Design Methods, Seventh Edition, Section 11.4.

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AGING	PROPERTY	TEMP RANGE	Virgin Binder(°C)	RAP Binder(°C)
Original	DSR G*/sin(delta), ≥1.00 kPa	High	67	N/A
RTFO	DSR G*/sin(delta), ≥2.20 kPa	High	68	103
PAV	DSR G*sin(delta), ≤ 5,000 kPa	Intermediate	28	44
	BBR Stiffness, "S" ≤ 300MPa	Low	-18	5
	BBR m-value, m ≥ 0.300	Low	-23	7
For Low Temp, enter True Grade values which are 10C lower than the test temperature. The plotted low test temp will be 10C higher than the True Grade.		Lowest "High"	67	103
		Highest "Low"	-18	7
	PG	Actual (True Grade)	PG 67-18	PG 103+7
		Equivalent M320 grade	PG 64-16	

Figure 1. Summary of True Grade Data for Use In Blending Charts

Figure 1 provides an example of the test data that is used to produce the blending charts. After testing, the true grade of the virgin binder is PG 67-18. This meets the requirements of a commercially available PG 64-16 binder. The RAP binder true grade is much harder, a PG 103+7.

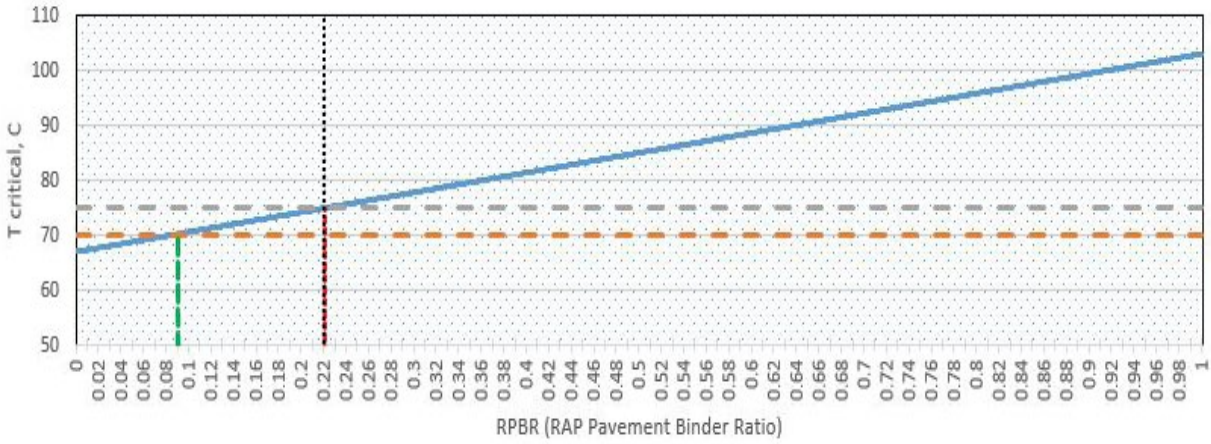

Figure 2. High Temperature Blending Chart

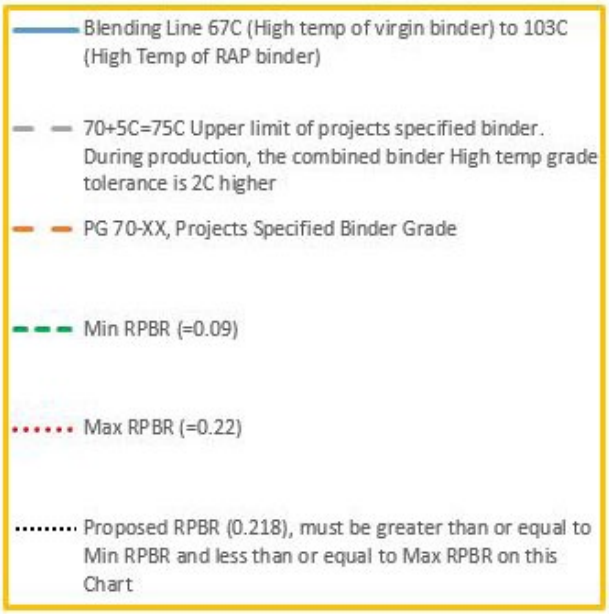

Figure 3. Blending Chart Legend

The blending charts provide graphical representations for the four critical test values—one high temperature test, one intermediate temperature test and two low temperature tests—when the virgin and RAP binders are combined at different proportions.

Figures 2 and 3 provide an example of a high temperature blending chart for our virgin and RAP binders at different proportions. In the example shown, for a desired final binder grade of PG 70-10, our virgin and RAP binders combine to produce acceptable high temperature results when the RAP binder replacement is between 9 and 22 percent. (Note: The chart used in this example uses the term 'RAP pavement binder ratio' in place of 'percent binder replacement'.) An allowable range of RAP binder replacement values can be found for each of the four critical tests / temperatures. Ultimately, all four blending charts need to indicate an acceptable RAP binder replacement ratio for the proposed target PG grade.

The Revised Standard Specifications, Section 39-2.02A, outlines additional responsibilities for the contractor when the decision is made to produce HMA with more than 15% RAP and blending charts are required. The blending charts and associated calculations must be 'sealed and signed' by a licensed civil engineer, or by an AASHTO-accredited laboratory manager. Contractors should be aware that most private materials labs are unable to perform the additional binder testing on the RAP, so there will be additional time required to hire a specialized binder testing lab to run the testing. This will need to be incorporated into the total time needed to perform mix design testing.

The blending chart spreadsheet used in the Figures is available at: http://www.dot.ca.gov/hq/construc/hma/

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Chip Seal Use by Counties

By R. Gary Hicks, CP2 Center

Introduction

What can be done to preserve the thousands of miles of aging asphalt pavements in California? One popular strategy - chip seals - have been used for many years, and now have improved performance with polymer modified emulsions and hot applied asphalt rubber binders.

It is believed by both state & local agencies and industry that the use of chip seals on asphalt pavements produces significant economic benefits by increasing the life of the pavement. But there have been no 'performance models' developed for how long the various chip seals will last. These models are needed to predict how much the pavement life will be extended when various types of chip seals are applied for routine maintenance in the different climate regions throughout California.

Figure 1. Hot Applied Asphalt Rubber Chip Seal Operation

CalRecycle's Interest

California's Department of Resources Recycling and Recovery (CalRecycle) is also interested in chip seal performance, especially the benefits that might be derived from hot rubber-modified binders incorporating ground tire rubber. Therefore, CalRecycle has contracted with the CP2 Center to develop the needed performance models to substantiate and compare the benefits of the various types of chip seals. These models will include parameters for climate, traffic, and binder types, such as polymer modified emulsion and rubber-modified hot binders - both field-blended asphalt rubber and terminal blends. The survey and literature review have been completed, and the Center is presently collecting project-specific data from county agencies for the model development.

Survey of Counties

To gather performance data for chip seals, all of the 58 California counties were sent a survey, and a total of 44 responded, for a return rate of over 75%. Below are the results from some of the survey questions.

Figure 2 shows the condition of the pavement at which most counties choose to apply a chip seal. Of the counties who responded, the most common road condition at which to apply a chip seal is "Fair". Seven counties also chose "Other", and two counties normally apply chip seals when the road condition is "Good". Many counties decide to do a chip seal depending on the type of road or the condition of the road surface, considering distress types.

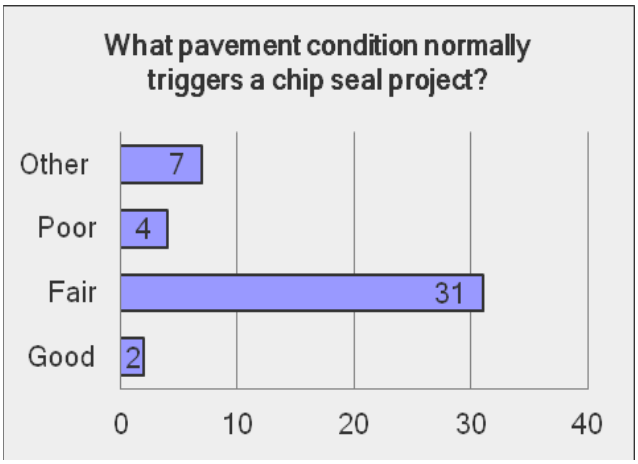

Figure 2. Pavement Condition That Triggers a Chip Seal

Figure 3 shows the number of agencies that use each of the most common types of chip seal. The most popular type of chip seal with counties is a polymer modified binder (emulsion). The second most common binder was the 'traditional' (unmodified) emulsion . Terminal blends and asphalt rubber were used much less often than the 'traditional' and the polymer modified emulsion for chip seals.

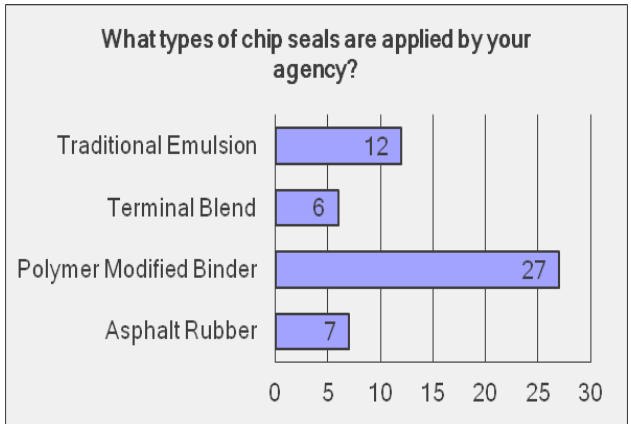

Figure 3. Types of Chip Seals Commonly Used

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Figure 4 shows how many agencies use the different pavement management systems (PMS) to track the performance of the chip seals. The most popular PMS, by far, is StreetSaver, from the Metropolitan Transportation Commission in Oakland, CA.

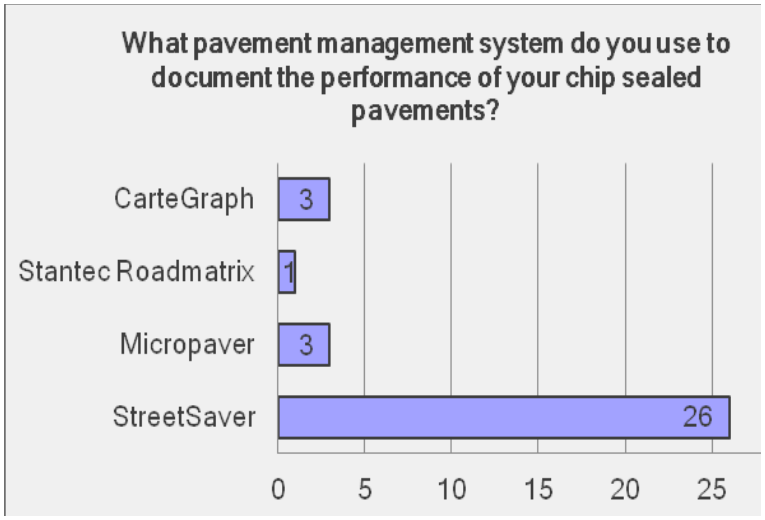

Figure 4. PMS Used for Documentation of Chip Seal Performance

Figure 5 shows the standards commonly used by counties to test chip seal's aggregates. The most common specification/standard for aggregate is Caltrans, while others use the Greenbook. One county said they use Caltrans specs, but with tighter testing constraints, and two other counties said that they developed their own specs.

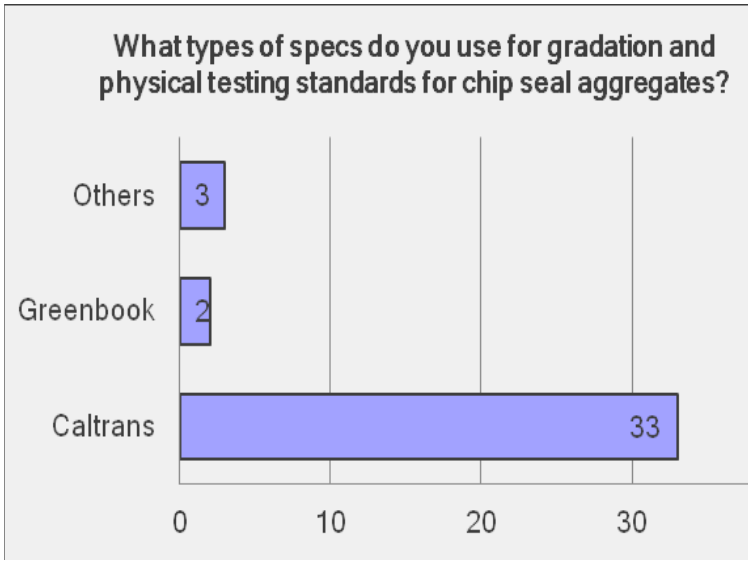

Figure 5. Specifications Used for Aggregates

Figure 6 shows what reference specifications are used by different counties for their asphalt binder types. The counties who answered 'Other' specified further - two said they used the 'industry standard' and two said they used a modified Caltrans version.

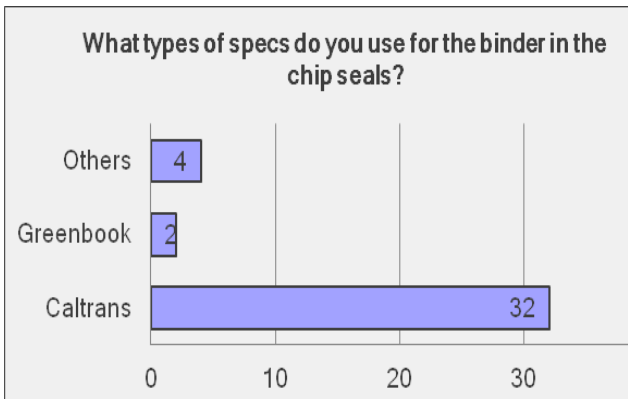

Figure 6. Specifications Used for Asphalt Binder

One other question asked of the counties addressed what the life expectancy for their chip seals was. The answer ranged anywhere from 3 to 20 years, with the majority of responses falling between 6 and 10 years. On average, each county's chip seals are expected to last around 9 years. Some made the comment that it depends on the amount of traffic on the road.
Also worth noting is that the year by which most County agencies were regularly using chip seals was 1983.

Summary

The survey showed that most of California's counties use chip seals, with the most common binder being either conventional asphalt emulsion or polymer modified asphalt emulsion. The life expectancy of the emulsion chip seals is generally 6-10 years. Life expectancy is likely longer for the polymer modified emulsions, and for rubber modified hot binders – both asphalt rubber and terminal blends.
This survey information will be useful in developing the performance models for the various types of chip seals. The CP2 Center is continuing work on this project for CalRecycle, and will report progress in future Newsletters.

For more information contact: Gary Hicks at: *rghicks40@outlook.com*

Pacific Coast Conference on Asphalt Specifications - Update

By Roger Smith, CP^2 Center

The Pacific Coast Conference on Asphalt Specifications (PCCAS) is a long-standing forum where Pacific region State DOT's - a total of six - and FHWA meet with asphalt suppliers and researchers in the interest of using appropriate and standardized specifications for asphalt. The CP2 Center is a new Associate Member of this group and will participate in their asphalt research efforts, since we are one of very few laboratories in California with the capability to test and grade asphalt binders.

The committees of PCCAS met at the University of Nevada, Reno (UNR) in October, 2016. Here's an update of the various committees' activities. Chairpersons are shown behind the committee name.

Paving Asphalt Committee:
Brad Neitzke (FHWA) and Shauna TecleMariam (U.S. Oil)
The Paving Asphalt Committee is involved with two primary issues:

1. MSCR Test Development – The MSCR test is a proposed new test and specification for an asphalt binder's high-temp properties using the DSR test machine.

2. Asphalt Rubber PG Grading tests – Work is continuing on developing PG grading methods for rubberized binders involving using the DSR for testing asphalt rubber (AR) binders with the coarser crumb rubber (e.g. California type). Two test methods using the DSR are being evaluated, as described below:

   a) a new DSR test method using the plate-to-plate DSR with a 3mm gap. The CP2 Center participated in 16-lab round-robin to help evaluate this new test's precision. A report on that study will be available by spring 2017.

   b) another new DSR test involving concentric cylinders (aka. cup-and-bob) with 7mm gap is being studied by the California Pavement Research Center (PRC) at U.C. Davis. An update report was given by Zia Alavi, of the PRC.

A Caltrans proposal to use 5% ground tire rubber in all asphalt mixes was also discussed. A committee working on this has come up with four methods that might be used to accomplish this, but there are still many unanswered questions. Work is continuing on the feasibility of this "PG + 5%" proposal.

Emulsion Committee:
Joe Devol (Washington DOT) and Sally Houston (VSSI)
The Emulsion Committee is focusing on developing a better method for recovering an emulsion's asphalt residue for testing purposes. The primary concern is that overheating the emulsion in order to evaporate the water may be altering the properties of the residue, especially polymer (latex) additives typically used in chip seal emulsions. A gentler recovery method, involving realistic field temperatures, is being sought.

Ultimately, this group also hopes to use the PG grading system to characterize the asphalt residue from emulsions. A national expert task force is also working on these goals.

The need for a correlation testing program for emulsions is also being discussed. The Oregon DOT currently runs such a program involving all labs that test emulsions for their projects. Participating in the Oregon program will be given further consideration by PCCAS.

Recycling Committee:
Charlie Pan (Nevada DOT) and Steve Escobar (APART Lab)
The state DOTs gave updates on their recycling policies with the general finding that most states now allow both reclaimed asphalt pavement (RAP) and recycled asphalt shingles (RAS) in their HMA. Most states (including California) allow a maximum amount (%) of "asphalt binder replacement" (ABR) due to the combined contribution on RAP & RAS. The amount of RAP allowed for surface lifts ranges from 15% to 25%. For lower lifts, the allowable RAP amount is as high as 40%.

Nationally, FHWA is investigating concerns over early cracking in projects containing high RAS and RAP (combined) content. This concern has caused some states to put a limit on the ABR. Most states also require that the final binder blend meet the PG specification for the project. In-place recycling was also discussed. A report on cold in-place recycling (CIR) performance is now available on the PCCAS website shown below. No DOTs reported doing any hot in-place recycling (HIR).

These committees will meet again in April at UNR in Reno. For more information on PCCAS go to *www.pccas.org .*

7th Rubber Modified Asphalt (RMA) Conference

By R. Gary Hicks, CP^2 Center and Tom Pyle, Caltrans

Over 130 participants attended the 7th Rubber Modified Asphalt (RMA) Conference held on November 2-3, 2016, in Ann Arbor, Michigan. The Conference was designed to increase the use of RMA throughout the U.S. based on the benefits demonstrated to date and the continued improvement and evolution of new technologies. As suggested in the introduction to the Conference, RMA use would grow more if the various states trusted the R&D done in one state, which is applicable to similar states.

The Conference was hosted by the Scrap Tire Research and Education Foundation, Inc. (STREF), the Rubber Manufacturers Association (RMA), Rubber Pavements Association (RPA) and the Rubber Division of the American Chemical Society. Joining as cohosts were the Asphalt Institute, National Asphalt Pavement Association (NAPA), Rubber Asphalt Foundation (RAF), National Center for Asphalt Technology (NCAT), Michigan Department of Natural Resources and Environment and the Federal Highway Administration (FHWA).

Technical sessions included the following topics:

- RMA history and overcoming perceptions
- Arizona and California experiences
- How states like Florida, Tennessee, and Louisiana implemented RMA
- How terminals blend rubber into asphalt binders
- Other agency case studies - Michigan DOT, Illinois Tollway, Nevada DOT, and Pennsylvania DOT
- What contractors need to consider when using RMA
- Environmental effects to consider when using RMA
- Cost Considerations for RMA
- Testing barriers to RMA
- Innovations and new developments
- FHWA's RMA guidebook update

Speakers from California included Tom Pyle, Caltrans' State Pavement Engineer, who overviewed the experiences of Caltrans, Gary Hicks, CP2C, and Theron Roschen, Interwest Consulting, who discussed cost effectiveness, and Sally Houston (VSSI), who provided an

Figure 1. Tom Pyle (Caltrans) visiting with Gary Mack (4 Seasons Pourable Pothole Filler)

update on the development of 'PG' grading and specifications for asphalt rubber binder, and the results of the 'round robin' testing studies by the Pacific Coast Conference on Asphalt Specifications (PCCAS).

Figure 2. John D'Angelo (Consultant) and Sally Houston (VSSI) discussing PG grading of asphalt rubber binders

Although Arizona and Caltrans discussed the use of field-blended asphalt rubber and terminal blends, the majority of the other states discussed their variation of terminal blends and 'dry' processes, which are usually easier to implement.

The final presentation was delivered by Dr. Carolina Rodenzo of the National Center For Asphalt technology (NCAT) on updating the FHWA guidebook on rubberized asphalt. The guide is under review, and the next version should be completed in December of 2016.

For more information contact the Rubber Manufacturers Association at: www.rma.org or jsheerin@rma.org

PCC PAVEMENT NEWS

Chain Wear Mitigation On PCC Pavement

By Doran Glauz, Caltrans

Chain wear has become an acute issue in some areas of Interstate 80 in the Sierra Nevada Mountains. Chain wear causes ruts to form in portland cement concrete (PCC) pavement (Figure 1). As ruts form deeper, they have an impact on vehicle steering response, and they also allow water to pool in the wheel paths.

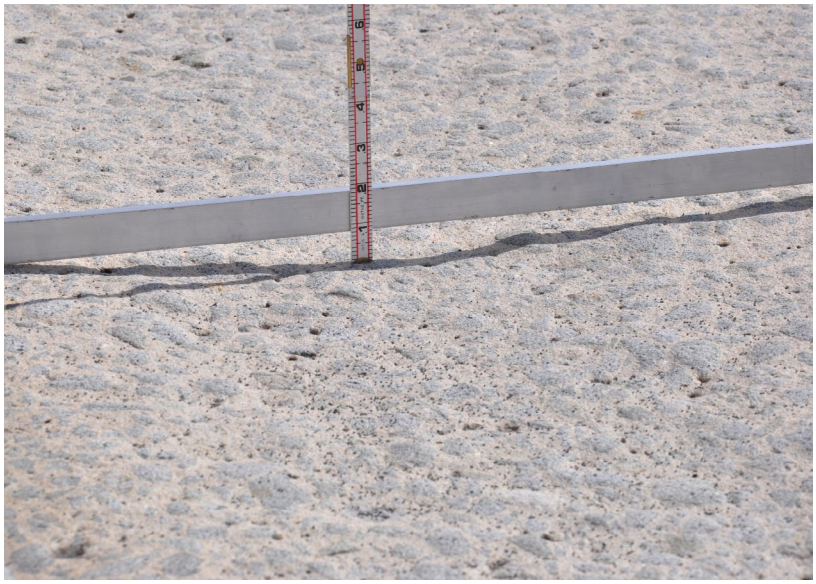

Figure 1. Rut in Concrete Pavement 0.08 ft (1 inch) Deep

Polyester concrete has been used for over 30 years as a bridge deck overlay. It is made using liquid polyester resin and mineral aggregates; there is not any portland cement in polyester concrete. The liquid resin is catalyzed and forms a solid polymer matrix with hard mineral aggregate filler. It has been observed over the years that polyester concrete is fairly resistant to abrasion. There is a California Test for abrasion loss (California Test 550) that simulates the action of chain wear on a concrete surface in a condition with free water. In this test conventional PCC pavement will have an abrasion loss of about 17 grams, while typical polyester concrete will usually have an abrasion loss of about zero grams.

Polyester concrete has been used as a very successful patching material for concrete pavements and overlay material for bridge decks. It has a very tenacious bond to a concrete substrate, over 500 psi when measured by a flexure bond test (California Test 551). The physical properties that contribute to polyester concrete being a successful patching material are probably the low modulus of elasticity coupled with the high tensile and compressive strength of the composite. These properties probably also contribute to the high abrasion resistance.

Because of polyester concrete's success as a bridge deck overlay and patching material, coupled with the observed abrasion resistance, engineers at Caltrans thought that it would be a good material to use as a rut-filler on interstate 80 near Truckee, CA. As a rut-filler, the important performance parameters are excellent bond and resistance to tire chain abrasion. Polyester concrete excels in both these properties.

In the fall of 2015, nine hundred feet of rutted PCC pavement in the truck lane of I-80 near Truckee was treated by filling the wheel ruts with polyester concrete. Two procedures were used: 1) shot blast the ruts and simply fill the depressions with polyester concrete, and 2) diamond-grind each rut to a minimum depth of 0.05 ft and about 3 ft wide and fill with polyester concrete. In each case, after filling, the entire lane width was profile ground for a smooth transverse and longitudinal profile.

The project was constructed under an "emergency contract" as time was of the essence. The polyester concrete materials used were materials that the contractor had left over from other work in another state. The resin did not meet the normal specification for polyester concrete resin as it did not pass the bond test requirement. So it possibly would not bind as well as it should to mineral aggregate.

Rut filling procedures include the following steps:

1. Diamond Grind wheel ruts*
2. Shot blast wheel ruts
3. Caulk joints
4. Apply prime coat
5. Place polyester concrete
6. Initial cut at joints
7. Profile grind
8. Seal joints

*This step omitted for a portion of project.

The two procedures used are quite similar, one starts with diamond grinding and the other omits that step. There is the possibility that the initial diamond grind may merely be an expensive cosmetic step. If it has no impact on the longevity of the inlay, it could be left out of future rut filling projects.

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In both cases the wheel rut is cleaned by blasting with steel shot, since it's important to have a clean surface for the polymer materials to stick to. Shot blasting is a very effective method for cleaning a concrete surface of contaminants and grinding residue.

The portion of freeway being treated had sealed transverse joints. The ruts were so deep that often the rut extended below the bottom of the joint sealant material. In these cases the open portion of the joint was caulked to assure that the polymer resins would not leak into the joint, which could have a negative impact on the ability of the joint to move properly.

High molecular weight methacrylate is used as a prime coat because it is alkali resistant, and having a high flash point temperature, it is low in fumes and safer than methyl methacrylate. The methacrylate is mixed in a 5 gallon pail, poured on the surface and spread with brooms ahead of the polyester concrete placement.

Polyester concrete is then placed on the methacrylate prime coat (Figure 2). In this project it was mixed in mortar mixers about 3 cubic feet at a time; it could also be mixed in a continuous volumetric mixer. Wheel barrows carried the mixed polyester concrete to the placement location and a roller screed easily consolidated and finished the concrete surface. (On the first day of work on this project the contractor used a small single-person vibrating screed that was slow and did not provide a smooth finish.)

Figure 2. Placing Polyester Concrete in Diamond Ground Wheel Rut.

Initial cutting of the transverse joints across the polyester concrete must be done on the day it is placed. This relieves the possibility of shear stress at the bond line developing due to the joint opening or closing in its normal daily cycle. This type of shear stress can lead to debonding near the joint.

The final profile grind makes for a smooth ride if there are any surface imperfections and it reduces the possibility of water concentration or ponding at the edge of the inlay. Due to the curved surface of the worn pavement even the most perfectly placed inlay will have a bit of a lip at the edge of the polyester concrete.

Sealing the transverse joints is the last step. Sealing involves re-sawing the joint to the proper width (the initial cut may be quite narrow) and placing the sealant materials. Care must be taken to ensure the new joint cut is directly over the underlying PCC joint. Misalignment can lead to delamination when the concrete slabs on the two sides of the joint move vertically relative to each other.

Figure 3. The Completed Polyester Wheel Rut Treatment.

Evaluation

The primary method of evaluation is measurement of wear in the wheel tracks. The first winter of exposure of the polyester inlay was an historically average winter, a welcome change in California's continuing drought.

Several 'wear indicators' were installed in the polyester concrete inlays, and in the original PCC pavement at either end of the treatment area. A wear indicator consists of drilling five small holes (1/2 inch diameter) a couple of inches deep into the pavement surface. The depth of the holes is measured periodically and the change in depth is the surface wear (Figure 4). The wear indicators were installed prior to the first snow event and the initial measurements were taken. These measurements are the baseline, or starting reference points. The indicators will be measured each year for a few years or until a clear indication of success or failure is achieved.

Continued, next page

Figure 4. Measuring the wear (rut depth) after one year exposure to traffic.

Success can be achieved, in this case, at various levels. The lowest level of success will be that the polyester concrete wears at the same rate as the original concrete surface. In that case we know that the surface can be restored and the underlying concrete structure can be preserved for an extended period of time by replacing the wheel paths periodically.

The highest level of success would be that the polyester wears very slightly, indicating that the surface will last several times longer than the original PCC.

Evaluations after one year of traffic exposure showed that the polyester concrete wore about ¼-inch in the outside wheel path. The PCC pavement before and after the polyester treatment wore less – only about 1/8-inch.

Conclusion

As a mitigation for chain wear-induced rutting in concrete, the polyester concrete did not perform as well as anticipated, but the material used was substandard, as mentioned earlier. The strategy is promising, and there is a better resin under development, so a future project will be undertaken to determine if the strategy can perform as initially expected. Caltrans is also experimenting on I-80 with the application of sprayed-on surface hardeners to improve PCC's resistance to chain wear.

For more information contact Doran Glauz at: *doran.glauz@dot.ca.gov*

GENERAL NEWS

Pavement Smoothness Forum

By Roger Smith, CP2 Center

The 2016 Road Profile Users' Group (RPUG) Conference was held in San Diego, November 1-4, 2016. This international gathering 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.

Pavement Survey Vehicle From Pathway Services Inc.

Caltrans was represented by Sri Balasubramanian, Chief, Office of Asphalt Pavements, and Dulce Feldman, with the Office of Pavement Management. Ms. Feldman is the current Vice-Chair of the RPUG Steering Committee.

Sri Balasubramanian of Caltrans (right) Discusses Pavement Smoothness With Dennis Scott (left) and Nick Schaefer of SSI.

The purpose of the RPUG is to serve as a forum for the exchange of information between people who have an interest in road profiles and smoothness, pavement surface textures, condition, friction, and tire-pavement noise. The Conference topics were heavy on equipment, measurement technology & research relating to smoothness (IRI) measurements using high-speed profiler vehicles, and also included a panel discussion of implementation of IRI specifications by State DOT's and other agencies.

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Here are some highlights and 'take-aways' from the Conference:

- A 22-state pooled fund study has worked towards standardizing profiling measurements. While this pooled fund study will come to an end in December, another pooled fund study lead by the South Dakota DOT has been initiated, which will continue the work.
- **Caltrans** has used IRI on a project level for about 5 years. It has been a difficult transition from using Profile Index. A smoothness subtask group and working Groups, with industry, were formed to implement the IRI specification.
- Most states now have their own **certification** site for inertial profilers and operators. Nevada DOT uses the Caltrans site in Sacramento and is looking into developing its own site. Certification is for accuracy and repeatability of machines and operators.
- Profiling on roads with **stop & go (urban) traffic** is a challenge. Braking effects cause error in data collected. While the inertial profilers have the capabilities to operate within a wide speed range, operating it at a constant speed is the key to gathering good data. Operator awareness is critical in getting accurate measurements. Research is continuing on this issue.
- Inertial profilers can be mounted on paving equipment for portland cement concrete (**PCC**) for real time 'behind-the-paver' measurements. These 'wet' profiles must be correlated with the final hardened PCC profiles, which are usually smoother.
- **PCC** profiles are affected by 'warp and curl' of slabs due to temperature effects which are greatest at night and early morning.
- In some countries **smart phone** applications have been used to get fast and easy data on pavement profile smoothness, but they are good only for approximate and relative profile (IRI) measurements. One application, "RoadLab" was used after an earthquake in Japan, to do a quick survey and was able to cover 3400 km/week. Another application is "RoadRoid' from Sweden.
- A friction (skid) tester using a **non-locking** wheel is being developed to better simulate the effect of anti-lock braking systems on today's vehicles. These devices typically measure a lower skid number than conventional locked wheel testers.
- The current version of **"ProVAL" software** for managing profiler data and computing IRI has other capabilities including "grind simulation models", a profiler certification module and a PCC joint faulting analysis. Help is available at: *www.roadprofile.com*
- Some states have more lenient smoothness spec for PCC than for HMA pavements. This is seen as a double standard by some. However, in many of these states the percentage of PCC pavements is considerably less than HMA pavements.
- Some states have adopted an '**incentive/ disincentive'** specification with a pay bonus for exceptional smoothness. In one state the average bonus is about $1000/lane-mile.
- A new machine is available from ARRB for measuring **deflections** at highway speeds. It's called Traffic Speed Deflectometer (TSD).

The 2017 RPUG Conference will be held in Denver.

For more information go to the RPUG website at: *www.rpug.org*

Upcoming Pavement Classes

Pavement is your agency's most important asset. Learn best practices and latest techniques in these new and updated classes on pavement materials, design, construction, and maintenance from the Technology Transfer Program, a unit of the Institute of Transportation Studies (ITS) at the University of California, Berkeley:

Fundamentals of Inspection Practice (PD-01)
January 24-25, 2017 - San Diego. Instructors: Joseph Goldhammer & Larry Horsman.

Asphalt Pavement Materials, Design, Construction and Maintenance (IDM-03)
February 7-9, 2016 - Monrovia. Instructors: James Signore, Irwin Guada & Frank Farshidi.

Superpave Mix Design for Local Agencies (IDM-27)
February 21-23, 2016 - Online, 3 sessions. Instructor: Frank Farshidi

Pavement Management Systems and Preservation Strategies (IDM-28)
March 15-16, 2017 - Sacramento. Instructors: James Signore & Margot Yapp

To learn more about these classes go to : *https://registration.techtransfer.berkeley.edu/wconnect/ShowSchedule.awp?Mode=GROUP&Group=PAVE&Title=Pavement%20Design%20and%20Maintenance*

Metropolitan Transportation Commission(MTC) Provides Technical Support

By Christina Hohorst, MTC

As pavement repair costs go up and many budgets for transportation go down, there are some things that a city or county public works department can do in order to make sure their road dollars go as far as possible. Implementation and maintenance of a pavement management system (PMS) is key to strategically applying available funds for streets and roads maintenance and rehabilitation. A good PMS should eventually improve overall pavement condition. But in some cases, jurisdictions don't have the budget or staff expertise to implement or maintain such a PMS.

METROPOLITAN TRANSPORTATION COMMISSION

In the San Francisco Bay Area, the Pavement Management Technical Assistance Program, referred to as 'P-TAP', is entering its 18th year of providing technical assistance to local jurisdictions with their PMS needs. The goal of the program is to assist jurisdictions with implementing and maintaining a PMS so that they may be able to at least keep the condition of their road network from declining further. The Metropolitan Transportation Commission (MTC), which manages the program on behalf of the region, has programmed over $16.5 million in Federal Surface Transportation Program (STP) funds during the last seventeen rounds of P-TAP. In total, MTC has funded about 700 projects and assisted all Bay Area jurisdictions with their pavement needs.

Project funding ranges from $15,000 to $100,000, and local jurisdictions must provide a 20% local match, which includes the required federal STP local match of 11.47% that is applied to the P-TAP projects plus 8.53% that is used towards paying for a two-year StreetSaver® subscription for the jurisdiction.

The P-TAP program provides consultant assistance and expertise to local jurisdictions for assistance with three project types: (1) implementing and maintaining Pavement Management Systems, (2) non-pavement asset management, and (3) designing pavement rehabilitation projects. The program is open to all Bay Area cities and counties.

P-TAP consultants primarily work with jurisdictions to help them determine the most cost-effective pavement preservation strategies utilizing the StreetSaver® software. These consultants help Bay Area city and county staffs understand key program inputs like decision tree setup, treatment unit costs, pavement condition index (PCI) break-points, and the use of GIS maps to help show funding impacts.

As part of the Pavement Management Program's certification process in the Bay Area, cities and counties must conduct two-year reviews and updates of all pavement inventory information, do inspection of pavement sections (every two years for arterial and collector routes, every five years for residential streets), and they must produce budget-need calculations. During each P-TAP cycle, approximately 1/3 of Bay Area jurisdictions are assisted with the process through the P-TAP program. Certification is required for Bay Area jurisdictions to be eligible for Federal funds distributed by MTC.

Bay Area jurisdictions may also apply for assistance with condition assessments of 'non-pavement' street assets (e.g., signs, curb and gutter, sidewalks, etc.). A variety of street assets may be examined using condition evaluations and cost data to better understand the distress rates of various assets and the costs to maintain and/or replace them.

The P-TAP Program also provides assistance in the project design phase, with the production of plans, specifications, and estimates (PS&E) for Federally-funded arterials and collectors. Qualifying cities and counties can end up with a complete design, ready for construction. Design project applicants must also demonstrate that there is funding committed for the construction phase in order to qualify for P-TAP assistance with a PS&E.

In summary, the P-TAP program allows jurisdictions that don't have the resources to commit to maintaining a PMS to be better-equipped to handle the challenges of maintaining streets and roads in a funding climate that has been challenging.

For more information contact Christina Hohorst at: chohorst@mtc.ca.gov

FHWA 'Every Day Counts' Summit

By R. Gary Hicks (CP2 Center) and James Moulthrop (FP2)

The Federal Highway Administration (FHWA) hosted the 5th of 7 Every Day Counts 4 (EDC-4) Summit on December 1-2, 2016, in Sacramento. These FHWA events promote their 'EDC- 4' products for improving project delivery, safety, and efficiency. The remaining two summits in 2016 will be held in Austin , TX, and Orlando, FL. This program is designed to incorporate innovation so states can do a better job of "delivering the goods" with the limited resources they have. States represented at this Summit included Arizona, California, Colorado, Hawaii, Nevada, New Mexico, and Utah. Representatives from local agencies, industry and other federal agencies also participated. Over 150 people attended this 1 ½ day event.

The program was kicked off by Tom Harmon, Director of FHWA's Center for Accelerating Innovation, followed by greetings from the FHWA Administrator, Gregory Nadeau, who is a strong champion of this program and stressed the need to use innovation to reduce the backlog of highway needs. One of the success stories for EDC includes the growing use of warm mix asphalt in the USA.

King Gee, Director of Engineering and Technical Services for AASHTO, also discussed the need for continuous improvements in all aspects of transportation, not just the need for improvements in maintenance of roads and bridges. EDC-4 includes the following 'innovations' that are covered at these summits:

- Automated Traffic Signal Performance Measures
- Data-Driven Safety Analysis
- Pavement Preservation - When and Where
- Pavement Preservation - How
- Construction and Partnering: A Vision For The Future
- Using Data To Improve Traffic Incident Management
- Safer Transportation For Every Pedestrian
- Community Connections

A panel of leaders then discussed the 'culture' needed for promoting and implementing innovation within their agencies. Karla Sutcliff (Chief Engineer of Caltrans) represented California. Items covered by the panel included the need for an agency champion for each innovation, for involving all partners related to the innovation, and for making certain the innovations are successful. Some of the barriers to innovation identified include fear of failures, establishing trust among the partners, and overcoming existing rules and regulations.

The rest of this story focuses on the two Pavement Preservation items - 'When and Where', and 'How'. The 'When and Where' session was led by Jason Dietz (FHWA), Kathryn Zimmerman (APTech), and Tammy Haas (New Mexico DOT). Dietz provided the background of the program, while Zimmerman set the stage for identifying when and where preservation treatments should be placed. She also stressed that pavement preservation needs to be integrated into agencies' pavement management systems. Examples of success stories from the Ohio and Washington DOT's were discussed, which demonstrated the benefits of using preservation treatments to change the network condition and the cost savings realized. The session ended with a facilitated discussion lead by Zimmerman to address the following topics and more:

- getting agencies to shift from a 'worst first' approach
- making sure the right projects are selected for preservation (Placing preservation treatments on the wrong projects can lead to early failures.)
- assuring qualified contractors are available and that they follow good construction practices
- quantifying the benefits of pavement preservation using pavement management systems
- developing simple tools or 'applications' to help agencies make better decisions.

For more information on the 'When and Where' program, please contact Thomas Van of FHWA at *thomas.van@dot.gov* or Jason Dietz of FHWA at *Jason.dietz@dot.gov* or go to: *www.fhwa.dot.gov/asset/*

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The afternoon session dealing with Pavement Preservation - 'How' was led by James Gray (FHWA), David Peshkin (APTech), and included presenters Scott Capps (North Carolina DOT) and Robert Seghetti (ACME Concrete Paving Inc.). Gray introduced the topic on quality materials and construction and why it is important. He mentioned that several tools were under development to accelerate deployment of this effort including:

- best practice guides being developed by Nevada and Missouri DOT's
- web-based training for concrete pavement preservations
- web-based training for asphalt pavements, which can be found at *http://slurry.org/wbt/issa-wbt-login-instructions/*
- use of RAP in pavement preservation. (A study is being conducted by APTech.)

Capps then discussed why chip seals are important to North Carolina DOT and how the program started. Initially, the chip seal work was done by state forces, but recently it is shifting to contract work. He discussed the importance of quality materials and construction to produce successful projects. He also mentioned they had to assist industry with construction training, since a chip seal industry was not present in North Carolina until recently. Seghetti discussed a number of preservation treatments for concrete pavements including cross stitching, dowel bar retrofit, partial depth repair, full depth repair, and diamond grinding, and why and how each of these treatments are used. David Peshkin concluded the session soliciting input from the participants on items such as:

- What treatments are used and are they successful?
- Do you have 'best practices' for flexible preservation treatments?
- What challenges does an agency face to ensure quality materials and construction?
- How do we make the necessary changes to ensure quality construction?
- How can we best track progress in this effort?

For more information on the Pavement Preservation 'innovations', please contact Bryan Cawley at *bryan.cawley@dot.gov* or James Gray of FHWA at *james.gray@dot.gov* or check out the website at *http://www.fhwa.dot.gov/preservation/*.

The Every Day Counts program is under the Direction of Tom Harmon at the Center for Accelerating innovation. He can be reached at: *tom.harmon@dot.gov*.

Information on the entire EDC-4 program can be found at: *http://www.fhwa.dot.gov/innovation/everydaycounts/*.

FHWA Update

By Steve Healow, FHWA - Sacramento

In the November elections, transportation funding initiatives were widely accepted across the country. Nearly 70% of the 280 measures considered were approved, for a total of $200 Billion in tax and bond initiatives. In Los Angeles County voters approved a one-cent sales tax, which is expected to raise $120 billion over 40 years to expand roads and transit. Transportation voter initiatives failed to pass in Sacramento, Placer and San Diego counties.

Pavement smoothness advocates: Have you downloaded the 'ProVAL 3.6' software yet? The technical support contract for ProVAL software expires December 31. At that time the web page [http://www.roadprofile.com/] may be shut down. Thus, it's important that you download the latest ProVAL version prior to the deadline.

Pursuant to MAP-21 Section 1106 if you have been waiting to see the Final Rule re. State DOT Asset Management Plans, your wait is over. The final rule was published October 24 and is available at: *https://www.federalregister.gov/documents/2016/10/24/2016-25117/asset-management-plans-and-periodic-evaluations-of-facilities-repeatedly-requiring-repair-and*

Similarly, the Final Rule re. 'performance measures' for pavements and bridges is expected to be published mid-December. Check this column in future issues for more details.

Be sure to visit AASHTO's Transportation Curriculum Coordination Council (TCCC) web page at: *https://training.transportation.org/browse_bookstore.aspx* to see the available web-based training. The target audience includes technicians and professionals in the transportation workforce. At the website you will note many of the web-based courses are 'freebies'.

Some of our readers have been around long enough to remember the "Pavement Preservation Checklists"

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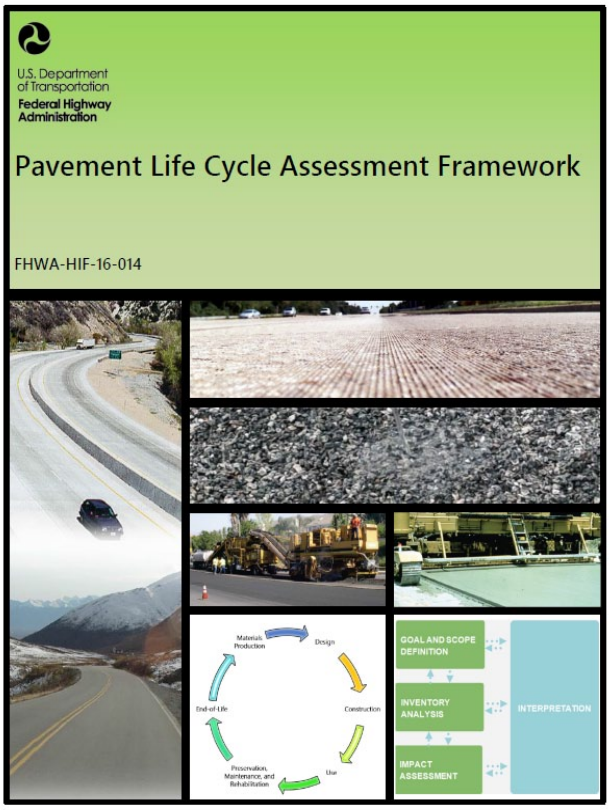
published by FHWA between 2002 and 2013. The pocket guides are no longer in print, but can be downloaded. Our friends at the National Center for Pavement Preservation have posted all fifteen checklists at their website: *https://www.pavementpreservation.org/fhwa-resources/fhwa-preservation-brochures/*. The checklists are also available at: *http://www.fhwa.dot.gov/pavement/preservation/ppcl00.cfm*.

If you haven't already done so, be sure to visit the "rePave Scoping Tool" web site, a product of the Strategic Highway Research Project (SHRP2) R23 Pavement Renewal Solutions Project. This site features an interactive web-based application for identifying pavement renewal strategies, while leaving the existing pavement in place. See the introductory video at: *pavementrenewal.org >> getting started*. Other resources on the site include guide specifications and guidance on best practices, project scoping and life-cycle costs.

If you're ever charged with using Life-Cycle Assessment to make a pavement type decision, here's a new (July 2016) reference which may be useful. It's the "Pavement Life-Cycle Assessment (LCA)Framework" [*http://www.fhwa.dot.gov/pavement/pub_details.cfm?id=998*].

The purpose of LCA is to evaluate and quantify the environmental impacts over the life cycle of a product or system.



CP2 CENTER NEWS

Hans Ho Retires From Telfer Oil

By R. Gary Hicks, CP2 Center

After 42 years working in the oil industry, Dr. Hans Ho has retired to spend more time biking, skiing, and playing with his grandchildren. Hans served as Co-chair of the CP2 Center's Patrons Group and as a guest lecturer on pavement preservation in the CSU, Chico, Civil Engineering Program.

Hans Ho (left) with Mike Telfer (right)

His services to industry and community included:

- Technical & Environmental Director, Telfer Oil Company
- Former Industry Co-chair, Flexible Pavements, Pavement Preservation Task Group
- Co-chair of the CP2 Center Patrons group at CSU, Chico and guest lecturer in the Civil Engineering Program on pavement preservation
- Member, Board of Directors, Asphalt Emulsions Manufacturing Association
- Former Commissioner, Contra Costa County Hazardous Materials Commission
- Former Chair, Antioch Police Department Crime Prevention Commission
- Current Neighborhood Watch Coordinator, Antioch Police Department

Though he is retired, he will continue to serve as a Technical and Environmental Advisor (Emeritus) for Telfer Pavement Technologies. We also hope he will continue to work with the Center as an advisor and periodic guest lecturer. Hans has mentioned that his occasional invitations to lecture at CSU Chico, were some of his most enjoyable and prestigious endeavors. Best wishes, Hans!

Dr. Ding Cheng Receives Award

By Roger Smith, CP2 Center

Dr. Dingxin Cheng, Director of the CP2 Center has been awarded the John F. O'Connell Endowed Faculty Chair. Dr. Cheng is a Professor of Civil Engineering at CSU, Chico and an exceptional scholar and educator.

(Left to Right) Hope Shapiro, Ben Juliano, Ricardo Jacquez (Dean of Engineering), Ding Cheng, Gayle Hutchinson (CSU Chico President), Mike Ward (Provost)

Dr. Cheng has an exceptional record of scholarly work. During the period from 2011 to 2015, he's published 26 peer-reviewed papers and 56 technical reports and manuals for various sponsoring agencies, and he attracted substantial external research funding, on the order of $4M. Dr. Cheng serves in key leadership roles as Director of both the California Pavement Preservation (CP2) Center and CalRecycle's Tire Derived Aggregate Technology Center.

At CSU, Chico, he has maintained a significant teaching load, including instructing eight core Civil Engineering courses, and has developed a Capstone Course on Advanced Transportation Engineering Design. Dr. Cheng has also supervised two MS students and an additional twenty undergraduate and graduate student research assistants. He has been recognized for his teaching contributions including an "Outstanding Research Mentor Faculty Award" by CSU Chico and an award for "Professor of the Year" by the American Society of Civil Engineers Student Chapter.

Dr. Cheng has also developed a number of instructional, web-based programs for state agencies such as the California Department of Transportation and the Alaska Department of Transportation. He has participated as a member on a number of high-level, national committees, including the Pavement Preservation Committee of the Transportation Research Board (TRB) and as a panel member of the Pavement Maintenance Database System of the National Academy of Sciences. Additionally, Dr. Cheng has served on a significant number of CSU Chico, committees including the CSU Chico Research and Sponsored Program Committee, the Faculty Recognition and Support Committee and a number of key search committees.

A reception honoring Dr. Cheng was held on October 20, 2016, at CSU, Chico, where colleagues, friends, students, and CSU administration, congratulated Dr. Cheng on his award.

According to Dr. Ricardo Jacquez, Dean of the College of Engineering of CSU, Chico, "Dr. Cheng's accomplishments clearly reflect the spirit of the O'Connell Endowment Award. Faculty who hold an endowed appointment have many professional achievements, and have earned the respect of their colleagues, both institutionally and nationally. Endowed faculty not only bring prestige to the university, College, and their department, but they assure high quality academic programs which, in turn, recruit the highest quality students. Endowed faculty appointments within the College of ECC are intended to recognize excellence that supports the mission of CSU Chico."

Congratulations to Ding!

Irene Smith, Roger Smith, Steve Healow, Ding Cheng, Sallie Houston, and Shakir Shatnawi (Left to Right)

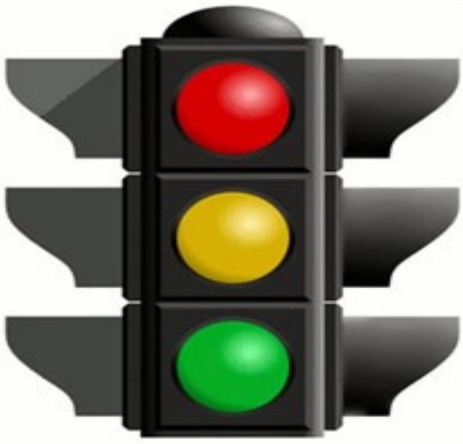
Patrons Program Update

By R. Gary Hicks, CP2 Center and Scott Metcalf, Ergon Asphalt and Emulsions

The CP2 Center's Patrons Program gives our partners from industry and other pavement oriented groups a way to provide more general sustaining support for the Center, and to help direct and even participate in the Center's activities.

The Center was established in 2006 at CSU, Chico, to provide assistance with the development and use of appropriate pavement preservation strategies. It celebrated its 10th anniversary in August, 2016. The Center was originally funded by Caltrans and continues to work closely with them, as well as other agencies. We maintain a very experienced staff of pavement experts and a state-of-the-art laboratory facility which continues to improve each year.

But the Center is funded only by its contracts with agencies such as Caltrans, CalRecycle, Metropolitan Transportation Commission (MTC) and also some industry clients. In all cases, work under those contracts is narrowly defined, so that funding may only be used for specific contract tasks. The Center, therefore, has no contingency funding to sustain "overhead" activities, such as maintaining lab equipment, preparing contract proposals, partici-pation in events to promote pavement preservation, organizing meetings and conferences, and delivering training classes. This funding must come from non-contract sources such as our Patrons Program. Donations of used lab equipment is another way Patrons have supported the Center.



Co-Chairs for the Patrons group are currently Dr. Gary Hicks, CP2C, and Scott Metcalf, Ergon Asphalt and Emulsions. The next Patrons meeting is being planned for May, 2017, at a location to be determined.

For more information on joining our Patrons Program, please contact Co-Chairs, Dr. Gary Hicks at *rghicks@csuchico.edu* and/or Scott Metcalf *scott.metcalf@ergon.com*. More information on the Patrons Program can also be found on the Center's website at *www.cp2info.org/Center* .

Mark Your Calendar (Coming Events)

By Roger Smith, CP2 Center

WRAPP Workshop, February 1-2 (Ontario, CA)

The Western Region Association For Pavement Preservation (WRAPP) annual workshop will include speakers, product vendors and an equipment display. Over two fact-filled days, benefit from the knowledge of Industry/Agency/Academic experts about the many cost effective processes and new technologies being tested around the western US. This popular event attracts hundreds from the pavement maintenance and preservation community.
For more information go to: *https://wrapp.org/*

National Pavement Expo 2017….February 1-4 (Nashville, TN)

This annual event brings together vendors, contractors, pavement managers and agency officials from across the U.S. to learn about products and equipment for pavement maintenance, repair, sweeping and snow removal. More than 50 training sessions are scheduled as part of the 2017 Expo.

For more detailed information, please go to: *www.NationalPavementExpo.com*

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AMAP Conference & Workshop, February 7-9 (St. Petersburg, FL)

The Association of Modified Asphalt Producers (AMAP) Conference brings together a broad-based group of presenters from government and industry to discuss the latest news and issues affecting the modified asphalt industry. A one-day Workshop is also planned. If you are associated with the asphalt industry as a buyer, owner, DOT or municipality official, contractor, producer, refiner, terminal operator or consulting engineer – this could be a valuable event for you.
For more information go to: *https://modifiedasphalt.org/annual-conference/*

Asphalt Institute Academy Classes

Constructing high quality asphalt pavements is the goal of our industry. The Asphalt Institute is the international trade association of petroleum asphalt producers, manufacturers and affiliated businesses. You can learn to produce high quality pavements by learning the basic principles of asphalt binders, hot-mix asphalt, and pavement in construction. Classes are offered both on-line and classroom settings. For more information go to: *http://www.asphaltinstitute.org/asphalt-academy-classes/*

AEMA – ARRA – ISSA, 2017 ANNUAL MEETING, February 14 – 17, (Tucson, AZ)

The Asphalt Emulsion Manufacturers Association (AEMA), the Asphalt Recycling & Reclaiming Association (ARRA) and the International Slurry Surfacing Association (ISSA) will hold their 14th Annual Joint Meeting in Tucson, AZ, February 14-17. The agenda will include industry speakers and cutting edge topics. Attendees will have the opportunity to enjoy the general sessions and then choose the topics on which they want to focus. For more information go to: *http://ppralliance.org/*

92nd AAPT Annual Meeting & Technical Sessions, March 19-22, (Newport Beach, CA)

The annual meeting includes asphalt-related technical sessions comprised of peer-reviewed poapers, and invited presentations on specific topics in the leading Edge Workshop, AAPT-ISAP International Forum, and Symposium. Please see the Annual Meeting page: *http://asphalttechnology.org/annualmeeting.html* for more details as they become available.

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