



CP2 CENTER NEWS

Newsletter of the California Pavement Preservation Center

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National LTPP Experiment on Pavement Preservation

By Gonzalo Rada (AMEC) and Gary Hicks (Consultant)

Background

The Long-Term Pavement Performance (LTPP) study, under management by the Federal Highway Administration (FHWA) since 1992, is the most comprehensive research program ever undertaken to determine how and why in-service pavements perform as they do. The mission defined for the LTPP program is to "increase pavement life by investigation of various designs of pavement structures and rehabilitated pavement structures, using different materials and under different loads, environments, subgrade soil, and maintenance practices" (SHRP, 1986).

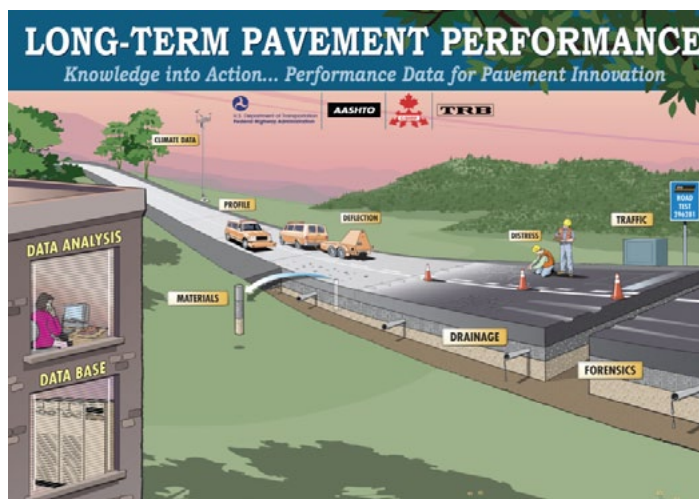


Figure 1.
Artist's
Rendering
of Long-Term
Pavement
Performance
Program

The effective design and management of pavements require prediction of the long-term performance under actual traffic loads and varied climate conditions. In turn, a critical requirement in the development of performance prediction models is long-term performance data. This realization led to the development of the LTPP program to support pavement engineering tools based on long-term performance observations, engineering structural measurements, climate measurements, and traffic loadings on in-service pavements.

Because pavement performance is at the heart of the pavement preservation decision-making process, evaluating long-term performance of pavement preservation treatments, is the motivation for the two latest LTPP experiments:

- 1) Specific Pavement Study-11 (SPS-11): Asphalt Concrete (AC) Pavement Preservation Study, and 2) Specific Pavement Study-12 (SPS-12): Portland Cement Concrete (PCC) Pavement Preservation Study.

The objective of the SPS-11 and SPS-12 Studies for asphalt and concrete pavements respectively, is to establish the impact of the timing of preservation treatments on pavement distress propagation rates. This information should improve pavement life extension and overall performance.

Experimental Approach

The underlying experimental concept is to apply the same preservation treatment, at different times, on the same pavement structure to determine the most appropriate time to perform a treatment, and to discover factors related to treatment timing. The vision of the experimental design is to

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include “new” pavement sections, i.e., ones that have recently been constructed, reconstructed, or received a structural overlay. Starting with relatively new pavement structures at each project site, test sections are established along a uniform road segment before other preservation treatments are applied. Over time, the same treatment will be applied to different test sections.

The SPS-11 and -12 experimental designs consist of multiple experiments, each addressing a specific preservation treatment. Those treatments, are as follows:

- SPS-11 AC pavement preservation experiments
 - * SPS-11T – thin AC overlay of AC overlay (over AC pavement)
 - * SPS-11C – chip seal of existing AC overlay (over AC pavement)
 - * SPS-11M – micro surfacing of AC overlay (over AC pavement)
- SPS-12 PCC pavement preservation experiments
 - * SPS-12G – diamond grinding of original dowelled plain jointed PCC
 - * SPS-12S – joint sealing of original dowelled plain jointed PCC
 - * SPS-12P – joint penetrating sealers for original dowelled plain jointed PCC

An ideal LTPP test section is illustrated in Figure 2. Each test section is 1,250 feet long, with a 500 foot lead in, 500 foot monitoring section,

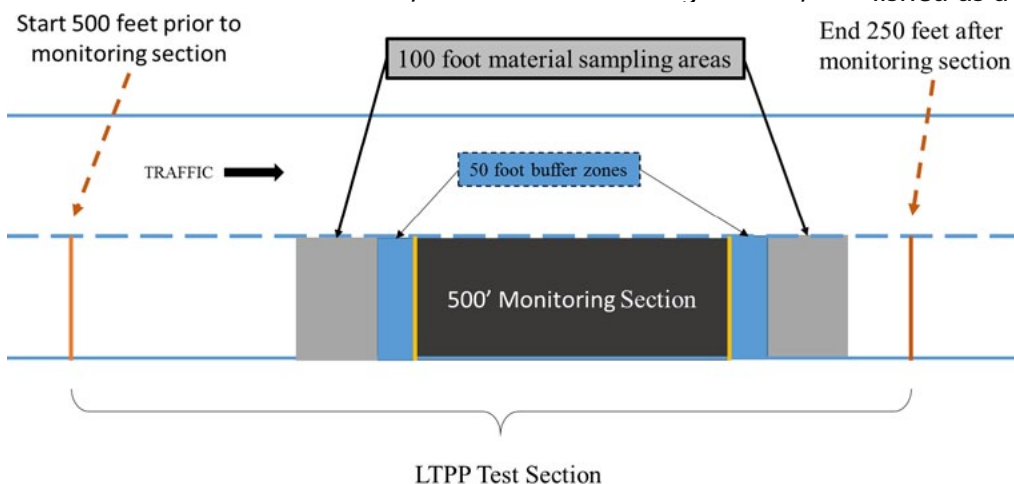


Figure 2. Illustration. Typical SPS-11 and -12 test section.

and 250 foot leave zones.

An example SPS-12 project layout is illustrated in Figure 3 for the diamond grinding treatments. While the layout of test sections on a project site must be adjusted to site conditions, the rule of thumb is that at least 1.5 miles of a relatively consistent pavement structure is desired.

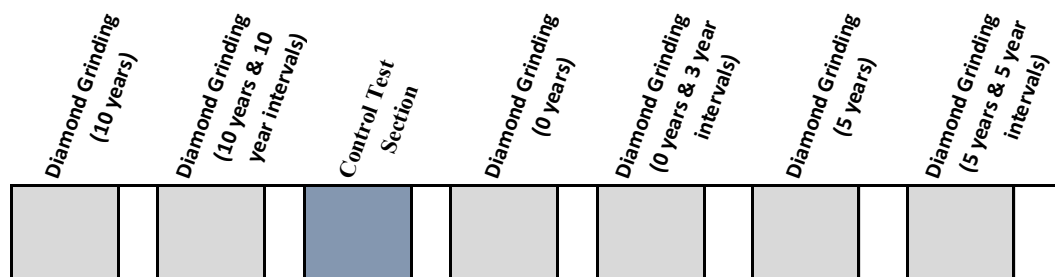


Figure 3. Typical SPS-12 Layout: Diamond Grinding Treatment

Experiment Status

Both the experimental design and materials sampling and testing (MS&T) plans have been completed for the LTPP pavement preservation experiments. Other documents will include:

- Project nomination guidelines
- Construction guidelines
- Construction data collection requirements
- Performance monitoring guidelines
- Other data collection requirements (e.g., traffic, climate, subgrade moisture, snow removal & deicing, ground penetrating radar (GPR) and Magnetic Imaging Tools (MIT) Scan-2 data)

Implementation of Experiment and Projects

As many as 48 projects – 8 projects per treatment covering a wide range of climate and traffic conditions nationwide – will be established as a part of the LTPP pavement preservation experiment effort.

At each project, several supplemental treatments could be placed by the participating agency in addition to the core project treatment. Selection of the LTPP pavement preservation project sites could begin as early as the summer of 2017, depending on funding availability. However it is likely that construction will not take place until 2018. For more information, please contact **Gonzalo Rada**, gonzalo.rada@amecfw.com or **Gary Hicks**, rg Hicks40@outlook.com.

Asphalt Pavement Conference & Equipment Expo

By Roger Smith, CP² Center

Once again, the **California Asphalt Pavement Association (CalAPA)** "Spring Asphalt Pavement Conference and Equipment Expo" proved to be a worthwhile and well-attended event. On April 20 & 21 the Double Tree Inn in Ontario was again a great venue, offering plenty of room for both indoor vendor booths and the outdoor display of construction and testing equipment. As usual, CalAPA put together a great line-up of speakers on hot topics in the world of asphalt pavements.



Heavy Falling Weight Deflectometer (FWD) Exhibit (Dynatest North America)

According to **Russell Snyder**, Executive Director of CalAPA, "Our event steering committee did a great job again this year putting together a very diverse program filled with valuable and timely technical and practical information attendees could put to use right away. The evaluations from the conference were among the highest we have ever had for one of our events." Here are a few highlights from the Expo.

Funding

Funding for road maintenance & improvements was a key topic, and the various California legislative proposals were over-viewed by **Brian Kelley**, Secretary of the California State Transportation Agency, and **Kome Ajise**, Caltrans Chief Deputy Director. With no gas tax increase since the early 1990's, the state faces a STIP reduction of \$750 million

due to low revenues. The prospects of Federal funding via the 2015 'FAST' Act was also discussed. It was noted that the FAST Act contains special funding for work on critical "freight corridors", which California has a lot of, and special funding for developing high-tech methods of improving traffic flow and reducing congestion. It was emphasized that Federal funds earmarked for the California high speed rail proposal could not legally be used for highway work. People were urged to contact their state legislators and encourage action on funding legislation.

Caltrans Updates

As part of panel discussions, **Sri Balasubramanian** of Caltrans advised the group that the 2015 Standard Specifications are now available online and in print form. He outlined the new Caltrans process for New Products Approval, and also overviewed the work of the Caltrans-Industry Rock Products Committee (RPC), inviting participation from the attendees. **Tim Greutert** of Caltrans Office of Roadway Materials Testing (ORMT) noted that skid testing of pavements using the portable skid tester will be done by contractors. **Al Ochoa** of Caltrans' San Diego District is the new manager of developing the Joint Training and Certification Program, whereby testing technicians for both Caltrans and Industry will be subject to training and practical (hands-on) testing and evaluation. There will be two university venues for this effort – CSU, Long Beach and CSU, Sacramento.

Pavement Smoothness

Mike Robinson, a pavement engineer / consultant, brought the group up to date on specifying and measuring pavement smoothness. The International Roughness Index (IRI) is the current metric for smoothness. The ability to attain a certain smoothness in a finished pavement surface is dependent on three primary factors: 1.) the pre-construction smoothness, 2.) the number of 'opportunities' a contractor has to improve smoothness (e.g., pre-grinding, number of lifts, etc.) and 3.) what is actually done at each opportunity. Smoothness strategies such as placing a leveling course, using windrow paving or an MTV, minimizing starts and stops of the paver, and minimizing hand-raking were discussed.

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Intelligent Compaction

Progress in evaluating the benefits of Intelligent Compaction (IC) was presented by **Don Mathews** of Pavement Recycling Systems. A total of 15 pilot projects will be done by Caltrans, most involving placement of HMA over cold in-place recycling (CIR) of the old pavement. This technology uses specially equipped rollers to monitor rolling coverage and density being achieved, and to provide real time feedback to the roller operator or to remote observers. The results are encouraging. For the foreseeable future it's likely that IC will be limited to use as a quality control (QC) tool for paving contractors.

RAP / RAS Use in HMA (Panel)

Interest in recycling has fueled pressure to increase use of reclaimed asphalt pavement (RAP), in the form of millings, and reclaimed asphalt shingles (RAS) – both old “tear off” shingles and new factory discards. **Bob Humer** of the Asphalt Institute outlined the national progress and concerns in this area, while **Edgard Hitti** of Alon USA and **Pascal Mascarenhas** of Vulcan Materials gave a more local California perspective, noting that the Green Book specifications allow 20% RAP, while Caltrans allows up to 25% in surface lifts and 40% in base lifts. The use of warm mix asphalt (WMA) technology can help accom-



Pavement Condition Scanner (Pavement Management Solutions - PMS)



Alon Asphalt's exhibit

modate higher RAP percentages by reducing the level of superheating required in the new / virgin aggregate. Laboratory evaluation of the actual binder properties in the finished blend continues to be a challenge.

Other topics of presentations included:

- Bitumen (Asphalt) Safety: Fire and Explosions - by **Barry Gundersen**, Safety Consultant
- Caltrans District Perspectives - by **Michael Beauchamp**, Caltrans, San Bernardino
- Pavement Preservation Overview & Update - by **Scott Metcalf**, Ergon
- Slurry Seal Mix Design - by **Sally Houston**, VSS
- Pavement Texture / Appearance - by **Steve Marvin**, LaBelle-Marvin, Inc.

All presentations are available for viewing and downloading at: www.calapa.net.

The Fall Asphalt Pavement Conference & Equipment Expo will be held on Oct. 26-27 of this year at the Doubletree Hotel, 2001 Point West Way in Sacramento.

Contact **Sophie You** of CalAPA at (916) 791-5044 for exhibitor and sponsorship information.



Long-Term Performance of Asphalt-Rubber in Leisure World,

California By Ding Cheng, CP² Center

How much of a difference do Asphalt-Rubber Composite layering systems make in comparison to conventional hot mix asphalt street maintenance strategies? Back in 1992, the road conditions of the gated community of Leisure World – Laguna Woods (formerly Laguna Hills) in southern California were very poor, as about 51% of the community's pavements qualified for major maintenance or even reconstruction. Today, the community's roadway condition is much improved as shown in Figure 1.



Figure 1. An Aerial Photo of Leisure World, Laguna Woods, California

Leisure World has a resident population of approximately 16,100, and has about 10.4 million square feet of paved surface (Figure 1). The replacement value of all pavements would exceed \$30 million in 1993's dollars. The estimated cost to bring all pavements to full structural integrity was \$6.9 million, and major rehabilitation improvement costs for pavements with significant deterioration would have been \$3.8 million.

However, a series of treatment strategies - at about 50% of the major rehabilitation cost - were utilized based on the condition of the existing streets. Many of these strategies utilized Asphalt-Rubber Composite Layering systems and were designed to have a minimum 10-year performance life. **Dr. Ding Cheng** surveyed the pavement conditions in December 2013 and found that most of the strategies involving Asphalt-Rubber (AR)

performed very well and far exceeded the original design expectations.

Manhole Adjusting Inc. developed the pavement maintenance strategies for the Leisure World community in 1992 and then applied the Asphalt-Rubber Composite Layering systems consisting of Asphalt-Rubber Hot Mix (ARHM) with an Asphalt-Rubber Aggregate Membrane (ARAM) Interlayer. The projects were grouped into classifications with similar distress and structural conditions, and based on conditions from good to poor, one of the following strategies was utilized for each group:

- A. preventative maintenance approach of seal coating cul-de-sacs and streets in good condition.
- B. for a cracked pavement in relatively stable condition, 1 to 1.5 inches of ARHM, which is sometimes referred to as Rubberized Asphalt Concrete (RAC). (ARHM uses AR binder, which contains 20% to 22% crumb rubber derived from scrap tires and approximately 78% paving grade asphalt, which is blended and reacted under a predetermined time and temperature. ARHM is a paving mixture in which the blended and reacted Asphalt-Rubber binder is incorporated into a hot mix asphalt plant and mixed with specified sized gradations of aggregate).
- C. 1 to 2 inch ARHM overlay.
- D. 1.25 to 3 inch ARHM overlay.
- E. 1.5 to 3 inch ARHM overlay.
- X. Asphalt-Rubber Composite Layering system, with a 1.25 to 3 inch ARHM overlay covering an ARAM interlayer. (The ARAM is a viscous blended and reacted AR binder which is spray-applied by distributor trucks and then covered with 3/8 inch, hot pre-coated aggregate. ARAM can be used as a wearing surface or an interlayer to defer reflective cracking).

Construction work was performed on 169 locations in Leisure World between 1993 and 2000, which was very challenging at times because of the narrow spaces in the residential areas and cul-de-sacs. Figure 2 illustrates ARHM compaction in a tight parking lot and local street, while

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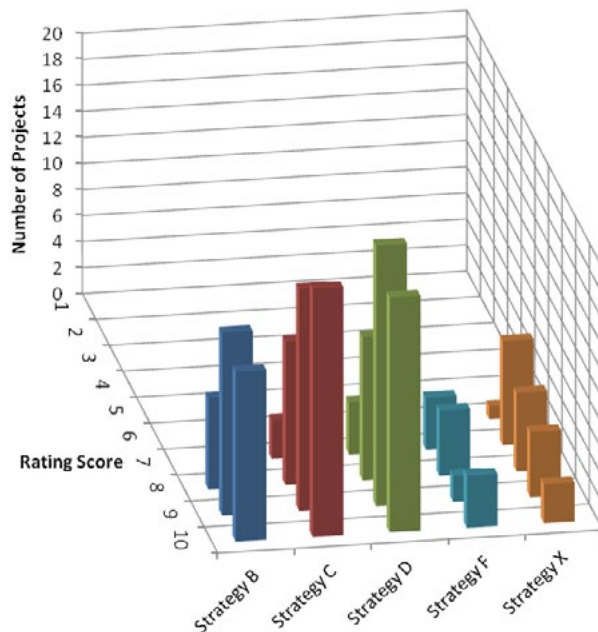
Figure 2. Compaction of ARHM in a Tight Parking Area

Figure 3 shows the process of installing the ARAM interlayer on a residential street.



Figure 3. Installation of an ARAM Interlayer

During the condition survey between December 27 and 29, 2013, the pavements were rated from 1 to 10, with 10 representing excellent condition and 1 representing a pavement failure. Based on the survey results, almost all of the treatment strategies have worked very well. The performance life had exceeded their original 10-year design and many were still in excellent condition after 20 years, or double the 10-year design life. Figure 4 is a



**Figure 4.
Summary of
Performance
of Asphalt-
Rubber
Strategies**

summary of the pavement conditions for different treatment strategies at Leisure World in 2013. Although it shows that Strategy X had some level 6 scores, they were built on pavements that were originally slated to be reconstructed.

As a demonstration, Figure 5a shows the preexisting pavement condition of location CDS327 during the construction in 1993. There were many alligator cracks and the pavement had severe deterioration. Figure 5b shows the excellent pavement condition of the same street 20 years after construction.



Figure 5a. Existing Pavement Condition before Asphalt-Rubber Composite Layering (1993)



Figure 5b. Pavement Condition after 20 Years of Service Life (2013)

Overall, the strategies used at Leisure World performed very well and exceeded expectations. Asphalt-Rubber Composite Layering Systems were shown to be very cost effective strategies that will perform for 20 years or more, as demonstrated by these Leisure World projects, along with many other projects throughout Southern California. For more information contact Western Pavement Maintenance Association at wpma@earthlink.net.

Asphalt Rubber Test Training, Training Course for Field Testers of Asphalt Rubber Binders using ASTM D7741

By Mark Belshe, RPA

In response to Caltrans' requirements that field samplers and testers of asphalt rubber binders be Caltrans Independent Assurance (IA) certified, The Rubber Pavements Association (RPA) in conjunction with Asphalt Pavement And Recycling Technologies, Inc. (APART), has organized a 4-hour Viscosity Testing Training Class.

Upon completion of this class, the student will have a thorough understanding of:

- 1) Caltrans Test Method 125, "Methods For Sampling Highway Materials and Products Used in the Roadway Structural Sections", relative to the sampling of asphalt rubber binders directly from production facilities, and
- 2) the requirements of ASTM D7741, "Measurement of Apparent Viscosity of Asphalt-Rubber or Other Asphalt Binders by Using a Rotational Handheld Viscometer".

The course includes a review of the sampling

procedures for hot asphalt rubber blends, the equipment required to perform the viscosity measurement, proper procedures to follow, and the specific requirements of Caltrans specifications for asphalt rubber binders. The student will demonstrate proficiency with these topics by practical (hands-on) performance of the measurement in front of a qualified instructor, as well as successfully completing a standardized written exam on the topics.

Upon completing the RPA class, the student will receive a certificate indicating they have completed this prerequisite for the Caltrans certification process. Students must then successfully complete only the written exam for Caltrans certification through their Caltrans IA District contact.

For information on the scheduling of the classes, please contact **Mark Belshe** with the Rubber Pavements Association at (602)818-4997 or mbelshe@rpamail.org.



California Contractor in National Magazine

By Roger Smith, CP² Center

A well-known California pavement maintenance contractor was recently featured in the popular national magazine, "Pavement Maintenance and Reconstruction".

American Asphalt Repair and Resurfacing, based in Hayward, is a medium-sized Bay Area paving and maintenance company, whose operation extends from Bakersfield to the Oregon border. They employ 130 people doing asphalt paving and patching, slurry sealing, parking area sealcoating, concrete work and even striping. They usually complete over 1000 jobs a year.

According to the magazine's Editor, **Allan Heydorn**, American was singled out for coverage in their popular national trade magazine because of their stellar reputation, diverse services and their unique approach to customer service.

American's President **Allan Henderson** says, "It was a great honor to be featured in the national magazine, "Pavement Maintenance and Reconstruction". We've been successful and continued to grow by maintaining one-on-one, face-to-face relationships with our customers, and by always backing up what we say. We're quality oriented and our company motto is,



Figure 1. American Asphalt's Allan Henderson

'Every job is our best job.' It's posted on our wall."

In addition to normal marketing and support services, they offer customers an annual Asphalt Maintenance Seminar, which includes equipment demonstrations and expert speakers. They also provide creative outreach to customers via catchy direct-mail postcards (e.g. FREE POT hole repair!), and even have a wine label, stemming from their work in the Napa Valley area. As Allan Henderson puts it, "I'm not a wine maker, but I make wine. We've even traded asphalt work for grapes!". For more information go to: www.ForConstructionPros.com/Pavement or www.americanasphalt.com



Increased Use of Tire Rubber in HMA Proposed

From the CalAPA "Insider"

The deployment of Rubberized Hot Mix Asphalt (RHMA) in California over the years has had more twists and turns than a mountain road, including legislative mandates, larger-than-life personalities and Byzantine specifications.



Scrap Tires for Recycling

All the while, the state has grappled with two overarching goals that appear to intersect where the rubber meets the road: the desire to be environmentally sustainable, including reducing the number of scrap tires that end up in landfills, and to ensure optimum and cost-effective performance of pavements on the state highway system.

In July of 2013, Caltrans implemented the use of Performance Graded Modified (PG-M) asphalt binder with minimum of 10 percent Crumb Rubber Modifier (CRM). On Feb. 10, 2015 Caltrans issued a memo and new guidance to its engineers on RHMA, which, according to **Chuck Suszko** of the Caltrans Division of Construction, had the effect of making RHMA the pavement surface course of choice when evaluating alternatives for a project. It was still deemed insufficient for the department to meet its tire-recycling goals, however.

That reasoning was given in 2014 when the department proposed something new: requiring the addition of 5 percent Crumb Rubber Modifier (CRM) in all unmodified asphalt binder. The proposal triggered a flurry of industry-agency meetings as the idea was evaluated and the logistical challenges and costs to implementing it, including accurately measuring

how much scrap tires would be used, were estimated.

The new "green" Performance-Graded binder with 5 percent CRM (PG+5) as envisioned by Caltrans would be required to meet the performance grade requirements for unmodified asphalt binder. At several very well-attended meetings, virtually every component of Industry was represented: refiners, emulsion manufacturers, tire processors, HMA producers, paving contractors and specialty materials producers.

On March 18 of this year, industry and agency came together at the Caltrans Translab in Sacramento for a meeting titled, "Increasing Crumb Rubber Usage: Small Amount of CRM in Hot Mix Asphalt." The daylong meeting was attended by 39 people. At the meeting, Caltrans estimated that if 5 percent crumb rubber binder was included in all asphalt binder that is currently classified as unmodified, it would use the equivalent of 8.3 million to 10 million tires per year.

Caltrans acknowledges there are many hurdles to overcome if such a rubber-boosting specifi-



Fine Crumb Rubber Sample

cation as "PG+5" is implemented, including changes in how scrap rubber is processed and handled at refineries. More meetings between industry and agency are planned, and CalAPA will be following developments closely.

This article was adapted with permission from the California Asphalt Pavement Association. For more information go to:

www.calapa.net



Street Maintenance Project of the Year

By Jim Brownridge, Tricor Refining, LLC, Bakersfield

The Western Regional Association for Pavement Preservation (WRAPP) is the new name for the old California Chip Seal Association (CCSA). At their February 2016 annual Workshop in Sacramento, **Norm Goldstrom**, Public Works Manager of City of Visalia and **Jim Brownridge**, Marketing Manager with Tricor Refining, LLC, were presented plaques for Street Maintenance 'Project of the Year' for the City's asphalt pavement rejuvenation work with Reclamite®.



Reclamite® Rejuvenator Application

This City's program encompassed over 1.7 million square yards of the surface treatment application in 2015 to residential and arterial streets south of Hwy 198 and west of Mooney Blvd. Intermountain Slurry Seal out of Elk Grove was the prime contractor and Talley Oil Company of Madera was the sub-contractor and applicator on the project. Cain Trucking, Tulare handled off site product storage and just in time delivery of the Reclamite® emulsion for the project with shipping from Tricor Refining in Bakersfield to the Visalia area.

Jose Herrera, was Public Works Inspector with the City of Visalia.

Public Works Manager Goldstrom packaged the project based on PCI and historical performance of the treatment. The 2015 application followed the successful 1.8 million square yards of Reclamite® surface treatment application performed in 2014 to residential and arterial streets on the north side of Hwy 198. The City of Visalia has a long history of asphalt

rejuvenator work dating back to the late 1980's. At that time and up to early 2004, that work was generally performed in house by City forces and utilizing a contractor for the spray application.

Reclamite® asphalt rejuvenator was chosen because of its long history of successful use, proven nationwide history and the reasonably low cost compared to other surface treatment applications. Jim Brownridge and Tricor Refining assisted with viewing the road network and conducting 'ring tests' for product absorption on the pavements in the program. The application rate varied between 0.07 to 0.10 gallons per square yard of the Reclamite® emulsion diluted with water 2:1. The goal was to maximize the absorption of the Reclamite® rejuvenator, then allow it to cure for a minimum one to two hours, followed by sanding and mechanical sweeping within the same day or within a 24 hour period.

Within the City's Rejuvenator Seal Project specification was the performance requirement to meet minimum changes in penetration and viscosity of the asphalt binder, and/or changes in the Dynamic Shear Rheometer (DSR) test results. Pavement cores were sent to APART Laboratories in Shafter, where their testing of the asphalt binder showed substantial improvement in penetration and viscosity, and reduced stiffness of the binder, retarding the aging process.

Norm Goldstrom says, "Thank you for sharing Visalia's historical approach that achieves positive results in our pavement preservation program. To relate Reclamite® work to the lay person, I explain a paradigm related to the skin on your body. Asphalt much like your skin is a living form, and when it lies in the hot valley summer sun, day in, day out, year after year it will dry out; much like the skin on your body would. What do you do to your skin? You rejuvenate it with lotion. Reclamite is the 'lotion' for asphalt! Later this year we will again be evaluating every street in Visalia for the pavement management system and we look forward to seeing if the PCI has maintained or increased flat lining - extending the maintenance curve."

For more information contact **Norm Goldstrom** at: ngoldstrom@visalia.city



Pothole “Sweeps Week” Campaign, By Mike Garcia, Sacramento County

There are lots of different approaches to fighting the pothole battle. Here’s one approach.

The Sacramento County Department of Transportation (SACDOT) started its **“Spring 2016 - Pothole Sweeps Week,”** on Monday, April 18, 2016. This is an intensified effort to identify and repair potholes, and is part of continuous efforts to improve preventative



Sacramento County Patching Crew

maintenance activities for unincorporated area roadways. Pothole sweeps weeks are performed twice each year: in late spring to repair potholes caused by inclement weather; and in early winter to ready road surfaces for the storm season.

Residents are encouraged to contact the County concerning potholes on neighborhood streets. To report a pothole, residents can call in or report it online at www.311.saccounty.net. This County-wide effort is organized geographically and covers the entire unincorporated area.

There are over 5,200 lane-miles of paved roadways in the County’s unincorporated area, and it’s inevitable that somewhere in this large infrastructure of streets there will be potholes. SACDOT’s policy is to: **“Repair all potholes as soon as possible.”** The Pothole Sweeps Week program enhances ongoing pavement maintenance activities, which include sending SACDOT crews into the field Monday through Friday each week to specifically repair potholes.

Some facts about potholes in Sacramento County:

- Potholes Reported to Customer Service Annually = 970.
- Potholes Repaired Annually = 41,000.
- Potholes Repaired Per Month = 3,400.

An amazing 7800 potholes were repaired during this years Spring Sweep!

For more information go to: www.sacdot.com or contact Mike Garcia at: garciami@saccounty.net



Long-Life Pavement Scoping Tool: *rePave*

By Imad Basheer & Robert Hogan, Pavement Program, Caltrans, and Steve Healow, FHWA, California Division

The California Department of Transportation (Caltrans) is one of nine agencies which received funding through the Strategic Highway Research Program’s (SHRP 2) Implementation Assistance Program (IAP) to evaluate and possibly incorporate “Pavement Renewal Solutions” technology into the long-life pavement rehabilitation process. The IAP is administered by both the FHWA and AASHTO.

One of the Pavement Renewal Solutions products is the interactive web-based long-life pavement design scoping tool, “*rePave*” (Figure 1). *RePave* assists engineers in selecting and scoping potential long-life (30-50 years) rehabilitation strategies for flexible, rigid, and composite pavements based on existing project conditions and other related constraints. *RePave* development was

motivated by the highway agencies’ need of guidance as to when (i.e., under what conditions) and where (i.e., which project) it is “beneficial” to use existing pavements as part of roadway renewal projects to accelerate rehabilitation project delivery, reduce life-cycle costs, and provide long-life treatment strategies. The main focus of the rehabilitation strategies proposed by *rePave* is on using the pavement in-place. The adoption of *rePave* will help Caltrans enhance its available toolbox of strategies to meet the demands of maintaining a sustainable transportation network. The *rePave* scoping tool can be found at: <http://www.pavementrenewal.org/> with accompanying resources (specifications, pavement assessment manual, life cycle costs, scoping methodologies, etc.) aimed at developing guidelines for long-life pavement renewal.

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GENERAL
NEWS

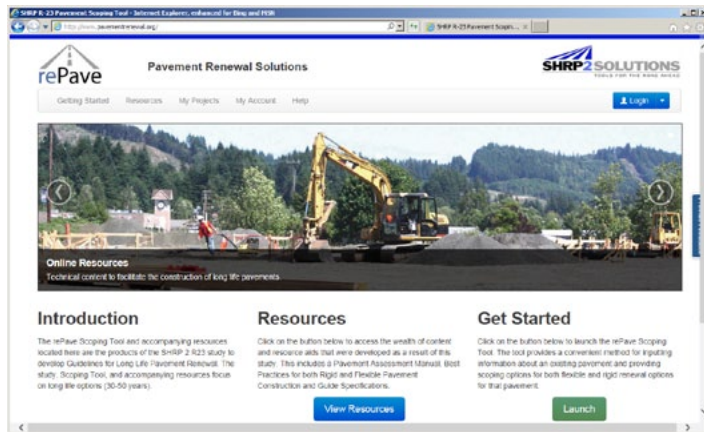


Figure 1. The *rePave* Web-based Scoping Program

The rehabilitation strategies offered by the *rePave* scoping tool include use of traditional materials such as hot mix asphalt (HMA) and portland cement concrete (PCC), in addition to other non-traditional innovative materials. While somewhat constrained by existing materials, thicknesses, and distress conditions, great benefits can often be realized in long-life rehabilitation when using the pavement in place, including (1) decreased use of new pavement materials; thus reducing the environmental footprint, (2) reduced project cost due to eliminating the need for hauling new materials into the project site and transporting away and dumping removed material, (3) shorter construction time, which enhances safety by reducing exposure to work zone hazards of both motorists and construction workers, and (4) better return on investment due to longer pavement service life.

The *rePave* tool was developed from a huge database that was created from a survey of a large number of in-service pavement performance records (from the LTPP database) and hundreds of mechanistic-empirical (ME) pavement design simulations. Extensive analysis and query of the database resulted in the development of 20 decision matrices applicable to nearly every possibility of existing pavement type and distress condition. The long-life rehabilitation strategies that were found to be effective for 30-50 years of service were: (1) Unbonded PCC overlays of flexible pavements, (2) Unbonded PCC overlays of rigid pavements, (3) Bonded CRCP overlay of CRCP, (4) HMA overlays of rigid pavements, which includes the following options: a.)with rubblization of PCC pavement; b.)with crack-and-seat of JPCP; c.)with saw crack-and-sealing of JPCP, and finally (5) HMA overlays of flexible pavements.

The *rePave* tool is aimed to be used only for

project scoping (programming) purposes, not for developing final designs, which require more project-specific tools. The Caltrans' CalME can be used to develop long-life rehabilitation and reconstruction designs of existing asphalt pavements and crack, seat and HMA overlay designs for JPCP. Besides preliminary design scoping, the SHRP 2 Pavement Renewal Solutions system offers additional guidance to project engineers for the successful completion of their long-life projects; including Project Assessment Manual, Guide Specifications, Best Practice-Rigid, and Best Practice-Flexible.

Caltrans is taking steps to increase awareness about the "Pavement Renewal Solutions" project within the agency and to encourage use of the *rePave* scoping tool. This is because typical long-life rehabilitation strategies considered during project scoping are somewhat limited. *RePave* requires only a limited data to provide more optimized strategies to consider for long-life rehabilitation; resulting in a better engineered preliminary design and cost estimate for the project. No additional resource costs should be incurred, since nearly all needed inputs are routinely collected at the programming phase of any project, as follows: (1) current surface distresses may be obtained from Pavement database and Pavement Condition Report, (2) existing pavement structure information obtained from Pavement, (3) traffic data obtained from Caltrans Traffic Census Program, Pavement, or the district traffic forecasting office, and (4) subgrade resilient modulus obtained from correlation with soil classification (available from District Materials records).

RePave offers potential cost savings for certain projects because of the wide variety of long-life rehabilitation strategies that are available for consideration based on their feasibility and initial cost. Training materials are being developed for Caltrans district engineers to increase familiarity and accelerate *rePave*'s use on future projects. Validation of *rePave* through analyses of recent long life projects (e.g., I-710 Long Beach, I-5 Weed, I-5 Red Bluff, and I-80 Solano) along with comparison with existing guidelines and final design tools (e.g., CalME) will be conducted. A report will be prepared and submitted to FHWA documenting the findings along with recommendations for future improvement of this scoping tool. For additional information, contact project manager **Imad Basheer** at imad.basheer@dot.ca.gov.

Graniterock Holds Pavement Expo

By Ding Cheng, CP² Center

Graniterock Company held another popular "Pavement Exposition" event on April 8, 2016, at its A. R. Wilson quarry site in Aromas, CA. The big event featured very interesting and

Frank Rancadore also discussed HMA paving best practices and current Caltrans Section 39 specifications. **Dr. Ding Cheng** thanked Graniterock for the opportunity to introduce the resources of the CP2 Center to the Expo participants.

Outside the big tent meeting area, there were multiple pavement construction demonstrations, including rolling / compaction techniques, method for raking joints, paver operation, and the HMA patching process. These techniques were very practical, and commonly used for pavement maintenance projects.

In the afternoon, the participants had an opportunity to visit the 106-year-old famous A. R. Wilson Quarry. People in four buses visited the quarry and actually watched a medium-scale rock blast of



Don Barrett of Graniterock Welcomed Pavement Expo Participants to the Big Tent

practical programs throughout the day, which attracted more than 350 people from state and local government agencies, and industry.

Don Barrett welcomed people and during the morning session, **Frank Rancadore** gave a presentation on pavement basics. Then, the attendees were separated into different groups. **Dennis McElroy** presented the sustainable practice of cold in-place recycling (CIR) technology, which included the benefits, effectiveness, and recent updates on the CIR technology.



Overview of Graniterock's A. R. Wilson Quarry

the quarry's rock face. Interesting to note is that this large quarry site sits atop the San Andreas fault line.

After the quarry tour, Monterey County Department of Public Works was recognized for its excellence in pavement evaluation, project delivery and pavement maintenance work.

These important educational events have become very popular and kudos must go out to Graniterock, who is also a strong supporter of our CP2 Center.

For more information contact Don Barrett: dbarrett@graniterock.com



Frank Rancadore, Ding Cheng of the CP2 Center and Don Barrett (left to right)



Local Pavement Managers Unite!

By Roger Smith, CP² Center

Street & road managers in smaller municipalities often don't have the advantage of much staff support and the varied expertise that comes with it. So an informal forum where they can rub shoulders with their counterparts from other agencies is a welcome resource. This is especially true when it comes to pavement technology. Local or regional forums can prove invaluable for sharing technical information, specifications and dos-and-don'ts of the trade.

One such local group has been thriving since 2008 in the Sacramento area. Members include the cities of Sacramento, Rancho Cordova, West Sacramento, Elk Grove, Roseville, Rocklin, Woodland and Folsom, and Sacramento County.

According to one of the founders, **Britton Snipes**, formerly with the City of Rancho Cordova and now Public Works Director for the Town of Loomis, "We started the group with a few creative thinkers, such as **Bob Cooper** of the City of Sacramento, who saw the value of being able to reach out to others for technical help and also share their own experiences...and even trade the proverbial 'war stories'."

Over the years they've learned they can exchange information about equipment, pavement maintenance strategies, specifications, research, new materials and even share field demonstrations of pavement products.

The group has evolved to be not only about pavement matters, non-pavement issues are also discussed, including most street-related technologies, and even budgets. Border

issues between neighboring agencies can also get solved more quickly in this forum, which is limited to public agency employees.

Although the group is not organized formally with officers, **Vin Cay** with the City of West Sacramento has taken on the responsibility of maintaining the email distribution list, and sends out reminders of upcoming meetings to ensure the forum is sustained.

According to Cay, "Other information and topics we share include recent bid prices, agency standards specifications and details, software applications, and document templates. Funding in pavement management and budgeting for ADA

requirements triggered by pavement preservation and street rehabilitation projects has also been a focus. The lack of trained qualified staff is also a pressing concern now, as attrition plays itself out. The group's meetings can be a good resource for orienting and training younger fledgling street managers."

The group decided quite a while back to have a constantly changing venue for their bi-monthly meetings. That way they can gain perspective of the agencies' different work environments. Sometimes the host agency selects a local restaurant for a quick lunch prior to the meeting.

Says Cay, "Over the years, some of the longer term members have really gained each other's trust and mutual respect, and we've become friends, and not just peers."

For more information contact **Vin Cay** at: vinc@cityofwestsacramento.org



JTCP Is Coming!

By Roger Smith, CP² Center

Caltrans is moving forward with a Joint Training and Certification Program (JTCP) for field material testers working on Caltrans projects. **Al Ochoa**, the Materials Engineer for Caltrans' District 11, San Diego, has been re-assigned as the new Project Manager for this major effort.

This "joint" program will offer standardized training and certification jointly for both

Caltrans and Industry technicians in the testing of soils and aggregates, hot mix asphalt (HMA) and portland cement concrete (PCC) with the objectives of:

- providing highly skilled, knowledgeable materials sampling and testing technicians
- promoting uniformity and consistency in testing

Continued, next page

- providing quality improvement
- creating a harmonious working atmosphere between public and private employees based upon trust, open communication, and equality of certification.

The JTCP program will require field testers to participate in training classes, take a written test and perform the lab tests 'hands on' in the presence of a Caltrans Independent Assurance representative. Currently there is no provision for the joint training and certification of both Caltrans and Industry technicians. The new program will also be open to technicians from local agency labs.

For Phase 1 of the program, an interagency agreement was set up with California State University, Long Beach (CSULB), to develop the training curriculum for the HMA I, HMA II, soils and aggregate modules. For PCC, the existing program of the American Concrete Institute

(ACI) will be used. Work on Phase 1, is continuing, under the leadership of Associate **Professor Shadi Saadeh, Ph.D.**

After the training curriculum is developed, Phase 2 will handle the implementation and execution of the program, involving training classes, written exams and hands-on proficiency testing of all technicians. CSULB will be leading this effort through an Interagency Agreement with Caltrans. The expectation is that approximately 1000 certifications will be issued per year through the program. Certifications will be good for 3 years. Two training and testing sites will be established – one in Southern California and one in Northern California. The training and testing will likely require about a 4-day time commitment of a technician.

For more information, contact **Al Ochoa** of Caltrans at: Al.ochoa@dot.ca.gov



Volunteers Needed to Explore New Funding for Roads

By Roger Smith, CP² Center

As we are all probably aware, the revenues currently available for highways and local roads are inadequate to preserve and maintain existing road infrastructure, reduce congestion and improve service. The old gas tax cannot meet California's funding needs because it continues to generate less revenue as cars become more fuel efficient. By 2030 as much as half of the revenue that could have been collected from the gas tax will be lost due to increased fuel efficiency of vehicles. So the State needs to explore other more sustainable transportation funding models.



'Road charging' is a funding mechanism whereby drivers pay to maintain the roads based on the miles they drive, often referred to as 'vehicle miles traveled' (VMT), instead of as a tax per gallon on the amount of gasoline they buy.

The California Road Charge Pilot program is a multi-year endeavor by Caltrans that strives to gain public input and feedback about their driving. The free pilot



program will give participants a variety of manual and technological choices for reporting the miles they travel, as well as a choice for submitting simulated payments.

The state is seeking 5,000 volunteers to participate in the pilot, which is set to launch in July 2016. They want a diverse group of participants - all ages, genders, races, income levels, vehicle types and parts of the state need to be represented. Applicants will be notified about their acceptance into the California Road Charge Pilot starting in May 2016.

To learn more about this pilot program and possibly volunteer go to: http://www.dot.ca.gov/road_charge/



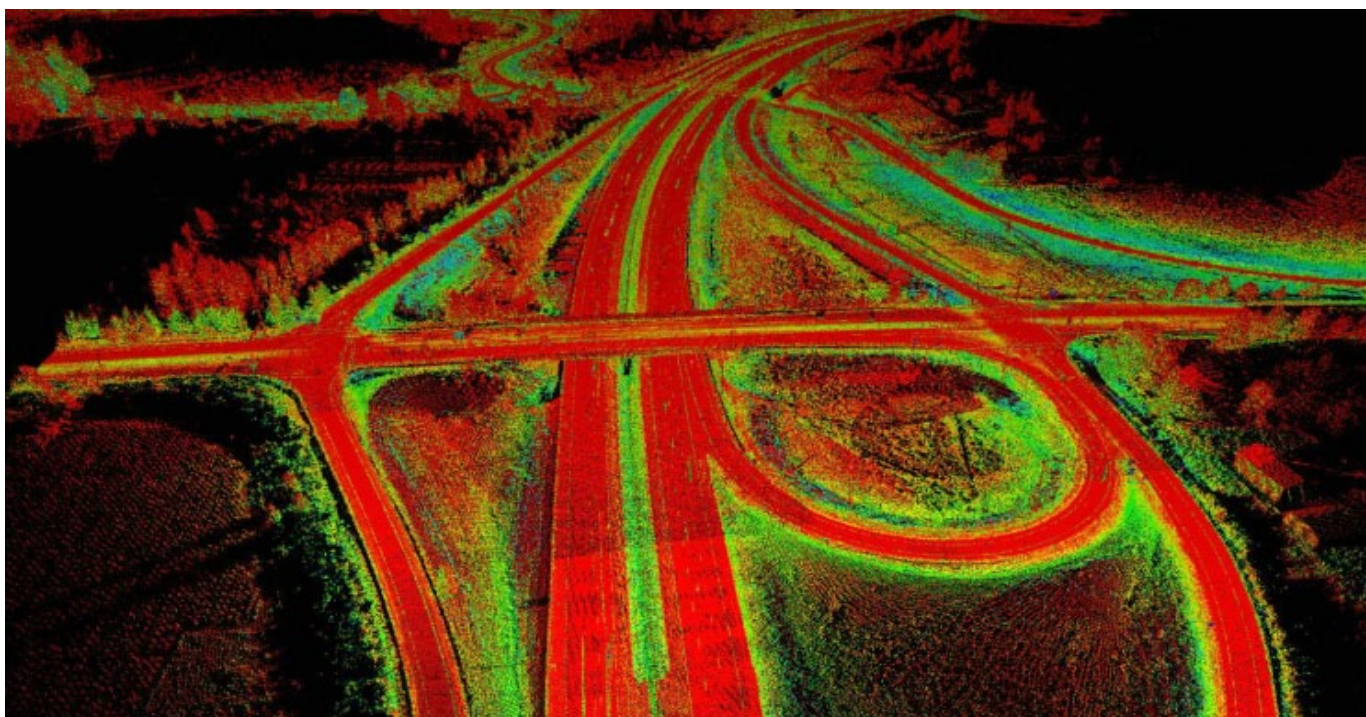
3-D Models

Three dimensional (3-D) engineered models are becoming a familiar practice in highway design and construction. Twenty-five state DOTs have pilot projects underway and 3-D engineered models are a standard practice in three states. Transportation agencies use 3-D models during pre-construction for public outreach and coordination with stakeholders. During design they are useful for collaboration between partners and utility location data management. During construction they are useful for inspection and quality control. Post construction, the 3-D files can make useful as-built records. If you'd like to learn more about

illuminates targets and measures distance with a laser scanner as it records three dimensional coordinates of each captured point. The final result is a high-resolution 3D map which has useful applications in planning, design, construction and maintenance of transportation infrastructure.

NCAT

The National Center for Asphalt Technology (NCAT) offers its research free of charge for public consumption. See the link below for numerous studies, including "Enhanced Compaction to Improve Durability and Extend Pavement Service Life: A Literature Review" and "Characterization of Asphalt Binder



LiD3D Technology Like LIDAR Can Be Used for Mapping and Surveying

3D engineered models for highways there is web-based training available at: <https://www.fhwa.dot.gov/construction/3d/wbt.cfm>. Caltrans has surveyed and developed 3-D models on over two hundred projects with their Mobile Terrestrial Laser Scanner. See the unit at work at: <https://www.youtube.com/watch?v=tRStYaExBFg&feature=youtu.be>

While you're learning 3-D technology, you might also consider reviewing NCHRP 748 "Guidelines for the use of Mobile LIDAR in Transportation Applications" at: <https://www.fhwa.dot.gov/construction/3d/hif16010.pdf>

Mobile 3D light detection and ranging (LiDAR) is a surveying technology that systematically

Extracted from Reclaimed Asphalt Shingles". <http://eng.auburn.edu/research/centers/ncat/info-pubs/technical-reports.html>

Tack Coats

Remember the Tack Coat Best Practices 1/2-day workshops co-sponsored by the Asphalt Institute and FHWA which occurred in Sacramento and Fontana in November 2015? If you missed it, you can still see a summary in the recently published Tech Brief on Tack Coat Best Practices at: http://www.fhwa.dot.gov/pavement/pub_details.cfm?id=981

For more information contact **Steve Healow** of FHWA in Sacramento at: steve.healow@dot.gov

FP2 National Update

By Jim Moulthrop, Foundation For Pavement Preservation (FP2)

As most of you reading this know, the Fixing America's Surface Transportation (FAST Act) was signed into law on December 4th, 2015 and authorizes \$305 Billion dollars over a 5-year period. This amount represents an over 2.3% increase in transportation spending over the previous bill, MAP-21. It also amounts to a substantial increase in the length of the legislation as compared to the 27-month MAP-21 act and previous continuing resolutions that spanned anywhere from two to six months. This, of course, is good news to contractors, material suppliers, equipment manufactures, and especially DOTs that now have a much longer planning horizon for securing funding for projects. The Foundation For Pavement Preservation (FP2) Inc. was active in Washington during the FAST Act deliberations, making sure that the provisions in MAP-21 relating to pavement preservation were not compromised. Now we can sit back and enjoy the fruits of our labor, right!

Hardly, if you followed the evolution of the legislation, you realize that the financing for the FAST Act amounted to capturing money from a variety of sources other than the Highway Trust Fund (HTF) including approximately \$75 Billion from the US general fund over the life of the bill. This funding may be fine for the 5-year life of the bill, but is not sustainable, and the HTF is again on the edge of a cliff. A myriad of "fixes" for the HTF - user-fee increases, vehicle mile traveled (VMT) assessment, etc. - have



been proposed over the years, but nothing has emerged as a "winner" to finally provide a stable funding source for the HTF.

As a result, FP2 Inc. continues to be involved in Washington assisting Congress to understand the cost benefits of pavement preservation and encouraging them to find ways to keep the HTF solvent, which will enable state and local agencies to better manage and plan for how to best utilize pavement preservation to get the most out of their surface transportation assets.

FP2 Inc. also continues to be involved as a funding partner in field research efforts to document and quantify the life extending benefits of pavement preservation treatments at NCAT and MN Road test site in Minnesota.

On a personal note, **Dr. R. Gary Hicks** from the CP2 Center nominated FP2 Inc. Executive Director **Jim Moulthrop** as an Honorary Member of the Association of Asphalt Paving Technologists (AAPT). The award was approved by the AAPT board of directors and was presented to Jim at their annual meeting in Indianapolis, IN, in March of this year.



Dr. Gary Hicks (left) introduced Jim Moulthrop (center) during the AAPT award presentation. Also shown is AAPT President, Dr. Geoff Rowe (right).

CP² Center Patrons Meeting, By Roger Smith and Gary Hicks, CP² Center

The California Pavement Preservation Center (CP²C) was established in 2006 at CSU, Chico, to provide assistance with the development and use of pavement preservation strategies. 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.

The Patrons Program, established in 2008, 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 2016 Patrons Meeting was held on May 31, 2016 at the Telfer Facility at Sacramento on the campus of the old McClellan Air Force Base. About 20 people attended – including

how they wanted to grow the program to include more work in the area of training and research. Special guest speakers were **Dana Davis**, President of Teichert Materials who described the role of industry in establishing and maintaining the Concrete Industry Management program at CSU, Chico, and **Jim Moulthrop**, Executive Director of the national Foundation For Pavement Preservation (FP²), who described the role of industry in promoting pavement preservation concepts nationally through advocacy, research and communications.

The general discussion of the benefits and needs of a Patrons program was led by **Ahmad Boura** and **Hope Shapiro** of the University's Advancement Office. They described how some recent efforts have resulted in major improvements to the concrete laboratories on campus. With the growing numbers of students using the CP² Center's state-of-the-art asphalt laboratory, it is expected the new concrete lab will also acquire new equipment to support additional CP² Center studies for concrete pavement preservation, such as with surface hardeners, dowel bar retrofit, and shrinkage studies.

The afternoon session consisted of breakout sessions to discuss the following:

- Vision for the Center over the next 5 years
- Role of the Patrons group and what changes are needed to make the program more successful
- Strategic plan development for the Center



Part of the Patrons Group Gathered on May 31

representatives for CSU, Chico. They were welcomed by Patron Program Co-Chairs, **Hans Ho** (Telfer Oil) and **Dr. Gary Hicks** (CP²C), and given an overview of the Center's activities by **Dr. Ding Cheng**, Director. Dr. Hicks also provided history and details of the Patrons Program and the cited the benefits of having a strong Patrons group. He also announced that **Scott Metcalf**, VP for Ergon, will be the incoming Industry Co-Chair.

Ricardo Jacquez, Dean of Engineering of CSU Chico and **Ding Cheng** provided a vision of the Center over the next 10 years. They indicated

As a follow-up to this meeting, we will be planning our 10th Anniversary celebrations in Chico on August 16, 2016 to show off our facilities and discuss our plans and goals for the next 5 years.

For more information on joining our Patrons Program, please contact Co-Chairs, **Dr. Gary Hicks** at rg Hicks@csuchico.edu and/or **Scott Metcalf** at scott.metcalf@ergon.com.

Information on the Program can also be found on the Center's website: <http://www.csuchico.edu/cp2c/>

Mark Your Calendar (Coming Events)

Maintenance Superintendents Association (MSA) Conference, Sept. 5-9, 2016 (Berkeley)

The MSA's 48th Annual Training Conference and Equipment Show" will be held at the Doubletree Hotel in on the water in Berkeley.

This popular and worthwhile event includes vendor displays and numerous training classes, most of which offer certifications, contact hours or CEU's. In addition to pavement topics, many other public works items will be featured.

For more information go to: www.mainsupt.com or www.sfmsa.com



- A forum for Regional Pavement Preservation Partnerships underwritten through the AASHTO Transportation System Preservation Technical Services Program (TSP-2).
- A national networking opportunity to share technology, experiences, and issues affecting agencies and industry alike.

For further details go to the Conference webpage: <http://nationalpavement2016.org/>



National Pavement Preservation Conference October 11-14, Nashville, TN

The NPPC is an opportunity to hear from experts in the pavement preservation field through plenary and technical sessions. The Conference offers:

- Opportunities to observe placement demonstrations for several types of pavement preservation treatments.
- Individual perspectives from leaders of industry, government, and academia about the need to protect our roadway investment through preservation



"Asphalt Pavement Maintenance For Local Agencies" (U.C. Berkeley / ITS Class) December 1, 2016 Rancho Cordova, CA

This popular half-day class, taught by **Roger Smith** of the CP2 Center, provides a solid working knowledge of the most common pavement maintenance and preservation practices. 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. Topics include pavement management systems, pavement distress types, asphalt materials, maintenance vs. rehabilitation concepts, repair options and common pavement maintenance / preservation strategies.

For more information go to: <https://registration.techtransfer.berkeley.edu/CourseStatus.awp?&course=162IDM041201>

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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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