



SB1 Funds Pave A "Road To Recovery"

By Russell W. Snyder, CAE - CalAPA



Here's a bit of good news, which seems in painfully short supply these days: Our roads are getting fixed at a rapid clip, resulting in a smoother and safer ride for everyone.

You may recall that the Legislature in 2017 passed SB1, authored by state Sen. Jim Beall, D-San Jose, known as the "Road Repair & Accountability Act." The most comprehensive transportation measure in decades, the bill included modest increases in fuel taxes and vehicle license fees to address our state's neglected and crumbling infrastructure. The last time California raised pump prices was when George Deukmejian was governor, and the buying power of those dollars had eroded by 50 percent. SB1 was projected to make a \$5 billion investment each year in our state and local roads, and included strict protections for transportation dollars, and transparency on how those dollars are spent.

SB1 was challenged at the ballot box in the form of Proposition 6 on the Nov. 6, 2018 ballot, but it was soundly defeated. Another measure, to add additional Constitutional protections on transportation dollars, Prop. 69, was approved by eight in 10 voters in June of 2018. Good roads are the ultimate bipartisan issue.

The entire state is starting to see the impact of those dollars as they turn into badly needed pavement rehabilitation projects. And in a thin silver lining in a pandemic year, less traffic experienced earlier this year has helped road construction crews accelerate work and complete projects early.

Most noticeable to motorists is the condition of pavements as they drive to work, run errands or other essential activities, often as they pass delivery trucks and other vehicles providing the essential goods and services to keep our economy functioning. These days pavement smoothness is measured with lasers and other high-tech equipment to international standards, and those measurements are showing clear progress. The state transportation department, Caltrans, recently reported it is well on its way to meeting its goal of bringing all major types

of routes – freeways, highways and rural routes – to good or fair condition by 2027. Repairs to bridges, tunnels and culverts are also making tangible progress, thanks to SB1.

The influx of dollars also has enabled Caltrans to deploy innovative design techniques. On Interstate 5 south of downtown, work is well underway on a \$370 million freeway reconstruction that includes a special "long-life asphalt" design strategy that will last 40 years or longer, and in a nod to sustainability, includes a substantial amount of recycled asphalt. It is a joint venture by two venerable contractors, Teichert Construction and Granite Construction, ultimately employing hundreds.

While the big projects grab all the headlines, smaller projects also are getting done. In another innovative joint venture, the University of California, Davis and the City of Davis are teaming up on a \$1 million

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project to rebuild a bicycle and pedestrian path connecting downtown to a massive student housing complex to the west. The Russell Boulevard-adjacent path is under construction now and will replace a well-worn route that resembles week-old lasagna.

The California Transportation Commission, meanwhile, on Dec. 2 approved another 56 projects valued at more than \$2 billion to advance more critical repairs and upgrades to roads and highways, which will keep an estimated 100,000 essential construction workers on the job for several years.

Overall, Caltrans says SB1 dollars will result in

the repair of more than 17,000 miles of pavement, 500 bridges, 55,000 culverts and 7,700 traffic operation systems that help reduce highway congestion, such as ramp meters, traffic cameras and electronic highway messaging signs. It is slow but steady progress, and a nice bit of good news these days. Or as the signs say, "Your Tax Dollars at Work."

For more information go to: www.calapa.net

Russell W. Snyder, CAE, is executive director of the California Asphalt Pavement Association (CalAPA). This article was reprinted with permission from the 2021 forecast issue of the CalAPA magazine, "California Asphalt."



Using RAP In Surface Treatments

By Greg Duncan, Applied Pavement Technology, Inc.

The asphalt paving industry has a long history of recycling asphalt pavements for use in new pavements. This practice has provided many benefits, including cost savings, reducing demand for new materials, and improved sustainability. Recently, the Federal Highway Administration (FHWA) completed a project to summarize the state-of-the-practice for the use of reclaimed asphalt pavement (RAP) in pavement preservation (P2) surface treatments. The recently published summary report includes case studies from agencies where RAP was used in surface treatments and provides guidance and specifications used by the agencies for design, construction, and quality assurance. Similar to the well-established benefits of using RAP in hot-mix asphalt, RAP is used in surface treatments because it reduces the reliance on virgin aggregate, meets sustainability goals for agencies, and can be supplied at a lower cost than virgin aggregate in some cases.

The report noted that using RAP in P2 surface treatments was most prevalent in Southern California, and two agencies that were highlighted in the case studies are Los Angeles County and San Bernardino County. Treatments using RAP include chip seals and slurry systems, which include slurry seals and microsurfacing. For RAP to be used in surface treatments, it must first be fractionated into coarse and fine portions. Because it was previously used in asphalt mixtures, RAP aggregate (RAGG) typically meets quality standards for soundness, abrasion, and angularity that are required for surface treatments. A key factor for using RAP in surface treatments is, 'Who owns the RAP?' If agencies 'own' and have a ready supply, they

can fractionate the materials and incorporate the product in treatments placed by their own forces. If agencies do not have a ready supply, then they are dependent on contractors to supply RAP for these treatments. In Southern California, market conditions exist for contractor-owned RAP supplies to be available to clients for surface treatments. The case studies show that treatments have been placed very successfully with agencies, sometimes realizing a 30 percent savings in delivered aggregate cost.

For chips seals, RAGG can be crushed and screened to meet chip gradation requirements. As shown in Figure 1, RAGG chips have smaller fragments adhered and may be mistaken for "dirty" aggregate. Gradation requirements are most often specified as a washed gradation rather than after extraction. RAGG chip seals have been used with almost no modifications required to design and construction processes. The asphalt coating on the RAGG increases the bond between the asphalt binder and the aggregate.



Figure 1. RAP chips with a partial coating of asphalt (Source: FHWA)

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RAGG chip seals also have a darker color than virgin aggregate and agencies report higher contrast with pavement markings as one of the RAGG treatment benefits (see Figure 2). Compatibility between the asphalt binder and RAGG is still a key concern, so emulsion suppliers should be consulted to ensure no conflicts occur.



Figure 2. Color difference between chip seals using RAGG and virgin aggregate (Source: FHWA)

Including RAP in slurry systems is more complicated because of the interaction between asphalt binder and the coated aggregate particles. As with the RAGG coating in chips seals, the asphalt coating reduces the effective exposed aggregate surface area and reduces the reactivity within the system. Agencies test the RAP gradation 'as received' and after extracting the asphalt from the RAP material. Because conglomerate RAGG particles separate during the extraction process, the gradation band may be expanded slightly to accommodate differences. As shown in Figure 3, the fine fraction of RAGG is used in the laboratory to conduct the slurry mixture design tests that are typically recommended by the International Slurry Surfacing Association (ISSA) and agency specifications.



Figure 3. Fine RAP materials (Source: FHWA)

Minor reductions in new asphalt emulsion required can be achieved using RAGG fines, and the chemistry within the system typically requires some adjustment to maintain similar set and cure times for the treatment. Reductions of 1.5 to 2.0 percent asphalt emulsion can be achieved if 100 percent of virgin aggregate is replaced by RAGG. It's important for asphalt suppliers to be involved in the mix design for slurry systems when incorporating RAP so the interaction of the binders can be observed during the mix design process and predicted.

Overall, the report provides examples of how RAP is being incorporated into pavement preservation surface treatments. It shows how agencies and contractors are modifying their approaches through practices and specifications to address the performance implications of replacing virgin aggregate with RAP in surface treatments.

For more information you can access the published report at the following web link:

<https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/21007/index.cfm>



Caltrans Nighttime Slurry Project Wins Award

By Jeff Roberts, VSS International

The International Road Federation (IRF) has announced that the "Pacific Coast Highway – South Los Angeles Project", a Caltrans slurry project performed by VSS International, Inc. of West Sacramento, California, has won the 2020 Global Road Achievement Award (GRAA) in the category of "Asset Preservation & Maintenance Management." The award was presented to VSS International, Inc. on November 13th at the 2020 IRF Global R2T Conference. This project also won the 2020 President's Award from the International Slurry Surfacing Association (ISSA).

This award-winning section of the Pacific Coast Highway (PCH) stretched 22 miles from Seal Beach north to Artesia Boulevard in Los Angeles County consisting of over 130 lane miles. Located in the heart of south Los Angeles County with a surrounding population of almost 10 million people, this roadway functions as one of the most heavily traveled routes in the area, with approximately 80,000 vehicles per day, serving the Port of Long Beach and many local commercial districts.

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Nighttime Slurry Seal Placement on PCH

With a final contract value of \$5,617,120, this Caltrans contract required nighttime placement of approximately 8 million square feet of slurry seal under intense working conditions. All work was performed between 9 PM and 6 AM, with all lanes open to traffic by 6 AM every day. Because of the cooler nighttime placement, an 'engineered' slurry mix involving higher polymer content was used.

The IRF's awards program is recognized around the globe as a prestigious industry accolade, and serves as a reminder to a much wider



PCH After Slurry Seal

audience that the mobility everyone takes for granted would not be possible without the talent and commitment of our global road building industry. By winning this award, Caltrans and VSS International, Inc. have joined an elite group of GRAA winners whose exemplary projects have been recognized by their peers for their excellence, innovation, and societal impacts. Projects like the PCH project serve as a model of inspiration for others in the road and transport sector.

For more information contact Jeff Roberts (VSS) at: jeff.roberts@slurry.com or go to: www.slurry.com



AMAP Annual Conference Highlights

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



From Feb 9-11, 2021, the Association of Modified Asphalt Producers (AMAP) held its 22nd annual conference, this time in virtual mode because of the pandemic. Over 500 attendees from throughout the world participated in this 3-day event. More impressive was that well over 200 of the group were from agencies, and there were nearly 40 international participants. The theme for this year's Conference was "Modifiers Make It Happen".

Day 1 consisted of a series of international presentations discussing materials and specifications used in Europe, Russia, South Africa, Latin America, the Middle East and Asia Pacifica. It was concluded with a presentation on Transportation Policy in the USA. Day 2 consisted of two virtual room's one dealing with highways (funding, legislation, materials, mix design, recycling, and a 20-year warranty project) with the other dealing with roofing applications and equipment. Day 3 also consisted of two virtual rooms, one dealing with airport applications, asphalt research, and

pavement preservation, while the other dealt with asphalt modifications using a variety of products. All of the presentation can be found at <https://www.modifiedasphalt.org/2021-amay-conference-video-presentations/>. Selected highlights of some of the 40 or so presentations are summarized below:

- AMAP President **Everett Crews** welcomed the record crowd and discussed the health of the Association. Membership has doubled in the past five years and the number of email contacts has increased to 8500. In coming years, the focus of the Association will be on durability, sustainability and emissions.
- **Alison Black**, Vice President of ARTBA, talked about the effect of the pandemic on agency shortfalls, drops in transportation demand, record high work in 2021, and the funding forecast for 2021. The funding will depend on what federal agencies do with the FAST Act and annual appropriations. State and local agencies are coming up with more funding due to adjusted motor fuel taxes, bonds, and ballot initiatives

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- Jay Hansen, Vice President of NAPA, discussed federal funding from the FAST Act as well as research funding of asphalt pavements and plastics in asphalts mixes. He also discussed President Biden's "Build Back Better" program, and how COVID will be addressed first, then the proposed infrastructure plan, and how it would be paid. He also mentioned the President's climate change executive order and some of its contents, including net zero GHG by 2050, made in America, prevailing wages, and environmental justice. The asphalt industry is working on a roadmap to address these issues, which includes applied research to assist with the reduction in GHG.
- Peter Grass, President of the Asphalt Institute, summarized asphalt production data, imports, plastics in asphalt, and training that the Institute is delivering. The training website is <http://www.asphaltinstitute.org/training/>. He also shared reports on plastics in asphalts, jointly funded by the Institute and NAPA, that can be found at <http://www.asphaltinstitute.org/engineering/plastics-in-asphalt/>
- Jim Moulthrop, Executive Director of the Foundation for Pavement Preservation (FP2), moderated a session on pavement preservation. Four presentations were included in this session. The first was by Judy Corley Lay, Director of the National Center for Pavement Preservation, on "What is pavement preservation?" She defined pavement preservation, public expectations, discussed treatment selection, economic analysis and sustainability. Erik Thibodeau, Chief of the New Hampshire DOT

Pavement Management Section, discussed "Pavement Management and Pavement Preservation?" His talk included types of data to be collected, how to collect it, reporting, and analysis of the data. David Peshkin, Vice President of Applied Pavement Technology, talked about "Choosing the right treatment for the right road." He focused on treatment selection, life extension associated with preservation treatments, treatment characteristics and capabilities, treatment costs and benefits, and determination of whether the project is suitable for preservation treatments by using cores and deflection testing. The final speaker was Tim Harrawood, President of FP2, who discussed "Flexible pavement preservation treatments." He discussed the description and benefits, when and where to use them, and life extension for fog seals, crack sealing, slurry seals, micro surfacing, chip seals, Cape seals, scrub seals, and thin HMA overlays.

A conference wrap up was given by outgoing AMAP President, Everett Crews of Ingevity. He introduced incoming AMAP President, Kevin McGlumphy of Associated Asphalt Partners. The next meeting of AMAP will be in Houston, Texas on February 1-3, 2022. Currently, it will be 'in-person' and have a virtual component.

For those interested in learning more about AMAP or becoming a member please check out their website at: www.modifiedasphalt.org or contact Jim Sattler at: jimsattler@modifiedasphalt.org. Their next workshop is scheduled for April 27, 2021.



Environmental Product Declarations

By Andrew Braham, U. of Arkansas, for PPRA

Multiple agencies are moving toward incorporating and even requiring Environmental Product Declarations (EPD) for civil engineering materials. For example, Caltrans performed multiple pilot projects in 2019 implementing EPD's with aggregate, hot mix asphalt, and portland cement concrete. There is a chance that California may require EPD's for a wider range of civil engineering materials, based on a minimum Global Warming Potential level, as soon as July 1, 2021. Therefore, the Pavement Preservation Recycling Alliance (PPRA) is working toward developing

an EPD for asphalt emulsion. The EPD will be a "cradle to gate" analysis, from raw material extraction through asphalt emulsion material production. It is anticipated that developing an EPD for asphalt emulsion will be the first step toward developing EPDs for asphalt emulsion based maintenance and rehabilitation treatments.

However, an EPD cannot simply be written, it is part of a sequence. In fact, it is the last step in a three step sequence. Before an EPD can be written, a Life Cycle Assessment (LCA) must be performed, and a Product

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Category Rule (PCR) must be written. Since there is no existing PCR for asphalt emulsion, the LCA is being performed first, which will 'inform' the development of the PCR. Once the LCA has been performed and the PCR has been written, the EPD can be written. This is shown in Figure 1.



Figure 1. Moving from an LCA to a PCR to an EPD (if a PCR does not exist)

An LCA involves compiling and quantifying the inputs and outputs of five life-cycle stages: 1) raw material acquisition, 2) material production, 3) construction, 4) use, and 5) end of life. Inputs to these stages include the manufacturing, the transportation, and the maintenance in all facets, while the outputs to these stages include fuel and electricity consumption, waste generation, and air emissions. This compilation and quantification is called the Life Cycle Inventory (LCI).

After the LCI is completed, the next step of the LCA is to perform a Life Cycle Impact Assessment (LCIA). An LCIA translates the environmental flows (the fuel and electricity consumption, waste generation, and air emissions) to environmental and human 'impacts'. These impacts include depletion of resources, decreases of human health, and damage to the ecosystem. Categories within the LCIA include energy use, resource use, emissions, toxicity, fresh water use, and hazardous waste. With the LCI and LCIA performed, the LCA can be determined.

An LCA is defined by two ISO (International Organization for Standardization) standards. ISO 14040 lays out the LCA principles and framework, while ISO 14044 provides the LCA requirements and guidelines.

As discussed earlier, since asphalt emulsion does not have a PCR, the LCA is being started before the PCR is written. The LCA being performed by PPRA will be a national average LCA for asphalt emulsion, which will produce a national average EPD. However, once the PCR is written, new LCAs can be written. So, for example, if California requires EPDs from specific asphalt emulsion manufacturing facilities, the PCR

being developed by PPRA may be used to perform a facility-specific LCA, which can then produce a facility-specific EPD. Therefore, developing a robust PCR is absolutely essential, which is why the first LCA on asphalt emulsion will be used to 'inform' the PCR. The PCR is defined by ISO 14025, and is a "set of specific rules, requirements, and guidelines for developing Type III environmental declarations for one or more product categories."

Finally, with the LCA and PCR established, PPRA will be able to produce a national average EPD for asphalt emulsion manufacturing. I think of an EPD as a 'Safety Data Sheet (SDS) for the environment'. Therefore, information on emissions and energy use are highlighted. Common emissions include global warming potential, fossil (kg of CO₂eq), depletion potential of the stratospheric ozone layer (kg of CFC-11 equivalents), acidification potential of land and water resources (kg of SO₂ equivalents), eutrophication potential (kg of N equivalents), and smog formation potential (kg of O₃ equivalents). Therefore, for every gallon, short ton, or any other chosen unit, the emissions generated for asphalt emulsion can be quantified.

In addition, energy use is reported in terms of renewable and nonrenewable primary and secondary energy sources. With these pieces of information, the environmental impact of asphalt emulsion will be quantified.

The development of LCAs, a PCR, and EPDs for asphalt emulsion provide a clear path forward to achieving the environmental pillar of sustainability in regards to asphalt emulsion, pavement preservation, pavement maintenance, and pavement rehabilitation. The environmental pillar, along with the economic pillar and the social pillar, allow agencies and companies to establish clear sustainable goals and levels of achievement.

Useful resources:

Asphalt institute (Life Cycle Assessment of asphalt binder): <http://www.asphaltinstitute.org/engineering/lca-study-on-asphalt-binders/>

National Asphalt Pavement Association LCA and PCR, with example EPDs: <https://www.asphaltpavement.org/programs/napa-programs/emerald-eco-label>

Federal Highway Administration sustainability resources: <https://www.fhwa.dot.gov/pavement/sustainability/>

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AASHTO ETF Update

By Colin Franco (RI DOT) and R. Gary Hicks (CP² Center)

The American Association of State Highway and Transportation Officials (AASHTO) TSP-2 Emulsion Task Force (ETF) continues to work on developing material specifications, design practices, quality assurance specifications, and construction guides for all emulsion-based pavement preservation treatments. Many of the materials specifications and design practices have already been approved and published by AASHTO. The construction guides for chip seals, micro surfacing, and fog seals, developed under NCHRP Project 14-37, were submitted to the AASHTO Committee on Material and Pavements Technical Subcommittee 5b (COMP TS 5b) for balloting in November 2020. Subcommittee Chairman Larry Ilg (Oregon DOT) passed these guides. Other guides are being developed through NCHRP Project 14-43 "Construction Guide Specifications for Cold Central Plant Recycling and Cold In-Place Recycling" by NCAT, and NCHRP Project 14-44 "Guide Specifications for the Construction of Slurry Seals, Scrub Seals, and Tack Coats" by the University of Arkansas.



Chip seal placement

Quality Assurance Guides

Another ETF effort underway is the development of Quality Assurance (QA) guides for chip seals and slurry systems (slurry seals and micro surfacing). These include sections on quality control, agency acceptance and independent assurance. The guides were submitted to AASHTO COMP TS 5c Chairman Curt Turgeon (Minnesota DOT) for balloting in November 2020 and were approved. Quality assurance guides will need to be developed for all the other treatments in the future. It is not clear

at this time whether NCHRP or the ETF will develop these guides.

Research

A 'research needs' statement proposed by the ETF resulted in the approval of NCHRP Project 9-63. The project, "A Calibrated and Validated National Performance-Related Specification for Emulsified Asphalt Binder", continues its work to develop and validate a performance graded (PG) specification for asphalt emulsions. This will involve developing a recovery method for obtaining an emulsion's residual asphalt, and a suite of tests which relate to the performance of emulsion treatments like chip seals, slurry surfacing systems and others. The project is being performed by the Asphalt Institute (AI) and NCAT under the leadership of Mike Anderson of the AI. The Phase 1 report was submitted, which lays out the work plan for the Phase 2 effort. Issues being addressed in Phase 2 include the recovery method for the asphalt residue, the low and intermediate properties for the residue, which relate to performance, and the effects of polymer in the binder. The project is expected to be completed in 2022.

The ETF has also developed and is requesting the endorsement of an important research problem statement on the topic of "Developing Performance and Safety Specifications for Rejuvenating Seals". The proposed research is intended to answer how to measure and quantify the performance of rejuvenating seals in the laboratory and field.

Accepted 'Best Practices'

'Best practices' documents for emulsified asphalt chip seals and slurry systems were started in 2020. The chip seal 'best practices' document is now complete and should be published in the Spring, while the 'best practices' for slurry systems is in final review, with expected completion in March. The publication date for slurry systems has not yet been determined.

Implementation Project

The 'best practice' documents will be used in NCHRP Project 20-44(26) "Implementing Guide Specifications for the Construction of Chip Seals, Micro Surfacing, Continued, next page

and Fog Seals” to facilitate the use of the new AASHTO standard specifications and guides. This project started in October 2020 with an initial priority of developing an appropriate message about the importance of adopting these specifications and guides. The project will also include an outreach to state and local agencies, free training, and construction of at least 12 demonstration projects. The contract is being executed under the leadership of Larry Galehouse of the National Center for Pavement Preservation (NCP) with support by the AASHTO ETF. The project recently received results from a questionnaire of state and local agencies. One of the questions asked, “If your agency has a project programmed in calendar year 2021 or 2022 for either a chip seal, micro surfacing, and/or fog seal, would your agency be interested in using all or part of the new standards in a demonstration project?” Initial response to this question found that 59% of the agencies queried were interested in hosting a project. If any state or local agency is interested in participating in the construction of a demonstration project, please contact

Larry Galehouse at galehou3@egr.msu.edu. Free training and assistance with the assembly of project contract documents will be available upon request. All specification final drafts can be found at the ETF website located at: <http://tsp2-etf.org/>.

Certification

The ETF also is endorsing a “National AASHTO Certification Initiative”, where individual practitioners and companies can get certified in all aspects of design and construction of emulsion-based pavement preservation treatments. It is extremely important to have a consistent education and training syllabus for each treatment that can be taught by capable individuals and institutions. More information about the National Certification process can be found at <https://www.tsp2.org/certification-information/>

For more information on any of the AASHTO ETF current or planned activities please contact Colin Franco at colin.franco@dot.ri.gov



IGGA Technical Session Highlights

The International Grinding & Grooving Association (IGGA) Annual Meeting, held online, included a Technical Session with presentations on surface maintenance strategies for concrete pavement. John Roberts of IGGA played host for the event. Videos of the presentations can be found at: www.igga.net

Recent successes with diamond grinding of concrete pavements in the urban Phoenix area were presented by Randy Everett of the Arizona DOT. After earlier problems with excessive tire noise from transversely tined concrete, ADOT implemented a successful program in 2003 of overlaying the concrete with a 1” layer of noise-reducing rubberized asphalt friction course (AR-ACFC). But as those overlays reached the end of their service life and showed signs of spalling or raveling, ADOT began to look at other long-term solutions. They settled on full removal of the asphalt layer and diamond grinding the exposed concrete as the final wearing surface. They feel this strategy is fulfilling their 3-prong goal of smooth, quiet and aesthetically pleasing pavement, and will save them almost \$4 billion over the next 30 years.

“Super Smooth” asphalt pavement reconstruction was the topic of a presentation

By Roger Smith, CP² Center



Grinding PCC in Arizona

by Jay Thompson of South Carolina’s SEPI, Inc.. Highlighted was a project on SR544 in South Carolina where 5 inches of the old deteriorating asphalt pavement, on cement treated base, was removed by milling and replaced by 5 inches of new HMA, placed in a single thick lift. Such a thick lift makes it difficult to attain smoothness. Added to that was the fact the paving was done in cooler “winter” season, and at night. To help facilitate the paving, warm mix asphalt (WMA) additives were used in the mix. But in order to ensure smoothness on this unseasonal paving project, the state DOT included a requirement for diamond grinding of the final surface to meet a smoothness requirement, in terms of IRI, of 70 inches/mile or less.

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The spec included provisions for stepped pay bonuses of up to 7% for low IRI's. The contractor was able to consistently attain IRI numbers in the 20 to 30 range.

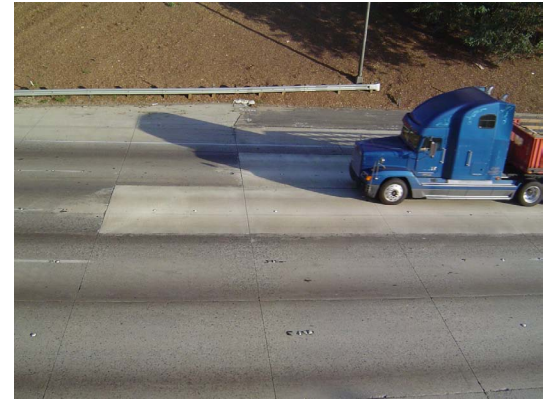


Slab replacement with RSC

Long-term performance of rapid strength concrete slabs in California was addressed by Dr. Mike Darter of Applied Research Associates. Rapid strength concrete (RSC) has been used By Caltrans for slab replacement work since the 1990's utilizing many different materials. This study looked at 4x4 concrete and CTS cement concrete . Construction is typically done at night beginning at 11pm with opening to traffic at 5am, with the RSC required to meet a 400 psi strength. Dr. Darter pulled together data from various Caltrans studies on 6 pavement sites evaluated in 2018. Two repair scenarios were used: 1. individual slab replacement, and 2. lengthier

"lane replacement" involving thicker concrete (12"-14") with 14-foot joint pacing with dowel bars and replacement of the base material. All sites studied involved lanes with very heavy truck traffic. Both strategies showed excellent performance, with the lane replacement approach performing slightly better in terms of long term fatigue cracking. Both approaches also performed well from the durability standpoint. These evaluations have led to the general conclusion that RSC can offer excellent long term performance under very heavy truck traffic, and can be used with confidence for overnight slab replacement work.

Other recommendations included requiring dowel bars, diamond grinding and including durability criteria as part of the specifications for the work.



New RSC slabs under heavy trucks

Disposal and possible beneficial uses of concrete grinding residue (CGR) was discussed by Dr. Halil Ceylan of Iowa State University (ISU). The study involved a survey of all state DOT's and also a research testing program. The survey disclosed various DOT practices ranging from no regulation, to rules for onsite spreading, to the requirement for disposal in a waste pond. Often detailed specifications were lacking.

ISU's work also involved a controlled test site to evaluate the effects of different concentrations of CGR (up to 40%) on soil properties and plant growth. General preliminary findings were that plant growth (density) can be impacted at higher application rates, and that soil properties are not significantly affected at spread rates up to 40 tons/acre. A third part of their work evaluated CGR solids as an amendment for unpaved shoulders – both in a mixed-in process and as a surface application. They found there could be some strength benefits, but obtaining the solids, by removal of the liquid (water), could pose a challenge in a production setting. Several reports are available and were cited by Dr. Ceylan in the presentation.

Videos of all four of these presentations can be found at: www.igga.net



CCPIC Update

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



The City and County Pavement Improvement Center (CCPIC) was officially formed in 2018 to work with local governments to increase

pavement technical capability through timely, relevant, and practical support, training, outreach and research. The vision for the Center is to make local government-managed pavements last longer, cost less, and be more sustainable.

The scope of the Center is to:

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- Increase knowledge through training, peer-to-peer exchanges, and tech briefs
- Develop sample specifications and other resources,
- Establish a pavement engineering and management certificate program, and
- Serve as a resource, research and development center.

CCPIC is currently supported by SB-1 (fuel tax) funds provided to the University of California, and to the California State Universities. UC Davis, UC Berkeley, CSU Chico, CSU Long Beach, Cal Poly San Luis Obispo, and CSU San Jose (Mineta Transportation Institute) are all involved with CCPIC.

The following provides an update on recent accomplishments and future plans of the CCPIC.

1. Training-CCPIC plans to continue to offer an online option for all classes as this virtual format has become so successful during the COVID period with high enrollment numbers. A 'group discount rate' on training courses is now available to agencies. When one person registers at full price, they will receive a discount code that they can share with up to 5 colleagues from the same agency to register for the same class at half-price. Classes currently open for enrollment in 2021 include:

- CCA-01 Introduction to Pavement Engineering and Management, July 19-22
- CCB-02 Pavement Management Systems and Preservation Strategies, April 19-26
- CCC-02 Asphalt Pavement Preservation Treatments, Materials, Construction and Quality Assurance, June 21-24

New classes and topics planned for 2021 and beyond include:

- CCC-01 Asphalt Concrete Materials and Mix Design (summer 2021)
- CCC-03 Pavement and Hardscape Construction Specifications and Quality Control Management (fall 2021)
- Paving inspection (2022)
- Concrete materials (2022)
- In-place recycling (2022)
- Gravel roads engineering, construction, and management (2022)

We are adding classes to the schedule on a regular basis. Please check this site for the

latest offerings: www.techtransfer.berkeley.edu/schedule

2. Technical guidance and tools- Efforts completed or underway include:

- Tech Briefs on 'Best Practices' for pavement work
- Writing and enforcing specifications for asphalt compaction (completed and posted)
- Writing concrete mix specifications to improve durability and sustainability (completed and posted)
- 'Unpaving' to Create Affordable, Safe, Smooth Gravel Roads (completed and posted)
- Pavement Condition Index (completed and posted)
- Tools and Model Specifications
- Pavement life cycle cost analysis spreadsheet software (completed and posted)
- Asphalt Compaction Model Specification Language (completed and posted)
- Concrete Pavement Model Specification Language (completed and posted)
- Superpave Mix Design for Local Government (SPLG) (draft completed; undergoing review and revision with industry and local governments; expected completion in March 2021)

Tack coat specification (near completion)

All posted guidance and tools are on the CCPIC website: www.ucprc.ucdavis.edu/ccpic.

Efforts currently planned for 2021 included

- 'RAP 101' Tech Brief
- Economic analysis of improvements in local agency pavement practices
- Environmental life cycle assessment for local governments

3. Resource Centers-Recent activities for the three resources centers (Northern, Central, and Southern California) have been somewhat hampered by COVID 19, but all presentations made can be found on the CCPIC website. If interested in a presentation, please let the CCPIC know by sending an email with the subject "Resource Center Presentation" to ccpic@ucdavis.edu. Presentations can be on the best practices, technical guides and tools or other related items.

Continued, next page

The CCPIC is also working to develop a contact list of people responsible for pavement in the cities and counties in the state. The list will be used to provide targeted information regarding upcoming training and other activities and gather input regarding technical information. We are looking for informal self-identification. To get on the list send an email to ccpic@ucdavis.edu with the subject "Pavement Contact Person" and provide your name and contact

information, as well as a short note about what your pavement responsibilities are. The information will only be used for official CCPIC outreach activities.

For more information on the CCPIC activities please go to our website at: <http://www.ucprc.ucdavis.edu/ccpic/> or email us at: ccpic@ucdavis.edu.



WRAPP Update



The Western Region Association for Pavement Preservation (WRAPP) reports that membership has voted to keep the 2020 board on for another year.

In lieu of the conference, WRAPP will be offering virtual trainings all throughout 2021 to its membership starting in late February. Topics such as: Mix Designs, Specifications, Chip Seals, Multi-layer lifts, Micro/Slurry, Aggregates, Emulsions and even some virtual demonstrations.

WRAPP will continue to provide pavement preservation trainings for Caltrans as well

By: Cesar Lara, WRAPP President

throughout the year.

We are happy to report that WRAPP has also been accepted as a member at the ATG level of Caltrans. Scott Dmytrow with Prism Worldwide will be the Association's representative. The group is working hard with Caltrans to finalize the Section 37 ("Bituminous Seals") of their Standard Specifications.

Dates will soon be announced for our virtual webinars!

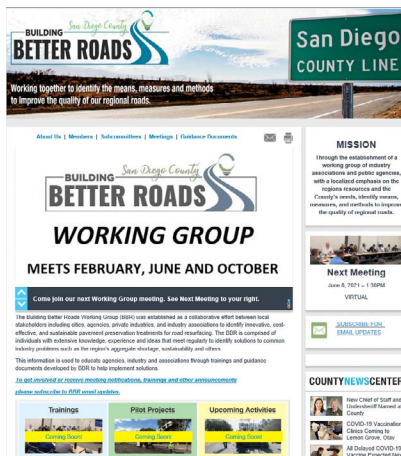
For more information contact Cesar Lara at: clara@ghirardelliassoc.com

or go to: www.wrapp.org



BBRWG Releases New Website

The Building Better Roads Working Group (BBRWG) has engaged industries, agencies, and associations to identify pavement preservation challenges and solutions throughout the San Diego region. Over the past two years, BBRWG has organized numerous meetings and workshops to share knowledge and provide educational opportunities and leadership on a number of topics. BBRWG continues to focus on regional priorities including reclaimed asphalt pavement (RAP) uses, paving mix types, maintenance innovations, and contracting strategies.



BBRWG Website Page

BBRWG is excited to announce the release of a new website with greater functionality and content. Meeting agendas, presentations, notes and trainings are now just a click away. <https://www.sandiegocounty.gov/content/sdc/dpw/roads/building-better-roads.html>

By Keith Kezer, San Diego County

they are finalized in an effort to support local agencies in the implementation of innovative pavement preservation techniques and solutions.

Along with the website, BBRWG has also introduced a new e-mail subscription service. Simply click the link and sign up to receive information about meetings and training opportunities, and to stay current with BBRWG progress and initiatives. Supporting web pages will be coming soon with information on training opportunities that are available through BBRWG and other organizations, pilot projects that are being conducted in the San Diego Region, and other activities.

Looking forward, the BBRWG will remain engaged with stakeholders, continue to implement pilot tests, and hold virtual meetings to continue this essential program to identify innovative and cost-effective pavement preservation treatments for the San Diego region.

For more information, please contact Keith Kezer with the County of San Diego at keith.kezer@sdcounty.ca.gov.



The first Guidance Document on RAP and reclaimed concrete pavement storage time limits is already available on the website. Other Guidance Documents will be posted as



The Metropolitan Transportation Commission (MTC) in the Bay Area has released a new "Technical Brief Note" related to the effects

of climate on pavement performance predictions. Pavement performance models are used in the StreetSaver® decision support software to predict the future pavement condition, identify needed treatments, and estimate budget needs over a period of time. Reliable pavement performance models are essential to support making cost-effective decisions for a pavement network. StreetSaver® performance models project the Pavement Condition Index (PCI) of individual management sections as a function of the age, and they are adjusted for individual sections after condition surveys and treatment applications. Climatic and environmental conditions influence the pavement performance, rate of deterioration of pavements. They also affect the performance and scheduling of maintenance and rehabilitation treatments. PCI family curves for different climatic zones were developed for use the StreetSaver® decision support software.

PCI-Age data sets from agencies using StreetSaver® located in four climatic regions in the United States were gathered for the analysis. The four climatic regions, (1) Dry, Freeze; (2) Dry, Non-Freeze; (3) Wet, Freeze; and (4) Wet, Non-Freeze, are shown in Figure 1.

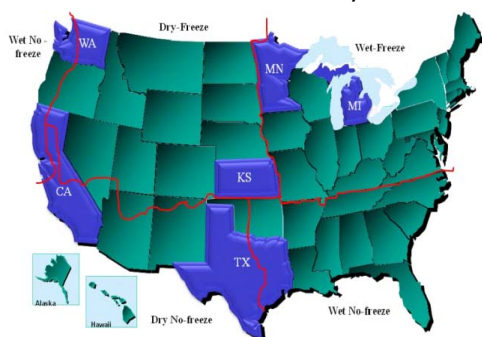


Figure 1. LTPP Climatic Zone Map

A total of 1,328,008 PCI-age historical records of field condition surveys were analyzed from 547 agencies using StreetSaver®. PCI-age records used in the study include only condition surveys field inspections after treatment and maintenance interventions. For each functional

class, PCI-age data was grouped by pavement surface type: Asphalt Concrete (AC), Asphalt Concrete/Asphalt Concrete (AC/AC), Asphalt Concrete/Portland Cement Concrete (AC/PCC), Portland Cement Concrete (PCC) and Surface Treatment (ST).

PCI climatic family curves were developed for each functional class and surface type family. As shown in Figure 2, different performance

curves were found for each of the climatic zones for the same pavement functional class-surface type family. In general, the pavements located in freeze climatic zones exhibited shorter lifespans than those located in non-freeze climatic zones.

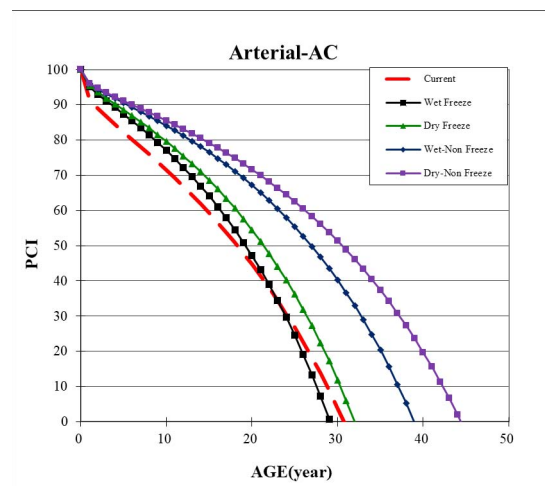


Figure 2. PCI Climatic Family Curves for Arterial AC

The PCI family climatic curves will provide more accurate projections of the pavement condition. Consequently, the identification of maintenance and rehabilitation treatment needs and timing for the interventions will be better related to the pavement deterioration rate in each climatic zone.

The implementation of the PCI climatic family curves should lead to better inform pavement management decisions. However, pavement deterioration is affected by several factors and PCI projections using the PCI family curves should be adjusted for individual pavement sections. StreetSaver® has procedures to incorporate feedback from field inspections in the PCI projection for individual sections. Maintenance and rehabilitation treatments will also influence the PCI projections by potentially modifying the deterioration rate and the extending the service life. It is recommended to review the pavement family curves periodically as more data becomes available, and update the procedures to adjust PCI projections for individual sections based on visual inspections and maintenance and rehabilitation records.

The complete Technical Brief Note can be found at: <https://streetsaver.com/best-practices/white-papers>. For more information contact Sui Tan at: stan@bayareametro.gov



FHWA Update

Enhancing Durability of Asphalt Pavements Through Increased In-place Density

In-place density is one of the most important factors that can influence the performance of an asphalt pavement. FHWA has published a series of four Technical Briefs, which provide an overview of FHWA's demonstration project on Enhancing Durability of Asphalt Pavements Through Increased In-place Density, including, key overall observations, and related specifications examples. The overall objective of the demonstration project was to show that additional density could be obtained through improved construction techniques. The information used to develop the Briefs was based on the review of the technical literature, a series of workshops, and support of 29 field demonstration projects performed by State Departments of Transportation (DOTs).

The series of four Technical Briefs are as follows:

- Density Demonstration Projects and Related Specifications <https://www.fhwa.dot.gov/pavement/asphalt/pubs/hif21020.pdf>
- Techniques and Tools for Improving Density <https://www.fhwa.dot.gov/pavement/asphalt/pubs/hif21021.pdf>
- Obstacles to Achieving Density <https://www.fhwa.dot.gov/pavement/asphalt/pubs/hif21022.pdf>
- Improving Longitudinal Joint Performance <https://www.fhwa.dot.gov/pavement/asphalt/pubs/hif21023.pdf>

By Chu Wei, FHWA – Sacramento

The four Technical Briefs are available on the FHWA pavement website at: <https://www.fhwa.dot.gov/pavement/asphalt/density/index.cfm>.

Asphalt Mixture Performance Tester (AMPT)

As part of FHWA's continued support of Balanced Mix Design (BMD), the AMPT is a testing machine specifically designed to measure asphalt mixture engineering properties. FHWA published four YouTube videos on the AMPT specimen preparation, dynamic modulus testing, cyclic fatigue testing, and stress sweep rutting testing. These videos provide information for agencies and industry on conducting asphalt performance tests, which can be used in the mix design process to better determine the durability and performance of the asphalt pavement. You can access the YouTube videos here: https://www.youtube.com/playlist?list=PL5_sm9g9d4T1BJ8GbspZ1CwG1op87RkZH

For more information contact Chu Wei at: Chu.Wei@dot.gov



Asphalt Mixture Performance Tester (AMPT)



Paving Inspector Certification Offered

By Bob Humer, Asphalt Institute

The Asphalt Institute (AI) rolls out a first of its kind Paving Inspector Certification (PIC) Program. It's an ideal orientation course for all new personnel, and a refresher course for experienced personnel. By implementing PIC as introductory training, owners can be confident that new employees understand the basics of asphalt construction and typical inspector duties. Passing the test for each module and earning AI's Paving Inspector Certification indicates that the new inspector understands the 16 hours of instruction and is equipped with the fundamental knowledge to effectively perform their critical role. Experienced personnel will find information that will augment their current knowledge of construction processes. While the PIC course content begins with the

basics, it also includes a substantial amount of information that will benefit highly experienced inspectors. Those earning certification will have tangible evidence of their knowledge level for all aspects of asphalt materials and paving. This also assures owners that their asphalt inspection staff has a level of competence necessary to be truly effective.

It is our hope that local Counties and Cities will include this on-line Training and Certification as an essential tool in their Inspection Program. To read more about this Paving Inspector Certification Program, go to; <http://www.asphaltinstitute.org/training/seminars/paving-inspector-certification-pic/>



CP² Center Pavement Preservation Academy Update

By Ding Cheng and Gary Hicks, CP² Center



As part of the Senate Bill 1 (SB-1) funding through the CSU Transportation Consortium headed up by Mineta Transportation Institute (MTI) in San Jose State University, the California Pavement Preservation Center (CP²C) is pleased to announce a certificate program in pavement preservation, via "The Pavement Preservation Academy". The purpose of the program is to help state and local agencies improve the design and construction of pavement preservation treatments.

The effort began in 2018 with the development of technical manuals for chip seals, slurry surfacing, Cape seals, and thin hot mix overlays. The four manuals can be found with the following links:

<https://transweb.sjsu.edu/research/1845A-Chip-Seal-Manual>

<https://transweb.sjsu.edu/research/1845B-Slurry-Surfacing-Manual>

<https://transweb.sjsu.edu/research/1845C-Cape-Seal-Manual>

<https://transweb.sjsu.edu/research/1906-Manual-Thin-Asphalt-Overlay>

The certificate program will consist of four 3-hour modules, and the student must pass an exam to gain a certificate. Initially the courses will be offered once per year. The first course will be offered on March 16, 18, 23, and 25, 2021. Each of the four modules will cover the following topics:

- Overview of the treatment
- Project selection
- Materials and design

- Specifications
- Construction
- Safety
- Quality Assurance
- Trouble shooting
- Other resources available

These manuals are designed to empower state and local agency staff, and contractors, through training, to choose and properly construct the right treatment, at the right time, to optimize preventative maintenance funds. Most local agencies defer road maintenance over many years, and there are thousands of miles of public roads that are currently in poor conditions. With new state funding (e.g. SB-1) available for maintenance and construction projects, proper preventative maintenance is an issue of paramount importance. Treatments that can preserve pavements and defer the need for and costs of road reconstruction are very important.

The instructors for the four modules will be recognized names in the field, including :

Gary Hicks - Chip seals

Lerose Lane - Slurry Surfacing

Ding Cheng - Cape seals and

Erik Updyke - Thin asphalt overlays.

Information on registration information can be found on the Center website at: <https://www.csuchico.edu/cp2c/educational-opportunities/pp-academy.shtml>.

For more information, please contact Dr. Ding Cheng, the CP² Center Director, at dxcheng@csuchico.edu.



COMING EVENTS - Mark Your Calendar!

By Roger Smith, CP²C

"Asphalt Pavement 101" Class March 24-25 (Virtual)

This popular class from the California Asphalt Pavement Association (CalAPA) offers an overview of the basics of asphalt pavement including asphalt materials and HMA pavement construction. It will continue to be offered virtually as two, 2-hour sessions, until further notice. This class is also available by request to road agencies or companies.

For more information go to: www.calapa.net

Caltrans' Section 39' Class April 8 (Virtual)

Responding to numerous requests, CalAPA is

adding a new course to its schedule of asphalt training classes. Understanding Caltrans Section 39 HMA Specifications will be taught by CalAPA Technical Director Brandon Milar, P.E., in a "webinar" format. The class will focus exclusively on the voluminous chapter of the Caltrans standard specifications that covers asphalt pavement including highlighting many new changes to the specifications that have been made in recent years. Details about the class and on-line registration can be found at: <http://events.r20.constantcontact.com/register/event?llr=bisj8dcab&oeidk=a07ehm0ec2i8dcf9ba8>

Continued, next page

COMING
EVENTS

“Pavement Management Systems and Preservation Strategies” April 19 - 22(Online)

Pavement networks are often the most valuable asset that an agency owns. A pavement management system is an essential tool to assist in cost-effective roadway maintenance planning. This U.C. Berkeley Technology Transfer course was developed in partnership with the City and County Pavement Improvement Center, funded by California Senate Bill 1, the Road Repair and Accountability Act of 2017. This course meets for five 4-hour sessions, from 1-5pm. For more information go to: <https://registration.techtransfer.berkeley.edu/CourseStatus.awp?&course=214CCB020419>

NPPC Conference May 17-21 (Virtual)

National Pavement Preservation Center (NPPC) Conference website and registration are now open. Nine webinars will be held over the five-day period, and you need to register for each webinar. All webinars are available with no registration fee (FREE). Topics include pavement preservation strategies for both asphalt and concrete pavements – including recycling. Continuing Education Units (CEUs) will be issued to attendees using the Michigan State University system. For more detailed information and to register go to: <http://nationalpavement2021.org/>.

Asphalt Pavement Preservation treatments: Materials, Construction and Quality Assurance Class June 21-24 (Online)

Transportation agencies at the city and county level can maximize the value of their huge investment in streets and roads by using proper pavement preservation strategies. This course provides a solid working knowledge of the most common asphalt pavement maintenance and preservation practices. Common preservation

treatments, basic principles, best field practices and quality assurance issues are covered. This is a core course in the pavement engineering and management training program offered by the City and County Pavement Improvement Center (CCPIC) in partnership with U.C. Berkeley TechTransfer. For more information go to:

<https://registration.techtransfer.berkeley.edu/CourseStatus.awp?&course=214CCC020621>

Nevada LTAP Center Classes Various Dates (Online)

The Nevada center for the Local Technical Assistance Program (NV-LTAP) regularly offers classes on a variety of pavement maintenance topics.

For more information go to: <https://nvltap.com/>

FHWA / PPRA Webinars Various Dates (Online)

FHWA will continue to team up with the Pavement Preservation and Recycling Association (PPRA) to offer short webinars on various popular pavement maintenance treatments, including crack sealing, slurry surfacing, chip seals, Cape seals, and proper handling of asphalt emulsion products. Find more information and dates contact: Jason.Deitz@dot.gov

The Asphalt Institute and NAPA Webinars (Online)

The Asphalt Institute offers national training on pavement design, asphalt binders, mix design and asphalt construction. For more information go to: <http://www.asphaltinstitute.org/training/seminars/>

The National Asphalt Pavement Association (NAPA) offers webinars on various asphalt pavement topics. For current listings go to: <https://www.asphaltpavement.org/programs/napa-webinars>



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

Caltrans established the California Pavement Preservation (CP² Center) at CSU, Chico in July 2006, and fully funded the Center in January 2007. Dr. DingXin Cheng is the current Director of the Center. Mr. Deepak Maskey 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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