CP² Center News

Newsletter of the California Pavement Preservation Center

No. 34 June 2015

2015 CalAPA Spring Conference

By Roger Smith, CP² Center

The twice yearly Asphalt Pavement Conferences, organized by the California Asphalt Pavement Association (CalAPA) have become the premier event for Californians operating in the world of asphalt pavements. The Spring Conference and Equipment Show was held in Ontario, April 15-16, and attracted over 240 people eager to learn and rub shoulders with others asphalt types from around the state. Executive Director Russell Snyder and his staff put together a jam-packed program of speakers and equipment vendors to make it a top-notch event. CalAPA Chairmen John Greenwood, Skanska USA Civil, welcomed the crowd and introduced a new Code of Ethics that CalAPA member companies have pledged to honor.

Outdoor Equipment Show at CalAPA

The 2-day event went on to feature 12 speakers and two panel discussions of topics timely to asphalt technology in California. Here are some highlights:

Caltrans Section 39 Update (Toni Carroll, Vulcan Materials)

Toni Carrol hit a high note with her overview of the changes coming in the new 2015 Caltrans Standard Specifications, Section 39,"Hot Mix Asphalt". CalAPA is in the process of finalizing a class on the elements of this important new specification. Since the new Section 39 will likely be too burdensome for most local agencies, there is a committee working on developing a Section 39 "lite" version for lower volume roadways. She also reviewed the recent Caltrans requirements for increased use of ground tire rubber in HMA. To meet legislative mandates, rubberized HMA will now be the default mix for all surface courses on state highways. This is discussed in a separate article on page 4 in this newsletter. Continued, next page

In this issue

Plant Inspection (Steve Marvin, LaBelle-Marvin, Inc.)

As HMA becomes more of a "modified product with additives / modifiers such as tire rubber, polymers, warm mix additives, RAP and even reclaimed roofing shingles (RAS)", agencies must face the challenge of verifying that they are in fact getting the modified HMA they are specifying. This will require closer communication with the plant to ensure you're getting what the mix design calls for. Increased sampling and testing of mixes will also be prudent.

Vendor Equipment Displays

Pavement Preservation – Keys To Success (Dr. Gary Hicks, CP^2 Center)

Dr. Hicks reviewed the available pavement preservation strategies and stressed that all could benefit from better quality control – even a formal QC/ QA plan by agencies. In addition to inadequate funding for the all needed pavement preservation work, he cited other challenges such as:

- Clearly documenting and publicizing the benefits of preservation.
- Shifting from "worst first" to preserving good pavements.
- Getting agencies to perform proper strategy selection.
- Establishing quality control and acceptance testing programs.
- Lack of performance-related specifications for most products.

Dr. Gary Hicks of the CP^2 Center

Greenbook Specification Update (Erik Updike, Los Angeles County)

The Standard Specifications for Public Works Construction (aka. "Greenbook") is used extensively by local agencies, especially in southern California. As the Caltrans Section 39 specification becomes less friendly to local agencies, the use of the Greenbook will likely increase. Erik presented highlights of Section 203-6 "Asphalt Concrete" noting that it still uses the Hveem (California) method of mix design, allows 20% RAP in mixes, allows warm mix asphalt (WMA) and allows three different processes for rubber additives. It also allows both hot and cold (emulsion) chip seals. The Greenbook Committee meets once a month and is always looking for new contributors.

Material Transfer Vehicles (Jeff Ensell, Roadtec)

Jeff suggested that material transfer vehicles (MTV), also know as "shuttle buggies", might be thought of as a moving silo, similar to the tall silos that store HMA at the plant. They serve as a "reservoir" for the accumulation of HMA within the paving train. They can usually result in less segregation, more homogeneous mix, with less temperature variance in the mat behind the paver and more uniform density. In addition, because the paver does not need to stop and start as much they can produce smoother pavement. Since Caltrans requires an MTV for placing rubberized HMA, MTVs will be playing a bigger role in highway paving as Caltrans moves to requiring rubberized HMA in virtually all surface courses. *Continued, next page*

Pavement Management Systems (PMS) – Expert Panel Discussion

This panel discussion produced lots of interesting information about applying the science of pavement management. Here are a few highlights:

- From 2012 to 2014 the statewide average PCI dropped from 68 to 66.
- People pay far less in gas taxes than they spend on telephone, cable TV and even their coffee habit.
- Sustainable pavement practices include recycling and pavement preservation practices.
- Turnover in personnel doing pavement management is a problem for agencies.
- PMS programs can benefit by having a quality control and training element for people doing the pavement evaluations.
- PMS data should be audited to make sure there aren't erroneously high or low PCI's that greatly affect the overall average.

Longitudinal Paving Joint

Paving Joint Construction (Bob Humer, The Asphalt Institute)

Longitudinal paving joints are considered the weakest and most failure-prone area of the pavement because they are notorious for ending up with poor density. Bob reviewed best practices for minimizing common problems. Here are some recommendations:

- Tack the vertical face of the cold face.
- The second hot pass should overlap the first by 1"; then just "bump" rake.
- Augers should extend to within 1 foot of the end of the screed.
- Roll the first pass to within 4-6 inches of the edge first; then roll the edge strip.
- Consider using the "notched wedge" paving technique for joints.

Bonded Wearing Courses – Expert Panel Discussion

Bonded wearing courses (BWC) are special very thin overlays which involve placing a heavy tack coat of polymer modified emulsion followed immediately by a thin (<1") lift of hot mix asphalt. It involves a special machine sometimes called a "spray paver". Here are some high points of the discussion:

- A BWC provides the sealing benefit of a chip seal with the smooth, quiet ride of HMA.
- It goes down fast and can usually be opened to traffic in less that 15 minutes.
- Production of 50,000 sq. yds / day is common.
- Minimum job size of 5000 tons makes for cost efficiency.
- It's non- structural, so you should remove and replace weak areas in advance.
- If pre-milling, use a micro milling head for a smoother surface.
- Many agencies are now using this strategy.

Warm Mix Asphalt (WMA) (Dr. Carolina Rodezno, NCAT))

Dr. Carolina Rodezno, from the National Center for Asphalt Technology (NCAT) at Auburn University, presented a national overview on warm mix asphalt (WMA), a technology whereby asphalt mixes are produced and paved at 30 to 70°F below conventional HMA temperatures. WMA has really gained popularity to the point where in 2013, 35% of all State DOT paving, 30% of local agency work and 25% of commercial paving work used WMA. Nationally, about 80% of all WMA is produced using the water "foaming" process - as opposed to using special additives. Fuel requirements for production of WMA mixes are usually 20% less than HMA, and emissions are reduced by about the same amount. So far studies have shown that WMA mixes can provide properties comparable to HMA and equally good performance under traffic. WMA continues to be used extensively in California.

Continued, next page

Caltrans New State Pavement Engineer Update (Jesse Bhular, Caltrans)

Jesse Bhular has been assigned to the position of state pavement Engineer. Jesse is optimistic about future funding that will be available for pavement work and stressed the need to be ready with projects when the funding becomes available. Road agencies will need to prioritize their projects through strategic planning. Using innovative, efficient strategies for pavement maintenance will be especially important. (See *Caltrans Names New State Pavement Engineer*, page 15)

All presentations from the Conference are available for viewing on the CalAPA website at: *www.CalAPA.net*. Be sure to mark you calendars for the Fall Conference & Equipment Show in Sacramento, October 28-29, 2015.

ASPHALT PAVEMENT NEWS

Caltrans Issues New Crumb Rubber Guidelines

By Roger Smith, CP² Center

On February 10, 2015, Caltrans issued new guidelines to help ensure the increased use of crumb rubber modifier (CRM) in asphalt paving work to meet the requirement of using not less than 11.58 pounds of CRM per metric ton of the total amount of asphalt paving materials used statewide. Use of CRM in 2013 was somewhat short of the Caltrans goal.

Under the new guidelines, RHMA will be the "default" material for pavement surface courses. Exceptions are projects involving less than 1000 tons, ambient temperature below 45 degrees, elevations above 3000 feet, or in HMA used as base under PCC pavement.

Where RHMA cannot be used, an appropriate Performance Graded – Modified (PG-M) must be considered as an alternative. The PG-M binders may contain a minimum 10% CRM.

Caltrans already requires a material transfer vehicle (MTV) for placing the RHMA-G, so these new guidelines can also mean increased use of MTV's throughout California.

The directive also contained special requirements for various ambient temperature conditions, as follows:

55°F or above ….. use MTV

50°F to 54.9°F …… use MTV + WMA technology

45°F to 49.9°F …… use MTV + WMA technology + end dump into paver + Intelligent Compaction technology

The new guidelines will be incorporated into Chapter 630, "Flexible Pavement", of the Caltrans Highway Design Manual due to be published soon. The Maintenance Technical Advisory Guide (MTAG), Chapter 3, "Treatment Selection" will also be revised to reflect the new guidelines.

Pacific Coast Conference on Asphalt Specifications Update

By Roger Smith, CP² Center

The CP² Center has become an official member of the Pacific Coast Conference on Asphalt Specifications (PCCAS). The PCCAS (aka. Pacific User-Producer Group) is a long-standing forum for Pacific region state DOT's - a total of 6 - and FHWA to meet with asphalt suppliers and researchers in the interest of using appropriate and standardized specifications for asphalt. The CP² Center is a new Associate Member of this group and will participate in their asphalt research efforts, since we are one of very few laboratories with complete capability to test asphalt binders.

The sub-committees of PCCAS met at the University of Nevada, Reno (UNR) on March 24 and 25, 2015. Here's an update of the various committees' activities. Chairpersons are shown behind the committee name.

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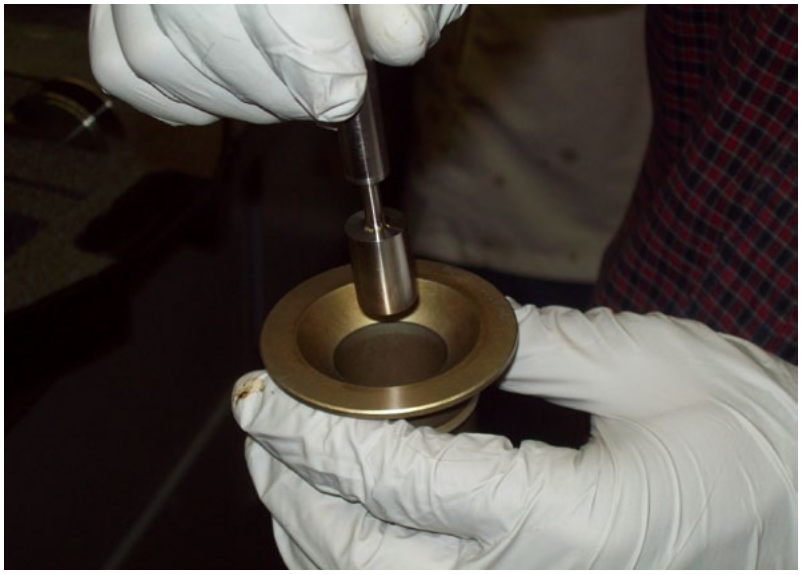
- **Paving Asphalt Committee…**Brad Neitzke (FHWA) and Shauna TecleMariam (U.S. Oil)

The Paving Asphalt Committee is involved with two primary issues:

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

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

  - a new DSR test method using the plate-to-plate DSR with a 3mm gap (The CP² Center is participating in multi-lab round-robins to help evaluate this test's precision).
  - another new DSR test involving concentric cylinders (aka, cup-and-bob) with 7mm gap is being studied by the University of California Pavement Research Center (UCPRC) at Davis.



Asphalt binder test specimen in CP2 Center lab

- **Emulsion Committee….** Joe Devol (Washington DOT) and Sally Houston (VSSI)

The Emulsion Committee is focusing on developing a better method for recovering the emulsion's asphalt residue for testing purposes. The primary concern is that overheating the emulsion in order to evaporate the water may be altering the properties of the residue, especially polymer (latex) additives typically used in chip seal emulsions (e.g. PMCRS-2). A gentler recovery method, involving realistic field temperatures, is being sought. Ultimately, this group also hopes to use the PG grading system to characterize the asphalt residue from emulsions.

A correlation testing program for emulsions was discussed. Oregon DOT currently runs such a program involving all labs that test emulsions for their projects. This will be given further consideration by PCCAS as a regional effort.

Asphalt shingle recycling

- **Recycling Committee….**Charlie Pan (Nevada DOT) and Steve Escobar (APART Lab)

The state DOT's gave updates on their recycling policies with the general finding that most states now allow both reclaimed asphalt pavement (RAP) and recycled asphalt shingles (RAS) in their HMA. Most states (including California) allow a maximum amount (%) of "binder replacement" due the combined effect on RAP and RAS. Nevada and Alaska only allow RAP at present. The amount of RAP allowed for surface lifts ranges from 15% to 25%. For lower lifts, the allowable RAP amount is as high as 40%. Nationally, FHWA is investigating concerns over early cracking in projects containing high RAS and RAP (combined) content.

A report on cold in-place recycling (CIR) performance is now available on the PCCAS website shown below.

There was also a presentation on the use of 100% RAP aggregate and ground tire rubber in cape seals (chip seal over slurry seal). Performance on residential streets over block cracking has been very good.

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

RAP Finds Use in Southern California Seal Coat Projects

By Erik Updyke and Dennis Ruh, Los Angeles County Department of Public Works

Despite recent increases in allowable content for reclaimed asphalt pavement (RAP) in hot mix asphalt concrete - both in the Caltrans Standard Specifications and in the Greenbook Specifications - a surplus of RAP continues to exist in most urban areas. New and innovative uses for RAP in slurry seals, micro-surfacing, and chip seals will help consume some of this surplus as well as reduce the demand for virgin aggregate. These uses are becoming increasingly common among Southern California agencies.

RAP aggregate is produced by crushing and screening RAP to the gradation required for use in various seal coats. After processing, RAP aggregate will typically have a residual asphalt content of between 5 and 8 %, a specific gravity of approximately 2.4, and an absorption rate of approximately 1.5 %, based on testing performed by Los Angeles County.

Making RAP chips

The use of RAP aggregate (chips) in chip seals has the longest history. Los Angeles County first used RAP chips in a scrub seal on a half-mile section of Avenue J in the Lake Los Angeles area in February 2008. Since then, RAP chips have been used in numerous chip seals. For chip seals placed under a contract, RAP chips are a contractor option. The Avenue J scrub seal, and subsequent chip and scrub seals, were placed using polymer modified emulsions, and the RAP chips continue to perform well.

In April 2013, a CalRecycle-funded chip seal composed of hot-applied PG 76-22 tire rubber modified paving asphalt and RAP chips was also placed in the Lake Los Angeles area. The intent of this project was to determine if non-pre-heated (ambient temperature) RAP chips would adhere to a hot-applied binder. Three-eighths inch RAP chips were placed on a two-mile segment of Avenue K, and 5/16 inch RAP chips were placed on a two-mile segment of Avenue M. A problem was encountered during the first day of placement on Avenue M that was traced to moisture content and cleanliness. RAP chips used with hot-applied binders must be dry and clean, as hot-applied binders do not have the forgiveness of emulsions. Despite adverse weather conditions, there were no subsequent placement problems. To date, this project also continues to perform well.

RAP chips

The use of RAP aggregate in slurry seal (RAP slurry) is a more recent development and becoming more common. RAP slurry is similar in specification requirements to other polymer modified slurry seals with minor exceptions. The residual asphalt on the RAP aggregate contributes to the asphalt content, thus the virgin residual asphalt content requirement is lower. Also, rolling of the RAP slurry with a pneumatic-tired roller after placement is required. Rolling helps to seat and knead the RAP aggregate. Testing and observation by Los Angeles County indicates the lower absorption rate of RAP aggregate may result in more of an encapsulation of the aggregate in the emulsion and less of a mechanical bond versus polymer modified slurry produced with virgin aggregate. Wet track abrasion test results were similar if the patties for RAP slurry were rolled to simulate the seating of the upper layer of aggregate by the field rolling (not a part of the ASTM D3910 test procedure). Testing also indicated that the use of aluminum sulfate in the RAP slurry mixture resulted in much

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higher loss of aggregate versus the use of only a portland cement additive.

RAP aggregate use in micro-surfacing has been less common. Los Angeles County had good results on a project constructed in 2010 on Soledad Canyon Road and Escondido Canyon Road in the Antelope Valley area, and now allows RAP aggregate as a contractor option.

The economics of RAP aggregate usage is affected by the typical market factors of availability and transportation costs. Some agencies in rural locations have chosen to stockpile RAP from nearby projects, then process it on-site into RAP aggregate at a later date. This reduces the haul-off costs of cold millings for current projects and eliminates the cost of virgin aggregates for future seal coat projects.

RAP aggregate usage in various seal coats is becoming more common, and specifications will continue to be refined as lessons are learned and the performance of completed projects reviewed. Currently there are no Greenbook specifications for RAP use in sealcoats.

For more information contact Erik Updyke at: *eupdyke@dpw.lacounty.gov*

Caltrans-Industry Joint Task Groups Update

By Roger Smith, CP^2 Center

"PG+5" Proposal

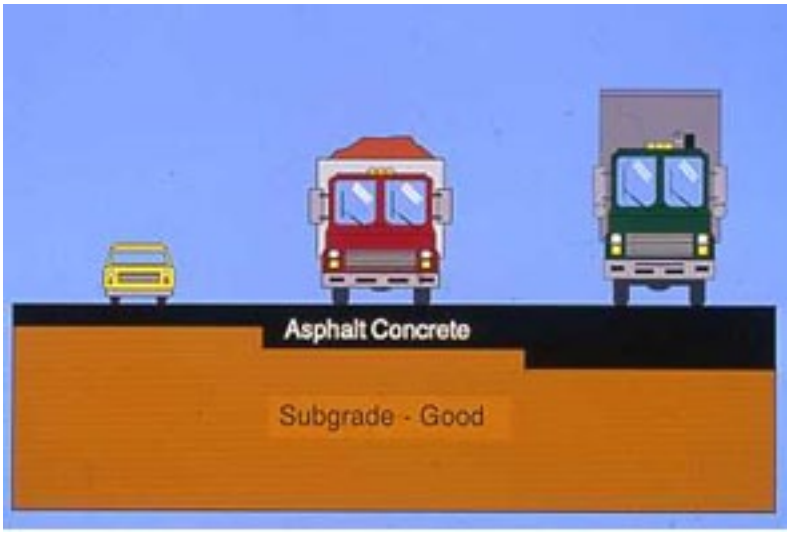
Caltrans has advanced a proposal to require 5% rubber modifiers in all conventional (unmodified) PG asphalt binders. The goal is to help meet the legislative directive to keep old tires out of landfills. This proposal would expand Caltrans already widespread use of tire rubber in asphalt in California, which makes the state a national leader in this technology. Under this new proposal, PG asphalt binders with the 5% rubber (aka. PG+5) would be required to meet the specification requirements of the unmodified binder. Two meetings have been held to get feedback from a wide array of Industry representatives on this proposal. Many concerns were voiced including the overall cost impact and the need for production facility modification requirements. More Caltrans-Industry meetings are planned.

Other Task Groups continue to work on developing or updating the Caltrans Standard Specifications for Hot Mix Asphalt (Section 39) and Asphalt Surface Seals (Section 37), developing new HMA specifications for Low Volume (LV) roads, HMA Intelligent Compaction technology, HMA pavement recycling, and the use of recycled asphalt shingles (RAS) in HMA.

In keeping with their 5-year cycle, Caltrans will be publishing updated Standard Specifications in 2015.

Designing Pavements For Low Traffic Volume: An Empirical Approach By Mike Robinson, Pavement Consultant

Many of us have been faced with a low-volume pavement, be it a rural highway, an access road, or a parking lot, that was reaching the end of its service life. After a cursory reconnaissance, we decide that a maintenance treatment would not be appropriate and a full rehabilitation or reconstruction is in order. A typical response is to order some borings to characterize the subgrade, estimate the anticipated traffic, plug it all into a design procedure, develop a thickness design, borrow a paving specification from Caltrans or The Greenbook, and solicit bids. While this is reasonable, rational, and typical, there is another approach worth considering. But before we discuss that, let's look at each of these steps in more detail.



Subgrade characterization
Characterizing subgrade is a balance between quantity, quality, and cost. Making decisions on a single data point should be avoided, but to truly characterize the subgrade using a statistically valid set of random samples is expensive. Sampling what appears to be the worst area or areas for design input will be conservative, and the resulting design may cost more than necessary. And then there's the question of choosing in-situ or lab-molded properties. Of course, it's sometimes possible to use soil data from very nearby projects - and the price is right!

Traffic Estimates
We usually don't have traffic counts for these types of facilities, especially not heavy vehicle counts and classifications. We can use the Asphalt Institute's "Thickness Design Manual" (MS-1), or the suggested values in "PerRoad Express", or make some estimates using AASHTO, but between the roadway classification and the percent of trucks we choose, the resulting traffic values can vary widely.

Thickness Design
Since the commonly-used pavement design methods were not developed for low-volume pavements, and since our design inputs are not as certain as we would like, we might try several approaches to see if we can reach a consensus design. In most cases, the various methods will not agree, so we use engineering judgment to settle on something that will likely work.

The Alternative
While a truly mechanistic pavement design is one of the "holy grails" of the industry, we aren't there yet. Even if we were, gathering the necessary design inputs for a low-volume roadway may not be cost-effective or efficient, as we discussed above. So instead we rely on methods that are largely or completely "empirical" - that is, based on observations and experience.

But, in the case of most low-volume pavements, we have a very specific empirical pavement design guide right in front of us. The old pavement! We generally know that the future traffic will be similar to the traffic up to this point, we know or can estimate the pavement age and thickness, we can visually assess the adequacy and uniformity of subgrade support, and we know the failure mode(s). In other words, if we replace the existing section with an equivalent section, we will likely achieve a similar life and see the same distresses.

If rehabilitation is truly needed (not just a maintenance effort), one common approach is to simply remove the old pavement layers (HMA and aggregate base (AB)) and reconstruct. But one question designers frequently forget to ask is, 'Do I really need to replace the AB layer along with the HMA? Does AB really go bad?' If water and fines haven't greatly degraded the AB, it often can simply be re-graded and compacted. Then new HMA placed. If the overall structure needs to be increased, a portion of the AB can be removed and replaced with an additional thickness of HMA, thereby retaining the same

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roadway surface grades – especially important where there's curb and gutter or other vertical controls. I am not suggesting that simply replacing in kind is adequate. If the pavement performance is not consistent throughout, adjustments will be necessary. The same goes for adjusting the section if we, for example, anticipate an increase in traffic. Localized failures may also need to be pre-repaired. If we desire a longer performance life, or only need our rehabilitation to last half as long in anticipation of some future change in use, we will also need to adjust our design.

But the point is that we have a pavement test section right in front of us that has already experienced the local climate, traffic, and the actual subgrade available to us. This is very valuable information that is often discarded.

And when it comes to specifying materials for our project, our "non-accelerated" pavement test facility (i.e., the old pavement) may also indicate that borrowing a specification meant for a high-volume pavement is not an optimal solution. In that regard, a Caltrans-Industry committee is in the process of developing an HMA specification for low traffic volume pavements typical of many local agencies. Watch for "SuperPave Lite" coming soon!

For more information contact Mike Robinson at: *mike@mikerobinsonllc.com*

Hot Asphalt Safety

By Barry Gunderson, Gunderson Consulting

Overview

Many spectacular accidents and serious injuries have occurred over the years involving hot asphalt. The hazards are many and varied, however many are not well understood by workers and management. In this article, I will briefly discuss:

- water boil-over
- flammability
- explosions
- asphalt burns

Water Boil-Over

Did you know that small amounts of water react very violently when in contact with hot asphalt resulting in vigorous foaming, rapid expansion and commonly - steam explosions. This is caused by the very high temperatures of our asphalt – much higher than the boiling point of water – which causes any water contamination to rapidly change from a liquid to a gas, increasing massively in volume. A steam explosion ejects steam and hot asphalt in all directions from the hatch and breather vent. If confined in a tank with the hatch locked down these explosions are quite capable of rupturing a tank. Very small amounts of water can produce massive amounts of steam, (at atmospheric pressure a pint of water can produce over 400 gallons of steam!)

Boil-over damage

Flammability – Can Asphalt Burn?

Hot asphalt is not classified as a flammable liquid, but, that doesn't mean it won't burn – in fact it will burn very well if it gets hot enough. However, most liquid asphalt fires are caused by very small amounts of kerosene or diesel contaminants that originate through flushing of valves and pumps. At normal hot asphalt temperatures, these contaminants produce very flammable vapors in sufficient quantity to produce a flammability risk when in contact with air at manholes and breather vents. Given an ignition source, a fire starting in these places can rapidly raise asphalt surface temperature in a tank to a point (flash point) where it will burn readily.

Auto-ignition – Can materials catch fire by themselves?

Yes if they are hot enough! The phenomenon of auto ignition (which is un-related to flash point) is often not well understood. This is the temperature needed to ignite a flammable

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vapor and is usually a lot lower than the temperature of a spark or a match flame. For instance, the surface temperature of an exhaust pipe can be hot enough to ignite kerosene vapor (410°F) or diesel vapor (445°F) – both lower than gasoline!

Equipment damaged by asphalt explosion.

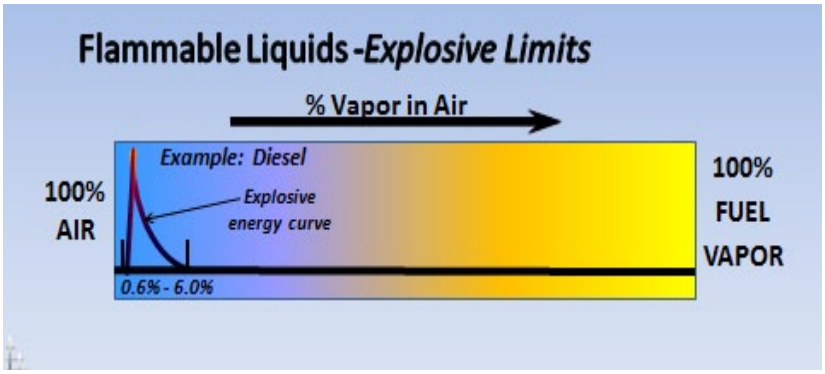
Explosions

Why do flammable vapors sometimes explode rather than just burn? - A common-enough question when an asphalt tank has just blown up!

Why are some explosions much bigger than others? It depends on the relative concentrations of the vapor and air.

For instance kerosene or diesel/air mixtures at concentrations of approximately 0.6% to 6% in air are explosive with maximum explosive force occurring roughly at 1%!

Above 6% concentration, the vapor usually just burns at the air interface with no explosion. (See graph below.)



To give an example, 2 gallons of diesel flushed into an empty, hot (350°F) 5500 gallon road tanker was sufficient to produce a mixture which exploded when a steel dipstick gave a "steel-on-steel" spark inside the tank. (Never use steel for dipsticks.)

Asphalt Burns – the "Do's and Don'ts"

Do wear suitable complete personal protective equipment with **NO** gaps.

Do protect yourself and others from harm.

Don't try to remove any asphalt or clean the area because:

- it provides a sterile protective coating
- removal is likely to further damage underlying tissue
- exposure to air will increase pain and risk of infection
- use of non-sterilized solvents or oils can lead to infection and skin damage.

Do cool the burned area with water for at least 20 minutes.

Don't use ice.

Eye Burns - Flush with water, same as above.

Don't remove any clothing stuck to asphalt. This may cause further injury.

Do remove belts and rings and any other constrictions if you can without further damage.

Do cover any exposed burns (not covered with asphalt) with clean, non-stick burn dressings, but do not wrap dressing too tightly.

Do maintain body heat and treat for shock.

Don't apply lotions or ointments.

Don't dress areas covered with asphalt.

Don't let blankets touch burns or asphalt.

Don't give anything by mouth until cleared to do so by medical personnel.

Do call for an ambulance immediately and advise an "Asphalt Burn".

Attach a "burns card" to the casualty.

(Information courtesy of the Australian Asphalt Pavement Association)

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One example of these "burn cards" are produced by the Australian Asphalt Pavement Association and carry the full endorsement of the Australian and New Zealand Burns Association, complete with their logo and the clear warning/instruction:

"Advice to Medical Professionals: Bitumen burns require specialised medical treatment. Immediately consult with burns specialist."

BITUMEN BURNS CARD – FIRST AID

Safety

PROTECT YOURSELF and others from harm.
DO NOT ATTEMPT TO REMOVE BITUMEN.
COOL THE BURNT AREA with cold water for a minimum of 20 minutes. **DO NOT USE ICE.**

Note

EYE BURNS – flush with water, same as above.
DO NOT REMOVE CLOTHING STUCK TO BITUMEN. This may cause further injury.
REMOVE BELTS & RINGS and any other constrictions if you can without further damage.

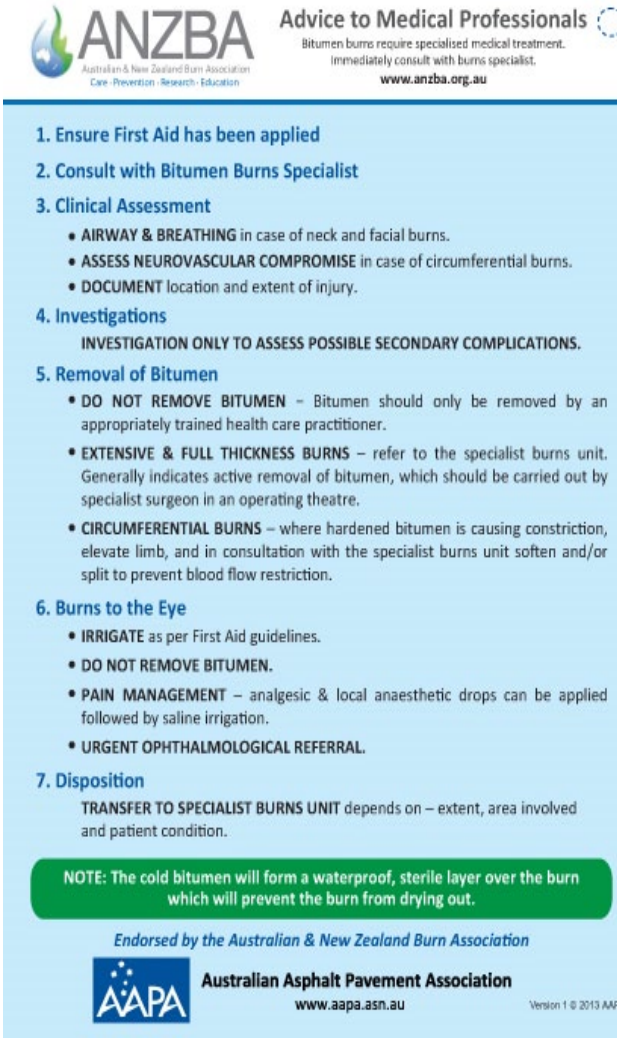
Treatment

COVER any exposed burns (those not covered with bitumen) with clean non-stick burns dressings. Do not wrap dressing too tightly.
MAINTAIN BODY HEAT and treat for shock.
DO NOT attempt to clean the affected areas.
DO NOT apply lotions or ointments.
DO NOT dress areas covered with bitumen.
DO NOT let blankets touch burns or bitumen.
DO NOT give **ANYTHING** by mouth until cleared to do so by medical personnel.

Call

CALL for an Ambulance immediately by dialling 000 and advise a "Bitumen Burn".
ATTACH the burns card to the casualty.

NOTE: A work colleague trained in these procedures should accompany the injured party to Hospital to support and ensure that a Bitumen Burns Card is attached to the casualty, and make treating medical staff aware of the details on the reverse of this card.



ANZBA
Australian & New Zealand Burn Association
Care · Prevention · Research · Education

Advice to Medical Professionals
Bitumen burns require specialised medical treatment.
Immediately consult with burns specialist.
www.anzba.org.au

1. Ensure First Aid has been applied
2. Consult with Bitumen Burns Specialist
3. Clinical Assessment
   - **AIRWAY & BREATHING** in case of neck and facial burns.
   - **ASSESS NEUROVASCULAR COMPROMISE** in case of circumferential burns.
   - **DOCUMENT** location and extent of injury.
4. Investigations
   INVESTIGATION ONLY TO ASSESS POSSIBLE SECONDARY COMPLICATIONS.
5. Removal of Bitumen
   - **DO NOT REMOVE BITUMEN** – Bitumen should only be removed by an appropriately trained health care practitioner.
   - **EXTENSIVE & FULL THICKNESS BURNS** – refer to the specialist burns unit. Generally indicates active removal of bitumen, which should be carried out by specialist surgeon in an operating theatre.
   - **CIRCUMFERENTIAL BURNS** – where hardened bitumen is causing constriction, elevate limb, and in consultation with the specialist burns unit soften and/or split to prevent blood flow restriction.
6. Burns to the Eye
   - **IRRIGATE** as per First Aid guidelines.
   - **DO NOT REMOVE BITUMEN.**
   - **PAIN MANAGEMENT** – analgesic & local anaesthetic drops can be applied followed by saline irrigation.
   - **URGENT OPHTHALMOLOGICAL REFERRAL.**
7. Disposition
   TRANSFER TO SPECIALIST BURNS UNIT depends on – extent, area involved and patient condition.

NOTE: The cold bitumen will form a waterproof, sterile layer over the burn which will prevent the burn from drying out.

Endorsed by the Australian & New Zealand Burn Association

AAPA **Australian Asphalt Pavement Association**
www.aapa.asn.au

This warning has been found to be essential, because non-specialist medical personnel have often attempted to remove the asphalt with unnecessary haste, not realizing that the material is sterile and basically inert.

For more information contact Mr. Barry Gunderson at: *barry.gunderson@gundersonconsulting*

9th International Conference on Managing Pavement Assets Held in Alexandria VA By R. Gary Hicks, CP² Center

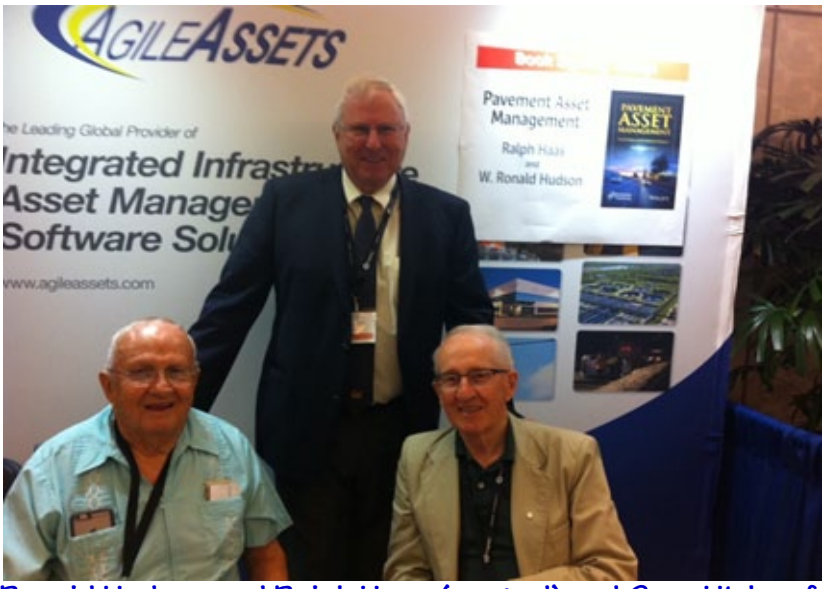
Over 300 people from more than 30 countries attended the 9th conference of the ICMPA held May 18-21, 2015. The program was truly an international experience. The conference began with four tutorials including:

- Introduction to Pavement Management
- Public-Private Partnership Tolls for Pavement Management
- The Role of Pavement Management in the Implementation of MAP-21 and the Development and Adoption of Performance Measures
- Pavement Management in the Context of Developing Countries and Countries in Transition

The second day consisted of a welcome to the conference followed by keynote talks by Dr. Sam Savage , Consulting Professor from Stanford University on "The Flaw of Average, Why We Underestimate Risks in Face of Uncertainty", and Katie Zimmerman, President of APTech on "Preparing for the next Transformation in Pavement Management".

Continued, next page

The later presentation discussed the developments in pavement management from the beginnings at the AASHO Road Test to the present and offered some insight into the future. She discussed the early developments of the concept including work by Fred Finn, Ronald Hudson, and Ralph Hass. The latter two were present and they have attended all nine conferences since the first one in Toronto Canada.



Ronald Hudson and Ralph Hass (seated) and Gary Hicks of the Center (standing)

Breakout sessions include ones dealing with:

- Innovation
- Case Studies
- Policy and Funding
- Airports
- Performance Prediction
- Sustainability
- Ride and Distress Measurements
- New Software Systems
- Structural Evaluation
- Decision Making
- Safety, Skid and Texture
- Data Quality and Accountability
- Pavement Preservation
- PMS Implementation
- Low Volume Roads
- Performance Based Contracts
- Pavement maintenance Management
- Other Topics in PMS

The quality of the presentations and the discussion that followed were quite good. Fifteen vendors participated in the event and provided opportunities to discuss new technologies and many of these provided support for the reception and a gala banquet. All the presentations can be found on the conference website at *http://www.icmpa9.org/*

CCSA/ISSA Pavement Preservation Roundtables in California

By R. Gary Hicks, and Roger Smith, CP^2 Center

Roundtable meetings were held in San Diego on May 12 and Martinez on May 14 to discuss important issues related to pavement preservation. The meetings were hosted by the California Chip Seal Association (CCSA) and the International Slurry Surfacing Association (ISSA). Both meetings covered the following:

- Slurry and Micro Surfacing Applications and Inspection
- Slurry and Micro Surfacing Materials testing
- Equipment Calibration and Inspection
- Live Slurry Mix Demonstration
- Chip Seal Inspection: Applications, materials, and Testing
- Multi-Layer Systems

About 40 attendees from local agencies and industry attended the San Diego Meeting, while over 60 attended the meeting in Martinez. Lively discussions occurred at both meetings. All the presentations can be found at *www.chipseal.org*

An overview of issues covered are as follows:

General

- Importance of surface preparation for all preservation treatments
- Importance of keeping the public informed on the construction process and timing.
- Need for a pre-job conference and just-in-time-training for pavement preservation treatments
- Setting expectations for the preservation projects in the pre-construction meetings
- Improved QC and acceptance inspection on the part of the contractor and agency
- Checking application rates for all treatments
- Discussions on the best practices for all treatments

Slurry and Micro Surfacing

- Understanding the mix designs for slurries and micros and the impacts of additives on the set rates and performance
- Need for rolling some micros and slurries to prevent shedding in areas high stress areas (e.g. cul-de-sacs)

Continued, next page

Figure 1. Sallie Houston of VSSI leading the slurry mix design demo

- Benefits of micros and slurries and where to use each (e.g. use only micros for rut filling & leveling)
- Need for calibrating the equipment to ensure the mix design is followed
- Newer material variations (e.g. fiber additive, ground tire rubber, RAP, polymers)

Figure 2. Jason Lampley Of Intermountain discussing chip seals

Chip Seals

- Best suited to open roadways, but chip seals can also be used on many residential streets, which are often caped with slurry or micro to increase smoothness. Double chip seal with finer chips on top layer works for residential streets as well.
- Consider smaller chip for smoother texture or a cape (slurry) seal where bicycles are prevalent.
- Consider scrub seals with polymer modified rejuvenating emulsion (PMRE) in areas with-marginal weather (e.g. foggy, coastal areas).
- Hot rubber chip seals have a proven record of performance. The newer terminal blend versions (e.g., PG76-22TR) are gaining in popularity.
- Double chip seals with ¼" chip on top may be acceptable for ADA compliance.

Multi- Layer Systems

- Many variations have been tried.
- San Francisco uses two layer systems as follows: Type 3 micro surfacing on bottom; followed by a Type 2 micro surfacing.
- Roseville has also been a leader in trying a lot of variations.

One of the speakers stressed the following general principle to the agencies, "You don't get what you spec, you get what you inspect".

Each of the agencies was asked to raise other important issues at the end of the meeting. Some of these included the following:

- The negative impacts of the ADA new rules. This is taking funds away from fixing road problems
- The importance of selecting the right treatment for the right road at the right time and using good construction practices
- Need for simple tests to evaluate the emulsion and the mix in the field
- Understanding what to look for in placing preservation treatments. (The ISSA Inspector's Manual passed out at the meeting should be a big help. It's available at *www.slurry.org*)

CCSA and ISSA are to be congratulated on offering these regular "Roundtables" to help agencies achieve full performance from preservation treatments.

For more information and to view the presentations, visit the CCSA website at: *www.chipseal.org*

Figure 3. Roger Smith (right) of the Center and others observing the demo

Impacts of Drying Shrinkage on Roughness In Concrete Pavements

By Tom VanDam, P.E., Ph.D., NCE Reno NV and Tyler Ley, P.E., Ph.D., Oklahoma State University

Introduction

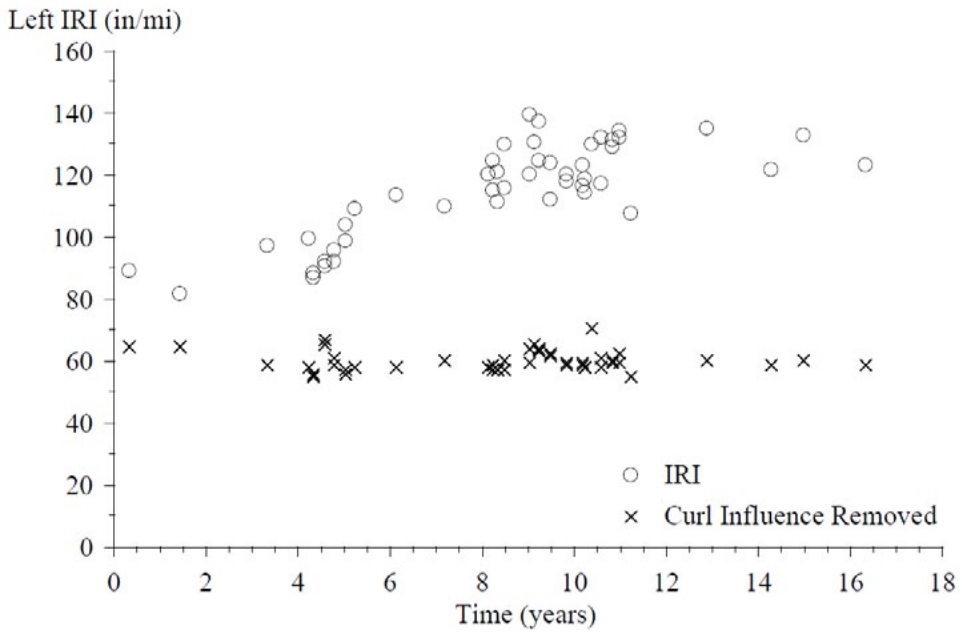
Today's modern concrete paving technologies provide an opportunity to construct the smoothest concrete pavements in history. Smooth pavements are demanded by transportation agencies and the traveling public to improve ride quality, reduce noise, and improve fuel efficiency. Field investigations have shown that the portland cement concrete (PCC) pavement roughness can increase within months of construction and continues to increase in the coming years even in the absence of distress (e.g. cracking, faulting). It is believed that this increase in roughness on plain jointed PCC pavement is largely related to differential drying in the concrete that in turn causes upward slab curvature (curl). This article describes field measurements of this upward curvature, the mechanisms thought to be responsible, and strategies that can be employed to mitigate it. More detailed discussions of these issues are available in other publications online (*http://www.cproadmap.org/publications/MAPbriefApril2015.pdf*).

The Problem

An evaluation of data collected on the Arizona LTPP SPS-2 site clearly shows the influence of concrete slab curvature and the subsequent increase in roughness as measured by the International Roughness Index (IRI). For example, in one section (040215) the IRI increased from an average of 90 in/mile for both wheel paths at 4 months to 124 in/mile in just over 16 years, without observed surface distress (Karamihas and Senn 2012). Detailed analysis of the profile data allowed the researchers to separate out the changes in IRI due to curvature. For example, the left wheel path of Section 040215 is plotted in Figure 1. It shows that the majority of the IRI increases over the 16 years of service were due to increasing curvature. In several instances roughness measurements were taken on the same day to separate out the influence of temperature. The results show that temperature differences explain relatively small daily changes in curvature, but did not impact the overall trend towards increasing upward slab curvature over the life to the experiment. The long term increase in curvature is thought to be due to differential drying, which resulted in almost four times the increase in roughness than temperature effects.

This study only evaluated pavements in Arizona in a very dry climate and a broader FHWA study is currently underway examining whether the same trends are observed nationwide. Research in Oklahoma has shown that field samples in a humid environment have about three times less upward curvature than the same samples stored in a drying environment in the laboratory (Ley et al. 2015). This research confirms the field data from Arizona and reinforces the importance of differential drying on concrete pavements in dry climates.

Figure 1. IRI progression in left wheel path for section 040215, with and without the influence of slab curvature (Karamihas and Senn 2011).



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Mitigation Strategies

For pavements that are already in place, it is challenging to significantly impact the influence of the moisture gradient on roughness, as the concrete material properties are already set and the bottom of the slab is often near or at saturation and the top will continually undergo wetting and drying cycles depending on the ambient conditions. If the pavement smoothness becomes unsatisfactory, then diamond grinding can be used to restore a smooth riding surface.

Designing concrete pavements with a lower potential for this increase in upward curvature is the most cost effective mitigation strategy. Some techniques to do this include:

- Design the pavement to have a reduced cement and water content by using a favorable aggregate gradation (Ley and Cook 2014).
- Use pre-wetted light weight aggregate (SLWA) in the concrete to provide an internal source of water to reduce the moisture gradient (Henkensiefken et al. 2009).
- Use of shorter slabs with dowelled joints for jointed pavements, or use of continuously reinforced concrete pavement (CRCP) to minimize transverse joints.

Closing

The development of upward slab curvature has the potential to increase pavement roughness, even when no distress is present. Careful selection of mixture proportions and design elements can reduce the occurrence of slab curvature in new pavements. Grinding of rough concrete pavements can result in an immediate reduction in roughness due to slab curvature.

For more information contact Tom VanDam, P.E., Ph.D, NCE, at: *tvandam@ncenet.com* or Tyler Ley, P.E., Ph.D., Oklahoma State University, at: *tyler.ley@okstate.edu*

GENERAL NEWS

Caltrans Names New State Pavement Engineer

By Roger Smith, CP² Center

Tony Tavares , Chief of the Caltrans Division of Maintenance recently announced that Jesse Bhullar assumed the position of State Pavement Engineer with the HQ Division of Maintenance effective February 17, 2015.

Jesse has worked at Caltrans for over 26 years in progressively responsible positions in the areas of Planning, Design, Construction, Traffic Operations, and Local Assistance at Headquarters, Districts 4 and 10. He is currently managing the Local Bridge, Bond and Safety programs in the Division of Local Assistance. Prior to that, he led the development and implementation of California's Strategic Highway Safety Plan, which in 2009 received the National Roadway Safety Award. While managing the Traffic Safety Program from 2000 to 2005, he developed and managed the collision reduction program in the SHOPP; expedited the delivery of safety projects; and developed the Run-off Road Monitoring program, which in 2005 received the National Roadway Safety Award. Jesse has also managed the Traffic Census, Traffic Accident Surveillance and Analysis System (TASAS) and Weigh-In-Motion (WIM) programs.

Jesse is a licensed Civil Engineer (P.E.) and a Traffic Engineer (T.E.) in the state of California. He is the recipient of the 2007 Karl Moskowitz Award by Caltrans. He has served on various national committees, research panels, and is a member of AASHTO's Standing Committee on Highway Traffic Safety (SCOHTS).

He recently spoke at the CP² Center's Patrons Meeting about Caltrans Pavement Management program and emphasized the need for strategic planning to have projects "ready to go" when the next wave of funding arrives. With the Governor and Legislature in agreement on the need for more funding for transportation, Caltrans and their industry partners will need to be prepared.

For Pavement Preservation, is IRI a better indicator than PCI?

By Sui Tan, Metropolitan Transportation Commission (MTC)

This sounds like a tricky question. For at least two decades, the academia has attempted to find a correlation between the International Roughness Index (IRI) and Pavement Condition Index (PCI). But none of the research thus far has found any strong correlation between IRI and PCI.

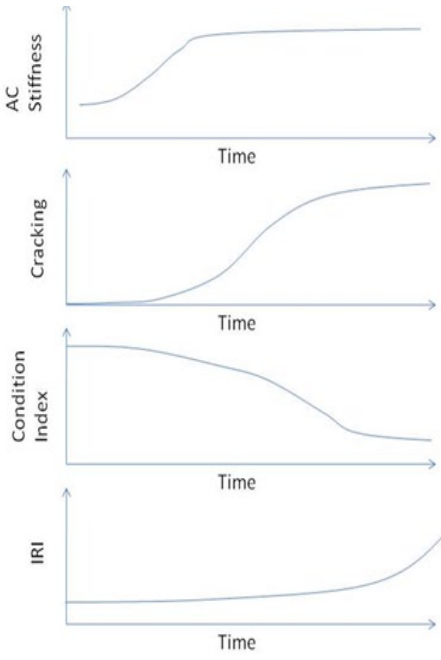
The recent MAP-21, FHWA's Notice of Proposed Rule Making has heightened the importance of IRI as one of the performance metrics on pavement conditions. Why would FHWA pick IRI? For one important reason – this is by far the only national-level data that the state highway agencies collect and submit every year for Highway Performance Monitoring System (HPMS) reporting. Caltrans has IRI data since 1990 when it was first required by FHWA. So it is reasonable to see why the IRI became one of the performance metrics proposed.

Definitions

But what exactly is IRI? The simplest definition is that it is a measure of ride quality. With measurements at highway speed over 55 mph, it is an important index to gauge how "comfortable" we, the motoring public, feel about our ride. On the other hand, PCI, an ASTM D6433 standard, is a composite index of various distresses related to load, environment, and construction deficiencies. The measurement of functionality, or ride quality, is important for facilities with high speed travel; however, not very significant for the lower speeds that typically occur on local roadways.

Engineering Perspective

From the engineering perspective, at the time of construction, the asphalt cement binder starts to age-harden. As it hardens, the asphalt cement and asphalt concrete loses its ability to expand or stretch without cracking. So after some time, cracks start developing, which leads to further cracking and decrease in the condition index, as shown in the graphs below. IRI stays relevantly constant through much of this, but as the cracking increases and the condition index deteriorates, the IRI starts to increase. However, by the time the IRI has increased significantly, the cracking may have caused significant structural deterioration in the pavement - well beyond what preventive maintenance treatments included in a pavement preservation program can address. So while IRI can be used to identify pavements that are beyond the point where most preservation treatments can be applied, it does little to identify when to apply preservation treatments.



Performance Management Indicators

In performance management, there are 'leading" and "lagging" indicators. Lagging indicator is usually easy to measure but hard to influence. An example is using weight loss as a goal. You step on a scale and you know your weight. However, the weight is a lagging indicator. So how do you reach your goal? Leading indicators like the amount of calories intake and burned will be good ones to start with.

In pavement management, IRI measures ride quality or smoothness of pavement. It is easy to measure and is used by all state highway agencies for HPMS reporting. However, the IRI increase is only noticeable when certain amounts of distresses have appeared, and is less sensitive to cracking distresses. Hence, when it comes to pavement preservation, IRI is a "lagging" indicator for preventive maintenance. On the other hand, PCI is an excellent "leading" indicator, enabling an agency to apply preventive maintenance when the first sign of distress appears. This is because pavement rating for PCI is based on low, medium, and high severity of various distresses and their quantity.

So if, in answer to the opening question, you picked PCI - right on! Because that's what 70% of the cities and counties in California use in their pavement management systems.

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

FHWA Update By Steve Healow, FHWA, California Division

The following summarizes some of the highlights going on within FHWA, Congress, and SHRP.

In Moving Ahead for Progress in the 21st Century (MAP-21) Section 1106 "National Highway Performance Program" congress intends to transition the Federal-aid highway program to a "performance-based" program, meaning the performance goals and measures in the law will be implemented via performance targets to be selected by state DOTs, Metropolitan Planning Organizations (MPOs) and other agencies that own and operate National Highway System (NHS) routes. Transportation agencies which own a piece of the NHS face numerous challenges in the short term as they develop risk-based strategies for managing the performance of NHS assets, develop deterioration models, prepare life-cycle-cost analysis, set performance targets and develop investment strategies. You can read the proposed regulation and highly informative public comments at the following website; *http://www.regulations.gov/#!documentDetail;D=FHWA-2013-0053-0073* .

Highway Trust Fund (HTF) facts:

- The fund was established by the Interstate Highway Act of 1956. Until that time highway projects were paid for out of the general fund.
- Congress has authorized spending from the fund through May 31.
- By July 31 the fund balance is projected to be near zero.
- The trucking industry contributes over $16 Billion annually to the fund in highway user fees.
- Prior to 2008 highway user fees and tax revenue from fuel, tires and trucks were sufficient to meet or exceed spending. Since 2008 congress has kept the highway trust fund solvent with cash transfers from the general fund, totaling $62 Billion.
- Over the next decade the highway trust fund is expected to run a cumulative deficit of $180 billion.
- For the current fiscal year a $13 Billion deficit is projected.
- As this article is written the senate finance committee is considering an $11 Billion infusion.
- Congress diverts over 25% of HTF dollars to non-road, non-bridge projects, including bicycle and pedestrian facilities and landscaping.
- In the absence of tax hikes or spending cuts congress must find an additional $15 Billion per year in revenue in order to finalize a multi-year surface transportation bill.

How is a transportation agency supposed to deliver projects in a timely manner, preserve and improve infrastructure and relieve congestion while the number of users is growing and budgets are static or shrinking? Even in good times transportation funds are limited. Thus we will always be challenged to identify and implement the most cost effective solutions. That is the purpose of the Strategic Highway Research Program, Part 2 (SHRP2), a program authorized by congress and administered by FHWA in association with the Transportation Research Board (TRB) and the American Association of State Highway and Transportation Officials (AASHTO). Over 100 research projects were launched to identify solutions for some of our more vexing challenges, i.e. aging infrastructure, congestion, reliability, and capacity. In this issue the featured SHRP2 products in the spotlight are precast concrete pavement and composite pavement. Both are potential solutions on high traffic volume corridors or truck routes where long-life pavement is justified. Composite pavements have the added advantage of sustainability since they often include recycled materials. Pre-cast panel concrete pavement is an alternative strategy to cast-in-place, with the added advantage of improved quality control at the pre-casting yard. Read more about precast concrete pavement here: *http://www.fhwa.dot.gov/goshrp2/Solutions/Renewal/R05/Precast_Concrete_Pavement*

and more about design and construction of long-life composite pavement systems here: *http://www.fhwa.dot.gov/goshrp2/Solutions/Renewal/R21/New_Composite_Pavement_Systems*

The AASHTO SHRP2 web site is: *http://shrp2.transportation.org/Pages/default.aspx*

CP² CENTER NEWS

CP² Center Holds Patrons Meeting

By Roger Smith, CP² Center

The California Pavement Preservation Center (CP²C) established in 2006 at CSU, Chico, provides assistance with the development and use of appropriate pavement preservation strategies. The Center was originally funded by Caltrans and continues to work closely with them, as well as other agencies and industry. We maintain a very experienced staff of pavement experts, and a state-of-the-art laboratory facility.

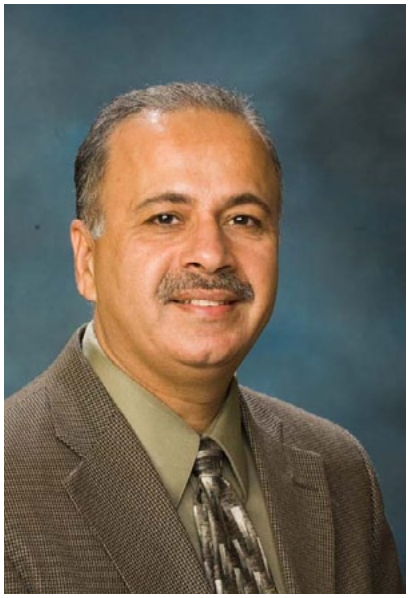
But the Center is funded only by contracts with agencies such as Caltrans and CalRecycle and other clients, and work under those contracts is narrowly defined, so that funding may only be used for specific contract tasks. The Center, therefore, has no contingency funding to sustain "overhead" activities, such as maintaining lab equipment, preparing contract proposals, organizing meetings and conferences, participation in events to promote pavement preservation, and delivering training classes. This funding must come from non-contract sources such as our Patrons Program.

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

The 2015 Patrons Meeting and Open House was held on March 19 at the Center at CSU, Chico. Over 30 people attended – including some Caltrans representatives. They were welcomed by Patron Program Co-Chairs, Dr. Hans Ho (Telfer Oil) and Dr. Gary Hicks (CP2C), and were given an overview of the Center's activities by Dr. Ding Cheng, Director, and Lerose Lane, Senior Pavement Engineer. Dr. Hicks also provided history and details of the Patrons Program, and the cited the benefits of having a strong Patrons group.

Tony Tavares, Chief of Maintenance Division of Caltrans

Special guest speakers were Tony Tavares, Chief of Caltrans Maintenance Division, and Jesse Bhullar, the new State Pavement Engineer. Mr. Tavares lauded the many accomplishments of the Center and stressed the value of a continued partnership with Caltrans. Jesse Bhullar is new to the field of pavements, but provided an overview of Caltrans pavement management efforts and stressed the importance of having projects "ready to go" when the next round of funding arrives.



Jesse Bhullar, State Pavement Engineer of Caltrans

The group was treated to a tour of the Center's state-of-the-art materials lab where they witnessed in-progress testing of asphalt binders and mixes using the latest SuperPave testing technology. They also were briefed on the recent shrinkage study of rapid strength concrete (RSC) involving testing done by the Center.

As a follow-up to this meeting, an Advisory Board will be formed to oversee the activities and finances of the Center and it's partners at CSU, Long Beach and Cal Poly San Luis Obispo.

For more information on joining our Patrons Program, please contact Co-Chairs, Dr. Gary Hicks at *rghicks@csuchico.edu* and/or Dr. Hans Ho at *handsho@telfercompanies.com*. More information on the Program is on the Center's website at *http://www.csuchico.edu/cp2c/*

Mark Your Calendar (Coming Events)

COMING EVENTS

CEAC Northern California, 34th Annual Bedroll Conference, JULY 29-31, 2015 (Lake Almanor, Camp Conery, Plumas County)

This Tri-Regional Northern California, Sacramento Motherlode and Bay Area CEAC meeting brings together Public Works Directors, our partner agencies, and senior staff from the three regions in an informal atmosphere to discuss new and challenging aspects we face today.

We will have several speakers lined up on current and interesting topics to address the many challenging aspects of public works. We will also receive briefings from CEAC, CSAC, and Caltrans Local Assistance to find out what the latest is in these fast changing times.

For more information visit: *http://www.ceac-counties.org/Bedroll_2015.aspx*

14th AASHTO/TRB Conference on Transportation Infrastructure Maintenance and Operations, July 19-23, 2015 (Des Moines, Iowa)

Breakout session, roundtable discussion, and evening dining and entertainment planning is currently underway. We kick things off Sunday evening with the Ice Breaker Social. Tuesday, hop on the charter bus as we head to Newton for Iowa Speedway Night. Wednesday, enjoy an evening of food and entertainment at Prairie Meadows Conference Center in Altoona. More details will be available soon.
For more information visit: *http://www.iowadot.gov/2015scom/*

NHI Offers Free Online Classes

The National Highway Institute (NHI) offers free online training classes on many hot topics related to pavements – including pavement construction, maintenance and rehabilitation. Both asphalt (HMA) and concrete (PCC) pavements are covered. These short, web-based classes range from 30 minutes to several hours in length, and can be viewed at your convenience and pace, from your location. They can be an excellent source of continuing education for road workers and their managers.

For more information go to: *http://www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0#course_search.aspx?tab=0&key=pavement&res=1*

This newsletter was produced in partnership with Caltrans. Caltrans established the California Pavement Preservation (CP^2 Center) CSU, Chico in July 2006, and fully funded the Center in January 2007. Dr. DingXin Cheng is the current Director of the Center.

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.

The Center works closely with the Pavement Preservation Task Group (PPTG), a statewide volunteer group consisting of members from Caltrans, Federal Highway Administration (FHWA), industry, various public agencies and academia to help promote cost-effective pavement preservation.

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