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On the cover: Cold-in-place recycling train on deteriorated roadway on Washoe County 447 in northwest Nevada. See article on pp. 12-17. Photo courtesy of Western Pavement Solutions.
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With enactment of new federal surface transportation legislation just behind us, the year 2013 began on a very high note for your FP² Inc. This fulfilled FP²’s primary goal of getting financial support for pavement preservation and asset management codified in federal law.

Also late last year we were cheered by the launch of quantitative pavement preservation research at the Pavement Test Track of the National Center for Asphalt Technology at Auburn University. Both the track and MAP-21 gave us and our many visitors much to talk about at our annual hospitality suite at the Transportation Research Board meeting in Washington in January (see Page 23).

But like the Russian matryoshka dolls—in which a second, derivative creation is found nested within the first, and another and another hidden within the second and the third—we are finding that just as soon as we reach one goal, we are compelled onward to another related challenge in keeping the momentum going.

Along those lines, here’s what we are tracking in 2013:

- **Rulemaking for MAP-21 provisions.** Getting preservation codified in the Moving Ahead for Progress in the 21st Century (MAP-21) bill was only the start of our work “inside the Beltway.” The bill provides the mandate, but it’s up to the Federal Highway Administration to provide the details. FHWA is in the process of issuing rulemaking regarding a number of provisions in the bill and they are scheduled to be issued for public comment by the end of the first quarter 2013. Included will be performance measures for agency networks. FP² Inc. will work to make sure that none of the provisions relating to preservation are adversely impacted by these rules.

- **American for Disabilities Act (ADA).** The federal U.S. Access Board, formerly the Architectural and Transportation Barriers Compliance Board, plans to issue new guidelines related to “alterations” to existing pavement facilities sometime in mid-2013. FP² Inc. has been working the FHWA to stay on top of this issue, and are in readiness to take whatever action is required on our part to keep reinterpretation of the ADA from negatively affecting our industry.

- **NCAT Preservation Group experiment.** As part of this exciting new research at NCAT, preservation treatments ranging from fog seals to thin HMA overlays have been placed on Lee Road 159, and others will be placed on the NCAT track as distresses occur. A small group of FP² Inc. supporters has been appointed by me to monitor these activities, and a meeting of all the funding partners (seven DOTs and FP² Inc.) was held in late December to review the performance to date. In 2013 we will continue our “due diligence” for this project and report the results in Pavement Preservation Journal, and our website, fp2.org.

- **The next surface transportation legislation.** When MAP-21 bill became law in October, it was valid only for 27 months. By the time you read this copy in March, only 18 months will remain before MAP-21 expires. That means we have to continue our work on Capitol Hill to make sure pavement preservation and asset management are part of the legislation that follows. Rep. Bill Shuster (R-Pa.) is the chair of the House Transportation & Infrastructure Committee, and we understand that he’ll begin writing the next bill as soon as the 113th Congress is convened, in January. We plan to stay engaged with Congress as this process begins; read more in our special article on Beltway politics on Page 9 of this issue.

It goes without saying that we have a full plate of activities for 2013. For our work to be a success, FP² needs your continuing support. We hope that you will join us financially to help make our efforts a reality in 2013.
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MAP-21: Pathway to Preservation at the Federal Funding Level

By Tracy Taylor

Much to the relief of the highway construction industry, Congress overcame the gridlock that stalled action on most issues, when, in July 2012—after three years and 10 short-term extensions—it passed the latest surface transportation reauthorization act, Moving Ahead for Progress in the 21st Century, dubbed MAP-21.

This bill—which will spend $120 billion on surface transportation over 27 months—expires Sept. 30 of next year. As such MAP-21 ensures needed predictability of federal funds for the industry and public for a relatively short period of time compared to previous “highway bills.” The relatively short length of the bill also ensures that this Congress will soon begin working on a subsequent reauthorization.

Notably, the bill authorizes easing of environmental requirements, speeding up highway construction. It also consolidates federal surface transportation programs by two-thirds, from about 90 programs, to fewer than 30. It creates a new National Highway Performance Program and increases state and local accountability for their highway and transit spending. Importantly for the pavement preservation industry, the bill embraces preservation as one of the key activities for which federal highway monies can be spent.

MAP-21 set in place an aggressive calendar for the Federal Highway Administration, Federal Transit Administration and other agencies.

Important for the preservation industry will be the establishment of performance and asset management measures and standards. These standards will be critical moving forward in the development of each state’s surface transportation performance targets, as required by MAP-21, because an important theme of the new law is accountability for work funded by the act.

FP² and its allies in the industry will continue to be actively involved in this process as it unfolds this year, as their work shifts from getting pavement preservation included in federal law to making sure the means by which progress in preservation will be measured are appropriate for the techniques.

NEW FUNDING STREAMS NEEDED

The “elephant in the room” for MAP-21 and any future surface transportation acts—what we used to call “highway bills”—is the funding mechanism. With the proliferation of fuel-efficient cars, and a gas tax that has not risen from 18.4 cents per gallon since 1993, the Highway Trust Fund is no
The challenge: rehabilitating the complete pavement structure of a 3.7 mile section of I-81 in Virginia. The solution: two project phases involving the use of as many as three different recycling methods. The result: REVOLUTIONIZING ROAD REHABILITATION!
longer sufficient to fund our country’s transportation needs.

A solution to this problem will be high on the agenda of the key transportation policy makers in the next Congress. Already, early in 2013 we have seen reports on funding alternatives from the Government Accountability Office (GAO), including Highway Trust Fund: Pilot Program Could Help Determine the Viability of Mileage Fees for Certain Vehicles. We can expect to see much more thinking along these lines on how to fund transportation both at the federal and state level. Finding new revenue sources will be a priority for transportation policy leaders on Capitol Hill.

What transportation related changes should we expect to see in the 113th Congress? Whereas there were very few changes in the composition of the Environment and Public Works Committee—aside from the former Transportation and Infrastructure Subcommittee ranking Republican Sens. David Vitter (R-La.) taking over the term-limited ranking Republican Jim Inhofe’s (R-Okla.) seat as leading Republican on the full committee—there were many changes in the House Transportation and Infrastructure Committee among both in its leadership and rank-and-file members.

In the House of Representatives, we have already seen the new Transportation and Infrastructure Committee chairman Rep. Bill Shuster (R-Pa.) take over the helm of the committee with a running start. He is expected to lead the committee to reach bipartisan consensus on the important reauthorization bills (not including MAP-21) that the panel will need to produce this Congress.

A 12-year veteran of the committee—as well as being the son of the highly effective long-time committee chair Bud Shuster—chairman Bill Shuster is no newcomer to transportation policy. Chairman Shuster got his feet wet achieving party consensus for a major highway bill last year when he was tapped by leadership to rally, and count, support for the future MAP-21.

Already, Chairman Shuster has made key decisions that bode well for an effective committee. He has kept seasoned transportation professionals on his staff while bringing additional well-respected staff to the committee.

The new committee chief of staff, Chris Bertram, served as the Highways and Transit Staff Director for Rep. Bud Shuster, was assistant secretary for Budget and Programs and CFO at the U.S. DOT in the first Obama administration, and has held additional financial and budget positions at the DOT and the Office of Management and Budget.

Bertram’s background provides Chairman Shuster and the committee with extensive knowledge that will come in useful to in addressing Highway Trust Fund financing. Other members of the staff including the deputy chief of staff Steve Martinko, counsel Jennifer Hall, and Highway Subcommittee staff director and senior advisor to the chairman, Jim Tymon, are experienced professionals who are well-respected on both sides of the aisle. In a year when a third of the members are new to the committee, this will be particularly helpful to the chairman in an effort to bring all his members up to speed.

**STRONG CASE FOR INFRASTRUCTURE**

In his first public comments as chairman, Shuster made a strong case to the public—and his colleagues in Congress—that a strong national infrastructure is critical to the economic growth of our country. He believes that an efficient national transportation network is a key to allowing American business to be competitive in the global marketplace, and allowing our economy to prosper and grow.

In the coming months, he will take that message of efficiency and growth to the public to develop support for investing in a strong infrastructure system. Chairman Shuster understands that with a small Republican majority in the House of Representatives, he may only have two years at the committee’s helm. It is expected that he will take advantage of that time and move full speed ahead on developing the next surface transportation reauthorization, as MAP-21 is set to expire in 2014, and in finding a way to solve decreasing revenues for highway spending.

In summary, while it is unclear whether Washington will continue to face partisan gridlock, thanks to the passage of the MAP-21 in 2012, its short time frame, a sense of urgency in confirming new revenue sources, and some new blood on Capitol Hill, the 113th may turn out to be an exciting Congress for proponents of investment in our nation’s infrastructure.

Taylor is principal, Williams & Jensen, PLLC, FP² Inc.’s representative on Capitol Hill
Punishing truck traffic, a brutal high-desert environment, a dearth of highway funds, and even an annual counterculture festival that brings thousands of artists and hipsters to remote northwest Nevada, all have pushed Washoe County’s Highway 447 to the breaking point.

But Washoe County is fighting back with a phased program of preservation for portions of Highway 447. The three elements of this preservation project are:

• A 3-in.-deep cold-in-place recycling (CIR) of the failing roadway
• Placement of a crack-resistant membrane that puts a network of fiberglass strands between two layers of polymer-modified emulsion—all placed simultaneously—then topped with a layer of chips, and
• Placement of a Type III slurry surfacing as the final wearing surface.

“With fuel prices going up, we are seeing a lot more truck traffic on 447,” said Bill Gooch, acting supervisor, County of Washoe Road Division, Gerlach, Nev. “It’s a shortcut; one truck driver told me taking 447 saves him three hours driving from Portland or Seattle to Phoenix or Las Vegas.”

And the highway is burdened once a year by the week-long, end-of-summer Burning Man art festival, celebrated in the desert north of Gerlach. Tens of thousands of “burners”—as they are dubbed locally—fight their way across the desert, carrying their own water, food and art supplies to camp, create extravagant sculptures and painted inventions, and walk around in costume (if that). Isolated from the limiting influences of civilization, participants are free to be themselves, at least for a week.

“In addition to the growing truck traffic, we see the Burning Man traffic,” Gooch said. “Their vehicles—school buses, campers and motor homes—all seem to all be overweight as

Cold-in-Place Recycling, Fiber Membrane and Seal Preserves Desert Highway

By Tom Kuennen
they bring in living supplies and building materials, and they are hard on our roads. Because of the way the road was built—an oil-sand mix, a cold-mix asphalt prepared with existing materials from the highway right-of-way—it is somewhat soft. Our water table is only 18 in. down—nothing you would want to drink—but when that is combined with the soft oil-sand mixture the road gives a lot, and you can feel a truck drive by. The road was badly fractured and I had no idea how we were going to fix it.”

“Basically it was just sand and oil, mixed together,” said Greg Belancio, P.E., senior licensed engineer, Engineering Division, Washoe County Department of Public Works. “The section averages 4 in. thick and the county has been doing it this way since the 1970s. We had a cold-mix plant up there and made our own material. It works for rural areas, but on 447 after 30 years, it deteriorated badly. We had been using microsurfacing to fill in the ruts. We can’t afford $8 million to go up and pave the whole thing, so we are taking this strategy because the whole surface needs renovation.”

THREE-PART SOLUTION
The solution was a combination of CIR, crack-resistant membrane and slurry seal, all of which should provide a relatively smooth pavement that will stand up to increasing loads and the high-desert environment for years to come, while saving the county precious road maintenance funds. The CIR provides a refreshed structural course, the membrane resists future cracking and provides strength against lateral loading, and the slurry seal protects the entire package and provides a high-friction driving course.

However, each of these processes are executed independently. On 447, the road was cold-in-place recycled, then allowed to cure for at least four days. The chip seal—in this case, the crack-resistant membrane—would then be placed and allowed to cure. And finally, a slurry seal would be placed as the final wearing surface.

“The biggest part of this project is the use of cold-in-place recycling to remediate problems on the roadway that normal sealing cannot rectify,” said Doug Olsen, regional area manager, surfacing division, Western Pavement Solutions, Las Vegas. “We’re going down 3 in., right to the base in some areas.”

Pre-work consisted of setting up traffic control and coring samples every mile. “We then would send these cores to an accredited lab for mix design,” Olsen said. “The lab would take these cores, and our emulsion samples, and give us targeted placement percentages of emulsion, water—and if we needed—a mineral filler to supplement the design.”

Standard tests for performance evaluation of the mix design targeted cold-weather raveling potential, density, gradation targets, and more. “This process takes four to six weeks to complete and is vital to ensuring that we get a good platform to complete a successful project,” he added. “Agencies with more experience with this process actually have these tests as a bid-item criteria.”

In the field—by means of a recycling train—the failed pavement is cold-milled 3 in. deep, and the RAP is funneled into a trailer-mounted screen deck that removes oversize and permits a gradation for a mix design. That graded material is introduced into a pugmill where an engineered asphalt emulsion is mixed in with the 1/2-to-3/4-in. RAP particles. Other mix designs may use other engineered emulsions, rejuvenators and lime antistrip additives.

The recycling train the places the 100-percent-recycled cold mix in a windrow, which is placed by a windrow elevator into the hopper of a conventional paver, which places it in a 3-in. lift. It’s then compacted with pneumatic and tandem vibratory rollers. Although the CIP pavement will cure for four to five days before placement of the crack-resistant membrane, traffic may be allowed on it immediately.
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Because the original cold mix still contains a lot of saturates, the emulsion dosage was designed not to overload the mix. “In this particular section of roadway, we don’t want to overload additional saturates,” Olsen said. “If you add too much, the resulting pavement will get soft.”

“From what I’ve seen of the cold-in-place process, I feel it’s really going to help us out,” Gooch said. “It’s totally redone the road surface. All the cracks are gone. And we follow with the fiber membrane, and I am anxious to see how that will hold up against our heavy truck traffic and rutting. We anticipate that it really will help out, as it will bring not just lateral and horizontal strength, but strength in all directions.”

The crack-resistant membrane, called FiberMat, is a specially formulated, polymer-modified, fiber-impregnated membrane binder for use with chip seal applications or as an interlayer with various overlays (e.g., HMA, slurry surfacings or micro surfacing).

FiberMat provides strength and flexibility due to the utilization of chopped fiberglass strands that form a high-tensile strength matrix. The system is installed by a truck-mounted machine that uniformly applies the fiberglass strands—cut from onboard spools—in a random, continuous application.

In placement, the strands are sandwiched between two layers of sprayed latex polymer-modified CRS emulsion, prior to the application of an aggregate cover. Much like a conventional chip seal, the final product then is gently rolled with rubber-tired compactors to seat the aggregate into the product. The combination of highly modified asphalt residue and a fiberglass reinforcement matrix creates a crack-resistant membrane that can stand up to heavy traffic loadings.

PRESERVING HIGHWAY 447

The county’s fight to save the 56-mile Highway 447 in northwest Nevada is a do-or-die effort that called for new thinking about how it could be done.

“Belancio is one of the most forward-thinking pavement maintenance engineers in Nevada,” Olsen said. “He isn’t afraid to try new technologies. He won’t step out beyond to take huge risks, but if something makes sense, then he is apt to use it as he always is searching for the means to benefit his constituents.”

There is a built-in reluctance among government agency officials to try new technologies, because if the new technology fails, they can be hung out to dry by the news media, citizens and elected officials. If they had only kept doing what had been done before, the rationale goes, the failure never would have taken place.

“The difference is that we all did our homework,” Olsen said. “The entire 447 project is based around cold-in-place recycling, and Nevada uses cold recycling. The county has been using cape seals [chip seal followed by one or more layers of a slurry seal or micro surfacing] for years. The problem is that no matter how well we seal something, cracks will migrate through it. The county had planned to do a million dollars’ worth of patching on it, but over 40 miles of roadway, where do you stop? You’ve patched the spots this year, but next year you will have failures adjacent to the patches. You’ve wasted your money and the ride is terrible.”

Highway 447 is maintained by the Nevada DOT from Wadsworth, Nev., some 30 miles east of Reno, to Gerlach, but the county is responsible for the 56 miles of 447 from Gerlach to the California state line. It is this stretch that is being rehabilitated in stages over a multiyear period.

“The state DOT had cold-recycled portions of its 447 just the year before,” Olsen said. “We checked it out and the county liked what it saw. The same crew was available to do the same work for the county. The stars lined up perfectly. They are very happy with the work we’ve already done and it’s changed the whole dynamic of the roadway. Instead of having a very rough ride with bumps and inconsistencies, they have gained as close to a new road as they can, for a lot less money than a new road.”

PRESERVING PAVEMENTS FOR 20 YEARS

“We’ve had a pavement preservation program for 20 years,” Belancio said. “Back then we didn’t call it pavement preservation, but we used slurry seals to keep our roads in good shape. The seals protect our pavements from the sun’s ultraviolet rays and the high desert temperatures.”

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Army Corps of Engineers and available through the American Public Works Association. “We also are a beta test site for them,” Belancio said. “Our commissioners wanted to enable us to keep our streets in line, to see where the funding was going, to project future needs, and help us source funds. Now with our years of data, and deterioration curves developed, we can project pavement conditions out five or six years and know what kind of funding we don’t have to keep our pavement condition index (PCI) averages high.”

Not having those funds hurts, Belancio said. Due to a lack of funds, Washoe County has seen its average PCI drop from 77 in 2008 to 72 in 2011. “We definitely don’t want to go any lower than that, because if we do we will have to start pumping money into the system,” he said. “When you are consistently in the 60s and low 70s you are not doing maintenance any more, you are doing reconstruction. And while you reconstruct streets, you fall further behind with the others. You fall off the cliff.”

One way the county preserves its streets is by extensive use of slurry surfacings. “In residential areas of the county we will do a Type II, and on low-volume roads and cul-de-sacs we will do Type II,” Belancio said. “On the arterials and collectors we’ll do a Type III, or skip right to a Type III micro, as it allows us to get traffic in and out quickly. A big advantage of micro surfacing is that you don’t have to wait four hours for the break. Some agencies will do micros exclusively, just to be able to get people back on the road ASAP. It’s a little more expensive but worth it in the long run.”

Washoe County has 710 lane miles for which it’s responsible, including the desert stretches, but also has urban arterials and highly trafficked mountain roads leading up thousands of feet to the expensive homes, resorts and tony casinos of Lake Tahoe. The latter roads are subject to heavy snowfalls, which the county must clear. For those roads the county uses micro surfacing and cape seals.

“We use micro surfacing to help protect pavements from snow plows, and the best thing we can use against the snow plows is the cape seal, with a chip seal topped by a micro,” Belancio said. Another benefit, he added, is that the micro surfacing prevents chips from leaving the lower seal, eliminating windshield claims.

In addition, he said, micro surfacing permits leveling of rutted surfaces, within limits. “With slurry only, you can’t ‘stack’ the aggregates,” Belancio said. “But the chemical package of the micro surfacing allows you to stack the aggregate, enabling rut-filling.”

**URBAN PAVEMENT PRESERVATION, TOO**

In addition to the work on 447, Western Pavement Solutions was undertaking urban slurry seals for the multijurisdictional Regional Transportation Commission (RTC). RTC’s Streets & Highways program provides pavement preservation and new roadway construction projects for regional roads under the jurisdiction of Reno, Sparks and Washoe County.

RTC’s pavement preservation projects for regional roads include slurry and micro seals to keep good pavements in good condition, as well as total pavement reconstruction for pavements that have failed or are no longer in serviceable condition. RTC Streets & Highways program also includes construction of new regional roadways and capacity improvements to existing regional roads to reduce congestion.

Its preservation efforts was evident in an application in Sparks, Nev., where Western Pavement Solutions was placing a Type III LMCQS-1h (latex-modified cationic quick-set emulsion with No. 1 hardness) slurry surfacing on a completed pavement in a subdivision in which new tract housing had yet to be built. The emulsion was manufactured by Western Pavement Solutions using latex modifier from BASF Corp.

Construction of homes on the existing subdivision streets—with curbs, gutters and sidewalks—had halted due to the collapse in the housing market, yet the pavement continued to age. Placement of a slurry surfacing years after original construction—but before the pavement began to deteriorate—would keep that driving surface in as-new condition, ready for the rebound in housing—the very definition of pavement preservation.

Information for this article contributed by Western Pavement Solutions unit of Colas Solutions
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New Online Tool Helps Measure Road Network Health

By Syed Waqar Haider, Ph.D., P.E.

A new web-based quick check highway health calculator tool—with minimal calculations—now is letting road agency personnel easily determine the adequacy of their resource allocation efforts for pavement preservation.

An agency needs to know whether its current or planned program activities—reconstruction, rehabilitation and preservation—will produce a net improvement in the condition of its road network. However, before the effects of any planned actions on the highway network can be analyzed and evaluated, some basic network life concepts need to be understood.

Assume that for every lane-mile of road in a network, the number of years of remaining life (until the terminal condition) is known. If no improvements are made for one year, the number of years of remaining life will decrease by one year for each road segment, except for segments already at zero. As a result the number of roads with zero life will increase because not only is the previous balance retained, but also roads that previously had only one year of remaining service life are added.

Some highway agencies continue to assign their highest priorities to reconstructing or rehabilitating their worst roads. The practice of “worst first” (i.e., continually addressing only those roads in the zero category) is a proven death spiral strategy, as reconstruction and rehabilitation are the most expensive ways to maintain or restore serviceability to the infrastructure. Furthermore, rarely...
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is sufficient funding ever available to sustain such a strategy.

Based on the concept of the loss of one year of service life for every elapsed year, the measurable network loss of pavement life can be thought of as the network’s total lane-miles multiplied by one year—i.e., lane-mile-years. To offset this quantity of network deterioration, the agency would need to perform an annual quantity of work equal to the total number of lane-mile-years lost just to maintain the status quo. On the other hand, performing a quantity of work that produces fewer lane-mile-years, while lessening the natural decline of the overall network to some extent, would still fail to maintain the status quo over an extended period. However, if the agency performed more total lane-mile-years of work than the size (in lane-miles) of its network, it would improve the network’s condition.

**‘QUICK CHECK’ OF HEALTH**

To illustrate the above concept, Larry Galehouse of the National Center for Pavement Preservation (NCPP) and the late Jim Sorensen of FHWA developed *A Quick Check of Your Highway Network Health*. This methodology gave road agency managers and administrators an opportunity to quickly assess the needs of their networks and other highway assets.

Today, this has been updated into the new web-based quick check highway health tool. The information needed to use this tool includes basic treatment information (treatment type, expected life extension and cost), network size reported in lane-miles, and available annual budget.

When evaluating pavement preservation treatments, it is appropriate to think in terms of “extended life” rather than “design life.” The term “design life,” as used with reconstruction and major rehabilitation, refers to a new or rehabilitated pavement and reflects the fact that a new life has begun, in contrast with extending an existing life. Actual values of design life and life extensions will vary for specific applications depending on construction practices and design.

“Treatment life” and “treatment life extension” are two terms often used to indicate the life of a preservation treatment. While the former term only refers to the typical life of a treatment, the latter term is influenced by the treatment’s application timing. The treatment life extension may be easily identified in the field by considering:

- The time taken for the treated pavement to deteriorate to the terminal condition, and the time taken for the untreated pavement to deteriorate to the same terminal condition.

Almost all pavement practitioners find that it is neither practical nor economical to wait until a pavement reaches its terminal condition before applying a preservation treatment. The continuum of preservation treatments must always be applied while pavements are still in good/fair condition to be cost-effective and preserve the integrity of the surface. Therefore, for the practitioner it is more logical and practical to consider the first approach to define the treatment life extension.

In certain cases the characteristics of the treatment will dictate that the second approach is used to measure life extension. Generally, treatments used early in the pavement life, before visible distress appears, are candidates to use a terminal condition measure. Examples of these are fog treatments, such as rejuvenators and asphalt sealers.

A study issued by the Federal Highway Administration and FP2 Inc. concluded that rejuvenators and spray-applied asphalt sealers are beneficial and cost-effective tools for pavement preservation. When rejuvenators are used as a preservation treatment to mitigate top-down cracking associated with pavement surface aging, early application timing (when there is no evidence of surface distresses on the existing pavement) of the treatment is vital. Since such treatments will not immediately improve a pavement’s surface condition, life extension can be estimated if a control section is established prior to the treatment.

**ESTABLISH BENCHMARKS**

The first step to determine your network health is to benchmark the pavement work completed during the previous year. A decision can then be made whether to improve the network condition or just maintain the status quo.

Preservation treatments are only cost-effective and extend pavement life when the right treatment is used on the right road at the right time.

In practice, highway agencies work within their budgets to achieve the greatest improvements in their network conditions. Funds allocated for reconstruction and rehabilitation projects may be viewed as investments in the infrastructure, while funds directed for preservation projects may be seen as protecting and preserving past investments. Integrating reconstruction, rehabilitation, and preservation in the proper proportions (mix of fixes) will substantially improve network conditions for the motoring public while safeguarding the highway investment for the taxpayers.

Dr. Haider is affiliated with the National Center for Pavement Preservation at Michigan State University.

**ONLINE**

Access the quick check highway health tool at: www.pavementpreservation.org/fhwa-resources/quick-check-manual
View past issues of the Pavement Preservation Journal online at www.naylornetwork.com/fpp-nxt
Thousands of equivalent single-axle loads and miles of truck trips have begun to accumulate on the new pavement preservation tests at the National Center for Asphalt Technology (NCAT) at Auburn University.

In the fall of 2012, for the first time, preservation techniques began to be studied at the Pavement Test Track at the National Center for Asphalt Technology (NCAT) near Auburn, Ala. The new NCAT Pavement Preservation Effectiveness Study is bringing the prestige of NCAT’s research facility to pavement preservation practice.

In addition to use of the NCAT Pavement Test Track to study pavement preservation treatments, preservation treatments also were placed off-track on a half-mile local county road that supports traffic to an aggregate quarry and an asphalt mixing plant with a high percentage of truck traffic. There, as part of the NCAT Pavement Preservation Effectiveness Study, Lee Road 159 is serving as the host roadway for the off-track component of the 2012 multi-sponsor Preservation Group (PG) experiment.

“There are three different classes of testing we do on Lee Road 159, as traffic develops,” said NCAT assistant director Buzz Powell, P.E., Ph.D., in January. “We do weekly testing with our ARAN van, which is an inertial profiler; we do weekly crack map videos where we also do visual inspections with notes and pictures of anything noteworthy; and we do subgrade characterization testing to document differences between sections that can affect surface performance.”

Subgrade moisture testing is run using permanently installed probes and falling weight deflectometer testing is completed monthly in multiple locations of every section on Lee Road 159. “There is an extensive amount of work done for weekly and monthly testing,” Powell said.

NCAT is collecting two different levels of distress data on Lee Road 159, Powell said. “We crawl around our test sections on the Pavement Test Track, looking for things you can’t see with network level video inspection systems,” he said. “We’re doing that same thing on Lee Road 159, but that’s just data for our own internal purposes, so we know where cracks have initiated. Life extending benefit curves that are the implementable product of the experiment will only be based on video inspections because that’s how they will be calibrated to local materials, climates, contractors, etc. by sponsoring state DOTs.”

For more information, please contact FP² executive director Jim Moulthrop at (512) 970-8865, jim.moulthrop@gmail.com. And please accept our sincere “thanks” for considering participation in this important undertaking at the NCAT Pavement Test Track.
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Ribbon Cuttings Shine Spotlight on New Hampshire Pavement Preservation

By Eric Thibodeau, P.E.

In an effort to bring pavement preservation (PP) practice to the attention of the motoring public and elected officials, the New Hampshire (NH) DOT conducted ceremonial ribbon cuttings for two pavement preservation projects in fall 2012.

The ceremonies highlighted two of NH DOT’s PP techniques, asphalt rubber chip seal and micro surfacing, on two separate roads that were in good condition. The ceremonies were attended by DOT executives and personnel, elected officials, news media and industry representatives.

NH DOT has developed an extensive strategy to preserve its 4,559-centerline-mile roadway network, valued in excess of $3.6 billion. Prior to 2005, most of the pavement maintenance work utilized hot-mix overlays, mill-and-fills, or rehabilitation/reconstruction. In most cases there were no planned strategies and most treatments were worst first.

‘KEEP GOOD ROADS GOOD’

Pavement preservation treatments were utilized to a limited degree, but there was no formal program. With the use of a pavement management system and developing strategies, NH DOT has developed an extensive pavement preservation program by increasing its efforts to “keep good roads good” and minimize the need to spend large budget dollars doing rehabilitation and reconstruction.

The PP program has been embraced not only by the pavement management group but also by NH DOT executives, including Commissioner Christopher Clement, as well as elected officials.

Today, NH DOT is using field data, automated roughness and distress data collected annually, in-house analysis, and a well-designed pavement management program to develop and implement performance and costing data to aid in the decision process of selecting the right treatment for the right pavement at the right time—the definition of pavement preservation. This has resulted in a mix of fixes based on the existing pavement condition, expected outcome relative to performance and life extension, and cost-effectiveness.

IDENTIFYING PAVEMENTS

The first key is the identification process of selecting pavements in good condition, based on field data and timing of the planning of the treatment before the pavement falls below the good condition. The treatment alternatives are determined based on pavement condition, expected service life, desired surface characteristics, traffic volume and type, and pavement location within the state. The techniques are inclusive from crack sealing to CIR with an overlay.

Originally in the development of the selection process, expected service life of various treatments were based on field experience, input from literature on various processes, other agencies experiences and contractor recommendations. Now, as NH DOT gains more experience with these treatments, the expected service life for each treatment is being determined for local conditions in the Granite State based on existing pavement, climate and traffic conditions.

As a result, a system of Equivalent Annual Costs (EACs) has been developed for NH conditions based on field performance experience and data from various techniques. The data used are based on actual project costs and expected life for all the PP treatments used. Completed projects will continue to be monitored over time for treatment performance, treatment pricing will be updated as new projects are advertised, and expected service life and EACs adjusted accordingly.

Pavement preservation now is embraced by DOT staff, management and elected officials in New Hampshire. Pavement preservation will continue to play an important role in spending the state’s limited budget dollars more wisely, and protecting previous infrastructure investments.

Thibodeau is the pavement management chief for NH DOT and serves on the board of directors of the Northeast Pavement Preservation Partnership.
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The Texas Pavement Preservation Center (TPPC) continues its ongoing mission to educate industry practitioners about the most recent developments in pavement technology and knowhow.

TPPC’s training courses provide the latest crucial information and advancements in pavement technology to a wide audience of engineers, technicians and policy makers. The Texas Pavement Preservation Center will offer six different training courses in 2013.

One of the courses taught by TPPC staff is MNT 705, Guidelines on the Use of Micro Surfacing. This course provides guidelines for planning and designing micro surfacing projects.

The application of micro surfacing or slurry seals to existing pavements does not increase the structural capacity of the pavement, but it does help preserve the structural capacity, primarily by reducing the environmental damage that would otherwise develop in the original asphalt concrete pavement from the surface down.

There, increased moisture levels will reduce stiffness of most pavement materials. Reduction of moisture infiltration reduces this loss of strength and may allow some strength to be regained during hot, dry periods so it can continue to effectively support traffic loads.

This TPPC course is composed of three chapters that cover all the components of micro surfacing. These topics include: TxDOT specifications for micro surfacing, mix design requirements and criteria, different applications and usage of micro surfacing, causes of micro surfacing failures, TxDOT’s use of cape seals, the concept of pavement preservation strategy, guidelines for appropriate selection of roadways for micro surfacing, guidelines for filling ruts, and guidelines for the use of cape seals.

### MICRO SURFACING BEST PRACTICES

Micro surfacing is a durable surface treatment that the Texas Pavement Preservation Center is promoting through educational courses.

- **Guidelines on the Use of Micro Surfacing.**
- **Best Practices of Micro Surfacing.**

A second course developed by the Texas Pavement Preservation Center, MNT 706, Best Practices of Micro Surfacing. This course builds upon MNT 705 and is intended to provide guidelines for planning, design and construction in micro surfacing projects.

More specifically, this course covers the following topics: the components of micro surfacing, how micro surfacing works as a surface treatment, and guidelines for quality assurance and possible problems that may occur. The course is organized in three chapters, starting with an introduction to micro surfacing, which is mostly a review of MNT 705. Chapter two presents the guidelines for quality assurance, while the last chapter gives an overview of the possible problems that could occur in micro surfacing applications.

Overall, these two courses will provide attendees with much-needed expertise in the following topics related to micro surfacing:

- **Selection guidelines.** These advise when to use micro surfacing treatments in place of conventional seal coats, in addition to quality layer thickness guidelines, and when not to use micro surfacing as a surface treatment.
- **Opening to traffic guidelines.** In most of the cases, micro surfacing can handle rolling traffic in less than one hour after placement without damaging the pavement, but stop-and-go traffic—especially heavy vehicles in cool, moist or very hot weather—may require additional curing time.
- **Quality assurance guidelines.** Micro surfacing, as a material, appears to be at odds with many of the techniques that TxDOT inspectors have developed over the years to ensure that quality hot-mixed asphalt concrete pavements are constructed. For example, micro surfacing requires that the surface be pre-wet, whereas normal hot-mix asphalt application requires a dry surface. Training is needed to provide direction for the proper checks and tests that take place during the application of micro surfacing and slurry seals in order to ensure that a quality product is provided by the contractor.
- **Possible problems, prevention and correction.** Micro surfacings and slurry seals are relatively new maintenance techniques, and even TxDOT inspectors may not be familiar with the potential problems that can occur on site. Training is needed to provide inspectors and construction personnel with the required information to prevent and/or correct problems which can occur during micro surfacing applications.

Yildirim is director, Texas Pavement Preservation Center
Pavement preservation has been a part of the MnROAD test facility since it first opened in 1994. Many conventional as well as innovative treatments have been evaluated both on concrete and asphalt pavements designed for high and low volume traffic.

The Minnesota Road Research Project (MnROAD) is an accelerated pavement test track, owned and operated by the Minnesota DOT. MnROAD is located adjacent to I-94, 40 miles northwest of Minneapolis/St. Paul. It consists of two separate roadway segments containing 51 distinct test cells. Each test cell is approximately 500 ft. long and consists of different combinations of surface materials (asphalt, concrete, pervious asphalt and concrete, aggregate), aggregate bases and subgrades as well as variations in structural design and drainage features. MnROAD is located in a wet-freeze zone, and over the years researchers have been able to study new construction, rehabilitation and preservation treatments as each test cell deteriorates.

The two MnROAD road segments are:

• A 3.5-mile, two-lane Interstate mainline carrying “live” I-94 traffic, averaging 26,500 vehicles per day with 13 percent trucks for the westbound lanes, or 750,000 flexible and 1 million rigid Equivalent Single Axle Loads (ESALs) per year, and
• A 2 1/2-mile, two-lane closed-loop low-volume road (LVR). Traffic on the LVR is restricted to a MnROAD 18-wheel, five-axle tractor/trailer that averages 70 laps a day.

Here are some of the significant findings from MnROAD related to pavement preservation:

• **Micro surfacing.** MnROAD demonstrated the effectiveness of traditional and flexible micro surfacing during the course of four maintenance projects between 1999 and 2006. The benefits of different crack repair techniques prior to micro surfacing were studied during the major study effort in 2003 that focused on restoring ride quality. In 2003, a matrix of 12 test cells received crack re-sealing, leveling of cupped transverse cracks, filling of rutted wheel paths, and control treatments. MnROAD learned multiple applications (crack repair with two lifts) provide the longest effect on ride, but costs need to be taken into account.

  Flexible micro surfacing uses an asphalt binder that is rigid enough for rut filling but is also flexible enough to inhibit low-temperature cracking. In a 2006 MnROAD study four LVR cells were filled with flexible micro surfacing. The treatments showed promising results for reflective cracking and rut filling. These results encouraged a 2012 micro surfacing project utilizing high-polymer modified emulsion on an interstate test cell. Using a softer base asphalt (PG-34) should enhance the performance of micro surfacing in the northern climate states.

• **Chip seals.** A pooled-fund study (TPF-5(153))—involving the Minnesota Local Road Research Board, Maryland, Minnesota, Ohio, Texas and Wisconsin—is underway to understand how pavement preservation improves the performance of the existing asphalt pavements relative to aging, to help determine the optimal timing for the application of these treatments. Surface treatments are being applied to successive subsections throughout the pavement life (from immediately behind the paver to successive years).
Field cores are taken from each subsection every year to determine material properties, especially related to aging. Monitoring activities will also include various distress surveys. The Asphalt Institute is the principal investigator for this study.

- **Warm-mix HMA overlays.** In 2008 a warm-mix asphalt (WMA) overlay was placed on an original MnROAD interstate cell that had poor ride, severe top-down cracking, and transverse cracking every 20 ft. Three in. were milled and 4 in. of WMA were placed. The WMA modifier assisted the contractor in achieving compaction. Forty percent of the cracking returned after four years of interstate service. A “mill-and-fill” is a commonly used repair in Minnesota, and lower plant temperatures associated with WMA may help extend the life due to less aging.

- **UTBWC and full-depth recycling (FDR).** In partnership with Road Science, three stabilized full-depth reclamation sections were constructed at MnROAD on the I-94 mainline in 2008. Three test sections with varying pulverized asphalt concrete/granular base ratios were constructed in order to study the performance of full-depth reclaimed pavements stabilized with engineered emulsion. Emulsion content and base structure varied between test sections. Each test section was designed for 3.5 million ESALs over a period of five years. As part of the experiment, the surfacing for cells 2 and 3 consisted of 2 in. of Superpave mix and surfacing consisting of an ultra-thin bonded wearing course (NovaChip) for a total surface of 2 3/4 in. Cell 4 had 2 in. of Superpave with 1 in. of dense-graded mix placed with the spray paver.

- **Thin bonded concrete overlays.** MnROAD has successfully completed three major efforts to provide data toward the development of a rational design procedure for bonded concrete overlays of asphalt pavements (whitetopping). MnROAD built six test cells in 1997, four test cells in 2004, and one test cell in 2008 on its interstate mainline. From these test cells, MnROAD has shown that smaller (5 x 6-ft) panels with sealed joints perform the best under the high traffic loads.

- **Concrete partial depth repairs.** MnROAD worked with manufacturers to use 13 different types of patching materials to repair several mainline concrete test sections in September 2011. After one winter it was observed that the emulsion-based products have not performed as well as the cement- and epoxy-based products. Monitoring will continue until 2016.

- **Full-depth joint repairs.** To demonstrate the feasibility of restoring the load transfer efficiency of distressed thin-concrete pavement joints, several full-depth joint repairs were carried out on a MnROAD LVR test cell in fall 2010. To provide load transfer between the patch material (fiber-reinforced concrete) and the existing 6-in. slab, differing amount of plate dowels were installed across the transverse joints. Performance to date has been very good, with minimal shrinkage of the patch or faulting across the repairs.

- **PCC diamond grinding.** Many recent innovations in diamond grinding techniques are a result of tests at the MnROAD facility. Working through a pooled-fund study, several diamond grinding configurations first developed at Purdue University were field-trialed on the LVR in 2007. MnROAD staff have been monitoring them to determine their long-term performance with regard to noise, texture and friction. The successful performance of these textures at MnROAD has led to their implementation in several projects in Minnesota and other states.

- **Unbonded concrete overlays.** Several MnROAD test cells continue to support efforts toward determining the optimal slab thickness and interlayer materials for unbonded concrete overlays of concrete and composite pavements. Test cells constructed in 2008 have shown that thin overlays with large panel sizes perform poorly. Two test cells constructed in 2011 included the use of nonwoven geotextile fabric, a material of great interest around the U.S., as the bond-breaking interlayer. These test cells, along with projects constructed around the country, are being used to develop an improved design procedure as part of a national pooled-fund study.

To become further involved with the MnROAD facility and research, please contact us or visit our website at www.mndot.gov/mnroad. Our pavement performance data and research database are available to all.

*The authors are affiliated with the Minnesota DOT Office of Materials, Maplewood, Minn.*

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Enlist News Media in Battle for Pavement Preservation  
By Barbara Lezotte, APR

Unless it’s a journalist who has covered infrastructure in depth, most reporters and editors know little about roads, highway funding, or even the difference between asphalt and concrete. Therein lies the challenge of informing the media, and by extension the public, about pavement preservation and why it’s so critical to the health of our national and local infrastructure.

Fortunately, a new pavement preservation media outreach toolkit has been released that will make that job easier.

Given the task of writing about our crumbling roads and bridges, most reporters have only a rudimentary knowledge, and therefore only scratch the surface of the issue. Roads are on the media’s radar but the coverage usually misses the mark explaining, perhaps even mentioning at all, why pavement preservation is such a key strategy in the long-term management of one of our most essential public assets.

The responsibility for educating the media is falling squarely on the shoulders of industry, and the National Center for Pavement Preservation has stepped up with the necessary tools, all available on the NCPP and TSP2 websites for member access.

Pavement preservation meets the “newsworthy” challenge on several levels. It leverages public funds for the long-term benefit of all road users; it’s an innovative, environmentally sustainable approach; and it’s timely in this era of budget deficits and aging infrastructure across the country.

In short, the media will be interested, but they need an assist to tackle the issue effectively. Journalists themselves have little time to research complex topics and they no longer have support staff who can do the legwork for them.

To ever achieve public awareness on the need for pavement preservation, industry experts will need to take up the gauntlet and give reporters the information they need to cover pavement preservation.

STAKEHOLDERS MUST ADVOCATE

Like it or not, the media today is a “slimmed-down” version of its old self, lacking the many warm bodies and resources it had in the past to cover the issues of the day. It’s no wonder that some issues get little or no media attention, when a smaller number of reporters barely have time to cover breaking news adequately.

To get news and editorial coverage of important issues, stakeholders need to be proactive advocates, essentially lobbying for the news coverage they believe is warranted. Just as public policy issues need advocates in Congress and state legislatures, critical issues also need to be advocated to attain media attention. Editors decide which issues deserve space or air time and they respond to the organizations and experts who make a compelling case for coverage.

Although national media attention—stories in the Wall Street Journal or on CNN for example—is unlikely without a national strategic public relations campaign, local industry experts can tell the pavement preservation story in their own communities using the Pavement Preservation Public Education Toolkit.

TOOLKIT SIMPLIFIES OUTREACH

This toolkit contains all the resources needed to generate media
coverage in community newspapers, television and radio stations. It’s designed for pavement preservation experts at the local level who can dedicate the time and effort to media education. From the Spokesperson Training Guide to the Changing Course to Preserve Our Roads brochure, the Changing Course video and numerous communication templates, the toolkit is designed to simplify the media education effort and arm spokespeople around the country with a message that resonates.

The toolkit explains the importance of developing cooperative relationships with reporters and editors to engage their interest in the issue and give them the background and details they lack.

For example, pavement preservation spokespeople can start by determining which reporters are covering infrastructure in their local media outlets. At larger daily newspapers, it is usually the business editor or business staff writers. Smaller papers tend to have general assignment reporters, tasked with covering anything from city council meetings to economic development. Such reporters are often young, inexperienced and not likely to stay on one beat long enough to gain the insight they lack.

Spokespeople are encouraged to understand the difficulties reporters face in covering road issues and look for opportunities to assist them. One strategy is to study relevant news coverage and contact the specific reporter to offer background that will make the next story more informed. Developing a cooperative relationship over time pays off in a more knowledgeable reporter who becomes informed enough to ask the tough questions of public officials and assure the pavement preservation facts of the story are included.

MESSAGES THAT RESONATE

The toolkit contains key messages that have been reviewed and approved by NCPP and TSP2 and that are geared to highlight how pavement preservation benefits taxpayers and helps the economy.

Some messages, depending on the community or geographic location, will resonate better than others. In a city or town where budgets are tight and road dollars are increasingly devoted to wasteful patching of deteriorated pavement, for example, spokespeople need to push the message that pavement preservation makes roads last longer and prolongs the need for reconstruction. Getting the media to understand that one concept alone will go a long way toward elevating the public debate about maintaining roads.

Another key message to consider, depending on the community, is the economic impact roads have on jobs and commerce. An investment in pavement preservation helps assure a viable infrastructure, which in turn allows for the efficient flow of goods and services and helps attract new businesses and employment to the area.

Spokespeople are cautioned to speak in the public interest rather than in industry’s interest. If media representatives view pavement preservation as a self-serving effort designed to create more work for road contractors, they will be unlikely to listen to spokespeople and less willing to include the pavement preservation angle in their coverage.

In addition to a comprehensive array of media communication tools—including templates for news releases, opinion columns and trade publication articles—the toolkit also contains communication materials to help spokespeople take the pavement preservation message directly to public officials and the community. A speech and companion PowerPoint presentation are designed for spokespeople who want to educate business and community groups, such as Rotary or other service clubs.

A five-minute video captures the pavement preservation message in a brief visual format that is a conversation starter at service clubs, public hearings or community forums. To date, there has been no national media relations campaign on pavement preservation. Until one is launched, grassroots efforts are the only way that local media may learn about pavement preservation benefits. Educating the media and public officials about pavement preservation is a challenge made easier by the toolkit, and it can pay off in more efficient use of ever-shrinking infrastructure funds.

Barbara Lezotte is president of Lezotte Miller Public Relations Inc., a Michigan firm serving corporations, associations, nonprofits and government agencies since 1995.
HIR Solves Cost Challenge to Runway Reconstruction  By Monty Kallio

Resurfacing asphalt runways at busy airports with commercial air traffic is always a challenge for owners, project managers and paving contractors. When this work is required at single runway facilities, the difficulties are compounded by severely limited working hours, typically scheduled during the night.

In 2011, the City of Kelowna, B.C., tendered a combined hot in-place recycle/mill-and-inlay for Kelowna Airport (YLW) Runway 16-34, its sole 2,600 x 61-m (8,530 x 200-ft.) runway. The tender also specified milling and inlaying of pavement on three taxiways and localized areas of the ramp/apron.

YLW is the busiest single runway airport in Canada, with about 1.4 million passenger movements annually. It is a vital component of the economy of the central Okanagan region and services an area population of over 100,000.

The project could not impact the daytime flight operations at YLW, where typical daily aircraft movements include 64 scheduled passenger flights, mostly 737s and Dash 8s (Q400), and 20 to 30 cargo/freight movements. A local flight training school with 15 aircraft and a vibrant general aviation community also utilize the airport. In addition, a major aircraft maintenance company capable of performing scheduled checks and repairs on a range of aircraft up to 757s operates out of the facility, while the provincial air medevac agency overnights and maintains a number of its aircraft at YLW.

CONSTRAINED WORK SCHEDULE

To accommodate these aircraft movements, runway shutdown was limited to a single five-and-a-half-hour period per 24-hour day; there could be no contractor access to the runway until 12 a.m., while all equipment had to be clear and the runway cleaned and swept by 5:30 a.m. the following morning, with the runway reopened for traffic at 5:55 a.m. Severe penalties would be imposed for any flight delays caused by the construction work or in the event of weather-related reopening delays.

The 2011 low tender, at C$6.4 million, far exceeded the budgeted amount for the work, and the project was canceled. The city then issued a request for proposals, opening up the project to alternative approaches to accomplish the resurfacing.

In 2012, SNC Lavalin Inc.’s engineering proposal was chosen by the city. SNC Lavalin specified and managed a revised strategy of separating the runway work from the taxiway work into two separate contracts. The entire width of the runway would be resurfaced by hot in-place recycling (HIR), with the addition of a plant-produced, virgin asphalt mix including the addition of an antistripping additive. The taxiways

ARC uses Ecopave 400 multistage recycling system to hot in-place recycle (HIR) Kelowna airport runway in summer 2012
would be repaired under a separate mill-and-inlay project, along with some areas of pavement reconstruction.

Renovating the runway as a separate HIR contract allowed three regionally located hot in-place contractors to bid on the runway resurfacing by pricing directly to the owner without going through, or being subcontracted to, general contractors.

Ken Fyvie, SNC’s airport pavement specialist, was tasked with preparing contract documents and specifications and managing the two projects while maintaining the airport’s operational requirements. Fyvie has extensive experience both with airport projects and hot in-place asphalt recycling, and believed that a 100-percent recycle of 50 mm (2 in.) of the runway, and adding 30-percent-virgin asphalt, would improve the existing in-place mix design of the 26-year-old runway pavement.

The Kelowna Airport projects were again tendered in 2012 by Kelowna as a hot in-place recycle with admix on Runway 16-34 while, in a separate tender, the taxiway pavements would be rehabilitated as a mill-and-fill, along with some reconstruction. The work-time limitations were increased by one hour over 2011, from 11 p.m. to 5:30 a.m., and the onerous penalties for daily delays and delayed completion were removed.

ARC Asphalt Recycling Inc., a Kamloops company specializing in HIR, submitted the low bid on the runway project at C$2.3 million, while the conventional milling and paving ramp work was later won by Peters Bros. Construction Ltd. of Penticton, B.C. at C$650,000. The cost of the two 2012 projects together was less than 50 percent of the 2011 tendered price when the runway and taxiway work were combined.

HIR TRAIN AT WORK

ARC is a well-established HIR contractor with a reputation for high-quality workmanship. The company’s experienced and skilled crew utilize a state-of-the-art EcoPave 400 multistage recycling system. ARC’s typical recycling train consists of a preheater to get initial heat penetration into the pavement and to remove residual moisture that may be present, followed by heater/millers, each capable of milling, grinding and windrowing 25 mm (1 in.) of RAP and adding a portion of the rejuvenating/recycling agent.

Following the second milling machine is a combined pick-up machine/admix hopper/pugmill mixer pushed by the paver, in which the virgin mix is added to the recycled material and thoroughly mixed. The recycled asphalt mixture is then placed by a Cat AP 1050B paver and compacted by a Cat pneumatic roller and a Cat vibratory steel compactor.

As in all HMA paving, warm ambient temperatures allow more workability and time for compaction. In HIP recycling, the sun also provides valuable energy by heating the existing pavement surfaces. To provide more heat during night operations, ARC modified its recycling train by incorporating a second preheater and by adding a third heater/miller. The extra preheater provided enhanced...
initial heat penetration and surface drying, while the additional grinder unit lessened the amount of material required to be removed by each unit, to achieve the specified 50 mm depth. Both additions would also increase the pace of production. A third roller, a rubber/steel combination, also was utilized to ensure the required compaction.

To produce the required admix, ARC set up its 2005 Terex 150 tph asphalt plant just five minutes from the jobsite. Although adding 30 percent of virgin HMA in the HIP process only required approximately 200 tons per shift, the custom nature of the added material made it cost-effective for ARC to use its own plant versus purchasing HMA from area stationary asphalt plants.

PASSES 7,217 FEET LONG

Runway 16-34 had been extended within the past few years, so the full length didn’t need to be resurfaced. Each pass of the recycling train would be 2,200 meters (7,217 ft.) long. Passes would be 3.65 m (12 ft.) wide, and with overlaps, 18 passes would be required to complete the runway. With only six and a half hours of runway time allowed per shift, which equaled a maximum five and a half hours of production time due to moves on and off the runway, it would not be possible to complete a full length pass per shift.

ARC started the Project on June 10, 2012. Kelowna is in the center of the Okanagan Valley, with daytime temperatures in the 30°C (86°F) range possible in June, and the norm in July and August.

Spring 2012 in the region was colder and wetter than usual; the first half of the project saw average nighttime lows of just over 10°C (50°F) and sporadic precipitation. When July came, nighttime lows stayed in the mid-to-high teens Celsius, while daytime temperatures were regularly in the high 20s to mid 30s.

The residual mat heat from hot daytime temperatures made a measurable improvement in productivity. Initial production in the cooler June temperatures made it possible to complete only about a half pass per shift. The later, warmer weather allowed ARC to complete two full passes in three shifts; average production was between 1,400 and 1,500 m (4,593 to 4,921 ft.) of runway length per night.

To improve the existing mix design, the admix was coarsened, with a 19-mm (3/4-in.) maximum aggregate size, and about 4.5 percent asphalt cement. As there was potential for stripping in the existing mix, an antistripping agent was incorporated into the 150/200, group A admix asphalt cement. Tricor Refining’s Cyclogen L,
supplied by Pounder Emulsions, was the specified rejuvenator, and was added at 0.4 liters per square meter (12.5 oz. per 1.2 square yard) or 0.33 percent by weight of the recycled mix component of the existing pavement.

The longitudinal profile of the runway also needed to be enhanced. Automatic slope and grade controls on each milling unit and on the paver contributed to achieving an excellent ride. The cut depth and ratio of admix had to be very consistent and the Ecopaver’s auto-add system was strictly monitored. Any variation could result in an unacceptable bump or dip, or changes to the recycled asphalt mixture properties. As there was at least one transverse joint within each pass, extreme care was required to make each takeoff and remain within the smoothness specification, 6 mm (0.24 in.) maximum deviation measured using a 4.5-m (14.76-ft.) straight edge.

To enhance long-term performance, both the longitudinal and transverse joints were sealed using Reclamite Preservative Seal from Tricor Refining LLC, manufactured and supplied by Pounder Emulsions.

In the HIP process, the paver moves continually and a constant head of material is retained in front of the screed, so end-of-load segregation does not occur. Even with the coarsened admix utilized on the project, ARC limited segregation to three small locations, early in the project, all along the first pass, on the outer edge of the runway. These open areas were later sealed and sanded with CRF Restorative Seal, another Tricor product also manufactured and supplied by Pounder.

ARC completed the project on July 18, 2012, six weeks before the specified substantial completion date.

NO AIRCRAFT DELAYS

Not a single flight/aircraft delay occurred during the project. The owner was extremely pleased with the results; not only with the excellent finished product but with the lack of impact on airport operations. Garth Parker, ARC superintendent, Phillip Elchitz, YLW operations manager and SNC Lavalin’s Fyvie all had positive comments about the hard work, cooperation and professionalism of the project team as well as the other participants.

Both Fyvie and Elchitz also had praise for the efficiency and organization of the work done by Peters Bros. on the taxiways and apron areas during the second part of the 2012 airport pavement rehabilitation work.

The success of the project still comes down to bottom line cost; more than C$2.5 million was saved by recycling the existing pavement in-place. Although there are a myriad of environmental benefits to recycling the runway, the cost of construction and life-cycle costs are what the City of Kelowna is responsible for to its taxpayers. Experience shows today’s HIR technology is both less expensive compared to convention mill-and-fill processes, while life expectancy of recycled pavements is approaching what can be expected from new pavements.

Kallio is marketing and technical representative, Pounder Emulsions division of Husky Oil Ltd., Kamloops, B.C.
Shale Gas Boom Drives Town’s Bridge Renovation

With an increase in heavy truck traffic due to shale gas projects in the area, a bridge that was not initially designed for heavy, constant loads on a daily basis was undergoing significant deterioration.

In the Town of Lindley, N.Y.—situated in the midpart of the state along the Pennsylvania border—daily repairs and re-repairs to the heavily traveled Morgan Creek Road (County Road 120) bridge were a source of frustration for the road crews sent out every day to manage potholes and damage to the bridge.

The flexible wood base supporting the surface was believed to be partially responsible for the problems. The increased traffic load was not anticipated in the original bridge design. Material shoving and rutting frequently resulted in complaints. Even worse, the downward slope approaching the bridge created severe loading and decelerating forces transferred through the HMA surface to the supporting wood timbers.

According to Town of Lindley highway superintendent Marc Stocum, repair crews were at the bridge constantly in the summer months. The primary repair material was a locally available conventional cold mix. Stocum realized something needed to change. Too much time, labor and money were being wasted on repair efforts that were habitually failing.

In May 2012, Stocum decided to explore solutions with Unique Paving Materials Corp. To identify a permanent solution, three repair options were demonstrated. The options were designed to identify the optimal balance between surface durability and supporting timber flexibility.

The repair options were:
• One repair with Unique’s UPM permanent repair material, a high-quality, performance-based cold patch at a 4 to 5 in. depth
• One full-depth repair using Unique’s CPM high-strength, fast-setting concrete patch at a 4 to 5 in. depth, or
• One repair using a combination of CPM on the wood timbers (roughly 2.5 in. in depth) topped with UPM (roughly 2.5 in. in depth).

The repair materials were installed on May 9, 2012. On May 20 Stocum reviewed the repairs and noted his observations. The UPM full-depth repair was 100 percent successful, showing no signs of pushing, shoving, spalling, rutting or loss of material.

The full-depth CPM repair initially cracked on a small section onto the steel bridge expansion joint, although the rest of the area held up with no movement of test material, no shoving and no loss of material.

The third repair that used the CPM base with the UPM overlay performed equally to the full-depth UPM repair. The repair experienced no movement or loss of material. The test section kept its shape and remained intact. At the final review after the decided 60-day evaluation period, Stocum was very impressed with all three repairs and was convinced that UPM was a permanent solution to his constant road repair headache.

After the 60-day evaluation period, Stocum met again with Unique to further evaluate the repairs. The repairs had still exceeded original expectations, although the full-depth CPM repair was removed after the evaluation time frame, due to cracking caused by the flexible wood substrate. Stocum also noted he tried to deplete preexisting inventory of a different cold mix, which subsequently failed and had to be replaced with UPM.

Finally, after six months of no repair issues related to the UPM repairs, the bridge was milled and resurfaced. Milling removed approximately 2 in. of the surface material. After milling, the aged HMA and UPM repairs were indistinguishable. Unlike other conventional cold mixes, UPM did not need to be removed prior to overlaying. The resurfacing overlay was installed over the UPM with no problems.

Stocum now believes UPM is a permanent, once-and-done solution to a problem of revisiting and constantly repairing the same potholes over and over again.

Information for this article contributed by Unique Paving Materials Corp., Cleveland
Local agencies and the Regional Transportation Commission (RTC) in northern Nevada use slurry seal as a main preventive maintenance for their flexible pavements. However, due to the lack of a standard specification, the timing of slurry application to asphalt pavements has been according to the project engineer’s standard of practice, which resulted in an inconsistency in the timing of application between and even among the agencies themselves.

Thus, recognizing the significance of optimal time at which a roadway would most benefit from a preventive maintenance treatment, in 2010 the RTC sponsored a research study at the University of Nevada-Reno (UNR) to evaluate and assess the optimum time of slurry seal application on asphalt pavements within the RTC region.

This objective was achieved by evaluating the long-term pavement performance and the cost-effectiveness of slurry seals applied to new and existing flexible pavements within the Washoe County, Nev., region with respect to the time of slurry seal application.

Exiting pavements were generally dense graded hot-mix asphalt (HMA) with AC-20, AR4000 or PG 64-22 unmodified asphalt binders. Slurry seals were designed in accordance with guidelines contained in International Slurry Surfacing Association (ISSA) Publication A105. In general, emulsion asphalts consisted of latex modified cationic quick set with a minimum of 3 percent latex rubber by weight of the binder following agencies requirements.

A total of 2,700 pavement sections from minor arterials, collectors and residential streets were evaluated in this study, with the latter having by far the highest number of pavement sections.

Only pavement sections that were slurry sealed once during their intended performance life were evaluated and were grouped as follows:

- Do-nothing: a slurry seal was not applied to the pavement
- Slurry seal applied immediately after construction, and
- Slurry seal applied at: one, three, five, seven and nine years after construction.

The figure illustrates the effect of slurry seal on the performance of a newly constructed pavement when applied at three or seven years after construction. The slurry seal performance life and the extension in pavement service life were determined for the various slurry seal applications. In this study, the slurry seal performance life ranged from two to four years, except when applied at years zero and one (ranged from zero to one years). The pavement service life was extended in only few cases by one-half to two years.

The study also evaluated the cost-effectiveness of applying slurry seals at various years following construction activities. Based on the relative benefit and benefit-cost-ratio observations, user satisfaction and agency cost effectiveness were maximized when slurry seals were applied as follows:

- Year three for newly constructed arterials and newly constructed residential streets
- Years three and five for newly constructed collectors, and
- Years three and five for arterials, collectors and residential streets with overlays.

The application of a single slurry seal immediately after or one year after construction of the asphalt layer is not effective in terms of both the benefit to the users and the benefit-cost ratio for the agency. For uniformity purposes, it is recommended that the agency apply slurry seal three years after the construction of the asphalt layer for both new and overlay constructions.

Hajj is research assistant professor, Loria is graduate research assistant, and Sebaaly is director and professor, Western Regional Superpave Center, University of Nevada-Reno
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