That’s precisely where Wisconsin state government is looking, too.

The Wisconsin Department of Natural Resources and the Wisconsin Standards Oversight Council are leading an effort to develop a state permeable pavement technical standard with a focus on water quality benefits.

“Wisconsin code has strong performance goals for new developments and redeveloped sites for mitigating stormwater runoff and pollutants,” explains Gini Knight, Standards Oversight Council Coordinator for the Wisconsin Land and Water Conservation Association. These goals are all spelled out in Chapter 151 [PDF] of the Wisconsin Natural Resources Administrative Code, which was born of the federal Clean Water Act.

“To that end, the Permeable Pavement Work Team, a cooperative effort among the state pavement industries and government, is working on a state standard for permeable pavements. The standard will be the first of its kind in Wisconsin and will address allowable infiltration rates, infiltration bed requirements, compaction mitigation, contributing source area limitations, treatment performance, groundwater protection, and maintenance requirements. The work team will examine the effectiveness of porous pavements in removing pollutants from stormwater runoff—and how to determine that effectiveness. Knight notes that this will not be a construction specification. “What the work team is trying to determine is the impact that permeable pavements have on water quality,” she says. “The state will leave how to build these pavements to industry, which already has the expertise in constructing these pavements.”

A seal of approval

This should come as welcome news for any agency that has been considering porous...
asphalt pavement as a way to mitigate stormwater effects. Agencies that shied away from porous pavement in the past out of concern that the state might not accept it as an approved mitigation technique can look forward to this new technical standard. As Knight explains, “Once we have a DNR technical standard for permeable pavement, then developments using these systems will be able to receive credit toward infiltration requirements and pollutant reduction.”

It will be some time before a new standard is approved, though. “Typically the development of a technical standard like this takes a few years,” Knight says. “Our team members are all volunteers who work hard to meet on a regular basis. There is also a significant need for research, which requires time and funding.

“Right now, the team is reviewing the available literature and running models to address the potential infiltration rates of these systems over time and determine how much credit to provide for pollutant reduction,” she continues. “This work is really exciting and has a lot of potential for reducing the incredible amounts of stormwater runoff in our urban areas.”

The asphalt industry’s role
Wisconsin’s asphalt industry is playing a central role in the development of the Wisconsin technical standard. Among the participants on the Permeable Pavement Work Team are Bob Givens, Program Manager for OMNNI Associates, and Scot Schwandt, WAPA’s Executive Director.

“I think our team is making good progress,” Givens says. “Porous pavement has a strong track record in other parts of the country, but we’ve only had a chance to observe it on a limited basis in Wisconsin.

“Part of what makes these kinds of pavements so appealing is that many of the other alternatives to meet the DNR requirements, such as standard detention ponds, biofilters or grass swales, can’t always be implemented,” he continues. “This is often the case for high-priced properties where there simply isn’t the real estate for a detention pond or biofilter.”

And beyond real estate issues, when it comes to detention ponds, the central concern can be safety. Givens pointed to the Federal Aviation Administration’s publication Wildlife Hazard Management at Airports [PDF]. “This manual discusses the significant hazards and costs of open water near airports,” Givens says, “which can attract waterfowl and lead to dangerous aircraft-bird strikes.” For open ponds and similar features that attract birds, the manual recommends a separation distance of at least 5,000 feet for all airports, and at least 10,000 feet for airports that service jet engines.

The more cost-effective and safer alternative for handling stormwater runoff at airports is porous asphalt pavement. OMNNI Associates knows firsthand: The firm’s project using porous asphalt at Wittman Regional Airport in Oshkosh has proved to be a very successful application of this technology (read more about it in the Summer 2009 issue [PDF] of Wisconsin Asphalt News).

So why wait?
While the official standard may be a few years away, there’s no reason to wait to take advantage of porous asphalt pavement. From parking lots to city streets to airports, the technology is already at work in Wisconsin helping address the ongoing challenge of stormwater runoff.

WAPA is developing a guide to help government and commercial pavement owners alike specify and construct porous asphalt pavements. Please check our website and newsletter for an announcement about the guide later this year, and if you need help now, just ask. ■
**Q&A**

**NAPA’s Chief Technical Expert on Asphalt Trends**

Audrey Copeland, Ph.D., P.E., is the National Asphalt Pavement Association’s resident research and engineering expert, and we recently spoke with her about the latest technology trends in asphalt pavements. She shared her perspective on which innovations are making a difference today, and what technologies might be emerging in the months and years ahead.

**WAPA:** Thanks for sitting down with us. You’re relatively new at NAPA. Can you tell us a bit about your background?

**AUDREY COPELAND:** Before joining NAPA’s executive team more than a year ago, I served seven years at FHWA in a number of roles. This included working as a highway engineer, managing research at Turner-Fairbank Highway Research Center, and leading the agency’s recycled asphalt pavement program and national efforts to implement the Asphalt Mixture Performance Tester. My move to NAPA in early 2012 gave me a unique opportunity to work with industry and gain a broader perspective on asphalt—not just the technical aspects, but also business, legislative and communications issues.

**What are some of the technological advances that are making a difference for asphalt pavements?**

One is Perpetual Pavement, a long-life pavement concept where asphalt pavements are constructed to last indefinitely with only periodic surface maintenance. Another is thin overlays, or Thinlays, which were a big topic at NAPA’s last annual meeting. Thinlays have demonstrated high durability in states like Ohio and Mississippi as well as in field tests at the National Center for Asphalt Technology. NAPA addressed Thinlays at length in an April webinar, and we are leading a nationally coordinated effort to promote their use.

**Those developments on thin overlays are particularly relevant here in Wisconsin given new executive priorities at WisDOT regarding preventive maintenance.**

Right. Another way today’s asphalt technology is making a difference—and I think this is not always properly recognized—is through the associated sustainability benefits. Recycled asphalt, warm mix asphalt and open-graded friction courses are used so routinely that they’re taken for granted. However, all of these advances have major environmental advantages.

**At the January North Central Asphalt User/Producer Group meeting, you talked about the findings of a recent survey of Midwestern asphalt contractors. [Note: See sidebar for more on this survey.] Were there any surprises in the survey results?**

The survey gave us an in-depth look at contractors’ concerns and provided some interesting results. Some of the technologies we focus on as an industry were not ranked quite as highly as we expected. For example, survey participants were asked to rank which technologies had the greatest potential to improve pavement performance, and we expected to hear about recycled asphalt and warm mix. These were included among the top five, but the top choice was material transfer vehicles. It was interesting to learn that MTVs are such a helpful tool in the Midwest from a contractor’s standpoint.

**Did anything else from the survey jump out at you?**

The survey also highlighted the importance of collaboration with state DOTs, especially when it comes to developing specifications. It’s critical for the asphalt pavement industry to have a seat at the table, and virtually all respondents said that they want to help.

This kind of feedback is in line with what we’ve heard from talking with NAPA members nationwide regarding the importance of working with transportation agencies. As a similar example, we have learned how
Asphalt Technology: Midwest Contractors Speak Out

The North Central Asphalt User/Producer Group, or NCAUPG, consists of representatives from government and the asphalt industry in 12 Midwestern states and two Canadian provinces. NCAUPG members work together to share technology solutions and collaborate on issues of common regional concern.

A recent survey of asphalt contractors in the 12 NCAUPG states yielded insights into technology and industry trends as viewed by the Midwestern asphalt industry. Here’s a sampling of what the NCAUPG heard about trending topics in asphalt, with top responses shown.

**Pavement Performance**

Which technologies do you think have the greatest potential to improve pavement performance?

<table>
<thead>
<tr>
<th>Technology</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material transfer vehicles</td>
<td>70%</td>
</tr>
<tr>
<td>Intelligent compaction</td>
<td>47%</td>
</tr>
<tr>
<td>Warm mix, water/foam</td>
<td>37%</td>
</tr>
<tr>
<td>Warm mix, additive</td>
<td>35%</td>
</tr>
<tr>
<td>Mixes with high RAP content (&gt;30%)</td>
<td>35%</td>
</tr>
</tbody>
</table>

**On a scale of 1 to 10 (with 10 being highest), which aspect of asphalt paving contributes most to good pavement performance?**

<table>
<thead>
<tr>
<th>Aspect of Asphalt Paving</th>
<th>Overall Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement design</td>
<td>10</td>
</tr>
<tr>
<td>Material transfer (plant to paver)</td>
<td>9</td>
</tr>
<tr>
<td>Material design selection</td>
<td>8</td>
</tr>
<tr>
<td>Paving foundation preparation</td>
<td>7</td>
</tr>
<tr>
<td>Asphalt mix design</td>
<td>6</td>
</tr>
</tbody>
</table>

What are the proper performance measures for asphalt pavements?

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoothness/ride quality</td>
<td>95%</td>
</tr>
<tr>
<td>Density</td>
<td>86%</td>
</tr>
<tr>
<td>Rutting</td>
<td>61%</td>
</tr>
<tr>
<td>Cracking</td>
<td>57%</td>
</tr>
<tr>
<td>Friction</td>
<td>40%</td>
</tr>
</tbody>
</table>
Creep and Recovery test provides information about asphalt binder beyond temperature performance and addresses the presence of polymer additives. Missouri has already implemented the MSCR test, and Indiana is considering it too. For mix testing, there’s the Asphalt Mixture Performance Tester, which more than 20 state DOTs have purchased. It’s used in mechanistic–empirical pavement design and for testing mixes for rutting and fatigue potential. Much of this is spelled out in a recent FHWA TechBrief on the AMPT [PDF].

Warm mix is a good place to wrap up our conversation. A few years ago we spoke with NAPA Executive Director Mike Acott about the growth of warm mix, and we’d appreciate an update.

We’re making progress. A recent survey NAPA conducted with FHWA found that about 20 percent of asphalt tonnage is produced using warm mix technologies. Warm mix was originally conceived as a way to save energy through reduced heating requirements, but it turns out the warm mix techniques lead to improved compaction and a longer paving season. We’re seeing the benefits of warm mix asphalt construction even when the temperature isn’t brought down by a large degree. But I think that kind of use of warm mix is commonly underreported.

Thanks for sharing all this information. This is an exciting time for asphalt, and we look forward to hearing about new developments in the years ahead.

I’m glad I could help. ■
the vehicles’ flotation tires, which are designed to reduce rutting and compaction on soil, do not reduce pavement damage.”

The upshot is extreme stress leading to premature failure on low-volume roads. It’s a costly problem, one often borne by counties or municipalities with little room in their budgets for early reconstruction or rehabilitation. Fortunately, this is a problem that has a range of possible solutions.

The most direct approach to addressing this issue is investing in pavements with sufficient structural capacity for these loads. “Road owners should look into selective improvements to low-volume pavements used by heavy vehicles,” Jordan says. “WAPA’s guidance would be a good place to go for information on designing roads for the proper loads.” WAPA’s Technical Bulletin on Pavement Structure Design [PDF] presents step-by-step guidance for calculating lift thicknesses for long-lasting pavements. Full-depth reclamation and overlays can also add structural strength to asphalt pavements.

Beyond using appropriate pavement designs and improvements, changing how agricultural vehicles use low-volume roads can also help reduce damage. “For example, researchers found that higher afternoon temperatures led to increased pavement distress,” Jordan says. “Encouraging early morning hauling when pavements are cooler could help counter this effect. Another strategy is to establish one-way hauling routes, with vehicles driving over the center line to minimize loading on the pavement edges.” Temporary weight limits can also be used when spring thaws or rain events saturate the subgrade.

Regardless of the damage mitigation strategy, the message is clear: County and local road authorities need to think about and plan for the traffic on their roadways. Long-life pavement designs, overlays and full-depth reclamation techniques—together with alternative use options where appropriate—offer road agencies a full set of tools to stop premature damage in its tracks.

This year in Wisconsin, the equivalent of 6 million passenger tires will be discarded as scrap. Given the state government’s environmental policies, which include a ban on scrap rubber in landfills, some may view these tires as a headache—a problem that must be shipped out of the state at considerable cost.

Yet others, including some WAPA members and an increasing number of road agencies, see all this scrap rubber as an opportunity. That’s because crumb rubber from old tires is proving to be a very promising modifier for asphalt pavements.

WAPA member Liberty Tire Recycling of Auburndale knows all about it. Liberty Tire specializes in tire recycling and reclamation, and along with other markets (such as turf, mulch and tire-derived fuel), the company recognizes the potential to incorporate used tires into high-performing roads in Wisconsin.

Why rubber-modified asphalt?

Rubber-modified asphalt offers a broad range of advantages:

- **Performance.** The engineering properties of rubber-modified asphalt mean a superior ride. Pavements made with this advanced material exhibit greater skid resistance, decreased splash and spray in wet conditions,
and reduced tire-pavement noise. Tests also show that rubber-modified asphalts exhibit increased resistance to rutting, which can mean longer pavement life.

• **Cost.** Improved performance leads directly to cost savings for road owners: Increased durability means more time before rehabilitation or reconstruction. Moreover, the price of recycled rubber fluctuates much less than other modifiers.

WAPA member Northeast Asphalt is an early adopter of rubber-modified asphalt in Wisconsin, and Corporate Technical Services Manager Brett Stanton explains, “The modifier styrene-butadiene-styrene is used in a number of other industrial processes, and the demand for it can cause price swings. On the other hand, the consistent feedstock of discarded tires assures availability and predictable cost.”

• **The environment.** Put simply, used tires need to go somewhere. What better place than back into Wisconsin’s roads?

### Significant strides in Wisconsin

Liberty Tire representatives have presented the concepts involved in rubber-modified asphalt to different Wisconsin stakeholders within the past year: at a meeting of Wisconsin DOT and industry representatives in August and at a workshop with the Wisconsin Department of Natural Resources and the Wisconsin Council on Recycling in December. Dick Gust, Liberty Tire’s Director of Government Affairs, says these meetings generated a lot of interest and excitement about rubber-modified asphalt in the state.

“It’s clear that there’s real potential for the rubber-modified asphalt market in Wisconsin,” Gust says. “After our August meeting with state government staff and asphalt contractors, we were pleased to see that Northeast Asphalt moved forward with a rubber-modified asphalt paving project in Calumet County.”

Stanton at Northeast Asphalt filled in the details. “We wanted to gain more experience in working with this product,” he says, “and we approached county officials to see if they’d consider using rubber-modified asphalt in the Calumet County Park repaving project.

“The green aspects were a real selling point for the county, and we received the go-ahead to use rubber-modified asphalt for the lower asphalt layer of the park last year,” he says. “We received the binder pre-modified with rubber, and we didn’t notice any construction issues at all—the modified pavement mixed and compacted just like standard asphalt.

“The county was happy with the results,” he concludes.

Stanton noted that the specifics on the remainder of the paving, to be completed this year, are yet to be determined.

### Getting the rubber into the road

The method Stanton described—receiving pre-modified asphalt cement—represents one option for rubberizing asphalt. “Crumb rubber can be added by the binder producers, who can store, handle and deliver the modified binder as they do with other binders,” explains Doug Carlson, Liberty Tire’s Vice President of Asphalt Products. “A chemical additive is typically used as a suspension agent to prevent the rubber from separating out of the binder.”

Alternatively, the addition of rubber can be left to the mix producers. “In that case, mix producers can keep equipment on-site and are able to modify binder on demand,” Carlson says.

In either case, tests would be used to assure expected performance and quality. Carlson explained that AASHTO committee members are working to revise existing binder tests to allow for the presence of recycled rubber. “There are some minor changes to make rubber fit into the PG spec,” Carlson says, “but the committee is using the opportunity to make some other necessary changes to the specification unrelated to rubber.

“The specification changes could be approved with a provisional specification next year,” he says. “In addition, given that the FHWA Expert Task Group on this topic has endorsed these revisions, Wisconsin or any other state could confidently move forward with rubber-modified asphalt before the AASHTO revisions are finalized.”

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*Continued on page 8.*
Novel applications

Carlson noted that an exciting application of rubber-modified asphalt is its use in rehabilitating concrete pavements. “We can create an asphalt mix with up to 20 percent rubber in the binder that can be placed as a thin layer on top of concrete,” he says. “The layer can be just 1 or 2 inches, but it can very successfully improve ride, particularly with old concrete that typically has terrible [International Roughness Index] values.

“This solution is very quick and cost-effective,” he continues. “Compared with traditional concrete rehabilitation that involves time-intensive diamond grinding and detours, a contractor can easily place 10 lane-miles of thin rubber-modified asphalt overlay in a day while keeping other lanes of traffic open. And because it’s rubber-modified, the new asphalt pavement layer is particularly durable. This has proven to be a very successful technique in locations where it’s been tried.”

Growing the local market

Right here in Wisconsin, paving contractors keep finding applications for rubber-modified asphalt. Carl Johnson, Technical Manager with Northwest Asphalt, said that Northwest plans to use rubber-modified asphalt for paving at Waukesha County Airport later this year. “This is a project for WisDOT’s Bureau of Aeronautics,” Johnson explains, “but the pavement design is based on the state’s highway specifications.

“Given the binder specified for this work, we had different options for modifiers,” he says. “Based on how rubber has been used in other parts of the country to improve rutting resistance, we proposed using rubber modifier to bump a performance grade 58-28 binder to PG 64-28, and the DOT agreed. We look forward to seeing the end results.”

Johnson sees other possible applications for rubber-modified asphalt in the future. “Stone matrix asphalt commonly uses fiber to prevent binder draindown, but I could see using recycled tire rubber instead to keep the binder from running off the aggregate,” he says. “At the same time, it could improve other pavement properties as well.”

Carlson said that Liberty Tire is also working with WisDOT and other agencies in Wisconsin to identify projects where rubber-modified asphalt can be used. “It would be great to see Wisconsin move forward the way other states have,” Carlson says. “For example, we reached out to build similar partnerships with government and industry in Georgia, and we expect 2 million pounds of rubber to go into new pavements there this year.”

Carlson also pointed out that with Liberty Tire’s facilities in Wisconsin, growing the demand for used tires means more local jobs. “Building pavements with rubberized asphalt is good for the economy, good for the pavements, good for motorists, and good for the environment,” he says.
Expert Advice on Longitudinal Joints

The longitudinal joint is among the trickiest parts of an asphalt pavement to construct. At the site where two paved lanes meet and overlap, cold joints and unconfined edges can naturally lead to weak spots in a pavement.

**Planning and design**
- Determine if echelon paving is feasible to minimize cold joints
- Mill-and-fill one lane at a time if possible to eliminate unconfined edges
- Plan joint locations to avoid wheel paths, recessed pavement markings, and striping
- Consider the use of less permeable mixes, or the use of warm mix as a compaction aid
- Use a notched wedge joint instead of a butt joint for lifts from 1½ to 3 inches

**Pavement laydown**
- Avoid mix segregation as well as stops and starts in paving
- Apply a uniform tack coat across the full width of the paving line
- Use the right technology, such as a joint matcher or ski, to get sufficient depth at the joint
- Coordinate the paver and auger to maintain a uniform head of material, and always keep the vibratory screed turned on
- Avoid luting the overlapped material, and don’t broadcast excess material across the mat

**Special treatment of the cold side**
- Consider the use of joint heaters, particularly in cold weather
- Consider the use of joint adhesives
- At a minimum, tack the existing face of the joint

**Pavement rolling and compaction**
- Follow the Asphalt Institute’s detailed strategies for first and second passes of the drum roller over the supported and unsupported edges—see the institute’s guidance for details
- Use pneumatic rubber tires for intermediate rolling

The Asphalt Institute also recommends that road agencies provide well-defined specifications for placement and for quality assurance testing. The guidance should provide specific guidelines for both quality assurance and quality control.

WAPA supports revisions to WisDOT’s standards to reflect national best practices for longitudinal joint construction. We anticipate that WisDOT’s HMA Tech Team—a joint effort of government and industry—will continue its work toward such revisions. Improved policies and practices for all parties involved in pavement construction will mean even better and more durable pavements in Wisconsin.
Training Opportunity: Asphalt Inspection

The National Center for Asphalt Technology is scheduled to offer training sessions on asphalt construction and inspection in June to WisDOT staff at the agency’s Waukesha and Green Bay regional offices.

NCAT Instructional Manager Don Watson shared a preview of the course. “In order to obtain a durable, smooth, long-lasting asphalt pavement,” Watson says, “it is essential to perform mix delivery, placement and compaction according to best practices. Attention to detail is a recurring theme during this course as participants understand the challenges involved in obtaining quality asphalt pavements. Course materials cover all aspects of the asphalt placement operation.”

Watson noted that the course uses both a lecture format and problem-solving case studies to help participants understand the importance of surface preparation, placement and compaction in extending the performance life of asphalt pavements.

While these scheduled sessions in June are invitation-only, WAPA expects that a larger community of road agencies, contractors and consultants may be interested in learning more. Are you are interested in holding similar training in your area? If so, please contact WAPA (or a WAPA member that you work with). We would be happy to arrange similar asphalt inspection training or black-bag lunch-and-learn sessions based on demand.

Need a refresher or update on best practices in asphalt inspection? Just let us know. (Image courtesy of NCAT)
Do you know someone looking for a career building Wisconsin’s roads? (Or are you looking yourself?) Then look no further!

AsphaltCareers.org is a new service from WAPA that connects our members with people in Wisconsin who want to work in the asphalt industry—a summer job, a lifelong career, or anything in between.

New Website! asphaltcareers.org

AsphaltCareers.org features:

- Exclusive job listings from WAPA members
- An overview of the different types of jobs involved in building asphalt pavements:
  - Asphalt plant and roadway construction crews, including specialty equipment operators
  - Quality control technicians
  - Supervisors
  - Managers
  - Engineers
- Typical pay for different jobs
- Typical education and training requirements—and resources to help you meet them

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- Northwoods Paving
- Payne & Dolan, Inc.
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- Liberty Tire
- Meigs Trucking
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- Miller, Bradford & Risberg
- Motion Engineering
- MSA Professional Services
- Omnni Associates
- OsI Environmental
- James Peterson Sons
- River Valley Testing
- Roadtec
- Roland Machinery
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