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Iowa State University's Center for Transportation Research and Education (CTRE) is the umbrella organization for the following centers and programs:

Bridge Engineering Center
Center for Weather Impacts on Mobility and Safety
Construction Management & Technology
Iowa Local Technical Assistance Program
Iowa Statewide Urban Design and Specifications
Iowa Traffic Safety Data Service
Midwest Transportation Consortium
National Concrete Pavement Technology Center
Partnership for Geotechnical Advancement
Roadway Infrastructure Management & Operations Systems
Sustainable Transportation Systems Program
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Popcorn ball pavement: Pervious concrete and porous asphalt

Porous pavements—generally known as pervious concrete or porous asphalt—are designed for water to drain through them.

Cores of these pavements have a texture like popcorn balls (figure 1). Just as candy syrup binds popcorn together but leaves plenty of holes to sink your teeth into, cement paste or asphalt binder glues aggregate together but leaves a system of connected voids that allows water to percolate through the slab.

The idea of porous pavements may seem counter-intuitive. Most pavements are designed to be as impermeable as possible to restrict the entry of water, chemicals, and other liquids that could damage the slab.

However, porous pavement systems can provide unique service features. Designers should understand porous systems' potential advantages, critical design and construction considerations, potential challenges, and limited applications.

Why porous?

Porous pavement systems can provide some advantages:

Increased safety. When water drains through a slab instead of flowing across it, the pavement surface dries more quickly and less snow and ice are likely to collect on it. As a result, porous pavements can provide improved traction for both vehicles and pedestrians. They can also reduce spray from trucks and glare from wet pavement surfaces and provide a quieter ride. (Note: These potential benefits can result from full porous pavement systems, as described on page 2, and from thin, open-graded friction courses.)

Potentially lower overall costs. In some applications, porous pavement systems may eliminate the need for and/or reduce the



Figure 1. A "popcorn ball" textured sample of pervious concrete.

costs of underground storm drainage, curb and gutter systems, and/or detention basins.

Reduced environmental impact. Porous pavement systems can help manage storm water runoff and mitigate its environmental effects. They do this by reducing the volume of direct runoff that can contribute to flooding and erosion.

Ground water improvements. Porous pavement systems potentially increase the volume of storm water that percolates down through the ground, replenishing ground water aquifers with naturally filtered water.

Active hazardous materials management. During rain events, pavement surface residues—oil and other fluid drip from vehicles, accidental spills of materials like pesticides or herbicides, etc.—are carried into the porous system's infiltration or recharge areas where any hazardous materials can begin to biodegrade naturally.

Generally, 90 percent of rain water-borne pollutants are found in the first 1½ inches of rainfall runoff. In Iowa, where 90 percent of all rain events produce less than two inches of rain, porous pavement systems can filter out most rain water-borne pollutants.

Acronyms in Technology News

AASHTO	American Association of State Highway and Transportation Officials
APWA	American Public Works Association
CTRE	Center for Transportation Research and Education (at Iowa State University)
FHWA	Federal Highway Administration
Iowa DOT	Iowa Department of Transportation
ISU	Iowa State University
LTAP	Local Technical Assistance Program
MUTCD	Manual on Uniform Traffic Control Devices
NACE	National Association of County Engineers



U.S. Department of Transportation
Federal Highway Administration



Iowa Department
of Transportation

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Improved paved environment. Porous pavement systems are generally quieter and cooler than traditional pavements. The connected pores that channel water away from the surface also deflect traffic noises downward and over a greater area, effectively absorbing sounds.

Air also circulates through the connected pores. On hot days, the air over the pavement—and the pavement itself—is generally cooler than in traditional pavement environments. This can be especially important in cities where sunlight reflected from buildings and pavements causes urban heat islands.

Design features

In a porous asphalt system, the process and materials for developing the asphalt slab are generally the same as for conventional hot mix asphalt (HMA) pavements, but porous asphalt contains less sand and isn't rolled—compacted—as heavily as conventional HMA. Like conventional HMA, porous asphalt is recyclable.

In a pervious concrete system, the concrete slab is composed of coarse aggregate (but little or no fine aggregate), cement, water, and specially formulated admixtures, commonly polypropylene fibers. The only special equipment required is a vibratory screed. Like porous asphalt, pervious concrete can be crushed and recycled.

The surface pavement layer—the concrete or asphalt slab itself—is only one element in a *porous pavement system*. Other critical elements of the system include an aggregate recharge bed, lined with a geotextile filter.

- Under the porous slab is a recharge or infiltration bed of uniformly graded aggregate with a high proportion of voids. The bed temporarily stores rainwater that flows through the porous slab, enhancing in situ bioremediation of contaminants.
- A special geotextile filter fabric lines the recharge bed, separating the aggregate from the soil below. The fabric allows water to slowly infiltrate into the underlying soil, while preventing fine materials from entering the recharge bed.

Only well-designed and well-constructed porous pavement systems, with all three of these elements, have the potential to deliver the benefits listed above (figure 2).

Reports of long-term installations of porous pavement systems indicate that they can perform as designed up to 30 years or more. Some porous pavement systems have been over-designed—sometimes by a factor of 100—to address concerns that the surface layer (the porous slab) will freeze, causing surface ice to form. In fact, the aggregate filtration layer typically contains any water that might freeze.

Limitations

Several factors can limit the type and number of applications for which porous pavement systems are appropriate:

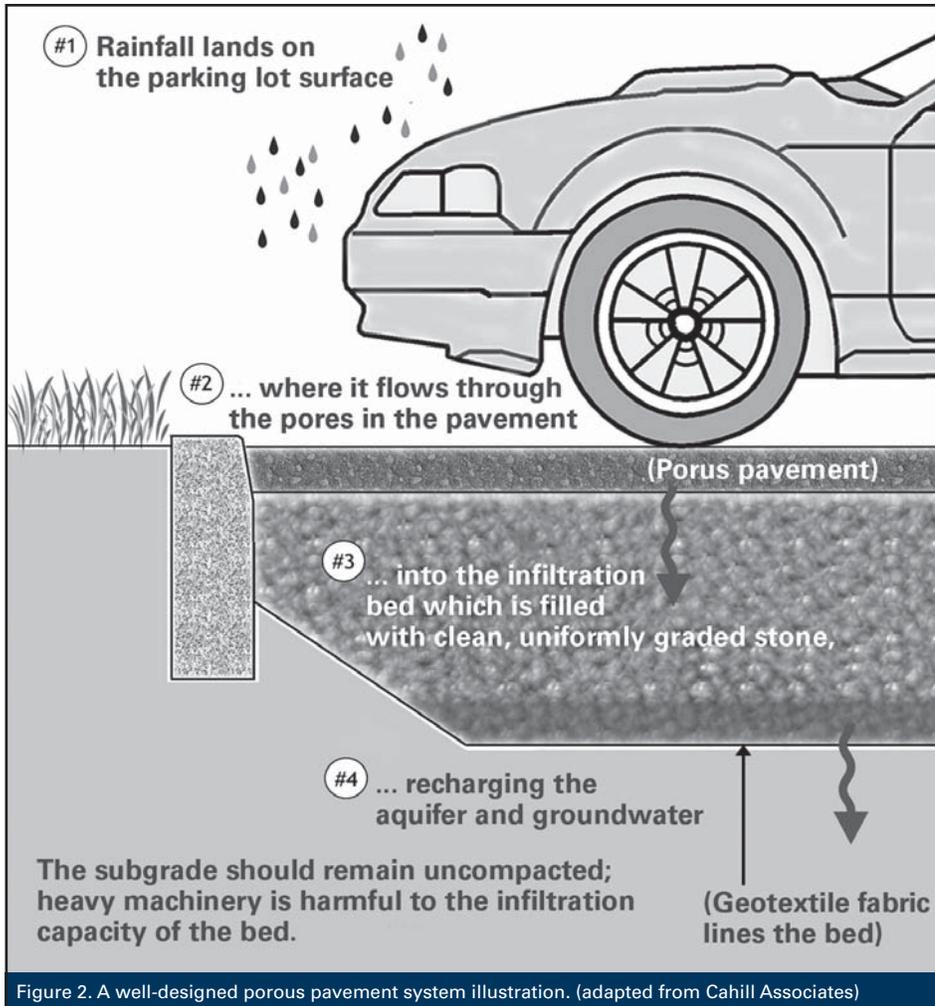
Potentially higher initial cost. Porous pavement systems may cost more to construct than traditional pavement systems because of expenses related to constructing the required recharge beds and fabric filters. These higher costs may be offset, however, by reduced expenditures for other storm water management features like sewers, land set-asides, and detention ponds.

Road bed preparation. The top 6 inches of subgrade must be granular material with less than 10 percent silt or clay. This requirement generally results in special road bed preparation.

Load-bearing strength. If cost were not an issue, both pervious concrete and porous asphalt pavement systems could be designed to meet nearly any specifications, including flexural or compressive strength. In reality, to be cost effective, porous pavement systems are generally designed to support four-wheel vehicles but not larger commercial vehicles, limiting their potential applications.

Other design limitations. In addition to load-bearing strength, a porous pavement system design must accommodate several other factors:

- Site-specific design factors:
 - Depth to water table. (Porous



Porous asphalt applications in Iowa

Since the early 1970s, it has been common practice in Iowa to apply a thin (generally 2–3 inch) surface layer of porous asphalt on asphalt pavements where vehicle skidding and/or hydroplaning is a potential problem. Such open-graded friction courses allow storm water to filter off the surface quickly, improving friction and reducing spray and glare.

To meet new requirements for managing storm water runoff, more pavement designers in Iowa are considering possible applications of porous asphalt pavement systems. Several systems have been constructed, including two parking lots at the Luther Park Center in Des Moines, installed in 2005, and a parking lot at the Prairie Ridge Sports Complex in Ankeny, installed in summer 2006. These relatively new projects are performing as expected.

- pavements require a minimum distance of 2–4 feet (vertical) from the bottom of the installation to the water table.)
- Local soil characteristics. (Suitable soil and subsurface conditions are essential for porous applications, especially in terms of erosion.)
- Slope, topography. (Porous pavement systems are well suited for upland areas where the soil allows storm water to spread over large areas.)
- Hydraulic gradient.
- Climate, including frost depth and freeze-thaw cycles.
- Proximity to water wells.
- Availability of appropriate materials, including the aggregate required for the recharge/filtration layer and the geotextile.

- Relevant local, state, and federal regulations.
- Economic factors.

Maintenance issues. Porous pavements must be protected from large amounts of dust and runoff from crop fields. Special maintenance equipment—high-power water jets and special vacuum trucks and sweepers—is required to remove debris from the surface pavement pores.

Potential applications

Because porous pavement systems are generally cost-effective only at strengths that do not support heavy industrial traffic, these systems are best suited for large expanses of pavement used primarily by cars, other light vehicles, and/or pedestrians. Potential applications include the following:

- Parking lots (most common).
- Sidewalks, bicycle paths, and walkways.
- Curb and gutter systems.
- Bridge embankments.

Porous sidewalk, driveway, and pathway systems have been constructed in some residential areas. A few porous street systems have been constructed (e.g., in Phoenix and Portland).

For more information about porous asphalt

Contact Chris Williams, asphalt materials engineer at CTRE and assistant professor of civil, construction, and environmental engineering at ISU, 515-294-2140, rwilliam@iastate.edu.

See the National Asphalt Pavement Association's 2003 report *Design, Construction,*

Iowa LTAP Mission

To foster a safe, efficient, and environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance, and technology transfer, thus improving the quality of life for Iowans.

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and *Maintenance Guide for Porous Asphalt Pavements*, IS 131. To borrow a copy from the Iowa DOT library, contact Hank Zalatel, librarian, 515-239-1200, hank.zalatel@dot.state.ia.us. To order a copy from NAPA's website, see <http://store.hotmix.org/index.php?productID=179&hasjavascript=yes>.

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Contact Vernon Schaefer, 515-294-9540,

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See the American Concrete Institute's 2006 publication *Pervious Concrete*, ACI 522R-06. To borrow a copy from the Iowa DOT library, contact Hank Zaletel, librarian, 515-239-1200, hank.zaletel@dot.state.ia.us. To order a copy from the institute's website, see www.aci-int.net/PUBS/newpubs/522.htm.

Pervious concrete applications in Iowa

Limited courses of pervious concrete were placed as early as 1852 in the United States, but applications that have been successful in other countries, like pervious concrete overlays (wet-on-wet friction courses), generally have not been tried here.

Today, however, pervious concrete pavement systems are attracting attention as an

effective storm water runoff management strategy. In 2005, an ISU research team led by Vern Schaefer, professor of civil, construction, and environmental engineering, studied the feasibility of cold-weather applications of pervious concrete. Conclusion: Specific mixes can be successful in specific applications, particularly parking lots.

John Kevern, a graduate research assistant at ISU's National Concrete Pavement Technology Center, researches pervious concrete applications in Iowa. At a pervious concrete system test lot in Ames (ISU parking lot 122, installed October 2006), he monitors storm water discharge. In the lab, he collects data on freeze-thaw cycles of various mixes of pervious concrete.

Kevern helped design and keeps tabs on several Iowa test applications of pervious concrete systems, including handicap-accessible areas and sidewalks around a parking lot at Arnold's Park in Okoboji, and the new North Liberty Middle School parking lot. These relatively new projects are performing as expected.



Figure 3. An ISU test lot of pervious concrete (Photo courtesy of John Kevern, ISU)



Work zone awareness

Nationally, it's April 2–6

But, if your shop is serious about worker and motorist safety, every week that your agency conducts road construction or maintenance activities should be Work Zone Safety Week.

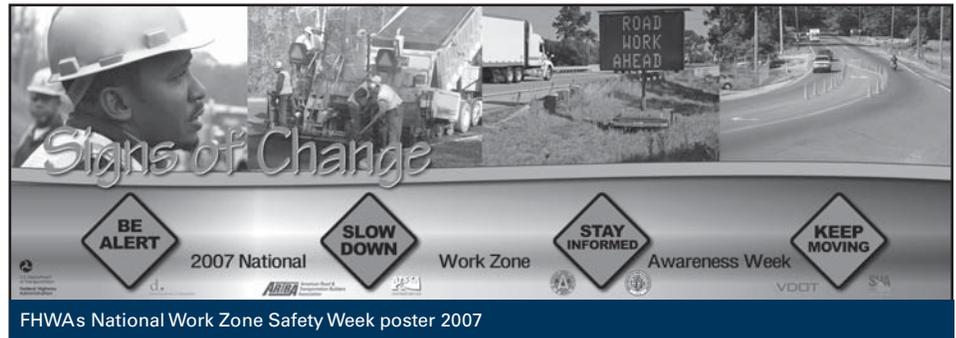
Here are some ideas for enhancing work zone safety in your jurisdiction:

Engineering

- Plan and implement standard work zones per the *Manual on Uniform Traffic Control Devices* (and NCHRP 350, which contains federal standards and guidelines for work zone safety devices).
- Use Quickzone software to help you improve work zone safety and mobility (www.tfhr.gov/its/quickzon.htm).
- Make sure emergency vehicles can access your work zones at all times.
- Work closely with law enforcement officials to identify appropriate countermeasures for high-risk work zone locations.
- Avoid construction delays.

Education

- Provide technical training about work zone safety for your staff. Examples:
 - Flagger safety training, available through Iowa's safety circuit rider, Tom McDonald, 515-294-6384, tmcdonal@iastate.edu.
 - *Model Traffic Management Program*, a self-evaluation guide to identify strengths and weaknesses of your work zone activities (www.fhwa.dot.gov/reports/evalgd.pdf).
 - *Best Practices Guidebook* highlights good work zone practices (www.ops.fhwa.dot.gov/wz/workzone.htm).
- Improve public awareness through public service announcements and/or articles in the newspaper. For possible content see
 - The "10 Tips" sidebar accompanying this article.
 - The National Work Zone Safety Week website, http://safety.fhwa.dot.gov/wz/wz_awareness.htm.
 - Encourage your local schools and/or driver education programs



to use *Moving Safely across America*, an interactive CD with information on how to drive safely through work zones. To borrow a copy contact Jim Hogan, Iowa LTAP library coordinator, 515-294-9481, hoganj@iastate.edu. To purchase a copy or for more information contact Timothy Barkley at FHWA, timothy.barkley@fhwa.dot.gov.

Enforcement

Work with local law enforcement to ensure their vigilance about drivers who speed or ignore work zone signs.

For more information

See FHWA's website, http://safety.fhwa.dot.gov/wz/wz_awareness.htm. ■

10 Tips for Driving Safely in Work Zones

You should ...	Because in work zones ...
Expect the unexpected.	Normal speed limits may be reduced, traffic lanes may be changed or merged, people may be working on or near the road, and other motorists may not be paying attention.
Slow down.	Speeding is one of the major causes of work zone crashes.
Don't tailgate.	Rear-end collisions are the most common crash in highway work zones. Keep a safe distance between your vehicle and the one ahead of you.
Maintain a safe distance between your vehicle and construction workers and their equipment.	Road workers and equipment may inadvertently move into your travel lane.
Observe posted signs.	Warning signs are there to help you and other drivers move safely through the work zone.
Obey the flaggers.	Flaggers have the same authority as regulatory signs. You can be cited for disobeying their directions.
Stay alert.	There's little room for error in work zones. If you get sleepy, stop at a rest area for some fresh air, a walk, or a nap.
Minimize distractions.	The slightest inattention—changing radio stations, using a phone, eating, reading maps, etc.—while you're behind the wheel makes it difficult to focus your attention on the road and work zone.
Keep up with the traffic flow.	Driving right up to a lane closure and then trying to enter the traffic lane can cause rear-end collisions. When warned of merging traffic ahead, merge as soon as possible.
Allow plenty of time.	Delays may occur. Ahead of your trip, check local TV and radio listings about work zones. Where road work is occurring, anticipate delays.
Be patient; stay calm.	Work zones aren't there to personally inconvenience you but to improve your future driving conditions.

Just for street and road workers

Editor's note: The two articles on pages 6–8 are the latest in a series based on information in Iowa's new Local Roads Maintenance Workers' Manual. The manual was developed by CTRE and sponsored by the Iowa Highway Research Board (TR-514). The series began with the July–August 2006 issue of Technology News. Previous topics included maintaining gravel roads and identifying/repairing asphalt pavement distresses.



Iowa One Call: It's the Law

Iowa law requires that anyone planning any form of excavation must contact the Iowa One Call notification system (1-800-292-8989) at least 48 hours in advance so that utilities can be located and marked. Always consult your supervisor before conducting any excavation like mud jacking and full-depth repair.

Rule of Thumb

Always check with your supervisor and follow your agency's policies and procedures for identifying distresses and performing maintenance or repair work.

Identifying concrete pavement distresses

Properly maintaining and repairing portland cement concrete (PCC, or simply concrete) pavements helps prevent, delay, and/or reduce the severity of distresses that can result in pavement deterioration. Random cracks, for example, can allow water to infiltrate the pavement base and subbase, potentially decreasing the pavement's load-carrying capacity. Some distresses grow, leading to pavement deformation and surface damage.

Every jurisdiction should have a system in place for regularly identifying distress(es) needing repair.

Cracks

Random cracks can occur in concrete pavement for many reasons:

Transverse cracks run across the pavement, perpendicular to the shoulder. Longitudinal cracks run parallel to the shoulder. These cracks may occur if joints are not sawed at the right time and in the right places to adequately relieve stresses in the restrained concrete due to drying shrinkage, curling and warping, etc.

D cracking occurs at slab corners where longitudinal and transverse joints intersect. The failure is due to poor quality aggregate in the original concrete mixture.

Map cracking is a pattern of interconnected random cracks that indicates the surface was over-finished or inadequately cured.

Joint deterioration/spalling

Joint deterioration like spalling is caused when water and/or debris in the joint freezes and expands, putting pressure on the concrete along the joint (figure 1).

Blowups

When concrete expands during hot weather, pressure can build up in the concrete along the joints until the panels rise at the joints and shatter. Blowups can be quick and violent, throwing pieces of concrete several feet.

Scaling

Scaling is the deterioration of the upper 1/8- to 1/2-inch of the concrete surface. It may be caused by deicing chemicals or inadequate curing.

Pavement settlement

Slabs sometimes settle, particularly bridge approach panels. Settlement generally indicates that subbase materials have migrated from beneath the slab.

Faulting

Faulting is a difference in elevation across a joint or crack caused by slab settlement on one or both sides of the crack/joint or by rocking of the slab at the crack/joint as traffic moves across it.

Pumping

Pumping is the seeping or ejection of water and subbase material from beneath the pavement through pavement cracks under heavy loads. Sometimes deposits of fine material are left on the pavement surface or stain it.

Corner breaks

A corner portion of the slab may separate along a crack that intersects adjacent transverse and longitudinal joints. Corner breaks can occur if loads are allowed on new pavement before it has gained adequate strength or where the subbase material is not uniform or has eroded away.

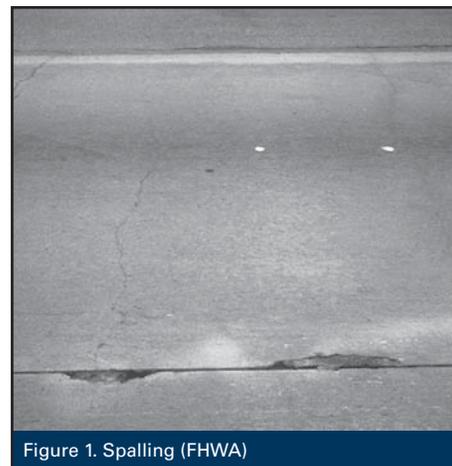


Figure 1. Spalling (FHWA)

Concrete pavement maintenance activities

After identifying concrete pavement distress(es) that should be repaired, determine the best treatment(s). See table 1.

Optimum timing and conditions

Some concrete pavement repairs can be made in any season. However, fresh concrete should never be placed on saturated or uncompacted subgrade. This would eventually cause support problems.

And fresh concrete should never be placed if the concrete is likely to freeze before it has gained its design strength. Practically speaking, this means that for a full-depth repair the subgrade, base, and adjacent concrete must not be frozen, and the air temperature must be above freezing. If the air temperature is expected to fall below 40°F in the 72 hours following paving, the American Concrete Pavement Association recommends covering the new pavement with insulating blankets, mats, or foam sheets.

Routine maintenance

Routine maintenance for concrete pavements generally includes regular street sweeping and joint/crack sealing. Sweeping removes caked mud, abrasives, and other debris from the surface. Clean pavement surfaces help keep drains clean and make travel safer for bicyclists.

Regularly cleaning and sealing joints and random cracks keeps them free of water and sediment and protects the subgrade from water intrusion.

Temporary (asphalt) repair

For areas experiencing scaling, faulting, pumping, or blowups, a temporary repair using asphalt may be appropriate:

1. Blow out joints with compressed air.
2. Remove broken concrete and square up the sides of the area.
3. Apply a tack coat.
4. Place an asphalt wedge and compact it.

Joint repair

For corner breaks, spalling, and D cracking, repair the area using a concrete mix:

Table 1. Distresses and maintenance activities for concrete pavement

Distresses	Maintenance Activities					
	Routine Maintenance		Temporary Repair	Joint Repair	Mud Jacking	Full-Depth Repair
	Joint/Crack Sealing	Surface Patching				
Cracks	X					X
Joint Deterioration/Spalling	X			X		X
Blowups			X			X
Scaling		X	X			
Pavement Settlement			X		X	
Faulting			X		X	
Pumping				X		
Corner Breaks				X		X
Pavement Failure						X

1. Saw cut, break out, and remove loose material, leaving the faces of the removal vertical. Use a cutting torch or saw to cut pavement reinforcement. (Normally the steel network is not reestablished.)
2. Clean the hole with compressed air.
3. Fill the hole with concrete mix, normally delivered by a ready-mix operation.
4. Consolidate the mix with a vibrator.
5. Screed and finish the surface, but do not add water. (Adding water to the surface dilutes the cement paste, increasing chances of future surface scaling.)
6. Texture, then cure the concrete by covering with a liquid curing compound, plastic, and/or wet burlap. (The burlap should be kept wet until the initial concrete strength is developed.)

Mud jacking

Mud jacking raises and adjusts a slab that has settled. Workable material is forced through holes drilled in the concrete slab, exerting pressure to raise the slab.

1. Examine the site and determine low spots.
2. Drill approximately 2-inch diameter core holes through the concrete slab at selected locations.
3. Starting at the downhill portion of the void and working up, begin pumping the mud jack mix into the holes. As the mixture raises the slab to the desired elevation or the void fills to capacity, move uphill to the next set of drill holes.

It's important to lift the slab uniformly to avoid cracking it.

4. After removing the hose, plug each hole temporarily with a plastic plug or a burlap bag until the mixture has cured.
5. After the entire slab area has been adjusted to grade, clean out each hole and refill with a fast-setting cement grout.
6. Reseal cracks and joints.

Blowup repair

Temporary asphalt patches may be initially applied to blowups that occur late in the day. Later, perform a permanent, full-depth patch. Leave room for future pavement expansion to prevent another blowup at the same location.

Surface Patching

Apply a surface patch to repair corner breaks, scaling, D cracking, and construction joint deterioration where the depth of deterioration is no more than 25 percent of the total pavement thickness. See figure 2.

1. Mark the area to be patched 2 to 3 inches outside the damaged area.
2. Remove surface concrete with light- to medium-weight hammers.
3. Sandblast exposed concrete and clean the area with compressed air.
4. For other than pre-cast, place a form for reestablishing the shoulder edge.
5. In reinforced pavement (except for pre-cast repair), reestablish the reinforcement

maintenance activities continued from page 3

by overlapping and tying or welding with either a double-face 4-inch weld or a single-face 8-inch weld.

6. Brush in cement or epoxy grout.
7. Place low-slump concrete with mechanical vibratory screeds.
8. Texture and cure the concrete.
9. Apply a double application of white pigmented curing compound.

Full-depth repair

Apply a full-depth repair for corner breaks, scaling, D cracking, construction joint deterioration, and localized distresses where the depth of the deterioration is greater than 25 percent of the total pavement thickness or covers a large area. See figure 3.

1. Mark the area to be patched 2 to 3 inches outside the damaged area.
2. Saw cut and remove full depth of concrete slab in the marked area.
3. Remove any unsound base or subbase. If a pre-cast slab is to be used, the base or subbase needs to be restored and compacted. Correct serious drainage problems with a lateral subdrain, etc.
4. Other than pre-cast, place a form for reestablishing shoulder edge.
5. Sandblast exposed concrete and clean area with compressed air.
6. Use coated dowel bars and deformed rebars for load transfer in all full-depth repairs.
7. Place low-slump concrete with mechanical vibratory screeds.
8. Texture and cure the concrete.

For more information

To borrow a copy of the maintenance manual, contact Jim Hogan, Iowa LTAP librarian, 515-294-9481, hoganj@iastate.edu. You can download a printable copy, www.ctre.iastate.edu/pubs/maint_worker. ■

Rule of Thumb

If deterioration is 25 percent or less of the total concrete pavement thickness, apply a surface patch.

If deterioration is more than 25 percent of the total concrete pavement thickness, apply a full-depth repair.

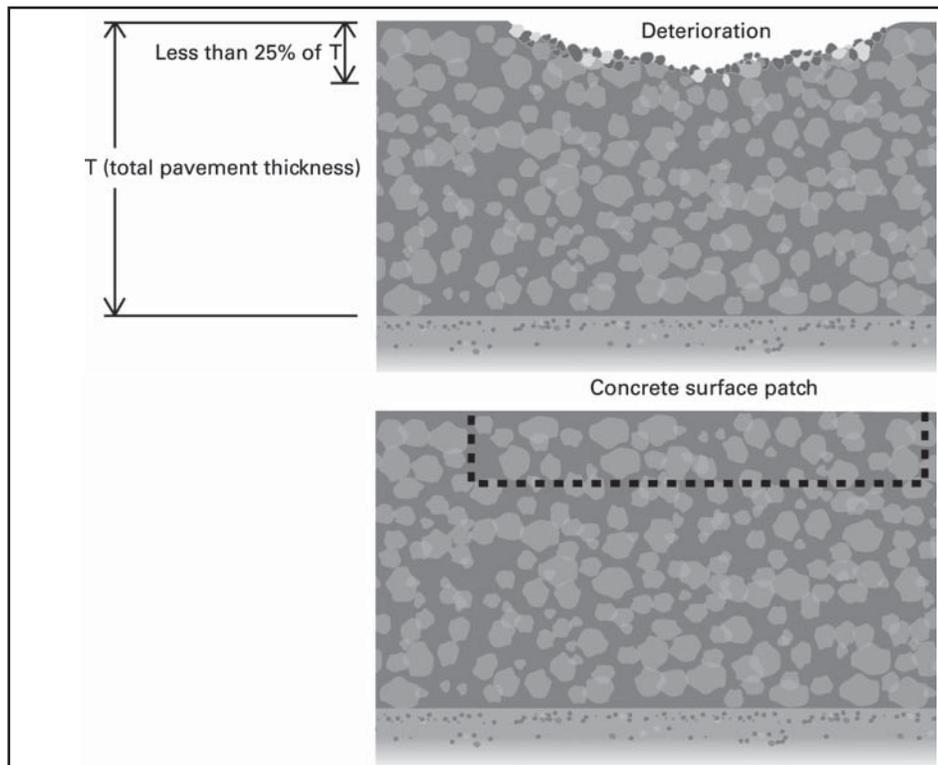
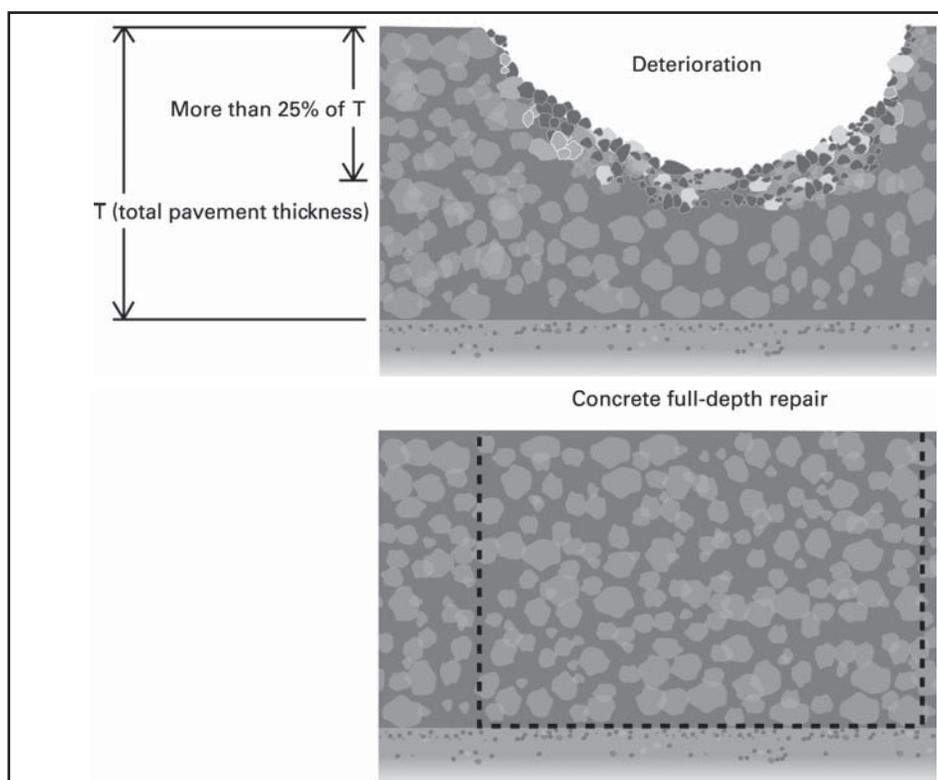


Figure 2. Concrete surface patching



SAFETEA-LU highlights for local transportation agencies

Editor's note: This is the final *Technology News* installment describing, in general, impacts on Iowa's local transportation agencies of the five-year transportation funding bill: *Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)*. SAFETEA-LU distributes roughly \$2.2 billion to Iowa (through 2009) and emphasizes local planning and decision-making.

As a result of SAFETEA-LU, Iowa's cities and counties are seeing some changes in several planning, regulation, and funding programs.

Metropolitan planning

For metropolitan planning organizations (MPOs), SAFETEA-LU expands the consultation and coordination efforts required during transportation planning.

According to Stuart Anderson of the Iowa DOT's Office of Systems Planning, SAFETEA-LU's broadened planning process addresses concerns about a project's impacts in the early stages of the project. A survey of potential impacts may include, for example, a cursory review of archaeological sites, cemeteries, or endangered species. MPOs can use GIS maps or other tools and existing data sources to complete this review.

In addition, SAFETEA-LU adds some consultation requirements. Planners may need to confer with U.S. Fish and Wildlife Service personnel and local historical officials, as well as representatives of bicycle, pedestrian, and accessibility interests. These expanded planning requirements are currently in the federal-level rule-making process.

Planners should also begin to notice SAFETEA-LU's new emphasis on visual elements in reporting and publicizing the planning process. Maps and figures will now supplement tables of numbers, making planning documents more user-friendly and accessible.

Equity Bonus Program

SAFETEA-LU's Equity Bonus Program replaces the Minimum Guarantee Program and affects Iowa's core highway funding (e.g., Surface Transportation Program, STP). In terms of taxes or tolls collected, Iowa is

beginning to receive less federal highway funding than it contributes to the national share.

To partially offset this gap and to guarantee at least a minimum level of return, Iowa will receive annual grants over the next five years. But the grants have been reduced significantly, from approximately \$15 million in 2004 to \$6.4 million in 2005 to \$630,000 in 2006.

The overall rate of return hovers around 92 percent, reducing core program funding for local systems.

Private activity bonds

A new funding feature under SAFETEA-LU allows local governments to issue tax-exempt, private activity bonds to finance highway projects and rail-truck transfer facilities.

These bonds are not currently a significant funding source in Iowa. A study of Iowa's future revenue needs, however, will examine alternative funding sources, including private bonds. Floating bonds may become a funding stream for local agencies.

Congestion Mitigation and Air Quality Improvement Program (CMAQ)

Because all of Iowa continues to meet federal air quality standards, no CMAQ funds are tied to particular areas of the state. The funds go into ITS projects and, more important for local agencies, the Iowa Clean Air Attainment Program (ICAAP).

ICAAP, with \$4.7 million set aside per year, funds projects that maintain Iowa's clean air status. These may include signal coordination efforts, transit projects, new roads, and some rail projects.

Newly eligible CMAQ projects under SAFETEA-LU include integrated and

interoperable emergency communication systems, diesel retrofits, and truck stop electrification systems.

Although Iowa's cities primarily use CMAQ funds at present, Stuart Anderson of the Iowa DOT's Office of Systems Planning notes that counties can also apply through

ICAAP. Funding priority will be given to cost-effective emission reduction projects that provide air quality benefits.

Environmental streamlining

SAFETEA-LU establishes a streamlined environmental review process for highway, transit, and multimodal projects. The process applies to new projects with environmental impact statements and, if the U.S. DOT elects, to projects with other environmental documents.

The U.S. DOT will take the lead on eligible projects, defining the projects' purposes and needs and coordinating public and agency participation.

For local agencies, an important new category, participating agencies, provides state, local, and tribal agencies a formal role and rights in the planning process that specifically address environmental issues.

Under this streamlined system, stakeholders may consider a range of alternatives for any project. A 180-day statute of limitations for lawsuits challenging federal agency approvals is provided, but it requires a new step: publishing environmental decisions in the Federal Register.

Iowa's cities and counties can apply for ICAAP funds for projects that maintain clean air.

SAFETEA-LU continued from page 9

FHWA characterizes these changes as an upgrade to the environmental decision-making process that accomplishes two goals: increased efficiency and improved dependability of the outcome.

According to Jim Rost, director of the Iowa DOT's Office of Location and Environment, it is not yet totally clear what this legislation will mean for the Iowa DOT nor specifically how it will affect Iowa's process.

For more information

For information about SAFETEA-LU's implications for metropolitan planning, minimum core highway funding, private equity bonds, and funding for air-quality related projects, contact Stuart Anderson, 515-239-1312, stuart.anderson@dot.iowa.gov. Additional information about the Iowa Clean Air Attainment Program is available on the Iowa DOT website, www.sysplan.dot.state.ia.us/icaap.htm.

For information about streamlining the environmental review process, contact Jim Rost, 515-239-1798, jim.rost@dot.iowa.gov. Additional information is online, www.environment.fhwa.dot.gov/strmlng/index.asp. ■

Stanley L. Ring Memorial Library: New acquisitions

The library recently began using the U.S. Postal Service for sending orders. This change will result in important savings for LTAP, but ordered materials will not arrive as quickly. If you have an urgent need for library materials, please let us know when you place your order so we can arrange faster delivery.

Publications

P 1688 Integrated Materials and Construction Practices for Concrete Pavement: A State-of-the-Practice Manual

This manual is intended as both a training tool and a reference to help concrete paving engineers, quality control personnel, specifiers, suppliers, technicians, and tradespeople bridge the gap between recent research and practice regarding optimizing the performance of concrete for pavements. Specifically, the manual will help the reader to understand concrete pavement construction as a complex, integrated system involving several discrete practices that interrelate and affect one another in various ways and to understand and implement technologies, tests, and best practices.

P 1689 Distress Identification Guide: Asphalt Concrete Pavements

This pocket guide is derived from the Long-Term Pavement Performance (LTPP) program's Distress Identification Manual. The guide includes photographs and text that clearly label, describe, and illustrate each type of distress.

P 1690 Distress Identification Guide: Jointed PCC Pavements

This pocket guide is derived from the Long-Term Pavement Performance (LTPP) program's Distress Identification Manual. The guide includes photographs and text that clearly label, describe, and illustrate each type of distress.

P 1691 Distress Identification Guide: Continuously Reinforced Concrete Pavements

This pocket guide is derived from the Long-Term Pavement Performance (LTPP) program's Distress Identification Manual. The guide includes photographs and text that clearly label, describe, and illustrate each type of distress.

CD-ROM

CR 85 Guidelines for the Selection of W-Beam Barrier Terminals

This CD provides information to designers and construction/maintenance personnel responsible for selecting and properly installing the most appropriate terminal design at any site. In addition to showing the actual crash performance of each terminal type, this CD provides guidance on proper site grading and presents real-world examples of both appropriate and inappropriate installations.

Order LTAP library materials in three ways:

- Order online, www.ctre.iastate.edu/library/search.cfm.
- Contact Jim Hogan, library coordinator, 515-294-9481, hoganj@iastate.edu, fax 515-294-0467.
- Mail or fax the order form on the back cover of *Technology News*.

Selected Iowa DOT library new acquisitions

To receive the following publications, contact Hank Zaletel, Iowa DOT librarian, 515-239-1200, hank.zaletel@dot.iowa.gov.

You can search the entire Iowa DOT library online as part of the State Library of Iowa. Go to the LTAP library site, www.ctre.iastate.edu/library/search.cfm; click on Iowa DOT Library.

Images of Rail: Iowa's Last Narrow-Gauge Railroad. John Tigges and James Scaffer, Arcadia Publishing, 2006.

A Way of Life: A Story of the Sioux City Stockyards (Volume 1). Marcia Poole, Sioux City Lewis and Clark Interpretive Center, 2006.

Local safety grants: What do YOU think?

Should the maximum amount of Iowa's Traffic Safety Fund (TSF) grants to local agencies be increased from \$500,000 to \$750,000? The Iowa DOT wants your opinion by the end of April.

Background

When the TSF program was established in 1987, its annual budget (fiscal year 1988) was \$1.8 million, and the maximum per-project grant was \$500,000. At that time, \$500,000 covered most of the cost of a major safety improvement, like installing left-turn bays and a traffic signal at an urban intersection.

In fiscal year 2008 the annual TSF budget is \$4.5 million, and the maximum per-project grant is still \$500,000, even if a benefit-cost analysis justifies additional funding. Today \$500,000 covers less than half the cost of a major improvement like that described above, making such a project unaffordable for many local agencies.

In recent years, cities and counties have generally submitted grant applications for smaller, less expensive safety improvements that can be completely covered by a TSF grant.

Addressing "five percent safety projects"

Of Iowa's five percent most severe road safety needs (as identified by the Iowa DOT under new federal legislation), many are located on city and county roadways. The cost to make needed improvements at these locations will far exceed \$500,000 per project.

To encourage cities and counties to apply for TSF grants to remediate "five percent safety projects" in their jurisdictions, the Iowa DOT is considering raising the maximum grant to \$750,000. A benefit-cost analysis will still be required to support the actual grant amount.

What's your opinion?

Increasing the maximum per-project grant could have advantages and disadvantages. Please share your opinions or recommendations with the TSF advisory committee

Conference calendar

March 2007

2	District No. 4 Workshop	Council Bluffs	Denise Wagner 515-294-5798 aleopold@snyder-associates.com
7 8 9	Work Zone Safety	Mason City Mason City Creston	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
12–16	2007 Route Surveying Class	Ames	Duane Smith 515-294-8103 desmith@iastate.edu
16	District No. 5 Workshop	Ottumwa	Denise Wagner 515-294-5798 aleopold@snyder-associates.com
27–28	SUDAS Erosion and Sediment Control Design Workshop	Marion	Laurel Raasch 515-294-3360 lmraasch@iastate.edu
27 28 29 30	Work Zone Safety	Council Bluffs Sioux City Storm Lake Ames	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
30	District No. 6 Workshop	Iowa City	Denise Wagner 515-294-5798 aleopold@snyder-associates.com

April 2007

3–5	NHI Bridge Inspection Course Number 130091: Underwater Bridge Inspection	Des Moines	www.ucs.Bridge Inspection mnet/_repository/2007/ nhibrIDGE/pdf/brochure.pdf
3–4	SUDAS Erosion and Sediment Control Design Workshop	Marion	Laurel Raasch 515-294-3360 lmraasch@iastate.edu
10–11	Intelligent Transportation Systems Heartland, 8th Annual Meeting	Omaha, NE	Dennis Kroeger 515-296-0910 kroeger@iastate.edu www.itsheartlandmeeting.org/
24–26	Western Plains MPO Conference	Rapid City, SD	Brad Remmich 605-773-3093 Bradley.Remmich@state.sd.us

August 2007

16–17	Mid-Continent Transportation Research Symposium	Ames, IA	www.ctre.iastate.edu/ events/midcon2007/index.htm
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Get more information and/or register online for these events at www.ctre.iastate.edu/calendar/.

The TSF advisory committee wants your opinion by the end of April.

of city, county, and Iowa DOT engineers. Contact Tom Welch, Iowa DOT transportation safety engineer, 515-239-1267, tom.welch@dot.iowa.gov.

The TSF advisory committee will thoughtfully consider all input. ■

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