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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
Traffic Safety and Operations

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Soggy spring gravel roads: Dealing with a bumper crop of frost boils

Wind, sun, and decent weather are the only sure cures for soggy, spring gravel roads. It's clear that the best time to deal with spring frost boils is when it's dry and sunny, not in the middle of mud season when resources have been depleted after a long, wet winter.

Unfortunately, here in Iowa, even the best dry-weather efforts can't prevent the upheavals, mud, ruts, and washboards on gravel roads after a wet fall, winter, or spring. In bad winters, these distresses may even show up on paved roads, and a good crop of boils are guaranteed on most gravel roads.

What causes frost boils?

The more severe the winter, the deeper the frost layer, and that's part of the problem. Spring thaw starts from the top down, which leaves an expanded, saturated layer of mud over a barrier layer of frost and ice. Since the top four feet serve as insulation, it takes

longer for the lower ice lens to disappear. This barrier forms an impervious layer that prevents moisture from draining down or away from the surface. Because the ground is saturated, the trapped moisture can't run off either.

This trapped moisture rises and falls with temperature fluctuations and results in roadway distresses that are made even worse after a late, wet snow in March or April.

Clarence Perry, the Iowa LTAP motor grader operator training coordinator, offered some tips for dealing with muddy gravel roads both now and when it comes time to install preventive measures.

How can damage be minimized?

Most of the stopgap measures that help control and minimize spring distress on gravel roads depend on timing.

Soggy roads continued on page 2



A typical spring gravel road saturated with water and showing signs of distress.

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 ISU)
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
TRB	Transportation Research Board



U.S. Department of Transportation
Federal Highway Administration



Iowa Department
of Transportation

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Soggy roads continued from page 1

- ✓ Plan your work—don't start randomly hauling rock.
- ✓ Haul rock early in the day while the road is still stiff from low nighttime temperatures.
- ✓ Treat priority trouble spots—like bridge approaches and intersections with paved roads—first.
- ✓ When you feel the need—or public pressure—to haul surface material, try to do so when frozen ground will support the load.
- ✓ When you have a bad frost boil season, notice new or severe problems and put them at the top of the list for good-weather repair.

Steve Akes in Warren County recommends using a roller to compact problem areas. Akes says, "First we fix the soft spots in the worst places—pull the edges in and build up the crown—then haul some rock. We use a pull-behind roller to compact the surface to speed up the healing process and keep moisture from seeping down. All this involves workers and machines—we use two motor graders and trucks to pull the roller and haul rock—but we think rolling makes the repair last longer."

Perry also recommended back dumping as one strategy for spreading rock with a minimum of damage to the road. When it is essential to make a stretch of gravel road passable—like when you need to get a hearse into a cemetery on a dead-end road or in emergency conditions—back dumping puts a layer of rock down ahead of the truck so it doesn't have to travel directly on saturated ground.

What are some preventive measures?

The common denominator for preventive measures is to find a way for moisture to drain. This can be accomplished by

- Tiling bad places.
- Bridging over the problem area. Remove a couple feet of the surface, then use stone and engineering fabric below a final, gravel top layer.



A muddy rural intersection with heavy traffic flow starts to show signs of spring damage.

- Coring down below the frost line in the center of the road and refilling the bore hole with calcium chloride.
- The chloride helps to melt the ice lens, and the bore hole allows moisture to drain.
- Lowering side ditches lowers the water table beneath the roadway. It also helps keep the grade from becoming saturated by giving the moisture a chance to drain away during the wet season.

We're all at the mercy of the elements and mother nature. With prevention and planning, gravel roads are reliable conduits for moving crops and livestock, allowing access for emergency responders, and keeping traffic flowing for rural residents.

For more information

Contact Clarence Perry at 319-986-5751 or Steve Akes at 515-961-1050, stevea@co.warren.ia.us. ■

Tips for local road repairs

This spring's snow melt is causing roadway challenges across the state. Soggy subgrades are hard on asphalt and concrete pavements, as well as gravel roads. For information about repairs for all types of roadways, see chapter 3 of the *Local Roads Maintenance Workers' Manual*, www.ctre.iastate.edu/pubs/maint_worker/index.htm.

LTAP 25th Anniversary

The Safety Circuit Rider Program

Editor's note: This article is part of our ongoing series celebrating Iowa LTAP's 25th anniversary in 2008.

In 1988, transportation experts from the Iowa DOT, FHWA, and the Local Transportation Information Center (LTIC, which would later become CTRE) had a mission: to bring transportation safety training to local agencies through the Iowa LTAP. The product of their collaboration was the Safety Circuit Rider Program—a one-of-a-kind program that would become a national model for transportation safety training.

The goals of the program at its inception were to provide transportation safety training to local street and road employees and to make the training accessible by taking the program to them.

Getting started

Getting the program started was no easy task, says Tom Maze, professor of civil engineering at Iowa State and then-director of LTIC. Maze credits John Whited, then-manager of the LTAP program at the Iowa DOT, with believing in the Safety Circuit Rider Program enough to get it started.

“John kept pushing for the program, even when others thought it was too much trouble,” says Maze.

The persistence of Whited and others paid off. Ed Bigelow, a retired Ida County engineer, became Iowa's—and the nation's—first safety circuit rider in the spring of 1989. He conducted his first workshop, training local officials in interpreting the Iowa DOT's accident location reporting system, in Hamilton County that fall. Workshops on flagging and signing followed closely thereafter.

Bigelow traveled around the state, conducting about 60 safety-related workshops each year in garages, shops, and meeting halls. He was passionate about his work and well-liked by the local agencies he worked with.

“It was because of the good work of Ed Bigelow that the program became a national model,” says Maze.

Success recognized

In 1990 the program won the “Best Overall and Most Efficient Use of Resources”



Current Safety Circuit Rider Tom McDonald (right) teaches a safety workshop.

category in the FHWA's Biennial Safety Award Competition. Jack Latterell, FHWA safety program manager for Iowa, nominated the program for the award.

“I felt that the program deserved attention so that other states could consider similar arrangements,” Latterell says.

By the time Bigelow retired as safety circuit rider in 1996, he had expanded his workshop offerings to include excavation safety, equipment safety, motor grader operation, construction inspection, pavement markings, and roadside design.

Tom McDonald took over the position in 1998, after it was briefly held by Iowa DOT's Mike Jorgensen in 1997. By June of 1998, McDonald was working to develop a new signing workshop and conference that covered MUTCD requirements, sign reflectivity, inspections, and other related subjects. He also offered in-house training on roadside safety, tailored to address topics of interest to a given agency.

Evolving program

“Tom has really shown the potential this position has for new things,” says Iowa LTAP Director Duane Smith. “He adds new workshops every year and has really focused on bringing research findings to local agencies.”

Being involved in research is one of the things McDonald enjoys most about his job.

“When I started as safety circuit rider, the position mostly offered flagging and crash

analysis training,” says McDonald. “Now I am involved a lot more in research and in the sharing of technology that comes from that research, in addition to worker safety training.”

All of these new opportunities have led to more work—more than just one person can handle effectively. That's where Bob Sperry, Iowa LTAP's new local roads safety liaison, comes in.

“Bob will provide face-to-face contact with county engineers to explain the safety circuit rider program and what training is available, with an emphasis on using crash data to help make safety-related decisions,” explains McDonald.

Over the years, the success of the program, and the efforts of Bigelow and McDonald, have not gone unnoticed. The national attention received by Iowa's Safety Circuit Rider Program has led LTAPs in other states to develop similar programs.

Impact

At least 17 LTAP centers now have safety circuit rider programs. There are many more under development, thanks to a pilot program started by FHWA in 2004 to provide funding for safety circuit riders.

The national pilot program was modeled after our very own Safety Circuit Rider Program, created by Iowans for Iowans almost 20 years ago. ■

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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Just for street and road workers: A checklist of shoulder maintenance issues

Editor's note: This article is 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 road and identifying and repairing asphalt and concrete pavement distresses. This table shows some shoulder maintenance issues, from chapter 4.

Potential problem	Why a problem?	Possible cause(s)	Maintenance activities
High shoulder	<ul style="list-style-type: none"> Creates a safety hazard for drivers. Restricts drainage away from the roadway. 	<ul style="list-style-type: none"> In earth shoulders that were originally flush with the adjacent roadway, vegetation collects sediment and gradually breaks down, raising the shoulder height. May occur in gravel shoulders in which vegetation has been allowed to grow. 	<ul style="list-style-type: none"> Earth and gravel shoulders: Reshape and compact in accordance with the original design. If vegetation is part of the problem, break up roots with a mechanical mixer and follow with blading.
Low shoulder, or shoulder (edge) drop-off	<ul style="list-style-type: none"> Creates a safety hazard for drivers (edge drop-offs are among the top crash-related conditions and commonly used bases for tort claims). Allows water to penetrate into the subgrade. 	<ul style="list-style-type: none"> Poor drainage. Erosion of uncompacted shoulder materials (earth or gravel). Settlement (asphalt or concrete). 	<ul style="list-style-type: none"> Earth and gravel shoulders: Refill, reshape, and compact in accordance with the original design. Low paved shoulders: Place a fillet (usually asphalt) along the pavement edge at an approximately 30-degree angle to shoulder. Note: An edge drop-off greater than two inches is generally considered excessive; consult your supervisor and follow your agency's policy.
Erosion	Exacerbates poor drainage.	Poor drainage. (Earth or gravel shoulders with steep slopes are especially susceptible to erosion.)	<ul style="list-style-type: none"> Note: An edge drop-off greater than two inches is generally considered excessive; consult your supervisor and follow your agency's policy.
Secondary ditch	Can cause structural damage related to drainage that may result in the need to rebuild the roadway.	<ul style="list-style-type: none"> Excessive throw-off of material from gravel roads. Heavy vehicles driving on the shoulder. 	
Vegetation	<ul style="list-style-type: none"> Can inhibit drainage, resulting in the formation of secondary ditches. Can collect debris, eventually encroaching on and narrowing the driving lane(s). Can cause snow to drift in the roadway. Can create unsafe conditions for vehicles that leave the roadway. 	Inadequate mowing or trimming of shoulders.	<ul style="list-style-type: none"> Mow earth shoulders regularly, trimming thoroughly along the pavement edge. Note: Be alert for abandoned materials from methamphetamine-manufacturing labs. These hazardous materials require special handling. Consult your supervisor, and follow your agency's policy.
Driveways	Shoulder maintenance activities can affect the road design where the driveway and shoulder connect, interfering with drainage. Be careful to maintain the designed drainage point at driveways.		

For more information

See chapter 4 of the *Iowa Local Roads Maintenance Workers' Manual*. To borrow a copy of the manual, contact Jim Hogan, LTAP library coordinator, 515-294-9481, hoganj@iastate.edu. ■

Shop focus: Tire care and safety

Remembering *PARTS* can help you maintain tire safety, a crucial factor in safety on the road.

The Rubber Manufacturers Association (RMA) recommends setting aside a minimum of five minutes each month to perform these *PART* activities on passenger vehicles—checking Pressure, Alignment, Rotation, and Tread.

In fact, Story County Maintenance Supervisor Craig Kirk says that road workers should visually inspect their vehicle's tires every day. You can start with the RMA *PART* routine and add a Standard safety inspection to complete a *PARTS* tire safety inspection.

P = Pressure

- Supplement daily hammer-method pressure checks with regular inflation gauge checks.
- Check tire pressure when the tires are cool. If you have to drive to your air source, check the tires before you go and add only the amount of air needed to bring the tire up to specification.
- Check the pressure in all tires, including the spare.

The National Highway Traffic Safety Administration (NHTSA) requires that standard tire and loading information should be located on the driver's side doorjamb (also known as the B-pillar). See figure 1 for a sample placard. Use this information along with sidewall markings to determine pressure requirements for each tire.

Figure 2 shows an example of sidewall markings that give, for instance, informa-

tion about the tire manufacturer, size, service rating, and Uniform Tire Quality Grading (UTQG) rating.

A = Alignment

- Notice if your vehicle pulls, vibrates, shimmies or makes noise, all signs that you may need to align your tires.
- Check tire balance. Out of balance tires contribute to uneven wear and misalignment.
- Schedule alignment at the first signs of tread wear.

R = Rotation

Check for wear and correct any mechanical problems (e.g., balance, alignment) before you rotate the tires.

T = Tread

Tread is the most important indicator of tire problems that can be related to pressure, alignment, and rotation. Frequently check tires for these signs of tread wear:

- Signs of damage or foreign objects.
- High or low spots, flat spots, or unusually smooth spots on the face of the tread.
- Wear bars across the width of the tread (indicates nearing the end of the tire's life).
- Excessive wear on both outer edges (indicates under-inflation).
- Excessive wear in the center of the tread (indicates over-inflation).
- Tread that shows cupping or dipping (may indicate worn suspension parts or a wheel imbalance).
- Saw-toothed or feathered tread edges (indicates wheel misalignment).

S = Standard safety inspection

Daily standard visual safety inspections—the pre-trip walk-around—are routine for trucks and other road maintenance vehicles.

- Check the wheel and the rim for damage.
- Check to see that the wheel and tire assembly is in roundness.
- Make sure the valve stem cover is in place.
- Check that all lug nuts are present and fully torqued.
- Check the hub oil seal.
- Make sure spacers or tire weights are not damaged or missing.

For more information

For more information about tires and tire safety, contact Craig Kirk at 515-382-7355, engineer@storycounty.com or Tom McDonald, Safety Circuit Rider, at 515-294-6384 or tmcdonal@iastate.edu

For more information about tire safety and tires, see

- NHTSA Final Rule: Tire Safety Information: www.nhtsa.dot.gov/cars/rules/rulings/TireSafety/TireSafety.html#secVII_A
- 4Crawler: www.4crawler.com/Diesel/Tires.shtml
- The Tire Rack: www.tirerack.com/tires/tiretech/tiretech.jsp
- Tire Safety: www.tiresafety.com ■

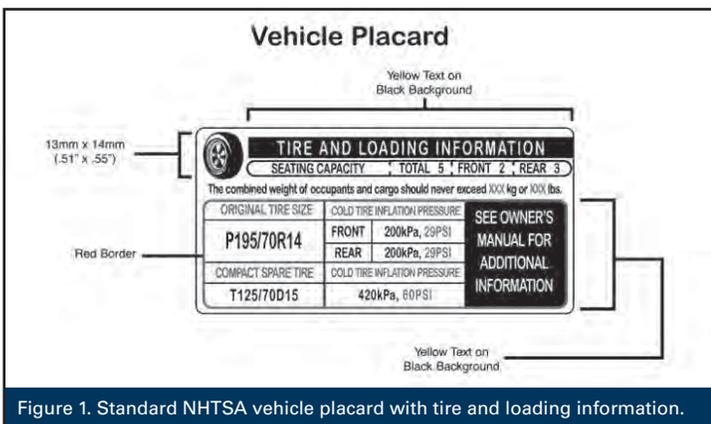


Figure 1. Standard NHTSA vehicle placard with tire and loading information.

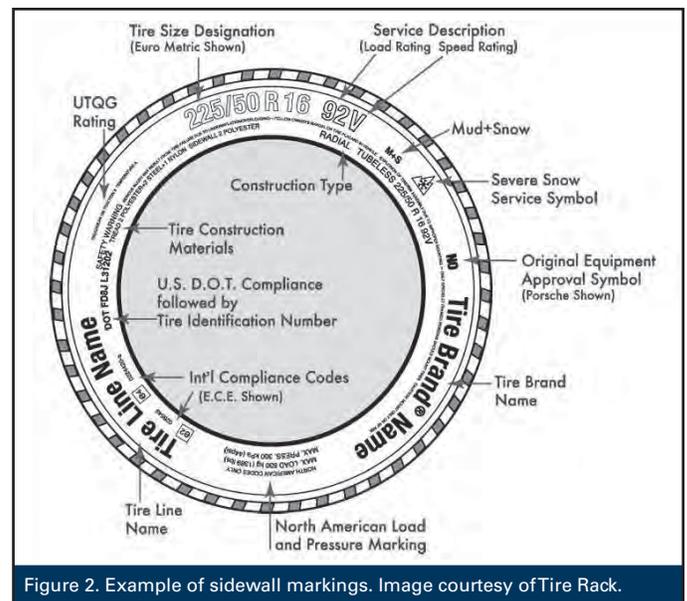


Figure 2. Example of sidewall markings. Image courtesy of Tire Rack.

Stanley L. Ring Memorial Library: New acquisitions

Note about delivery of materials: The library now sends orders through the U.S. Postal Service. This change is resulting in important savings for LTAP, but ordered materials do not arrive as quickly. If you have an urgent need for library materials, let us know when you place your order and we will arrange faster delivery.

Three ways to order LTAP library materials

- Use the online catalog, 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*.

Publications

P-1711 Erosion Control Treatment Selection Guide

This guide presents a strategy and information to assist in developing cost-effective erosion control treatments for conditions commonly encountered on USDA Forest Service lands. It focuses on erosion control treatment on steep slopes.

P-1712 Surface-Aggregate Stabilization with Chloride Materials

This publication provides information on the performance and cost-effectiveness of road-mixing high applications of calcium and magnesium chloride that are applied in a one-time construction process.

P-1709 Prairie Seedling and Seeding Evaluation Guide

This guide features color photos and field descriptions for seedlings of native grasses, forbs, and common agricultural weeds as well as their seeds. It also includes a method for assessing a prairie seeding during the first few years after planting.

P-1710 Central Region Seedling ID Guide for Native Prairie Plants

This guide helps identify native plants at various stages of growth. Color photos illustrate seed, seedling, juvenile, and flowering stages, and distinguishing characteristics.

DVDs and Videos

DVD-154 Commercial Drivers License (CDL): Class A & Class B

Three videos for each class cover pre-trip inspection, basic control skills, and the road test, showing exactly what must be done (and not done) in order to pass the test.

DVD-160 and V-757 The Road and the Environment

This video by the USDA Forest Service presents an introduction to the practical considerations of road building in environmentally sensitive areas. Safety, efficiency, and economy are placed in perspective with preserving the environment and improving the driving experience.

DVD-157 and V-752 America's Highways

This Learn the whole story of America's 42,000-mile-long Interstate Highway System through rare photographs, films, computer recreations and revealing interviews. From the days of paving rocks to modern day "Bott's Dots," experts explain the ideas and innovations that have gone into America's roads. Former officials recall the strange origins of Eisenhower's "national defense highways" system, which was completed in 1984. And historians explore how this sprawling, \$125 billion lifeline has transformed America.

DVD-158 and V-755 The Transportation Engineer as a Court Witness

This video assists transportation engineers in accomplishing legal and court activities, including researching background information, making field investigations, preparing written depositions, presenting oral depositions, assisting lawyers in preparing cases and in preparing for examination and cross-examination of witnesses, and serving as an ordinary witness and as an expert witness.

DVD-155 and V-749 The Big Dig

This is the story of the Massachusetts Central Artery/Tunnel Project. At its peak, the project employed 5,000 hard hat workers, 300 cranes, and 453 dump trucks all engaged in the monumental task of replacing Boston's decaying highway system with 160 lane-miles of new road, more than half of which are underground and underwater.

V-750 DRIVE-THRU

DRIVE-THRU takes a fascinating ride through one of the most intriguing aspects of our car-based culture. From the very first filling station to drive-in restaurants to wedding chapels and funeral parlors dedicated to wheeled clientele. It tracks the development of these roadside establishments from necessity through convenience and on to a strange form of luxury.

DVD-156 and V-751 The Autobahn

The Autobahn proves that the familiar adage "speed kills" isn't necessarily true. From the system's origins in Hitler's Third Reich to a breathtaking ride down a midnight highway at over 200 miles per hour, this video explores every aspect of the most famous freeway system in the world. See how German drivers are trained to navigate the autobahn, and find out how the roads are maintained and monitored to keep accidents to an absolute minimum.

V-753 I Wanna Be a Train Engineer

This video takes a tour of a real working Diesel, shows how a train really operates, and provides fascinating information about trains.

DVD-159 and V-754 Running a Steam Locomotive

This video provides a unique hands-on introduction to how steam locomotives are constructed, operated, and repaired.

V-756 Steam Across America

This video provides exclusive footage of the world's largest and heaviest locomotives - the Union Pacific Big Boys. It includes a visit to the yards and backshop where the Big Boys were rebuilt. ■

Newly
printed!

Iowa Drainage Law Manual

Newly printed hard copies of this manual are available. Contact Tom McDonald to get a copy, 515-294-6384, tmcdonal@iastate.edu. The manual is also available online as a pdf: www.ctre.iastate.edu/pubs/drainage_law/.

Conference calendar

May 2008

9*	Concrete Pavement Trouble Shooting: Phase 1	Ankeny, Iowa	Anne Leopold 515-964-2020 aleopold@snyder-associates.com
13–14	Motor Grader Operator Training	Ames	Georgia Parham 515-294-2267 gparham@iastate.edu
16*	Concrete Pavement Trouble Shooting: Phase 1	Charles City	Anne Leopold 515-964-2020 aleopold@snyder-associates.com
20–21	Motor Grader Operator Training	Albia	Georgia Parham 515-294-2267 gparham@iastate.edu
30*	Concrete Pavement Trouble Shooting: Phase 1	Sioux City	Anne Leopold 515-964-2020 aleopold@snyder-associates.com

June 2008

3–4	Motor Grader Operator Training	Cherokee	Georgia Parham 515-294-2267 gparham@iastate.edu
4–6	2008 Midwest Transportation Planning Conference	Iowa City	For details see http://iowadot.gov/2008TransConf/
17	Tractor/Mower Operator Safety Training Workshop	Davenport	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
17–18	Motor Grader Operator Training	Mason City	Georgia Parham 515-294-2267 gparham@iastate.edu
18	Tractor/Mower Operator Safety Training Workshop	Iowa City	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
19	Tractor/Mower Operator Safety Training Workshop	Waterloo	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
20	Tractor/Mower Operator Safety Training Workshop	Eldora	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
20*	Concrete Pavement Trouble Shooting: Phase 1	Council Bluffs	Anne Leopold 515-964-2020 aleopold@snyder-associates.com
27*	Concrete Pavement Trouble Shooting: Phase 1	Ottumwa	Anne Leopold 515-964-2020 aleopold@snyder-associates.com

July 2008

8–9	Motor Grader Operator Training	Clinton	Georgia Parham 515-294-2267 gparham@iastate.edu
11*	Concrete Pavement Trouble Shooting: Phase 1	Iowa City	Anne Leopold 515-964-2020 aleopold@snyder-associates.com
22–23	Motor Grader Operator Training	Creston	Georgia Parham 515-294-2267 gparham@iastate.edu
17–21	International Conf. on Concrete Pavements-ISCP	San Francisco, CA	For details see www.concretepavements.org

September 2008

10	Snow Rodeo (Truck, Motor Grader, Loader)	Newton	Duane Smith 515-294-8817 desmith@iastate.edu
11	Iowa Maintenance Training Expo	Newton	Duane Smith 515-294-8817 desmith@iastate.edu
30	Streets and Roads Conference	Ames	Duane Smith 515-294-8817 desmith@iastate.edu

Tractor/Mower Operator Safety Training

This new one-day workshop on best safety practices for industrial mower operator safety will be offered four times in June in central and eastern Iowa (see the Conference Calendar for specific dates and locations). The workshop will include four hours of classroom training and three hours of hands-on training. The \$75 registration fee includes course materials and lunch. The instructor, Jim Green, has more than 20 years of experience as an OSHA-authorized trainer.

Classroom training will include

- Responsible operation
- Safety management of hazards and risks
- Before-operation safety
- Operation safety
- Safety during shutdown
- Safety practices during maintenance

Hands-on training will include

- Equipment inspection
- Safety signage placement
- Use of checklists
- Performance driver's test
- Safe operating techniques
- Personal protective gear use

For more information, contact Tom McDonald, Safety Circuit Rider, 515-294-6384, tmcdonal@iastate.edu or see an online brochure at www.ctre.iastate.edu/events/mower/. ■

* At press time, the dates for Concrete Pavement Trouble Shooting are tentative; contact Anne Leopold at 515-964-2020, aleopold@snyder-associates.com to confirm.

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