



Circles slow speeders on residential streets

An old-fashioned idea is making a come-back on neighborhood streets in Seattle, Minneapolis and Madison. These cities are planting small circles in residential street intersections to slow down traffic.

Traffic circles are 12 to 20 feet in diameter, depending on street width and intersection radius. Formed by curved curbing, they are usually landscaped with low growth vegetation. While all drivers must slow down to negotiate the circle, fire trucks, emergency vehicles, school buses, garbage and recycling trucks, and snow plows negotiate them easily.

Seattle, which now has more than 600 circles, has seen lower vehicle speeds and fewer accidents because of them. Neighborhoods there are competing to have circles installed, with more than 700 requests coming in each year. The city has developed selection criteria emphasizing strong community support (60% of all households and businesses in the area). The request must also satisfy a traffic safety analysis based on collision, volume and speed data.

Minneapolis has also adopted the idea, with two traffic circles in place and 32 more being tested. About 28 will be made permanent this summer. "It improves the esthetic quality of the street. And drivers see greenery instead of a long strip of asphalt enticing them to speed," says Mike Monahan, Minneapolis Director of Transportation.

Testing proves they'll work

In Minneapolis, each circle gets a two-season experiment (fall-winter or winter-spring) using portable curb with flower planters inside. This allows residents to try out the circle in their neighborhood before much money is spent. A formal safety test for service vehicles involves videotaping each one going through the intersection. Their cost to install a circle is under \$3500 plus \$1500 for the test.

Snow plow drivers have to learn how to clear the



Traffic circles slow traffic, beautify residential streets and allow service vehicles to pass easily.

roadway around the circles on their routes, which takes a while. With this year's heavy snows, Minneapolis is plowing more intensively around traffic circles to ensure that fire trucks can pass easily.

"This is the third winter and plow drivers are finally speaking to me again," says Monahan. "They admit that the circles are not so bad after all." Speeds on neighborhood streets are definitely lower, but traffic volumes are down only two to five percent.

Monahan attributes the reduction to through traffic leaving residential streets and returning to arterials.

Residents must want them

Neighborhood support is critical. "People either like them or they absolutely hate them," says Monahan. Even though traffic turning left may either turn in front of the circle or go around it, the disruption can produce negative reactions from neighbors, he says.

In Madison, the circles are a focal point for a new, neighborhood traffic planning initiative, says City Traffic Engineer David Dryer. "We have a neighborhood with documented traffic problems and they are willing to work

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Idea Exchange

Easy ways to use waste glass as aggregate

A few hundred or thousand tons of unsalable colored glass can be a big headache for local recycling facilities but small potatoes to highway agencies, as a recent demonstration showed. The demonstration project showed two low-tech methods for using glass: as fill around culverts and in cold mix asphalt.



Unwanted glass is easily disposed in culvert fill base course or cold mix asphalt.

To fill around a culvert, Columbia County crews took green glass from the recycling facility and crushed it roughly by running over it with a roller. They bladed a mix of about five percent glass with material excavated from the culvert trench. Returning the fill around the culvert they compacted it normally, leaving a top layer without glass. State specs permit up to five percent glass in base course material that will be covered by pavement.

Glass has been part of the aggregate in cold mix asphalt for four years in Green County. It is crushed to a grade of less than $\frac{3}{8}$ inch and mixed with conventional aggregate, up to 10 percent of the total mix design weight. The cold mix, which is covered with a seal coat, is used to resurface county roads.

"To date we've done around nine miles with the material," says Dallas Cecil, Green County Highway Commissioner. "You can see the glass as it's laid behind the paver, but we've seen no serious raveling." There is little cost to the County in using glass which otherwise has no market.

For information about glass in culvert backfill, contact Wayne Cornford, at Columbia County, 608/429-2136. Call Green County's Dallas Cecil about cold-mix uses at 608/328-9411.

Do you have an idea that could help another streets or highway agency? Tell us about it. Call, fax, write, or e-mail and we'll help share your idea with others.

ROADWARE 6.0 easier to use

ROADWARE, the computer program that helps you make better maintenance and repair decisions using data about your pavement condition, is out in a new version.

The new manual is easier to follow. It features clear step-by-step instructions and example screens to lead you through each operation. For first time and infrequent users, new on-screen instructions make the system much easier to use. If you get stuck, give our new software support person, Judy Pounders, a call at 608/262-6147.

A redesigned road data screen makes it easier to enter and update condition ratings, dates and history. There are several new ways to sort and report data, including a variable, such as a ward number, that each user can define. With 10 comment lines available for each road segment, you can keep better information on the history of each road segment: who did the work and how much it cost, for example. New reports and graphs also help make results more useable.

There is space for individual costs for pavement, shoulder, drainage, walk, curb and storm sewer in the expanded cost estimates section. This should particularly help those who have road systems with both rural and urban cross sections.

All current Roadware users should have received Roadware 6.0 by mail last December. If you have been using version 5.1.2 and did not get the update, your name is missing from our users database. Please call Mercy Ranum at 800/442-4615 to get version 6.0 and add your name to our database.



Judy Pounders is the new new ROADWARE support person. Call her if you have problems with the program.

Crossroads

This newsletter provides information on roads and bridges to local officials and is published quarterly by the Wisconsin Transportation Information Center. **Crossroads** is produced with assistance from the Federal Highway Administration, the Wisconsin Department of Transportation, and the University of Wisconsin-Extension.

Non-profit organizations are welcome to reproduce articles appearing here. Please contact us first for any updates or corrections.

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Getting started on ROADWARE

ROADWARE, the T.I.C.'s pavement rating and analysis software, makes managing your street and highway system easier, faster and more consistent. There's plenty of help available, too, for newcomers to Roadware. There are staff in county highway departments, county Extension offices, at Regional Planning Commissions, and with private engineering consultants who help communities get Roadware up and running.

In Trempealeau County a number of local towns have gotten help from Extension Agent Pat Malone. She's the Community Natural Resource and Economic Development Agent for the County.

Roadware's information storage was very helpful for one Trempealeau town that had a lot of turnover on the board of supervisors. The pavement inventory in Roadware, showed the new Chair that they were not spending enough to keep up their roads. "It gave the board a greater awareness of their roads and helped them think through a little better where they are putting their funds," says Malone.

For most towns highway and street maintenance represents their largest single investment and usually runs 60% to 75% of their budget. Roadware gives the board and citizens a tool for planning. "Since road maintenance is such a big part of the budget, it's subject to a lot of political wheeling and dealing. Roadware helps them think ahead and use an organized structure for evaluating their choices," says Malone.

In north-central Wisconsin, there are 60 towns, villages, cities, and counties using Roadware. They got started with the help of staff from the North Central Regional Planning Commission (NCRPC). This year the City of Wausau rated its roads and entered the information into Roadware with help from the NCRPC. For the future, Wausau will maintain the database on its own and plans to link the information

with data in its Geographic Information System (GIS).

Rhineland, which started with Roadware a couple years ago, contracts with the RPC to maintain and update the records and prepare reports. "The charge is minimal," says NCRPC representative Darryll Landeau. "We think this is a useful and important tool for our communities."

Some engineering consultants now include developing a Roadware program as one of their contract services. "It helps them maximize their budget and state aids," says Mike Flesch, Senior Project Engineer with the firm of Crispell-Snyder. In his previous position at the Rock County Highway Department, Flesch also helped many towns get going on Roadware.

"The program is pretty friendly and each time a new version comes out, they make major improvements," he says. "The biggest problem is getting the local people used to using a computer."

To get them started Flesch usually rides over the town roads working with the local officials to rate the roads for a day. "We try to hit all the different types of roads that day. After that they do it on their own," he says. If they have a question, they consult the photos in the PASER manuals and usually they find one that fits the situation.

Graphs from Roadware are especially helpful to show committees and governing bodies, Flesch feels. "The bar graph that shows the aging of the system and what percent of the roads are at each level is great. It's very visual," he says. Customizing costs for street improvements in the community helps them get a clearer picture of their financial needs.

"It's a win-win situation," says Paul Munia, a consultant with Ruckert and Mielke in Waukesha. "If they put a little money into a pavement management system, we'll all have a clearer understanding of the system, and we can make

their repair and maintenance money go as far as possible." Costs to hire Munia to do training, or help get the system rated and into Roadware vary. In one community with 283 road segments on 85 miles of roadway, the cost was about \$8000, which covered rating, computer entry, and reports.

You can get the benefits of Roadware. Help is available from your county highway department or Extension office, a local Regional Planning Commission, or engineering consultant. If you can't find help, contact the T.I.C. for a source nearby. Use the form on page 7, or call 800/442-4615.

ANY TOWN USA			
CONDITION RATING	RECOMMENDED TREATMENT	MILES	PERCENT OF ASPHALT ROAD SYSTEM
			0 10 20 30 40 50 60 70 80 90 100
10	No treatment needed	2.420	***** 12.64%
9	No treatment needed	1.250	**** 6.53%
8	No treatment needed	1.270	**** 6.64%
7	Crack seal	1.780	**** 6.64%
6	Crack seal	5.950	***** 31.09%
5	Slurry seal	2.650	***** 13.85%
4	Overlay	1.280	**** 6.69%
3	Reprocess & Overlay	2.030	10.61%
2	Reconstruct	0.000	
1	Reconstruct	0.510	** 2.66%
TOTAL		19.140 miles	

Operation Mode: USER-DEFINED VALUES

ROADWARE's bar charts help show decision makers what roadway treatments are needed.

Asphalt pavements are tops with QMP

Everybody wants a high quality product when they are laying hot-mix asphalt. It's easier in Wisconsin which is a national leader in ensuring asphalt pavement quality through its Quality Management Program (QMP).

Under QMP the contractor follows state specifications, using standardized testing to ensure that everything from mix design to compaction are top quality.

Contractors and municipalities both benefit from the joint state-industry effort to develop specifications, implement training, and institute quality management in asphalt paving projects.

"Contractors use testing and make changes during the construction operation that ensure a quality product before the job is completed," says Gary Whited, Director of the Bureau of Highway Construction at WisDOT. He helped get the quality program started five years ago. "They know more about their product and what makes it perform, and that has helped them find ways to manage quality and even cut costs in some cases."

Municipalities who generally didn't have the staff to inspect for quality under the old system get the benefit of contractors and crews who are committed to the quality program and trained to deliver it. The municipality can easily include quality management in its contracts by using the state's standard bid specs for asphalt paving.

"Use the state spec book," Jerry Waelti Executive Director of the Wisconsin Asphalt Pavers Association (WAPA) advises. "DOT has the expertise, the engineers and the resources to set up good specs. And, since we helped them develop the specs, we know them and they take our needs into account. Having a standard set of specs throughout the state makes it easy for contractors to come up with a competitive bid because they know exactly what's expected of them."



Quality management procedures are an important element in state asphalt paving specifications.

Once contractors were skilled at using testing to manage quality, they were ready to take a further step—warranting the performance of their pavements.

"Our contractors are so confident of their product that they are willing to warranty it for five years on some stretches of pavement. We were the first ones in the country to do that," says Jerry Waelti, of WAPA. The first pavement warranty was made three years ago on a selected stretch of state highway. In 1997 the state will receive up to eight pavement warranties.

Training and testing ensure quality

The two critical components of quality management are training and testing. Most larger contractors and private engineering testing labs, and some communities, have trained employees through the Highway Technician Certification Program offered by the UW-Platteville. More than 50 training sessions one to five days long are taught throughout the "off" season for roadway construction. Training is formal, and tested, and it leads to various certifications.

This uniform training ensures that workers know what tests to perform, when to perform them, and how to do them the same way every time. In addition, it means that everybody has the same reference points: contractors, consultants, and state inspectors. "Our DOT inspection personnel have the same training as contractors and consultants," says Gary Whited. "So we're using the same specs, the same tests, and the same language."

Testing ensures that the aggregate, the asphalt and the mix are all at the quality that is specified in the mix design. In addition to the trained technician, testing requires special equipment and a place to do the work.

In Chippewa County, where they operate their own hot-mix asphalt plant, they've invested more than \$30,000 in setting up a testing lab to ensure a quality product in the 90,000 tons of asphalt they produce each year. They test the aggregate for gradation and moisture content daily or about every 1500 tons. They also test the asphalt for conformance to the mix design. Technicians from the nearby counties of Clark and Barron also use the testing lab for a fee.

"Our objective is to increase the longevity of the pavement," says Bruce Stelzner, Chippewa County Highway Commissioner. "Looking at the roads we've done in the last couple years, there's less rutting and less flushing. They look like they will have more durability."

You don't need your own facility to take advantage of testing. Smaller contractors and communities can contract with independent testing labs to run quality tests on their aggregate and hot mix, as well as Portland cement concrete mix, base material and other roadway components that affect quality.

It's expensive to re-do, repair, or repave. Quality management means fewer costly mistakes.



Asphalt testing labs

The commercial testing labs listed here will do asphalt testing for construction quality assurance. You may also wish to consult them on initial asphalt mix design and/or construction. If this list is incomplete, please advise us and we will update it.

B.R. Amon & Sons, W2950 Hwy
11, Elkhorn, 53121

Bacco Construction, PO Box 458,
Iron Mtn., MI, 49801

CGC, Inc., 1409 Emil St.,
Madison, 53713

Chicago Testing Laboratory,
3360 Commercial Av.,
Northbrook, IL, 60062

Cooper Engineering Co., Inc., 310
W. South St., Rice Lake, 54868

Graef, Anhalt, Schloemer &
Assoc., 1150 Springhurst Dr.,
#201, Green Bay, 54304

Kenosha Testing & Engineering,
Inc., 7865 Green Bay Rd.,
Kenosha, 53142

Mathy Construction Co., PO
Box 189, Onalaska, 54650

Metro Quality Testing, Inc.,
2090 W. County Rd. E, #104,
New Brighton, MN, 55112

Northeast Asphalt, Inc., 1524
Atkinson Dr., Green Bay, 54303

Northwest Asphalt Products,
11710 W. Hampton, Milwaukee,
53225

OMNNI Assoc., Inc., On ESystems
Dr., Appleton, 54914

Payne & Dolan, PO Box 781,
Waukesha, 53187

Pitlik & Wick, Inc., 4827 Sand
Beach Dr., Eagle River, 54521

River Valley Testing Corp., 1302
Cleveland, Wausau, 54401

Robert E. Lee & Assoc., PO Box
2100, Green Bay, 54306

STS Consultants, Ltd., 1035 Kepler
Dr., Green Bay, 54311

Tower Asphalt, Inc., PO Box 15001,
Lakeland, MN, 55043

Westbrook Assoc. Engr., Inc., 619
East Hoxie, Spring Green, 53588

Woodward Clyde Consultants, 2135
S. 116th St., West Allis, 53227

Resources

Materials listed are available from the Wisconsin T.I.C. unless otherwise noted. To get your copy call 800/442-4615, or use the form on page 7. Video tapes are loaned free through Wisconsin County Extension Offices.

The SAFER Manual—Safety Evaluation for Roadways, T.I.C., 40 pp. This is the Transportation Information Center's newest publication. It presents a hazard rating scale that is demonstrated with many pictures and brief text. The manual will help you identify potential hazards along your roadsides, at intersections and railroad crossings, and associated with roadway geometrics. It also covers the role of proper signs and pavement markings in reducing hazards. The SAFER Manual will help you identify hazards, rate safety needs, address immediate problems, and budget for longer term safety improvements.

Dust Control on Unpaved Roads, T.I.C. Wisconsin Transportation Bulletin No. 13, 6 pp. This newly revised factsheet includes a more extensive discussion of when and where to use dust control measures and an expanded review and comparison of the most common dust control agents, including chlorides, petroleum products and lignin.

State-of-the Art Design of Roundabouts, Joe Bared, William Prosser, and Carol Esse, FHWA, paper presented at the 1997 US Transportation Research Board Annual Meeting, 26 pages. This paper summarizes up-to-date international and US practice for rotary intersections and makes practical design recommendations regarding geometrics, accident prediction, capacity and delays, and bicycle and pedestrian considerations. The list of references and design guidelines is excellent for those who want more information.

City of Seattle Operating Instructions on Traffic Circles, 25 pp. This complete approach to traffic circles—petition, approval and design—includes detailed instructions on how Seattle manages its neighborhood traffic circle program. It includes the enabling resolution, general conditions and criteria, sample correspondence and citizen petition, and geometric and other design standards.

ROADWARE 6.0. The latest version of the T.I.C. pavement management software that implements the PASER pavement rating system is available at no cost to local governments in Wisconsin. The ROADWARE package includes the software, users manual, and **PASER Manuals** to help you inspect and rate your pavements.

Systems for tracking preventive maintenance on equipment

Everybody knows that preventive maintenance saves money by catching small problems before they turn into major breakdowns. Making repairs on schedule also saves time — preventing unanticipated equipment down time, saving lost hours for the operator and emergency crew, and allowing speedier repairs because necessary parts are on hand.

Effective preventive maintenance requires keeping good records and using them. Computerized equipment management systems are available from many sources, but they often don't quite do what you need, or only do part of the job, or their reports are too complex. Some systems only track specific aspects of the process: parts control, fueling, or manufacturer-specific systems that report on their maintenance schedules. Any system, computerized or manual, will need to be customized for your operation.

Whether you are using a computer or a paper system, there are two keys to preventive maintenance records: equipment usage and service history.

Track equipment usage

When there are only a couple trucks to manage, the foreman can often track usage in his head. In larger operations, you can track usage effectively through fuel consumption.

"Even if I had a small fleet, I'd get on a computerized fueling system or register the miles or hours every time the piece of equipment fueled up," says Bill Fischer, Outagamie County shop superintendent. His fleet of more than 300 pieces of equipment is on a customized computer-based PM system that starts with fuel tracking.

Hours or mileage are the trigger for scheduling preventive maintenance based on the equipment manufacturer's maintenance schedule. In Outagamie County, they have linked their fuel tracking system to a computer program that keeps the history of each unit and its PM schedule.

Driver time cards can also be used to track the number of days or hours a unit has been in use. This is less precise because it doesn't directly reflect the intensity of use. For example, a snowplow driver covering a couple hundred miles in a weekend after a major snowstorm would be tracked just like a day of light sanding and salting.

A reminder system is a big help. Outagamie's computer system adds fueling miles to the unit's history and delivers a regular report, noting those units that are approaching their next service interval. Another software program offered by FABCO for Caterpillar equipment has a "to-do" list that shows equipment approaching service intervals and also keeps unit service histories which can be reviewed.

Keep service history

By using mechanic time sheets you can track what was done to each unit and record any comments, such as reminders to check hoses or brakes that show wear. More details on the time or work sheet mean more information is available on the equipment, and more data can be tracked.

These records are especially important for tracking the number of miles or hours for recurring problems such as brake jobs, overhauls, etc. Some systems will print out a task checklist and a list of parts for each type of planned service. It may also list tools required for the service. This type of system helps you track labor and parts costs for each unit.

Any PM tracking system, paper or computerized, is only as good as its data. "You need to assign ownership of the system to someone so the data gets properly recorded and entered," advises Bob Bruce, Technical Service Manager at FABCO in Green Bay. In his experience, fleet managers who have worked with a good manual PM tracking system can move fairly smoothly to a computer-based system, but those who have never had any system in place often do better if they use a simpler paper system first.

You can learn more about fleet maintenance at the UW-Madison seminar **Managing Fleet Maintenance Operations**, offered April 29-30. Scholarships are available for Wisconsin local government officials through the T.I.C. See Calendar on the insert page for information.

What system do you use? Would you recommend it? Tell us and we'll share your experience with other Crossroads readers. Fax or mail the form on page 7, call 800/442-4615, or e-mail to Pudloski@engr.wisc.edu. For more information about preventive maintenance, see *Crossroads*, Sp 96. If you need a copy, use the form on page 7 or e-mail to Ranum@engr.wisc.edu. Note that description of commercial products is given for information only and does not imply evaluation or endorsement.

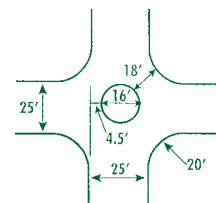
Circles on residential streets

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with us as an organization." He hopes to install the first test circle in late summer.

Dryer had experience with traffic circles in Mobile, Alabama, where he worked until last year. "We had 20 there, and quite a bit of controversy," he says. "Drivers think you're nuts but residents like them."

Madison plans to use a mountable 30-inch curb for its permanent traffic circles to allow a moving van to easily negotiate the intersection, even if it can't quite make the circle. Neighborhoods will be responsible for maintaining low shrubs and flowers inside the circles.



A 16 foot circle in a typical intersection.

"Speeding is a problem on every street, and we're really hand-tied as to what works to get motorists to travel at lower speeds," Dryer says. Traffic circles and other traffic calming devices are widely used in Germany and the Netherlands where they seem to be effective and well-liked.

For more information on traffic circles and other traffic calming techniques, borrow the videotape of T.I.C.'s 1996 satellite workshop: **Livable Neighborhoods: Rethinking Residential Streets**. Print materials are also available. See Resources, p. 5 for details.

Rotary intersection a winner

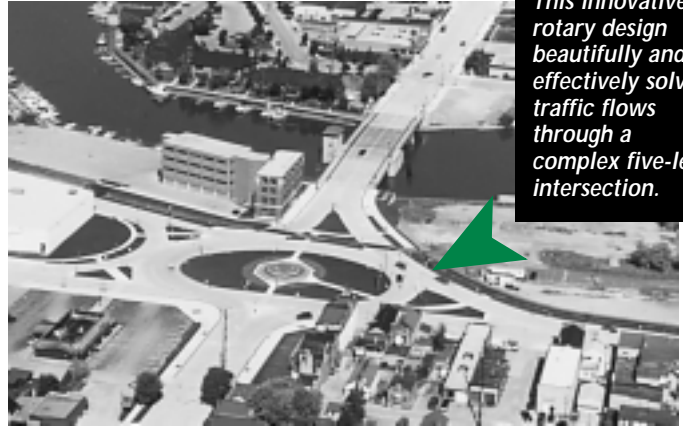
A new rotary intersection has won the hearts of Sheboygan's citizens along with recognition as Public Works Project of the Year for 1996 from the American Public Works Association. The oval-shaped rotary handles traffic from 8th Street, Indiana Avenue and Water Street, and accommodates a railroad track. The new intersection also helps beautify the entrance to a redeveloping harbor area.

"With plans to convert land in the old harbor to residential and commercial uses, we project significantly more traffic on Water Street which entered 8th Street about 150 feet north of the Indiana Avenue intersection," says, Dave Biebel Deputy Director for Public Works in Sheboygan. "More traffic would backlog the intersection severely and we couldn't solve the problem with signals." Traffic counts in 1994 were 16,200 ADT with an increase to 23,800 projected by 2015. That makes this a major intersection in a city with about 50,000 population.

The city, its engineering consultants and adjoining businesses looked at many alternatives. They concluded that the modified rotary design would work best to accommodate the fifth leg of the intersection.

The rotary opened in September 1995. Traffic flows smoothly through the oval which is 240 by 140 feet. There are never less than two lanes on the circle, which, along with multi-lane entrance and exit ramps, expands capacity. Stop or Yield signs control vehicles entering all legs of the circle while traffic on the circle has the right of way.

Department of Public Works staff worked hard to involve and educate the adjacent property owners, members of a downtown business improvement district, and the general public. Speeches to civic groups, along with early and frequent news media contact, were important to encourage a positive attitude to the unusual design.



This innovative rotary design beautifully and effectively solves traffic flows through a complex five-leg intersection.

"During the time we were planning and building it, people were saying, 'It will never work,'" says Biebel. "Now it's installed and operating very effectively—more than even we in the department expected. Some drivers actually go out of their way to take a field trip onto it."

The project was recognized by the American Public Works Association for its esthetic appeal and innovative planning. The project had to meet stringent time deadlines relating to the opening of a newly constructed 8th Street bridge and also included a contaminated soils cleanup which required complex coordination among multiple consultants and state agencies.

"We would seriously consider doing another one," says Biebel. "It's a specialty design and there are very few places where it is warranted, but it is an effective solution where it is warranted."

For more information on City of Sheboygan's 8th Street rotary intersection, contact David Biebel, Public Works Engineering Department, 414/459-3394. For information about design practice and criteria for roundabouts or rotary intersections, see Resources, page 5.

Reader Response



If you have a comment on a **Crossroads** story, a question about roadways or equipment, an item for the *Idea Exchange*, a request for workshop information or resources, or a name for our mailing list, fill in this form and mail *in an envelope* to:

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University of Wisconsin-Madison
432 North Lake Street
Madison, WI 53706

Or call, fax, or e-mail us:
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fax 608/263-3160
e-mail Ranum@enr.wisc.edu

- Please put me on your **Crossroads** mailing list.
- Please send me information on _____

- My idea, comment or question is _____

(We'll contact you to get more details or answer your question.)

Name _____ Title/Agency _____
 Address _____ City _____ State ____ Zip _____
 Phone () _____ fax () _____ e-mail _____

Specing Antilock Braking Systems

Antilock Braking System (ABS) brakes will be mandatory standard equipment on all trucks and trailers as of March 1998. Testing shows that these brakes are safer and work much better than traditional brakes.

When you order new equipment, it's a good idea to include ABS brakes for the greater safety they offer. But don't just accept whatever braking system is standard with the truck you're buying. Look into the two main types and select one that fits your needs then plan to train your service technicians.

"Advance training on repair and trouble-shooting of these brake systems is very important," says Carl Garrod, of Fox Valley Technical College's Transportation Division. Like other truck components, it takes training for the mechanic to learn how to identify problems and fix them.

The basic components of the ABS system are a sensor, an electronic control unit (ECU), and the ABS valves. The sensor continuously sends wheel speed information to the ECU. The ECU has four microcomputers, two to operate the ABS valves and two to monitor the system. If one diagonal of the ABS has a failure, control automatically reverts to the standard braking system.

The ECU sends signals to the ABS valves. These valves adjust air pressure to the brake chambers when ABS brakes

are operating. Air pressure controls braking and prevents wheel lock. A panel in the cab has warning lights which blink in sequence to report system operation and problems.

The general difference between the two types of modern ABS brakes is where the computer is placed. Some manufacturers locate it in the cab while others locate it on the valving. Four companies currently make ABS systems, and more are expected to enter the market as the March 1998 deadline approaches. "They're not all the same," says Garrod. "Some are easier to troubleshoot than others."

Manufacturers have long since solved the problems that made the ABS brakes of a decade ago worse than useless, but drivers and fleet managers remain skeptical.

"If they are hesitant, we take them through skid pad testing and have them try making a panic stop with and without the ABS engaged," says Garrod. "Everyone walks away with a great appreciation of how well it works."


"Brake safety and adjustments," an article in the Spring 1996 Crossroads, has more information on brakes. For a copy of that story send us the reader response form on page 7, or contact Mercy Ranum by e-mail. ABS brakes were just one topic at the T.I.C.'s Equipment Maintenance workshop last November. If you missed it, mark your calendar now so you can get to the next one, coming again in August 1997.

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