

Crossroads

Spring 1996



TRANSPORTATION Information Center

University of Wisconsin-Madison

Preventive maintenance saves money

"Most people probably don't do enough preventive maintenance on equipment, especially in smaller municipalities where budgets are small and a trained mechanic may not be available," says Carl Garrod, Diesel Mechanics Instructor at Fox Valley Technical College. Garrod spoke to local streets and highway folks at the T.I.C.'s December Equipment Maintenance Workshops.

Fixing it when it breaks is called *demand maintenance*, and that can be a "penny wise and dollar foolish" approach to equipment upkeep. For example, wheel bearings cost about \$40 to \$50. But if one fails while the equipment is operating, it may destroy a whole spindle, causing unplanned downtime and costing \$700 to \$800 to repair. Checking and repacking wheel bearings on a *preventive maintenance* schedule is considerably less expensive.

Because demand maintenance is done when something happens, you can't plan for it, and that costs in:

- increased downtime
- more road calls
- poorer service
- increased risk of accidents
- non-compliance with state and federal laws
- work delays

Demand maintenance also causes budgeting problems, Garrod says, because there's no regular pattern for parts replacement and maintenance.

In addition to saving money and time, preventive maintenance can help you cut down on repetitive repairs, predict when to replace equipment, spec new vehicles, and spot driver abuse. For example, if the alternator on a truck keeps wearing out, the alternator may be too small. You will know to spec a larger one the next time you order a new truck.

Frequent clutch adjustments, drive shaft damage, premature engine wear, or turbo charger failure can all be caused by drivers operating a truck incorrectly. The mechanic and the supervisor can work with the driver to change those behaviors, saving on equipment repairs.

P.M. takes inspection

"Equipment inspection is the heart of a good preventive maintenance program," says Garrod. "Follow the manufacturer's recommendations for when to inspect and what to



Inspect vehicles systematically everytime. See page 4.

check on each vehicle." And be wary of misinformation that may be going around, especially on things like cooling system additives.

Do routine inspections at regular intervals, Garrod says, and do them the same way every time. The senior or lead mechanic should train all other mechanics to follow the same systematic inspection procedures and to inspect the same way every time. Garrod

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Idea Exchange

Spray injection for pothole repair

Spring is pothole season and getting those teeth-rattling pavement holes filled can be both frustrating and dangerous. Spray injection is one successful technique for pothole repair, according to a study by the Strategic Highway Research Program (SHRP).

The Dickinson County Road Commission, in Michigan's Upper Peninsula, has invested in spray injection equipment. "I never thought I could propose spending over \$100,000 on a pothole patcher," says Superintendent Tim Hammill. "But these days we have to look at equipment that will be cost-effective in the long run."



Aggregate and hot emulsion are combined with forced air and shot into the pothole, all from an enclosed distance of 20 feet.

The self propelled patcher is operated entirely from the cab by just one worker. A blast of air cleans and dries the hole, blowing out loose rock and debris. Next, the patcher sprays a tack coat of hot emulsion. Then aggregate and hot emulsion are combined with forced air and shot into the hole. Last, a dust coat of aggregate is applied. Traffic can flow immediately.

Learning to operate the machine is relatively easy, according to Dickinson County Driver Michael Timbrook. He says it takes a little practice because, "you are filling a hole that is 20 feet away from where you are sitting. But once you get it figured out it does an amazing job."

Cold weather operation attracted Hammill to the equipment. It can operate at temperatures of -25°F. Materials are heated and held in different containers. The emulsion is heated by a hot water regenerative system, and the chips are heated by the engine exhaust system. Getting potholes patched while it's still cold helps keep them from getting bigger, and reduces motorist complaints, Hammill says.

Workers are also safer in the patcher's cab than out behind a truck. "When the guys on the crew have to dive for cover to avoid inattentive motorists, it's time to do something different," says Hammill.

Dickinson County bought their patcher from ROSCO Manufacturing Company in Madison, South Dakota. The equipment is also available in a trailer mounted unit, according to SHRP.

*Adapted from **The Bridge**, summer 1994, newsletter of the Michigan LTAP program. Used by permission.*

Winter road survey results

Pre-wetting of salt is gaining popularity; most people get their pavement condition information from law enforcement agencies; a reasonable number of you now have written snow removal policies; and too few actively reach out to the community through public relations efforts. These are some of the conclusions we draw from an informal survey of 421 participants in last fall's winter maintenance workshops.

Salt and sand use — About half of the respondents from counties (68 out of 103) indicated that they pre-wet salt before spreading, while only 12 of 85 city-based respondents said they did. County pre-wetting is probably due to the recent state-funded winter maintenance improvement program. Only one each of the 38 village and 169 town participants are pre-wetting.

"Pre-wetting is a good tool for providing a higher level of service," says T.I.C. Director Don Walker. "It can help save labor because you may not have to go back over the same areas again, and it can save on salt if you dial down your spreaders."

Dry salt and sand are used about equally often by most groups. When all salt and sodium chloride uses are combined the total is about 50% higher than the combined total of sand and other materials.

Storm alerts — Seventy percent of respondents get storm alerts and road condition information outside work hours from law enforcement agencies, while about 25% use contract weather forecast services. Counties and state people are also using pavement sensors. "The police are a good first line of information for many agencies, but for those who provide a high level of service, contract weather forecasts are a good buy," says Walker. "You get a lot for your buck."

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Crossroads

A newsletter providing information on roads and bridges to local officials, published quarterly by the Transportation Information Center, located at the UW-Madison, Dept. of Engineering Professional Development, 432 N. Lake St., Madison, WI 53706. Phone: 800/442-4615. Fax: 608/263-3160.

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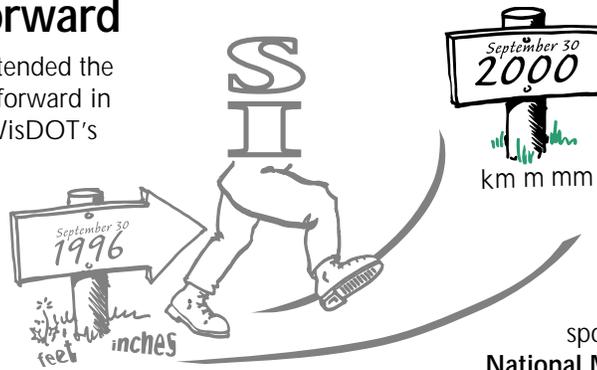
Metrication moves forward

Although recent federal legislation extended the deadlines, metrication is still moving forward in Wisconsin, according to Ron Nohr, WisDOT's metrication coordinator.

"We're continuing on schedule," he says, "with pilot projects beginning in the spring and more metric designed projects in the letting schedule this fall."

The federal highway system act passed at the end of 1995 changed the mandatory date for all roadway improvement plans to be in metric units from September 30, 1996, to September 30, 2000. According to an AASHTO survey, Wisconsin is one of 33 states who will continue on the original schedule, while six others will have slight delays.

"We had already received exceptions for 320 projects which were far enough along that it was more economical to leave them in English units," says Nohr. "This new



deadline just gives us a little flexibility in case some projects slip behind schedule."

The change also gives local governments more time and flexibility to convert their road project planning to metric.

An AASHTO and FHWA sponsored national conference, **The**

National Metric Conference, will be held

April 15-18 in Minneapolis for people interested in what is happening in metrication nationally. For information contact Robert McPartlin, 612/296-4337.

WisDOT has a new brochure, **The New Metric Rule**, to explain metric to members of the public affected by transportation projects. Copies are available from the T.I.C. Use the form on page 7 or call 800/442-4615.

Winter road survey results

from page 2

Written snow policy — More than 40% of the respondents said their agency had a written policy or snow removal plan (175 out of 421). Two-thirds of city-based participants have a written plan (51 of 85), while villages and counties are about half and half. Relatively few towns have such a plan (40 out of 169).

"People find written plans very useful," says Walker. "It's easier to sub in replacement drivers. You can explain your practices better to the constituents. And you can remove snow more efficiently when you think comprehensively about your procedures, as you must in preparing a plan."

Levels of service — One aspect of a written plan is deciding which roads are to get the highest service levels, such as school bus routes and heavily traveled roads. About one-third (148 out of 479 responses) try to achieve bare roadways on their most important routes during overtime hours, the survey shows, while half, 226, sand hills and intersections and plow to keep the road open to traffic.

News media reports — More than 100 respondents (about one-quarter) regularly get policy and road condition information to the media, including half of the county and state agencies represented and a third of the cities. Relatively few from villages and towns do so.

"It's encouraging that significant numbers of people are getting information out, but more need to," says Don Walker. "Road condition reports are a good way to build support and understanding for your agency and its efforts."

Do you have an idea to exchange? Have you designed a gadget or found a new way to do something that other highway people can use? Use the form on page 7 to let us know, or call Don Walker or Steve Pudloski at 800/442-4615.

Calendar

T.I.C. workshops

Specific details and locations for workshops are in the announcements mailed to all **Crossroads** recipients.

Spring ROADWARE User Group Meetings Current ROADWARE users will have a chance to get together to share ideas and ask questions of the computer support and TIC staff at six regional user group meetings in March and early April. A new version of ROADWARE (6.0) will also be demonstrated. Notices will be sent to current ROADWARE users. If you are not a current ROADWARE user and would like to attend call 800/442-4615 for locations, dates, and times.

Roadway Maintenance This workshop includes how drainage affects road life, pavement maintenance techniques, an opportunity to discuss either asphalt paving or gravel road maintenance, and a look at new techniques and materials.

March 19	Rhineland	March 25	Green Bay
March 20	Cable	March 26	Brookfield
March 21	Eau Claire	March 27	Barneveld
March 22	Tomah		

UW-Madison seminars

Local government officials are eligible for a limited number of scholarships for the following engineering courses in Madison. Use the form on page 7 for details or call 800/442-4615.

Bridge Rehabilitation, March 4-6

Environmental Impacts of Highway Projects, March 18-20

Intro to Global Positioning Systems (GPS), April 9-12

Roadway Safety Improvements, April 15-17

Managing Roadway Liability, April 17-19

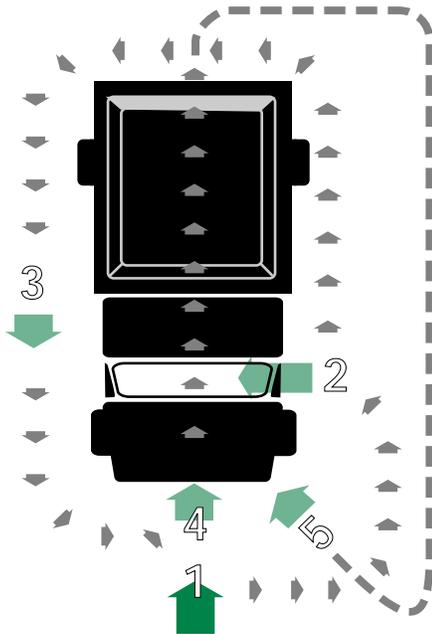
Managing Fleet Maintenance Operations, May 16-17

Preventive maintenance a money saver from page 1

recommends a five-part general inspection procedure:

- 1 Approaching the vehicle
- 2 In cab inspection
- 3 Around the vehicle
- 4 Under the vehicle
- 5 Engine compartment

A summary of what to look for in each step was distributed to workshop participants. Copies are available from the T.I.C. Call, fax or e-mail for a copy.



General guidelines for equipment inspection intervals

Operation hrs	Miles	Days	Inspection type*
50-100	3000-6000	30	A
250	10,000-20,000	90	B
500	40,000-50,000	365	C

* Maintenance items for each inspection type:
 A = checking fluid levels, greasing, and general check over
 B = all A inspection items plus changing engine oil and filters
 C = A & B plus repacking wheel bearings, changing differential and transmission fluids, and similar activities

Don't just follow the routine, though, Garrod says. Think also about how the vehicle is used. For example, a vehicle with low mileage may be incurring a lot of wear because it is constantly idling. It should be inspected sooner.

Driver inspections

The driver knows more about how a vehicle is operating than anyone. Drivers should inspect their vehicles daily before they take them out and after they return to the yard.

Continued next column

Maintain cooling system, prolong

Forty percent of all diesel engine problems are directly or indirectly related to improper maintenance of cooling systems, says Carl Garrod, Diesel Mechanics Instructor at Fox Valley Technical School. Garrod reviewed how and when to maintain cooling systems at the T.I.C.'s December Equipment Maintenance Workshops.



Check coolant and test often for acidity, dissolved solids, and proper additive levels, as well as freeze protection.

When cooling system chemicals are not tested and properly maintained you get corrosion, cavitation, scale, and silicate drop out, Garrod says.

Scale is a residue build up on cooling system walls. It insulates the metal from the engine coolant, letting it get overheated. Every 1/32nd of an inch of scale has the insulating effect of two inches of metal. Overheating can damage engine parts and cause premature failure.

Cavitation is a pitting of the exterior cylinder walls. It happens when coolant lets bubbles form on the walls, and then the bubbles are

Routine driver inspections promote vehicle safety and help spot developing problems before they become serious.

Federal law requires such inspections for commercial operators — which includes private firms or individuals who contract with a municipality to do street maintenance and repair. Although municipalities are exempt from the law, the inspections make good sense, not only for preventive maintenance, but also in case of a lawsuit.

Many drivers have little mechanical background, so shop mechanics should explain how to inspect the truck. Inspection forms, like the one required for commercial CDL holders, help ensure thoroughness.

Driver condition reports will let you know about problems— if the reports are clear, complete and detailed. The report from the CDL test works well, says Garrod.

"If you don't use the drivers' condition reports, neither will they," says Garrod. Take the reports seriously, and the driver will too.

For printed summaries of the standardized inspection method, contact the

engine life

burst by normal piston action. Eventually they can create a hole in the cylinder wall.

Corrosion is caused by chemical imbalances in the coolant. Silicate dropout, or green goo, results from over-concentrated antifreeze, too much corrosion inhibitor, low coolant levels, and a variety of other causes. It will plug coolant passages.

Use simple tests

Nearly everyone tests coolant regularly for freeze protection levels, and some also test for proper additive levels, but too many people overlook tests for acidity and total dissolved solids, says Garrod.

"It may sound like a lot of work, but it takes just five minutes to do the tests," he says. "And the \$300 cost of a test kit is a lot less than the price of boiling out a radiator."

Even routinely flushing the radiator and refilling it every two years won't ensure a proper coolant mix, says Garrod. Two years is too long. Some chemicals start to deteriorate in three to six months.

Use recommended products

Garrod's advice for keeping cooling systems in good shape:

- Use low silicate and low phosphate antifreeze that is designed for diesel engines.
- Follow the recommendations of your equipment manufacturer for what additive to use.
- Test regularly and replenish additives.
- Consider installing "need release" filters to extend service intervals.

Mechanics should **DO IT ALL**

A preventive maintenance program includes seven parts, according to Garrod. And every one of them is important.

- D**river vehicle condition report.
- O**perate the equipment yourself. Test drive it.
- I**nspect equipment. Be consistent and thorough.
- T**est equipment.
- A**djust and tighten.
- L**ubrication.
- L**ots of record keeping.

Record keeping is particularly important. Without it you might as well be doing demand maintenance because you lose the advantage of a planned and methodical approach. Computerized and paper systems for record keeping are available from such sources as J.J. Keller and the American Trucking Association.

T.I.C. at 800/442-4615, or use the form on page 7 by fax or mail.

Brake safety and adjustments

More than half of all truck brakes inspected in one 24-hour period had incorrectly adjusted brakes, according to a study by the National Highway Transportation Safety Agency (NHTSA). At the same time, only a quarter of all trucks with automatic adjusters on their brake systems were out of adjustment.



Inspect brake slack adjusters daily. Truck brakes are often out of adjustment.

Since improperly adjusted brakes are a safety hazard, the Federal Highway Administration took action. Automatic brake adjusters are now required on all commercial motor vehicles for both mechanical and air brakes. The rule took effect in October 1995 for vehicles manufactured on or after October 20, 1994.

Although the rule has not been adopted in Wisconsin yet and does not apply to municipal-owned vehicles which are exempted from most Commercial Motor Vehicle regulations (49 CFR 396), the safety and liability benefits are clear.

Checking brakes is supposed to be part of every CDL driver's daily pre and post trip inspections. In addition, a 1992 CMV Act rule also specifies training and experience standards for those who inspect brakes. But, as the study shows, there are many badly-adjusted brakes on the road.

"If your driver has a crash and the brakes weren't adjusted, you take the chance that you'll get nailed in court," says Fox Valley Technical College instructor Carl Garrod. He strongly encourages municipalities to keep automatic brake adjusters on trucks and to routinely certify those who adjust brakes manually.

"Just because drivers have a CDL doesn't mean they know how to adjust brakes," Garrod says. "And it's relatively simple for a mechanic to certify their skill and put it on paper." Fill out a simple certification form and put it in a file. That way you'll feel more confident of your vehicles' safety and also be protecting your community from unnecessary liability.

For a sample "Brake Inspector's Certification" form, contact the T.I.C. at 800/442-4615 or use the form on page 7.

Resources

Print materials listed here are available from the Wisconsin T.I.C. unless otherwise noted. Copies are limited. To get yours call 800/442-4615 or use the form on page 7. Videotapes are loaned free through Wisconsin County Extension Offices.

Transition to the Metric System, Implementation Guide, APWA, 1995, 56 pp. An introduction to the metric system for those who know little about the why, what and how of the change. Includes a list of resources and publications.

NACE Action Guides Series, National Association of County Engineers, 1995. New editions are available of selected guides. These guides feature practical straight-forward explanations, methods, examples and further references which will help you effectively organize and manage street and highway maintenance activities and organizations. A limited number of the following action guides are available:

Purchasing Authority, 28 pp.

Public Awareness and Support, 44 pp.

Solid Waste Management, 32 pp.

Traffic Operations, 88 pp.

Bridge Rehabilitation on Local Roads, 92 pp.

Bridge Maintenance on Local Roads, 80 pp.

Rural Transportation Planning, 28 pp.

Impact of Land Development on County and Local Transportation System Planning, 32 pp.

Highway/Utility Guide, FHWA-SA-93-049, 1993, 298 pp. This guide assembles under one cover, state-of-the-knowledge guidance on the best practices being used to address the issues that arise when highways and utilities share common rights-of-way. Topics include permits, mapping, notification, legal issues, and relocation reimbursement.

Utility Accommodation Policy, WisDOT, 1995, 46 pp. Effective April 1, 1995, this revised WisDOT policy will help local governments improve their utility permitting process. It includes requirements for permits, line and appurtenance location, maintenance,

and construction of private utilities in state highway and freeway rights-of-way. This policy is Chapter 96 of the Wisconsin State Highway Maintenance Manual, so manual holders should have copies already.

Subsurface Utility Engineering (SUE) Handbook, FHWA-PD-93-056, 1993, 79 pp. Intended as a guide to highway engineers who wish to engage an engineering firm that specializes in location of underground utilities. It includes definitions of the techniques employed by these firms, sample requests for proposals, engineering agreements, selection criteria, and information about typical costs and savings.

New tapes in video library

Setting Speed Limits, Vermont Local Roads (#17786, 10 min.) Discusses the need for completing a traffic engineering study before setting speed limits. Includes six important factors to investigate.

Summer Roads Maintenance series, Ontario Ministry of Transportation:

Hard Top Roads, (#17792, 37 min.) Describes various hard top surfaces, types of pavement failure, and some appropriate repairs, including materials and proper techniques.

Roadside Drainage (Rural), (#17793, 53 min.) Discussion of roadside drainage fundamentals: basic theory and legislation, system monitoring, regulations.

Roadside Maintenance, (#17794, 37 min.) Good ideas on developing effective maintenance patrol operations. Also presents information on proper road signs, guard rails and barriers, and shoulder maintenance.

Loose Top Roads, (#17795, 37 min.) A complete guide to maintaining gravel roads, including: how to select the right material, types of surface failures, appropriate remedial action, types of equipment to use, and tips for getting maximum benefit.

Clarifications

CDL for grader operators?

In answer to a question that came up at our Winter Maintenance workshops, State Patrol Lt. Lyle Walheim says: "We're not sure at the moment." Up to this point the federal interpretations have indicated that a Commercial Driver's License (CDL) is not required for grader operators operating on public roadways. However, Walheim received a new interpretation in January which indicates that the CDL is required. He's checking further before imple-

menting this change. Tune in to the next **Crossroads** for the latest information.

Municipalities exempt from most CMV requirements

The federal government has applied a number of requirements to commercial motor vehicles (CMV) in Section 396.25 of the Code of Federal Regulations (CFR). These include brake servicing, brake inspection, and pre-trip and post-trip inspections. Federal, state and municipally owned and operated

motor vehicles are specifically exempted from all CFR 396.25 requirements except those regarding the CDL and alcohol use. However, Lt. Walheim reminds us, private contractors hired by a municipality for snow and ice control and other work **ARE** required to comply with **ALL** parts of CFR 396.

"Pre and post-trip inspections and many of the other requirements are good ideas and worth adopting," says Walheim, "but they are not mandatory."

Training helps supervisors

"Many people are promoted into positions as first-line supervisors because they have technical knowledge, they get along well with people, and they show up for work every day," says Robert Priester, an instructor with the Madison Area Technical College's Supervisors Management Program. "All of a sudden they are responsible for other people's productivity, and that's a challenge."

Most new supervisors who have no training make three common errors, Priester says:

- They're too autocratic. Without knowing how to assess other workers' styles, new supervisors often try to control them too closely. "Instead of improving productivity, this approach gets in the way," says Priester. Training helps in understanding about styles of supervision and of working.
- They don't know what a manager is supposed to do. "Workers see a manager staring into space, and they think she or he is goofing off," says Priester. "What they're probably doing is thinking and planning." Planning, organizing, and facilitating worker involvement in planning are important skills that managers need to learn.
- They don't understand the impact of what they do on the people they supervise. Very commonly the same person who complained about supervisors not listening, being insensitive to the worker's situation, and never giving praise or credit, will be guilty of that behavior when they're promoted to supervisor. "A supervisor needs a good understanding of the work requirements," says Priester, "and of how to provide training, tools, and accountability for getting it done."

Vocational Technical campuses across the state offer a variety of supervisory management training courses, usually in the evenings, to help new, first-line supervisors. Class

participants generally have work experience and most are currently employed. The courses are designed to be immediately applicable in daily supervisory situations.

Twenty-six courses are offered. You can take individual classes to meet a specific need or accumulate them for an Associate Degree. Courses can also be offered at a work site through special arrangements with the school.

CPM program for middle and senior managers

UW-Madison's Governmental Affairs Unit offers the Certified Public Manager program—a nationally accredited program that provides training in planning, supervision, problem analysis, public policy, quality improvement, and other management topics for people with several years' experience. "The people who come to our programs are mid-career, mid-level managers with strong experience and educational backgrounds," says Susan Paddock, CPM Program Director. "They bring their management problems to the classroom and that becomes part of the course content." Managers need not be officially enrolled in the degree program to take individual classes as they need them, Paddock says.

One-day CPM courses are offered around the state and throughout the year. Some of this spring's offerings include: **Problem Analysis and Problem Solving**, Apr 10–Madison, Apr 17–Menasha; **Productivity and Quality Improvement**, Apr 17–Wausau, Apr 18–Menasha, May 13–Madison; **Working with Councils, Boards and Commissions**, May 3–Madison; **Reengineering Your Organization**, May 18–Eau Claire; **Organizational Performance Measurement**, May 22 –Madison; **External Relations**, May 22–Menasha; **Supervising Supervisors**, Jun 4–Wausau.

For information on first-line supervisor training, call your nearest VTAE campus. For information on CPM courses, call the CPM Program Office at 608/262-3830.

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:

Crossroads
Transportation Information Center
University of Wisconsin–Madison FAX 608/263-3160
432 North Lake Street
Madison, WI 53706

- Please put me on your **Crossroads** mailing list.
- My idea, comment or question is _____

Please send me information on _____

Name _____

Title/Agency _____

Address _____

City _____ State _____

Zip _____ Phone () _____

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

Kenosha expects savings with Roadware

For many years, the City of Kenosha has used a paper-based pavement management system for its nearly 300 miles of urban streets.

"We just have a huge amount of paper," says Alan Zumwalt, Kenosha's director of engineering. "In the past someone worked all winter long to update the old paper system, and it was very cumbersome to use."

This winter Kenosha Civil Engineer Charlie Hassel is spending his time entering pavement data into the newest version of Roadware, the T.I.C./WisDOT pavement management software program. With the street system divided up into nearly 6000 one-block segments, it's a big job, but no bigger than with the old paper system. The amount of data also put a strain on the older version of Roadware, so T.I.C. has created a new version that handles big files better. (See next story.)

"We figured we could use the same amount of time as usual to get Roadware going, and then next year's inventory update should take one-tenth the time," says Zumwalt. "Using Roadware's budget projections for our reconstruction and maintenance plans will help us spend our money as smart as we can spend it."

Zumwalt expects the system to help him get a handle on which streets can benefit from maintenance, and which should be let go and placed on the reconstruction plan.

Roadware Version 5.1.2 patch

All current users of Roadware should have received an updated version of Roadware 5.01 on a single disc labeled Roadware 5.1.2 Patch Disc 1. If you did not get that disc and have Roadware 5.01, we are missing you from our users data base. To request your update and to insure you get future updates, call 800/442-4615.

While there have been a number of small improvements in help messages and screen formats in this update, the three most important new features in Version 5.1.2 are listed below. All of these were suggested by users to improve the use of Roadware . If you experience problems or have any suggestions, call Randy Reinbrandt at 608/246-5454 or Steve Pudloski at 608/262-8707.

- Automatic re-indexing of the history records. This corrects a problem users found when they tried to recover new history files that they just entered.
- Addition of a complete description of each road segment on the history file printout.
- Separate Utilities Menu Items titled "SAVE Data" and "INSTALL Data" were added to clarify and simplify the way users can make backup copies of their data. The old version had both "Install" and "Save" in the same menu item. Some users reported that the instructions and menu questions were confusing. The new SAVE Data menu instructions should solve that problem.

Address incorrect?
Please call or write us with
the correct information

Route To

Do not use for return mail

Nonprofit Organization	
U.S. Postage	
PAID	
Madison, Wisconsin	
Permit No. 658	



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Crossroads is produced with assistance from the Federal Highway Administration, the Wisconsin Department of Transportation and UW-Extension

