Technology News

Roads Bridges Transit

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Elderly mobility an issue for engineers

By Larry Mendenhall
Editor, *Technology News*

County engineers were told that improvements made to benefit elderly drivers benefited all drivers as well at the 45th Iowa County Engineer's Conference held December 3-5 in Ames.

The impact of a growing number of elderly drivers and their problems were one of several concurrent sessions held at this year's conference. Roundtable discussions were also held on various topics. Ken Jensen, regional administrator for the FHWA, gave a keynote speech on new transportation legislation.

Hal Lunenfeld, a engineer psychologist at the FHWA, said one reason people are driving longer is because of modern technology. Today, drivers can operate their vehicles longer because of power steering, power brakes and automatic transmissions.

"Before these innovations, it was very hard, if not impossible, for elderly people to operate their vehicles," Lunenfeld said.

Lunenfeld said elderly drivers should be a concern for county engineers because Iowa ranks closely behind Florida in the number of elderly drivers. Fifteen percent of Iowa drivers are over 65 years old. In Iowa's rural counties, people over 65 comprise 16 percent of the drivers. Lunenfeld defined older drivers as those 65 or over, but said driving skills actually begin to deteriorate around 55.

County engineers browse through manufacturer's exhibits at the 45th Iowa County Engineer's Conference held at Iowa State University.

"It's about that age when health begins to deteriorate so that more medications are needed," Lunenfeld said. "Vision is also less acute, motor skills require more response time, and cognitive skills — especially with complex tasks like driving — are also declining."

Because of vision deterioration, elderly drivers find intersections and yield situations particularly difficult. This is especially true if the elderly driver is not familiar with the location. But there are a number of things that can be done to help elderly people drive safely, according to Lunenfeld. They

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Inside pages

Isolated traffic signals studied

The Iowa Motor Vehicle Fuel Reduction program was initiated in 1988 to demonstrate that modern traffic signal equipment could reduce energy consumption by installing arterial coordination systems, implementing actuation at isolated signals, and retiming existing signals and signal systems.

Part of the program involved upgrading signals. Some signals were upgraded from pretimed control to fully or semi-actuated and 25 signals at isolated intersections were upgraded to fully-actuated from semi-actuated. These improvements were made in Algona, Bettendorf, Des Moines, and Monticello. In 14 of the 25 installations, increases in either or both the number of stops or delay time were found. Overall, upgrading to actuated signals increased energy consumption. This perplexing result was the subject of later research by Mohammad Elahi, a transportation specialist with the Iowa Transportation Center.

At an actuated controlled intersection, the signal indications are adjusted in response to detectors which sense when a vehicle enters the intersection approach (calls). When intersection volume is low, actuation minimizes the delay experienced by any one driver. In other words, the purpose of the actuation is not necessarily to minimize the total number of vehicles stopped or the average delay. Actuation will adjust the timing so that when a car is stopped on an approach, it will be given a green indication as soon as practical.

When intersections experience a high volume of traffic (approaching saturation), calls from the approaches will request the signal to provide its maximum length of green. At high volumes, therefore, an actuated traffic signal operates much as a pre-timed controller, allowing the maximum time at every phase (indication).

To better understand the increase in fuel consumption that resulted from actuation, Elahi decided to run experiments using a computer simulation model, Network Simulation (NETSIM). NETSIM can simulate different traffic control strategies and estimate fuel consumption. The model is then used to analyze a number of traffic volume levels, cycle lengths, and left turn volumes under actuated and pretimed control. An analysis of upgrading to actuated control on energy consumption can then be made.

Elahi used a prototypical four-leg, two-way, two-lane approach intersection in his analysis. No left turn bays were present at the intersection. The signal operated in a simple two-phase operation, meaning that left-turns were permitted during the through movement.

Simulation runs were repeated with different left turn and total approach volume ratios at 10 percent of the approach volume turning left, 20 percent, and 30 percent. Intersection volumes were varied from 200 vehicles per hour to 4,500 vehicles per hour. Cycle lengths for the pretimed control were varied from 20 seconds to 140 seconds at 10 second intervals. Some of the results are plotted in Figure 1.

The points plotted represent the average gallons of fuel consumed by vehicles passing through the intersection at increasing volumes. The top and bottom curves are estimated fuel consumption under two different pretimed strategies. The bottom curve defines the fuel consumption per vehicle at the most efficient pretimed cycle length. The top curve represents the fuel consumption per vehicle for the most inefficient cycle length. The curve that is generally in the middle is the fuel consumption under actuated control.

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The opinions, findings, or recommendations expressed here are those of the Iowa Transportation Center and do not necessarily reflect the views of the Federal Highway Administration or the Iowa Department of Transportation.

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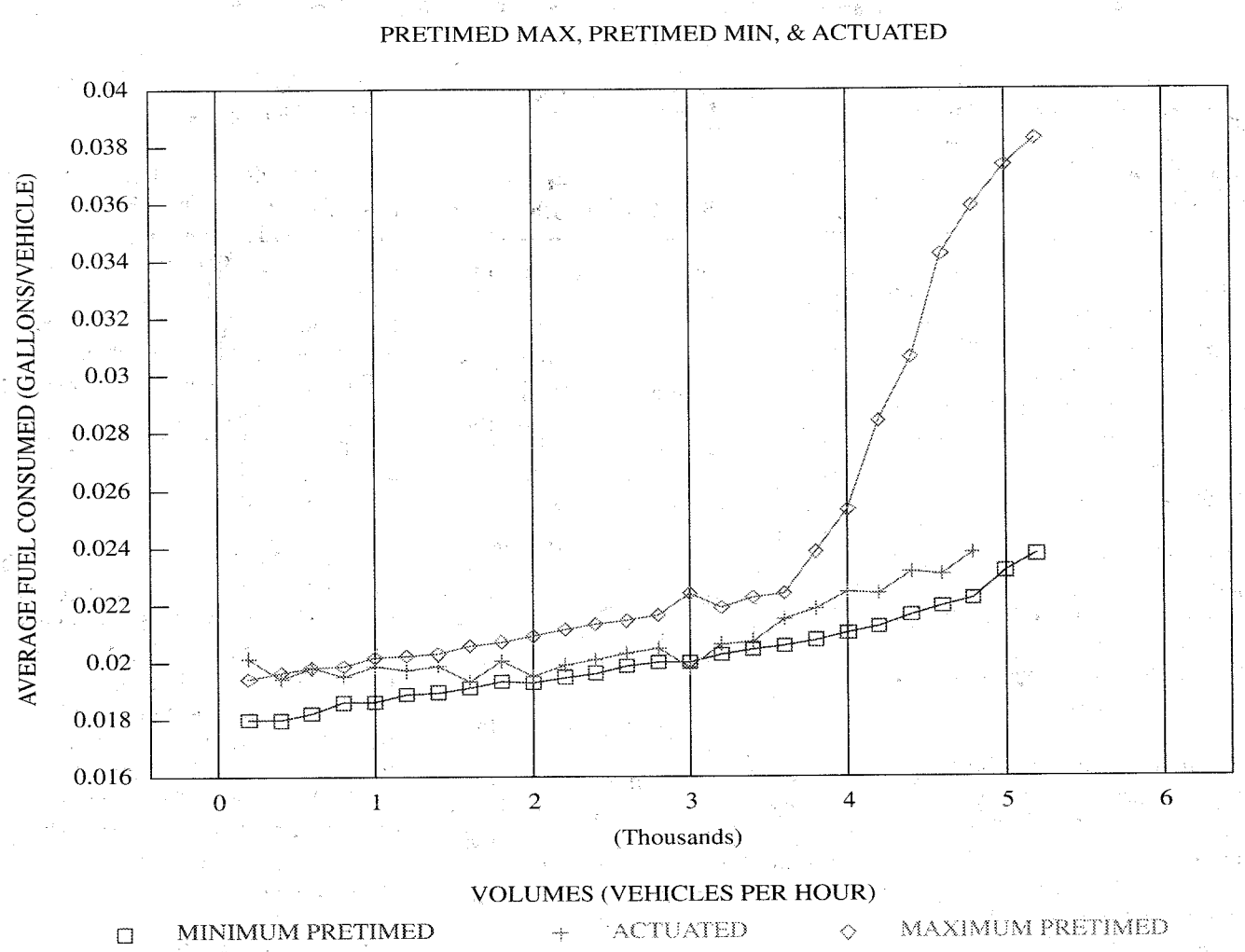
Fig. 1 — Average fuel consumption vs. volumes



From this analysis, Elahi identifies four distinct zones:

- For volumes less than 400 vehicles per hour, actuation will actually increase fuel consumption regardless of the cycle length used.
- For volumes between 400 and 1,000 vehicles per hour, actuation results in fuel consumption levels that are almost as inefficient as the most inefficient pretimed control.
- For volumes between 1,000 and 3,500 vehicles per hour, actuated control closely emulates the most efficient pretimed settings. But any fuel efficiency that may be gained through pretiming signals is probably negated by those signals' inability to adapt to varying traffic flows.
- For volumes above 3,500 vehicles per hour, pretime is more efficient.

Elahi's analysis examines only a simple intersection with two-phase control. Also, his recommendations are based on selecting intersection control that minimizes fuel consumption. Clearly, an analysis investigating more complicated intersection geometry and more sophisticated phasing would result in different findings regarding specific volume level where one control is more efficient than another. It is, however, likely that under different intersection geometry and more complicated phasing that actuated control would not be the most energy efficient strategy at some traffic volumes.

In summary, it is not clear that actuation will result in more energy efficient operation at isolated signalized intersections. From an energy standpoint, Elahi's analysis and the result of the Iowa Motor Vehicle Fuel Reduction Program indicate that upgrading from pretime to actuated control may actually increase fuel consumption.

Hard disks need maintenance

Microtechnology

By Larry Mendenhall
Editor, *Technology News*

Hard drive reliability has increased to the point where it is easy to take that reliability for granted. Yet, hard drives are like any other piece of equipment; they need regular maintenance to perform properly.

Just a few years ago, the worst computer owner's nightmare was a hard disk crash. A hard disk crash occurred when the drive's read-write heads physically crashed on the platter that contained data. This not only physically damaged the drive's components it also destroyed data.

Improved manufacturing make head crashes rare, although they can still occur if the computer is dropped. But while hard drives may be more robust mechanically, everyday use can impair their performance.

Three major computer problems resulting from simple everyday use are (1) accumulation of files; (2) lost disk clusters; and (3) fragmented files. These problems waste hard disk space and slow down the hard drive's performance. Since a computer is supposed to increase an individual's productivity, slowing the computer's operation is potentially decreasing productivity. None of these problems are disasters and are easy to fix once they occur. Preventing these problems, however, is the best plan.

Files saved on a hard disk can accumulate rapidly. Even an 80-megabyte hard drive can be filled to the last meg in a surprisingly short time. Many files on a hard drive, however, have been saved for months and are no longer needed. These old files need to be erased from the hard disk on a regular basis. It's not uncommon to clear up to five megabytes of hard disk space after the first "purging."

The first files to purge are old ones that contain outdated information, letters already mailed, and reports that have been submitted. Are there several draft versions of a current report? The earlier versions are probably taking up unnecessary disk space and should be erased. If there's a small chance that a file may be needed, it can be copied and stored on a floppy disk.

The second place to look is in application files. Some programs, like WordPerfect, automatically back up any file that is currently opened. Any file with the extension .BAK or .TMP is a candidate for erasing. These files, usually around 2K in size, can add up to a sizeable chunk of space if they're allowed to accumulate over several months. Graphic applications, and even some word processing programs, contain clip art. Once again, use floppy disks as storage for graphic files that aren't used extensively. Graphic files are an exceptionally good place to find hard disk space as they usually use more space than text files.

Using an application's install program (if it has one) is another good way to save space. These programs often examine a computer's configuration and install just the files needed for the application to work properly. Simply copying all the application's files from floppies to the hard disk almost guarantees that some unneeded files will be taking up hard disk space.

Each computer user should devise a priority system for files. Files, for example, could be prioritized as permanent and essential, current work, ready reference, long-term storage, and junk. Sorting through files with this list or a similar one will help the computer user decide which files are really necessary and which aren't. The junk category can be considered a catch-all for files that may fall between the cracks.

The second computer problem is lost disk clusters. This problem usually occurs when something prevents the computer from properly closing files. This could happen when the computer user is writing a report and the power fails. When the computer boots up again, the file could be stored on the hard disk, but the code necessary for the computer to find it may not have been recorded when the power went out.

These lost clusters may be found by running the CHKDSK command from the DOS prompt. When told to turn the lost clusters into files, CHKDSK will store them in the root directory with a name like FILE0001.CHK, FILE0002.CHK, and so on. These files are text files which may be possible to recover.

The third problem is fragmented files. Files are fragmented when they are too large to be stored in a single sector on the hard disk. Each sector contains 512K. If a file is larger than that, it must be stored in a separate sector. If there is enough room, or if the hard drive has just been formatted, the file is written on sequential sectors as long as those sectors are empty. After a few months of use,

however, the number of empty sequential sectors dwindles. That forces the computer to store the file on sectors scattered throughout the disk.

The only problem is that after eadditional use, the computer has to send the read/write heads to several locations on the disk to retrieve the file. This slows down the computer's operation and wears out the read/write heads more quickly.

There are two ways to defragment a hard drive or floppy disk. One is to purchase a commercial utility program that includes a defragmenting program. These programs rearrange data stored on the disk so that sectors containing information from a particular file are sequential. The second way is to make a complete back up of your hard disk and reformat it. Files containing applications and data will be written sequentially when they are copied back to hard disk.

It is critical, however, that a back up be made before reformatting the hard drive. Reformatting basically erases ALL information from the disk.

While these problems are usually not serious, they can significantly slow down operation of a computer. Computer users — especially those who use computers during most of the working day — should try to establish a maintenance schedule that checks for outdated files, lost disk clusters, and fragmented files.

NACE software program

The National Association of County Engineers has a program to match counties looking for software with counties having software experience in the desired area.

Areas in which NACE has counties willing to share expertise with other members include: computer-aided design, communications, cost accounting, database management, fleet management, fuel records, highway inventory, hydraulics, a library system, pavement management, permit tacking system, project management, road design, sign inventory, surveying, traffic and speed zone, and work processing.

NACE members interested in the program can contact the Douglas County Highway Department PO Box 398, Alexandria, MN 56308 612/763-6001.

If your county would like to join as an associate member and become eligible to take part in this program (associate membership is $70 per year), contact Ed Wiles, Executive Director, NACE, 440 1st. NW, Washington DC 20001; 202/393-5041; Fax 202/393-2630.

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include improved signage in the form of advance warnings, clearer directions, overhead signs, better reflectivity, and protected turn lanes. Street and road designers can also help by providing good sight distance, good markings, and wider edge markings. New technology such as intelligent vehicle highway systems and night vision technology may also help the elderly driver.

But these improvements benefit other drivers as well. Lunenfeld suggested that this be a "selling point" that engineers could use to help fund improvements.

Risk management and loss prevention were discussed in a separate session. Michael Wieck, risk manager for Polk County, discussed five techniques for risk control that — along with other techniques — helped reduced lost work days from 565 to 240 within a year.

Wieck listed these techniques as exposure avoidance, loss prevention, segregation of loss exposure, and contractual transfer of risk. Segregating loss exposure means separating activities so that a loss in one area doesn't affect all other areas. Duplicating equipment in some instances also segregates loss exposure. Risk can be transferred by contract; leasing equipment instead of owning it.

Preventive maintenance is another excellent way to reduce losses, according to Wieck.

"Preventive maintenance is making sure everything is in working order," he said. "For instance, take buildings. When was the last time you inspected your buildings? Look for frayed cords. Are all the fire extinguishers charged?"

Wieck also recommended checking to make sure all employees who drive county vehicles have valid driver's licenses and the right type of license. This is particularly true for employees who must have a CDL license by April

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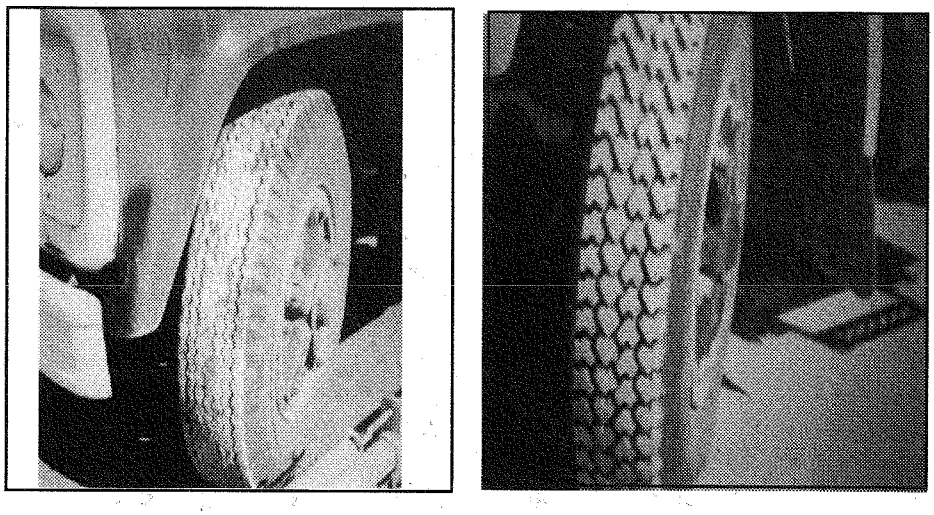
Tips From The Field

Better treads keep trucks rolling

Ice- and snow-covered roads are dangerous even for snow removal equipment, but control and safety can be improved by tires with treads more suitable for slick driving.

The photo at on the left shows the most common tire tread as used in public works departments today. But after a lot of frustration on cul-de-sacs and hills, the Clive Public Works Department decided to switch to the type of tread shown in the far right photo and found it helps to improve vehicle control.



Tire tread types make a difference on icy roads.

For more information contact Willard Wray, City of Clive Public Works Director, 8505 Harbach Blvd., Clive, Iowa, 50053, 515/223-6230.

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of 1992. He also recommended that each county have a safety policy and establish a procedure so that employees will know what to do when an accident happens.

Loss prevention also includes safety for employees. Two county engineers, Don Linnan from Buena Vista county and Bob DeWys From Scott County, gave examples of their counties' safety policies. Linnan said that employees have to be convinced that their supervisors have their safety in mind and suggested working out a reward system.

DeWys said Scott County has an overall safety policy and that the secondary road department has one designed with that department specifically in mind. The secondary road department's policy states the department's responsibility and the responsibility of everyone in the department for safety. In addition, a safety handbook is given to every employee each year and employees also complete a defensive driving program.

To make the program work, DeWys said employee training was critical and that the policy statement should prioritize what the department does and why.

Also covered in a short session was the county engineer's electronic bulletin board service (BBS). Chair of the Iowa State Association of County Engineer's computer committee, Steve DeVries of Jackson County, said he expected the bulletin board system to be open for general use by the summer of 1992.

"The purpose is to better serve engineers' needs and improve computer use for engineering as well as office work," DeVries said.

County offices will have to provide a computer, a modem, and communication software to make use of the BBS. It will contain a variety of information such as: news bulletins, passive electronic mail, AutoCad files, spreadsheet templates, database source information, an equipment specifications library, a calendar of events, legislative information, problems and solutions, inter-county want ads for equipment, sample document files containing IDOT forms, and regulatory information.

For More Information

The videotapes and publications listed in this column are available on a loan basis by contacting John H. Moody, Iowa State University, Iowa Transportation Center, 194 Town Engineering, Ames, Iowa 50011 or by calling 515/294-5642 Monday, Wednesday, and Friday mornings.

Drainage of Highway Pavements - Circular 12 — This 136-page document contains tables and sample problems involving the effects of roadway geometry on pavement drainage. Other topics related to highway drainage are included. **Request #10**

Guide to Small Scale Pavement Maintenance — This 41-page booklet makes comparisons between various highway and street maintenance methods. Specific topics include reflection cracks, manhole height adjustment, lane tapering, and wedge cuts. **Request #12**

Iowa Signals Go — Iowa Fuel Reduction Program — This manual explains in detail an Iowa program to study the effect of signal timings on fuel efficiency. The study was paid for with oil overcharge funds and involved 18 test cities in Iowa. Copies may be kept. **Request #630**

Bus Fleet Management Techniques Guide — This guide, prepared by the Oklahoma Highway and Transportation Engineering Center, contains easy-to-follow examples of transit system maintenance records. Nineteen worksheets are included and some chapters have study questions to further explain the methodologies involved. Copies may be kept. **Request #631**

Hydrology — This manual provides practical hydrologic methods and techniques for the analysis and design of highway drainage structures. It should be of interest to hydraulic bridge and highway design engineers. Request #31

Tips From the Field #1 — This 13-page manual describes and illustrates 13 innovative ideas on equipment and procedures used in carrying out various maintenance or improvement projects associated with roads and streets. Published by the Iowa Transportation Center. **Request #17**

Quality Assurance for Local Governments — This 61-page manual published by the U.S. DOT explains the issues related to a quality assurance program. **Request #18**

The New Jersey Breakaway Sign Support System — This videotape from the New Jersey Department of Transportation demonstrates how to assemble the sign support system it developed. **Running time 11:30; Request #243V and publication #767**

Can a PC Help You? — This videotape illustrates how a personal computer can be used in a public works office and how to select appropriate software. It is a four-part film. **Running time 30:00; Request #244V**

E-Z on Front End Loader Attachment This is a promotional videotape to illustrate the use of a relatively simple unit for adapting a straight or V-type snowplow blade to a front end loader. **Running time 5:00; Request #150V**

Publication order form

To obtain the materials listed from the ITC, return this form to the Iowa Transportation Center, Iowa State University, Extension to Communities, 194 Town Engineering, Ames, IA, 50011.

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___**Please send a complete listing of all publications from your office.**

___**Please send a complete listing of all audio visual materials available.**

Conference Calendar

Aggregates in Transportation January 9, Iowa State University Engineers, contractors, and aggregate producers will learn ways to understand the problems each faces in providing a quality product for public transportation. Contact Connie Middleton 515/294-5961.

Transportation Research Board Annual Meeting January 12-16, Washington, D.C.

Asphalt Paving Conference January 28, Iowa State University This conference is designed to inform the construction and design elements of the highway industry of the innovations in the design, construction, and operation of asphalt highway and runway surfaces. Presentations include subjects of quality control, mix design, equipment specifications, construction procedures, and maintenance techniques. Contact Connie Middleton 515/294-5961.

IDOT Traffic Control January 28 - Storm Lake; January 29 - Fort Dodge; January 30 - Waterloo; February 18 - Davenport; February 19 - Cedar Rapids; February 20 - Ottumwa Contact Joyce Emery 515/

Professional Flagging January 29 - Fort Dodge; February 19 - Cedar Rapids This workshop will be held in conjunction with the Iowa Department of Transportation's "Traffic Control in Construction, Maintenance, and Utility Zone" conferences. Both programs are designed for all utility, city, county, road and street maintenance workers. Contact Ed Bigelow 515/294-6384.

National Association of County Engineer's Annual Meeting February 9 -13, Frankenmuth, MI Contact NACE

Iowa Concrete Paving Association February 26-29, Des Moines 515/278-0606

Iowa Bridge Inspectors Course March 2-27, Iowa State University Contact Janet Gardner 515/294-5366.

APWA Iowa Chapter, Public Works Conference, March 5-6, Iowa State University Contact Connie Middleton 515/294-5961.

ASCE Low Volume Roads and Streets Workshop, March 2-4, Arlington, TX This work will allow participants the opportunity to meet and discuss low volume safety, design, maintenance, and construction issues. Contact Eugene Wilson 307/766-3202.

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