IOWA DEPARTMENT OF TRANSPORTATION
RESEARCH news
Iowa Department of Transportation
BUREAU OF RESEARCH AND TECHNOLOGY ◆ Summer 2005

tripGuide™

State-of-the-art ITS for Des Moines

In January 2005, Iowa was presented with the state of the art in ITS applications in tripGuide, a new online travel information guide for the Des Moines area.

The impetus for tripGuide was reconstruction of I-235 through Des Moines. Iowa DOT leaders recognized the need to develop a traffic management system that would help manage traffic flows to reduce congestion and increase safety during the course of the project. Early phases of the reconstruction, such as bridge replacements, have been underway since 2002. Reconstruction of most mainline pavement and bridges will continue in 2005 through 2007.

TripGuide is based on the CARS/511 travel information system used by several states. The system uses complex technology, including 68 pole-mounted traffic sensors and 44 closed-circuit video cameras at locations on 62 miles of highways in and around Des Moines, including I-235, I-35/80, U.S. 65/69 and Iowa 5. The wireless, side-firing radar sensors measure vehicle presence, volume, occupancy, and speed in up to eight lanes of traffic, and transmit the data to a central computer system. The cameras, with pan, tilt and zoom action, have been placed to monitor traffic throughout the area. The video network uses a combination of wireless and fiber optic transmission at a rate of 20 to 30 frames per second.

The system allows traffic managers to keep an eye on the road system and quickly notify motorists of situations they might encounter. Cameras and sensors feed information to the project office in Des Moines where traffic is monitored and the CARS/511 system. As sensors detect slow or backed-up traffic, an alert is communicated to the TMC staff telling them to monitor the camera feed for incidents such as crashes or vehicle breakdowns.

Pole-mounted camera on I-235 in Des Moines

When incidents are verified, Iowa DOT staff can dispatch Highway Helpers, alert appropriate emergency personnel, display warning messages on a network of 28 dynamic-message signs to inform drivers of delays and notify news media, as needed. In May 2005, a travel information radio broadcast station (highway advisory radio) was also linked to the system so motorists can get updated information via AM radio 1670.

By clicking the tripGuide icon on internet sites www.511ia.org or www.i235.com, the public can view a dynamic, color-coded traffic flow map and camera images, which are refreshed every 60 seconds. Direct connection to camera video is available to cities, counties, 911 call centers, and media outlets.

Traffic and incident management planning involved three teams: DOT personnel, traffic management and incident response. Design and installation of the system has been a collaborative effort between several Iowa DOT offices, including Systems Planning, Transportation Data, Purchasing, Research and Technology Bureau, Des Moines Construction Residency, and District 1 Construction; as well as Polk County; the cities of Des Moines, West Des Moines, Clive, Urbandale, Windsor Heights, and Ankeny; and the Des Moines Area Metropolitan Planning Agency.

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Tire Buffings Fill a New Expansion Joint

The cooperative efforts of District Bridge Maintenance Crew leaders, the Office of Bridges and Structures and the Office of Materials resulted in a new, lower cost and more effective method of filling bridge expansion joints.

A bridge of moderate length can expand several inches from winter to summer. In the past, expansion joints filled with blocks of plastic foam and topped with a sealant were used to avoid damage to the bridge and approach pavement as temperatures changed. Unfortunately, within a few years the sealant in a typical joint wears away and the blocks of foam often disengage from anchors and float out, creating problems for motorists. Replaced blocks often stay in only one year.

District 6 Bridge Crew leader Mark Carter suggested replacing the foam blocks with tire buffings, a byproduct of the tire retread industry. They don't deteriorate over time and are heavier than water, so they can't float out of a repaired joint. Any buffings that did leave the joint would not be obstacles on the roadway.

The idea seemed good, but needed testing. Bob Steffes of the Office of Materials, now retired, developed the testing program since there are no standards specifically for tire buffings. Steffes examined the buffings, sieved the particles for size and distribution, performed compression tests to determine the compression and recovery characteristics of the buffings, and constructed sample joints with several types of sealants.

In the compression and recovery test, one combination of buffings and sealant performed better than the others and virtually at the same performance level as the foam. Cost estimates indicated that construction costs for a tire buffings joint are less than half the costs for a foam joint. Details of the testing program are published in the October 2001 Final Report MLR-01-1 "Rubber Buffings for Bridge Approach Expansion Joints." (Available online at www.dot.state.ia.us/materials/research/reports/reports_pdf/mlr/reports/mlr0101.pdf.)

The use of tire buffings was successful enough in expansion joints that the same idea was soon applied to pavement relief joints at the far end of each approach pavement and is now the repair method used.

1. Removing the old foam

2. Filling with tire buffings (crumb rubber)

3. Adding sealant

4. Finished joint

Human Factors Focus

Iowa's first Human Factors Focus Group was held June 1, 2005, at the University of Iowa Memorial Union in Iowa City. Eighty participants from many different organizations came together to share ideas about Human Factors (HF) research needs and influence the direction of HF research in Iowa.

Human error is a leading factor in crashes, whether by automobile, plane, train or bicycle. Human factors research seeks to understand and explain the behavior of drivers and to determine the differences in driver capabilities, perceptions and responses to elements of vehicle, highway and environmental design.

The participants broke into subgroups around a variety of topics, including needs of older and young drivers, multi-tasking and distractions, judgment and decision-making, and intelligent vehicle interactions. Each subgroup identified several possible research topics and reported them back to the full assembly, where preference was indicated by multi-voting.

The top two selections among the 20 ideas presented were: 1. To develop a manual for Driver Education and parental involvement; and 2. To develop a process for analyzing and correcting locations that meet engineering standards, but don't function well due to human factors.

Two speakers were also featured. Matt Sundeen of the National Conference of State Legislatures spoke about the effects of cell phones and other driver distractions. Greg Davis of FHWA's Turner-Fairbank Highway Research Center discussed the Coordinated Intersection Crash Avoidance System (CICAS) currently being developed.

A report on the meeting, with information about all topics discussed, is being written and will be distributed to all participants.

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