IOWA DEPARTMENT OF TRANSPORTATION
RESEARCH news
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Utility Cut Repair Research Continues

Poor performance of pavements over utility trenches on local and state road systems often causes unnecessary maintenance problems due to improper backfill material and/or its properties, and construction procedures. Pavement settlement occurring in and around utility cuts is a common problem, resulting in uneven pavement surfaces, annoyance to drivers and, ultimately, further maintenance. The expense and inconvenience of repairing pavements as a result of poorly performing utility cut restoration can be reduced with an understanding of proper material selection and construction practices.

Phase I of utility cut repair research, funded through the Iowa Highway Research Board (IHRB), consisted of both a survey of municipal authorities and field and laboratory investigations to identify factors contributing to the settlement of utility cut restorations in pavement sections. Responses received from seven cities across Iowa indicated that utility cut restorations often last less than two years. Observations made during site inspections showed that backfill material varies from one city to another, backfill-lift thickness often exceeds 12 inches and backfill material is often placed at bulking moisture contents with no quality control/quality assurance.

Concrete pavement cut being made

Laboratory investigation of backfill materials showed that at the field moisture contents encountered, backfill materials have collapse potentials of up to 35 percent. Falling weight deflectometer (FWD) deflection and elevation data indicate the maximum deflection in the pavement occurs in the area around the utility cut restoration. The FWD data indicates a zone of influence around the perimeter of the restoration extending 2 to 3 feet beyond the trench perimeter.

During Phase I, the research team analyzed moisture control using 65 percent relative density in a granular fill. The team also removed and compacted the native material near the ground surface around the trench. Test sections with geogrid reinforcement were also incorporated.

Recommendations presented to the IHRB from Phase I findings included monitoring constructed utility cuts for two more years, constructing new trenches using three methods (report TR-503 is online at www.operationsresearch.dot.state.ia.us/reports/reports.html), and instrumenting utility trenches to further understand the mechanisms of trench backfill settlement and load distribution.

Phase II activities will investigate improving utility cut construction practices through continued monitoring of restored cuts, and increasing understanding of trench settlement and load transfer. The instrumentation of utility trenches will be studied with the goal of increasing the pavement patch life and reducing the maintenance of the repaired areas. Field tests (nuclear gauge, dynamic cone penetrometer, clegg hammer, geogauge, and FWD) and laboratory tests (gradation, specific gravity, relative density, standard proctor, and granular material collapse) will be incorporated into the results and recommendations.

Utility cut, *continued on back*

Pavement removal

Calibrating Vital Reflections

By Carol Culver

In the spring of 2004, the Iowa DOT purchased three new handheld reflectivity machines, bringing the total owned by the Iowa DOT at that time to six (one per district). Each unit has the ability to record reflectivity readings by GPS latitude and longitude, with route and milepost information recorded by default.

In 2003, District 1 began using a unit as part of its paint operations. The unit was positioned approximately two miles behind the paint truck at a point where the paint was dry to the touch. At these points, an initial reflectivity reading was recorded and relayed to the paint truck operator to make any necessary adjustments.

This constant calibration process became an invaluable tool in maintaining consistency in dealing with weather and road surface changes. In fact, in 2004, District 1 employees found that after exhausting all of their expertise in adjusting truck speed, paint and bead rates, they were still not able to meet their initial reflectivity goal. In using the portable retroreflectometer the problem became apparent. The beads being used lacked a coating required for application with waterborne paint. Without the reflectivity feedback, the crew may have used the defective beads all summer.

In the spring of 2005, the Iowa DOT purchased seven additional retroreflectometers, bringing the total to 13 (two in each district and one in the Office of Materials). The additional units placed in the districts are used in the inspection of contractor-applied paint and biannual evaluation of all traffic paint in the state. The data received from these biannual readings is instrumental in developing a traffic paint management program. This management program is used to monitor paint longevity and for developing an efficient statewide repainting schedule.

***Editor's Note**: Contributions to this article were made by Will Zitterich and Steven Brodie, Iowa DOT's Office of Maintenance.*

***Utility cut,** continued from front*

Large backfill lift being placed

The research will be conducted through a statewide collaborative effort including researchers from Iowa State University, the Center for Transportation Research and Education (CTRE); Statewide Urban Design and Specification (SUDAS) committees (including six district committees and Geotechnical Committees); and Iowa DOT's Materials and Construction offices.

Information gained through this research will be incorporated into a final report and technology transfer, with presentations made at local, regional and national conferences. Project results will also be published in professional journals. Phase II of the project should be completed by June 1, 2009.

***Editor's Note**: Information for this article was taken from the IHRB's research report TR-503, "Utility Cut Repair Techniques – Investigation of Improved Cut Repair Techniques to Reduce Settlement in Repaired Areas Phase I," and the IHRB's TR-566 Phase II proposal. For more information, contact Muhannad Suleiman, lecturer, Department of Civil, Construction and Environmental Engineering, Iowa State University, at 515-294-6076 or suleiman@iastate.edu.*

Research and Development Annual Report 2006 Online

The Iowa DOT Highway Division's Research and Technology Bureau has published its annual report titled, *Annual Report of Iowa Highway Research Board Research and Development Activities FY 2006*. The report is available online in PDF format at www.operationsresearch.dot.state.ia.us. In addition, detailed final reports and abstracts for completed projects are available on the Web site.

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