

MONTANA DEPARTMENT OF TRANSPORTATION
Helena, Montana 59620-1001

MEMORANDUM

To: Research Review Committee

From: Susan C. Sillick
Manager, Research Section

Date: January 10, 2002

Subject: Implementation of *Statewide Corrosivity Study on Corrugated Steel Culvert Pipe* Research Results

In January of 2000, The Montana Department of Transportation initiated a research study titled *Statewide Corrosivity Study on Corrugated Steel Culvert Pipe*. The driving force for this study was the premature failure of steel culvert pipe. The main purpose of this study was to investigate various soil corrosivity testing methods. A secondary purpose was to consider soil sampling procedures.

MDT's Technical Panel for this research project has approved the final report and has met to discuss implementation of research results.

Four soil resistivity test methods were compared: AASHTO T288, saturated paste, one part soil to one part water dilution (1:1), and a one part soil to two parts water dilution (1:2). MDT's current method is the 1:2 soil dilution method. This report suggests that MDT's current method is much less conservative than the other three methods. A more conservative method may prevent premature pipe failure. The AASHTO T288 is considered the most conservative method of the four methods that were investigated. Also, MDT's design method is more in line with this test procedure. However, this test method is extremely labor intensive. Given this, it is not feasible nor perhaps most cost-effective in terms of labor to implement this procedure at this time. The saturated paste method is, on average, more conservative than either the 1:1 or 1:2 dilution methods. However, a large standard error in the quality control checks resulted from this method. This suggests there may be some subjectivity in the test method. The 1:1 dilution had an acceptable standard error and is more conservative than the 1:2 dilution method. Therefore, as a first step toward decreasing the number of premature pipe failures, the Materials Bureau will begin using the 1:1 dilution test method. For a period of time, dual tests (1:1 and 1:2 dilution) will be run. Also, the Materials Bureau will ensure this testing procedure is added to MDT's Materials Manual so that there is no confusion as to which method MDT is using and which method consultants should use.

This report also establishes a framework and gives some guidelines for the development of improved sampling procedures. Conversely, this report does not address pipe policy issues. Therefore, it is the recommendation of this committee that a new committee be formed to develop improved sampling plans and review MDT's pipe

policy. It may be that further improvements on testing procedure can be made based on the decisions of this committee regarding soil sampling and pipe policy.

In addition, NCHRP Project 21-06, titled *Corrosion in the Soil Environment: Soil Resistivity and pH Measurements*, will address some of these same issues on a national level. The objectives of this research are: 1) to develop recommended test methods for practical laboratory and field measurements of soil resistivity and pH that yield more precise and accurate values than existing methods; and develop practical guidelines for the frequency, location, and interpretation of tests; 2) to develop correlation factors to compare the results of these recommended methods with the historical record of data obtained through previous methods; and 3) to use the recommended test methods, correlate soil resistivity and pH measurements with soil corrosivity, and validate the usefulness of measuring soil resistivity and pH when investigating soil corrosivity; and develop practical guidelines to assist transportation practitioners with predicting the rate of corrosion in buried structures. This project is scheduled to be completed in April 2004. The MDT will certainly want to review the results of this research for further refining MDT's test methods, sampling protocol, and pipe policy.

Finally, it is intended that as new information is obtained, soil testing and sampling procedures, as well as pipe policy will be adjusted as appropriate to yield the best results for the taxpayers of the State of Montana.

C: Technical Panel
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