Research Project

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Capsule

Technology Transfer Program

LTRC

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Traffic Detector-Loop Failure Study and Innovative Repair Techniques

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Problem

Inductive loops are widely used for traffic detection and control of semi-actuated and fully actuated traffic signals. Reliable detectors are critically important to maintaining smooth traffic flow in large metropolitan areas where traffic volumes are increasing annually and air pollution is becoming a major concern. When geometric, right-of-way, and fiscal consideration prohibit expansion of existing road networks, improved signal operations may be the only way to meet the transportation needs of expanding and developing locales; thus, reliable detectors may be the difference between an adequate transportation system, or no system at all.

In general, LADOTD has a significant problem with premature loop failure and has no procedure for conducting field repairs. This results in replacing, rather than repairing, failed loops. Alternative detection methods are available; however, technical uncertainty, the capital costs of new installations, and the need to train personnel and inventory new parts make changing to other methods impractical.

Loop failures cause inefficiencies in traffic flow and signal control. They result in unnecessary traffic delays, increased maintenance, increased air pollution, public dissatisfaction, and the possible breakdown of local traffic networks. This situation creates a need to determine how and why inductive detector loops fail and how to cost effectively repair, replace, or improve them.

Loop failure resulting in unnecessary traffic delays and increased maintenance greatly affects the public.

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Objectives

The objectives of this research are three-fold:

- Determine the typical modes of loop failure and their relative frequency. Determine the distribution of failure modes by location, construction, traffic, and related factors.
- Determine the specific mechanisms which cause these failures. Relate the causes to roadway types, traffic volumes, loop construction, etc.
- Following a study of the failure modes and causes, make recommendations for improved loop construction methods and design a method to cost-effectively repair failed loops. This will include laboratory and field tests.

Description

As a first step, an extensive literature search will be conducted, using the TRIS database, to determine the state of knowledge regarding detector-loop failures and repair methods. A field study will follow to determine the status of existing detector-loop installations. This study will be coordinated with LADOTD and include Baton Rouge, La., and the surrounding areas. The results of the study will include the number and types of loops in use, the characteristics (including location, material, construction, traffic volume, and maintenance) of failed and working detectors, and the modes of failure. The information collected during the literature and field studies will be analyzed to determine the specific mechanisms and causes of loop failure. Based on this analysis, an efficient, cost-effective repair method will be developed. The method chosen will be easily implemented with minimal personnel training or capital investment. The final stage of the research will involve the design, construction, and testing of equipment required for the proposed repair method. This will include laboratory tests and field demonstrations.

Implementation Potential

Information from this research project is expected to improve both contract and employee work on the installation and repair of loops. The improved installation and repair techniques will improve traffic flow at actuated signal installations, reduce motorist time delay, and result in a more responsive system operation.

The findings of this research can be implemented by LADOTD in its procedures for detector-loop installation and repair. The proposed repair method should reduce both the cost of loop repair and the lag time between a failure report and repair. It is anticipated that LADOTD specifications will be revised and standard details developed to reflect recommendations of this study.

The literature and field studies will improve the knowledge base of causes for traffic detector-loop failure. An understanding of how and why loops fail will lead to improved installation and repair. Currently a failed loop is replaced with a new loop installed in a new groove, at an approximate cost of $1000. Because of a limited number of cutters and trained personnel, the time lag between the report of a failed loop and its repair is substantial, causing a backlog of loop repairs and an unhappy public. This improved repair method will provide a reduction in the time between the reporting and repair of a failed detector-loop.

The results of this work will be presented at conferences and published in archival journals.