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HIGHWAY RESEARCH CIRCULAR

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COMMITTEE ACTIVITY

OPERATION AND MAINTENANCE OF TRANSPORTATION FACILITIES

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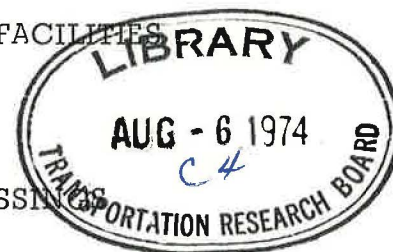
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SUMMARY OF RAILROAD-HIGHWAY GRADE CROSSING RESEARCH ACTIVITY

Introduction

This circular is the first in a proposed series to be published from time to time by TRB Committee A3A05, Highway-Railroad Grade Crossings. It is intended to provide public and private agencies, organizations, and individuals involved in grade crossing research or improvement programs with information - including annotated bibliographic entries - concerning research either under way or recently completed. Additional information may be obtained from Committee Chairman Robert C. Hunter, TRB Staff Representative K. B. Johns, or the agency reporting the research.

The circular can contain only information of which members of Committee A3A05 are aware and free to disseminate. At present this comprises primarily State and Federal activities. However, it is intended that future circulars also describe research - related activities of railroads, the railroad supply industry, universities, and relevant committees of other organizations concerned with grade crossings. Contributions regarding such research, as well as comments on the content of this circular, will be appreciated and will enhance the value of future issues. Such correspondence should be sent to K. B. Johns at TRB.

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Project Abstracts

Research Completed

Human Factors Countermeasures to Improve Highway-Railway Intersection Safety.

This study, which was conducted by Bio-Technology Inc. for the Federal Railroad Administration and the National Highway Traffic Safety Administration, included a review of railroad-highway accidents and an appraisal of inherent driver safety potential. A field study was conducted at nine grade crossings which included measuring the performance of drivers as they approached the grade crossing and administering a questionnaire to drivers regarding their knowledge and attitudes related to grade crossings. The final report was published in July 1973. It may be obtained from the National Technical Information Service (NTIS), Springfield, Virginia 22151, by requesting accession number PB 223416. The price is \$5.50.

Urban Railroad Relocation

The objectives of this study, conducted by Stanford Research Institute for the Federal Railroad Administration and the Federal Highway Administration, were (1) to identify the nature and magnitude of the urban railroad problem on a nationwide basis, and (2) to develop a cost-benefit methodology for evaluating individual railroad relocation studies. The basic study is essentially complete and reports are being prepared.

High-Speed Passenger-Service Rail Corridors

A brief report entitled "Grade Crossing Protection in High-Speed, High-Density, Passenger-Service Rail Corridors," prepared for FRA by the Transportation Systems Center, has been published and is available from NTIS. The accession number is PB 223902/AS. The price is \$3.00.

The Visibility and Audibility of Trains Approaching Rail-Highway Grade Crossings.

This study, prepared for Federal Railroad Administration by Systems Consultants Incorporated, identified desirable performance levels for audible devices and for visibility configurations on railroad locomotives and tested several prototype units and methods, from which some recommendations were made for improving visibility and some limitations were set forth on the practical limitations of audible devices. The final report dated May 1971 is available from NTIS. The accession number is PB 202668. The price is \$3.00.

Research Underway (Reported by the Federal Highway Administration)

New Passive Devices (Pooled Fund Project)

This study, being conducted by Systems Development Corporation, is being supported by 25 States and the Federal Railroad Administration. This pooled-fund project will test seven new signing systems on at least 56 crossing sites located in 23 States. The purpose of the study is to determine if any one of the new signing systems is more effective in notifying drivers of the presence of and dangers of a railroad grade crossing, protected

only with passive devices, than the existing signing systems. The effectiveness of the devices will be measured by speed profiles of vehicles approaching the crossings and by the extent to which the driver looks for trains. The study is scheduled for completion in early 1976.

New Passive Devices (New Jersey HPR Project)

This project is considering new passive devices both in advance of and at the crossing. New advance warning signs being tested include a train symbol sign and a track angle symbol sign. New crossing signs being tested include a brilliant yellow-green crossbuck, and a crossbuck imposed on a yield sign with lettering on the crossbuck. Techniques for measuring the effectiveness of the signs include driver interviews and spot speed profiles. Ten grade crossing sites will be used in the study. The study is scheduled for completion in early 1975.

Grade Crossing Surfaces (Texas HPR Project)

A research project to investigate the geometrics and structural capabilities of existing crossing surfaces and to develop an improved crossing surface is being conducted by the Texas Transportation Institute for the Texas Highway Department as a HPR project. The study will consist of a literature review; development of a synthesis of the grade crossing intersection surface problem; an analysis of films of trains and vehicles going over the grade crossing; development, fabrication and installation of alternative grade crossing designs under laboratory conditions, and field testing of candidate systems. The study will end in 1977.

A related development in the area of grade crossing surfaces is a State of the Art Report on Railroad-Highway Grade Crossing Surfaces prepared by W. J. Hedley and issued by Federal Highway Administration Notice N5120.1 dated November 30, 1973. The report includes the latest available information on physical characteristics, riding quality, and relative costs of the various types of surfacing materials used at grade crossings.

Indiana Crossing Study (Indiana HPR Project)

This study is evaluating the effectiveness of grade crossing warning devices at a grade crossing with a bad accident record. Flashing light signals were replaced with flashing lights and gates with train speed detection equipment to provide constant warning time and with strobe lights on the gate arms. Effectiveness is being evaluated by measuring vehicle speed profiles approaching the crossing. Results are expected to be available late in the summer of 1974.

Accident Potential Study

The objective of this study is to develop accident prediction equations and accident severity prediction equations for train-involved accidents. Results are expected to be available late in the summer of 1974.

Research Underway (Reported by the Federal Railroad Administration)

In-Vehicle Devices

The Federal Railroad Administration and the National Highway Traffic Safety Administration are cooperating in a study to determine the feasibility of installing a device inside of an automobile to warn drivers of nearby emergency vehicles and/or railroad locomotives. Study results are due in the summer of 1974. If some device (or system) appears feasible, it is expected that further testing will be undertaken.

DOT-AAR Inventory

Under this project, all public and private railroad-highway crossings, both at grade, and grade separated, will be inventoried and a unique number posted at each. A pilot project has been completed in five States and work in the remaining States is now underway.

Train Conspicuity

The National Bureau of Standards, under a contract with the Federal Railroad Administration, has developed and is evaluating devices to improve the conspicuity of approaching locomotives to drivers approaching railroad-highway grade crossings. They are also considering the feasibility of various techniques for improving the conspicuity of railroad cars.

Research Underway (Reported by Transportation Systems Center and sponsored by FRA)

Equipment Standardization - This project is planned to evaluate the potential benefits from modularization of active warning device system components and standardization of equipment design, management and installation. An initial task initiated in the spring of 1974 is evaluating the feasibility, including technical and economic viability, of modularization and standardization as well as the nature and magnitude of problems anticipated.

Innovative Concepts - This project is to solicit innovative concepts for active warning systems and investigate the feasibility of promising concepts that will be more effective and less costly than existing systems.

Low-Cost Barrier - Active warning systems which include automatic gates are the most effective, but also most expensive to install and maintain. This project will solicit innovative concepts for a yielding, low-cost barrier design for use at grade crossings.

Locomotive Conspicuity - This is a continuation of several past FRA studies. Guidelines as to optimal light type, characteristics, and use are in preparation. Xenon strobe lights and truck marker lights have been installed on six line-haul locomotives on two railroads and have been in operation for several months. Durability and crew response have been good.

Application Guidelines - A simple model has been developed to aid in determination of the proper type of warning device to be installed at each class of crossing, in terms of maximum overall effectiveness for limited resources. The program is highly interactive, permitting assessment of the implications of many alternative criteria and implications. A report on this work should be available by late summer.

Improved Flashing Lights - This study is based upon possible utilization of xenon flash lamps in standard grade crossing flashing lights. Factors under consideration include optimal shade of red, lens characteristics, flash pattern, repetition rate, power consumption, etc. Prototype lights are now being tested at TSC; experimental use with cooperating railroads is anticipated in coming months.

Motion Detection Devices - This research is directed at clarification of current uncertainties in the railroad community concerning the safe use of motion sensing train detection systems. The goal is development of functional and application guidelines.

Impact Attenuation - The objective of this study is to determine the feasibility of mounting a crash attenuation device on the front of a locomotive to reduce the severity of train-hits-vehicle accidents. Guideline recommendations on effectiveness and application of this concept are expected to be published in mid-1975.

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