TEXAS TRANSPORTATION INSTITUTE
THE TEXAS A&M UNIVERSITY SYSTEM

Project Summary Report 0-1881-S

Project 0-1881: Enhanced Traffic Control Devices at Highway-Railroad Grade Crossings

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PROJECT SUMMARY REPORT

Enhanced Sign Systems at Passive Highway-Railroad Grade Crossings

Passive crossings lack train-activated signals or gates to warn of an approaching train. Traffic control devices at passive crossings include advance warning signs, pavement markings, and crossbucks at the crossing locations. Approximately 58 percent of the public highway-railroad grade crossings in Texas (7160 crossings) are classified as passive crossings.

Project 0-1881 evaluated enhanced sign systems to increase driver awareness of passive highway-railroad grade crossings, with the premise that increased awareness would result in more cautious behavior when drivers approached grade crossings. The enhanced sign systems devices were previously developed in Texas Department of Transportation (TxDOT) Project 0-1469. In that project, enhanced sign systems yielded positive results and showed promise for improving safety at passive grade crossings. Project 0-1469 recommendations included validating results by implementing the enhanced sign systems at rural passive highway-railroad grade crossings, specifically at those crossings scheduled to be upgraded to active control. Project 0-1881 fulfilled that recommendation.

Figure 1. Flashing beacon assembly

The first experimental enhanced sign system consists of a 36-inch YIELD sign (*Manual on Uniform Traffic Control Devices [MUTCD]* R1-2) with a supplemental message plate (36 inches by 24 inches) containing the phrase TO TRAINS. The second experimental enhanced sign system consists of a vehicle-activated strobe or flashing yellow beacon mounted above a standard railroad advance warning sign (MUTCD W10-1) in combination with a new yellow warning sign that reads LOOK FOR TRAIN AT CROSSING.

What We Did . . .

Researchers selected nine project sites from TxDOT's list of passive crossings that were scheduled to be upgraded to active control. TxDOT and the Texas Transportation Institute developed criteria to rank the potential sites, and researchers made field visits to determine the roadway alignment and to verify that each site satisfied the defined criteria. Researchers selected four sites for the YIELD TO TRAINS enhanced sign systems, two sites for the LOOK FOR TRAIN AT CROSSING enhanced sign systems with flashing strobe lights, and three sites for the LOOK FOR TRAIN AT CROSSING enhanced sign system with flashing beacons.

Researchers chose sign system equipment for ease of use in rural locations and for use on non-paved as well as paved roads. Long-range infrared detectors were chosen because they are designed to detect vehicles regardless of the roadway surface. Solar panels were used due to the lack of on-site power at the rural locations. The flashing strobe was selected based upon its candlepower and durability to outside elements. Researchers also selected the same flashing beacons that TxDOT uses in school zones in order to provide consistency in installation for TxDOT crews. (See Figure 1.) TxDOT personnel fabricated the signs and installed the signs and equipment. The infrared detectors were installed under the direction of the supplier.

Railroad warning signs do not require drivers to slow upon approaching a grade crossing; however, the comparison of before and after speed profile data provides a means of determining whether drivers do slow on the approach to the grade crossings. Researchers conducted before and after speed studies at each project site. The before studies indicated speed conditions at the passive crossings before installation of the enhanced sign systems, and the after studies recorded vehicle speeds at least one month after installation of the enhanced sign systems. Researchers found that the majority of the drivers at each location were familiar with the area and, therefore, researchers assumed that the novelty effect of a new sign system would not affect travel speeds after 30 days.

The YIELD TO TRAINS enhanced sign systems were placed close to the railroad right-of-way. The locations of the LOOK FOR TRAIN AT CROSSING enhanced sign systems were determined by *MUTCD* requirements based on the posted speed or assumed speed of the roadway, legibility distance requirements, and perception-reaction time.

Additionally, researchers conducted surveys with drivers traveling in the vicinity of the highway-railroad grade crossings with the LOOK FOR TRAIN AT CROSSING enhanced sign systems to obtain opinions regarding the effectiveness and usefulness of the enhanced devices.

What We Found . . .

The analysis of the before and after speed studies did not find any across-the-board decreases in speeds at any of the locations using the three enhanced sign systems. On-site surveys indicated that the vehicle-activated systems were effective in gaining drivers' attention and that the devices did not alarm the drivers. (See Figures 2 and 3.) For the LOOK FOR TRAIN AT CROSSING enhanced sign systems, 82 percent of survey respondents at the four sites surveyed noticed the flashing lights at the approaches to the railroad-highway grade crossings, and 73 percent noticed the sign placed below the flashing

Figure 2. Enhanced sign system

Figure 3. Site conditions determined sign location

light or beacon. Additionally, 20 percent of the survey respondents remembered that the sign said to look or watch for trains, and another 36 percent noted that the signs said something about a railroad crossing. Thirty-eight percent of the survey participants stated that they believed the LOOK FOR TRAIN AT CROSSING enhanced sign system was a good idea. Also, 69 to 91 percent of the survey respondents at the four project sites where surveys were conducted were from the same county, verifying the researchers' belief that most drivers were familiar with the area.

The Researchers Recommend . . .

Although before and after speed studies for the LOOK FOR TRAIN AT CROSSING enhanced sign system indicated a speed reduction on only one approach of one study site, on-site interviews indicated that the flashing lights were effective in gaining drivers' attention. Researchers recommend the use of the LOOK FOR TRAIN AT CROSSING enhanced sign system *as an interim measure* prior to upgrading to an active grade crossing, particularly at high-accident crossings or locations with noted problems. Researchers also recommend the following changes to the experimental set-up:

- Pavement loops should be used rather than infrared sensors (for paved roadways). The infrared sensors were difficult to set to the proper angle, and TxDOT crews are more familiar with pavement loops.
- The LOOK FOR TRAIN AT CROSSING signs should be 36 x 48 inches.
- Flashing beacons should be used rather than flashing strobes. The flashing beacons appeared to be more effective in gaining drivers' attention, they were more dependable, and TxDOT crews are more familiar with the installation and maintenance of flashing beacons.
- The system should be used as an interim measure (for a period of one to two years) before upgrading to an active crossing.

For More Details . . .

The research is documented in the following reports:

Report 1881-1: *Evaluation of Enhanced Traffic Control Devices at Highway-Railroad Grade Crossings*

Report 1469-1: *Enhanced Traffic Control Devices and Railroad Operations for Highway-Railroad Grade Crossings: First-Year Activities*

Report 1469-2: *Enhanced Traffic Control Devices and Railroad Operations for Highway-Railroad Grade Crossings: Second-Year Activities*

Report 1469-3: *Enhanced Traffic Control Devices and Railroad Operations for Highway-Railroad Grade Crossings: Third-Year Activities*

Report 1469-4: *HIGHWAY-RAIL GRADE CROSSINGS Public Safety Education Materials—Look, Listen, and Live*

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TxDOT Implementation Status
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This research project evaluated the effectiveness of two warning sign systems developed for use at passive highway-railroad grade crossings. One product was required for this project: recommended revisions to the Texas MUTCD for enhanced highway-railroad grade crossing traffic control devices. The implementation of this product was contingent on the effectiveness of the enhanced traffic control devices in the field. The survey results indicated that the enhanced sign system was somewhat effective in attracting drivers' attention to an approaching highway-railroad crossing. Several recommendations were made by the researchers in favor of using the enhanced sign system as an interim measure prior to upgrading to an active grade crossing; however, maintenance and liability issues discouraged the implementation of this system as an interim measure. As a result, no changes to the Texas MUTCD were suggested.

For more information, contact Mr. Wade Odell, P.E., RTI Research Engineer, at (512) 465-7403 or email wodell@dot.state.tx.us.

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