DEVELOPMENT OF AN IMPROVED METHOD FOR EVALUATING AND REPORTING THE STRUCTURAL CONDITION OF RAILROAD GRADE CROSSINGS

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Objective

The principal objective of the project was to develop a method by which a Louisiana diagnostic team could evaluate and then report the structural condition of public rail-highway grade crossings.

Background

The evaluation of railroad-highway grade crossings usually centers around the safety and structural adequacy of these facilities. Traffic accidents which occur at the intersection of a rail line and a street or highway are one type of highway safety problems. Statistics indicate that such accidents are both rare and severe. The approximately 220,000 public railroad-highway grade crossings throughout this country have an annual total of slightly more than 11,000 accidents or an average of 0.05 accidents/public crossing/year. Fatalities occur in 11 percent of the collisions between highway vehicles and trains, while the remainder of these collisions produce occupant injuries. Even though they account for less than 0.1 percent of nationwide traffic accidents, collisions with trains result in approximately 2 percent of highway fatalities. These grade crossings are similar to other highway intersections where two flows of traffic, in this case rail vrs. highway, cross. The generally low train volumes create a situation where the approaching highway driver knows that a train may be at the crossing, but he does not expect one to be there while he is actually at the intersection of the railroad and highway.

In setting priorities for potential grade crossing improvements, these safety improvements must compete for available funding with a variety of other highway

programs ranging from spot improvements to new construction. The Louisiana Department of Transportation and Development presently uses the New Hampshire formula to evaluate safety-related conditions at grade crossings. This formula is based on type of traffic control device, average daily vehicle traffic and average daily train volume. This formula yields a numerical index of hazard. The New Hampshire formula has been shown to be a valid one for evaluation of safety implementation. Like most hazard index methodologies, this procedure calculates a relative value with no clear distinction between safe crossings and hazardous crossings. The index of hazard may be useful for setting priorities among potential grade crossing improvements, but the index is of minimal value in allocating funds among competing safety programs. This index serves only to develop a list of projects which deserve first attention because of safety deficiencies. Based on the results provided by such models, a diagnostic team can then be called to the site for further evaluation. These diagnostic teams in particular need a method to help them evaluate the structural condition of the grade crossing. Some sort of numerical rating system for structural condition would help in the assignment of rehabilitation priorities for Louisiana's railroad grade crossings.

Method of Procedure

To find a method of evaluating the true physical condition of its railroad-highway grade crossings and to establish priority replacement needs, a questionnaire (Attachment 1) was sent to the 48 continental states and the District of Columbia. This questionnaire solicited the states insight into existing methods or rating schemes which might give Louisiana a starting point.

Results of Questionnaire

Thirty-three states, or 67%, responded to the questionnaire. The other sixteen states (33%) failed to respond. Of the thirty-three states which responded, fourteen states (42%) used some sort of on-site checklist or evaluation sheet to help determine replacement priorities. Nine states (27%) have no present system. In seven states (21%), the railroads themselves have the responsibility of taking care of the grade crossings and replacing them. Two states (6%) primarily use their hazard index to determine replacements. One state (3%) uses rideability alone to determine when the grade crossings should be rehabilitated. Of the states which did have a replacement priority system, some of the other items mentioned in their methods of determining replacement priorities included:

1. Railroad Company Recommendations
2. Hwy/RR ADT
3. Hwy/RR Speeds
4. Accident Statistics or Data
5. Hazard Index
6. Crossing Roughness
7. Sight Distances & Alignments
8. Numerical Rating Scheme
9. Public Utilities Commission; Town/City; Department and Local Officials Comments and/or Recommendations

Analysis of Louisiana's existing statistical and historical data maintained on file revealed little, if any, insight into the actual physical condition of the crossings present integrity other than the hazard index.

With the results of the returned questionnaires in hand, Louisiana developed their own Railway-Highway Grade Crossing Evaluation Checklist (Attachment 2) which could be used for field checking the various items at the in-situ grade crossings and establishing a structural number or index that might identify those railroad-highway grade crossings that merited priority replacement. The

Louisiana Department of Transportation and Development asked each of our nine highway districts to use this checklist to evaluate one particular brand of elastomeric crossing panels which had shown signs of failure throughout the state. The results of this evaluation were very surprising. When the results (generally fair to poor) of this particular statewide elastomeric crossing condition survey were compaired to one district's evaluation of all railroad-highway crossings, the results were opposite to the results expected. This was shown when the checklist gave excellent or good ratings to a gravel, timber, or hot mix crossing with potholes but only fair or poor ratings to the elastomeric crossing panels under question which had loose or misaligned panels. The elastomeric crossings were still a smoother riding crossing than the gravel, timber, or hot mix crossings in most cases, although the elastomeric checklist survey structural number was worse.

Conclusions

Inspection often revealed that factors other than in-situ physical condition of the crossings were responsible for the high incidence of accidents and other variables that comprise the hazard index formula.

A similar type effort was being made under research project no. 80-1SS, Evaluation of Experimental Railroad Highway Grade Crossings in Louisiana. With the results of Louisiana's Railway-Highway Grade Crossing Evaluation Checklist it was evident that we should reconsider the objectives and priorities put forth in this research project. With the Railroad-Highway Grade Crossing Checklist developed in this research project, several of our highway districts experimented with the on site crossing checklist which showed that all

variables entered thereon averaged or obscured the true physical condition of the crossings examined and rated with our checklist. Further work will be needed to clarify the use of Louisiana's checklist on site and to explain the rating scheme in more detail. The checklist developed under Research Project No. 84-@SS gives us a starting point for rating Louisiana's grade crossings, but additional work is needed to refine this method of assignment of rehabilitation priorities.