Abridgment

Passive Control at Railroad-Highway Grade Crossings

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Between 1968 and 1972, there was an average of one fatality for every seven accidents at railway-highway grade crossings. Accidents at these crossings accounted for 0.06 percent of all accidents and 1 percent of all fatalities. The seriousness of this kind of accident necessitates the development of an effective warning design as soon as possible. In New Jersey, over 60 percent of all railroad crossings have only passive control.

Because of the great expense of installing active control, this project concentrated on evaluating and attempting to improve the designs for passive control. Three basic objectives for passive control were established:

1. Make the motorist aware that he or she is approaching the crossing (awareness of the presence of a train is beyond the scope of passive protection),
2. Make the motorist aware that his or her judgment alone will determine whether it is safe to go over the crossing, and
3. Create a uniform motorist response both on the approach and at the crossing to reduce the likelihood of conflict between vehicles in the traffic stream.

The first phase of this project concentrated on the development of field techniques to measure the effectiveness of passive designs. Four measures were formulated and subsequently tested in three pilot studies conducted at two sites. The following conclusions were made from these studies.

1. The standard deviation of the spot speeds on the crossing was high in relation to the variation of spot speeds on the approach. (Spot speeds at the crossing were one measure used for evaluation.)
2. Head movements of motorists looking down the tracks were found to be virtually nonexistent. (This measure was not used for evaluation.)
3. Brake lights were applied on the approach to the rail crossing in only 7.6 percent of the vehicles, even though during the pilot studies over 60 percent of the motorists claimed to slow down at crossings. (This measure was used for evaluation, although specific conclusions were not made.)
4. Motorist interviews were believed to be the most effective method for determining the effect of experimental designs. (This measure was used for evaluation.)

After measures of effectiveness were developed, attention was focused on developing experimental signs. Two combinations of experimental advance and crossbuck signs were chosen for evaluation:

1. A yellow diamond-shaped advance sign with a black silhouette of a train and a yellow diamond-shaped sign with a superimposed crossbuck located at the crossing; and
2. A brilliant yellow-green, diamond-shaped advance sign with a black silhouette of a track crossing a road and a brilliant yellow-green, diamond-shaped sign with a superimposed crossbuck located at the crossing.

Each combination was installed at three locations for a total of six experimental sites. New conventional signs were installed at four additional sites. Before and after studies measured the effectiveness of two control changes: (a) as is conventional to upgraded conventional and (b) upgraded conventional to experimental.

The before and after studies were compared, and an increase of motorist awareness was noticed at all sites where experimental signs were used. Differences among experimental signs were noticed when the signs were considered together (advance and crossbuck) and in combination with other changes. It was found that the experimental signs using brilliant yellow-green scotchlite were more noticeable than the yellow experimental signs. Other changes included a reduction in the variance of spot speeds at nine out of ten sites and an increase in the percentage of motorists observed applying brakes at seven out of seven sites.

The results indicate that all control changes increased awareness of the crossings. However, the increase was statistically significant at only two sites. The general

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reduction in standard deviation of spot speeds implies a more uniform motorist reaction at the crossing. The increases in percentage of motorists observed applying brakes and in average spot speed reductions at the track and the decrease in percentage of motorists responding to the question of slowing down imply a more pronounced slowing with experimental signs than with conventional signs.

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