# Field Research on a Passive

# Railroad Crossing Animated 'Eyes' Signal Unit

by

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Abstract

Forty five percent of injury crashes and forty two percent of fatal crashes occur at rail grade crossing protected only with cross bucks (USDOT, 1996). This study examined the effects of an LED animated eyes display that looked back and forth when a vehicle was detected approaching the crossing on vehicle speed. The crossing was controlled by a stop sign by many vehicles were in non-compliance with the sign. Speeds were measured during the before and after period using two counter hoses, one on each side of the stop bar. The introduction of the animated eyes display produced a significant reduction in vehicle speeds and an increase in the percentage of vehicles in compliance with the sign.

Crashes at railway grade crossings kill over 500 people per year and injure 1,754. In the State of Florida 22 people were killed and 50 injured in 1995. Because 45 percent of injury crashes and 42 percent of fatal crashes occur at rail grade crossing protected only with cross bucks (USDOT, 1996), it was decided to evaluate the animated 'eyes' technology at such sites . The low power requirements of LED signals and piezo sensors make it practical to power these signals with a solar array in any part of the nation.

## Method

*Subjects and Setting.*

Subjects were east bound drivers at a passive railroad crossing on Ralph Road in Polk County, Florida. Ralph Road is a 18 foot wide paved street with one lane in each direction. The east bound direction was selected because of the poor sight distance because of heavy tree growth on the right side of the road. Cross bucks were erected 15 feet back from the center of the railroad tracks, and the STOP sign was located 10 feet behind the cross bucks. A stop bar was located next to the cross bucks. A W10-1 warning sign was placed 300 feet before the crossing. Because of previous crashes Polk County had installed stop signs at all passive railroad crossings. The speed limit on Ralph Road was 30 mph and the ADT in the eastbound direction was 133 vehicles per day. Two school busses used the crossing and rail traffic was 4 switch trains per day.

*Measures.*

Vehicle speeds were measured by the Polk County Traffic Engineering Division using two counter hoses, one on each side of the stop bar.

*Apparatus.* The animated 'eyes' signal used in this research is shown in Figure 1. This device measured 6.5 inches high by 20.25 inches wide and consisted of a pair of white animated 'eyes'. The 'eyes' were each 7.5 inches wide, 4 inches

**Figure 1**. A photograph of the animated eyes display used at the crossing.

high, and 3.25 inches apart. The eyes were mounted on a post four feet to the right of the stop sign at a height of 10 feet above the roadway. The 'eyes' were activated by a microwave sensor that detected approaching vehicles at a distance of 150 to 180 feet. The sensor was mounted at a height of 12 feet above the roadway on the same post as the eyes. The devices were activated by breaking a normally closed circuit so that a broken circuit would turn the signal on all of the time. The signal was activated for 10 seconds as soon as an approaching vehicle was detected and stayed on until either 10 seconds elapsed or the vehicle passed out of view whichever duration was longer. The eyes looked back at forth with equal dwell times at a rate of 1 cps.

*Experimental Design.*

A pre/post experimental design was employed in this research. Following an eight day baseline period during which the speed of all vehicles was measured as they crossed the stop line, the animated 'eyes' display was introduced and data were collected for an additional eight days.

## Results

The introduction of the animated ‘eyes’ sign at the passive rail crossing was associated with a 49 percent reduction (from 5.5% to 2.8%) in the number of vehicles crossing the loops with speeds over 15 mph while the percentage of travelling in the direction not treated by the sign showed an increase in the number of drivers crossing the loops travelling over 15 mph. A two sample z-test for the difference between the two proportions was performed. This test was appropriate because of the large sample sizes. The value of z was 3.9 (P=.0001). A two sample z-test was also used to test whether the increase in the percentage of vehicles travelling over 15 mph in the direction opposite the sign was statistically significant. The results showed that this change was also highly significant (z = -5.7, P =.0001). The sign was associated with a downward shift in the speed distribution. It is interesting to note that 2.1% of the drivers were travelling over 30 mph as they crossed the loops during the baseline condition while only 0.6% were travelling that fast after the sign was installed.

## Discussion

The results of this experiment showed that the animated ‘eyes’ sign reduced the percentage of motorists not stopping or significantly slowing at the site by about half. These data are consistent with other data demonstrating the efficacy of the ‘eyes’ display at crosswalks, garage exits, and midblock crossings. They also replicate another study showing that the use of animated ‘eyes’ can increase the percentage of motorists coming to a complete stop at stop sign locations with a high crash history (Van Houten & Retting, 1999). Follow-up data collected after the sign has been up for 6 months should help determine whether the effects of the sign persist over time.

## References

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