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VEHICLE DRIVER BEHAVIOUR AT LEVEL CROSSINGS

M W Pickett and G B Grayson

Transport Research Laboratory
Old Wokingham Road
Crowthorne
Berkshire
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The Health and Safety Executive has been concerned at the behaviour of motor vehicle drivers at road traffic signal controlled level crossings. A particular concern relates to those motorists who drive over a crossing while the warning lights are flashing. The Transport Research Laboratory has undertaken a study which has reviewed earlier research, analysed the relevant statistics and interviewed 100 motorists observed driving through a crossing after the lights had commenced flashing. This report details the different elements of the study and discusses possible ways to improve the safety of level crossings.

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EXECUTIVE SUMMARY

The Railway Inspectorate of the Health & Safety Executive is concerned about the behaviour of road users at automatic level crossings and the implications that this has for the safety for both road and rail users of these crossings.

The 1992 Annual Report of the Railway Inspectorate expressed concern at the disturbing number of accidents involving collisions between trains and road vehicles at automatic crossings.

This study has examined a number of aspects of driver behaviour at level crossings.

Behavioural analysis.
Three categories of driver have been identified as likely to be involved in accidents at level crossings:

- those who are unwilling to stop because they believe they have plenty of time to cross before the train arrives
- those who are unable to stop because they are too close to the stop line at the onset of amber, or because someone is driving too close behind
- those who are unaware of the signals because they are inattentive or are distracted.

In the analysis of the witness statements, it was found that over half of drivers were unwilling to stop when the warning systems were activated and continued to cross. Just over one quarter crossed while unaware of the crossing or warning lights. About an eighth of drivers were unable to stop at the crossing, and a twentieth could not be classified.

Those drivers who reported they were unable to stop at a level crossing may be receptive to improved driver guidance. Often the reason given for failing to stop was that another driver was travelling too close behind to be able to stop safely. It is possible that if signs were positioned earlier at each crossing, both leading and following drivers would be able to moderate their behaviour accordingly.

Drivers who are unaware of the status of the warning signals as they drive over the crossing are a group worthy of more study. The most common reason given for accidentally crossing against the warning signal was that drivers had not noticed the lights were activated. There may be several reasons why these drivers are unaware of the warning signals, one of which may simply be a case of the driver being distracted from the driving task. Another possibility is one that was discussed earlier. If the driver crosses at the same each day without seeing a train, there is then a predisposition not to expect a train. Consequently, should the warning signals be activated, the driver does not expect to have to attend to them. A third possibility is that drivers have an incorrect perception of how to behave at level crossings. As was mentioned earlier, previous copies of the Highway Code have included quite complex to understand instructions on how to cross. Anecdotal evidence suggests that the procedure for negotiating level crossings is rarely taught in driving lessons.

Analysis of accidents at level crossings.
The most important conclusion to emerge from this part of the study is that, when judged by the standard set by conventional road junctions, level crossings are remarkably safe: the annual rate of injury accidents per level crossing is approximately one-fiftieth of the rate at road junctions, and less than one two-hundredth of the rate at junctions controlled by Automatic Traffic Signals. Although it is clear that significant numbers of drivers attempt to cross level crossings when being warned that a train is approaching, and some of them are in consequence involved in accidents, many more drivers fail to observe conventional traffic signals and become involved in accidents.

There is some indication of an increase in the number of non-injury accidents at protected level crossings between 1984 and 1992, but not in the number of injury accidents nor in the number of non-injury accidents at unprotected level crossings. The increase could be the result of improved reporting of non-injury accidents, perhaps associated with the introduction of a new computer database for holding accident details.

Analyses of the distribution of level crossing accidents by day of week and time of day provide some indications of the reasons why certain drivers are prepared to take risks at level crossings. Level crossing accidents are relatively infrequent outside the working day (8am-4pm) and on Sundays, compared with the national distribution of accidents at road junctions. Drivers will probably tend to feel more relaxed and under fewer time pressures at these times, and so less inclined to take risks when approaching a level crossing where the warning system indicates that a train is approaching A model of the process which leads certain drivers to decide to cross illegally is suggested by this evidence. The model predicts that the number of illegal crossings could be reduced by increased enforcement and by making the risk of being struck by a train more obvious.

Survey of motorists.
100 drivers were interviewed after being seen to cross level crossings when the red stop lights were flashing. The majority were regular users of level crossings. Crossing closure times were in general over-estimated, but most felt that the length of time was acceptable.

Although only a minority of drivers could give the correct Highway Code interpretation of the signals at crossings, the majority showed an understanding of the operation of the crossings. However, there were small numbers of respondents who could not answer the questions about the meaning of both the amber and the flashing red signals. Understanding of level crossing signals was on the whole less good than that of conventional road traffic signals.

Measures to improve safety.
A review of the literature showed that there was relatively little to be learned from overseas experience in developing ways to elicit behaviour change by drivers. Traditional road safety practice in this country has a battery of measures at its disposal, most of which could in principle be applied to level crossings. Using the modern technology that is now available, a marked reduction in red light violations is a real possibility. However, to achieve gains in safety will be a more difficult proposition, in which long term education and publicity as well as short term enforcement will have a part to play.

5. ANALYSIS OF QUESTIONNAIRE SURVEY DATA

5.1 Methodology.

Drivers who had crossed against a red signal and who were selected for interview were sent a letter (see Appendix A) which explained the study and sought their cooperation in being interviewed. The letters explained that the information was required purely for research purposes and that confidentiality would be maintained. The letters also asked for confirmation of the driver at the time of the incident so that the correct person would be interviewed.

The questionnaire survey focused on those drivers who disobey the light signals in an attempt to gain an understanding of why they disregard them. The survey was designed to investigate the following issues:

- *Whether driver behaviour at level crossings differs from that at junctions controlled by traffic lights.*

As level crossings operate on similar principles to signalised road junctions, it was of interest to know whether drivers treat level crossings as a special case, or whether their observance of light signals is the same in all cases.

- *Driver expectation of the average waiting time experienced at level crossings.*

If drivers overestimate the amount of time they will be delayed at level crossings, they may be inclined to violate the light signals in order to save time.

- *Driver understanding of the operation of level crossing warning systems.*

Automatic half barrier crossings are operated by the approaching train. It would be interesting to find out if drivers are aware of this, or whether they think crossings are continuously monitored.

- *Whether drivers habitually ignore level crossing warning systems, or was the occurrence recorded on film unusual behaviour caused by special circumstances*

If drivers habitually ignore the light signals, it would be useful to find out their reasons. This may lead to the discovery of appropriate countermeasures.

5.1.1 The drivers.

100 drivers were interviewed in their own homes by a TRL interviewer. A printed questionnaire was used, along with cue cards as aids for asking questions and recording the answers.

It is important to bear in mind that the survey was conducted in special circumstances with a particular group of people. It is possible that some of the responses are not true representations of the situation. Even though subjects were assured that their responses would be kept confidential, there is the possibility that some subjects may have been less than accurate in order to present themselves in a better light to the interviewer. It is also important to remember that any conclusions relate only to this sample, and do not necessarily generalise to the driver population as a whole.

5.1.2 The Questionnaire.

The questionnaire collected information on:

the frequency and purpose of the journeys made over level crossings
the drivers' personal feelings of safety on the crossing
their understanding of operational details
drivers' knowledge of the signs and light signals that may be found at both level crossings and road traffic light junctions
frequency of driving through a red light at each type of junction during the previous year

Drivers were also asked if they were aware they had driven through a red flashing light, and why they failed to stop.

5.2 Results.

5.2.1 Characteristics of the driver sample.

The numbers of subjects successfully interviewed are shown in Table 8 below, grouped by the crossing at which they offended:

Crossing	Number of subjects successfully interviewed	Number of red runners recorded
Sunningdale	37	107
Pooley Green	30	62
Waterloo Road	21	28
Waterbeach	7	19
Star Lane	3	8
Furze Platt	1	1
Cookham	1	1
Total	100	226

Table 8: Successful interviews per level crossing.

As can be seen from the table, a large number of drivers were seen to drive through the red light at Sunningdale. This crossing is on the A30, where the volume of traffic is much higher than at the other sites.

5.2.2 Characteristics of drivers interviewed.

The demographic characteristics of the drivers were analysed. 66% of the sample were males, 34% were females. The ages ranged from 18 to 78, with a mean of 40 years. Drivers had held driving licences from 1 to 60 years, with a mean length of 19 years. All the subjects held full licences.

5.2.3 Frequency of level crossing use.

The majority of the drivers in the sample stated that they had driven across level crossings at least once a week on average in the past year. In the past twelve months, 22% of drivers had crossed between 51 and 200 times and 56% had crossed more than 200 times. The table below shows how often the drivers reported using the crossings at which they were filmed.

Frequency	Percentage of subjects
Once a day or more	53
Once a week or more	23
Once a month or more	11
Rarely	13
Total	100

Table 9: Frequency of use of level crossings.

As can be seen, 76% of subjects reported using the crossing at least once a week. It is suggested that these drivers would be very familiar with the operation of the crossing, and the length of time between the lights coming on and the barriers being lowered. Thus, familiarity with the operation of the barriers may result in them deciding to ignore the red stop lights, preferring to stop only when the barrier starts to descend.

When asked about the purpose of their journey on the day they were filmed, 50% were travelling to or from work or in the course of their work, 21 % were making social trips, and 18% were involved in other reasons. This finding supports the model put forward earlier which suggested that motorists consider the costs and benefits of stopping at a level crossing when deciding whether to proceed in contravention of the red lights. Drivers journeying to or from work, or driving for their work, may feel under time pressure, and thus be tempted to violate the light signals.

One of the concerns of the survey was whether drivers felt confident when crossing. If drivers feel unsure about the safety of the crossing they may hesitate before continuing across, thus increasing nuisance and danger to other road users. However, of the drivers surveyed 46% thought that level crossings are safe, 27% were worried that a train might come while they were on the crossing, but only 3% would prefer not to have to cross them at all. 13% said they gave no thought to the safety of level crossings when using them.