LEVEL CROSSING PROTECTION

Report by officers of the Ministry of Transport and Civil Aviation and of the British Transport Commission
MINISTRY OF
TRANSPORT AND CIVIL AVIATION

Report on Level Crossing Protection based on a visit to the Netherlands, Belgian and French Railways by officers of the Ministry of Transport and Civil Aviation and of the British Transport Commission

LONDON: HER MAJESTY'S STATIONERY OFFICE
1957
FOREWORD

The protection of public road level crossings in Great Britain is governed mainly by an Act of Parliament of 1845. Railways were then something of an unknown quantity and were regarded with hostility by many, so that Parliament, in order to ensure the safety of the public on the highways, thought fit to impose rigorous conditions for the construction and operation of level crossings. Attendants were required at all public road level crossings, but their cost at that time was negligible.

The same standards of protection are generally required today and crossings must still be manned, but many more gatekeepers are now needed because traffic has grown so much and hours of work are fewer nowadays. Wages are also much higher than they were. The cost of manning crossings is consequently about five times what it was even in 1938, and amounts to more than a million pounds a year. This is a heavy financial burden from which the British Transport Commission are seeking relief. Moreover, national prosperity and full employment are making it difficult to obtain reliable men for these simple but responsible safety duties.

The delays to road users caused by the rigid standards of level crossing protection were probably of little account in the mid-19th century, but the story is very different under modern traffic conditions.

Level crossing protection on the Continent of Europe has not been so closely regulated as in this country, and there has been more freedom there to try out new ideas. Some of the methods now in use, and especially lifting barriers automatically controlled by the trains, reduce delays to road users and save manpower, and it was thought that we might profit from a study of them. A party consisting of representatives from the Railway Inspectorate and the Highways Engineering Staff of my Department and from the British Transport Commission have therefore visited the Continent and their report is attached. Its recommendations if put into effect would reduce costs and save delays at many level crossings. But the present law will first need to be amended and proposals for this purpose are now before Parliament. If Parliament accept those proposals the Chairman of the British Transport Commission and I are agreed that the recommendations in this report should be a valuable guide in framing future policy.

I would add a word to allay any fear that public road level crossings may not be so safe in the future. Many crossings will probably be unsuitable for the automatic system, even though it should help so much to reduce the delays to road traffic. As mentioned in the report, there will be no sudden abandonment of the present system of protection and the changeover to more modern methods will proceed with caution. Before it is submitted to me every case will be considered most carefully on its merits by the Commission and then by the Inspecting Officers of Railways and the Highways Engineers of my Department. Furthermore, the local and highway authorities will be given the opportunity of representing to me their points of view which will receive every consideration. I trust therefore that we will advance in this particular field of modernisation with the confidence and co-operation of public opinion.

In conclusion I extend my thanks to the administrations of the Netherlands, Belgian and French Railways for their ready co-operation which has made the preparation of this report possible, and for their agreement to its publication.

Minister of Transport and Civil Aviation.

Berkeley Square House,
REPORT ON VISIT BY OFFICERS OF THE MINISTRY OF TRANSPORT AND CIVIL AVIATION AND OF THE BRITISH TRANSPORT COMMISSION TO HOLLAND, BELGIUM AND FRANCE TO STUDY THE PROBLEM OF LEVEL CROSSING PROTECTION

4th–13th October, 1956

1. The purpose of the visit was to study the latest Continental practice in level crossing protection and to consider to what extent it might be applied in Great Britain in order to secure important economies and reduce delays to road traffic, without prejudice to safety. Lt.-Col. G. R. S. Wilson, Chief Inspecting Officer of Railways, Ministry of Transport and Civil Aviation, met the heads of the railway administrations of Holland, Belgium and France at the International Railway Congress at the Hague in June 1956, and took the opportunity of making the request that a party of officers from Great Britain should visit their systems to study the methods of protecting level crossings, and they welcomed the suggestion. Arrangements were therefore made with Mr. J. F. A. Baker, Chief Engineer, Highways Engineering of the Ministry and Mr. R. F. Harvey, Chief Operating and Motive Power Officer of the British Transport Commission, and it was agreed that the party should consist of:

- Colonel D. McMullen ... Inspecting Officer of Railways, Ministry of Transport and Civil Aviation.
- Colonel W. P. Reed ... Inspecting Officer of Railways, Ministry of Transport and Civil Aviation.
- Mr. R. A. Lovell ... Deputy Chief Engineer, Highways, Ministry of Transport and Civil Aviation.
- Mr. J. G. Taylor ... Divisional Road Engineer, Ministry of Transport and Civil Aviation, North-Eastern Division.
- Mr. E. G. Brentnall ... Assistant Signal Engineering Officer, British Transport Commission.
- Mr. L. W. Hatley ... Assistant to Chief Operating and Motive Power Officer, British Transport Commission.

2. Colonel McMullen paid a short visit to each railway administration in August to arrange the details for the main visit in October. He explained the reasons for the proposed visit and handed over a list of the types of level crossings which the party would be interested to see. He also gave to each administration a copy of a detailed questionnaire on level crossing practice in general.

The officers of the foreign railways took great pains to reply to the questionnaire at length and in detail, and their replies were found most useful as a basis for all our discussions. They made the most thorough arrangements for our visit and afforded us the greatest help and courtesy; we particularly appreciated being able to discuss the problems with their senior officers.

We received the most generous hospitality throughout, which was greatly appreciated.

Itinerary

3. 4th October. Party arrived early at Hook of Holland. Travelled by train to Rotterdam and were met by officers of the Netherlands Railways. A preliminary discussion was held with them followed by visits to level crossings in the neighbourhood. Proceeded to Amsterdam.

5th October. Visited level crossings in neighbourhood of Amsterdam.

6th October. Final conference with Netherlands Railway officers at Amsterdam and departed for Brussels.

7th October. Sunday free.

8th October. Discussions with officers of S.N.C.B. and then visited level crossings in vicinity of Brussels.

9th October. Visits to level crossings and also to a new route relay signal box at Namur.

10th October. Final discussion with S.N.C.B. officers. Departed for Paris in afternoon.

11th October. Discussions with officers of S.N.C.F. followed by visits to level crossings in neighbourhood of Paris.

12th October. Visited level crossings in South-West Region.

13th October. Travelled by train to Rouen and visited level crossings in Western Region, finishing at Le Havre, from where party sailed for Southampton.

In all we visited 15 level crossings in Holland, 11 in Belgium and 20 in France.
Terms of reference to the party

4. (i) Background. The background to the problem in Great Britain is outlined in Lt.-Col. Wilson's letter of 25th September to Col. McMullen, a copy of which is attached as Appendix I. Briefly, it is as follows:

(a) The Regulation of Railways Act of 1845 requires, generally, that all public level crossings in Great Britain (some 4,000) must be equipped with gates which close alternately across the road and rail and that the gates must be attended. The Commission's private Act of 1954 allowed lifting barriers, closing only across the road, to be used in specially approved cases; it was not intended to permit the removal of attendants.

(b) The system of gate protection has stood the test of time and manned level crossings are, generally speaking, safe. Safety at crossings worked by gatekeepers is, however, largely dependent on the integrity of the gatekeepers, and it is becoming increasingly difficult to obtain reliable men, especially for relief purposes for which a far greater number are now required. The failure of gatekeepers has been the cause of a number of accidents in recent years.

(c) The cost of providing attendants at level crossings has risen enormously and now exceeds £1m. a year. At many crossings it has risen tenfold and is out of all proportion to the amount of work done.

(d) The great increase in the number and speed of road vehicles has brought about conditions which were never envisaged when railways were constructed and it has brought into prominence delays to road traffic which are inherent in the present system of protecting crossings. Delays are due to the necessity to close the gates sufficiently early before the arrival of a train to enable the protecting signals to be cleared soon enough to avoid any check in the speed of the train, and, frequently, to the slow operation of heavy and cumbersome gates. For a single train it is not unusual for a crossing to be closed five minutes or more and when two trains are to pass over with only a short interval between, this time may well be doubled; it may also be increased if the attendant errs a little on the side of safety, an understandable and not unusual occurrence.

(e) Lifting barriers are mechanically more efficient than gates and are lighter and quicker in operation, but the mere substitution of barriers for gates offers only small economies and comparatively little benefit to road traffic. The use of this type of equipment does, however, make practicable from a technical point of view automatic and remote operation without attendance such as is used on the Continent; both systems would effect considerable economies and the former would greatly reduce the closure time of crossings.

(ii) Terms of reference. These were given in Lt.-Col. Wilson's letter and are repeated here for convenience:

(a) To examine and report on the design, general arrangement and methods of operation of protective equipment at public road level crossings in Holland, Belgium and France, with special reference to lifting barriers, with local attendance and with remote and automatic control.

(b) To consider the comparative efficiency and safety of the various methods adopted.

(c) To make recommendations in principle and detail on the conditions under which Continental practice might be adopted with advantage to economy for the protection of public road level crossings on British Railways, having due regard to the safety of road and rail traffic.

The situation on the Continent

5. The situation on the Continent is very different from that in Great Britain in that, generally speaking, there is no statutory obligation on the railway administrations to fence in the line and there is no binding legislation to fix public level crossings. Continental administrations have a double problem, one aspect of which is to increase the standard of safety at level crossings with a bad accident record by providing better or additional protection, a problem which does not exist in this country. The other is the economic aspect which is very similar to that in Great Britain, and the urgent need for economy is causing them to find ways and means of reducing the expenditure in connection with level crossings.

None of the countries we visited uses gates closing alternately across the road and rail as in Great Britain. There are a number of old-fashioned gates which slide across the road, but these are not popular. It is generally considered that lifting barriers are the most satisfactory and the cheapest method of barring the road.

Barriers are used in several forms: there are full length barriers and double half-barriers covering the whole width of the road, controlled either by an attendant on the spot or remotely, and in Holland and France there are short barriers covering only a part of the road. In some cases in Holland these short barriers are operated from a remote location, but generally speaking, and invariably in France, they are worked automatically by the trains. There are also a great number of open crossings some with and some without automatically operated visual and audible warning apparatus. We visited examples of all these different types.

In Appendix II some basic statistics are given to enable the size of the road and railway systems, the traffic on them, and the numbers of the level crossings to be compared with those in Great Britain.
We found that the practice in the three countries differed considerably; to avoid making this report unduly long we have included only the more important points. The countries are mentioned in the order visited.

**HOLLAND**

6. Until 1922 all level crossings on main lines were required to be protected. Owing to the economic situation on the railways at that time the law was repealed and a large number of crossings were made "open" without any physical protection or attendance. On the main and secondary lines there are now 3,350 public level crossings and 890 have barriers covering the full width of the road; 530 of these are "attended" and 360 are operated from a remote location. Fifty-three crossings are equipped with half-barriers; 39 of these are operated automatically by trains and the remainder are operated from remote locations. The balance of some 2,200 crossings are of the open type and 196 of these are equipped with flashing lights and bells.

The policy is to eliminate crossings on all the most important roads by bridging. On State roads, the cost is borne mainly by the Government, but the railway contributes in proportion to its interest. In towns the current five-year programme for this will cost £12 million; eight million pounds will be found by the local or provincial authorities and the balance will be shared equally by the railway and the Government. It is also the policy, on account of the economic situation, to continue to remove full barriers and attendants from crossings wherever practicable and to equip them either with automatic half-barriers or to convert them to open crossings with flashing lights and bells. Either type of equipment may in some cases be provided at open crossings to give additional protection. For reasons which are explained later, remotely controlled half-barriers are not considered satisfactory, and no further such equipment will be installed. It may therefore be assumed that in Holland half barriers are synonymous with automatic working. No formula is used in deciding what type of protection should be provided, and each case is decided on its merits by the equivalent of the Chief Inspecting Officer of Railways in consultation with the railway authorities and the local highway authorities. Much stress is laid on making crossings conspicuous and floodlighting is used extensively.

*Manned crossings operated at site*

7. Nearly all the 530 crossings of this type are on main lines and on roads with very heavy vehicular, cyclist and pedestrian traffic; some crossings are, however, to be found on the secondary passenger and freight lines and on freight lines only. All barriers are of the lifting type and cover the full width of the road. Single barriers or double half-barriers are used; the latter are considered particularly suitable at busy crossings to assist the operator to create a gap in the road traffic. When double half-barriers are used those on the right-hand side of the road in the direction of traffic are controlled separately from those on the left-hand side of the road and in some cases all four barriers are controlled independently. The barriers are worked either electrically or by "double wire." Up to now a heavy type of boom with a stiff skirt has been employed, but experiments with a lightweight, built-up, timber barrier and a light stiff skirt are being carried out. Single barriers are pivoted on either side of the road, as convenient.

Busy crossings are equipped with single flashing red lights on the side of the road, but lights are never placed on the barriers; Scotchlite strips and reflectors are used extensively. On busy roads a Scotchlite triangle with a vertical bar (the Continental danger sign) is placed in the centre of the barriers. At present about one-third of all such level crossings are provided with floodlighting, and the ultimate object is to install this at nearly all crossings.

The barriers are kept normally open to the road and they are seldom interlocked with railway signals. Crossing keepers are warned of the approach of trains either by telephone, by bells, or by lights and slow ringing bells operated by track circuits.

*CROSSINGS OPERATED REMOTELY*

8. Special permission is required for this method of working. Some of the 360 crossings of this type are on busy roads and are close to the point of operation while others on less important roads are up to 350 metres distant. It is considered desirable but not essential that crossings of this type should be in view from the point of operation in good weather. The barriers, which are usually of the same type as at manned crossings, are always normally open to the road. All such crossings on the busier roads are nowadays equipped with single flashing red lights at the side of the road, and they start to operate 10 seconds before the barriers begin to fall. The lights are repeated at the place of operation. On unimportant roads the warning sign consists merely of a circular turning red and white disc with the word "Stop." Again there are no lights on the barriers but there are Scotchlite strips and reflectors. Floodlighting is not normally an essential requirement. "Safety bays" are not used and they are considered wrong in principle as they make the crossing unnecessarily long. The barriers are not locked in the lowered position so that road users can lift them by hand if trapped. The trapping of vehicles is recognised as a possible danger, but there have not been many incidents.

Remotely controlled half-barriers covering only part of the road have been tried but are not considered satisfactory because the lowering of the barriers is dependent on an operator at a distance who cannot work to time limits of time and the crossing may therefore be closed for several minutes. This makes such crossings dangerous because motorists are likely to become impatient and to zigzag round the barriers, and no further such installations are proposed.
Automatic half-barriers

9. Automatic lifting half-barriers were introduced experimentally in 1951 and are now considered by the Netherlands Railway Authorities to be the most economical and safest form of level crossing protection, even on busy roads, where pedestrian or bicycle traffic is not exceptionally heavy. They have not yet been used on lines with more than two tracks but are considered suitable for four track lines. Government approval is required for each installation.

The equipment consists of a conspicuous light timber skirtless barrier which extends over approximately half the width of the carriageway on each side of the crossing; the barriers are operated by electric motors actuated by track circuits. There are twin flashing red lights and bells which start to operate 25 seconds before the fastest train on the section reaches the crossing; the lights flash for 5 seconds before the barriers start to fall and their movement takes 10 to 12 seconds. The barriers are therefore lowered 8 to 10 seconds before the train arrives; for slower trains this time is proportionately longer. While the barriers are down the lights continue to flash but the bells stop ringing. There are also three red lights on each half-barrier which become illuminated as the barriers start to fall and remain alight while they are down; the light at the tip is steady but the other two flash. The barriers lift as soon as the train has cleared the crossing, and all the lights are then extinguished. All the lights are duplicated to show in both directions along the road and the flashing lights operate at a rate of 45 times a minute each. The twin lights therefore give the impression of flashing 90 times a minute in combination. A sketch of the equipment is given below.

There are no protecting railway signals. The lights are not repeated in any signal cabin, but if one of the flashing lights fails the other continues to flash. There are usually two sources of electric power supply and if both should fail, or if there is any failure of equipment, the barriers assume the horizontal position.

A minimum clearance of 3½ m. from the tip of the barrier to the far edge of the carriageway is required. In the centre of the road on each side of the crossing, a solid line is marked and motorists are prohibited from crossing this line. On very busy roads central kerbs will be provided. The barrier normally covers a footpath on the side of the road. All the crossings are floodlit and the lighting used is generally in contrast with any street lighting; in other words if the latter is sodium, mercury vapour lighting will be used on the crossing and vice versa although care is necessary with mercury vapour lighting on account of its similarity with the "green" in railway colour light signals. At each crossing there is a notice warning motorists of the possible approach of a second train. Reflecting St. Andrew's crosses are provided and double crosses are used when there are two tracks.

The great advantage of this type of crossing is that it is closed to the road for a very short period. We were told that in general delays of 3 to 4 minutes, and in some cases 7 to 8 minutes, had been reduced to 45 seconds; consequently road users do not become impatient and are not tempted to zigzag round the barriers. For this reason this type of crossing has the approval of the Royal Netherlands Automobile Club and the Tourist Club, and it is also popular with local authorities and the Police.

We saw one very interesting example of automatic barriers on an autobahn crossing over a light railway carrying about four trains a day. In this particular case there were railway signals which cleared only when
the barriers were down, and there were also yellow advance flashing warning lights on the road in addition to the normal level crossing warning signs, all of which are reflecting. Several crossings with a traffic moment of 200,000 to 400,000 (80 to 100 trains and 2,500 to 4,000 motor vehicles per day) are equipped with half-barriers and since our visit one near Leiden on the Amsterdam–Rotterdam main line with a traffic moment of 800,000 (160 trains and 5,000 motor vehicles) has been so equipped. This installation is being attended in the daytime for the present.

We were informed that cost of the standard type of automatic half-barrier equipment at a level crossing, including the provision of track circuits, is about £4,000.

Open crossings

10. These are allowed only on unimportant roads and are divided almost equally between the main lines and secondary and freight lines. About 2,000 crossings have no protection except St. Andrew's crosses, but an adequate view of trains from the road is necessary at all of them.

As mentioned earlier 196 are equipped with flashing lights and loud sounding bells; these are nearly all on main lines and they have been installed progressively in recent years. Generally speaking they are not used when there are more than two tracks.

The lights consist of three-lamp units, viz. green, yellow and red. A unit is erected on each side of the crossing and the red and green lights are duplicated to show in both directions along the road. Normally, the green lights flash (at a rate of 45 times a minute) when no train is approaching. When an approaching train occupies a controlling track circuit, the green lights are extinguished and the red lights flash (at 90 times a minute) until the train has passed. The difference in the rates of flashing is to assist colour-blind road users. The bells ring when the red lights are showing. Duplicate power supplies and other precautions are taken against failure of the lights, but should there be any failure the yellow non-flashing lights become illuminated and will operate for six hours from a stand-by battery.

The cost of such an installation was given as £1,800 to £3,000.

We saw an interesting example of an open crossing of a busy road carrying 1,500 vehicles a day at high speed and a single track light railway with about six goods trains per day. Each train is required to stop on the approach side of the crossing where it occupies a track circuit, and the engineman operates a plunger. These cause red flashing lights on the road to operate and bells to ring. They cease to function automatically when the train has passed beyond the crossing and cleared the track circuit. There are no green flashing lights or yellow "out of order" lights on this installation.

Accidents

11. It was not possible to obtain statistics comparable with those in Great Britain. The number of cases of motor vehicles colliding with barriers is high. There have been only two train derailments on account of collisions at level crossings in the past five years and both of these were at open crossings; there were no train casualties.

Generally speaking, the number of accidents in which trains and road vehicles were involved at attended or remote control crossings is not large. Separate statistics for remote crossings are not kept but, as already mentioned, there have not been many cases of vehicles being trapped. The number of accidents at open crossings with flashing lights shows a slight increase which is, however, roughly proportional to the increase in the number of these crossings in use. Allowing for the fact that the accident risk increases by 15 per cent. each year due to the increase in road and rail traffic, the Dutch administration does not regard the figures with alarm. There have been only two train accidents at automatic half-barriers since they were first installed in 1951, but the number of such equipments is not large. Both accidents occurred since our visit; in one a cyclist was involved and in the other a motor vehicle stopped with a trailer on a crossing. Observations have shown that road discipline generally at these crossings is good.

BELGIUM

12. There is now no law governing level crossings, but any reduction in the standard of protection requires the approval of the Minister of Communications in consultation with the local authorities. Improvements to crossings may, however, be carried out by the railway administration without any other authority. There are some 4,300 public crossings, 1,850 of which are equipped with barriers covering the full width of the road; of these 1,500 are controlled at site and 350 from remote locations. The remaining 2,450 crossings are of the open type including some 400 equipped with automatic flashing lights and bells. There are no level crossings with half-barriers, but the administration is proposing to experiment with such equipment. The policy of the administration is to curtail expenditure by removing barriers and attendants wherever possible and to convert the crossings into the open type with or without flashing lights, and possibly later with automatic half-barriers; also to increase protection at open crossings by providing warning devices.

Formulas are used in assessing the type of protection necessary; they take into account the number and speed of trains, number of road vehicles, visibility, etc.
13. Approximately 1,000 of these are of the sliding type, and the remaining 500 are lifting barriers. The latter are generally preferred on account of their cheapness, simplicity, and rapidity of operation. All barriers cover the full width of the road. Single barriers pivoted on either side of the road as convenient, or double half-barriers are used. They are of substantial construction and equipped with very flimsy skirts. The barriers are usually worked mechanically by double wire, but electric motors are sometimes used which are coupled either to the barriers direct, or to a final double wire drive. On important lines the barriers are usually interlocked with railway signals.

Lights are placed on the barriers only in exceptional cases, but extensive use is made of reflectors and Scotchlite. Busy crossings generally have steady red lights on the side of the road which come into operation before the barriers are lowered, and some form of general lighting. The latter two items are being installed progressively, and we were informed that they reduce the number of collisions between road vehicles and barriers considerably.

The barriers are normally open to the road but if rail traffic is heavy they may be kept normally closed to the road. Trains are usually "announced" by telephone but automatic announcement by track circuit or treadle operated bells is sometimes used.

14. The great majority of the crossings at which remote control is used (some 350) are on little-used roads. It is seldom employed at distances of more than 200 metres and the crossings must be visible from the point of operation in good weather. All such crossings have lifting barriers which are usually operated by double wire; when electrically worked the position of the barriers is indicated at the point of operation. The normal position of the barriers may be either open or closed to the road. Trains are usually "announced" by a signal; when electrically worked the position of the barriers is indicated at the point of operation. The latter two items are being installed progressively, and we were informed that they reduce the number of collisions between road vehicles and barriers considerably.

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Crossings operated remotely

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15. As already mentioned there are a great number of such crossings, some 400 of which are equipped with flashing lights and loud sounding bells; these are not, however, generally used on lines with more than two tracks.

Crossings with such warning devices are not normally permitted when the "moment" (the product of the number of trains and road vehicles) is greater than 10,000 and there are other qualifications; these include an adequate view (in accordance with formulae) of approaching trains and a maximum number of road vehicles and children. There are, however, ten open crossings with a moment greater than 50,000 and we visited one crossing which had a moment of 90,000. The double tracked main line carried about 70 trains per day and the road, which was straight, about 1,300 vehicles and cyclists. The view of trains in this case was particularly good.

The warning devices comprise a red and green flashing light and a bell on each side of the crossing. When no train is approaching the green lights flash continuously at 40 times per minute. When an approaching train occupies a suitably located track circuit the green lights go out and the red lights start to flash, at 80 times per minute, and the bells sound. This warning is given at least 25 seconds before the arrival of the fastest train and continues until it has passed. The lights are operated from a mains supply and are repeated in the nearest signal cabin. In modern installations stand-by trickle-charged batteries are provided which become switched in automatically if there is a power failure, and operate the lights and bells. No "out of order" lights are provided.

Open crossings without warning devices are permitted only when the view of trains from the road is adequate (in accordance with formulae) and generally only on unimportant roads. However, at some 300 such crossings on less important lines a speed limit of 5 km.h.―40 km.h. is imposed on trains and then a reduced view of the trains is acceptable. Such crossings carry up to 500 road vehicles per day.

All open crossings with or without warning devices are provided with St. Andrew's crosses.

Accidents

16. Again no statistics comparable with ours are available. Collisions between road vehicles and barriers are frequent but as mentioned above these are being reduced by the provision of floodlighting and steady red lights at the side of the road.

It was stated that there have been no accidents at remotely operated crossings as a result of a vehicle being trapped.
The great majority of accidents occur at open crossings but it was stated that at the busy crossing with a moment of 90,000 mentioned above, there had been only one accident in the last eight years. The open crossings at which the speed of trains is restricted are said to have a particularly good record of safety.

There has been only one derailment as a result of a train colliding with a road vehicle in the past 30 years, and it occurred two weeks before our visit. A rail-car was involved but no one was killed.

FRANCE

17. Originally the law required all crossings to be equipped with full barriers and attended, but it permitted exceptions to be made in individual cases. Since 1938 the type of protection has been governed by Ministerial decree which lays down certain rigid requirements dependent on the amount of rail and road traffic over a crossing, and the visibility of trains. The Regulation is detailed and is accompanied by a useful chart showing the conditions required for different types of protection.

At present, of a total of approximately 31,000 public level crossings, some 17,000 are operated at site and 2,000 from a remote location. There are about 11,300 open crossings, and the balance of 700 crossings have automatically operated half-barriers with flashing lights and bells.

During the decade 1945–1955, some 2,500 guarded crossings were converted to crossings of the open type, with or without warning devices. The policy is to continue to remove the full barriers and attendants wherever possible and to convert the crossings to the automatic half-barrier type. Automatic half-barrier crossings are more economical than guarded crossings and are also regarded as safer because it is considered that automatic working is more reliable than human operation. The policy is also to improve the protection at certain open crossings by the addition of half-barriers. The present programme is to install a further 300 automatic half-barriers, and when this has been completed authority for a further 1,000 conversions to this type will be sought.

Crossings operated at site

18. Lifting, sliding and swinging barriers are used, all of which extend over the full width of the road. The general preference is for lifting barriers which are always used at busy crossings or when the span exceeds eight metres. Lifting single or double half-barriers are used; the latter are considered particularly suitable where road traffic is heavy and then the barriers are operated in pairs diagonally. Single barriers are pivoted on the same side of the road, as convenient.

The barriers are usually of stout construction with reasonably stiff skirts and are worked generally by double wire but sometimes by electric motor with a direct or double wire drive. On electrified lines steel barriers contain an insulated section to prevent shock if the barrier should touch the overhead wire.

It is the exception rather than the rule for lights to be placed on the barriers; they are usually oil lamps but electric lamps are used in special cases. Reflectors and Scotchlite are standard equipment. At busy crossings single red steady lights are provided at the side of the road operated in conjunction with the barriers. The lighting of the crossing area is not considered of great importance, although many crossings have street lights on both sides.

Barriers are normally closed to the road unless road traffic is considerably heavier than rail traffic. They are seldom interlocked with railway signals. Trains are not always "announced" but an increasing number of crossings are being equipped with announcement devices.

Attendants are provided with flare torches for warning trains in case of accident and also with the means of placing the railway signals at danger on sections of the line with automatic signalling.

Crossings operated remotely

19. Special permission is required for this method of operation. It is used at quite busy crossings up to 500 metres distant and in view from the point of operation; also at crossings out of sight of the operator where the road traffic is very light. Some crossings are manned for part of the day and remotely operated for the remaining period.

Lifting barriers are always used and they cover the full width of the road. The barriers are normally open to the road but when visibility is bad they are always kept closed; there are some "on call" crossings on roads with very light traffic. They are usually worked mechanically, but electrical operation is being introduced; when electrically worked the position of the barriers is indicated at the point of operation.

Crossings with barriers normally open to the road are usually equipped with single steady red lights at the side of the road and sometimes with a red light on each barrier; they also have bells. The lights and bells work in conjunction with the barriers. The lights are not repeated at the point of operation, but the bulbs are changed frequently.

"On call" crossings are usually equipped with warning bells but no lights; there are call plungers which can also be used for emergency purposes. Free wicket gates are always provided.

The lighting of such crossings is not considered of importance unless the road is busy. "Safety bays" are never provided. The trapping of vehicles is avoided by the provision of lights and also by ensuring that the barriers fall slowly.

An experiment is being conducted at an "on call" crossing with two-way loudspeakers which enable the operator to hear everything within a radius of 50 metres of the crossing, and to give instructions to road users.
Automatic half-barriers

20. Half-barriers are associated only with automatic operation. They were introduced in 1955 and at the time of our visit there were about 700 installations. They have not yet been used on lines with more than two tracks, and are permitted only at crossings with a traffic moment of not more than 20,000 and where approaching trains are in view for not less than 12 seconds.

Two types of equipment are used; in one the barriers are of very light construction and in the other type they are somewhat heavier, but not nearly so robust as the barriers at attended crossings.

The light type is provided on narrow roads and is in more general use. The barrier is generally 2 to 3 metres in length; it need not extend to the centre of the road, but the tip must not be more than 1.6 metres from it, and a clearance of at least 2.5 metres from the tip to the further edge of the carriageway is essential. The barrier itself is of timber construction, with a "fracture segment" near the base. If the barrier is broken the mechanism, which is set back from the edge of the road, is not damaged and the stump at the base continues to operate; a new end can be fitted to the stump quickly.

The heavier type of equipment is used on wider roads and barriers then extend to the centre of the road. They are also of timber construction; initially some difficulty was experienced on account of deflection due to wind pressure but this has now been overcome.

The principles of operation of both types of barrier are the same. Single red flashing lights and bells are provided at the side of the road and they begin to operate when a train passes over a treadle or track circuit, and 5 seconds later the barriers begin to fall. The arrangements are such that the barriers are horizontal not less than 5 seconds before the arrival at the crossing of the fastest train, and they rise again as soon as the train has passed. The bells stop ringing when the barriers are down but the lights continue to flash. There are no lights on the barriers but they are made conspicuous by the use of Scotchlite.

The barriers are operated by individual electric motors and they and the lights and bells are fed from a mains supply; there are stand-by trickle-charged batteries which take over the operation in the event of a power failure. If there is a total failure of current or any failure of the equipment the barriers assume the horizontal position. The lights and the position of the barriers are not repeated in any signal cabin, but again the bulbs are changed frequently.

The barriers are never interlocked with railway signals. Telephones are usually provided but they are not obligatory; they are, however, found useful when an attendant is sent to the crossing for single line working. All half-barrier crossings on double lines have clear Scotchlite notices, under St. Andrew's crosses, warning road users of the possibility of a second train arriving from the opposite direction. Whistle boards are placed on the track at suitable distances from the crossing. Floodlighting is not provided.

When the carriageway is of sufficient width its centre is usually marked with a solid yellow line, the crossing of which by road vehicles is an offence; central kerbs are never used.

The cost of a complete installation was given as £2,000 to £2,500. A sketch of the light type of equipment is given below.

![Sketch of light type of equipment](image)
The public reaction to this equipment appears to be mixed. The Motoring Associations appreciate the big reduction in road delays and expect that the standard of road discipline will improve, but there are some anxieties. We saw one crossing of a light railway with 2–3 trains per day and a high speed double carriageway carrying over 3,000 motor vehicles which was provided with this type of equipment, and the arrangements were said to be very satisfactory.

Open crossings

21. As mentioned there are a very large number of such crossings. The great majority have no protection except St. Andrew's crosses. An essential requirement at all such crossings is a good view of trains. We saw one crossing on a single line carrying seven to eight trains per day and on a road carrying 100 vehicles per day. The maximum speed on the line is 60 km.p.h. and there are 60 km.p.h. speed boards on the road. The view of trains was particularly good.

Accidents

22. Again, statistics are not comparable with those in Great Britain. Generally, in the last ten years, the number of accidents at guarded crossings in which trains and road vehicles were involved has fallen considerably while the number at unguarded crossings has risen. During this period the number of guarded crossings has decreased by some 3,500 and the number of unguarded crossings has risen by about 2,500. The crossings with remotely controlled barriers are considered as guarded crossings, and no separate figures for them are available. Separate figures are also not available for automatic half-barrier crossings, since the installation of these began only in September 1955. We were informed, however, that at the time of our visit there had been only eight accidents at such crossings, involving 11 occupants of road vehicles and some animals killed. In the five years ending 1955 seven railway passengers have been killed as a result of collisions between road vehicles and trains.

There are a large number of cases of road vehicles running into crossing barriers, where trains are not involved.

GERMANY

23. We did not visit this country but it is felt that it will be useful to record briefly certain facts which have been taken from an article on level crossings on the Deutsche Bundesbahn in the August 1956 issue of the I.R.C.A. Bulletin and from information which that administration has been kind enough to supply. The route mileage on this system is much the same as on British Railways but there are 39,000 level crossings (34,000 public and 5,000 private) compared with 26,000 in Great Britain (4,500 public and 21,500 private).

The number of road vehicles in Federal Germany has increased threefold from 1949 and this has created serious level crossing problems both from the safety and economic point of view. It is mentioned that the cost of manning crossings is about 2 per cent. of the whole of the Deutsche Bundesbahn budget.

Lifting barriers covering the full width of the road are used extensively and they are operated either at site or remotely; they are not usually interlocked with signals. Lights on the booms and floodlighting are provided when road traffic is heavy and reflectors are used liberally.

Remotely controlled barriers may be normally either open or "on call," the latter only with agreement of the local authority and they must generally be within sight of the point of operation. Recently, however, experimental two-way loudspeakers have been installed at a number of crossings out of sight of the point of operation. The results are said to be encouraging and the safety record very good; it is proposed to increase the number of such crossings to 3,500.

Trials have been made with automatic half-barriers with flashing lights and bells at 24 crossings and they resemble the Dutch rather than the French type; a good visibility of trains is an essential condition. The results so far are said to be satisfactory and the equipment is considered most suitable for very busy level crossings.

MISCELLANEOUS

Road warning signs

24. The standard international road warning signs for level crossings are used in all four countries. They are frequently reflecting and much use is made of Scotchlite. In Belgium the advance warning signs are sometimes illuminated by the highway authority. At automatic half-barrier crossings in France these signs are supplemented by special notices (Signal automatique).

In Belgium and France white marker posts at 50/100 metres intervals are frequently used, sometimes on both sides of the road. The posts have diagonal red reflecting stripes reducing from three stripes to one stripe as the crossing is approached.

At automatic half-barrier crossings in Holland and France and at all open crossings in the four countries, St. Andrew's crosses are used; they are fitted with reflectors or reflecting material.
25. In Belgium and France the width of the carriageway on the crossing is about the same as its width in the approaches. In Holland it is considered desirable to widen the carriageway on the crossing by $\frac{1}{4}$ metre on each side as a margin of safety, providing this does not tend to make the crossing into a convenient passing place on an otherwise single track road.

In Holland particular attention is paid to the road surface at level crossings and extensive use is made of precast concrete slabs.

Cattle grids

26. Cattle are not driven along roads on the Continent to the same extent as in Great Britain, and cattle grids are not provided at level crossings.

Pedestrian barriers

27. In Holland these are occasionally provided at guarded crossings; they are sometimes controlled by the attendant but more often free. They are also sometimes provided at automatic half-barrier crossings where the barrier does not cover a footpath or cycle track; more frequently, however, steady red lights only are provided and worked automatically by trains.

In Belgium barriers are usually provided at busy guarded crossings and controlled by the attendants.

In France, pedestrian barriers are occasionally placed at guarded crossings; they are sometimes controlled but more often free. They are not provided at automatic half-barrier crossings which are usually located on roads without footpaths.

Television and other devices

28. We were informed that consideration has been given by the Netherlands railway administration to the use of television and other electronic aids, but that the difficulties of maintenance and the high cost are not commensurate with the advantages to be gained. The S.N.C.F. are, however, experimenting with a commercial form of television at one remotely operated "on call" level crossing.

Propaganda

29. The Netherlands and French railway administrations recognise the benefits of propaganda for instilling obedience and improving the behaviour of road users at automatic half-barrier crossings; both administrations have published very good illustrated pamphlets on the subject which give prominence to the suicidal risk of zigzagging round half-barriers. We were shown an excellent propaganda film which has been made in France; a similar film was in the course of preparation in Holland.

The S.N.C.F. consider that once the public understand the timing of the automatic half-barrier, the risk to road users will be considerably less than at attended crossings because, as already mentioned, automatic operation is held to be more reliable than human operation.

When a new automatic half-barrier is installed in Holland all the children from nearby schools are taken to it and shown its operation, and it is explained to them carefully when it is safe to cross the line and when they must not do so. Subsequent observations have indicated excellent behaviour on the part of the children, some of whom were in fact selected to instil these elements of safety into adults.

CONCLUSIONS

30. We consider that some of the Continental methods of operating level crossings will prove suitable for adoption in Great Britain without prejudice to safety. For instance, lifting barriers can in general be used to replace gates at most attended crossings on lines operated either by steam or diesel traction or by electricity on the overhead or third rail system; also, automatic and remote operation might be adopted at selected crossings after satisfactory trials.

31. We recognise the necessity for a fundamental change in outlook as to the purpose of protection at level crossings. The type of heavy wooden gate which has been in use for over 100 years was intended to be, and in fact was, a completely effective obstacle to the horse-drawn road vehicle. The situation has changed with the advent of the modern powered road vehicle which can easily break through such a gate, and its value, therefore, as an obstacle to vehicle movement when closed against the road lies primarily in its conspicuousness. This characteristic can be fully achieved with a barrier of suitable construction, especially when it is equipped with modern reflecting material. Barriers can also be designed as an obstacle to pedestrians and cattle when necessary. The barrier can be of light construction, and as it is mechanically more efficient than the gate it can be operated more easily and more quickly. It should compare very favourably with the gate both in initial cost and in maintenance, especially as no stops are required in the road.

32. We have not overlooked the safety of pedestrians, although we feel that their attitude to the level crossing requires to be changed. The belief that pedestrians and particularly children must be afforded full protection against the dangers of the line is nowadays illogical. There are many level crossings where adults and children already have free access to the railway, viz. public level crossings with controlled gates but uncontrolled wickets, footpaths and accommodation and occupation crossings with wicket gates or stiles. Crossings of these types exist on the most important main lines and also on lines electrified on the third rail system. Furthermore, the dangers to which pedestrians are exposed on the roads are at least as great and certainly more frequent than those at level crossings.
With the introduction of lifting barriers at level crossings, and in particular if automatic half-barriers are to be adopted, the principle must be recognised that it is the responsibility of the individual to protect himself from the hazards of the railway in the same way as from the hazards of the road. The attitude of the Dutch to this problem, particularly as regards children, is significant (see paragraph 29).

**Crossings operated at site (i.e. within 50 yards of operator)**

33. In our opinion lifting barriers are suitable for use at almost all level crossings operated by an attendant at the site. The barriers should be of sufficient length to cover the full width of the road or there should be double half-barriers on each side of the track with the half-barriers diagonally opposite each other operating together. The latter system is particularly attractive when road traffic is heavy.

The barriers may be of light construction such as the experimental built-up timber construction used in Holland. There should be light but stiff folding skirts and both barriers and skirts should be made conspicuous by alternate painted red and white stripes; reflectors or reflecting material should also be used on the barriers.

The barriers should be fitted with lights which, except at relatively unimportant crossings and where no power supply is available, should be electric. Red flashing road signals at the side of the highway may also be required in certain conditions of road traffic.

The principles applicable to the interlocking of gates with railway signals should be applied to such barrier crossings.

**Crossings operated remotely**

34. This system eliminates the risk of misunderstandings between signalmen and gatekeepers, which has been the cause of some accidents in recent years, and we consider that it might be employed with safety at certain level crossings. It can effect substantial economies in operation. In general, the crossings should be on relatively unimportant roads and within a quarter of a mile of and in view from the point of operation. Where road traffic is very light an “on call” crossing (barriers normally closed to the road) at a greater distance and out of sight of the operator might be considered.

We agree with the Dutch objection to remotely controlled half-barriers and consider that only full length barriers covering the whole width of the road or double half-barriers worked as at a manned crossing should be used. Except where road traffic is very light the barriers should normally be open to the road and be interlocked with railway signals.

Adequate devices in the form of flashing road signals, lights on the barriers, or bells, or a combination of these, should be provided to give sufficient warning of the lowering of the barriers. Safety bays will not usually be necessary but a lowered barrier must be capable of being lifted by hand, and there must be other safeguards, e.g. some emergency means of communication between a road user and the operator.

We think also that experiments should be made with the German type two-way loudspeakers at “on call” crossings; if successful, this system may be worth considering for use at “on call” level crossings out of sight from the point of operation.

We note that an experiment is being carried out at a level crossing in France with closed circuit commercial television. This equipment is expensive and has some other disadvantages; nevertheless we consider that its development should be watched with a possible view to similar experiments in Great Britain.

**Crossings operated automatically**

35. The automatic half-barrier equipment which has been developed in recent years on the Continent has undoubtedly been successful. In France the accident record at the 700 crossings so equipped has been satisfactory taking into account the fact that the public are not yet fully educated to them, and there have been only two accidents at the crossings fitted with automatic half-barriers in Holland and none at the experimental installations in Germany. We believe that this type of protection, which has also been in use in the U.S.A. for some years, will prove to be safe in this country.

This type of barrier spans only part of the road and leaves the exit side unbarred, and consequently there is no danger of a motorist being trapped on the crossing. The obstacle is, however, mainly psychological and the barriers can be circumvented with ease by an impatient motorist. It is necessary therefore that the way in which they fall shall present an unvarying and urgent warning to the road user which he dare not disobey. To achieve this the barriers must be timed to fall so that a train will invariably pass within a few seconds; they must also be timed to rise immediately after the train has passed. This fine timing can be achieved only with automatic operation, and the lowering of the barriers must be regarded by road users as an immediate danger signal. The fine timing also precludes the use of protecting railway signals.

We consider that the timing adopted for automatic half-barriers in Holland and France is appropriate. It will be remembered that in Holland the introduction of barriers reduced average delays at crossings from 3-4 minutes or more to some 45 seconds, and we feel convinced that such substantial reductions combined with the unmistakable warning given by the flashing lights and the fall of the half-barriers immediately before the arrival of the train will tend to decrease the incentive to disobedience by road users.

We note the Dutch and French view that automatic operation is more reliable than human operation and that the same conclusion was reached by Mr. W. J. Hedley, of the Wabash Railroad Company, U.S.A., in his “Second Report on the Achievement of Grade Crossing Protection.” We share that view but we must point out that it is the exception rather than the rule for the barriers at crossings in Holland and France to be interlocked with railway signals and the human element therefore plays a more important part in achieving safety than it does in Great Britain, where at the majority of crossings the gates and signals are interlocked. As mentioned earlier the safety record over the years at public level crossings in Great Britain
has been very good but there have been accidents arising from errors by gatekeepers and from misunderstandings between signalmen and gatekeepers; furthermore, British Railways are finding it increasingly difficult to obtain reliable men as gatekeepers, especially for relief purposes.

For these reasons we do not think that, on balance, safety would be any less with automatic operation. This method of control would undoubtedly benefit road traffic substantially and result in economies to the British Transport Commission. We recommend therefore that trials should be carried out in Great Britain at crossings with a road user of say 500-1,000 vehicles a day which do not have a high pedestrian or cycle user. It will be necessary for the crossings to be carefully selected and for the new equipment to be given thorough publicity.

The type of half-barrier equipment which we have in mind combines some of the features of both the Dutch and French types and incorporates twin red flashing lights and bells. Adequate safeguards against failure of the power supply or equipment will be necessary.

Open crossings

36. We do not recommend the use of open level crossings without gates or barriers and with or without red flashing road signals and/or bells, except in cases where rail traffic and, generally, road traffic is light and where the speed of trains approaching the crossing is reduced to not more than 10 m.p.h. An adequate view from the road of approaching trains is an essential requirement.

Where, however, rail movements are exceptionally light and trains can be brought to a stand, an open crossing with or without flashing road signals and/or bells might be considered on a road carrying moderate traffic. In such cases a more restricted view of trains would be acceptable. A crossing of this type is used in Holland on a road carrying heavy and fast traffic, with satisfactory results.

It should be mentioned here that there are a considerable number of open crossings without any protection already in existence in Great Britain on railways worked under Light Railway Orders.

General

37. We think that the Continental practice of using the St. Andrew's cross at all open and automatic half-barrier crossings should be adopted and we also attach considerable importance to advance road warning signs which should be of the approved type. The signs and crosses should be fitted with reflectors or with reflecting material when necessary. Marker posts as used in Belgium and France may also be beneficial in some cases.

38. Little has been said so far about cattle. The driving of cattle by road to market in Great Britain is nowadays considerably less than in years gone by, but it does still take place; the more frequent movement of cattle along the roads is between the grazing fields and the milking sheds. Cattle are driven along the roads on the Continent but, it seems, to a lesser degree and much milking is done in the fields. In neither Holland nor France, however, does the movement of cattle appear to present a difficult problem at automatic half-barrier crossings, nor at open crossings or remotely controlled full barrier crossings in any of the three countries. Nevertheless it is recognised that special consideration will need to be given to the movement of cattle in the application of some of the Continental methods to level crossings in this country; cattle grids should be provided where necessary to prevent cattle straying on to the lines.

39. It should be realised that if Continental methods are adopted in Great Britain there will be no sudden and wholesale abandonment of the present methods of protection, and the changeover will be gradual; also, that so far as automatic and remote operation are concerned, it will be necessary to proceed with caution.

40. The plain substitution of lifting barriers for gates at attended level crossings is already legal, subject to the approval of the Minister in each individual case. New legislation will, however, be required before automatically operated half-barriers, remotely operated barriers, or the use of open crossings on other than Light Railways can be introduced. We note that the British Transport Commission have included a clause in their present Bill to legalise these systems, with full powers to the Minister of Transport and Civil Aviation to impose such conditions and requirements as he may consider necessary for the protection and safety of the public.

41. In our view it is undesirable that there should be any attempt, for the present at any rate, to devise a formula to determine the degree of protection for crossings. Each case should be decided on its merits, having regard to the above general principles which would be embodied in a code of requirements.

42. We would state in conclusion that we feel that if our recommendations are implemented, level crossings in Great Britain should in the course of time become less of a cause for irritating and unprofitable delays to road users and less of a financial burden on the British Transport Commission. We feel that at the same time the present high standard of safety would not suffer.

D. McMULLEN.
W. P. REED.
R. A. LOVELL.
J. G. TAYLOR.
E. G. BRENTNALL.
L. W. HATLEY.

LONDON,
14th March, 1957.
Dear McMullen,

Before you leave for the Continent I feel that it may be helpful to the party in their work for me to recapitulate very briefly the considerations which have led to the arrangement of this visit to study problems in connection with the design and working of lifting barriers at public road level crossings.

First of all I should say that there is no doubt in anyone's mind of the very high standard of safety to road and rail traffic which has been maintained over the years at our public level crossings with their automatically closing swinging gates worked by gatekeepers or signalmen on the spot. The wisdom of Parliament in insisting on this form of protection by legislation in the early days has thus been well proved in practice, and if it were only a question of safety we should be content to leave things as they are. The cost of providing attendance has, however, risen very greatly in recent years, in some cases as much as tenfold, and furthermore there are growing difficulties in finding reliable men to act as gatekeepers, particularly at relief periods, as some recent accidents have shown. The only solution to these present day problems is to take full advantage of modern technical developments, as is so often done in other spheres.

Some years ago the railways began to consider the simple substitution of lifting barriers for conventional swinging gates as a better engineering proposition to construct, maintain and operate, and an experimental installation has now been in use for some time at Warthill in the North Eastern Region, with the barriers worked from an adjacent signal box and interlocked with the railway signals. The use of attended lifting barriers in this way, subject to the Minister's consent in each individual case, was made legal by the Commission's Act of 1954, and preliminary requirements for their construction, arrangement, and working have been sent to the Commission after agreement with all concerned; they will eventually be incorporated in the Minister's printed Requirements, subject to any modifications which may be desirable in the light of further experience. No important safety principles are affected by the substitution of attended lifting barriers for attended gates.

Only minor economies can result from the mere substitution of lifting barriers for swinging gates, but with lifting barriers, remote or automatic control without attendance at the barriers becomes practicable technically, and the latter type of working has been developed extensively on the Continent and in the U.S.A. The British Transport Commission are therefore anxious to experiment on these lines for British Railways in order to save considerable expenditure, particularly at rural level crossings where the wages which have to be paid are altogether disproportionate to the amount of work a man has to do. It is the Minister's wish that the Commission should be encouraged in this direction. While automatic or remote operation carries some risks of its own, ways can be found to minimise these risks, and on the other side of the scale automatic operation eliminates the possibility of human failure, which has been responsible for some serious accidents at level crossings, including two fatalities in 1955. The law, however, now requires attendance at all public road crossings and the Commission are asking for relief from this provision in their forthcoming Annual Bill, so that they may be free to experiment with automatic or remote control of lifting barriers, subject to any conditions which the Minister may require in each individual case.

There is no experience of unattended lifting barriers in this country, but experience on the Continent of automatic operation is considerable, and there are also some examples of remote control. The main purpose of the visit, therefore, is to study these two methods with all their implications and working results so far, and to consider whether or under what conditions they would be suitable for adoption, on an experimental basis at first, in this country. Apart, however, from automatic and remote control you will also have the opportunity of considering whether the preliminary requirements for attended lifting barriers should be modified as a result of what you have seen.

I could not imagine a more strongly representative or better qualified party for the fulfilment of the objects in view. It has not been formally appointed as a Committee, nor does this seem necessary, but no doubt you will wish to consider yourselves as such, and I would suggest the following broad terms of reference:

(a) To examine and report on the design, general arrangement and methods of operation of protective equipment at Public Road Level Crossings in Holland, Belgium and France, with special reference to lifting barriers, with local attendance and with remote and automatic control.

(b) To consider the comparative efficiency and safety of the various methods adopted.

(c) To make recommendations in principle and detail on the conditions under which Continental practice might be adopted with advantage to economy for the protection of public road level crossings on British Railways, having due regard to the safety of road and rail traffic.

I have good hopes that your report, which I think should be signed by all the members of the party, will provide a firm basis for the determination of future technical policy in the protection of public level crossings in this country, and for any changes in legislation which may be necessary.

I enclose additional copies of this letter which you might like to give to the other members.

Yours sincerely,

(Sgd.) G. R. S. WILSON,

Chief Inspecting Officer of Railways.

Colonel D. McMullen
### BASIC STATISTICS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>HOLLAND</th>
<th>BELGIUM</th>
<th>FRANCE</th>
<th>GREAT BRITAIN</th>
</tr>
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<tbody>
<tr>
<td>(a) Area of country</td>
<td>35,000 sq. km.</td>
<td>30,000 sq. km.</td>
<td>545,000 sq. km.</td>
<td>226,000 sq. km.</td>
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<td>(b) Length of highways systems</td>
<td>38,500 km.</td>
<td>92,000 km.</td>
<td>720,000 km.</td>
<td>303,000 km.</td>
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<td>(c) Number of motor vehicles licensed (4 wheels or more)</td>
<td>320,000</td>
<td>530,000</td>
<td>3,800,000</td>
<td>4,300,000</td>
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<td>(d) Railway route lengths</td>
<td>3,200 km.</td>
<td>4,900 km.</td>
<td>39,800 km.</td>
<td>30,700 km.</td>
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<td>(e) Train km. (1 year)</td>
<td>72 million</td>
<td>78 million</td>
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<td>584 million</td>
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<td>(f) Number of Public Level Crossings</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Manned</td>
<td>Remote operation</td>
<td>Auto-half barriers</td>
<td>Open, with auto-flashing lights only</td>
<td>Open, without half barriers or lights</td>
</tr>
<tr>
<td>526</td>
<td>353</td>
<td>39</td>
<td>196</td>
<td>2,036</td>
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<tr>
<td>Remote operation</td>
<td>Auto-half barriers</td>
<td>Open, with auto-flashing lights only</td>
<td>Open, without barriers or lights, and without speed restriction</td>
<td>Open, without barriers or flashing lights, and without speed restriction (secondary lines)</td>
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<tr>
<td>354</td>
<td>700</td>
<td>387</td>
<td>1,721</td>
<td>304</td>
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<tr>
<td>Auto-half barriers</td>
<td>Open, with auto-flashing lights only</td>
<td>Open, without barriers or flashing lights (on Light Railways only)</td>
<td>Other types (unmanned)</td>
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<tr>
<td>Nil</td>
<td></td>
<td>249</td>
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<tr>
<td>Open, with auto-flashing lights only</td>
<td>Open, without half barriers or lights</td>
<td></td>
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<td>1,488*</td>
<td>11,300</td>
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<td>Total</td>
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<td>3,150</td>
<td>4,305</td>
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<td>(g) Number of private level crossings</td>
<td>3,200</td>
<td>1,041</td>
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**NOTE:**
(i) The figures in columns (b) to (e) inclusive are taken from the Annual Bulletin of Transport Statistics for Europe.
(ii) The figures marked * include a small number of crossings operated by train crews.