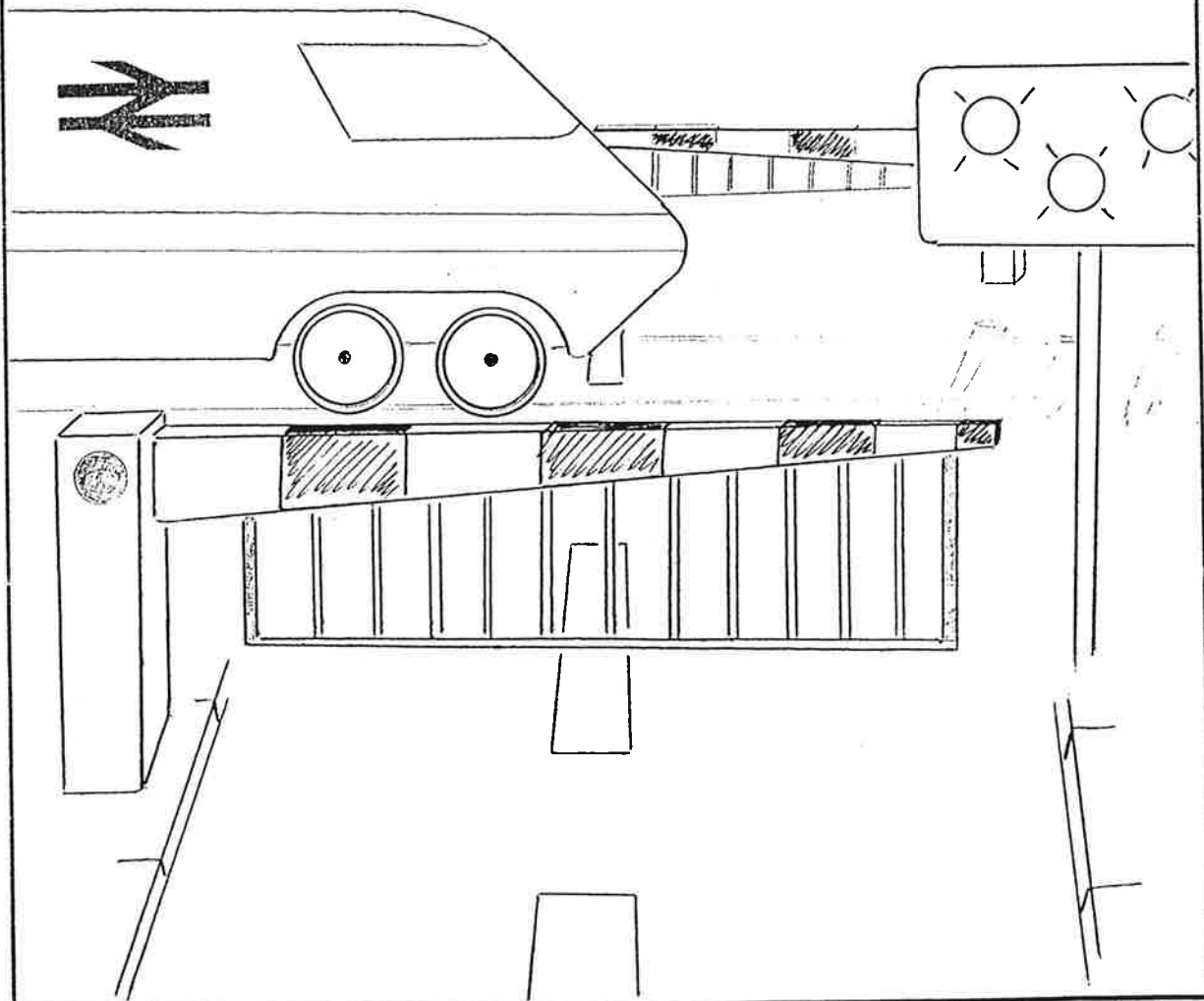


DIRECTOR OF S & T ENGINEERING.  
WEST MIDLANDS PROJECTS GROUP.

*INTRODUCTION TO LEVEL  
CROSSINGS*



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INTRODUCTION TO LEVEL CROSSINGS

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## INTRODUCTION

With the introduction of the steam locomotive in the middle 19th Century, Parliament laid down a statutory obligation on the railway companies to fence off their lines from adjoining lands with continuous fencing, but did not require them to provide a bridge at each intersection of a railway and a public road. This gave way to the possibility of a Level Crossing which would alternatively fence off the road and railway, thus conforming to the continuous fencing requirement.

This gave rise to the “**Level Crossing Act 1839**”. This was followed by the “**Railway Regulation Act of 1842**” which stated that it would more conducive to safety if the gates were kept normally across the road and opened as required. Signalman’s General Instructions No. 43, an extract of which is shown below:-

43

BR 30062  
June, 1988

### Signalmen’s General Instructions

#### 43 WORKING OF LEVEL CROSSINGS WITH GATES

##### 43.1 Working of gates

- 43.1.1 The normal position of gates is closed to road traffic. Where authority is given for the gates to be normally open for road traffic, they must be operated without delaying trains.

Then came the “**Railway clauses Acts of 1845 and 1863**”, the latter forcing the railway companies to erect and maintain a lodge where the railway crosses the road for greater security and safety of the public.

In 1933 the “**Road and Rail Traffic Act**” stated that the Minister of Transport can if requested, direct that the gates at any level crossing over a public road shall be kept normally closed across the railway instead of previously across the road.

The “**British Transport Commission Act 1954 (Section 40 for Public Road and Section 41 for Private Roads)**” gave power to substitute lifting barriers for gates and the provisions of “**Level Crossing Acts 1839 and 1845**” ceased to apply.

The “**British Transport Commission Act 1957 (Section 66)**” supported the 1954 Act but had a much wider application enabling the Minister to dispense with the obligations to provide a lodge and resident crossing keeper. Furthermore the company need not provide gates which fence off the railway as well as the road or provide gates at all.

This enabled the “open crossing” to be considered.

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The “**1968 Transport Act (Section 124)**” gave the railway company freedom to apply for an order to change the means of protection at a Private Road Level Crossing with a general public usage. A private road with an authorised user does not require a 124 Order but does require Health and Safety Executive (HSE) approval.

The “**Level Crossing Act 1983**” was introduced originally for Private Railway Crossing’s but is now often used instead of a Section 66 as it is the latest legislation for level crossings.

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INTRODUCTION TO LEVEL CROSSINGS

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## DEVELOPING A SCHEME FOR LEVEL CROSSING IMPROVEMENTS

A Site Meeting is called by BR-Regional Operating Manager (ROM) with the Health and Safety Executive (Railway Inspectorate and Regional Office or Welsh Office), Highway Authority, Local Authorities, Police, Farmers Union, Parish Councils and Railway Departments.

Before this meeting British Rail will have carried out a census of road and rail traffic and detailed road and rail characteristics. The meeting is "chaired" by the Health and Safety Executive Inspecting Officer and the details of the operation of equipment will be described.

Financial and technical details are discussed and all parties are invited to discuss the proposals at length. If the Local Authority has any proposals for a road improvement or re-alignment scheme he is asked for details in order that they can be included in the proposals.

Minutes are produced and issued by BR-ROM to all concerned. The ultimate decision as to the type of protection to be provided is made by the BR-ROM.

The layout drawing is then produced by BR Director of S & T Engineering depicting the proposed layout of equipment, road signs and markings at the crossing. The layout is circulated to Railway Departments for estimating (RCE, AS & TE and M & EE) and to Chief Estate Surveyor to assess involvement with BR boundaries.

The layout is issued to the Health and Safety Executive (Railway Inspectorate and the Regional/Welsh Office), and also the Local Authority for their approval. On receiving this approval the BR Director S & T Engineering drafts out the crossing (Section 66 or 1983 etc.) order and issues to BR-ROM who submit it via the BR Solicitor to the Health and Safety executive for official issue. The commissioning date has to be stated on the Order. Six weeks are allowed for objections and publicity. The 2nd and 3rd Schedules of the Order detail arrangements of equipment and the layout drawing also accompanies the Order.

When the Health and Safety Executive issues the "Order", six copies are required for authorisation of Traffic Signs. The Health and Safety Executive sends copies of the "Authorisation of Traffic Signs" to the British Rail solicitor and the "Order" is distributed to Local Authorities with the layout drawing.

Final layouts are issued to Railway Departments for installation purposes, which cannot be carried out until the signed "Order" is received.

When the installation is complete the Health and Safety Executive (Railway Inspectorate) is contacted to arrange an official inspection.

Attendance is left at the crossing until the Inspecting Officer has confirmed that the installation is in accordance with the signed "Order".

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## TYPES OF LEVEL CROSSINGS

In 1981 The Department of Transport issued new requirements in respect of Level Crossing protection which superseded all previous requirements. All new Level Crossings must be statutorily authorised and their protection arrangements approved by the Secretary of State for Transport.

The types of Level Crossings are as follows:-

### 1. MANUALLY CONTROLLED GATED CROSSING (GATES)

The crossings are acceptable for all locations and all conditions of rail and road traffic.

The gates must completely fence off the railway when open to road traffic. The gates swing alternatively across the road and railway and protecting railway STOP signals interlocked with the gates are required unless the crossing is to be worked by Train Crews.

Most of all these crossings are now being replaced by Barriers or Open Crossings in the interest of both safety and high maintenance costs.

### 2. MANUALLY CONTROLLED BARRIER CROSSING (MCB) (SEE FIGURE 1)

These crossings are acceptable for all crossings as an alternative to gates and as with gates the barriers, usually with skirts, extend across the whole width of the carriageway. They are usually equipped with Steady Amber/Flashing Red Road Traffic Signals on each side of the road and rail.

These crossings may be controlled by one of the following methods:-

- a. Manned Barrier Crossing - by a signaller or crossing keeper situated within 50 m of the crossing and with a clear view of it.
- b. Remote Barrier Crossing - by a signaller or crossing keeper situated within 400 m of the crossing and with a clear view of it in normal weather conditions.
- c. CCTV Monitored - by a signaller or crossing keeper with the use of closed circuit television.
- d. Staff Operated Crossing - by other authorised staff from a point within a clear view of it.
- e. Trainman Operated Barrier Crossing - by a trainman or other staff after the train has been stopped short of the crossing from a point adjacent to it and with a clear view of it.

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**INTRODUCTION TO LEVEL CROSSINGS**

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The barriers shall extend across the full width of the carriageway and over footpaths if provided. Wicket gates which must be locked can also be provided but not at CCTV or Remote Crossings. The barrier top, when lowered, must not be less than 900 mm above road surface.

Two red lights (3 on barriers over 6 m in length) shall be provided on each barrier, 1 light must be within 150 mm of barrier tip. Each barrier shall display alternative red and white bands, 600 mm on each side of the barrier, the red being retro-reflective for 50 mm (minimum) depth.

Cattle guards 2.6 m minimum width should be provided if a significant movement of cattle on hoof occurs over the crossing or if there is a serious risk of trespass.

**Operating Cycle:-**

Amber lights show and audible warning begins. After 3 seconds amber lights go out and red flashing lights commence. After 4-6 seconds the barriers start to descend. Each barrier descent time is 6-10 seconds. If 2 barriers are provided on 1 side of the railway the offside barriers shall not descend until the nearside ones are completely lowered. When all barriers are down the audible warning stops but the red lights continue to flash. All barriers rise simultaneously and red lights shall be extinguished before barriers have risen to 45° from horizontal.

**3. AUTOMATIC HALF BARRIER CROSSING (AHB) (SEE FIGURE 2)**

These consist of barriers and steady amber/flashing red road signals. The barriers must be pivoted on the nearside of the road and extend across the nearside of the carriageway only leaving the exits clear. The operating sequence is initiated automatically by the train as it approaches the crossing. AHB's can only be provided if:-

- a. Maximum speed of trains is 100 mph.
- b. No more than 2 running and 2 other lines.
- c. Carriageway is wide enough on approaches to enable vehicles to pass.
- d. Vertical profile of road over crossing be such to avoid low vehicle grounding.
- e. Road layout and traffic conditions shall be such to avoid "blocking back" over the railway.

The barriers are positioned at right angles to the road if possible and do not have skirts otherwise their construction is the same as for the MCB.

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Cattle guards may be provided if a serious risk of trespass is evident or there is a movement of cattle on hoof over the crossing.

Telephones for public use are always provided.

**Operating Cycles:-**

Amber lights show and audible warning device sounds. After 3 seconds amber lights go out and red lights flash. After 4-6 seconds barriers start to descend and are fully lowered in 6-8 seconds. Trains shall not arrive at the crossing in less than 27 seconds after the amber lights first show. The barriers shall rise and audible warning cease as soon as the train has cleared the crossing. The red flashing lights shall be extinguished before barriers have risen above 45° to the horizontal.

Section "e" of the above refers to:-

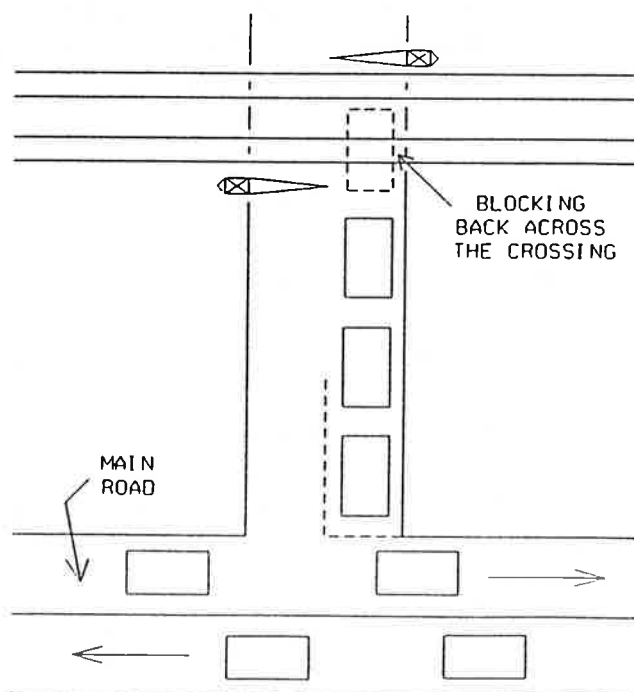
"Road layout and traffic conditions shall be such to avoid "blocking back" over the railway."

What does "blocking back" mean?

Blocking back can occur where a crossing is situated near to a road junction. The diagram below shows an example of "blocking back".

What has happened is that the road traffic is unable to flow out, onto the main road and is "blocking back" onto the crossing, creating obvious problems to road and rail traffic.

**BLOCKING BACK**



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4. **AUTOMATIC OPEN CROSSING LOCALLY MONITORED (AOCL)  
(SEE FIGURES 3 & 4)**

This type of crossing consists of road traffic light signals on each side of the road and railway with audible warning devices usually on the primary signal. The trains pass over the crossing at the "crossing speed" and the warning sequence is initiated automatically by the approaching train driver who can halt his train short of the crossing if the equipment at the crossing is not functioning.

ACOL's can only be provided if:-

- a. Maximum train speed is 55 mph and the driver must be able to stop short of the crossing from a point at which the crossing comes fully into view.
- b. No more than 2 running lines and 2 other lines.
- c. The driver shall normally be at the front of the train.
- d. The carriageway on approaches is wide enough for vehicles to pass safely.
- e. Although there is no limit to the amount of road traffic there should be no danger of vehicles "blocking back" over the crossing.

Cattle guards can be provided if a serious risk of trespass is evident or if there are movement of cattle on hoof over the crossing.

Telephones are not normally provided but a notice shall give drivers a public telephone number for contacting BR.

**Operating Cycle:-**

Amber lights show and audible warning device sounds. After 3 seconds amber lights go out and red lights flash. The trains shall not arrive at the crossing in less than 27 seconds after the amber lights first show.

The train driver will get a flashing white signal located just before the crossing which will allow him to proceed, if he does not get this signal he will stop short of the crossing.

The red lights and audible warnings shall cease as soon as the train has cleared the crossing. At all times that the flashing white signal is not showing, then a flashing red signal, located on the same post shall be displayed.



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5. **AUTOMATIC BARRIER CROSSING LOCALLY MONITORED (ABCL)  
(SEE FIGURE 2)**

The equipment here is similar to that at an AHB but as with the AOCL it is monitored by the train driver. The location and construction of barriers and lights are the same as the AHB. Audible warning devices are also provided. The trains pass over the crossing at the "crossing speed" and the warning sequence is initiated automatically by the approaching train. The equipment at the crossing is monitored by the train driver who can halt his train short of the crossing if the equipment at the crossing is not functioning.

ABCL's can only be provided if:-

- a. Maximum speed of trains is 55 mph and the driver must be able to stop short of the crossing from a point at which the crossing comes full into view.
- b. No more than 2 running and 2 other lines.
- c. The driver shall normally be at the leading end of the train.
- d. The carriageway on approaches is wide enough for vehicles to pass safely.
- e. Although no limit to the amount of road traffic, there should be no danger of vehicles "blocking back" over the crossing.

The construction and location of barriers shall be the same as the AHB.

Cattle guards can be provided if trespass or cattle movement is evident.

Telephones for public use are always provided near each duplicate primary traffic light signal.

**Operating Cycle:-**

Amber lights show and audible warning begins. After 3 seconds amber lights go out and red flashing lights commence. After 4-6 seconds the barriers start to descend and are fully lowered in 6-8 seconds. Trains shall not arrive in less than 27 seconds after amber light first shows. The barriers shall rise and audible warning cease as soon as the train has cleared the crossing. The red flashing lights shall be extinguished before the barriers have risen above 45° to the horizontal.

The train driver will get a flashing white signal located just before the crossing which will allow him to proceed, if he does not get this signal he will stop short of the crossing. At all times that this flashing white signal is not showing, then a flashing red signal, located on the same post, shall be displayed.

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**6. OPEN CROSSING (OC) (SEE FIGURE 5)**

This crossing has no lights or barriers and requires road users to give way to trains and therefore must be able to see approaching trains in sufficient time to enable them to stop safely. Trains either approach the crossing at 10 mph (the preferred arrangement) or stop at at stop board 25 m from it (if road and rail visibility is poor).

OC's can only be provided if:-

- a. There is only normally one line over the crossing.
- b. The maximum daily traffic moment is not more than 2000 and the peak hour traffic movement not more than 30 and the maximum daily road user 200. The 85% ile road speed at the crossing should be less than 35 mph (the traffic moment = number of trains x number of road vehicles in a specified period).
- c. There should be no danger of "blocking back" of road vehicles.
- d. Driver should normally be at leading end of train.

Telephones are not normally provided but a notice shall give a road user a public telephone number for contacting BR.

Cattle guards can be provided if trespass or cattle movements are evident.

**7. USER WORKED GATES OR BARRIERS (UWC)**

This crossing has gates or barriers at Public Level Crossings, or Private Level Crossings with a significant public "usage". If gates are used they must open away from the railway. The road user must operate the gates or barriers himself. Telephones are provided and users with vehicles or animals are requested to telephone before crossing.

UWC's can only be provided if:-

- a. Road traffic does not exceed about 20 vehicle a day, local in character, although there are no limitations upon rail traffic.
- b. Traffic shall be able to pass safely on the approaches to the crossing. Whistle boards must be provided 7-10 seconds running distance for the fastest train from the crossing unless an audible warning is given at the crossing.

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**8. MINIATURE WARNING LIGHTS (MWL)**

These crossings consist of miniature red and green lights which can be used with UWC and at footpaths and bridleway crossings. The green light normally shows but an approaching train changes the light to red.

MWL's are not suitable for public vehicle level crossings. They are suitable for use at heavily used footpath and bridleway crossings where line speeds are high and at private vehicular crossings. Telephones may be required.

**Operating Cycle:-**

The warning lights shall be operated automatically by the approaching train, the green light always showing until the red light appears. For footpath crossings the red light must show normally for 20 seconds and at bridleway and vehicular crossings for about 40 seconds before a train running at the fastest permitted speed can reach the crossing.

If whistle boards are provided they must be 10 ± 2 seconds running time from crossing.

**9. AUTOMATIC OPEN CROSSING REMOTELY MONITORED (AOCR)**

Although Department of Transport requirements exist for this type of crossing it is not anticipated that we will provide any new ones in light of the Lockington AOCR accident of 26-7-86 and in fact all those now in existence on the LM Region are programmed for renewal with an alternative form of protection.

**NOTES**

In addition to the above types of protection there are private crossings which come into 2 categories and consist of gates opening away from the railway.

**OCCUPATION**

This private crossing is one which gives landowners etc. access to their property.

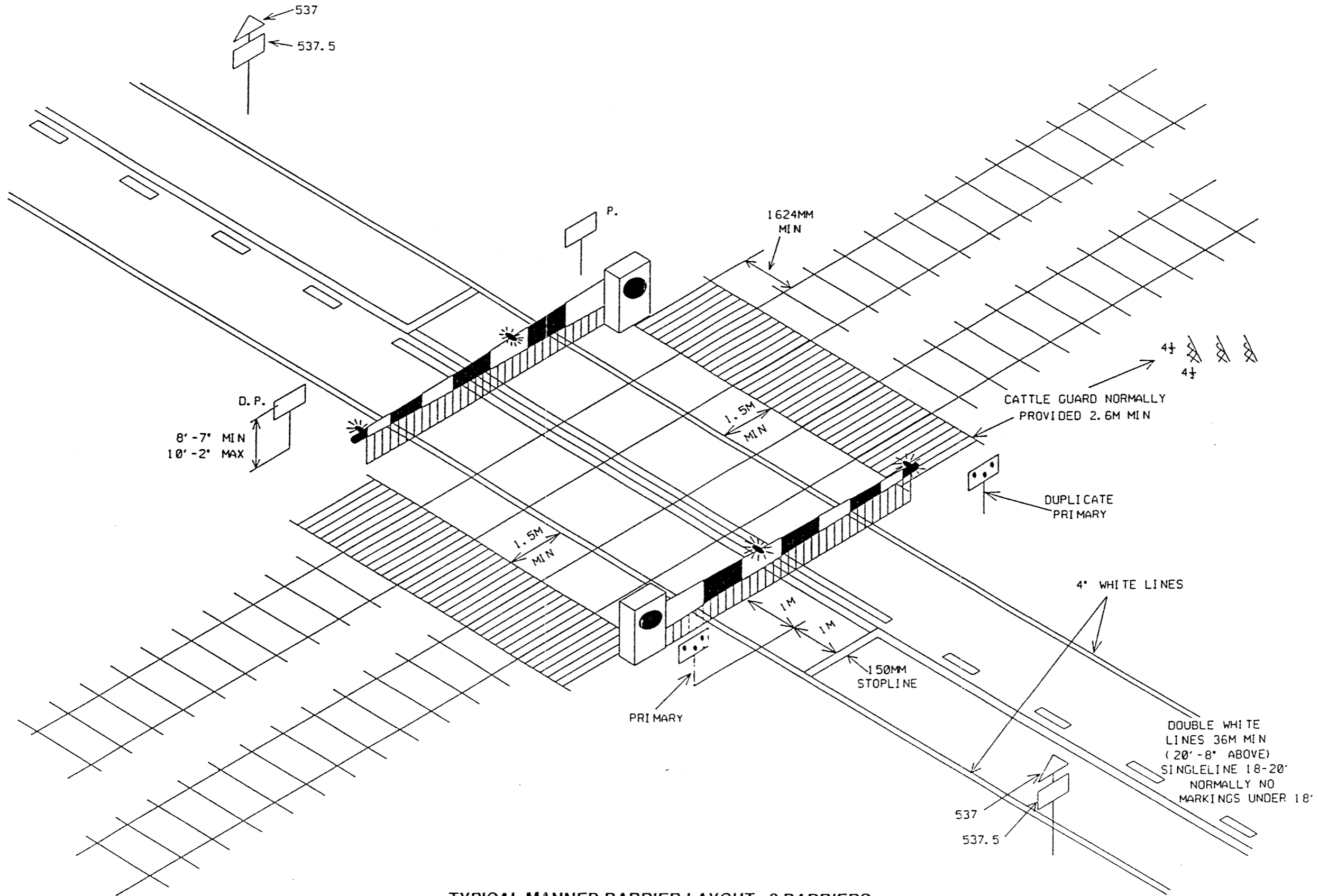
**ACCOMMODATION**

This private crossing is one which gives a landowner access over the railway between fields which are both owned by the same person.

If the land on each side of the line ceases to be owned by the same person the railway has the right to close the crossing.

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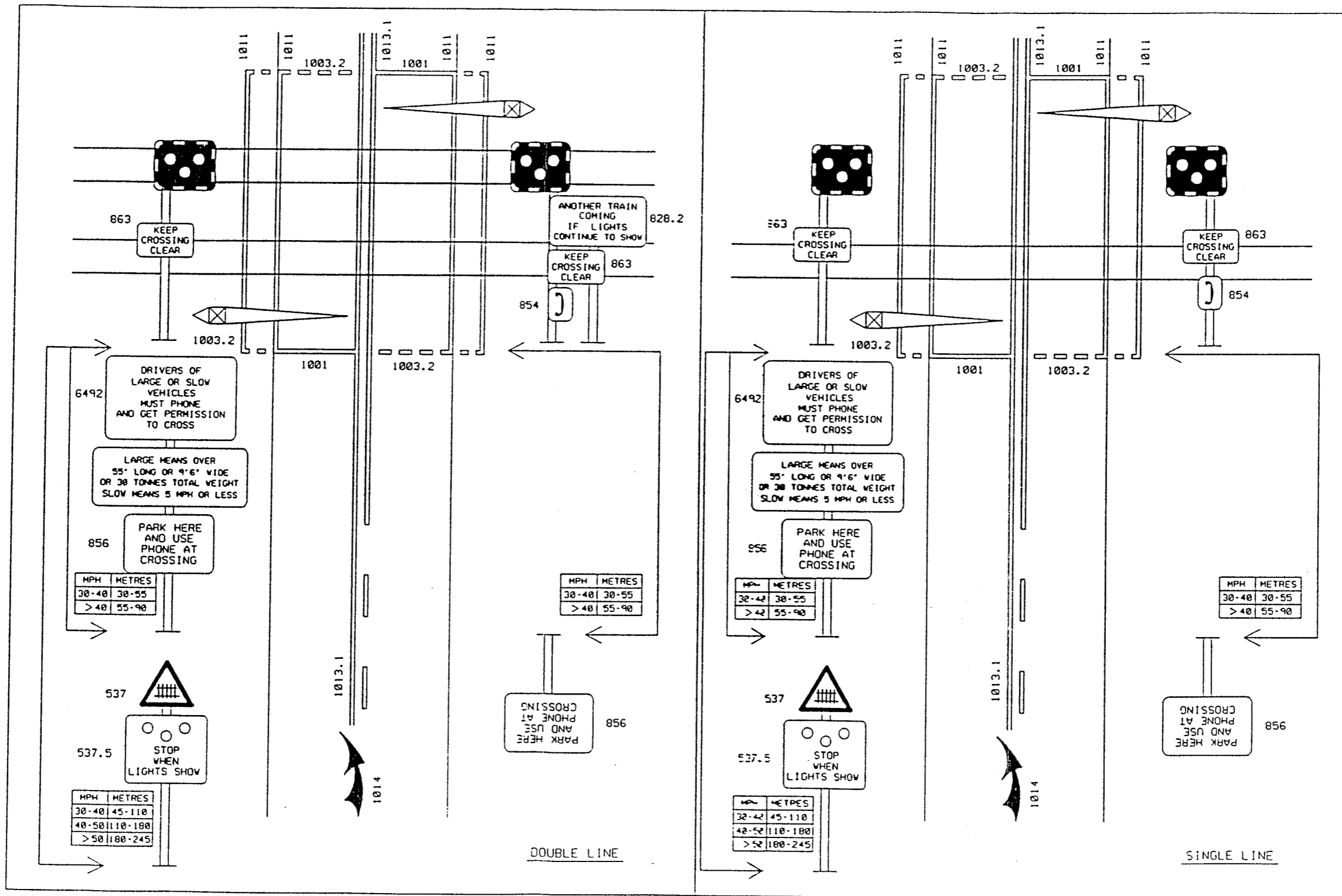
FIGURE 1.



TYPICAL MANNED BARRIER LAYOUT - 2 BARRIERS

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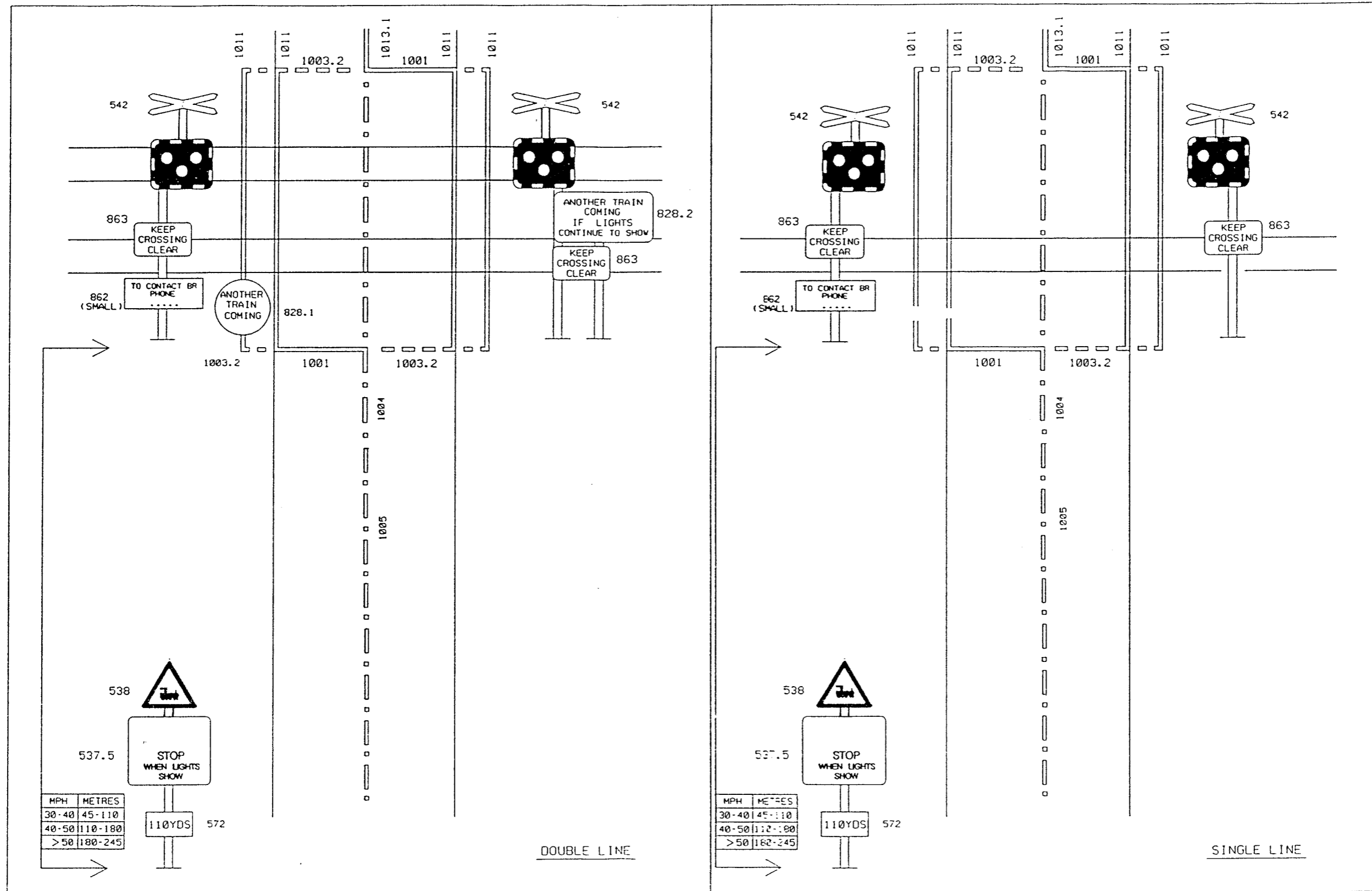
FIGURE 2.



AUTOMATIC HALF BARRIER (AHB)  
AND  
AUTOMATIC BARRIER CROSSING LOCALLY MONITORED (ABCL)

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FIGURE 3.

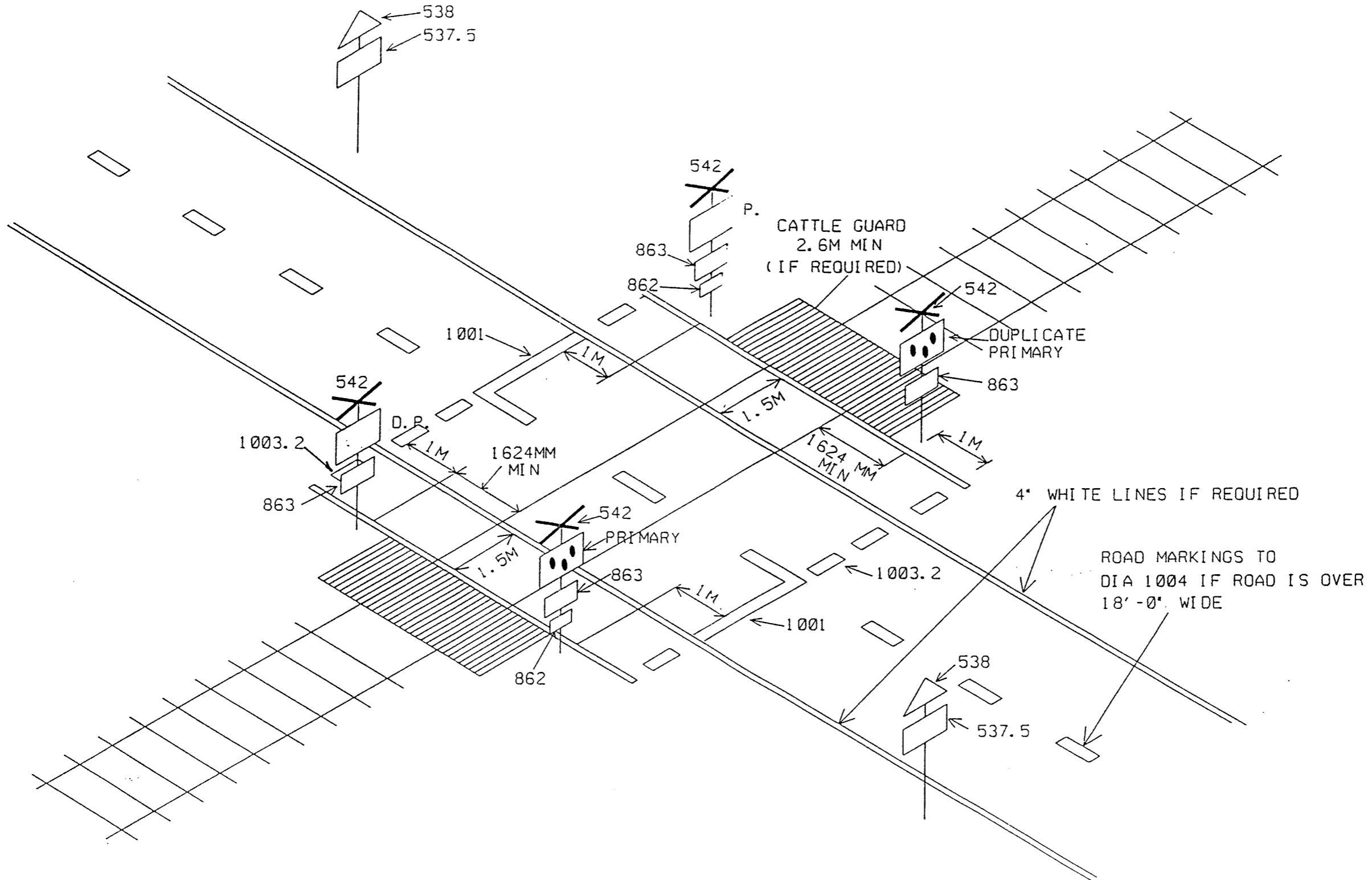


AUTOMATIC OPEN CROSSING - LOCALLY MONITORED (AOCL)

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NOTE: AUDIBLE WARNING DEVICE TO BE PROVIDED ADJACENT TO EACH PRIMARY LIGHT SIGNAL

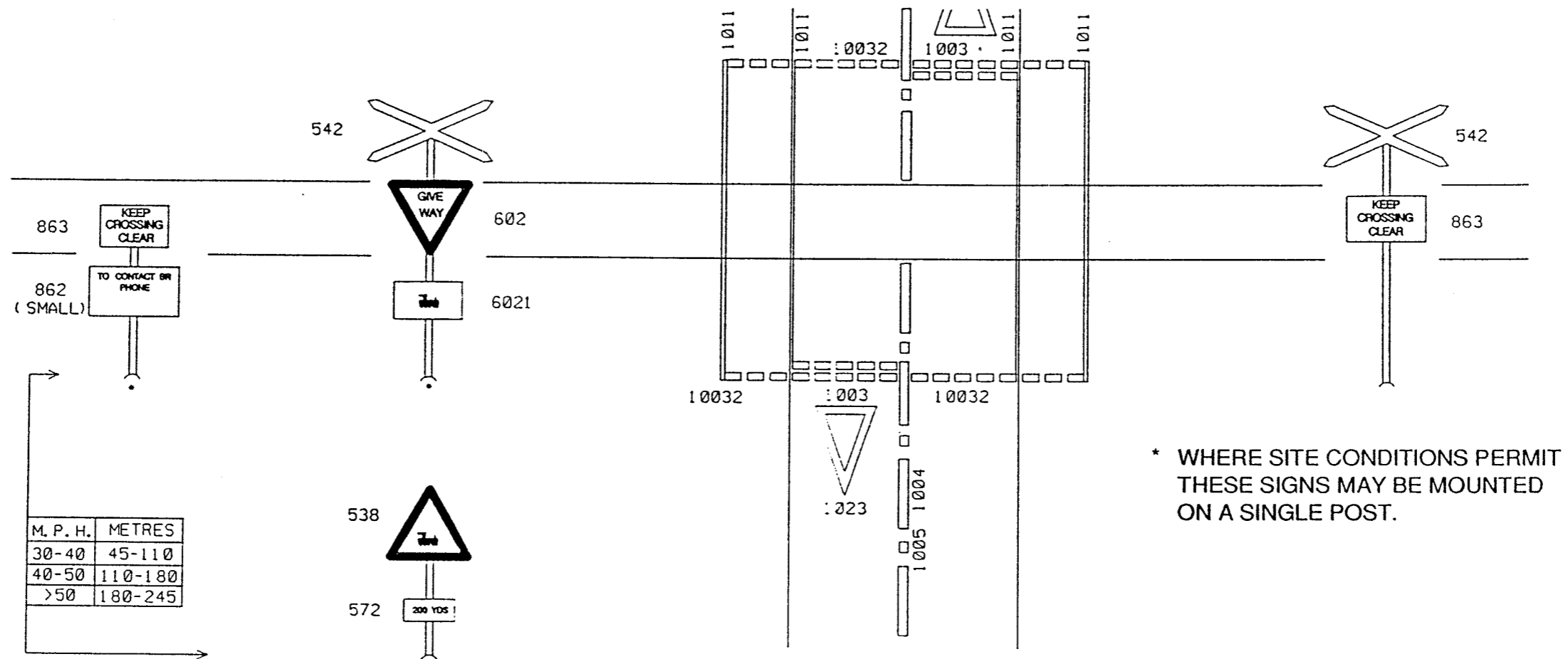
FIGURE 4.



AUTOMATIC OPEN CROSSING LOCALLY MONITORED (AOCL)

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FIGURE 5.



OPEN CROSSING (OC)