

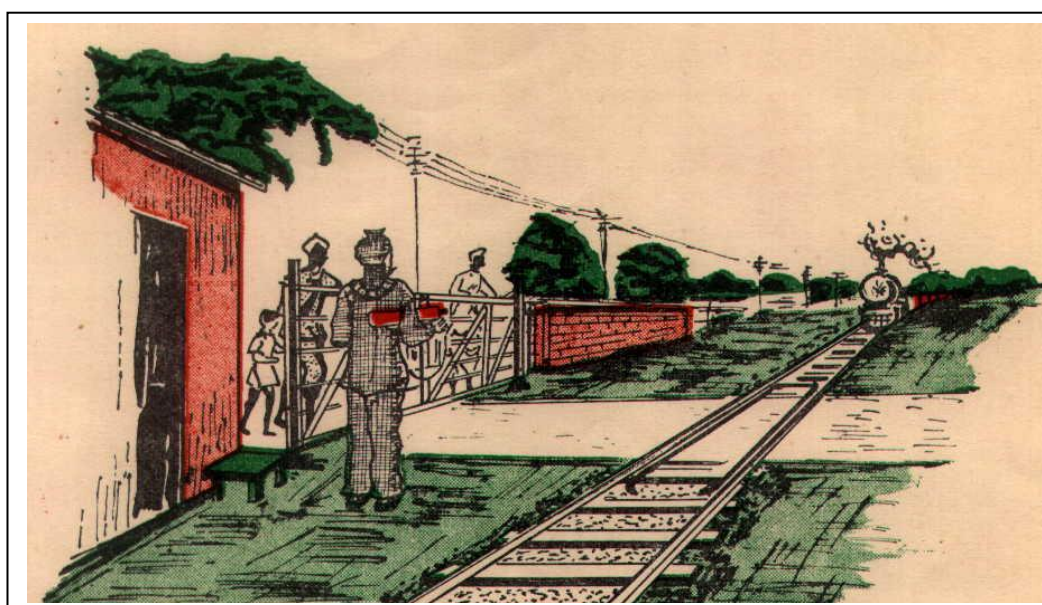
(For official use only)



सत्यमेव जयते

Government of India - Ministry of Railways

LEVEL CROSSING



CAMTECH/2009/C/L-XING/1.0

March – 2009

Centre
for
Advanced
Maintenance
TECHnology



Excellence in Maintenance

Maharajpur, Gwalior - 474 005

LEVEL CROSSING

Foreword

India is a thickly populated country with increasing demand for transportation, both rail and road traffic is continuously increasing. This has necessitated construction of very large number of level crossings on railway track. Due to astronomical number of level crossings in our country, it has not been possible to man each and every level crossing. Therefore, we have both manned as well as unmanned level crossings.

To ensure safety of road as well as rail passengers, it is utmost important to maintain level crossings impeccably. It is in this direction that handbook on level crossings has been prepared by CAMTECH.

The book incorporates all important aspects of level crossing maintenance and operation including list of equipments, requirements of indicator etc. The book also incorporates useful drawings for important items such as speed breakers, indicators etc. With these extremely useful topics, I am sure this handbook will prove to be extremely useful to the field staff at all levels and will serve as a reference to the operating and maintenance staff.

We welcome any suggestions from our readers for further improvement.

CAMTECH/Gwalior
Date : 27.03.2009

S.C.Singhal
Executive Director

Preface

Indian Railways is experiencing a period of continuous growth both in freight and passenger traffic. This increasing demand is being met by more intensive utilization of the railway assets.

Railway men often get baffled when an accident occur on a reasonably well maintained track & vehicle. Level crossing is the location, where most of the accident attributed to road users. Even then railways suffers badly. The handbook on level crossing is expected to fully meet the requirement of Railway men working on Indian Railway on the construction, maintenance and operation fields.

In addition to providing the necessary technical details about the level crossing, the theory behind its development has also been presented in a simple way to use for the civil engineering personnel.

This handbook is aimed at assisting the field maintenance staff. It is and should be used only as a compliment in the daily routine to enhance the safety on Level Crossing.

This handbook is prepared with the objective to provide informative technical details on '*Level Crossing*' for the guidance of civil engineering personnel involved in operating and maintenance.

This handbook does not supersede any existing instructions from Railway Board, RDSO & Zonal Railways and the provisions of IRPWM, BIS codes & reports on the subject. *This handbook is not statutory and contents are only for the purpose of guidance.* Most of the data & information mentioned herein are available in some form or the other in various books and other printed matter.

We welcome any suggestions from our readers for further improvement.

CAMTECH/Gwalior
Date : 26.02.2009

Sushil Kumar
Director/Civil

CONTENTS

Sr. No.	Topic	Page Nos.
	Foreword	<i>i</i>
	Preface	<i>ii</i>
	Contents	<i>iii</i>
	Correction slip	<i>iv</i>
1.0	Classification of level crossing	1
2.0	Gates & Locking arrangements	1
3.0	Skew level crossing	2
4.0	Gate lamp and blinders	2
5.0	Traffic and Engineering gates	2
6.0	Equipments at level crossing	2
7.0	Maintenance & Inspection of level crossing	4
8.0	Visibility requirements for un-manned level crossing	5
9.0	Census of traffic at level crossing	5
10.0	Level crossing indicators	6
11.0	Speed Breakers	7
12.0	Protection of level crossing	10
13.0	Common problems at level crossing	11
	Notes	

[Go to index](#)

Introduction

Level crossings are provided on the railway lines to pass the road traffic across the track. As the road traffic passes at the same level on that of the railway track, the crossing is termed as level crossing. Other type of crossings are Road Over Bridge (ROB) or Road Under Bridge (RUB), where the road traffic passes over or under the railway track.

1.0 Classification of Level Crossings

- (1) The classification of level crossings should be settled in consultation with the Road authorities concerned keeping in view the class of the road, visibility conditions, the volume of the road traffic and the number of trains passing over the level crossing.
- (2) The classification of level crossings shall be as under-
 - (a) Special: for roads- TVUs > 50,000
 - (b) 'A' Class.....: for roads- TVUs > 30,000 but < 50,000
 - (c) 'B' Class: for roads- TVUs > 20,000
 - (d) 'C' Class: for roads- All other L-xings for road not covered above.
 - (e) 'D' Class.....: for cattle crossings.
- (3) Level crossings over colliery, factory and other similar sidings where railway traffic is light may however be dealt with according to local conditions, subject to the approval of the Commissioner of Railway Safety concerned being obtained in each case to the measures adopted for the safe working of trains over the crossing.

2.0 Gates and locking arrangements

- 2.1 **Gates** : The gates may be in the form of chains, lifting barriers or movable gates of approved design.
- 2.2 **Locking arrangements** : Lifting type barriers, swing gates or chains when closed against road traffic shall be securely locked. When the locking arrangement is of the hasp and staple type with padlocks, two spare chains with loops at both ends should be provided for locking the gates when the locking arrangement goes out of order.

In the case of all manned level crossings, two long spare chains with loops at both the ends, should be kept as a reserve for use as an alternate to the barrier/gate, in case of damage to them. Two discs painted red with the words "stop" with arrangements for fixing them to the ground should also form part of

the spare equipment. Separate rail posts should be erected near the gate, so that the chains can be fixed on them.

3.0 Skew level crossings

All roads should preferably cross the railway line at right angles. In special cases when modification is required to suit the road approaches the angle of crossing should not be less than 45 degree and at all level crossings, the gate posts shall be fixed square to the road.

4.0 Gate Lamps and Blinders

Fixture of gate lamps and indicators to road users.- Gate lamp should be mounted preferably in rectangular sockets over gates so as to give correct indication to road users. The lamp should be lighted by the gateman at sunset and remain lighted till sunrise. All gate lamps should be provided blinders.

5.0 Traffic and Engineering Gates

Traffic Gates -

The manning and operation of the gates at level crossings located between the outermost stop signals shall be under the control of Operating Department. The level crossings and structures pertaining there to shall be maintained by the Engineering Department.

When protected by signals the equipment shall be governed by the signals of the station/block hut and the operation as per the station working rules.

Engineering Gates -

Level crossings beyond the outermost stop signals shall be under the control of the Permanent Way Inspectors (PWI) both as regards to their operation and maintenance.

6.0 Equipment at Level Crossings

The equipment for a manned level crossing shall be as follows; in addition to such others as may be prescribed by special instructions:

- (a) 2 hand signal lamps, tricolor provided with bright reflectors;
- (b) 1 hand signal flag, green;
- (c) 2 hand signal flags, red;
- (d) 1 staff suitable for exhibition of red lamp or red flag;
- (e) 2 long spare chains with "stop" marked disc attachment at the center to cover the full width of the gate, for use in case the gates/barriers are damaged;
- (f) 2 spare small chains and padlocks for locking gates, in case locking arrangements of gates become defective;

- (g) 12 detonators;
- (h) 1 tin case for flags;
- (i) 1 canister for muster sheet;
- (j) 1 tin case for detonators;
- (k) 1 can for oil;
- (l) 1 tommy bar;
- (m) 1 water pot or bucket;
- (n) 1 mortar pan;
- (o) 1 powrah;
- (p) 1 rammer;
- (q) 1 pick axe;
- (r) 1 tool list (with columns drawn for checking of tools);
- (s) 1 book of safety rules in Hindi or regional language;
- (t) Duty roster;
- (u) Complaint book for road users;
- (v) Inspection register;
- (w) Level crossing working instructions (in local language) where applicable;
- (x) Two gate lamps;
- (y) Gatemen working on double line/multiple lines, ghats, suburban and automatic block territories shall be provided with three fusees. Gatemen working on single line sections shall be supplied with one fusee;
- (z) Diagram indicating the method of protection to be adopted, in case of obstruction in the level crossing;
- z(i) Wall clocks in gate-lodges at all manned level crossings to enable the gateman to correctly record the time of exchange of private number, expected and actual time of passage of train, time for opening and closing of level crossing, etc.;

In addition to this sufficient stock of kerosene oil and match at the gate lodge. Quantity of detonator, signal flags/ lamps may increase suitably in the case of level crossings in multiple lines.

[Go to index](#)

7.0 Maintenance and Inspection of Level Crossing

7.1 Clearing of trees and bushes: All trees, bushes or undergrowth that interfere or tend to interfere with the view from the Railway or roadway when approaching level crossings, should be cut down.

7.2 Overhauling of level crossing: The level crossings having sleeper other than concrete sleepers overhauled at least once a year or more frequently, as necessary.

However level crossings laid on concrete sleepers should be overhauled with each cycle of machine packing or more frequently as warranted by conditions and in no case, should be delayed by more than two years.

During overhauling, the condition of sleepers and fastening, rails and fastening should be examined. The wooden sleepers be given a coat of coal tar.

7.3 Maintenance of rail track: In all cases, rail and fastening in contact with road shall be thoroughly cleaned with wire brush and a coat of coal tar applied. Flange way clearance, cross levels, gauge and alignment should be checked and correct as necessary, and the track packed thoroughly before reopening the level crossing for road traffic.

7.4 Maintenance of check rails: Check rails of level crossings are required to be removed for tamping, overhauling distressing, track renewal and should be re-fixed as quickly as possible preferably before leaving site. In case check rails cannot be fixed a speed restriction of 30 kmph. will follow, a standing watch man shall be posted to ensure safety besides arrangement for diverting the passage of road traffic.

7.5 Clearance of check rails at level crossings

Item	BG	MG	NG
Minimum clearance of check rails at level crossing	51 mm	51 mm	51 mm
Maximum clearance of check rails at level crossing	57 mm	57 mm	57 mm
Minimum depth of space for wheel flange from the rail level	38 mm	35 mm	31 mm

7.6 Identification post for detonators: Should be provided so as to indicate the location and number of detonators to be placed in case of obstruction to level crossings.

- a) Indication post with one dot at 600 meters and another post with three dots at 1200 meters from rear of level crossings in the case of BG.
- b) In case of MG and NG indication post will be at 400 and 800 meters.

7.7 Height gauges: Height gauge should be erected suitably on either side of level crossing so as to ensure that all vehicles can pass with adequate clearance. The height gauge shall be located at a minimum distance of 8 m from the gate post. The road surface up to height gauge is at same level as the road surface in side the gate post.

7.8 Duty huts: Should be so located that a clear and unobstructed view is obtained of all approaching trains and road vehicles. The minimum distance of duty hut from the centre line of nearest track edge of road metalling shall be 6 meters.

7.9 Checking of equipment and examination of gateman in rules: The Assistant engineer should inspect the every manned level crossing on the sub division every six months, and examine the gateman in rules during his inspection.

Sectional PWI should inspect each level crossing once in a month. During their inspection, they shall:

- a) Inspect the equipment with gateman.
- b) Ensure that the gateman have a correct knowledge of rules. Besides this, they should endeavour to examine them periodically their trolley inspection particularly on appointment, promotion or transfer by conducting practical demonstration of protection of level crossings in case of emergency.
- c) Ensure presence and alertness of gateman by carrying out surprise night inspection of level crossing once in a month.

8.0 Visibility requirement for the unmanned level crossing

For new unmanned level crossings the visibility requirements for road users along the track shall be 600M. with single or double line track. where this is not feasible, the distance may be reduced suitably with the approval of the Chief Engineer provided the maximum permissible speed is less than 100 kmph. and/or there is only a single track to be crossed on the level crossing. Visibility of trains for road users at unmanned level crossing may be assessed, from a distance of 5 meters from the centre of the track.

9.0 Census of Traffic at Level Crossings, Unmanned/Manned

Periodical census of traffic at all level crossings, unmanned/manned should be taken at least once in five years to review the classification, in the case of manned level crossing and need for manning in the case of unmanned level crossing. However, for manned level crossings with traffic density 75000 TVUs or more but less than 1 lakh TVUs, the census should be taken up once in a 2-1/2 years to determine their eligibility and priority for replacement with ROB/RUBs on cost sharing basis. The total train vehicle units/day (Train units + vehicle units) are worked out taking the census for a week. Train, motor vehicles, Bullock carts and Tongas being considered as one unit. Cycle rickshaw/ Auto rickshaw being considered as half unit.

[Go to index](#)

10.0 Level Crossing indicators

10.1 Whistle indicator -

- (i) At the approach to all unmanned 'C' class level crossings or manned level crossing where the view is not clear on either side for a distance of 600 meters and those which have normal position open to road traffic, without interlocking and protection by signals, under special conditions, bilingual whistle boards as per IRPWM annexure 9/5 should be erected at 600 meters along the track from the level crossing to enjoin the Drivers of the approaching trains to give audible warning of the approach of a train to the road users. The Drivers of the approaching train should whistle continuously from the time they pass whistle boards to the time they cross the level crossing.
- (ii) The whistle indicator shall consist of two 600 mm. square boards painted yellow and bearing letter W/L in black. Its height shall be 2000 mm. from the rail level to the underside and the post on which it is fixed, painted with 300 mm. high bands in white and black. As far as possible luminous paint or strip may be used.

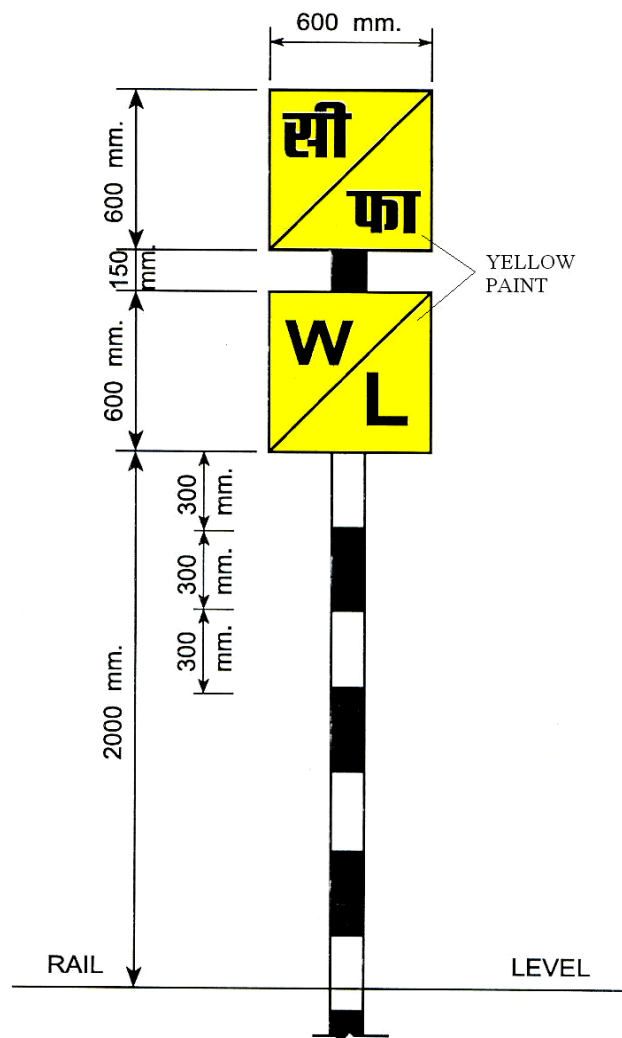


Figure : Details of whistle board on the approach of a level crossing

10.2 'Stop' Boards

- (a) On the road approaches to all the unmanned 'C' class level crossings 'Stop' Boards should be provided on the road at either sides of the level crossings at suitable points, within the railway boundary.
- (b) This shall consist of a board 675 mm X 525 mm on a suitable post bearing the indication of an engine and the legend "**Stop, look out for trains before crossing**" in English, Hindi and Regional language. The paint used shall preferably be of luminous variety. The distance of the "Stop" board from the track on the approaches of the unmanned level crossings shall be 5 meters from the centre line of the nearest track, within the Railway boundary.

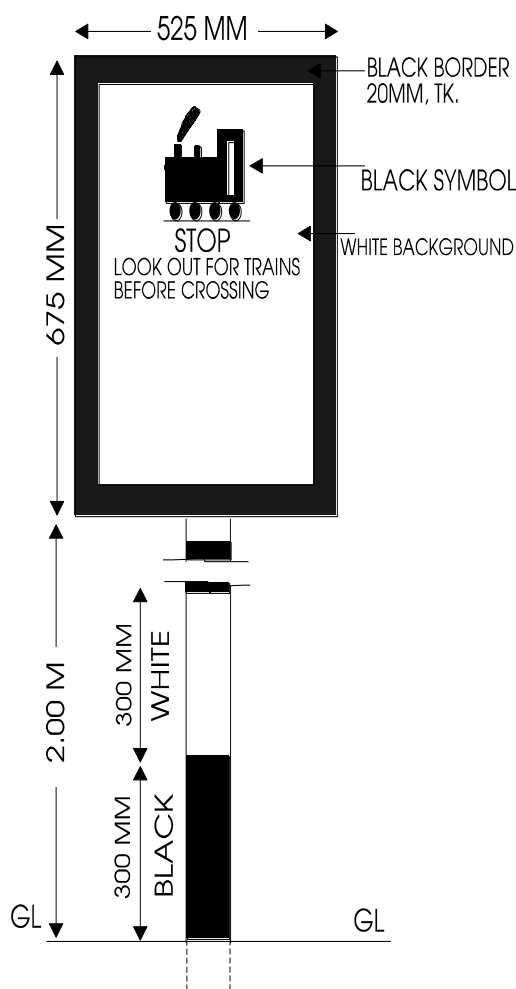


Figure : Stop Board

- (c) The vertical post shall be painted black and white, each strip to be 300 mm. in height starting with black paint at the bottom.

11.0 Speed breakers on the approaches of level crossing

Provision of rumble strips on approaches of level crossings as per the standard design is the responsibility of Road authorities. Matter may be pursued with all State Governments/Road authorities to ensure that rumble Strips are provided on all level crossings as per standard design over the total width of the road i.e.

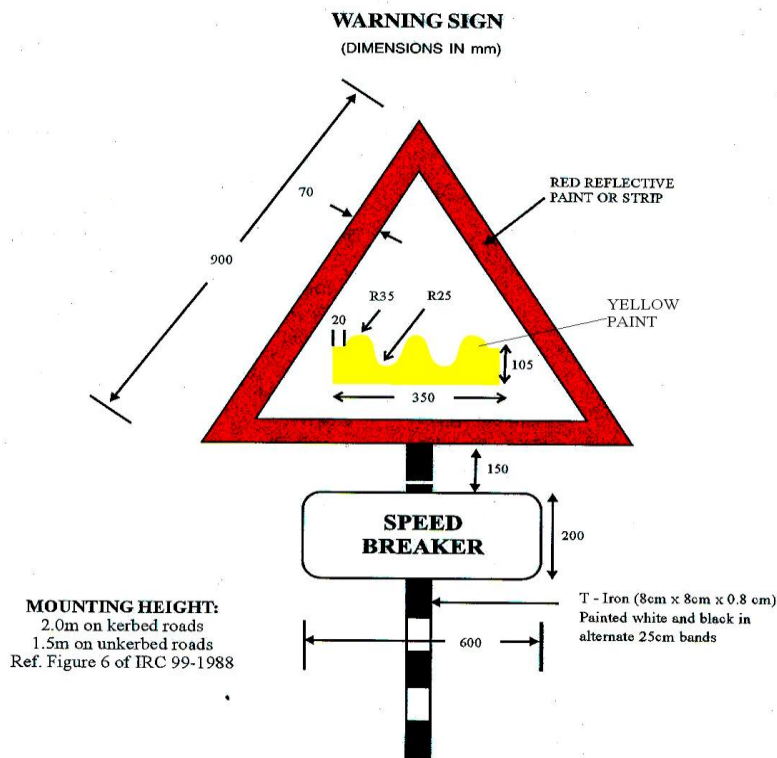
edge of the berm to edge of berm with proper road warning signs as per the standard design. However, it is incumbent upon Railways to provide speed breakers as per the standard design on both manned as well as unmanned level crossing irrespective of whether the approach road are metalled are un-metalled, as a temporary safety measure, till such time these are replaced with rumble Strips of proper design by the Road authorities. While providing speed breakers, following guidelines may be observed.

- (a) One speed breaker should be provided on either approach of level crossings located within the Railway land boundary at a distance maximum feasible but not exceeding 20m covering full width of the road including berms. For safety reasons, the paint marking should be provided and their maintenance ensured.
- (b) Standard warning signs for speed breakers should be invariably provided at a prescribed distance as follows.

Class of Road	Plain Area	Hilly area
Class I	120 m	60 m
Class II	60 to 90 m	40 to 50 m
Class III	40 m	30 m

- (c) Speed breakers should be constructed with hot pre-mix bituminous material, well compacted after laying on well prepared surface. Enough time is to be allowed for the bituminous material to harden before opening to the traffic.

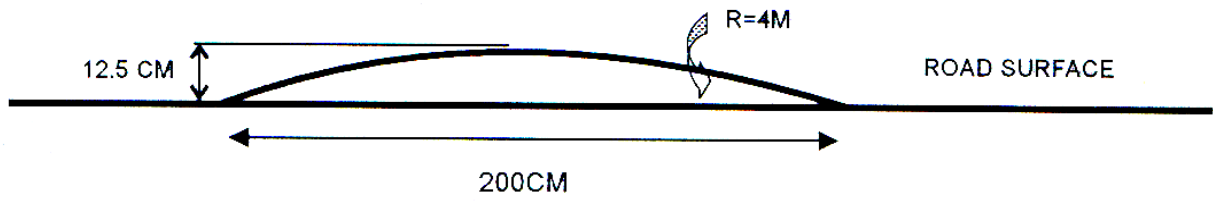
On berms and un-metalled roads, the speed breakers should be supported on proper base of compacted road metal.



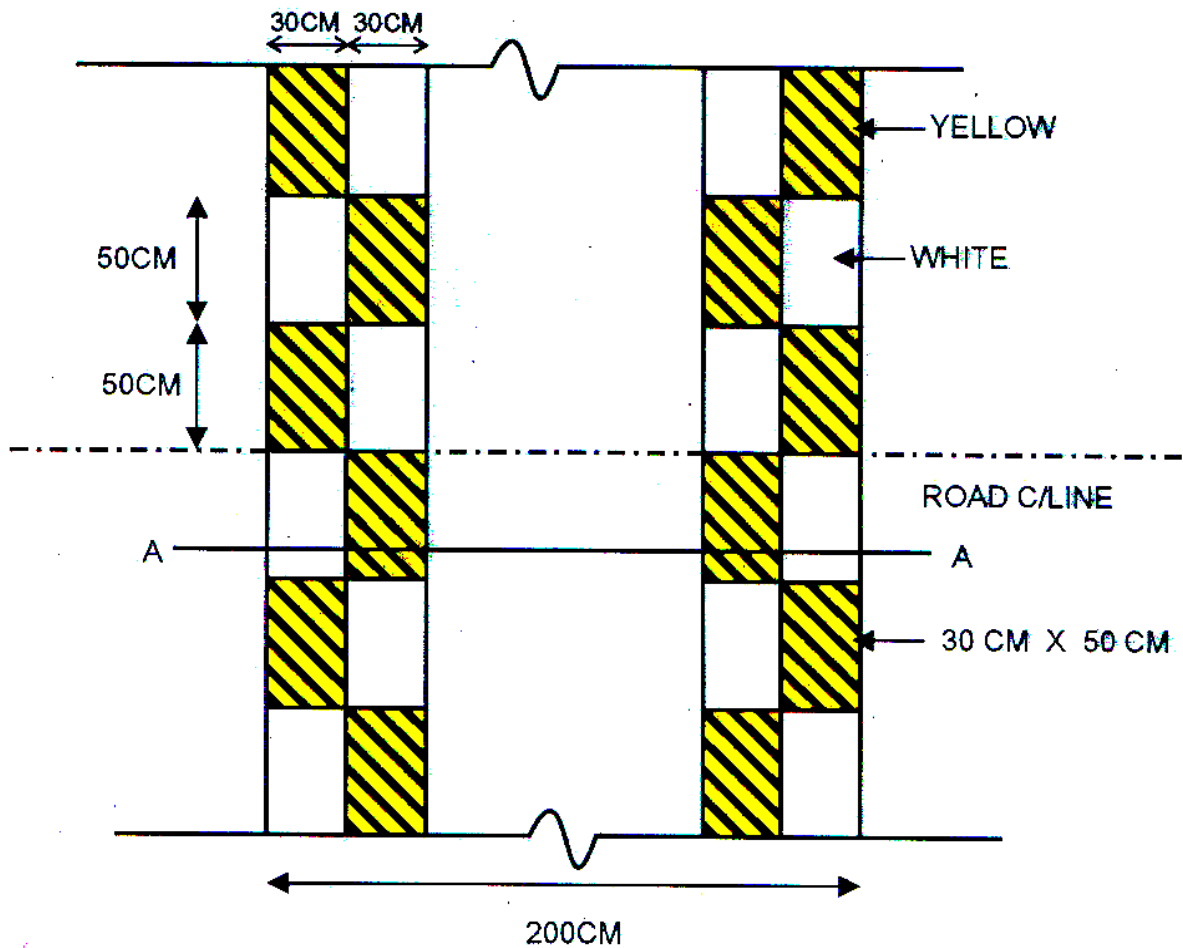
Location – To be so placed on road formation that no part of the sign comes of the vehicles

Figure : Speed Breaker

Speed Breaker Design



Speed breaker – Section – ‘AA’



Note : The hump should be extended to the full roadway width appropriate base course material should be extended over the shoulders for placing the humps over these

Figure : Details of speed breaker

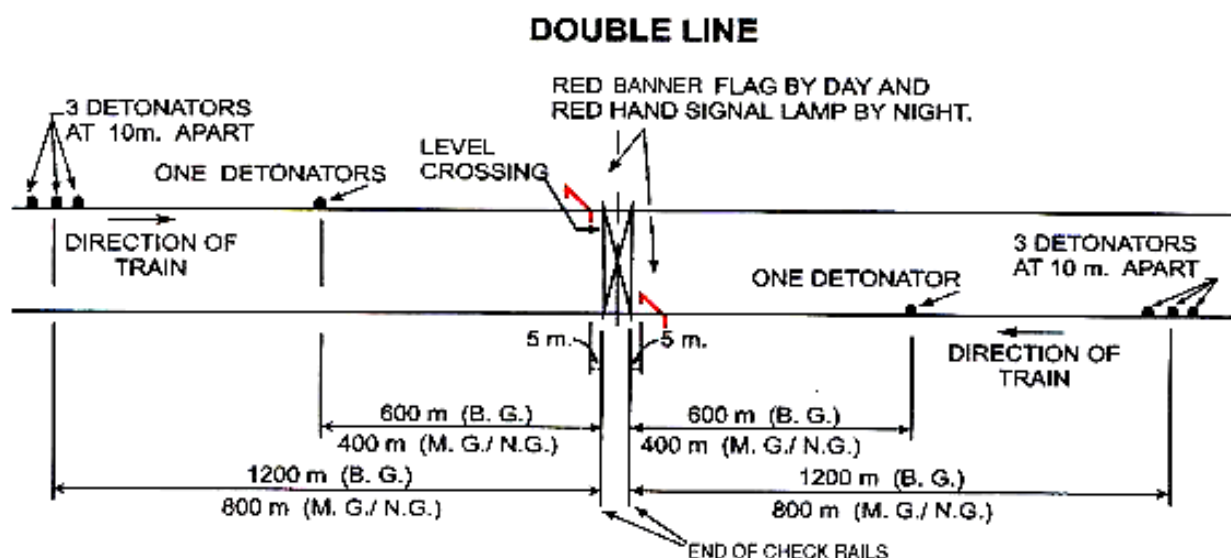
[Go to index](#)

12.0 Protection of level crossings gate in an emergency

In the case of an obstruction at the level crossing, the gateman should maintain the gate signals if any in the "ON" position and if unable to remove it, protect the line as follows.

On Double Line

On Double Line, if both lines are obstructed, he shall plant a red flag by day and red by night on the line on which a train is expected to arrive first, then attach another red flag red light to the staff and fix it on the other line at the site of obstruction. He shall then pick-up the first danger signal and proceed on that line plainly showing his stop hand signal (red flag by day and red light by night) to a point 600 m for BG and 400 m for MG and NG from the level crossing and place one detonator on the line after which proceed further to not less than 1200 m for BG and 800 m for MG and NG from the level crossing and place 3 detonators on the line about 10 m (10 yards) apart. Having thus protected the line on which a train is expected to approach first, he should return to the level crossing picking up the intermediate detonator on his way back and remove from the other line the staff with the red flag red light and plant it on the line towards the direction protected with detonators. He shall then proceed on the other line showing the danger signal, place detonators similarly and return to the site of obstruction to warn the Driver of an approaching train.



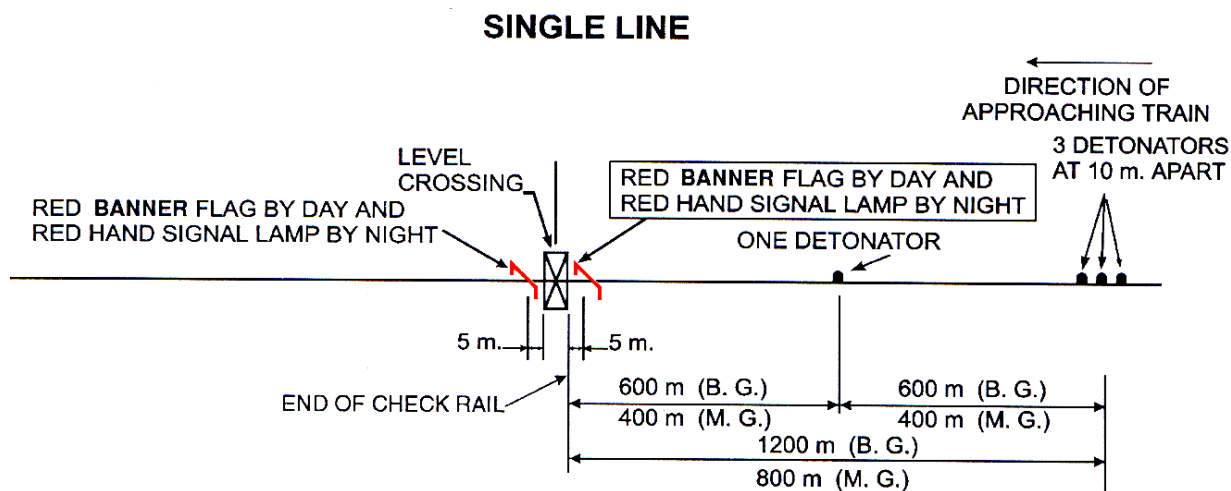
Note : In the case of Meter Gauge (MG) section where trains run at more than 75 kmph the detonators shall be placed at distances to be specified under special instructions by the administration.

On the Signal Line

On the Signal Line, if the line obstructed during day, he shall plant a red flag towards the direction from which a train is expected to arrive first, then attach another red flag to the staff and fix it towards the opposite direction at the site of obstruction. He shall then pick up the first danger signal and as in above protect

the line in the direction from which a train is expected to approach first, return to the site of obstruction, refix the staff to show the danger signal on the side the line is protected and proceed with all haste in the other direction to protect the line. Having protected the line on both sides he should station himself at the place of obstruction to warn the Driver of an approaching train.

At night the gateman should light the two hand signal lamps and take action to exhibit red lights and protect the line as in above.



Note : Protection for the direction opposite to that of approaching train to be repeated on the other side also.

13.0 Common problems at level crossings

Generally following problems occurs at level crossings:

- a) **Uneven road surface:** Road at level crossings are generally found uneven or broken due to traffic density and due to over hauling of level crossings and also for track maintenance at level crossings.

In manned level crossing, proper attention is not being given for leveling of road and providing proper slope causing inconvenience to road users. Hence, the proper attention for the same should be adhered to.

Remedies: The uneven or broken surface of road should be leveled as early as possible. and patch work should be done immediately, so that the road surface can be made leveled and smooth.

Hexagonal concrete blocks may be provided, which are durable against wear and tear in gauge conversion and new construction. It has been proved more useful and durable for maintaining the road surface. Secondly it gives better appearance to the road surface and having high resisting power during monsoon season. It should be provided in between the two gates. Outside the gate road surface can be maintained by black top road.

Hence it is easy to maintain and easy to prepare a smooth road surface quickly. Road surface is made smooth in such a way that vehicles are not struck to the track.

Low life of paints at speed breakers: Paint at speed breakers get faded with the time and due to the road vehicles.

Remedies: Paint of speed breakers should be regularly painted with luminous paint having more durability.

Reflective pavement markers may be most suitable on the speed breakers as same are being used now a days in National Highway or Express Way.

- b) Indicators and warning boards:** Generally indicators and warning boards get faded with time when ordinary paint is used. Hence as far as possible luminous paints / luminous strips should be used.

As far as luminous strip and luminous paint are concerned, for speed breakers sign boards, whistle boards and stop boards etc. the luminous strip are more effective rather than luminous paint as it is just a like a pre-cast concrete which can not be deteriorated immediately.

- c) Inadequate visibility:** Un manned level crossings are more prone to accidents which can be avoided by maintaining proper visibility.

In India a number of level crossings are not having adequate visibility and even then the adequate speed restriction have not been imposed. It is very serious matter. Visibility of many level crossings can be improved by relocation and slight diversion of road in consultation with road authorities.

In un manned level crossings where visibility is not clear up to 600 m along the track at a distance of 5 m centre of track, suitable speed restriction should be imposed with the approval of Chief Engineer so as to avoid accidents.

- d) Difference in level between check rail and running rail:** At level crossings, in most of the cases there is difference of level between check rail and running rail resulting in inconvenience to the road users. Hence, proper attention should be made at the time of overhauling of level crossing by providing proper sleepers underneath the rails.
- f) Fencings:** Some times fencing along the level crossings get damaged , so it become unsafe. If fencing is found broken, it should be immediately attended.
- g) Gates and locks are not working properly,** there should be arrangement of spare chain in case of emergency.
- h) Telephone instrument:** Telephone instrument should be always in working order for exchanging the private numbers. If it is out of order it reported immediately for repairing for S&T department.
- g) Height Gauge:** Proper attention should be given for the maintenance of height gauge as it is a major safety item.

[Go to index](#)

- i) **Duty rosters** of gateman should be maintained in such a way that gate should always be operated with those gatemen, who are having adequate knowledge of operation of gate as well as protection of train in case of emergency. Those trackman/ gang man/ key man should not be deployed who are not having proper knowledge of safety. However, in case of unavoidable circumstances, it is the duty of PWI in charge to issue competent certificate to those railway staffs who are not working in the capacity of regular gateman. Gate should never be operated under the influence/ pressure of road users. Hence it should always be operated as per railway working rules.
- j) In busy Rajdhani routes, as far as possible, the number of manned level crossing in station limit can be eliminated by providing ROB/RUB which will eliminate jamming of road traffic for a long duration.

[Go to index](#)

⇒ NOTES ⇐

OUR OBJECTIVE

To upgrade Maintenance Technologies and Methodologies and achieve improvement in productivity and performance of all Railway assets and manpower which inter-alia would cover Reliability, Availability, and Utilisation.

*The contents of this handbook are for guidance only & are **not statutory**. It also does not supersede any instructions from Railway Board, RDSO, and Zonal Railways & the provisions of IRPWM, BIS Codes/Reports on the subject. If you have any suggestion & any specific comments, please write to us :*

Contact person : **Director (Civil)**

Postal Address : **Centre for Advanced Maintenance Technology, Maharajpur, Gwalior (M.P.)
Pin code – 474 005**

Phone : **0751 - 2470869, 2470803**

Fax : **0751 – 2470841**