GUIDELINES
FOR
PEDESTRIAN FACILITIES

THE INDIAN ROADS CONGRESS

1989

MEMBERS OF THE HIGHWAYS SPECIFICATIONS AND STANDARDS COMMITTEE

GUIDELINES
FOR
PEDESTRIAN FACILITIES

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GUIDELINES FOR PEDESTRIAN FACILITIES

1. GENERAL

1.1. Guidelines for pedestrian facilities were under the consideration of the Traffic Engineering Committee. The Committee in their meeting held at Calcutta on the 1st November, 1980 constituted a Subcommittee under the convenorship of Shri K S. Logavinayagam with S/Shri A. K. Bandhopadhyaya, P S. Bawa, P. S. Majumdar, S. M. Parulkar, R. P. Sikka and C. Ramdas as the members to take up at the first instance preparation of the warrants for pedestrian grade separations and design of railing barriers.

Accordingly, the draft documents on (1) Criteria for fixing of railing barriers and its design, (2) Warrants for pedestrian crossing facilities and (3) Warrants for pedestrian grade separation were finalised by the Subcommittee. These were then considered by the Traffic Engineering Committee in their meeting held at Gandhinagar on the 29th September, 1982. It was decided to revise the documents on the basis of the comments received.

Shri J. B. Mathur of Indian Roads Congress redrafted the document and combined the above three documents into one cohesive document and this was placed before the Traffic Engineering Committee (personnel given below) at their meeting held at New Delhi on the 12th June, 1987. The Committee approved the draft guidelines :

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D. Sanyal	...	*Member-Secretary*

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K. Suryanarayana Rao	The Chief, Transport & Communication Board,
Prof. N. Ranganathan	B.M.R.D.A.
Dr. O. S. Sahgal	(R. Y. Tambe)
D. V. Sahni	S.E., Traffic Engg. & Management Cell, Madras
Dr. A. C. Sarna	The President, IRC & DG(RD)
R. K. Saxena	(K. K. Sarin) —Ex-officio
H. C. Sethi	The Secretary, IRC
H. N. Shah	(Ninan Koshi) —Ex-officio
R. P. Sikka	
R. Thillainayagam	
V. V. Thakar	
D. L. Vaidya	

1.2. The guidelines as finalised by the Traffic Engineering Committee were considered by the Specifications & Standards Committee in their meeting held at New Delhi on the 9th November, 1987 and it was decided to revise the document in the light of the comments of members. For this purpose, a Working Group was constituted under the convenorship of Shri R. P. Sikka with S/Shri A. Sankaran, D. Sanyal, K. Arunachalam and Dr. M. S. Srinivasan as members.

1.3. The guidelines finalised by the Working Group were approved by the Highways Specifications & Standards Committee in their meeting held at New Delhi on the 24th November, 1988. The guidelines got the approval of the Executive Committee by circulation and the Council in their meeting held at Madras on the 10th December, 1988.

2. INTRODUCTION

2.1. Walking is an important mode of transport. In urban areas, a significant proportion of trips upto 1-2 kms in length is performed on foot. Moreover, every journey necessarily starts and ends as a walk trip. Since pedestrians are more vulnerable to being involved in accidents, it is imperative that adequate consideration should be given to their safety through provision of facilities like guard-rails, secured crossing areas, footpaths, and grade separations.

2.2. Requirements of pedestrian facilities have been covered partially in some of the earlier IRC Standards, for

instance IRC : 70-1977 'Guidelines on Regulation and Control of Mixed Traffic in Urban Areas' and IRC : 86-1983 'Geometric Design Standards for Urban Roads in Plains'. Recommendations in this regard are consolidated here, adding supplementary informations.

3. GENERAL PRINCIPLES

3.1. Pedestrian facilities should be planned in an integrated manner so as to ensure a continuous pedestrian flow. It should be useful therefore to look at pedestrian needs for an area as a whole and prepare an overall strategic plan.

3.2. The basic aim should be to reduce pedestrian conflicts with vehicular traffic to the minimum. Efforts should be made to create such conditions that pedestrians are not forced to walk in unsafe circumstances, and that the motorists respect the position of pedestrians.

3.3. While planning, the convenience of pedestrians should be a paramount consideration. Otherwise, the facilities provided will not be fully used.

4. FOOTPATH (SIDE-WALK)

4.1. In order to be effective, the side-walks should be provided on both sides of the road and above the level of the carriageway separated by non-mountable kerbs. Height of the kerb at the edge should, however, not exceed the height of non-mountable kerbs, as this might otherwise detract pedestrians from getting on to the side-walks.

4.2. The width of side-walks depends upon the expected pedestrian flows and could be fixed with the help of guidelines given in Table 1, subject to a minimum width of 1.5 m.

TABLE 1. CAPACITY OF SIDE-WALKS

Width of side-walk (metre)	Capacity in number of persons per hour	
	All in one direction	In both directions
1.50	1,200	800
2.00	2,400	1,600
2.50	3,600	2,400
3.00	4,800	3,200
4.00	6,000	4,000

4.3. For side-walks in shopping areas, the width should be increased by 1 m which is treated as the "dead width". In other situations where side-walks pass adjacent to buildings and fences, the dead width can be taken as 0.5 m. For areas of heavy pedestrian activity such as bus stops, railway stations and recreational area, the width of side-walk should be suitably increased to account for accumulation of pedestrians.

4.4. In purely residential areas, and special cases like shopping centres and industrial/office complexes, different principles will apply to side-walk design than the capacity considerations given in Table I. Enhancement of environmental values and safety are the governing criteria in pedestrian sensitive situations such as these and layouts need to be carefully planned keeping these points in view.

5. PEDESTRIAN GUARD-RAILS

5.1. Pedestrian guard-rails are an important design element to prevent indiscriminate crossing and spilling over of pedestrians on to the carriageway. Their judicious use can help to ensure that pedestrians cross the streets at predetermined and safe locations. As the guard-rails would confine the movement of pedestrians to the footpath, it is obligatory that sufficient width of footpath be made available for the use of pedestrians.

5.2. Design

The design of guard-rails should be neat, simple in appearance and, as far as possible, vandal proof. Two aspects which need special consideration are the height of hand-rail and the obstruction to visibility. The height should be sufficient so as to deter people from climbing over it. The visibility of the approaching vehicles by the pedestrians as well as the visibility of the pedestrians by the drivers of the approaching vehicles should be adequate. The railings should not, therefore, have any thick horizontal member, other than the baluster to achieve the desired objective. Above all, the guard-rails should be of sturdy but slender design.

Pedestrian guard-rails in reinforced cement concrete have been found to be generally suitable in urban situations. Details of a typical design of this type of guard-rails are shown in Plate 1.

Iron tubes, steel channeled sections and pipes may also be adopted so as to fit in with the environment or for better aesthetics. These can, however, be costly and may also need higher level of maintenance. Fig. 1, shows a type design for this category of guard-rail.

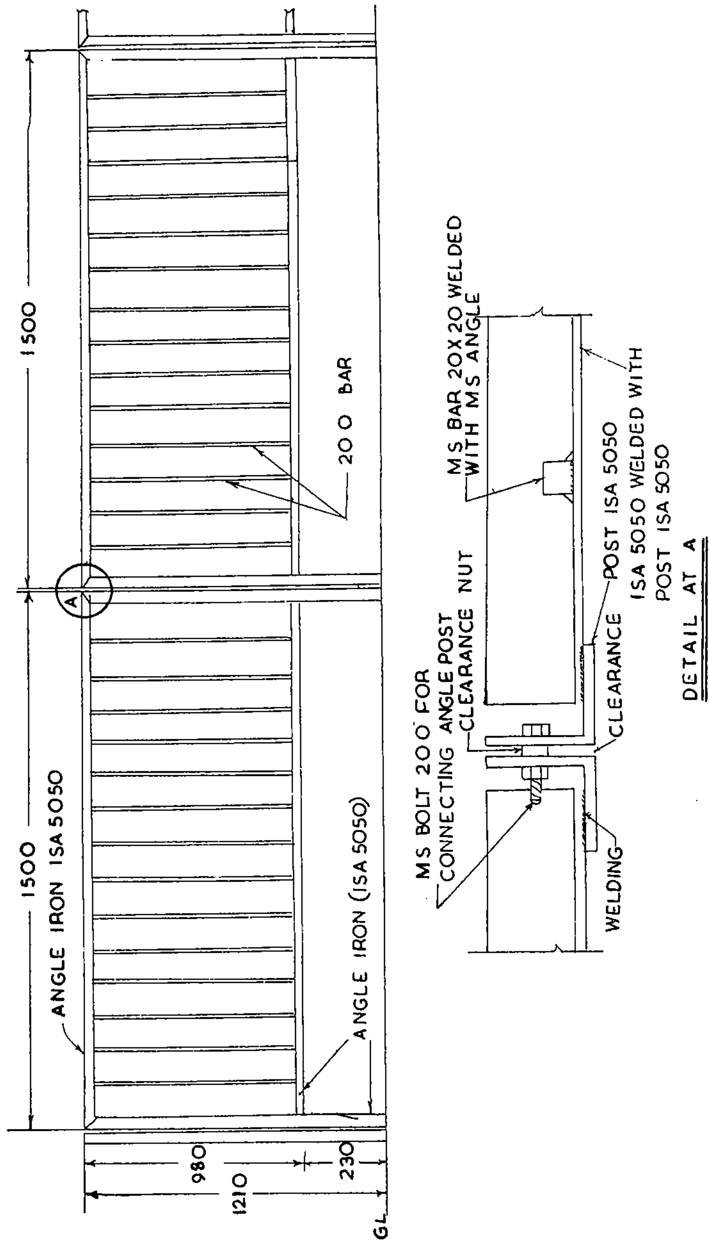


Fig. 1. Typical steel pedestrian guard-rail

5.3. Application

Use of pedestrian guard-rails could normally be considered under the following situations :

(a) **Hazardous locations on straight stretches**

In particularly busy reaches where the road is congested and vehicles move at a fast pace, guard-rails should be provided on both sides of the carriageway so as to channelise the pedestrians on to the planned crossing locations.

(b) **At Junctions/Intersections**

Railing barriers should be provided to prevent people from crossing the junctions diagonally at signalised intersections. The barrier must open only at planned crossing facility (at the zebra crossing). At unsignalised junctions they should be provided for sufficient length to guide the pedestrians to the nearest planned pedestrian crossing.

(c) **Schools**

Provision of guard-rails near schools where children would otherwise run straight into the road is essential. If there is a pedestrian crossing or a school crossing patrol nearby, the guard-rails must be extended upto it.

(d) **Bus stops, Railway stations, etc.**

Provision of guard-rails along side-walks with suitable access at bus stops, railway stations and other areas of heavy pedestrian activity such as cinema houses, stadiums, etc. is recommended for guiding pedestrians safely in such areas.

(e) **Overpass, Subway, etc.**

Guard-rails may be necessary at these locations in order to compel the pedestrians to use the facilities provided for them.

(f) **Central reserves**

Where there is a central reserve or a median, guard-rails can be erected within it to deter the pedestrians from attempting a crossing.

5.4. Gaps/Setback Distance

Occasionally, gaps in guard-rails may have to be provided, to accommodate trees, pillar boxes, sign posts, electrical control boxes, etc., located near the side-walk. However, these should be suitably designed to prevent pedestrians or little children from squeezing through to cross the carriageway.

Preferably, the guard-rails should be set back from edge of the carriageway by at least 150 mm.

5.5. Maintenance

Railing barriers should be painted periodically, especially after the monsoon, for increased life and better appearance. Broken barriers must be promptly replaced.

6. PEDESTRIAN CROSSINGS

6.1. Where complete segregation of pedestrians from vehicular traffic is not possible, some form of planned road sharing principle must be applied. Being the most vulnerable road user, pedestrian should increasingly be given the place and time to legally claim the right to cross the road. Pedestrian crossings are to be provided where they will be well used. Hence it is necessary to follow certain criteria for establishing the right of pedestrian crossing at a particular location.

6.2. Types of Pedestrian Crossings

Pedestrian crossings could be broadly classified as :

(i) At-grade crossings; and

(ii) Grade separated crossings.

6.3. At-grade pedestrian crossings are those where the pedestrians cross the carriageway at the same level as that of vehicular movement. Grade separated crossings are those where the pedestrians are required to cross the carriageway at a level different from that of vehicular movement. Thus, the latter may be in the form of a pedestrian subway or a foot over bridge across the road.

7. AT-GRADE PEDESTRIAN CROSSINGS (PEDESTRIAN CROSS-WALKS)

At-grade pedestrian crossings are of common occurrence in cities and towns. With respect to locational aspects, such crossings could be classified as :

(i) Pedestrian crossings at intersections

(ii) At-grade pedestrian crossing away from intersection (e.g. mid-block crossings).

Pedestrian cross-walks should be provided at all important intersections and such other locations where substantial conflict exists between vehicular and pedestrian movements. Wherever possible the cross-walks should be at right angles to the carriageway and properly marked so that the pedestrians are subjected to minimum inconvenience. Cross-walks should not substantially increase the walk distance of pedestrians. Adequate visibility, freedom from obstructions and sufficient space for waiting are the other important requirements for location of cross-walks.

7.1. At-grade Pedestrian Crossing at Intersections

At-grade pedestrian crossings could be uncontrolled or controlled. Uncontrolled crossings are those where the pedestrian cross-walk is marked by studs or paint line but not controlled by any system of signals or a zebra form of crossing. Provision of uncontrolled pedestrian crossings must, as far as possible, be avoided except where the intersection itself is left uncontrolled because of extremely low volumes of both vehicular and pedestrian traffic even during peak hours and where accident records do not indicate any need to segregate vehicular traffic from cross pedestrian traffic.

7.2. Controlled Crossings

Controlled form of crossing is achieved normally through provision of zebra crossings whether at a unsignalised or signalised intersection. Once a pedestrian is on a zebra crossing, he gains priority of movement with respect to vehicular traffic.

Pedestrian crossings must inevitably be integrated with the overall design of the intersection.

7.2.1. **Zebra crossing :** A zebra crossing is a clearly specified pedestrian track across the carriageway and is delineated with the help of alternate black and white stripes.

A zebra crossing must always be accompanied by a "STOP" line as per IRC : 35-1970 'Code of Practice For Road Markings (with Paints)'.

7.2.2. **Siting of zebra crossing :** A zebra crossing should not be sited within 150 m of another such crossing. Provision of zebra crossings at short intervals adversely affects the overall efficiency of traffic operation in the area.

For safety reasons, the zebra crossing should be somewhat set back from the carriageway line. However, the set back distance should not be so much as to cause an appreciable increase in walking distance for the pedestrians. Pedestrians guard-rails may be necessary where the setback distance is appreciable or at the skew crossings.

7.2.3. **Width of zebra crossing :** The width of the zebra crossing must be adequate and should generally lie within a range

of 2.0 m to 4.0 m. For divided carriageways, the crossing should, as far as possible, proceed uninterrupted through the median strip. In the event of the median strip being used as pedestrian refuge, adequate width of median must be provided. In case of raised medians, such portion could be suitably depressed with curb height not exceeding 15 cm.

7.2.4. **Guard-rails and lighting :** Guard-rails in the vicinity of zebra crossing should be of sufficient length to deter pedestrians from crossing the road at any arbitrary point along the road. Night time visibility of zebra crossing is of vital importance and this can be achieved through proper lighting of the intersection area. Fig. 2, gives a typical layout of zebra crossing at an intersection controlled by channelisation only.

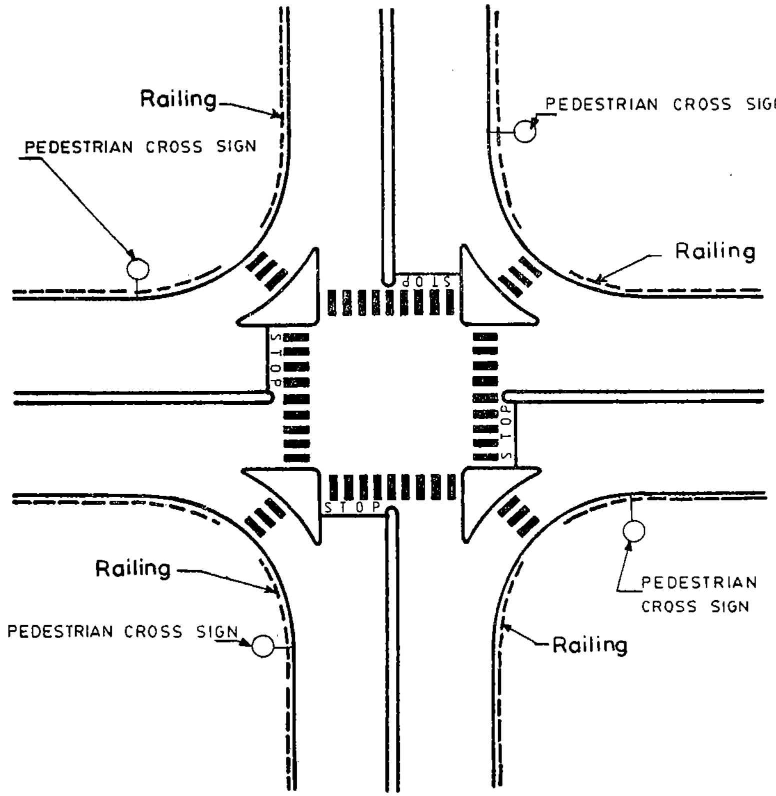


Fig. 2. Type design of four arm channelised intersection showing arrangement of zebra crossing

7.2.5. **Zebra crossing at signalised intersections :** Unlike in the case of unsignalised intersections where the pedestrian uses the zebra crossing through judicious gap selection, a signalised intersection could allow exclusive time slots for movement of cross pedestrian traffic. In the case of intersections controlled by two phase signals, an "all red" phase could be inserted to ease pedestrian movements. In case of intersections controlled by three or four phase signals, zebra crossings could be utilised in such a manner that pedestrians could move across the road in a direction parallel to the movement of vehicular traffic during a particular green phase. If exclusive time slots for movement of pedestrians is not available, use of zebra crossings at such locations would also warrant judicious gap selection. It is a good idea to install a flashing warning signal for pedestrians and left turning vehicular traffic at such intersections that permit uninterrupted infiltration to the left for vehicular traffic. The physical design features of zebra crossings at signalised intersections will be similar to those at unsignalised intersections. Fig. 3, shows zebra crossings and other details for a typical four arm signalised intersection.

7.3. Mid-Block Zebra Crossings

7.3.1. **Uncontrolled crossings :** Mid-block zebra crossings are to be provided only when the distance between two consecutive intersections is more than 300 m and simultaneously, there is a genuine demand for such a facility (e.g. shopping or commercial area being located within this area).

It must be noted that mid-block crossings are more difficult to control and frequently warrant provision of additional safety measures. All such crossings must be properly maintained with respect to painting/marking, etc., and must always be accompanied by suitable "pedestrian cross" signs. These signs must be so located that their visibility is not impaired by road side trees, overhead service poles, bends, humps or any other physical obstruction. For undivided carriageways, mid-block crossings should be accompanied by "STOP" lines with central barrier line marking being continued on either side of the crossing upto a certain distance on each side. Fig. 4, shows a typical layout plan for such a crossing. In case of one way streets, the "STOP" line will be on one side of the crossing only as shown in, Fig. 5. Beacons or flashing signals may be used with advantage in conjunction with pedestrian cross signs at such locations. In the case of mid-block crossings the guard-rail must open at the crossing only. Guard-rails are rather essential for satisfactory

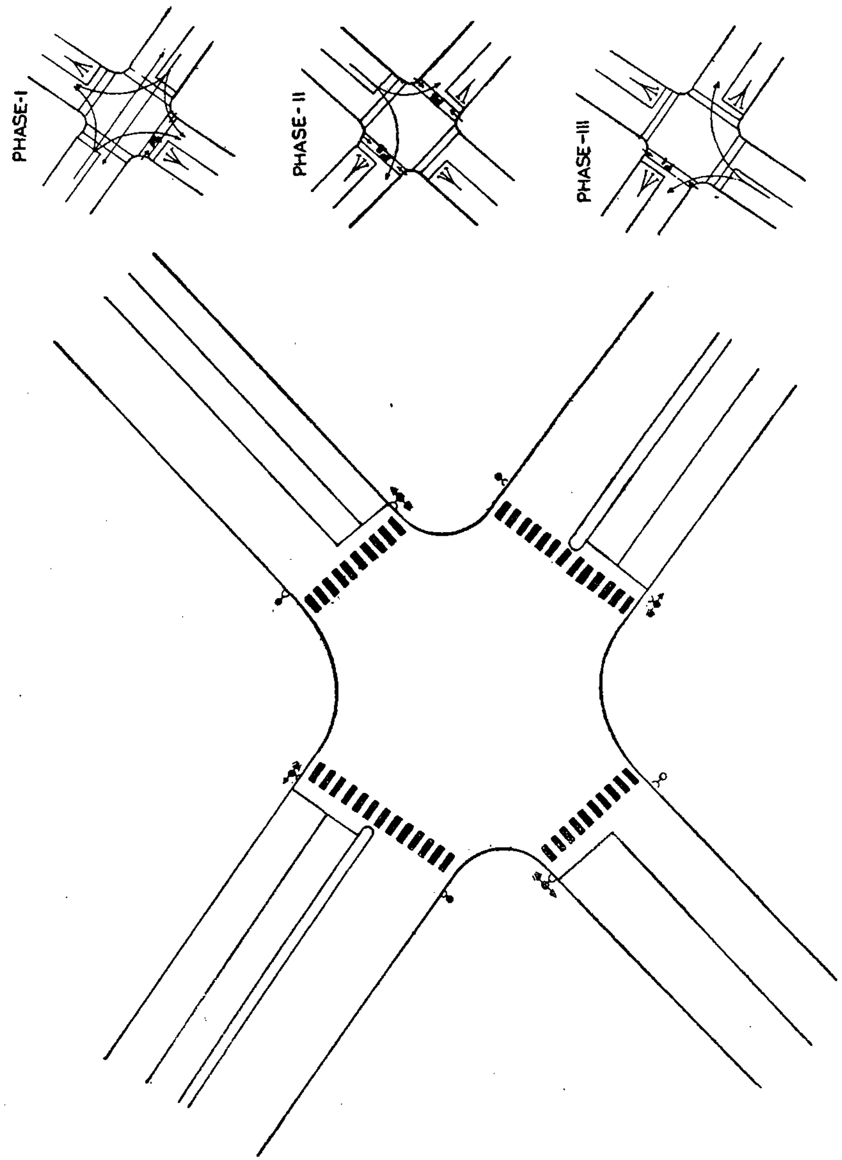


Fig. 3. Type design of four arm intersection showing zebra crossing and pedestrian phases

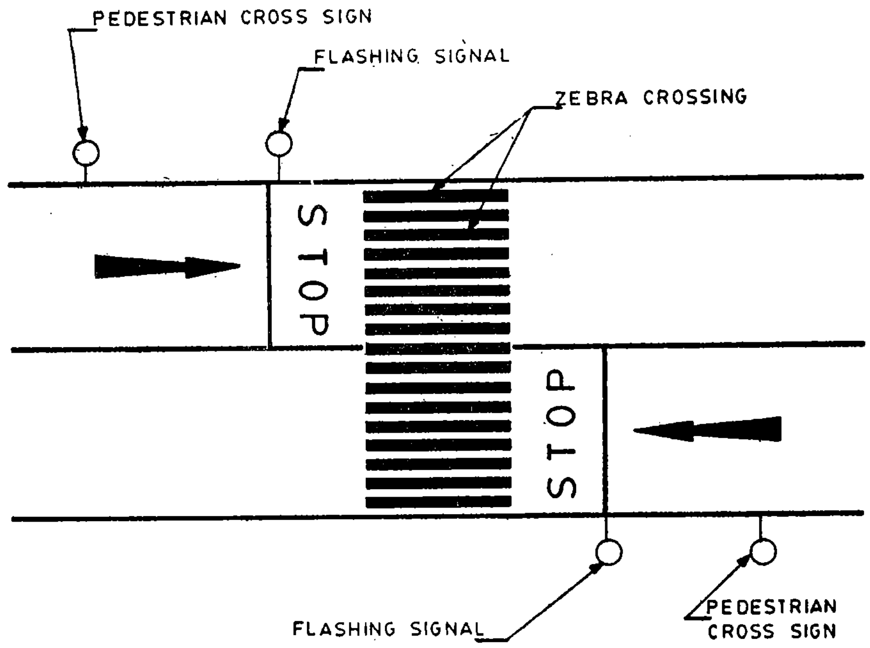


Fig. 4. Mid-block zebra crossing across two way street

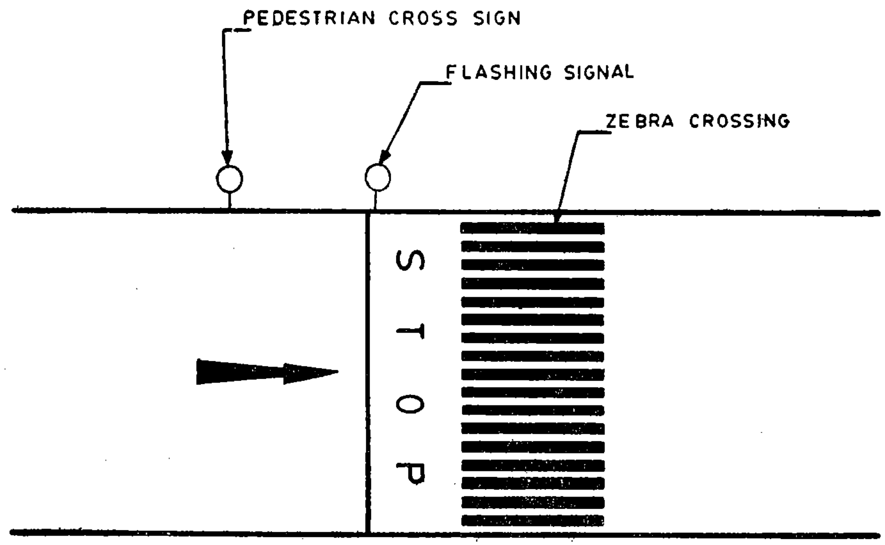


Fig. 5. Mid-block zebra crossing across one way road

operation of mid-block crossings. All other physical design considerations in this case remain same as in the case of zebra crossings at intersections.

7.3.2. **Controlled crossings :** Control measures at mid-block crossings may be warranted when one or more of the following conditions exist :

(i) Peak hour volumes of pedestrians (P) and vehicles (V) are such that $PV^2 \geqslant 10^8$ for undivided carriageways, and $PV^2 \geqslant 2 \times 10^8$ for divided carrigeways;

(ii) Approach speeds of vehicles exceed 65 kph;

(iii) Waiting time for pedestrians/vehicles becomes too long;

(iv) Accident records indicate 5 or more injuries to pedestrians in a year due to collision with vehicles.

The control measure usually adopted in such cases is a traffic signal with exclusive pedestrian phase. In certain cases, where the warrants are met only during peak hours, police control could also be introduced. Pedestrian operated pelican signals could also be introduced at such locations where the vehicular volume is too large even though the volume of pedestrians may be low. Unless judiciously used, pelican crossings are known to cause undesirable impediments to the flow of vehicular traffic.

8. GRADE SEPARATED PEDESTRIAN FACILITIES

8.1. Warrants

Provision of a grade separated pedestrian facility may be warranted at locations where one or more of the following conditions exist:

(i) Volumes of pedestrians and vehicular traffic are so large that insertion of an exclusive pedestrian phase will increase the cycle time for traffic signals beyond 120 secs :

(ii) Vehicular traffic demands uninterrupted flow as associated with major arterial roads and expressways;

(iii) Control at-grade pedestrian crossing decisively fails to mitigate the problems of pedestrian-vehicle collision. Viability of a grade separated pedestrians facility must be checked against delay costs for both pedestrians and vehicle drivers/users including increase in vehicle operating costs inflicted by increased delays.

8.2. Type

Grade separated pedestrian facilities could be generally of two types :

(i) Pedestrian subways;

(ii) Foot over bridges (F.O.B.).

8.3. Selection of Type of Facility

Any grade separated pedestrian facility will almost always entail a departure from the normal travel line of pedestrians which will tend to be along the most direct and shortest route between two points across the carriageway. This means that certain changes in pedestrian travel behaviour will have to be brought about if these facilities are to be effectively utilised. While selecting a particular type of facility, therefore, the behavioural pattern of pedestrians, site constraints (inclusive of possible maintenance problems and difficulties in shifting of services), topography, the cost implications and the environmental and aesthetic aspects, etc., must all be kept in view. As a general rule, at a given location the pedestrian subway will be usually costlier than a foot over bridge. Even recurring cost of maintenance of a subway is much higher. Experience, however, shows that a subway usually proves to be much more acceptable to the users than an F.O.B. A major reason for this could be that the energy expended in negotiating an F.O.B. is usually much more compared with that required to negotiate a subway. Aesthetically, a foot over bridge may often cause problems of blending with the surrounding environment and could also affect the privacy of residential units. Treatments required to improve aesthetics in such cases are usually costly. On the other road, subways, if properly maintained, could become a source of revenue through rentals for display windows, etc. These various pros and cons should be suitably considered in each case. In contrast to normal situations use of foot over bridges might be particularly meaningful in certain special circumstances, where for example, these could be elegantly integrated with elevated walk-ways at terminal areas, central business districts and important multistoreyed shopping complexes.

8.4. Layout of Grade Separated Pedestrian Facilities

8.4.1. **Foot over bridges :** A foot over bridge is usually a straight bridge across the carriageway. Under ordinary circumstances such bridges are provided not far away from the intersection and across a straight portion of any approach arm. Where both land and adequate funds are available, the layout geometry could be suitably modified for the purpose of improving the aesthetics of such a structure, e.g. the approaches could be in the form of a spiralling ramp. Such over bridges must be provided with adequate vertical clearance as stipulated in IRC:86-1983.

8.4.2. **Subways :** Layouts for pedestrian subways could be of various types. At an intersection, where all the approach

arms are to be connected through a pedestrian subway, the layout of this facility would largely depend upon the intersection geometry and angles of intersection. Away from the intersection, a pedestrian subway usually takes the shape of a straight tunnel across the carriageway.

Good alignment, both horizontal and vertical, helps to make a subway attractive. It is important to avoid recesses or dark corners within the subway so that the users could feel safe inside. Similarly, abrupt bends in the alignment, including stairs or ramps, must be avoided. Access to subways should be straight, convenient and in the direction of major pedestrian movement. Wherever possible, ramps could be provided as access facilities. A gradient of 1 in 10 should be regarded as maximum allowable gradient for such ramps.

8.4.2.1. **Dimensions :** For reasons of economy it will be desirable to adopt a rectangular subway section. The minimum width of pedestrian subway is 2.5 m and the vertical clearence should not be less than 2.5 m. However, experience shows that in order to get rid of the adverse tunneling effect, it will be preferable generally to increase the width of the subway to about 4.0 m and wherever possible upto 6.0 m. Adequate provision must be made for housing display windows, etc., if such appurtenances are to be provided within a subway. In case such display windows are provided, the width of the subway should be increased suitably to account for dead width. At locations catering to very large volumes of pedestrian traffic, e.g. at exits from suburban railway stations, subway width should be fixed on capacity considerations, see para 8.5.

8.4.2.2. **Drainage :** The floor of a subway should normally be cambered to fall to channels on each side at a slope of 1 in 30. Gullies should be provided to trap water entering from the ramps or steps.

8.4.2.3. **Safety :** Subways should be kept closed during night hours in order to avoid misuse. The entire subway must be kept properly illuminated.

8.4.2.4. **Sign markings :** For proper pedestrian guidance, a pedestrian subway must be served by suitable marking scheme of signs. The internal sign markings will be mostly in the form of destination/direction signs. Fig. 6, shows a typical layout of a pedestrian subway.

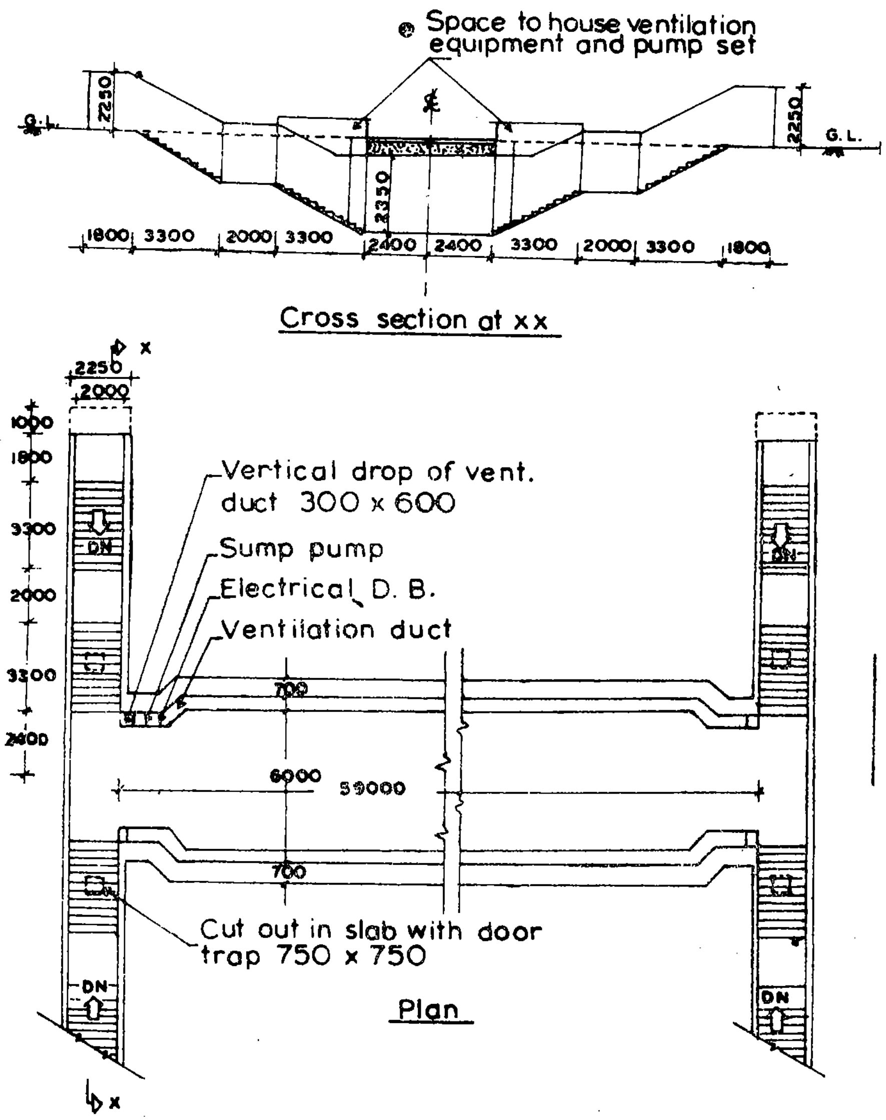
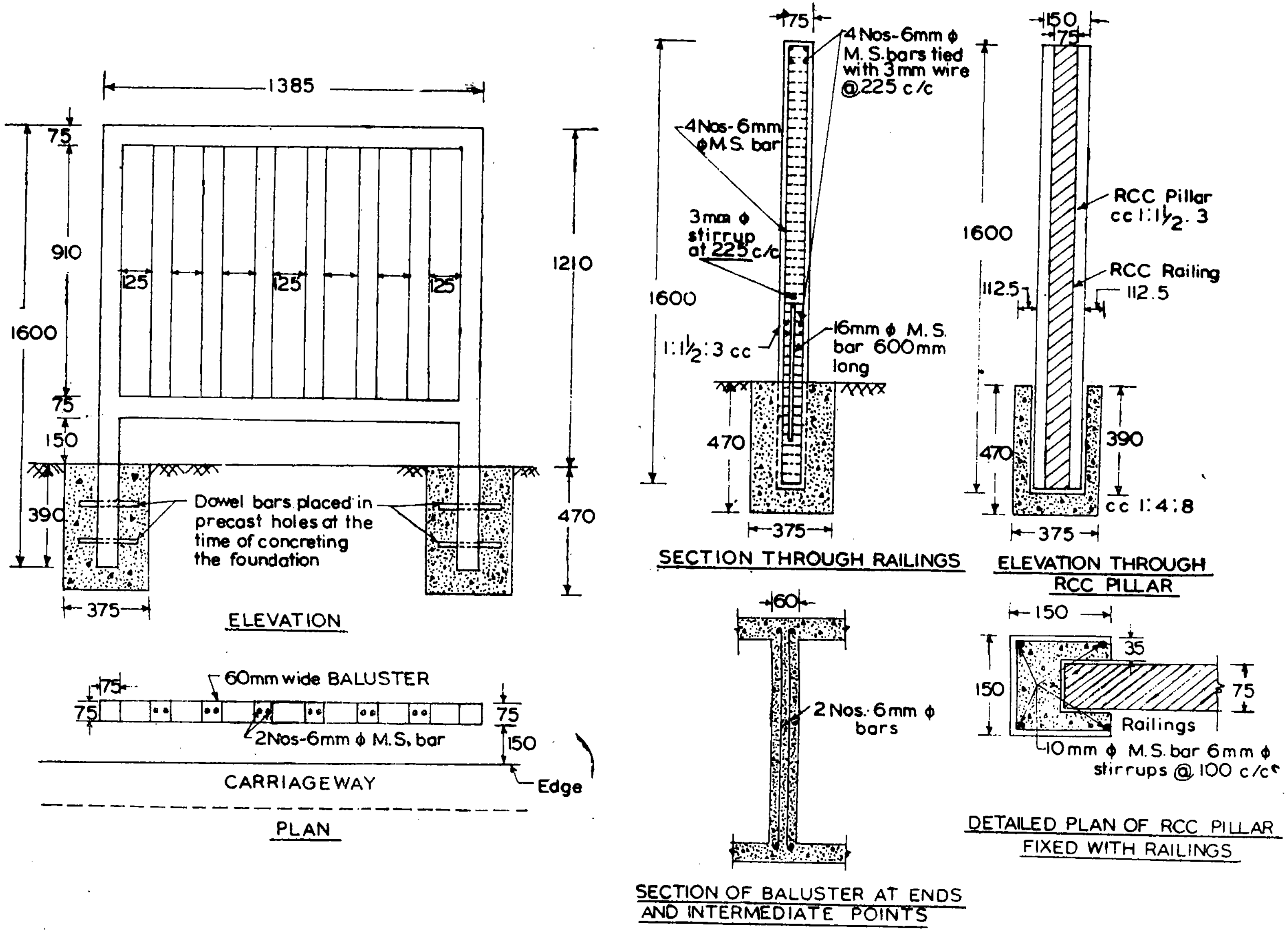


Fig. 6. Type design of a pedestrian subway
(All dimensions are in mm)

8.5. Capacity

Capacity of grade separated pedestrian facilities should be worked out as per guidelines given in IRC : 70-1977 i.e. 50 persons per minute per metre width on the level or upto 1 in 20 gradient; and 35 persons per minute per metre width on steps or ramps over 1 in 20 gradient.

PLATE 1



TYPICAL RCC PEDESTRIAN 'GUARD-RAIL'

Note : All dimension are in mm

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