



Study on Design and Safety of Pedestrian Railing in Urban Areas of Developing Countries

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ABSTRACT

In Srinagar city In India, There has been a lack of facilities for pedestrian railings at intersections, at pedestrian crossings, at school zones, at shopping malls and commercial areas. So we have to follow the IRC 103-1988: Design Guidelines on safety of pedestrian railings in Indian urban areas. At present methodology, we did study on questionnaire surveys, Design guidelines, setback distances, Maintenance and applications of guard rails. and finally the results are obtained based on the Review criteria of pedestrian rail installation code and questionnaire surveys conducted at various locations in the city. In Future there is a Scope to design and Maintenance of guard- railing facilities in Srinagar city.

Keywords: *Pedestrian, Guard rails, Design guidelines, safety, Maintenance, set back distances*

INTRODUCTION

Pedestrian guard Rails are an important design element to prevent of indiscriminate crossing and spilling over of pedestrian on to carriageway. Their judicious use can help to ensure that pedestrian cross the streets at predetermined and safe locations. As the guard rails would confine the movement of pedestrian to the foot path, it is obligatory that sufficient width of foot path be made available for the use of pedestrians. According to IRC: 103-1988 Guidelines for pedestrian Facilities. Pedestrian guardrailing was first introduced in the 1930s as a measure to improve pedestrian safety. Early designs comprised horizontal tubes between posts, with no infill. Initial evaluations showed that they had not significantly reduced accident numbers, because they could be climbed through. To address this, the first post-war report on road design The Design and Layout of Roads in Built-up Areas (Ministry of War Transport, 1946) stated that guardrails "should be so designed that pedestrians, particularly children, cannot crawl through them". This led to the development of the type of pedestrian guardrailing we know today. Research, Development and Implementation of Pedestrian Safety Facilities in the United Kingdom (Davies, 1999) examined the development and implementation of pedestrian safety facilities, and noted that "Rather oddly, considering how widely it is used, there is very little research into the effectiveness of guard railing". However, the before-and-after research that is available indicates that the provision of pedestrian guard railing improves safety (e.g. Simmonds, 1983; Bagley, 1985). In 2007, A Clearer Vision for Pedestrian Guardrails (Stewart, 2007), Stewart reaches the same conclusion. British Standards

Institution (1976). Pedestrian guard rails (metal). British Standard BS 3049:1976. British Standards Institution, London. Simmonds, A. G. (1983). The effects of the erection of guard rail. Report ATWP 77, London Accident Analysis Unit, London. Zheng P. and Hall, R.D. (2003). Pedestrian Guard Railing – A Review of Criteria for Installation. University of Southampton, Transportation Research Group. Report to Transport for London. Since the 1960s, guard railing has been used for traffic management purposes, e.g. for channeling pedestrians and/or cyclists along particular routes (see Figure 1 and Figure 2), towards designated crossing points, or splitting pedestrian crossing movements into sections to enable traffic signal control to operate more efficiently. It should be noted that guard railing is not the only measure available to achieve this purpose. Comparison between developed and developing countries-use of pedestrian guard railing facilities.

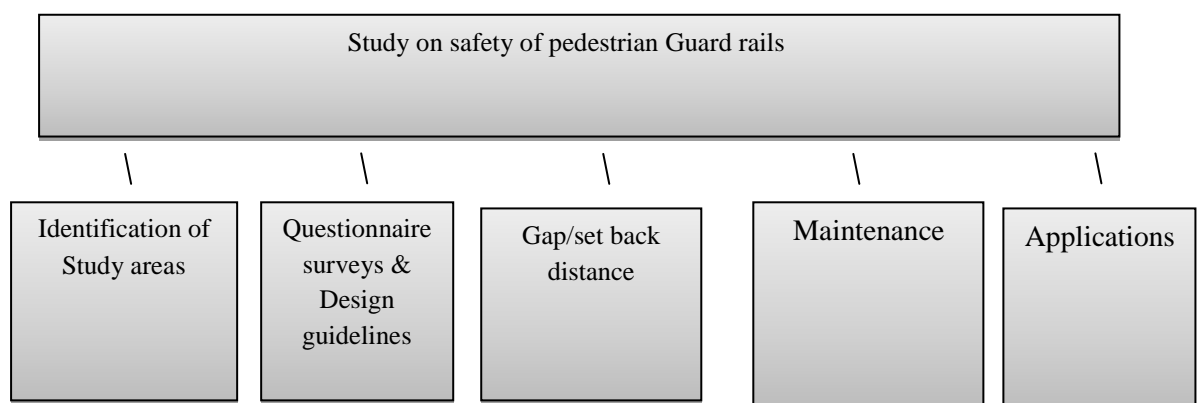


Figure 1: guard rail in Camden London.



Figure 2: lack of pedestrian guard rails in Lalchowk, Srinagar.

II. METHODOLOGY



2.1. Identification of study areas

At intersections, at pedestrian crossings Due to Lack of facilities for pedestrian rails at different locations in Srinagar city



Figure i. Lalchowk –Jahangir fly over



figure ii. Lalchowk junction



Figure iii. Civil secretary road



figure iv. Batamalooroad



**Figure v. Lalchowk at signalized intersection
signalize Intersection**



fig.vi. Kashmir University at un-



Figure vii. Kashmir University to Dal gate road

Figure 3: Site locations where the survey conducted in the city

2.2 Questionnaire surveys

Table 1:Details of site naes, Review criteria of pedestrian rail installation and Date of survey

S No	Site/Location name (intersections, junctions)	Review criteria of pedestrian rail installation (Yes / No)	Date of survey
1	Lalchowk	yes	13/06/2017
2	Kashmir university junction	No	12/06/2017
3	Batamaloo	No	21/06/2017
4	Civil secretory road	No	21/06/2017
5	Ku-Nishat garden road	No	12/06/2017
6	Lalchowk to Jahangir fly over road	No	13/06/2017
7	Gantagar (clock tower)	No	13/06/2017
8	Dal gate to nishant garden road	yes	20/06/2017
9	Dal gate junction to panthachowk road	No	20/06/2017
10	Bemina bypass	yes	17/06/2017
11	Rainawari junction	yes	15/06/2017
12	TRC to lalchowk junction	No	13/06/2017

Table 2: Type of reference site to be used when installing/removing guardrailing

Proposal	Type of reference site
Installation of guardrailing	Site with guardrailing
Removal of guardrailing	Site without guardrailing

To identify reference sites, individual locations near the proposed site with similar characteristics should be identified and surveyed for comparison with the proposed site. There is no intention to produce a national database of reference sites to use. It is for individual local authorities to decide if they wish to develop a local database that can be established and refined over time.

2.3 Safety Applicationsof Pedestrian Railings/ Guard-rails:

a) Pedestrian Railing between Footpath and Carriageway/ Central Verge

Where considerable pedestrian traffic is expected, railing in the median of the road and reinforced concrete crash barrier is provided separating the vehicular and pedestrian traffic. For rigid railing, the strength should be

equivalent to that of rigid RCC type. For areas of low intensity of pedestrian traffic, semi-rigid type of railings, such as concrete, steel, etc. can be adopted.

b) Objectives: Pedestrian 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.

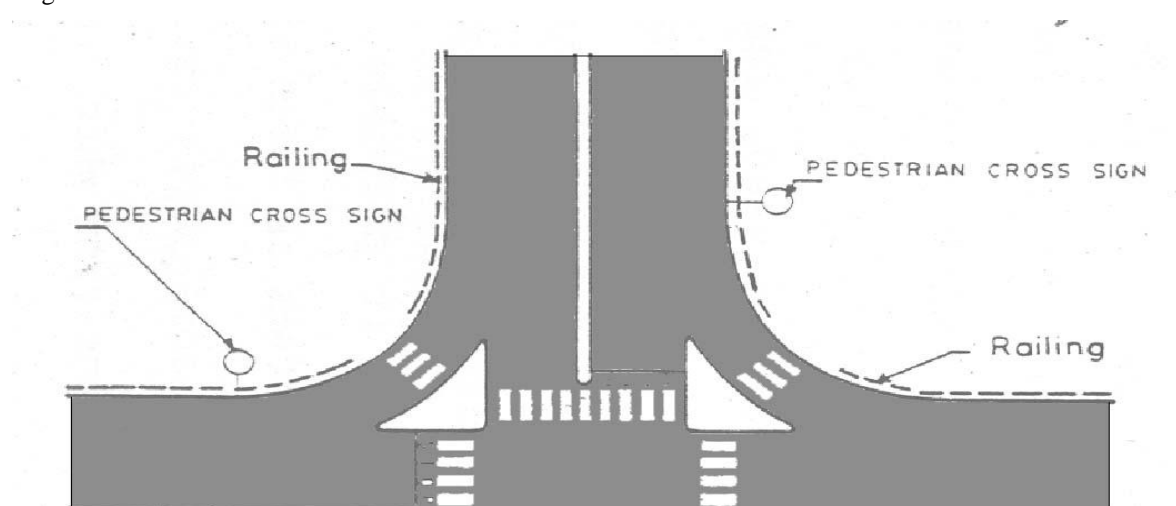
c) Location: Use of pedestrian guard-rails could be considered under the following situations:

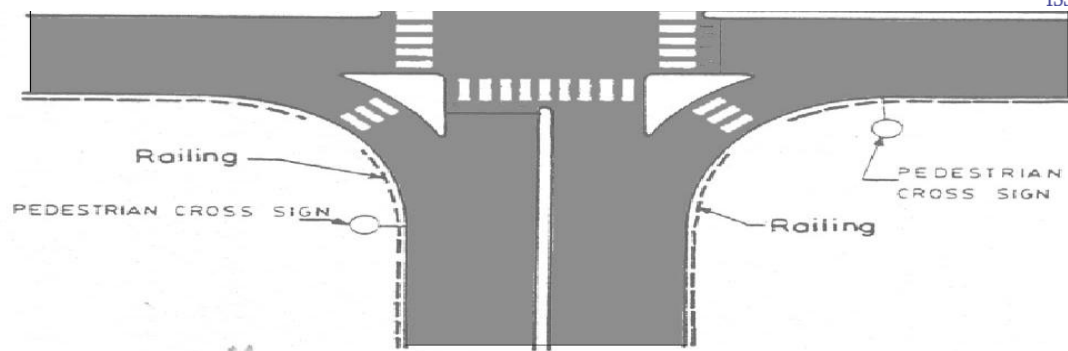
i. Hazardous locations on straight stretches: In particularly busy reaches where the road is congested and vehicles move at a fast pace, guard-rails should be provided on both sides of the carriageway so as to segregate and channelize the pedestrians to the planned walking and crossing facilities.

ii. **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 up to sufficient length (150 M) in either side of road.

iii. **Bus Stations/stops, Metro Railway Stations, etc:** Provision of guard-rails alongside walks with suitable pedestrian crossing facility at bus stops, railway stations and other areas of heavy pedestrian activity such as cinema houses, stadiums, etc. are recommended for guiding pedestrian's movement and enhancing safety in such areas.

iv. **At Junctions/Intersections:** Railing barriers should be provided to prevent people from crossing the junctions diagonally at signalized/ un signalized intersections. The barrier must open only at planned crossing facility (at the zebra crossing). It is recommended to put blinkers before the zebra crossing which should be made mandatory. At both signalized and unsignalized junctions the railing barrier should be provided for sufficient length to guide the pedestrians to the nearest planned pedestrian crossing. Pedestrian guard-rails in the vicinity of zebra should be of sufficient length to deter pedestrians from crossing the road at any arbitrary point along the road.





**Fig 4: A typical layout of four arm channelized intersection
with zebra crossing and railing barrier.**

Source: IRC: 103-1988

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.

v. Overpass Subway, etc. Guard-rails may be necessary at these locations in order to guide and compel the pedestrians to use the facilities provided for them.

vi. Central verges/ Footpaths

Where there is a central verge or a median with frequent pedestrian crossing to either side, guard rails can be erected within it to deter the pedestrians from attempting a crossing. Where considerable pedestrian traffic is expected, railing between the footpath and carriageway and / or on the median of the road is provided separating the vehicular and pedestrian traffic.

2.4 Design Requirements and Options

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. Railing should not be placed in case the width of side walk is less than 1.2 M. The design of railings/ guard rails should be consistent for a particular corridor/ area. It should be as far as possible uniform and relate with the boundary walls, urban character and street furniture. 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. The guard-rails should be of sturdy but slender design. A tapered and thick base/ ends to support the railing will prevent the pedestrians to climb over the railing to cross the road. Pedestrian guard-rails in reinforced cement concrete have also been found to be generally suitable in urban situations. 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. Long lengths of guard rails give any environment an undue effect of severe confinement and regimentation. When pedestrian and vehicle separation is desirable, thought should be given to possible alternatives rather than specifying guard rails as a matter of course. Continuous central refuges, small aqueducts, planters, bollards, trees, are all ways in which

Source: IRC: 103-1988

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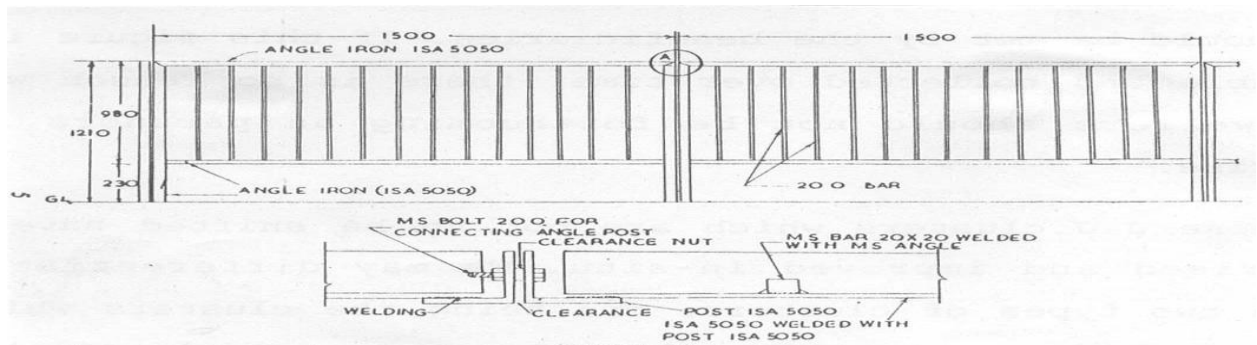


Figure 6: Typical RCC pedestrian 'Guardrail

Source: IRC: 103-1988

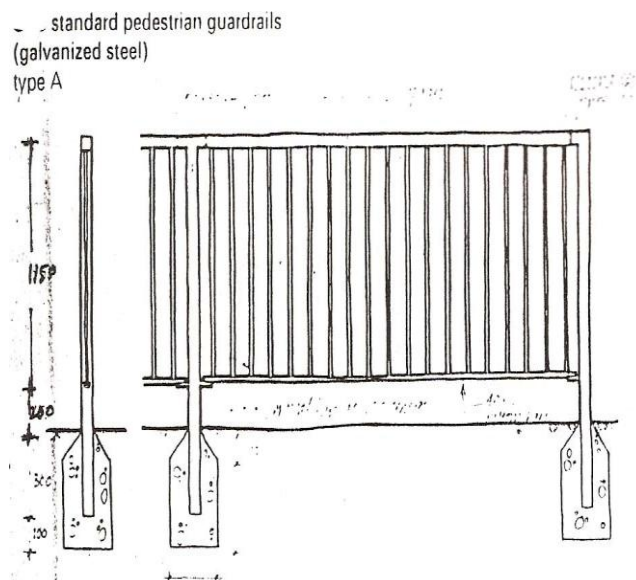


Figure 7: Steel Guardrails

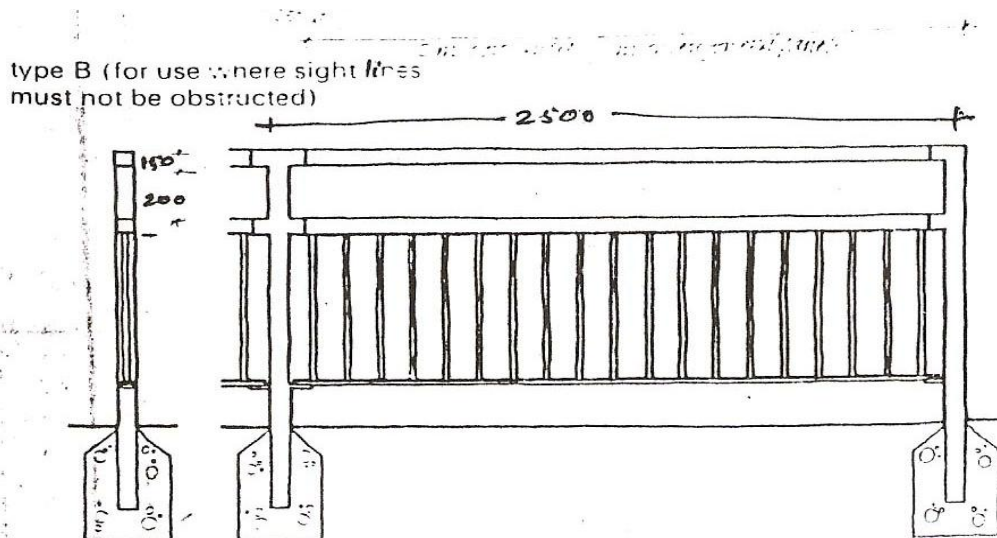
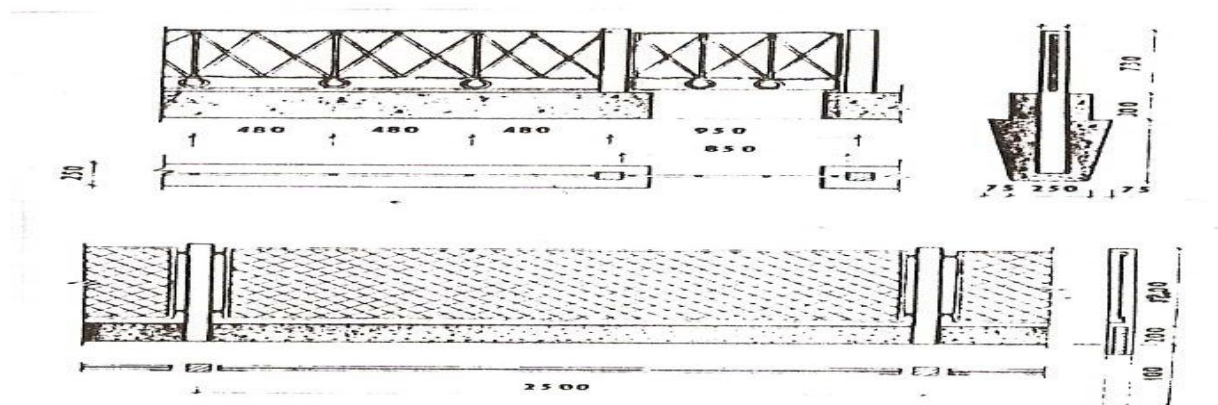


Figure 8: Steel Barriers, Railing & Fencing



Source: GLC

2.5 Gap /set back distance:occasionally, gaps in guard –rails may have to be provided to accommodate trees, pillars boxes, sign posts. Electrical control boxes, etc. Located near the side walk however, these should be suitable design to prevent pedestrians or little children from squeezing through to cross the carriageway. Preferable, the guard-rails should be set back from edge of the carriageway by at least 150mm.

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

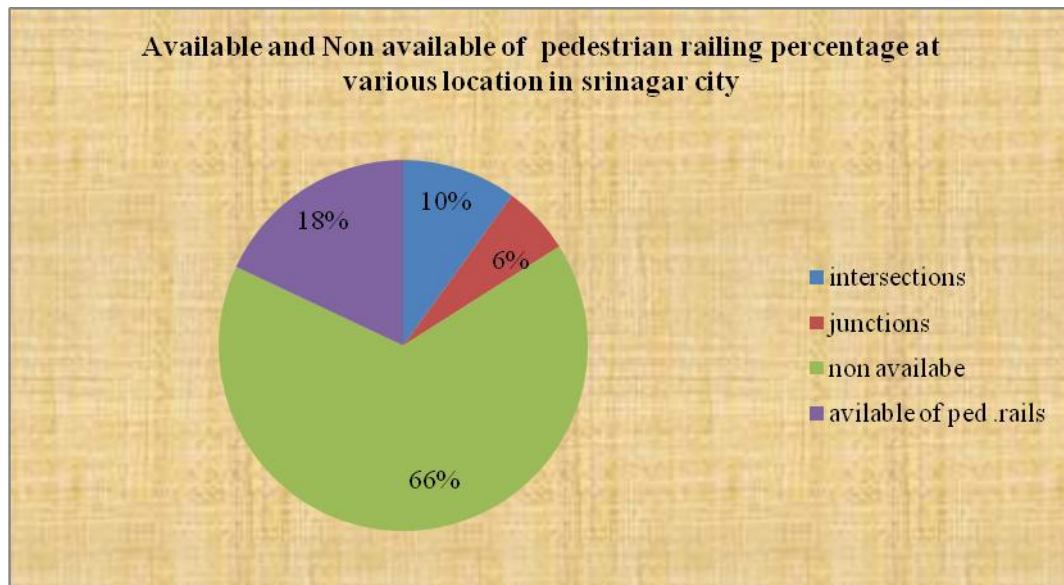
Figure 9: Existing MS Railing at Rainawari junction, Srinagar



Figure 10: Existing MS Railing at Bemina By-pass road

III. RESULTS

The below results are based on the questionnaire surveys conducted at various site location in the Srinagar city (see Table 1). At present situation in Srinagar city, there is 66% no safety to pedestrian guard rails in urban areas.

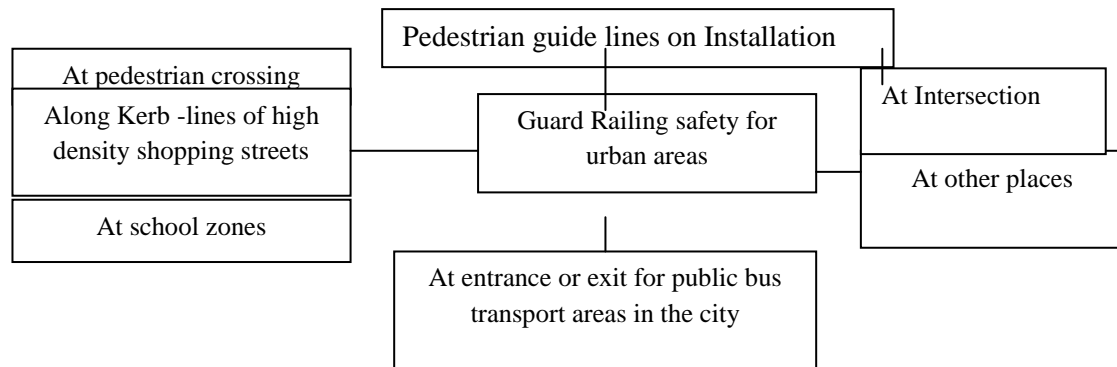


Note: ped. Rails– pedestrians railing , non available – No pedestrian railings

IV. CONCLUSION

i. It is recommended the length of the railing barrier should not be more than 200 M. The minimum length of railing barrier should be 50 M. RCC pedestrian guard-rails may be used in thickly populated area of Lalchowk, dalgate, batamaloo, Jahangir, Kashmir university, Dal lake and outer areas of Srinagar city, whereas mild steel/steel railing/ fencing of “Tubular Section” may be used as guard-rails for pedestrians in busy commercial and institutional area (MCD area) to suit with the aesthetics and urban environment of the area. ii. 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 up to sufficient length (150 M) in either side of road. iii. Railing barriers should be provided to prevent people from crossing the junctions diagonally at signalized/ un signalized intersections. The barrier must open only at planned crossing facility (at the zebra crossing). It is recommended to put blinkers before the zebra crossing which should be made mandatory. At both signalized and un signalized junctions the railing barrier should be provided for sufficient length to guide the pedestrians to the nearest planned pedestrian crossing. Pedestrian guard-rails in the vicinity of zebra should be of sufficient length to deter pedestrians from crossing the road at any arbitrary point along the road. Although much of the before-and-after research indicates that provision of pedestrian guard railing improves safety, there is little or no such evidence from the guard rail studies. It is therefore hard to draw definite conclusions from these few studies without knowing the cause and nature of the accidents in relation to the site conditions and location of the guard railing.

V. FUTURE SCOPE OF THE STUDY



VI. ACKNOWLEDGEMENT: MR. BADVEETI ADINARAYANA is currently pursuing PhD research scholar in Transportation Engineering from National Institute of Technology, Srinagar, Jammu & Kashmir, India.



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- [10] BRITISH STANDARDS INSTITUTIONS. Pedestrian Guard Rails (Metal) . BSI, London, 1976,BS 3049 Pedestrian Guard Rail is generally used along the edge of footways to provide guidance to pedestrians. Other names, e.g. pedestrian safety barrier, pedestrian fence etc. [DOT, 2001], have also been used to refer to such railing systems