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STUDY ON SAFETY BARRIERS ON HIGHWAYS NECESSITY & RECOMMENDATIONS

Rajdeep Dwivedi [1] **Rajneesh Sharma[2]** **Utkarsh Nigam[3]**

[1] Asst. Professor, Govt. Engineering College, Jhalawar, rajdeep.gecj@gmail.com

[2] H.O.D.(Civil) Asst. Professor, Govt. Engineering College, Jhalawar, rajneeshcivil.gecj@gmail.com

[3] Asst. Professor (NPIU Faculty), Govt. Engineering College, Jhalawar, utkarsh.nigam99@gmail.com

ABSTRACT: *The safety barriers and the safety fences are devices which prevent vehicles from running off the roadway physically. However there exists a tiny functional difference between the barriers and the fences: the former do not get deformed in the process, whereas, the latter are designed to absorb some of the kinetic energy by getting deformed. Both types aim to prevent the striking vehicle from gyrating or overturning and, within a narrow angle, redirect it along the direction of traffic movement. For simplicity, the term safety barrier is used to denote both the barriers and fences throughout this technical note. The present approach will help to evaluate the necessity and requirement of safety barrier along roads, highways and to plan appropriate, manageable and cost-effective safety barriers as deprived by site conditions.*

Key Words: Accident, Barricade, Highway, IRC, Roadway, Safety Barriers.

IMPORTANCE OF SAFETY BARRIER :

Loss of control of a vehicle may be due to several reasons, some of which are hard to be rectified. Safety barrier can greatly reduce the severity of accidents. Its installation lowers accident frequency because of the improved delineation. Therefore apart from introducing other safety measures and improving the road geometry, it is often desirable to install safety barriers along stretches where chances of loss of control of vehicles are higher. Accident records of year 2016-2017 show that in approx 89 km of KOTA-DEOLI section of NH-12 as 41-Fetal, 326-Grivious and 158-Minor accidents were there. The severity of some of these accidents could have been reduced if appropriate safety barriers were used.

Criteria for Provision of Safety Barriers :

In principle, the following three situations may warrant a safety barrier:

1. To protect vehicles from falling down a slope - this applies where there is a drop of 3 meters or more at or near the edge of the road and the slope is steeper than 1 in 4.
2. To protect vehicles from hitting a roadside object - this applies where there is a hazardous object, such as a bridge pier, large sign post, breast wall, rocky face, or the

end of a bridge parapet which is close to the edge of the carriageway. Protection of the any body or object from damage by the vehicles can also be a reason for utilizing and installing safety barrier.

3. To prevent out-of-control vehicles from crossing over the central median - this applies on the known crossover-accident locations along a dual carriageway.

SOME GENERAL CONSIDERATIONS :

• A barrier that is too close to the edge of the carriageway can be, a hazard in itself. If it reduces the effective carriage- way width there will be a greater risk of collisions between opposing vehicles, especially on narrow roads. Sometimes however the risk of severe run-off-road accidents may be so great as to justify installing barrier close to the edge, even on the shoulder, if this is the only space available.

• Safety barrier should be placed so that it does not obstruct pedestrian movement, for example the movement of pedestrians to and from bridge footpath. Where there are long sections of safety barrier which are close to the edge of the running lines of roads, provision of a gap should be left in the safety barrier at at least every 30 meters, so that walking persons on pedestrians can take refuge in it. On sections and parts of road where there is often rockfall, gaps should be left in the safety barrier to enable and enhance the road workers to push the fallen rock off the road.

• Safety barrier should not interfere with drainage of the carriageway. Solid barriers may need to have drains through them.

• Care should be taken to reduce the risk of a vehicle hitting the end of the barrier, as this can result in extensive damage to the vehicle and severe injuries to the occupants.

• Probably the best way to reduce the risk is to flare the barrier away from the road edge, and, if possible, bury the end in an earth mound.

• Care is needed when barriers of different types have to be connected, especially if one is more flexible than the other. The more flexible one should be stiffened gradually ds it approaches the joint, and, the joint itself must be strong enough to withstand vehicle impacts. The same applies when barrier leads up to bridge parapets.

• Safety barrier should be located so that it is in front of as many roadside obstacles (signs, utility poles, utility cabinets, trees, open drains, etc.) as possible.

• Ends of barrier, and barriers that are located in high-risk situations, should be made more conspicuous by being painted with the yellow and black diagonal bar pattern (solid barriers) or marked with reflective paint (all types of barrier) or fitted with vandal-proof reflectors.

• Proper maintenance of barriers is essential if they are to continue being effective. Moreover, un-repaired damage to barriers may give people the impression that authority does not care, so encouraging vandalism.

Road Side and Median Safety Barriers:

a. Barricades are purposefully provided to give control without critical diversion or displacement under impact and affect and to divert errant along the boundary. They are intended to be effortlessly managed to relocated and have four particular attributes to:

(i) Prevent movement from entering work zones, for example, unearthings or material stockpiling locales;

(ii) Provide security to specialists;

(iii) Separate two-way traffic; and

(iv) Protect design, development and construction, for example, false work for courses and other unidentified items.

b. Barricades can be convenient or portable. Portable Barricades ought to be steady under unfavorable weather conditions and seem significant yet not really as to cause unnecessary harm to the vehicle on the off chance that they are struck. Fig. 1 indicates normal blockades; Types I and II are portable though Type III is changeless. The suggested measurements of different parts are given in Table 4. (2001: Guidelines for Safety Construction, Indian Road Congress ,IRC :SP:55:2001 p 19-22)

c. The horizontal member from type I and II Barricades might be of wooden boards, metal or other economic material .These ought to be 300 mm wide and ought to be painted in exchange yellow and white stripes of 150 mm width. The stripes should slant away at an edge of 45º toward the path activity is to pass. Where the barricades expand completely over the carriageway, the stripes should sloe descending towards the heading the movement must turn in reroute. Where both left and Right turns are accommodated, the chevron stripes should incline descending in the two headings from the focal point of the blockade. The whole region of chevrons ought to be reflectorised to be unmistakable from safe separation. Sort I or Type II barricades might be utilized when activity is diverted.

These barricades can be utilized between variably and are more valuable in repair work that is for the most part started on crisis premise. The help ought to be of "An edge design or pivoted or generally smoothed at the best to allow advantageous collapsing and stacking for transportation. Since these blockades are helpless to toppling in wind, their solidness can be enhances through counterbalance.

d. Type III Barricades are the changeless kind and can be made of wood, metal or other reasonable material like stone work. These are raised at the purpose of conclusion when a street segment is closed to movement on development ventures. They may expand totally over a roadway and its shoulders or from Kerb to Kerb. Fig demonstrates some run of the mill ex of settled and moveable blockades. Wherever the arrangement have to be made for the entrance of development and the supervision vehicles, type III Barricades must be given an entryway or moveable area That can be opened or potentially shut as required .signs, for example, "Street Closed " and "Reroute ARROWS" ought to be raised on the settled blockade.

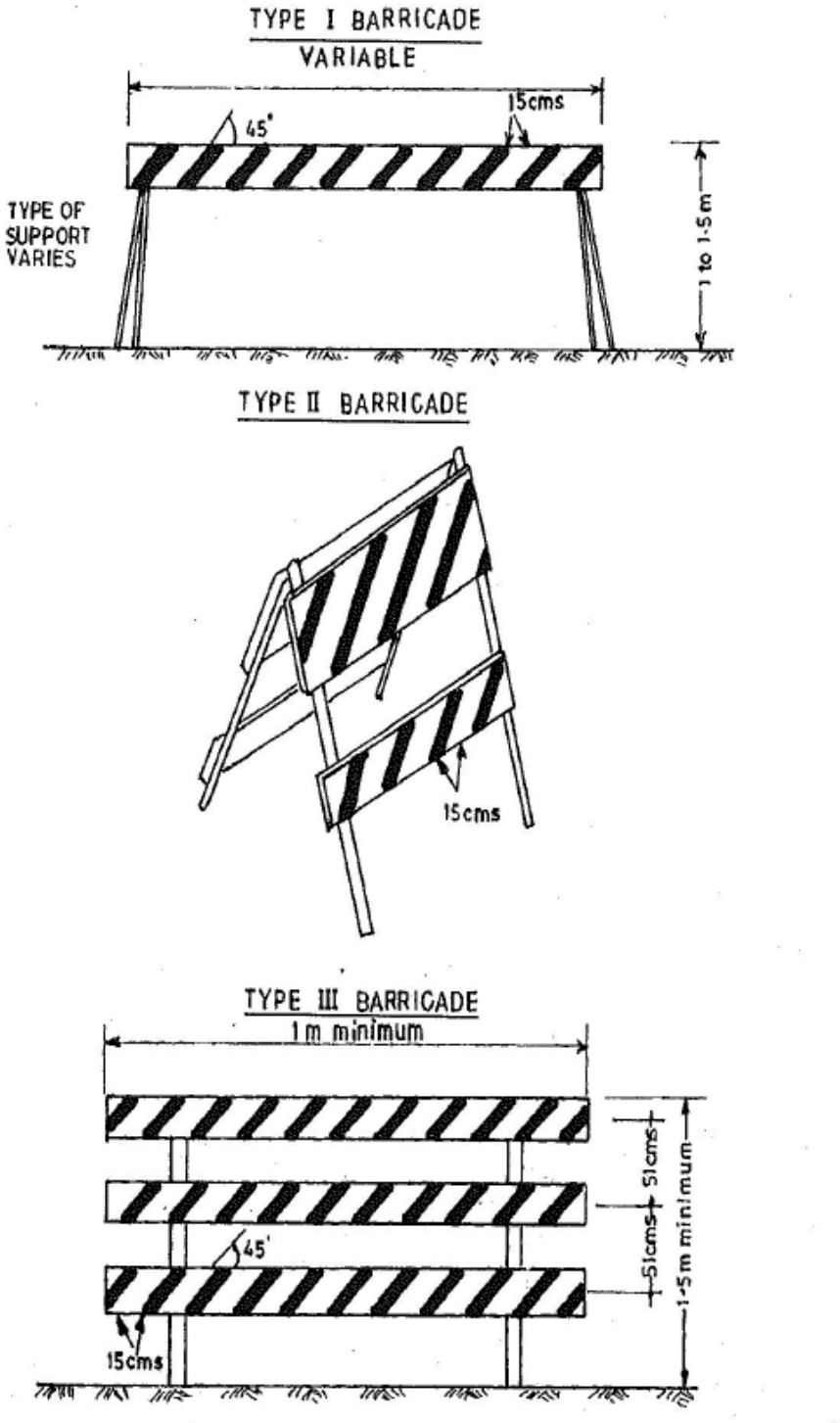

Fig.1. Barricade specifications

Table 4: Barricade Characteristics

Type / Component	I	II	III
Width of Rail	200 mm-300 mm	200 mm-300 mm	200 mm-300 mm
Length of Rail	2 m – 2.5 m	1 m – 1.2 m	1 m min – variable max.
Width of Strip	200 mm	200 mm	200 mm
Type of Frame	Heavy 'A' Frame	Light 'A' Frame	Fixed, Demountable
Flexibility	Essentially movable	Portable	Essentially Permanent

e. Where the works are to be embraced which will proceed for quite a while or where the space is constrained and there is a requirement for the security of the work drive, especially where the speed of passing activity might be high, reason planned concrete or plastic boundaries may be utilized. Their plan is regularly like the cross area of a New Jersey Barrier or rectangular nd they are somewhere in the range of 1.5 m to 2.0 m long with molded closures that can be interlocked and associated .Plastic hindrances accessible fit as a fiddle of around 80 cm to 100 cm length can likewise be attempted. Their utilization ought to be painstakingly controlled until the point that more experience is picked up with them however they offer favorable circumstances to the workforce in that the speed of effect will be tremendously diminished ought to there be a mishap and the workforce will feel more secure. They will empower smaller activity paths and support zones to be utilized where space is a premium and vehicle speed liable to be high.

Type IV Barriers: When the work territory has profound exhuming which must be barricades from moving movement and other street clients, Type IV blockades ought to be utilized as appeared in figure 2.

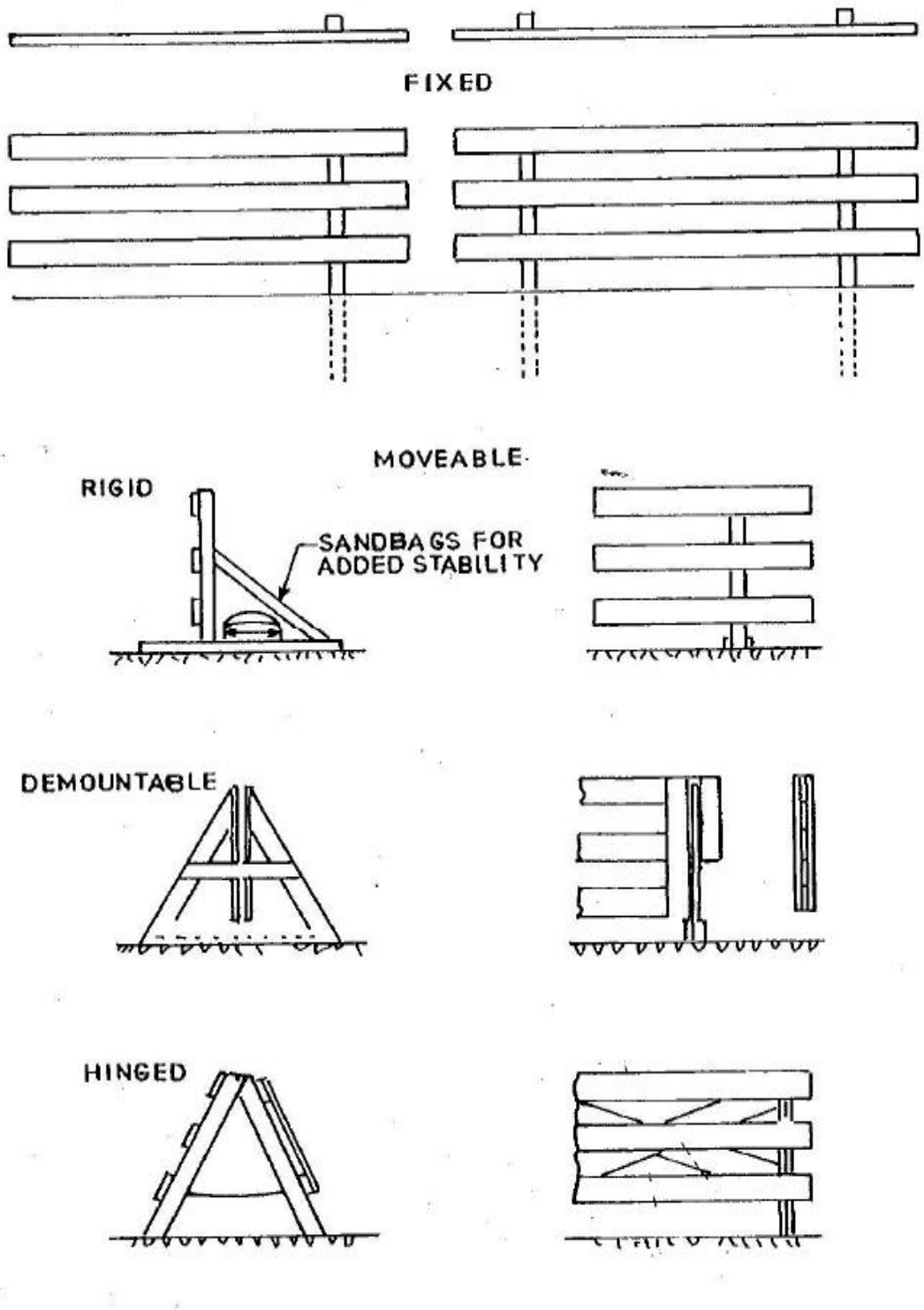

Fig.2. Barriers specification

SUMMARY OF RECOMMENDED USE :

Steel beam barrier is recommended for use in high speed roads where the speed has to be limited. Gabion barrier is recommended for general use but not in crowded area or towns. Random rubble masonry barrier is recommended for use in alternate to other barriers on bridge approaches. Plum concrete barrier is alternate to ganbion barrier where a more permanent looking structure is required in the slower speeds. Reinforced cement concrete barrier must be provided as narrow medians where the space is not enough and limited and also where it is essential the vehicles should stop. The below table 1 also summaries the barrier and recommended use.

Table: 1 Barrier Types and its Recommended Use

Barrier	Recommended Use
Steel beam barrier	High Speed Roads, Speed is limited
Gabion barrier	General use not in towns
Random rubble masonry barrier	Alternate to other barriers on bridge approaches
Plum concrete barrier	Alternate to Gabon barrier where a more permanent looking structure is required slower speeds
R.C.C. Barrier	Narrow medians, where space is limited; where it is essential that the vehicles to stop

REFERENCES :

- **IRC:73** Geometric Design Standards for Rural (Non-Urban) Highways.
- **IRC:86** Geometric Design Standards for Urban Highways in Plains.
- **IRC:SP:73** Manual for standards and specifications for two laning of state highways on BOT basis.
- **IRC:SP:84** Manual for Standards and Specifications for Four laning of Highways through PPP.
- **IRC:SP:87** Manual for Standards and Specifications for Six laning of Highways through PPP.
- **IRC:SP:55** : Guidelines for Safety Construction, Indian Road Congress.
- **MORT&H** manual for safety in Road Design.