

Traffic Calming Measures for Enhanced Safety

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4th Webinar: Road Safety Management and Action Plan

I. Over Speeding is a Major Killer

- ▶ Highways (both National and State) which accounted for about 5% of total road network witnessed a disproportionately large share of accidents of 55 % and accident related fatalities of 63% during the year 2019.
- ▶ **Over-speeding accounts for the maximum share of road accident and road accident deaths**

The sad truth: India now tops in global road accident fatalities



67.3% fatalities attributed to Speed

Speeding: Safety & Quality of Life Issue

- ▶ Speeding in urban areas, towns, villages, and other settlements is both a safety and a quality of life issue.
- ▶ **Higher speeds increase the severity of crashes, particularly in crashes with VRUs.**
- ▶ And conventional wisdom also suggests that increased speed increases the likelihood of a crash.

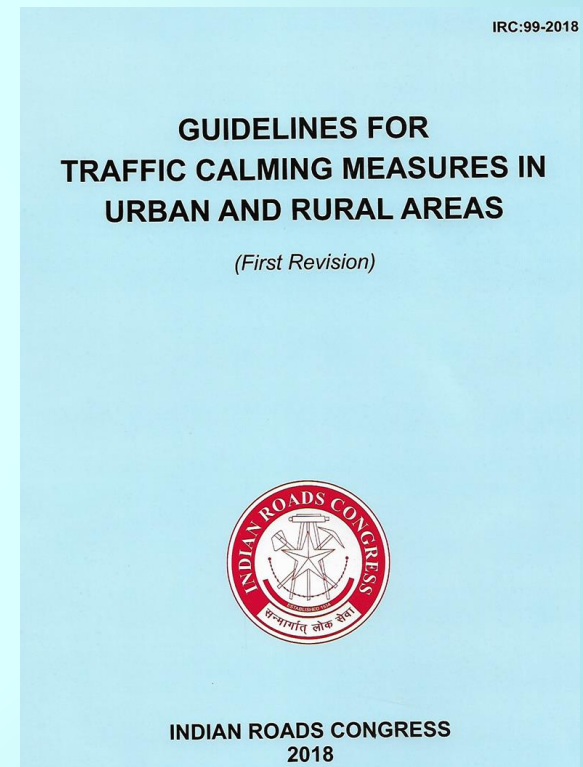
Table 1.1 Effect of Death and Injuries by Change in Mean Speed

Change in	Change in Mean Speed					
	Speed Reduction			Speed Increase		
	-10%	-5%	-1%	+1%	+5%	+10%
Deaths	-38%	-21%	-4%	+5%	+25%	+54%
Serious Injuries	-27%	-14%	-3%	+3%	+16%	+33%
Other injuries	-15%	-7%	-1%	+2%	+8%	+15%
Property damage crashes	-10%	-5%	-10%	+1%	+5%	+10%

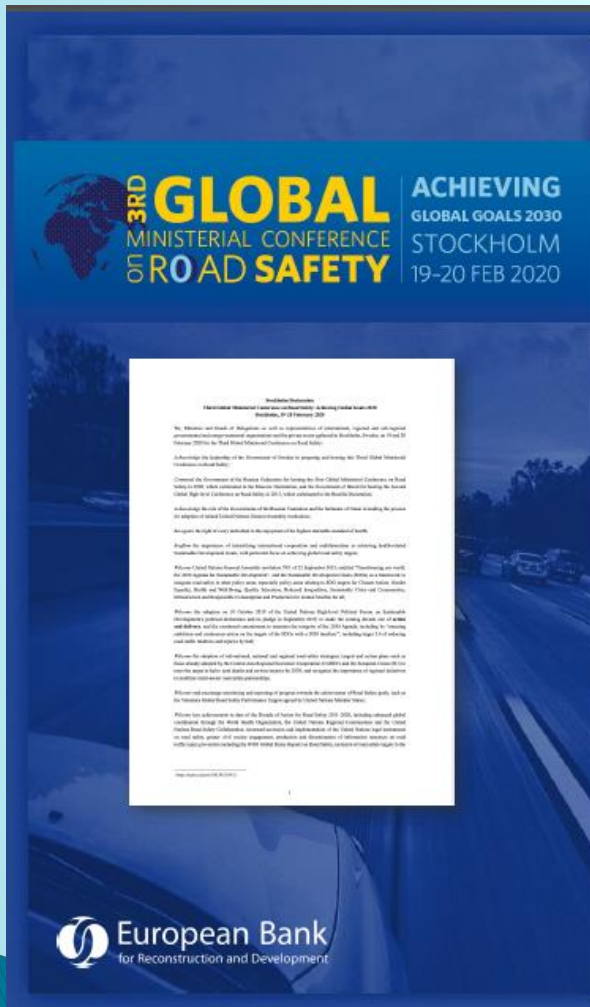
Source:
IRC:99-2018

Managing speed through Traffic Calming: One of the most promising action for ensuring Road Safety

- ▶ Traffic calming is a method to slow down the speed of traffic at locations where higher speed is not tenable due to possible safety hazards for different road users.
- ▶ IRC:99-2018 is a guideline for traffic calming measures, which covers a very wide range of measures for traffic calming at all such possible locations, where high speed cannot be permitted.



Global Road Deaths 50% by 2030 ? (Sustainable Development Goals – SDG)

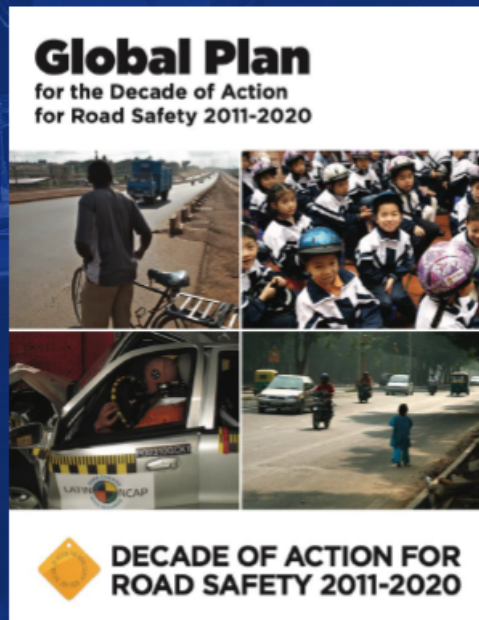


3RD GLOBAL MINISTERIAL CONFERENCE ON ROAD SAFETY, STOCKHOLM

The SDGs were reaffirmed, calling for a new decade of **action and delivery** to cut global road deaths by 50% by 2030 – calling on governments to:

- *Ensure* minimum road safety standards for all road users in all road infrastructure improvements and investments;
- *Focus* on speed management, mandating a maximum road travel speed of 30km/h in areas where vulnerable road users and vehicles mix

UN Decade of Action Plan



THE GLOBAL ROAD SAFETY PLAN
INCLUDES '**5 PILLARS**' FOR ACTION –
AMONG THEM SAFER ROADS

Road
safety
manage-
ment

Safer
Roads

Safer
Vehicles

Safer
Road
Users

Improved
Post-
Crash
Care

Speed

Tools for Managing Speeding and Reducing Speed-related Crashes

1. Engineering

Traffic Control Devices to Reduce Speed e.g.

Advisory speeds, pavement speed limit marking, speed activated feedback sign, optical speed bars

Road and Street Designs like reducing lane width, a road diet, A center island or raised median , a roundabout

Traffic Calming e.g. speed hump, speed tables, mini roundabouts, traffic circles and Gateway Treatments

2. Enforcement:

Traditional and Automated

3. Education:

Citizen concerns and behavior often drive speed management policies and any associated education efforts.

Supreme Court of India's Directions for Improvement of Road Safety in the States/UTs: 30.11.2017.

- ▶ **Set annual targets to reduce fatalities due to over-speeding on NHs, SHs, and MDRs**

(Use Interceptor vehicles not only as first responders but to prevent over-speeding also. Use other means for checking the speed on the basis of time taken by the vehicle to travel between two toll gates)

- ▶ **Identify the total number of intersections of lower hierarchy roads with higher hierarchy roads after every 2 years and set annual targets for providing Traffic Calming Measures on lower hierarchy roads as required.**

II. Traffic Calming

- ▶ **Traffic calming techniques which seek to reduce vehicle speeds with the intent of improving safety (reducing crashes) have been applied internationally for many years with good success.**



However, the majority of traffic calming applications has historically been made in urban and suburban environments and often applied at spot locations.

Traffic Calming Increases Road Traffic Safety

- ▶ **Traffic calming on highways passing through rural communities and built-up areas can increase the safety of road users and rural community members.**
- ▶ **The degree of effectiveness is diverse with differing traffic calming devices offering benefits in varying ways.**



As such it is important to select the appropriate treatment for each individual road environment.

More specifically, traffic calming schemes may be used on Highways to:

- ▶ Encourage appropriate vehicle speeds;
- ▶ Enhance safety along a particular route;
- ▶ Reduce community severance;
- ▶ Facilitate access for public transport, pedestrians, cyclists and horse riders;
- ▶ Enhance the local environment; and
- ▶ Improve driver awareness and promote appropriate behaviour.



Traffic Calming for Higher Speed Roads .

Traffic calming is a useful way of controlling drivers' speeds where speeds are either excessive and/or inappropriate for the type and use made of a road.

Suitable measures are now available for higher speed roads, although as speeds increase it becomes less safe to use physical measures and greater reliance is placed on non-physical means.



This means that physical measures are less likely to be used on highways

Traffic Calming for Higher Speed Roads ..

- ▶ **Non-physical measures are likely to result in less significant reductions in speed unless they can be accompanied by strict enforcement of speed limits.**
- ▶ **As far as practicable, schemes should be designed to be self-enforcing. This will help achieve the required speed reductions and will have the added advantage of reducing the demand on police resources.**

Apart from safety as the primary factor, the local environment, community severance and accessibility issues are all acceptable reasons for introducing traffic calming on trunk roads.

The Village Speed Control Working Group (VISP) in UK concluded that large reductions in major road traffic speeds in villages could only be achieved through comprehensive traffic calming schemes.

III. Location for Application of Traffic Calming Measures on Highways

- ▶ 1. **Traffic Calming on Highways passing through villages, towns and other built up-areas**
- ▶ 2. **Traffic Calming on Critical Elements of the highways such as on approaches to sharp bends, junctions or approaches to schools and hospitals etc located along the Highway or vicinity of it.**



1. Traffic Calming on Highways passing through villages, towns and other built up-areas



Convergence of Roadway Purposes

- ▶ **Speed management is a significant challenge for small, rural communities where the main roadway through the town serves a dual role.**
- ▶ **Outside the town, the roadway provides high-speed travel over long distances;**
- ▶ **Within the built-up area, however, the same roadway accommodates local access, pedestrians of all ages, on-street parking, bicycles, NMTs and the many other features unique to the character of a community.**
- ▶ **This convergence presents both an enforcement challenge for the community and a potential safety problem for the public.**

Transition zones on approaches to Villages /Settlements/ Urban areas

- ▶ Speeding may be particularly problematic on approaches to urban areas from rural areas, often called transition zones.
- ▶ Motorists tend to *underestimate their travel speeds* after having driven for a long time at a significantly higher speed—may cause motorists to travel faster than they should upon entering the urban or settlement areas. (*speed adaptation phenomenon*).
- ▶ An examination of transition zones in Australia, found that the injury-producing **crash rates on these approaches are significantly greater** than those of rural roads.
- ▶ Similarly, research studies of speeds in rural settlements concluded that a lack of respect for posted speed limits appears to translate into **high multivehicle crash rates on posted “low-speed sections”** of road.

Road design must inform road users about the impending road environment

- ▶ Based on the principle of Self-Explaining Roads, the road design should always advise the expected action on the part of the road user.
- ▶ A popular tool adopted for this purpose is the traffic calming device popularly known as Village Gateway treatments.
- ▶ Gateway treatments alert drivers that they are entering a slower area.



In this treatment name of the approaching village/settlement along with advisory speed limit sign are put on both sides of the roadway so as to give an impression of a Gateway.

An example of Gateway signs from Lao Republic.



The uniformity of such signs before every settlement cautions and prepares the road user to changed road environment where one is to be cautious while driving.



1: Baseline



2: Gateway



3: Gateway and patches



4: Alternative gateway and patches



5: Gateway and continuous coloured surface with patches

Gateway Treatments at Entrance to a Village

Changes in surface texture on approaches to hazards or gateways

- ▶ **Textured surfacing can provide a visual, audible and vibratory warning to drivers but to a lesser degree than rumble devices or rumble areas.**
- ▶ **It is important to ensure that skid resistance maintained. This is best achieved through the use of a high skid resistant surfacing.**



Traffic Calming thro' Road Markings : Central Hatching/Refuges, Speed Limit Roundels, Coloured Patches & Pedestrian Facilities



Speed Management Treatments

1. Speed change treatments

- ▶ Gateway treatments
- ▶ Physical thresholds
- ▶ Visual thresholds

Best results typically occur when Thresholds and gateways employ a combination of physical and visual measures and when they are accompanied by downstream changes in the roadway and/or built environment that serve to maintain or manage the speed change.

2. Speed maintenance treatments

Designs to reinforce and aid drivers' maintenance of appropriate speeds

- Road width
- No of lanes
- Delineation
- Medians
- Road Surface
- Physical restrictions
- Signs
- Roadside features

Highways pass through many villages/settlements and towns

- ▶ The Demo Corridor (Renigunta – Kadapa Section of SH-31, Andhra Pradesh) passes through many (44) villages/settlements and towns on its 138 km stretch.
- ▶ **As there are various activities going on both sides of the highway, the character of the highway changes which requires certain adjustments on the part of various road users including those who are passing through the facility.**



Existing Practice: Sequence of Signs

- ▶ **The settlement name and speed limit signs were being provided but their locations and the order was not always uniform.**
- ▶ **As such there was a lack of system and uniformity which did not give optimum results for road safety in the long run.**

One could find, on approaches to settlements en route, village/town names provided after the advisory speed limit sign.

Ideally the Speed Limit sign should either follow the Village name or those should be together as in a Gateway Type of Signs.

If the two signs, the Information sign for Place Name and Advisory Speed Limit are together on the same poles, the message is likely to be better understood and respected.

Two options for Gateway sign on Demo Project

Such Gateway Signs were recommended to be put on both sides of the roadway and on approaches in each direction of travel.

Thus, 4 such signs would be there for each settlement stretch



Left: Putting the Speed Limit sign through a third pole.

Right: Both the signs on a single board. Speed limit sign placed on yellow backing board. The place name on green background with white alphabets.

Placement of 2 signs on a Pole



The advisory speed limit indicated before the Curve sign.

The Speed Limit sign should either follow the Curve sign or ideally two signs should be together on a same pole.



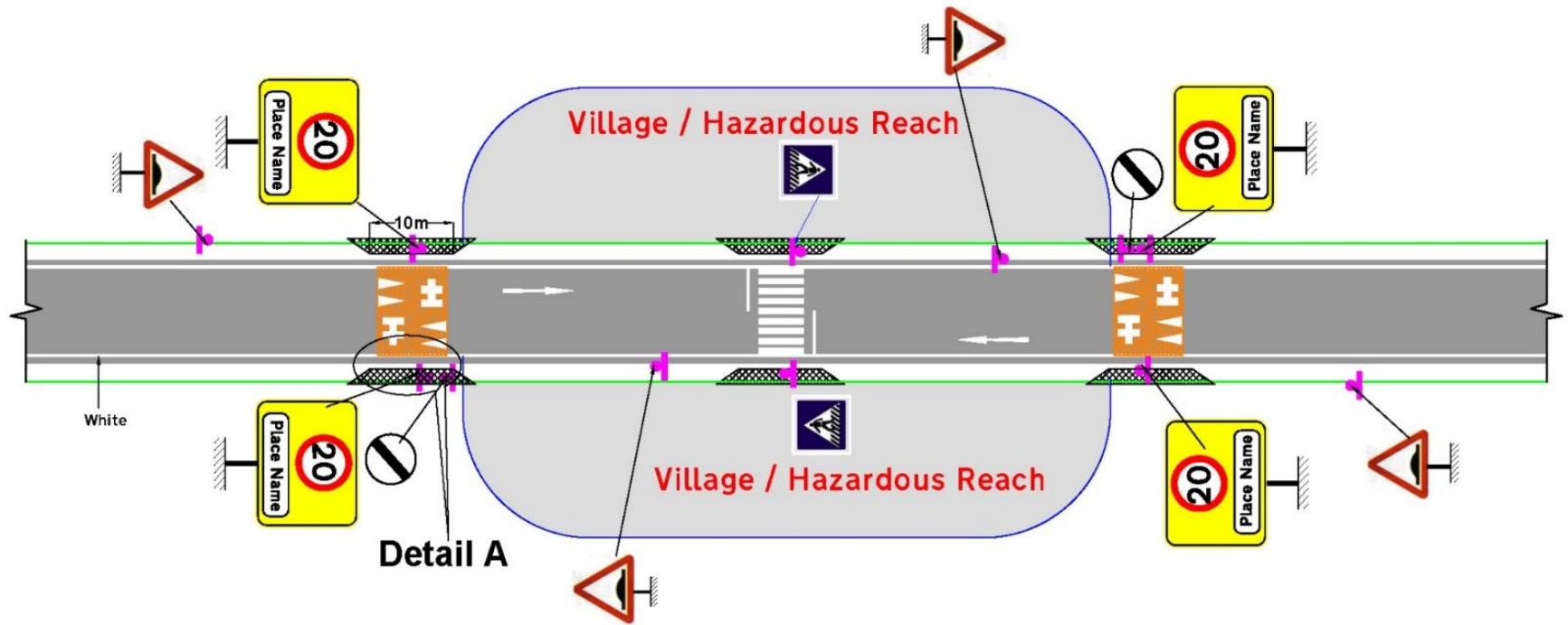
The reason for reduced speed limit will be better appreciated and respected by the road user.

Situations where there is a linkage between two signs following each other



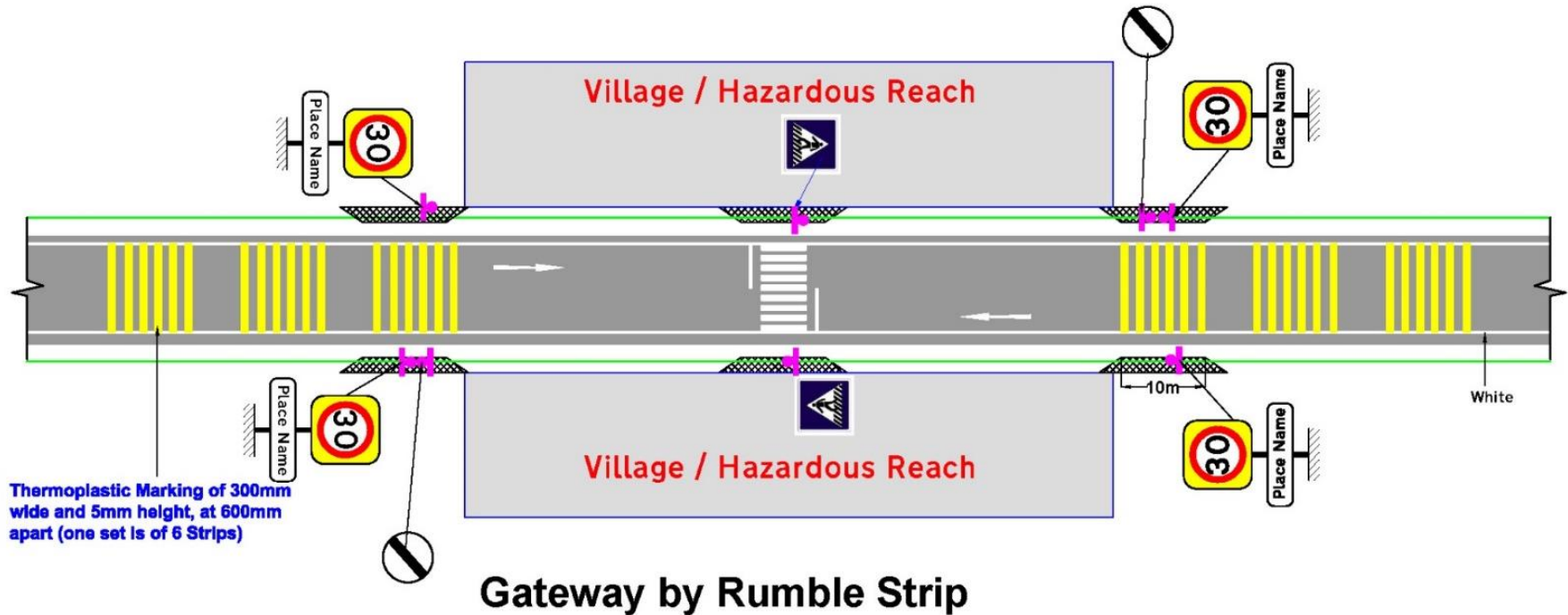
- ▶ Two signs on a single pole could be provided on such locations.

Villages with Speed Breakers

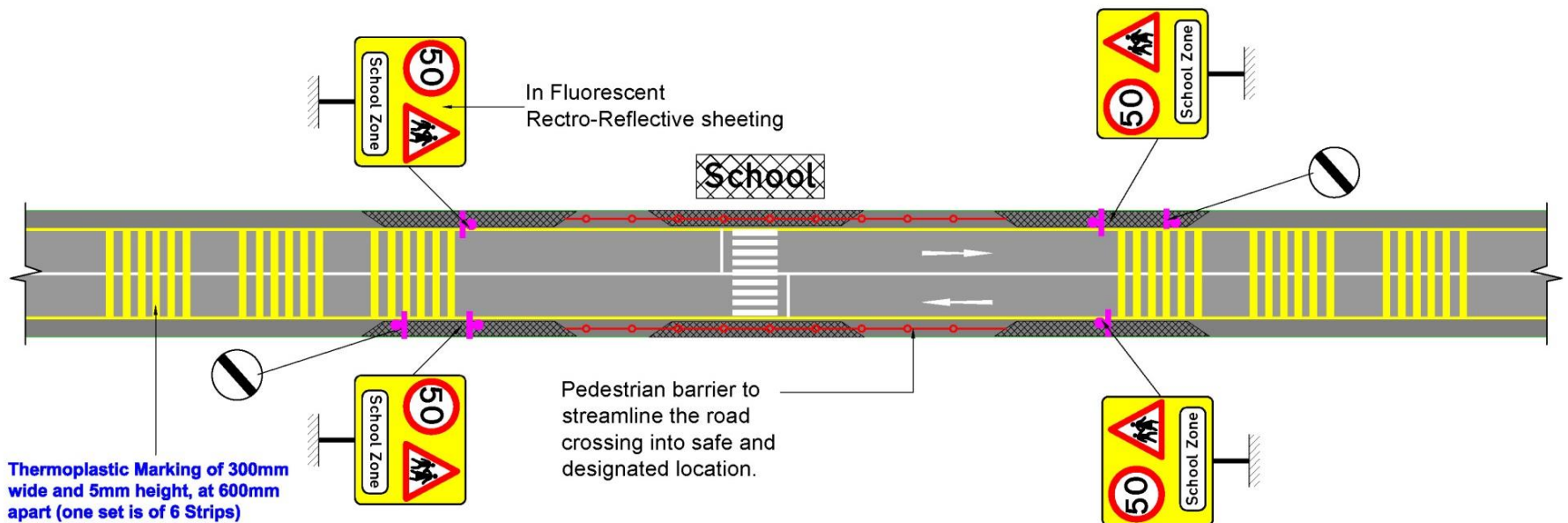


Gateway by Speed breakers

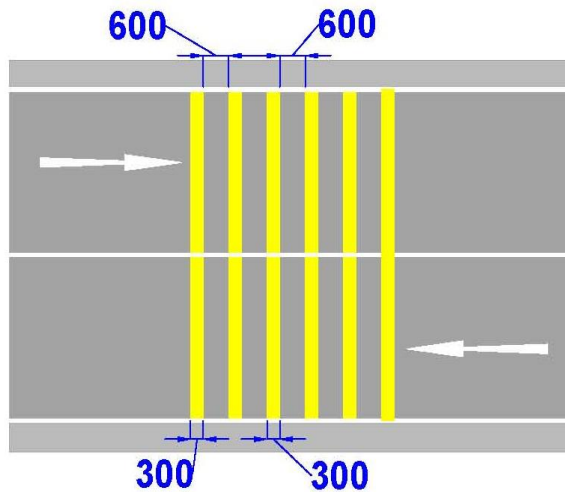
Villages with Soft Treatment



School Zones in Villages

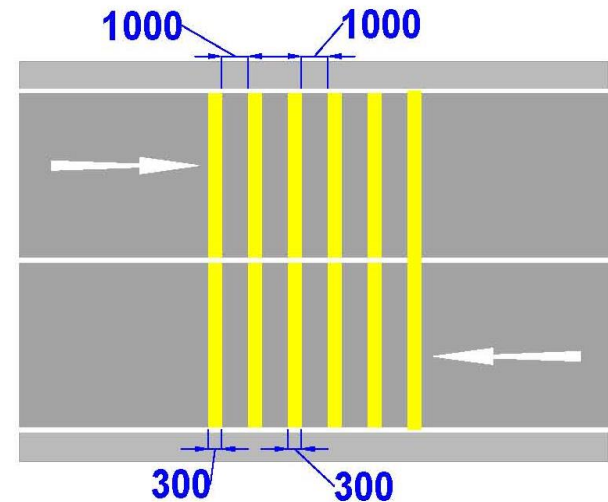


Thermoplastic Bar Markings



Thermoplastic Marking of 300mm wide and 5mm height, at 600mm apart (one set is of 6 Strips)

5mm height is achieved through two applications of thermoplastic, applied at an interval not less than 1 hour for the 1st layer to be solidified



Thermoplastic Marking of 300mm wide and 15mm height, at 1000mm apart (one set is of 6 Strips)

15mm height is achieved through six applications of thermoplastic, applied at an interval not less than 1 hour for the previous layer to be solidified

Signs at the end of the villages/built up areas

- ▶ Restriction end sign should be put after the built up area is over and normal highway conditions prevail



Restriction End Sign about 0.5 km after the built up area is over.

This sign indicates the point at which all prohibitions notified by prohibitory signs for moving of vehicles cease to apply.

2. Traffic Calming on Critical Elements of the highways



TRAFFIC CALMING DEVICES

- ▶ **1. Rumble Strips** (Transverse, Longitudinal or Central)
- ▶ **2. Coloured speed reinforcement**
- ▶ **3. Speed feedback sign**
- ▶ **4. Speed Table**
- ▶ **5. Speed Cameras**
- ▶ **6. Road Narrowing**

Different types of Rumble strips



Coloured speed reinforcement

- ▶ Coloured speed reinforcement involves the installation of the new speed limit on the road pavement surrounded by a large box of coloured paint.
- ▶ The coloured paint aims to draw driver attention to the speed limit and determine a physiological response.
- ▶ The physiological response will result in drivers reducing their speed closer to the highlighted speed limit.



Speed Feedback Sign: an Electronic Board, which measures your speed as you drive along the road



The speed is displayed on an electronic speed sign adjacent to the road.

Typically the speed sign is placed next to the existing posted speed limit so that the driver between can compare his own speed and the posted speed.



Thermoplastic Rumble Strips

- ▶ Rumble devices are designed to alert drivers to approaching hazards or gateways through noise, vibration and visual effect.
- ▶ **Devices may be referred to as rumble bars, jiggle bars, rumble strips or rumble areas.**
- ▶ Bars or strips are usually formed of thermoplastic and must not exceed 15mm in height and no vertical face may exceed 6mm in height.
- ▶ **Adequate audible and vibratory warning can be achieved from 13mm high rumble devices.**



Transverse markings before bends



Transverse markings before sharp curves



Transverse markings before Pedestrian Zebra Crossings

Faster a driver is traveling, the greater is the stopping distance required to stop with sufficient time, to prevent a collision with a crossing pedestrian, and the lower the likelihood that the stopping distance will be available.



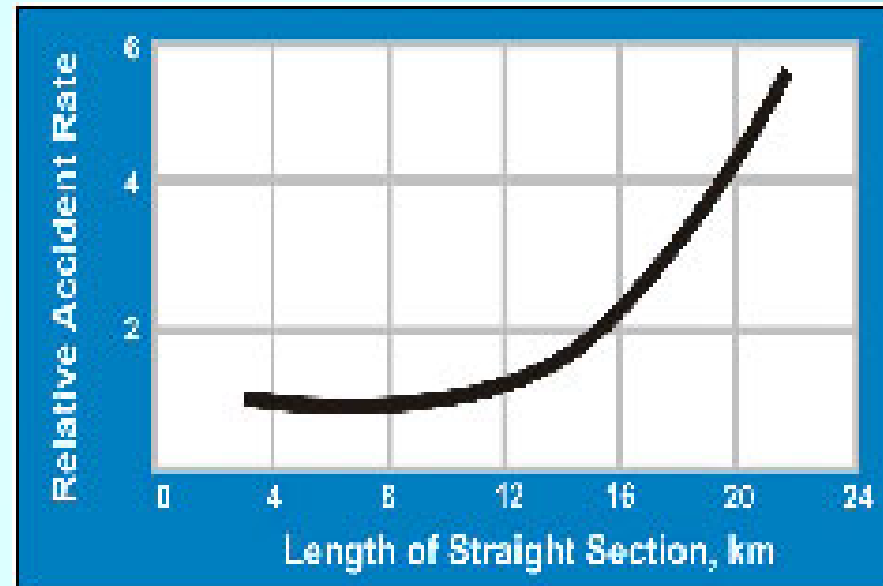
Higher-speed roads, thus, need additional treatments to facilitate safe pedestrian travel.

Transverse markings before Junctions



Traffic Calming for too long Straight sections

- ▶ Too long straight sections result in monotonous conditions and driver hypnosis. There is blunting of attention, increase in reaction time, drowsiness and sleep under such conditions.
- ▶ The longer the length of the section higher is the relative accident rate per km. The German standards limit the length of straight sections to 20 V, where 'V' is the design speed in km/hr.



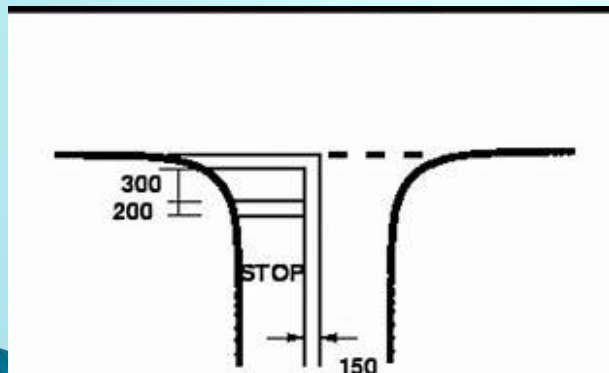
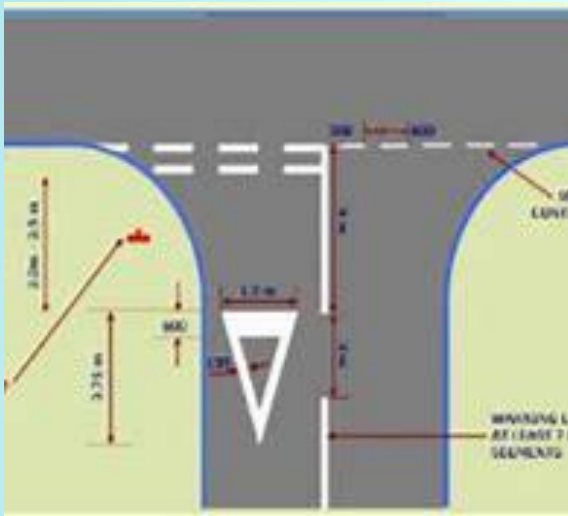
Escape Lanes on Steep Down Grades

On steep down grades where there is a history of run away truck accidents, may be considered to bring these vehicles to a safe and controlled stop.

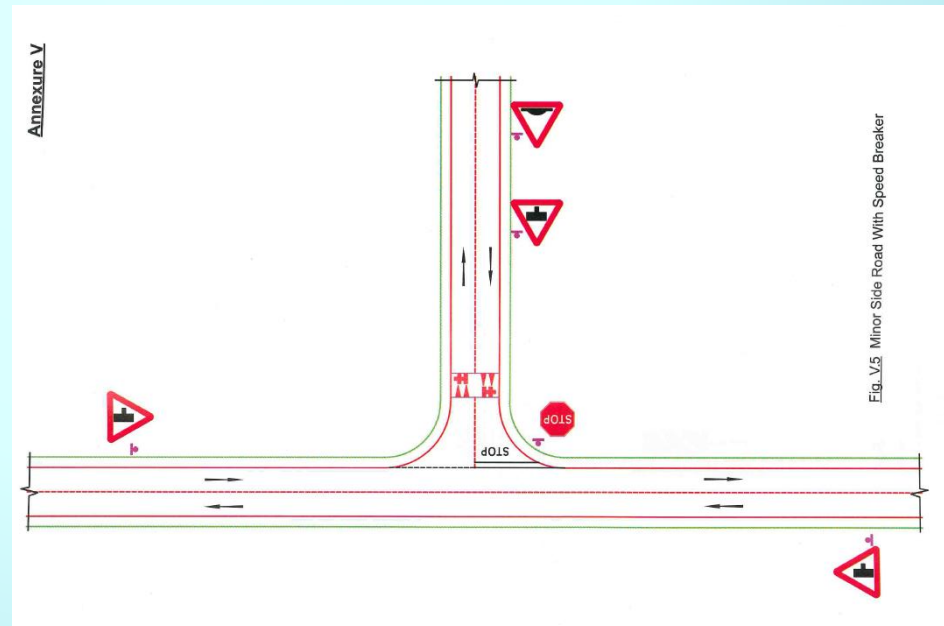
- ▶ Escape lanes are very effective in minimising accident injury and preventing gross property damage.
- ▶ Escape lanes usually take the form of an unsurfaced, steep, uphill ramp.
- ▶ Deceleration is provided by the retardation component of gravity on an upgrade and drag/friction of the vehicle's tyres running on the gravel or earth surface.



TRAFFIC Calming at Major-Minor roads situations

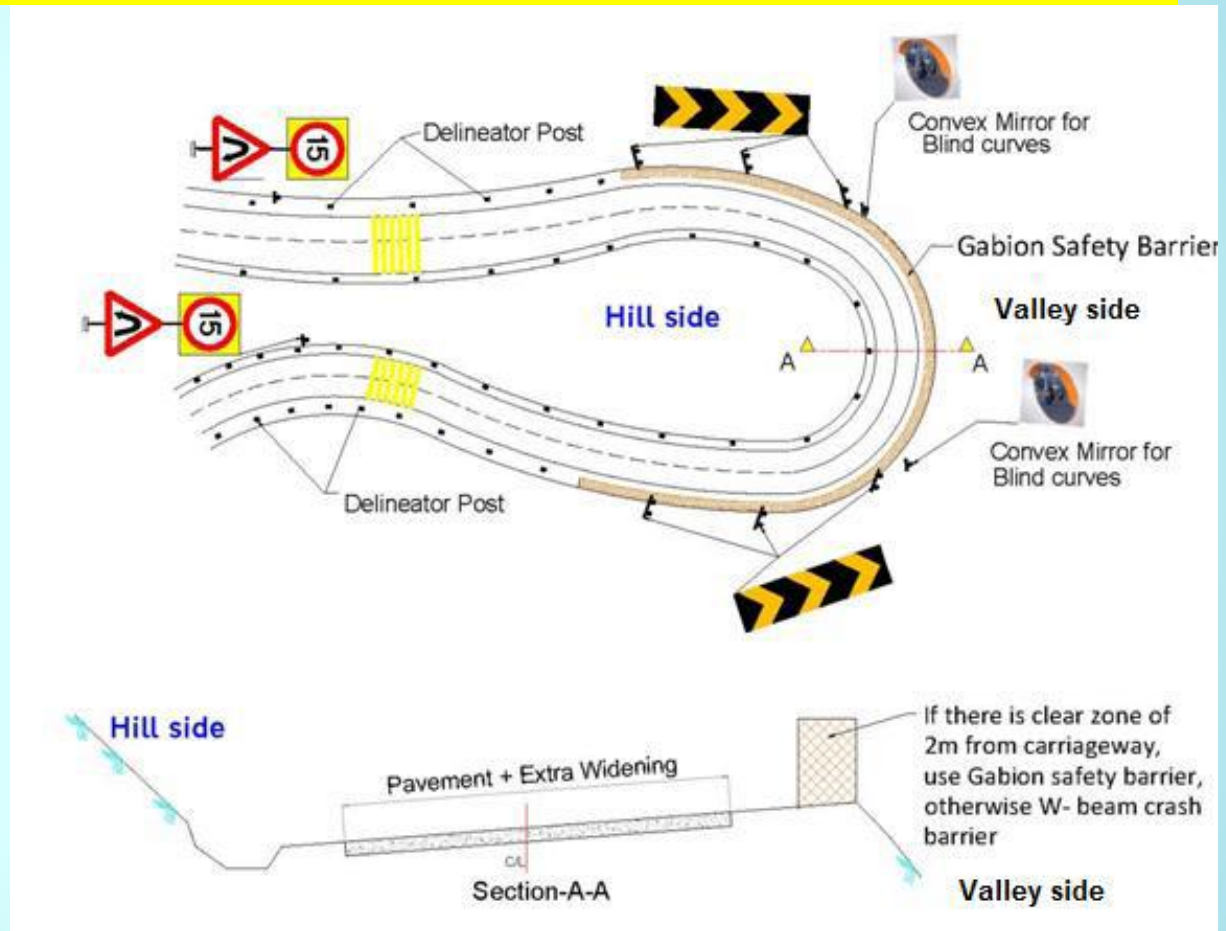


Identify the total number of intersections of lower hierarchy roads with higher hierarchy roads after every 2 years and set annual targets for providing Traffic Calming Measures on lower hierarchy roads as required. (SC Committee on RS)



Blind Bends on Hill Roads

- Post adequate speed limit sign posts
 - **Provide adequate signage indicating “steep drop/climb ahead”.**
- Provide Centre line Marking
 - **Provide reflector studs on centre line markings**
- Provide psychological Rumble strips
 - **Provide Triple chevron signs indicating the direction of bends.**
- Provide convex mirror to see oncoming vehicle
 - **Provide adequate crash/ deflection barrier**



Final Remarks

1. Speeding is a safety and QOL issue as established by National and global data
2. 3rd Global Ministerial Conference (2020) called for minimum RS standard for all road users as well as focus on speed management
3. SC Committee on RS directed states to set annual targets to reduce fatalities due to over-speeding on NHs, SHs, and MDRs
4. Traffic Calming provides important cost-effective Engineering measures for Managing speeds. IRC-99-2018 provides guidelines.
5. As speeds increase it becomes less safe to use physical measures on highways and greater reliance is placed on non-physical means.
6. On high-speed roads one important area of Traffic Calming applications is in the transition zones from rural to urban character while the other broad area is speed management for critical elements of such highways.
7. There is a need for consistency in design of critical elements on the highways keeping in view self-explaining roads.

THANKS

