DESIGN GUIDELINES FOR LATERAL CLEARANCE AT HORIZONTAL CURVES IN EXPRESSWAYS

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Design guidelines for lateral clearance require designing expressways by confirming drivers' line of sight is not obstructed by the objects at the horizontal curves. It gives sufficient sight distance to drivers ensuring safety of drivers and passengers. There are guidelines for lateral clearance design such as AASHTO Green Book. In the expressway, lateral clearance is measured from the centreline of the inner lane to the guard rail. Lateral clearance distance is varied with the radius of the curve and speed of the vehicle. Sometimes widening should be done to reach the required lateral clearance. If the driver's line of sight isn't obstructed by guard rail, there is no requirement to go for road widening with additional cost. This study was done to evaluate whether the existing lateral clearance is enough to fulfil the lateral clearance guidelines for various radii of curves and speeds. Subsequently, if the existing clearance is not enough, the line of sight is obstructed by the guard rail is checked, by using road geometry, height of guard rail and design speed. If the available lateral clearance is not enough at the centreline of the road, widening must be done because, even the line of sight is not obstructed by the guard rail, line of sight can be obstructed from vehicles that are going in the other direction. But at the outer shoulder sometimes even the available lateral clearance is not enough, widening is not necessary because the line of sight is not obstructed by guard rail. Therefore, drivers can see sufficient stopping sight distance.

This research underscores the critical importance of lateral clearance in ensuring the safety of expressways, particularly at horizontal curves. By verifying the effectiveness of design guidelines, such as those outlined in the AASHTO Green Book, the study highlights the necessity of maintaining adequate lateral clearance to preserve drivers' line of sight and prevent potential accidents. The findings reveal that while widening roadways may be necessary in cases of insufficient lateral clearance, careful consideration of factors such as curve radius, design speed, and superelevation is essential. Moreover, the study emphasizes the paramount importance of prioritizing safety in roadway design, underscoring the need to implement measures that guarantee an unobstructed line of sight for drivers.

According to the results, at inner shoulder, if sufficient lateral clearance is not provided, even driver's line of sight doesn't cross the guard rail, road widening is necessary. Because in such situations, the driver's line of sight crosses by the vehicles coming from opposite direction. At the outer shoulder, for the 120 kmph design speed, if the radius is less than 1650 m, the initial and final 250 m of the curve should be widened. Also, for the design speed of 110 kmph, if the radius is less than 1300 m, the initial and final 220 m distance of the curve should be widened. The initial and final 185 m distance of the curve should be widened for a design speed of 100 kmph if the radius is less than 900 m. If the radius is less than 695 m for a design speed of 90 kmph, the initial and final 160 m of the curve should be widened. So, at least 33% of road widening costs can be saved from the recommended suggestions, without affecting the safety of drivers and passengers.

Keywords: Guard rail, Line of sight, Obstruction, Sight distance

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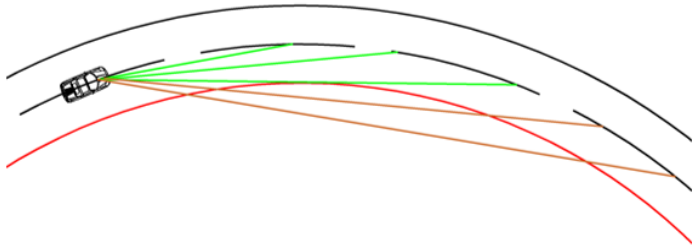
BACKGROUND

At the horizontal curves in expressways, if sufficient lateral clearance is not provided, the line of sight is obstructed by the various type of barriers like Guard rail, Noise barriers, Sign boards, Bird fences, etc.

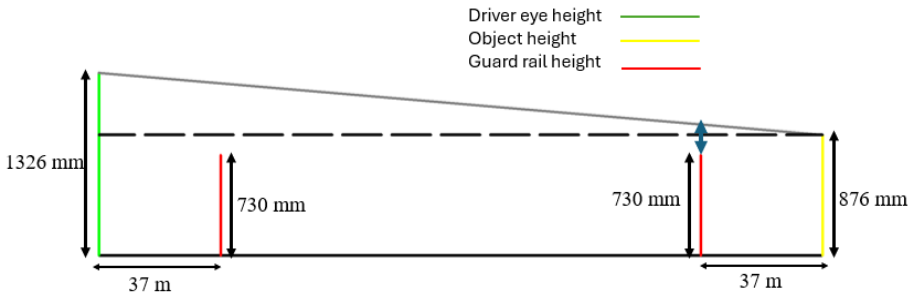


Methodology

DATA
Check available lateral clearance at each speed, radius and super elevation

CALCULATION
Calculate height difference between top of the guard rail and line of sight

- ✓ Driver and object both are at superelevated curve section
- ✓ Driver at the tangent section and object at the superelevated curve section
- ✓ Driver at the superelevated curve section and object at the tangent section



Difference between line of sight and top of the guard rail at 37 m distance from object's location

$$0.876 + 37 \times \left(\frac{1.326 - 0.876}{220}\right) - 0.730 = 0.221\ m$$

Therefore, difference between line of sight and top of the guard rail is 221 mm