

Geometric Design Standards for Narrow Curves in Hilly Terrain of Sri Lanka

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The geometric design standards of roads in Sri Lanka are primarily based on the 'Geometric Design Standards of Roads (GDSR) of Road Development Authority, 1998. The GDSR is a complete set of guidelines that the Highway Design Division of RDA is following to design new roads and rehabilitate existing roads. However, the problem identified in this research with this glorious manual is the lack of design details for the horizontal curves whose radii are below 25m. As a design engineer, a main problem one faces in designing the roads in Sri Lanka is the financial constraints imposed with the design. Even though one is obliged to follow the GDSR in designing roads, it is common to find places where the minimum curve radius 25m is not possible at all without significantly increasing the cost. The aim of this research is to find out a set of guidelines for the geometric design standards for these narrow curves.

The main objectives considered are; to find out the horizontal design standards, in the context of design speed and superelevation that are adoptable to the curves whose radii are below 25 m, to find out the appropriate vertical design standards to cater the above situation and to find out the different physical measures to enforce these design standards.

The Factor of Safety (FOS) was assessed in each of the speeds from 100kmph to 30kmph as used in GDSR. □A representative FOS was taken to use in design speeds lesser than 30kmph. The maximum superelevation was assessed subjected to the practical maximum of 10% as per the findings from the literature review. Side Friction Factor (F_{max}) was taken as 0.21 in conformity with the findings from the literature. Minimum radii for each of the superelevation values from 2.5% to 10% were determined against speeds of 25kmph, 20kmph, 15kmph and 10kmph. □The practical minimum radius of 13m was adhered to cater for the design vehicles.

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It is shown that the derived design standards can be used for the narrow curves up to 13m, which are not covered by the GDSR and they should be accompanied with suitable vertical design standards. The practical minimum design radius should be 13m.