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## Impact of Bitumen Content Tolerance Limit on Performance of Asphalt Concrete Pavements

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### Abstract

The development of corrugation along the longitudinal profile is one of the most common distresses in asphalt pavement. Especially road sections with high longitudinal slope, the problem is more severe than sections with a mild slope. This is because the slope decreases average speed of vehicles running upward, so the total loading time increases drastically. On the other hand, vehicles tend to apply brakes when running downward.

The research aims at finding out how asphalt material (Bitumen & aggregates) properties have an impact on corrugation distress in sloped pavements. For this purpose, a recently constructed and heavily trafficked road (Ambepussa, Kurunegala, Dambulla A006) is considered.

The above road has bitumen bleeding and corrugation issues within a short period after construction in some sloped pavement sections.

The standard specification for construction and maintenance of roads and bridges has specified requirement for bitumen content and combined aggregate grading for mix design of asphalt with tolerances. The most common aggregate combined grading is Type 1 and 3 where Type 1 has finer and Type 3 has coarser particles. The gradation is one of the important characteristics of aggregates affecting permanent deformation of hot mix asphalt. The gradients of slopes are usually not considered when selecting the combined grading type for mix design of asphalt.

The specification may be adapted to suit different conditions considering various criteria. For above road project, combined grading Type 1 and the bitumen content percentage by weight of total mix was adapted as +3% where the standard specification states  $\pm 3\%$ . This leads the asphalt plant production to maintain bitumen content at higher than the design (maintain at 4.9% in the plant though design bitumen content was 4.8%).

The investigations reveal that combined gradation of asphalt mix is towards the lower limits of specification values in corrugated pavement sections although within the tolerance. Further

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temperature and traffic loading to have an impact on sloped pavements. The recent traffic counts show that heavily loaded vehicles travel in the affected sections between 10.00 a.m. to 3.00 p.m.

As per the investigation, it is recommended to always adopt Type 3 (Courser) combined grading for asphalt mix design for heavily trafficked roads in steep gradients and curves.

Keywords: Bitumen content, Combined aggregate gradation, tolerances, temperature, AADT, Climate, Marshal Test

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