# Abstract

A pavement structure is composed of several horizontal layers. Typically, the thickness of each layer is uniform across its transverse section. Pavement has two general classifications: bituminous pavement, and concrete pavement. Bituminous pavement is generally composed of four main layers: the surface layer, base layer, subbase layer, and the subgrade. Concrete pavement is composed of three layers which are surface layer (as plain concrete slabs), base layer and the subgrade. At present, bituminous and concrete pavements are designed with uniform thickness throughout cross-sections.

However, the lateral wander of the wheel path on the pavement follows a certain distribution, indicating that the pavement is subjected to varying amounts of wheel load repetitions along the transverse direction, the provision of constant thickness may not necessarily be the most optimal design.

Thus, the present work proposes to explore the possibility of designing the pavement with a non-uniform thickness along the transverse direction, thicker along the wheel path where load repetition is more. Both bituminous and concrete pavements were considered in this study.

The FEM modelling was done for both bituminous pavement and concrete pavement to calculate the stress and strain in the pavement.

The design methodology was developed for designing a non-uniform pavement. The LtDF was considered in the design to include the effect of lateral wander. Rectangular and truncated rectangular non uniform pavement section were designed. It was found that the non-uniform pavement section exhibits less strains at critical locations, indicating a higher service life.

Further, a benefit analysis was performed to investigate the benefit of the non-uniform pavement section relative to the pavements with traditional uniform thicknesses. To perform benefit analysis overlay design was done on both bituminous and concrete pavements individually.

Overlays were provided in two ways, (i) equal overlay thickness, where extension of life to these sections will be different. (ii) unequal overlay thickness, where the extension of life to these sections can be designed to be equal.

It was that in the bituminous pavement, the strain in the non-uniform section was reduced by 9.022% as compared to uniform section if equal overlay was provided on both uniform section and non-uniform section. For equal overlay in the concrete pavement the stress reduction in the non-uniform section was 14.4% as compared to uniform section.

If unequal overlay was provided, then thickness of overlay required in the non-uniform section was reduced by 46% in bituminous pavement and by 20% in the concrete pavement.

So, it was found that non-uniform thickness pavement can be beneficial in terms of future rehabilitation works, either with a thinner overlay or extended life.