ABSTRACT

Bituminous pavements in India are designed as per the guidelines of Indian Roads Congress (IRC: 37, 2001) and bituminous mixes are designed as per the specifications of the Ministry of Road Transport and Highways (MoRT&H, 2001). In spite of complying with the specifications of pavement design and mix design guidelines, many stretches of the bituminous pavements constructed in the recent past on national highways developed premature rutting after opening to traffic. It is therefore, widely felt that the mere compliance of the bituminous mix design specifications is not sufficient and performance based tests are necessary to ensure that premature rutting does not occur during the design life of the pavements. Very few studies were conducted in the past in India on rutting performance of bituminous mixes. Hence, this study has been carried out on the evaluation of rutting characteristics of bituminous concrete mixes with the help of an indigenously developed wheel tracking device.

Sinusoidal oscillation tests were conducted to determine the rutting parameters, $G^*/\sin\delta$ and zero shear viscosity values of different unaged and aged binders using Dynamic Shear Rheometer at different temperatures. Bituminous concrete mixes were prepared with different aggregate gradations, binders at different binder contents. Laboratory rutting tests were conducted on bituminous concrete mixes using wheel tracking device. Effect of mix parameters such as aggregate gradation, binder type, binder content, temperature and air voids on the rutting potential of bituminous concrete mixes was evaluated. Correlations were developed between binder $G^*/\sin\delta$ and zero shear viscosity values and the rutting in the bituminous mixes.

Field cores of the bituminous surfacing were obtained from stretches of NH-6 constructed using bituminous concrete mixes prepared with different binders. Cores were extracted from portions without any rutting. Rut depth was measured along the wheel paths. The rut depths were normalized by dividing them with the square root of the number of equivalent single axle loads (ESALs) at the time of rut depth measurement. ESALs were estimated using traffic data and IRC: 37 (2001) guide lines. Laboratory rutting tests were conducted on the cores collected from using IIT KGP Rut Tester. A critical rut depth of 20 mm was considered in design guidelines for the bituminous pavements. By relating the field rut depths and laboratory rut depths measured, critical rut depths for the bituminous concrete mixes that could be used as acceptance criteria for different cumulative standard axle load repetitions were developed.

Key words: rutting, bituminous pavement, binder, aggregate gradation, bituminous mix, wheel tracking device, correlations, rutting criteria, equivalent single axle loads.