

ABSTRACT

The current practice in India for thickness design of roads with bituminous surfacing is based on limited experience of road performance during late 70's. The total thickness of bituminous pavement is determined from the *CBR* value of the subgrade and the design traffic expressed in terms of cumulative standard axle load repetitions. Extrapolation of the existing design methodology to the present day condition of traffic and new pavement materials is not valid because of the empiricism in the original method. In this context, an investigation was taken up in this thesis to develop a design method by correlating the performance data of bituminous pavements from different parts of India to the critical stress-strain parameters of the pavement composition leading to its failure.

A computer program, **FPAVE**, has been developed for the analysis of a pavement section idealising it as a layered elastic structure. The stress-strain-displacement values at any point of a pavement structure can be computed from this model. Pavement performance data of various representative stretches of bituminous pavements throughout India was collected and analysed. The database contained a record of the nature and extent of fatigue and rutting failure of the selected stretches and structural failure criteria were developed for Indian conditions. Fatigue behaviour of bituminous mixes were studied in the laboratory at various temperatures. The elastic modulus of bituminous mixtures and their parametric dependence on various factors were also studied. Some limited Falling Weight Deflectometer (FWD) study was performed on a few selected stretches and in-situ elastic moduli values of different layers were back-calculated for validation of material moduli of different layers. Modular ratio between the granular layer and subgrade was found to be different from that of the Shell's criterion.

A computer software **IITPAVE** was developed for design of a bituminous pavement for Indian conditions. Appropriate values of elastic modulus and Poisson's ratio of pavement layers and structural failure criteria obtained from fatigue and rutting behaviour of in-service pavements from several National Highways in India were the inputs to the program. Thicknesses for bituminous surfacings were determined iteratively for different values of granular layers, subgrade modulus and traffic. A few bituminous pavement design charts with granular and cemented base were presented. Effect of parametric variation on the design charts, behaviour of a thin bituminous layer, stage construction of bituminous pavements, design of full-depth bituminous pavements *etc.* were studied with the help of the IITPAVE program.