INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title:
DETERIORATION MODELLING OF FLXIBLE PAVEMENTS WITH MODIFIED BITUMEN IN WEARING COURSE

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SHORT ABSTRACT

India is developing its highway infrastructure through widening and rehabilitation of existing national highways under different phases of National Highway Development Program (NHDP). The NHDP road network is considered as a high speed road corridor of India. Use of modified bituminous binders have increased manifold in the last decade in India, mainly in the bituminous concrete (BC) hot mix asphalt wearing course of flexible pavements. Because of their enhanced engineering properties, modified binders are preferred to conventional (unmodified) binders. Crumb rubber-modified bitumen (CRMB) and polymer-modified bitumen (PMB) are the most common modified binders used with the intent to improve the pavement performance against large variations in temperatures and continually increasing axle loads on Indian roads.

In light of the fact that the high-speed road corridors are vital assets for socio-economic development of the country, adoption of a scientific approach for their maintenance is imperative. Highway Development and Management (HDM-4) is one of the most useful and internationally recognised tools available for pavement performance and management analysis. HDM-4 is developed under the aegis of World Bank and its use has been advocated by the government agencies in many developing countries, including India. At present, there is a strong need for well-calibrated and validated HDM-4 pavement deterioration models for the high-speed road corridors of India constructed with modified binders in the wearing course, for development of pavement maintenance and management strategies.

The main objective of this study is to perform deterioration modelling of flexible pavement sections with modified binders in the BC wearing course using HDM-4 tool. The road deterioration models inbuilt in HDM-4 predict the deterioration of the pavement over time with traffic, which is useful for decision making for highway administrators for planning pavement

maintenance. However, the models need to be calibrated for local conditions, a process that requires time series data collected over several years through extensive field and laboratory scale investigations.

A total of 23 in-service flexible pavement road sections were identified from various sections of NHDP corridor. Extensive field and laboratory studies were carried out to gather time series data related to structural and functional characteristics of different sections selected for the study, consecutively for three years. The collected time series data included pavement distress data, traffic and axle load data, pavement crust composition data, pavement material characterisation data, temperature and rainfall data, and construction and maintenance history data. The acquired time series data for first two years were used for determination of calibration factors of various HDM-4 distress models. Calibration factors were obtained for various distress models, including cracking, ravelling, potholing, rut depth, roughness, texture depth, and skid resistance. Calibration factors were then validated through statistical comparison using the chi-square test between the data predicted by the calibrated models and the third year observed time series data. Validation results indicated that the differences between observed and predicted values for all distresses were not statistically significant. The study successfully produced calibration factors for different distress models of HDM-4. The calibrated and validated HDM-4 deterioration models can be put to use for prediction of distresses and the development of maintenance strategies for the Indian high-speed flexible road corridor sections with modified binders.