

# **Field performance of flexible pavement constructed with Copper and Steel Industry wastes in subbase layer**

## **Synopsis**

The research topic of the thesis addresses the twin challenges of depleting natural aggregate resources and the disposal of open dumps of environmentally harmful metal slag and fly ash. This is an important subject and needs a detailed study.

Based on a detailed laboratory study, three different industrial waste mixes, namely, FAL, CFA and FAG, comprising of lime, fly ash, copper slag and granulated blast furnace slag in different ratios were selected. Nine flexible pavement test sections, each 50 m long and 3.5 m wide, having different thicknesses of subbase layers made of these waste mixes, were constructed and their performances were compared with that of a conventional pavement section (control section) over a 3-4 years time period.

The structural and functional performance of the test sections were evaluated using Falling Weight Deflectometer and Bump Integrator tests. Laboratory tests and microstructure analysis were performed on the samples collected from the test pavements by coring operation and the samples prepared in the laboratory to compare strength gain. Leaching potential was assessed by conducting TCLP and water leaching tests on these samples and also by testing the leachate collected from the drains installed in the test sections.

The performance of pavement was investigated in four phases. In the first phase extending to nine months, a gradual strength gain of the pavement was evaluated. In the second phase covering pre and post-monsoon period, the effect of seasonal moisture variation and related structural and functional changes and damage to test section was investigated. In the third phase which was taken up after two years of pavement construction, a truck overloading operation was conducted post-monsoon to simulate seasonal overloading during harvesting and the associated damage sustained by the test sections. In the final phase in the third and fourth year, post-damage performance typical to pavements with waste mix subbase layers was captured. A detailed life cycle impact assessment of using the waste mixes in subbase layers was also undertaken.