

# **Optimization of steel slag aggregates for bituminous mixes in Saudi Arabia.**

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Abstract

Selection of materials for use in bituminous mixes that are resistant to possible future instances of pavement distresses on highway systems is a complex phenomenon. With the rapid infrastructural development that occurred over the last two decades in Saudi Arabia, the ensuing construction boom led to massive depletion of the scarce quality road construction aggregates. Premature failures in the road pavements manifested on road surfaces in form of fatigue cracking, rutting, and raveling, have been common occurrence on almost all the major corridors of the Kingdom.

In the Eastern Province, crushed limestone and sandstone aggregates used are sedimentary rocks of marine origin that lack the desirable qualities for proper mix performance. Concomitantly, large amounts of steel slag aggregates with some of the desirable aggregate qualities are being produced and put to waste at Hadeed company in Jubail, Saudi Arabia.

This research was done to investigate the use of steel slag aggregates in bituminous mixes for use in the hot and arid Arabian Gulf environment. Laboratory evaluation of pure steel slag mixes was done by reconstituting mixes basing on Ministry of Communications (MOC) and the Strategic Highway Research Programme (SHRP) gradation specifications. Steel slag and limestone aggregates were proportioned in the sand and filler portions of prioritized gradations for the wearing and base courses. Treatment was done using Portland cement, lime, polymer, and amine additives. The mix engineering properties tested include resilient modulus, stability, split tensile strength, fatigue, and permanent deformation. The results indicate that polymer modified mixes with steel slag in the coarse portion and crushed limestone in the fine and filler portions of the modified MOC wearing course and base course gradations, are the most resistant to fatigue failure and permanent deformation.