

PERFORMANCE OF STEEL SLAG AS REPLACEMENT OF NATURAL
AGGREGATE IN WEARING COURSE OF FLEXIBLE PAVEMENT

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Dedicated to my family specially my mother and father, to my brothers and sister,
my son and all my friends...

I really appreciate their support and encouragement

I miss you all...

Zulfiqar Ali

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ABSTRACT

A byproduct obtained from steel industry known as steel slag, is reflecting as a construction material throughout the world. Mainly there are two types of steel slag, Basic Oxygen Furnace (BOF) and Electric Arc Furnace (EAF) obtained from steel industry. Steel slag is further processed to obtain different grades of aggregate to be used in pavement construction. Not all but most of the physical properties of steel slag are similar to the natural aggregate. This project was carried out to evaluate the performance of EAF steel slag aggregate in AC 14-wearing course mix. Where the conventional granite aggregate was replaced with steel slag. Five dense graded mix designs were incorporated with penetration grade 80/100 bitumen binder. The EAF steel slag was used to replace granite aggregate at percentage of 0, 25, 50, 75 and 100%. The same gradation as used for natural aggregate was followed for steel slag aggregate also, in accordance with Jabatan Kerja Raya (JKR) specification. Marshall mix design was used to obtain the optimum bitumen content (OBC) for test samples. The asphaltic concrete samples were examined through sand patch test to evaluate the surface texture depth of five different asphalt concrete mixes. The same mixes were also evaluated to find out the skid resistance of samples. The overall results of samples containing steel slag show productive results as compare to the conventional aggregates. These results confirm the potential of steel slag aggregate, and appreciate the use of EAF steel slag for the construction of green pavements by saving natural resources of aggregate.

ABSTRAK

Satu hasil sampingan industri keluli yang dikenali sebagai keluli sanga, adalah bahan pembinaan di seluruh dunia. Terdapat dua jenis keluli sanga utama diperolehi daripada industry keluli iaitu, Relau Oksigen Asas (BOF) dan Elektrik Arc Relau (EAF). Steel sanga terus diproses lagi untuk mendapatkan gred yang berbeza daripada agregat yang akan digunakan dalam pembinaan turapan. Tidak semua tetapi kebanyakan sifat-sifat fizikal keluli sanga adalah sama dengan agregat semula jadi. Projek ini telah dijalankan untuk menilai prestasi EAF keluli sanga agregat dalam *AC 14-wearing course mix*, di mana agregat granit konvensional telah digantikan dengan keluli sanga . Lima padat reka bentuk campuran bergred telah digabungkan dengan penembusan gred 80/100 bitumen pengikat. EAF keluli sanga telah digunakan untuk menggantikan agregat granit pada peratusan 0, 25, 50 , 75 dan 100%. Penggredan sama seperti yang digunakan untuk agregat semulajadi diikuti untuk keluli sanga agregat juga boleh, selaras dengan Jabatan Kerja Raya (JKR) spesifikasi. Rekabentuk campuran *Marshall* telah digunakan untuk mendapatkan kandungan bitumen optimum (OBC) untuk sampel ujian. Sampel konkrit asfaltik telah diperiksa melalui ujian tampalan pasir untuk menilai kedalaman tekstur lima permukaan asfalt campuran konkrit yang berbeza. Campuran yang sama juga dinilai untuk mengetahui rintangan tergelincir sampel. Keputusan keseluruhan sampel yang mengandungi keluli sanga telah menunjukkan keputusan yang produktif berbanding dengan agregat konvensional. Keputusan ini mengesahkan potensi keluli sanga agregat, dan seterusnya menghargai penggunaan EAF keluli sanga untuk pembinaan laluan pejalan kaki hijau dengan menyimpan sumber semula jadi agregat.