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Investigation of the Mechanical Performance of Hot Mix Asphalt Modified with Crushed Waste Glass

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Abstract : The successive increase of generated waste materials like glass has led to many environmental problems. Using crushed waste glass in hot mix asphalt paving has been though as an alternative to landfill disposal and recycling. This paper discusses the possibility of utilizing crushed waste glass, as a part of fine aggregate in hot mix asphalt in Egypt. This is done through evaluation of the mechanical properties of asphalt concrete mixtures mixed with waste glass and determining the appropriate glass content that can be adapted in asphalt pavement. Four asphalt concrete mixtures with various glass contents, namely; 0%, 4%, 8% and 12% by weight of total mixture were studied. Evaluation of the mechanical properties includes performing Marshall stability, indirect tensile strength, fracture energy and unconfined compressive strength tests. Laboratory testing had revealed the enhancement in both compressive strength and Marshall stability test parameters when the crushed glass was added to asphalt concrete mixtures. This enhancement was accompanied with a very slight reduction in both indirect tensile strength and fracture energy when glass content up to 8% was used. Adding more than 8% of glass causes a sharp reduction in both indirect tensile strength and fracture energy. Testing results had also shown a reduction in the optimum asphalt content when the waste glass was used. Measurements of the heat loss rate of asphalt concrete mixtures mixed with glass revealed their ability to hold heat longer than conventional mixtures. This can have useful application in asphalt paving during cold whether or when a long period of post-mix transportation is needed.

Keywords : waste glass, hot mix asphalt, mechanical performance, indirect tensile strength, fracture energy, compressive strength
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