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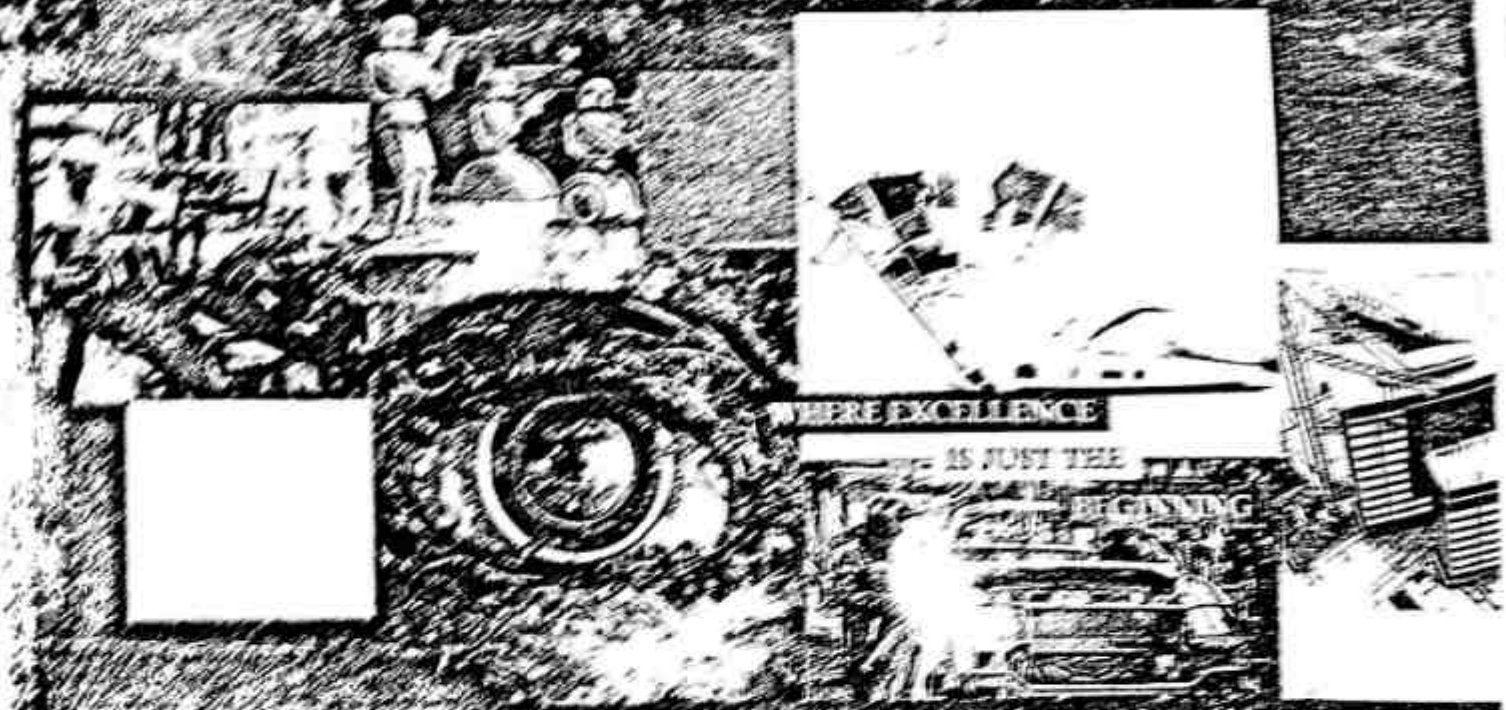

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Lightweight Concrete Using Expanded Polystyrene (EPS) Beads

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With the increase in demand for construction materials there is a strong need to utilize alternative materials for sustainable development. Considering the present situation we are making an attempt to incorporate Expanded Polystyrene (EPS) beads in concrete as a replacement for course aggregate. Waste on its own is a hazardous waste produced in millions of tons around the world which will ultimately cause pollution. National and International environmental regulations have also become more inflexible, causing this waste to become increasingly expensive to dispose. Therefore utilizing polystyrene waste production not only solves the problem of disposing waste but (up to 98% of air & 2% of polystyrene) solid waste also helps to preserve natural resources. The incorporation of this ultra-light material in concrete reduces its density to a large extent. The reduction in weight is up to 80% and lightweight concrete so formed is 80% lighter than the concrete made by using conventional course aggregate. Instead of using OPC as it is much finer and zone II sand as fine aggregate. The main objective of this investigation is to study the properties such as compressive strength, tensile strength, water absorption, density and ultrasonic pulse velocity (UPV) of lightweight concrete in order to make it not only satisfactory but efficient and economical replacement for the conventional concrete used in construction. Moreover the self-compacting property of this concrete makes it easy to handle. Also the blocks made from this not only act as thermal insulator but also absorbs sound to a great extent.

Keywords—Compressive strength, EPS Beads, Lightweight concrete, Split tensile strength, Water absorption

I. INTRODUCTION

EXPANDED POLYSTYRENE(EPS) is a lightweight cellular plastic material consisting of fine spherical shaped particles and is comprised of about 98% air and 2% polystyrene. It has a closed cell structure and cannot absorb water. Therefore, it has good sound and thermal insulation characteristics as well as impact resistance (Cook, D.J., 1983). EPS is an inert material which is quite resistant to alkalis, methanol, ethanol silicone oils, halide acids, oxidizing and reducing agen However, it has limited resistance to paraffin oil, vegetal oils, diesel fuel and Vaseline, which can attack the polystyre foam after long term contact. Polystyrene foam is a no biodegradable material. It is a waste material from packagi industry. It may create disposal problems. Utilizing crush polystyrene granules in concrete is a valuable waste dispo method. However, because it is a chemical material, there a contradict arguments appear in relation to its toxici Polystyrene foams undergo deterioration slightly of th mechanical properties when temperature is increased to 'glass transition temperature' which is ranging from 71 to 77 C. Nevertheless, according to National Bureau Standard Combustion Tests the level of toxicity of EPS wh it is burnt is no greater than those from wood; similar tox gas, carbon monoxide and carbon dioxide are produced. The are two principal components of EPS: solid styrene polym (polystyrene beads) and a blowing agent, typically pentan Pentane content may be present in concentrations rangi from 3-8 per cent in the beads or lower for low grades of EI which are also available. Pentane vapour is colourless, has relative vapour density approximately 2.5 times that of air a a flammable range of 1.4 to 8.3 per cent pentane vapour-in-a Because pentane vapour is heavier than air, it may accumula in depressions, trenches, sumps, stairwells, enclosed are (containers, trailers) or confined spaces (e.g. bulk storage bi and silos) that are not continuously ventilated. This hazard recognised in transport as the Australian Dangerous Goo Code (ADG Code) includes a UN Number entry, UN_{2211} as Class 9 dangerous goods for "polymeric beads, expandabl evolving flammable vapour".

Nevertheless, this effect is unlikely to happen when the bea are embedded in concrete. EPS does not contai chlorofluorocarbon (CFC) and Hydro chlorofluorocarbo (HCFC). Therefore, lightweight concrete with polystyrer beads is safe for the environment and does not contribute t