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Experimental Analysis on Lightweight Concrete by Using Expanded Polystyrene (EPS)

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ABSTRACT: Extended polystyrene (EPS) geofom is a lightweight material that has been utilized in designing applications since at least the 1950s. Its thickness is about a hundredth of that of soil. It has great warm protection properties with firmness and pressure strength practically identical to medium mud. It is used in diminishing settlement underneath banks, sound and vibration damping, lessening sidelong strain on sub-structures, decreasing weights on inflexible covered channels and related applications. Extended polystyrene squander in a granular structure is utilized as lightweight total to create lightweight underlying cement with the unit weight changing from 1200 to 2000 kg/m³.

Polystyrene dots are the waste material acquired from bundling enterprises. With the improvement of current development procedures, the interest for the development materials increments step by step. Thus the requirement for solid bountiful option is obligatory. Request of lightweight concrete is expanding in the development business for the non-structural individuals. In this paper, coarse totals of cement are supplanted by Extended Polystyrene (EPS) dots to accomplish lightweight cement. The fundamental goal of this examination was to look at the properties, like compressive strength of EPS cement to the standard substantial block. The 3D squares comprise of 25% and 30% EPS (by vol. of coarse total) for M25 blend plan. The shapes were tried at 7day,14day and 28day of relieving. The outcomes acquired were looked at with standard substantial examples.

I.INTRODUCTION

The expanded polystyrene (EPS) is the light weight concrete has the characteristics of lightweight, energy absorption, and heat preservation, it is used in many specific construction industries like high rise buildings, floating marine platforms, and large-sized and long-span concrete. The lightweight concrete (LWC) has no pollution to the environment because manufacture EPS particle consumes little energy, and the particle has no poison and harm. The EPS concrete has the characteristics of economy, environmental protection, and energy saving, meeting the design concept of modern construction material. The EPS concrete was produced by replacing the partially.

Normal aggregates in concrete; the specific mix stage was depending upon the requirements of density and strength levels. The relationship between the strength and a wide range of density of the EPS concrete could be obtained by changing the mix scale of the EPS particle. Also, there have been some researches focused on the influence of expanded polystyrene particles size to the concrete compressive strength. EPS concrete has been considered as an energy-absorbing material for the protection of buried military structure and some specific constructions which suffer long-term cyclic loading. Meanwhile, it has requirements for strength and durability of EPS concrete. The main purpose of this is to quantify the properties of EPS concrete with respect to normal concrete on the basis of strength mainly.

II. LITERATURE SURVEY

International Journal Research (IJSR) (Volume 4 Issue 3 March 2015)⁽¹⁾ Hereby, we observed that the cost of EPS is less to that of normal concrete. Increase in EPS beds content in concrete mixes reduces the compressive and tensile strength of concrete. All the EPS concrete without any special without any special bonding agent shows good workability and could easily be compacted and finished. The replacement by using EPS has shown the positive application as an alternate material in building non-structural members, and it also serves as a solution for EPS disposal. Obtained results suggest the expanded polystyrene concrete has scope for non-structural applications, like wall panels, partition walls etc.

International Research Journal of Engineering and Technology (IRJET) (Volume 05 Issues 11)⁽²⁾ Polystyrene is chemically very inert, being resistance to acids and bases but it easily dissolved by many chlorinated solvents, and many aromatic hydrocarbon solvents. The Expanded polystyrene is a stable, low-density Foam. It has closed structure and cannot absorb water. It has a good impact resistance. Polystyrene is packaging material in medical industry and a non-biodegradable material, so it creates disposal problems. Utilizing crushed polystyrene in concrete is a good waste disposal method. The polystyrene beds can easily merge into mortar or concrete to produce the lightweight concrete with a wide range of density. An application of polystyrene concrete includes wall, cladding panels, till up panels and composite flooring. From the literature survey, it is understood that there is a scope for future studies in this field.

Bengin M A Herki⁽³⁾ Volcanic materials such as pumice are used in the production of concrete as partial replacement of natural aggregate concrete (LWAC) utilizing a locally available lightweight aggregate (LWA) called pumice aggregate (PA). This novel LWAC is made by partial replacement of coarse aggregate with different replacement levels of 10%, 20%, 30%, 40% and 50% of PA by volume. This study id focused to determine the mechanical and durability properties of LWAC to find the optimum replacement level of PA. The properties of PA were reported by conducting comprehensive series of tests on workability, compressive strength, density, and total water absorption and ultrasonic plus velocity (UPV). It is concluded that the LWAC has sufficient strength and adequate density.

Prof. Ashish S. Moon⁽⁴⁾ This study gives an idea to use a waste material in construction work. This study forces us to use other waste materials and check for construction work. The bearing strength of polystyrene aggregate concrete is increased with an increase in the ratio of total area to bearing area. With the increase in the polystyrene aggregate content, the ratio of the bearing strength to the compressive strength increased.

J. Arunprasad⁽⁵⁾ This research is carried out to produce a low cost and eco-friendly concrete steel blocks. Studies have been carried out to investigate the possibility of utilization a broad range of material of partial replacement of coarse aggregate. This composite steel block preparation is eco-friendly and cost effective. The main advantage of this concept is the application in load bearing multi-storey building, reduction of environmentally hazardous material and increases the strength of blocks to desirable percentage. But advanced researches are required for practical application.

D. EASWAR KARTHIK⁽⁶⁾ This paper reports the results of an experimental investigation into the engineering properties, such as compressive strength, modulus of elasticity, drying shrinkage and creep, of polystyrene aggregate concrete varying in density. All the EPS concrete without any special bonding agent show good workability and could easily be compacted and finished. The replacement by using EPS has shown a positive application as an alternate material in building nonstructural members, and it also serves as a solution for EPS disposal.

“Aasif Ahmad Ganie⁽⁷⁾ The project reports the result of light weight concrete (partial replacement of coarse aggregate using polystyrene beads). With increase in demand for construction materials, man has improved a lot in construction techniques of structure. The workability characteristics of the mixes are very different from the normal concrete. Compaction by vibration was not effective owing to the lightweight nature of the mixes. The mixes were cohesive that the cement slurry coating the beads was very effective in holding the mix together.

Abdulkadir khan⁽⁸⁾ In this paper to determine the effect of cement and expanded polystyrene ratio, M25 mix design by volume were used. In this experiment EPS beads taken for the mixture were constant at 0.02 to 1. The examination of the final result leads to a final decision that with the grow of cement to EPS beads ratio in that the mixes, the final thickness, compressiveness, split fingers rise when it has been compared to the control sample.

A S Moon and Dr. A Patel⁽⁹⁾ In these paper author assumed to build up another sort of basic light weight concrete by



supplanting the coarse total with EPS dabs. Expanded Polystyrene (EPS) this is light in weight and it has been utilized as in building applications. EPS is in granular structure and it is utilized in light weight cement to make the solid lighter from 950 kg/m³ to 1350kg/m³. In this paper we did test examination on the designing properties, as compressive quality, modulus of flexibility, drying shrinkage and creep, of polystyrene total cement fluctuating in density. Factors, for instance, water/solid extent, polystyrene/solid extent, solid substance, advancement, compaction, fire, resistance. At the completion of the examination, a philosophy for arranging EPS light weight solid mixes is plot.

Abhijit Mandlik⁽¹⁰⁾ Expanded polystyrene (EPS) geofom is a lightweight material that has been used in engineering applications since at least the 1950s. It is utilized in reducing settlement below embankments, sound and vibration damping, reducing lateral pressure on sub-structures, reducing stresses on rigid buried conduits and related applications. The polystyrene aggregate concrete was produced by partially replacing coarse aggregate in the reference (normal weight) concrete mixtures with equal volume of the chemically coated crushed polystyrene granules. This paper reports the results of an experimental investigation into the engineering properties, such as compressive strength, modulus of elasticity, drying shrinkage and creep, of polystyrene aggregate concrete varying in density. The main objectives of this study are the cement contents for the concrete mixtures used were 410 and 540kg/m³.

III.METHODOLOGY

1. Finalizing the Topic
2. Collection of Literature
3. Deciding the Specification
4. Working on The Mix Design
5. Selection and Collection of Materials
6. Cubes 150 X 150 X 150 mm
7. Testing on Cubes
8. Results and Conclusion

IV.RESULT

THE COMPRESSIVE STRENGTH OF CEMENT MORTAR CUBES AFTER 7 DAYS, 14 DAYS & 28 DAYS ARE AS FOLLOWS.

% EPS	At 7 Day (N/mm ²)	At 14 Day (N/mm ²)	At 28 Day (N/mm ²)
25 %	9.59	8.72	16.80
	8.72	10.9	17.43
	9.59	10.46	16.33
30%	8.71	7.85	9.59
	6.1	6.97	8.71
	6.5	6.53	8.71

V.CONCLUSION

1. Compressive strengths of concrete were significantly influence by the mix ratios and curing period. As the EPS balls are increasing in mixture, the compressive strengths of concrete get reduce and vice versa.
2. All proportions EPS concrete shows good workability and could easily compacted and finished without adding any admixture.
3. At 25% replacement, the compressive strength obtained was 16.85 N/mm², which is 67.4% of the conventional



concrete block.

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