LIGHT WEIGHT CONCRETE AMENDED WITH FIBRE

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Abstract - *We have created a new structural light concrete by entirely substituting expanded polystyrene (EPS) beads with coarse concrete aggregates. Extended polystyrene (EPS) is a lightweight material utilized since at least the 1950s in technical applications. Extended polystyrene waste in granular form is used to make lightweight non-structural cement with unit weights ranging from 950kg/m3 to 1350kg/m3 as a lightweight aggregate. This article presents the findings of experimental investigations into the engineered characteristics of polystyrene aggregate concrete of different densities such compressive strength, elasticity modulus, drying shrinkage and creep. Factors like water/cement, polystyrene/cement ratio, cement content, maturity, compaction, fire, strength. A method for the design of EPS low weight concrete mixes is described at the conclusion of the research.*

The goal is to compare conventional concrete compressive strength with lightweight concrete composed of 30 per cent off-fill ash and expanded polystyrene in accordance with IS code 10262-2009.

#Key Words: EPS beads ,pp fiber , fly ash , mineral admixture , plasticizer

1. INTRODUCTION

Beton is one of the most popular building materials since 100 years ago. Due of its versatility in application, it is moreessential and preferable to wood or steel. A concrete consists of the mixture of cement, coarse aggregates, fine aggregates and water. Now it is accepted that not only the strength of concrete plays a major part in determining the quality of concrete but also durability at the service stage are the most important things.

The aggregate in concrete may generally be described as having a specific gravity of 2.4 or above. The aggregation may be further classified into the irregular, angular, flaky and surface texture rounded, i.e. glassy, smooth, granulated rough,crystalline, honey, combed and porous. Due to the density of the aggregate, the concrete is very heavy and has a density of 2400kg/m3. "Reducing the density of concrete will lead to cheap building, since it lowers transport, handling and buildability costs.'' The use of a lightweight aggregate and air trainer is one of the approaches for making concrete lighter. The concrete results in reduced dead load, quicker construction time and cheaper carriage and handling costs using a lightweight aggregate and air entry agent.

2. LITRATURE REVEIW

Lightweight Aggregate

Lightweight aggregates are the main components in lightweight concrete manufacturing, and their cellular pores system have comparatively low particle density. Heating some raw materials, especially clays, through incipient fusion creates a cellular structure inside particles. Gasses developinside the pyroclastic material at such temperature, producing expansion which maintains a certain form after cooling. The use of lightweight waste materials as an alternative to those expanded clay aggregates. This reduces the total building costs as well as solid waste. One such resource is the oil palm (OPS) or palm kernel (PKS), a substance which is accessible in large amounts in tropical areas. In the past, many studies have created concrete with a grade of 20–50 in OPS lightweight aggregate concrete.

Fiber Reinforcement

Fiber reinforcing may significantly increase the absorption of energy by d-impacting concrete, leading to enhancements in ductility, tensile-to-compression strength, seismic behavior and earthquake resistance, cracking resistance, and tightness. Natural fibers provide a wide range of beneficial characteristics as composite strengthening, including substantial cost savings and heat conductivity. The usage of natural fibers may help reduce and save energy and therefore preserve the environment. Cocoa nutrients, sisal, sugar cane bagasse, bamboo, jute, wood, akwara, elephant grass, water reed, plantain and musambah, and cellulose fibers are main sources of natural fibers.

The effect of PP fiber on some mechanical properties of selfcompacting concret

Self-compacting concrete (SCC) is compacted by its own weight and nearly entirely filled throughout the shape. In structural components with a high reinforcing percentage, it fills up all holes and gaps. The aim of the research provided is to study the fresh characteristics and hardened properties of Steel Fiber SCC. Fresh characteristics include flow ability, passage ability and resistance to segregation linked to viscosity. The findings showed fresh characteristics of SCC with steel fiber, decreased workability by increasing the amount of steel fiber. The Steel fibers also had an effect on thecompressive & tensile strength, the modular elasticity and ultrasonic pulse velocity of the steel fiber self-compacting concrete.

Light Weight Concrete by using EPS Beads

They have created a new lightweight structural concrete by entirely replacing the coarse concrete aggregate with expanded polystyrene (EPS) beads. Extended polystyrene (EPS) is a lightweight material utilized since at least the 1950s in technical applications. Extended polystyrene waste in granular form is used to make lightweight non-structural cement with unit weights ranging from 950kg/m3 to 1350kg/m3 as a lightweight aggregate. This article presents the findings of experimental investigations into the engineered characteristics of polystyrene aggregate concrete of different densities such compressive strength, elasticity modulus, drying shrinkage andcreep.

3. OBJECTIVE OF THE STUDY

1. To understand the Lightweight concrete and level of application in construction industry.

2. To compare the strength and density of LWC with normalconcrete.

3. To know the effect of PP Fiber on LWC

4. To determine the optimum percentage of EPS Beads.

4. MATERIALS USED

Cement

The trial was carried out using standard 53-grade Portland Cement from the Ultra Tech Company brand, readily available in the local market.

The cement so obtained was tested according to IS: 269-1989.

Coarse Sand

Sand is a natural granular material which is mainly composed of finely divided rocky material and mineral particles.

Coarse sand is used for the manufacture of ready-mix concretewith aggregate, water and cement.

Poly Propylene Fiber

In the construction sector, fibers vary in kind, shape, characteristics and availability. A severe environment may be used for special kinds of fibers, such as carbon and Kevlar, natural fiber, mineral fibers and asbestos fibres.

Fig(1)poly propylene fiber

Expanded polystyrene foam (EPS Beads)

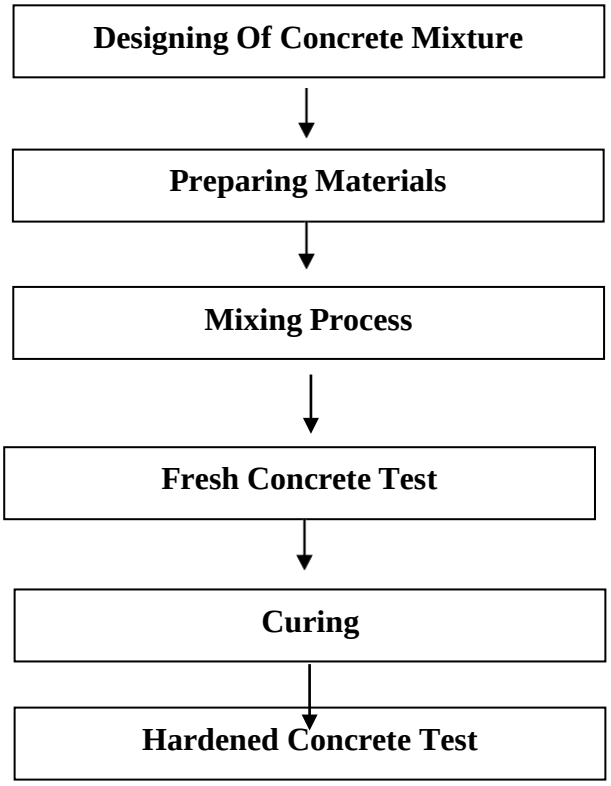
Concrete EPS is a material that is lightweight. In this research, various sized beads and polyamide-66 fibers of expanded polystyrene (EPS) were used for the production of novel lightweight concrete. The use of polyamide-66 threads influenced fracture reduction significantly.

Figure(2) EPS Beads

Water

Water serves an essential function in creating concrete strength. It needs about 3/10th of its water weight for full hydration. For ordinary concrete it is realistically shown that a minimum water- ciment ratio of 0.35 is needed.

5. METHODOLOGY



6. Trial Design

In this design, coarse sand of Zone II, Ultratech cement of OPC 53 Grade, Fly ash of NTPC Dadri, Bore well Water and air entraining admixture were used.

Trial mix design summary sheet

Mix Group	Mix Id	Mix Specification	Cement	Fly ash	FA	PS	Water	Air Add mix (Kg)	Propylene Fiber of dia 24 mm
M1	T1	C300FA200EPS4PP0.9	300	200	869	4	180	3.25	0.9
M2	T2	C300FA200EPS8PP0.9	300	200	750	8	180	3.25	0.9
M3	T3	C270FA150EPS12PP0.9	300	200	375	12	200	2.73	0.9
M4	T4	C300FA200EPS12PP0	300	200	375	12	200	2.73	0

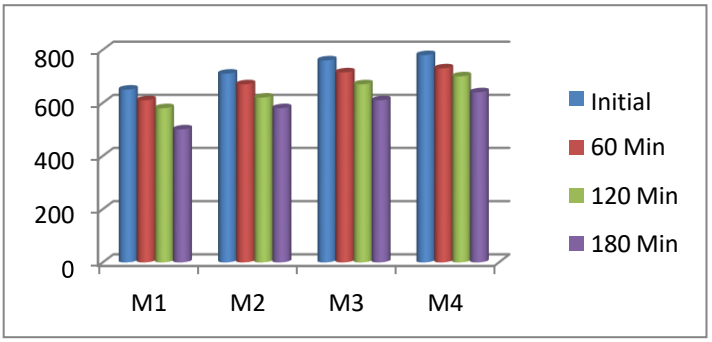
Fig(3)mix design summary sheet

7. TEST RESULTS

Workability test

Mix Group	Mix Id	Mix Specification	Initial Flow in mm	60 Min	120 Min	180 Min
M1	T1	C300FA200EPS4PP0.9	650	610	580	500
M2	T2	C300FA200EPS8PP0.9	710	670	620	580
M3	T3	C270FA150EPS12PP0.9	760	715	670	610
M4	T4	C270FA150EPS12PP0	780	730	700	640

Figure(4) Results of Flow Test of lightweight concrete at different intervals



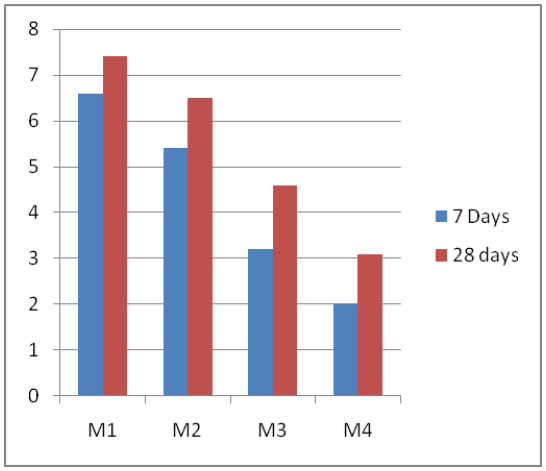
Figure(5)Comparison graph between all trial mixes

COMPRESSIVE STRENGTH

Mix Group	Mix Id	Mix Specification	7 Days	28 Days
M1	T1	C300FA200EPS4P P0.9	6.6	7.4
M2	T2	C300FA200EPS8P P0.9	5.4	6.5
M3	T3	C270FA150EPS12 PP0.9	3.2	4.6
M4	T4	C270FA150EPS12 PP0	2.0	3.1

Figure (6)Compressive strength data of light weight concrete

Figure(7)Compressive strength Result of light weight concrete



8. CONCLUSIONS

1. Initial finding have shown that the lightweight concrete using EPS beads has a desirable strength to be an alternative construction material for the construction of partition wall, foot path, parapet wall, bed concrete.

2. The strength of light weight concrete using EPS beads are low for lower density mixture. This resulted in increment of voids throughout the sample caused by the Air entraining admixture. Thus the decrease in compressive strength of the concrete

3 .The increase in Coarse sand and decrease in EPS beads causes increase in compressive strength and density of concrete and wise versa.

4. After adding 1.5% Poly propylene fiber strength of concreteincreases

5. After adding EPS Beads flow of concrete increases and density decreases.

6. PP fiber decreases the flow of light weight concrete.

9. FUTURE SCOPE

This study is mainly aimed at knowing what is the lightweight concrete level utilized in the building sector. Any element will be added as a suggestion in this study. The use of LWC (Lightweight Beton) is therefore restricted to specific applications compared to conventional concrete, ''however the advent of LWC offers additional alternatives to building, which at now relies on natural resources." Some of the lightweight aggregates are made from waste materials such as spray ash. Research on LWCs should be expanded and deepened in order to include additional durability tests that are usually carried out on regular concrete. This compares the efficiency of LWC with regular concrete.

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