



CHARACTERISTIC OF EPS BREAD IN LIGHT WEIGHT CONCRETE

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Abstract

Lightweight concrete has gained significant attention in the construction industry due to its numerous benefits, such as reduced dead load, improved thermal insulation, and enhanced seismic resistance. One popular approach to achieve lightweight concrete is by incorporating expanded polystyrene (EPS) beads into the mixture. EPS beads are lightweight, closed-cell beads made from expanded polystyrene foam, which possess excellent insulating properties. Normal concrete has a viscosity of 24- 25 kN/ m³ which increases the tone load of the structure and also makes it uneconomical. To reduce the weight of the structure light EPS beads concrete is used. One of the styles to produce light concrete is to use Expanded Polystyrene globules as a partial cover to fine total. The main ideal of this disquisition is to gain light EPS beads concrete and also to determine the optimum lozenge of Expanded Polystyrene globules. In the present work the Expanded Polystyrene beads are added at 10 %(by total volume of fine total) and their parcels similar as viscosity and compressive strength are studied. From the results attained it's observed that an optimum of 40% of Expanded Polystyrene beads can be replaced by volume of fine total which gives a strength of 21 N/ mm² for M20 grade concrete It can be used for simple concrete building, where M20 concrete is liked after testing of 7 and 28 days.

Keywords: Concrete, Expanded Polystyrene (EPS) Beads, Strength, Light Weight, Construction

1. INTRODUCTION

Lightweight concretes aren't a advanced accomplishment of concrete invention. They've been known since old times and are unnaturally the forerunners of moment's concrete. The primary European references of lightweight EPS beads concrete were erected two thousand a long time



previous amid the early Roman Realm. But the enhancement and generation of industrially produced lightweight aggregate within the 19th and 20th centuries checked a memorable turning point for fabric invention. Lightweight concrete mix is made with a lightweight coarse aggregate and in some cases a portion or whole fine summations may be light rather than typical summations. supplementary lightweight EPS beads concrete has an in- place consistence(unit weight) on the arrange of 90 to 115 lb/ ft ³(1440 to 1840 kg/ m ³).

Lightweight concrete keeps up its huge voids and doesn't shape laitance layers or cement pictures when put on the separator. This disquisition was predicated on the prosecution of circulated air through light concrete. In any case, acceptable water cement proportion is imperative to produce satisfactory cohesion between cement and water. shy water can beget need of cohesion between patches, hence mischance in quality of concrete. also, as well important water can beget cement to run off total to make laitance layers, hence debilitates in quality. Hence, this pivotal disquisition report is ready to appear exercises and advance of the light concrete. Centered were on the prosecution of circulated air through lightweight EPS beads concrete similar as compressive quality tests, water assimilation and consistence and supplementary tests and comparisons made with other feathers of light concrete. Figure 1 show the EPS beads.



Figure 1. EPS Beads



EPS beads EPS(Expandable Polystyrene) may be a lightweight, inflexible, plastic head cover fabric delivered from strong patches of polystyrene. Expansion is fulfilled by ideals of little totalities of pentane gas dissolved into the polystyrene base material amid production. The gas extends beneath the action of warm, connected as brume, to make impeccably closed cells of EPS. EPS beads are blended with concrete to extend its warm standing and drop its weight per boxy cadence, which comes about in critical sparing in supplementary brought. By replacement of 25 of the summations with EPS globules, the compressive quality gotten was 17.09 N/ mm², which is 64.73 of the conventional concrete forecourt.

The main objective of light weight concrete using EPS beads project is to determine the compressive strength of EPS beads concrete cube. In this report we also discuss the overall procedure of making concrete cubes of EPS beads. In this report we are casting the cubes of light weight of WPS beads. We take M20 mix design concrete for testing of compressive strength of EPS cubes. We mix 10 to 50% of EPS beads in all five cubes. Then we determine the compressive strength of all concrete cubes in 7 days and 28 days. Light aggregate stonework can be used in structures with higher strength than normal weight. The benefits of using mixed concrete include: Reduce dead parts, protect foundation and support. Improved thermal performance.

1.1 EPS BEADS

Expanded Polystyrene (EPS) this is light in weight and it has been employed as in structure operations. EPS is in grainy structure and it's employed in light weight cement to make the solid lighter from 950 kg/ m³ to 1350 kg/ m³. It could be a shape of concrete known for its light weight. It has been utilized as street bedding, in soil or geo-stabilization ventures and as sub-grading for railroad trackage. It is made by utilizing small lightweight EPS balls as an aggregate rather than the smashed stone that's utilized in standard concrete. It has preferences such as expanded warm and sound cover properties, simple forming, and capacity to be shaped by hand with sculpturing and development apparatuses.

2 REVIEW OF LITERATURE



Lightweight concrete with expanded polystyrene (EPS) has been gotten for numerous decades. The EPS is to drop the abecedarian weight of the texture for precast and development advancement with streamlined thermal/ aural division. On a veritably introductory position, the EPS beads was to some degree superseded with both coarse and fine summations. The prosecution, plasticity, mechanical parcels, and long-term prosecution were anatomized and briefed. Other than, the precious businesses similar as moistness division, warm cover, and sound division of the texture were as well talked around. In addition, subsequently considers nearly centered on cement-grounded accoutrements with reused EPS globules. At last, the challenges and practical courses of action of exercising the accoutrements against current around the world normal enterprises on cleanser examine quality and practicality were said. These challenges are truly precarious for making the texture taking after the subsequently around the world grade; when it can not be unraveled, either the lightweight total exercising mineral seasoning or cellular fumed concrete might be better employed. EPS are broadly used by the Ready-mix makers for light weight screed era, which has shocking characteristics of warm cum acoustic properties utilized by the advancement businesses. EPS globules are mixed with concrete to expand its warm rating and diminish its weight per cubic meter, which comes around in basic saving in assistant taken a toll.

Ratnesh Ojha, Sumit Kumar Singh et al, considered the generation of lightweight concrete utilizing EPS globules. The think about covers the separator property of EPS concrete and its applications. They evaluated that the quality of EPS concrete increments marginally and strength of concrete is nice. EPS dots makes concrete lighter than standard concrete.

Pratichhya Pradhan and Sanjeev Maharjan studied concrete bricks using expanded polystyrene and their estimated cost. They make EPS concrete bricks and compare the cost of concrete and ordinary bricks. It turns out that handoperated mixing and handoperated compression also work perfectly. Their research shows that the cost of concrete depends on the cost of cement used and EPS concrete bricks cost more than regular bricks.



VishakhT. M,Dr.VasudevR. banded about the product and operation of EPS along with environmental concern. They stated in this composition Lightweight concrete is better fire resistant and lower heat transmitted through it. It's cost saving and makes the structure more sustainable as it's durable and no trouncing and cladding is needed. They divided LWC into orders grounded on bulk viscosity and compressive strength

3. MATERIALS AND MIX PROPERTIES

3.1 Hand Mixing

Mix the cement and fine aggregate on a watertight none-absorbent stage until the blend is completely mixed and is of uniform color. Add the coarse aggregate and blend with cement and fine total until the coarse aggregate is consistently dispersed all through the group. Add water and blend it until the concrete shows up to be homogeneous and of the specified consistency. The still moulds of cubes 150x150x150mm and 150x300mm were oiled legitimately some time recently filling the mortar in cubes and barrel moulds. The mortar is filled in cubes and barrel in three layer with a hand compaction after including each layer of mortar. After filling the moulds totally, the overabundance mortar were removed from the form with the assistance of travel and it utilized for leveling the surface.

3.2 CURING

The cubes utilized for this test have a measurement of 150 x 150 x 150 mm if the biggest aggregate does not surpass 20 mm. By and large talking, the cubes are cured for and tried at 7 and 28 days, although certain ventures might require curing and testing times of 3, 5, 7, 14, or more days. The results from the compressive strength test are used to determine the strength of the concrete.

The materials employed and method entered in this research work is as per the “ Bureau of Indian Standard ”(BIS).

The materials used are;



Coarse aggregate 20 mm

Fine aggregate M- sand

Cement OPC- 43 Grade

M20 blend of extent 11.53 is planned as per IS and W/ C of the blend is entered as 0.5 from the comes about attained from the trial blend. The quantum estimation for different proportions of EPS.

Then mix the cement and fine aggregate on a watertight none-absorbent stage until the blend is completely mixed and is of uniform color. Add the coarse aggregate and blend with cement and fine total until the coarse aggregate is consistently dispersed all through the group. Add water and blend it until the concrete shows up to be homogeneous and of the specified consistency. The still moulds of cubes 150x150x150mm and 150x300mm were oiled legitimately some time recently filling the mortar in cubes and barrel moulds. The mortar is filled in cubes and barrel in three layer with a hand compaction after including each layer of mortar. After filling the moulds totally, the overabundance mortar were removed from the form with the assistance of travel and it utilized for leveling the surface. After 24 hours setting time, concrete tests, were demoded taken for casting and curing. By and large talking, the cubes are cured for and tried at 7 and 28 days, in malignancy of the fact that certain gambles might bear curing and testing times of 3, 5, 7, 14, or further days.

3.3 Test Conducted

Compressive Strength test

Workability Test

4. RESULTS

The test result on the characteristic of EPS beads

COMPRESSIVE STRENGTH OF EPS BEADS CONCRETE



To find out the basic quality of the concrete cubes, casted utilizing EPS beads in concrete and Compressive strength test was conducted at the conclusion of 7 and 28 days curing period utilizing compressive testing machine , capacity 2000 kN. The comes about gotten are.



Figure 2 compressive testing machine

Table 1. Compressive Strength Different Proportion of EPS beads

S NO.	%OF EPS	COPRESSIVE STRENGHT (7DAY)	COPRESSIVE STRENGHT (28DAYS)
1	10	17.95	24.58
2	20	17.08	23.88
3	30	16.83	22.76
4	40	15.48	21.49
5	50	14.65	19.86

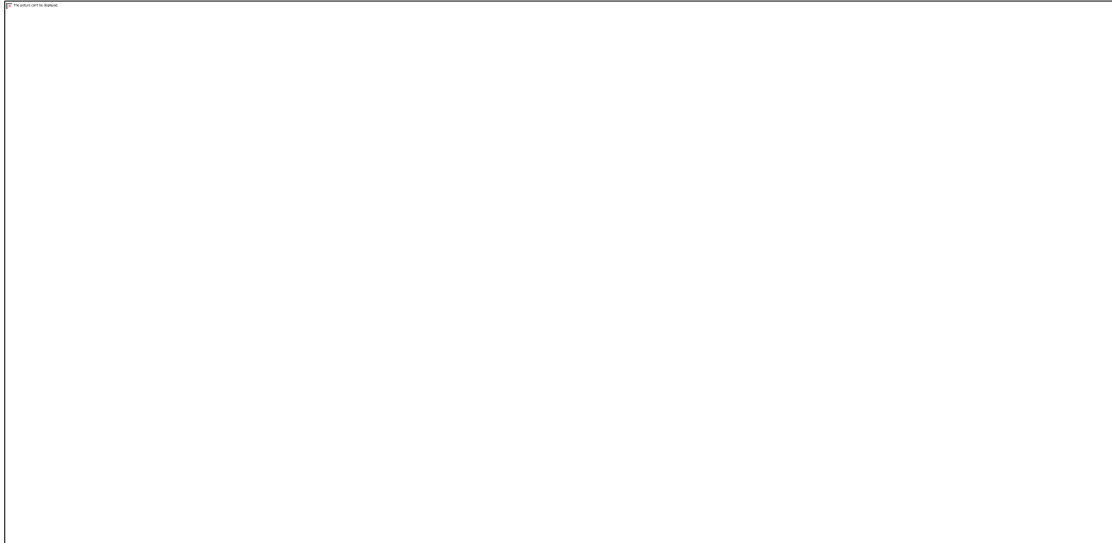


Figure 3: Compressive Strength of the Cubes Cast with different percentage EPS beads

The cubes of comprises of 10%, 20%, 30%,40% and 50% EPS for M20 mix plan. As per explore we know the10% EPS beads test has high compressive strength as compare to other test.

WORKABILITY TEST ON EPS BEADS CONCRETE

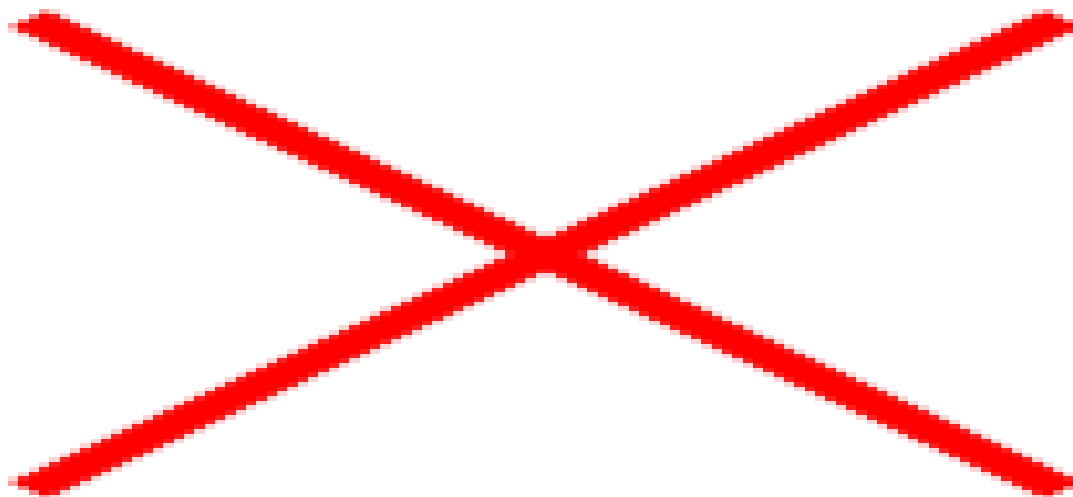
To determine the workability and consistency of EPS Beads concrete, it is recommended to consult the relevant standards, guidelines, or research papers specific to lightweight concrete incorporating EPS beads. These resources will provide you with detailed information on the appropriate testing methods and acceptance criteria for EPS Beads concrete in your specific application.

The addition of polystyrene to a concrete mix generally resulted in increased workability. It was observed that as the percentage of coarse aggregate replaced by polystyrene increased, the workability of the mixes also increased. In other words, higher levels of polystyrene replacement led to higher levels of workability.



Table 2. Slump test results

CONCRETE MIX	SLUMP VALUE
10% replacement	65
20% replacement	68
30% replacement	70
40% replacement	75
50% replacement	81



CONCLUSIONS

EPS beads concrete has gained popularity in the construction industry due to its lightweight nature, which reduces the structural load on buildings and infrastructure. It offers excellent thermal



insulation, helping to minimize heat transfer and reduce energy consumption for heating and cooling. Additionally, the concrete exhibits good acoustic insulation, contributing to soundproofing in buildings.

EPS concrete has good density, thermal insulation and good seismic performance. Therefore, the study of new materials is crucial to the investigation of modern materials and engineering techniques.

EPS beads concrete is a promising material in civil engineering applications. Its lightweight nature, combined with its insulation properties, makes it suitable for a wide range of construction projects. The reduced weight of the concrete can help decrease the load on structures, leading to cost savings and increased durability.

Furthermore, the thermal insulation provided by EPS beads concrete can contribute to energy efficiency in buildings, reducing the need for heating and cooling systems. This can have a positive impact on the environment by decreasing carbon emissions associated with energy consumption.

The present review of cement-based materials containing EPS beads was conducted to discuss the advantages and limitations of EPS beads from various perspectives, including mechanical properties, dynamic performance, other recyclability and environmental effect.

Based on the analysis made and results obtained the following concluding remarks are made,

- The viscosity of the concrete has been reduced without compromising the compressive strength of concrete.
- The optimum lozenge of Expanded Polystyrene globules set up to be 40(by volume of fine total) with a viscosity of 19 kN/ m3.
- The viscosity of concrete has been reduced by 20 for optimum lozenge of Expanded Polystyrene globules compared to conventional concrete.



- Lightweight Concrete prepared using Expanded Polystyrene globules can be used in the upper bottoms of high rise structures as well as in partition walls in order to reduce the tone- weight of the structure.

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