

# Light Weight Floating Concrete for Low Structural Applications

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**Abstract:** This paper deals with the development of lightweight concrete. This also shows the importance of water/cement ratio as in first type of concrete it produce lightweight structural concrete with the unit weight varying from 1200 to 2000 kg/m<sup>3</sup>. The isomer of all the phenyl groups on same side called polystyrene. Now a day's number of researches have been done on lightweight concrete but in this research we have tried to make a concrete having possible lesser density and higher compressive strength. We have taken the following proportions ,

30 % CM and 70 % EPS

40 % CM and 60 % EPS

50 % CM and 50 % EPS

The size of the mould we adopted is 15 X 15 X 15 cm . hence the volume of the cube is 3.375 cm<sup>3</sup> . The plasticizer we used is sulphonate naphthalene formaldehyde. The plasticizer amount is 1.5% on volume of the cement mortar . The main aim of our project is to make a less air voids and densed concrete .

**Keywords:** Floating concrete, EPS(Expanded Polystyrene), Density, Compressive strength, less air voids, densed concrete.

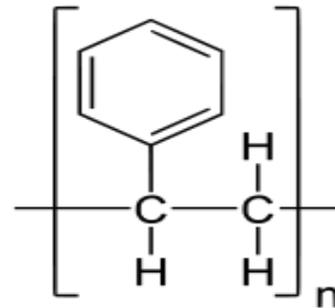
## I. INTRODUCTION

The present day world is witnessing construction of very challenging and difficult civil engineering structures. Lightweight concrete can be defined as a type of concrete which includes an expanding agent in it that increases the volume of the mixture while reducing the dead weight. Researchers all over the world are attempting to develop low density or lightweight concrete by using different admixtures in concrete up to certain proportions. Expanded polystyrene (EPS) is a lightweight cellular plastics material consisting of fine spherical shaped particles which are comprised of about 98% air and 2% polystyrene. It has a closed cell structure and cannot absorb water. It has a good sound and thermal insulation characteristics as well as impact resistance. The main specialties of lightweight concrete are its low density and low thermal conductivity. There are many types of lightweight concrete which can be produced. But ultimately, the application has extended vastly in the building and construction industry such that EPS is now used in road construction, bridges, floatation and drainages. EPS used for building construction are of various types and sizes with the most common ones being for wall panels and for slab. Expanded Polystyrene is one product that can contribute towards achieving good quality, low cost and record time completion of building product.

The two-phase material is an ultra-high strength mortar and expanded polystyrene spheres (EPS).

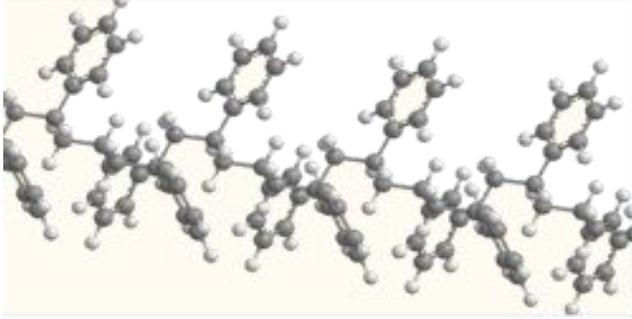
**IUPAC name of EPS**

Poly ( 1 – phenylethene – 1 , 2 – diyl )



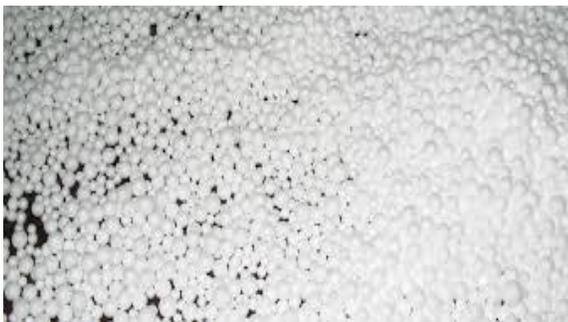
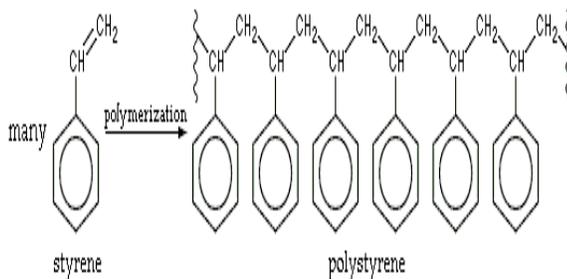
*Polystyrene*

## II. EXPANDED POLYSTYRENE



*Polystyrene molecule*

EPS is formed by the polymerisation of Benzene and Styrene



*Expanded polystyrene beads*

### III. MATERIAL USED :

- ❖ OPC cement ( grade 53 )
- ❖ Manufacturer sand ( MSAND )
- ❖ Fine sand
- ❖ Flyash
- ❖ Water ( tap water )
- ❖ Expanded polystyrene ( EPS )
- ❖ Plasticizer ( sulphonate naphthalene formaldehyde )
- ❖ Mosaic powder

### IV. PROPERTIES OF EXPANDED POLYSTYRENE :

- ❖ Strong
- ❖ Durable
- ❖ Light weight
- ❖ Water resistance
- ❖ Thermal insulation
- ❖ Flame retardant
- ❖ Chemically inert

- ❖ Non - toxic

### V. PROCEDURE

For 30 % cement mortar and 70 % EPS is given by

- ❖ The quantity of 30 % cement mortar = 1.67 kg
- ❖ The quantity of 70 % EPS = 32 gm
- ❖ volume of water = 226 ml
- ❖ volume of plasticizer = 25 .05 ml
- ❖ Take 1.67 kg of cement mortar
- ❖ Mix the water and superplasticizer simultaneously in the jar .
- ❖ Add the mixture of water and superplasticizer in the cement mortar . mix the cement mortar until it attains the consistency . Add 32 gm of EPS to the mix . continue the mix of concrete .
- ❖ After attaining the normal consistency , put the concrete in the mould
- ❖ Fill the concrete in the mould by 1 / 3 rd of the volume .The mould is filled in three equal layers. Tamp the concrete by giving 25 blows on the corners and center . By tamping the concrete the airvoids is reduced and the concrete is compacted . similar procedure is adopted for the full mould . At the top of the mould levelthe concrete by using the shovel.
- ❖ Similar procedure is adopted for all the proportions



*During the mixing of concrete*

#### *USING M sand*

In 30 % CM we taken cement + Msand and 70 % EPS  
 In 40 % CM we taken cement + Msand and 60 % EPS  
 In 50 % CM we taken cement + Msand and 50 % EPS

#### *USING fine sand*

In 30 % CM we taken cement + fine sand and 70 % EPS  
 In 40 % CM we taken cement + fine sand and 60 % EPS  
 In 50 % CM we taken cement + fine sand and 50 % EPS

#### *USING flyash*

In 30 % CM we taken cement + flyash and 70 % EPS  
 In 40 % CM we taken cement + flyash and 60 % EPS

In 50 % CM we taken cement + flyash and 50 % EPS

**USING mosaic powder**

In 30 % CM we taken cement + mosaic powder and 70 % EPS

In 40 % CM we taken cement + mosaic powder and 60 % EPS

In 50 % CM we taken cement + mosaic powder and 50 % EPS

**From the above proportions**

30 % CM we taken cement + Msand and 70 % EPS

In 40 % CM we taken cement + Msand and 60 % EPS

In 30 % CM we taken cement + fine sand and 70 % EPS

In 30 % CM we taken cement + mosaic powder and 70 % EPS

In 30 % CM we taken cement + flyash and 70 % EPS

- ❖ These proportions of mix are floating in water . the unit weight of this cube is less than the unit weight of water which tends the cube to float in water .



**Research Significance**

- ❖ Light weight concrete
- ❖ To reduce the self weight of the structure
- ❖ Constructions on water bodies
- ❖ Used as an acoustic medium
- ❖ Low thermal conductivity

**VI. CONCLUSIONS:**

World energy consumption is rising to meet the demands of the growing world’s population and increasing development, particularly in the emerging economies. Both consumers and government authorities are becoming more aware of the global sustainability issues due to this soaring demand and high price associated with the fossil energy.

The Aerated concrete is a much lighter concrete and can float on water. It does not contain coarse aggregates. It is composed of cement, sand, high water-cement ratio.

Just as we mix the cement-sand slurry with EPS, the expansion in the volume can be observed. Within 5 minutes it expands by 30%. It consists of many pores and

thus is not structurally strong. It is a good insulator of heat and sound and thus can be used in place of conventional bricks or at the places which does not bear any load.

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