EXPERIMENTAL INVESTIGATION: BUBBLED BEAM

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Abstract :In building constructions, the beam is a very important structural member to carry load of the slab. Bubble beam is a method of virtually eliminating all concrete from the middle of a Beam, which is not performing any structural function, thereby dramatically reducing structural dead load. Bubble beam is a beam whose core is replace with Spherical balls that can be of various sizes and shapes. Usually the Bubble Deck system combines the benefits of factory-manufactured elements in controlled conditions along with on-site completion. Some of its major benefits are lower total cost, reduced material use, enhanced structural efficiency, decreased construction time, and is a green technology.

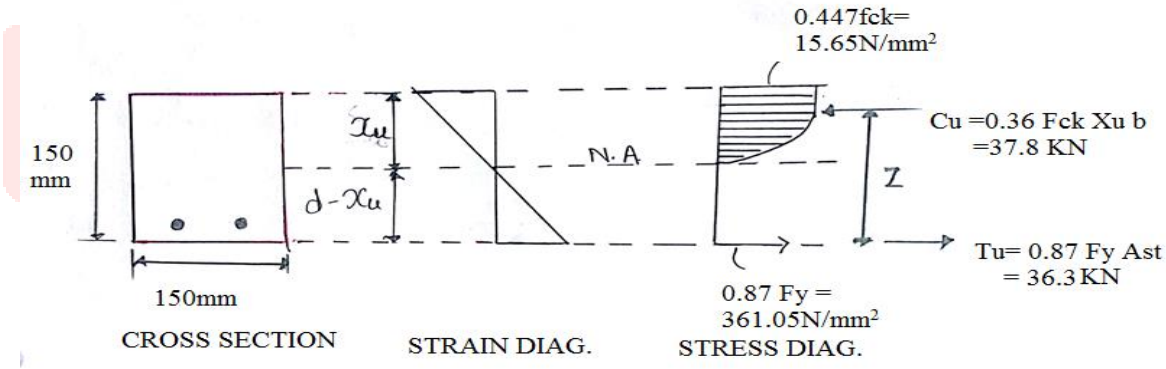
In this project the in-effective concrete in the centre of the beam is replaced with High density polyethylene hollow spheres, using M35 grade of concrete no of beams with and without spherical bubbles were casted to compare weight and flexural strength.

IndexTerms- Neutral Axis, Hollow bubbled Beam, Light-Weight Material, Flexural behaviour etc.

I. INTRODUCTION

To build any building structure beam is important member of structure and concrete is dominant material for construction of beam due to its advantages like low cost, workability, fire resistance, etc. It is produced from a hardened mixture of cement, sand, water and coarse aggregate. Major exploration of the natural resources for producing the environmental impact.

According to LSM, compression is resisted by concrete and tension is resisted by steel. As we know concrete is strong in compression and weak in tension. Stresses in beams are maximum at top and bottom and zero at neutral axis. In RC beams concrete below neutral axis is not performing any structural function so this un-utilized concrete is removed by high density polyethylene balls which do not react with concrete.



Experimental work is carried on bubbled beam in comparison with conventional beam. In bubbled beam ineffective area of concrete below neutral axis is replaced by high density polyethylene balls.

II. MATERIALS AND PROPERTIES

2.1 Three main materials used in Bubble Deck beam construction are:

Steel: Steel of grade Fe500 or higher. Nominal steel is used in the beam to resist bending moment as well as shear force

Plastic spheres: To form bubble in the beam hollow spheres, made from recycled high-densitypolyethylene or HDPE can be used. High density polypropylene materialscan also be used.To create bubbles we used Plasticballs. As plastic is nonporous materialsthat does not react chemically with steel as well as concrete. Plastic balls can get in various diameter so we can use it for various depths of beams as per requirement.

Concrete

The concrete used for Bubbledbeam system must be above M20. In this work we used M35 concrete.

Self-compacting concrete isusually used, Self-compacting concrete can be poured into forms, flow around congested areas of reinforcement and into tight sections, allow air toescape and resist segregation.

Fig. 1 Hollow spherical Plastic Balls

2.2 Dimension of Plastic Balls

Depth of limiting neutral axix =60mm

Depth below the neutral axix=150-90

=90mm

Size of ball=90-20cover

So provide size of ball 60mm

There are total 6 Beam samples named as C1, C2, C3, and B1, B2 and B3. All samples have the same dimension of 150X150X750 mm. The notations C and B denote for the conventional beam and Bubbled beam, respectively.

Fig. 2 Form work for Conventional and Bubbled beam

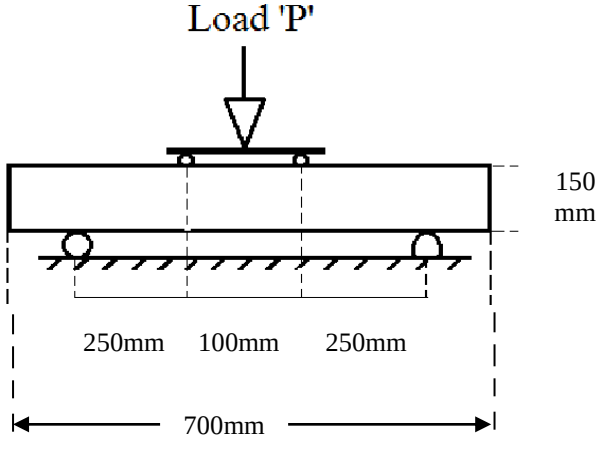
III. EXPERIMENTAL INVESTIGATION

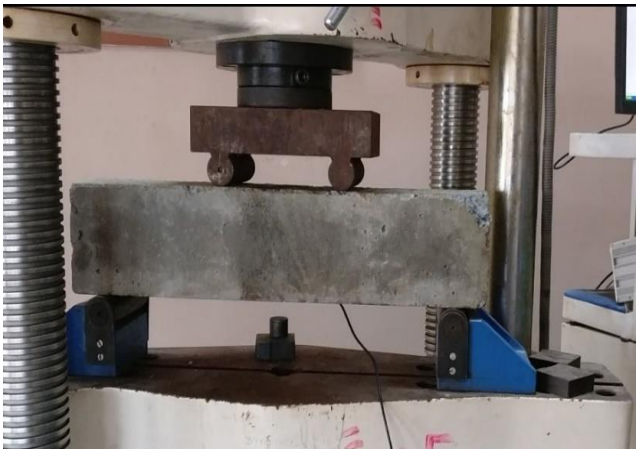
Figure 3 shows the model and actual experimental setup. The Beam samples are simply supported by two steel Rollers of UTMTwo Point loads are applied on the beam by using hydraulic jack with the capacity of maximum loading 1000kN. Initially, the hydraulic jack is adjusted with the force same as the self-weight of the beam. In this experiment6 beams were tested, three without bubbles (conventional) and three with bubbles

Table No 1 Dimension and Notation of Bubble Deck and conventional beam Samples

Sr. No.	Specimen name	length (mm)	c/s of Beam	Bubblediameter B (mm)	No. of plastic spheres
1	Conventional beam (C1,C2,C3)	700	150X150mm	60	-
2	Bubbled beam (B1, B2, B3)				8

All beams are of same dimensions





Modeling Actualization

Figure 3: Experimental Setup

IV. RESULTS AND DISCUSSION

4.1 Load v/s deflection

The conventional beam carried a average load of 130 KN and cause 8.46 mm deflection. Whereas bobbled beam carries a average load of 105KN and 4.89mm deflection.

Table No 2 Experimental Results

Beam Type	Load (KN)	Displacement (mm)	Type of failure
C1	125	8.9	Shear
C2	130	8.37	Shear
C3	135	8.12	Shear
B1	110	5.16	Shear
B2	100	4.31	Shear
B3	105	5.2	Shear

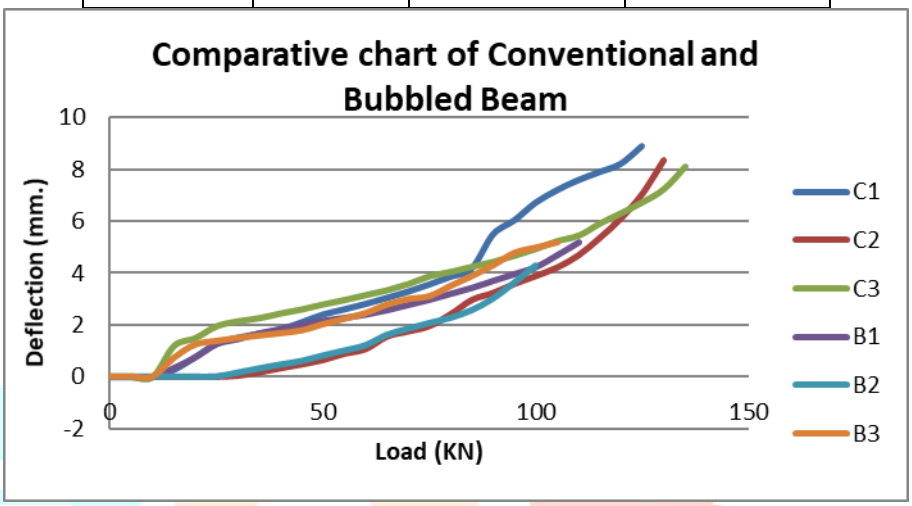


Figure 4: Load – Deflection

Figure 4 shows the maximum Deflection at ultimate load point this figure is plotted for two types of beam, conventional as well as bubbled. As the load increases the deflection of beam also increases so the load is directly proportional to the deflection. The load value and corresponding deflection of the conventional beam and bubble beam are safe up to the load of 100KN is given in table.

4.2 Crack pattern –

At initial stages all beams are uncracked .when the applied load reaches to rupture strength of concrete on specimen, the concrete started cracking. The failure pattern in all beams was observed as shear failure. All the beams shows the same failure of pattern.

4.3 Saved amount of concrete –

Concrete is important building material made up of cement, sand, aggregate and water .the amount of concretedirectlyaffect the cost of project. And due to its higher density, weight of the members also increases.

V. CONCLUSION

Bubble deck **beam** with plastic sphere were tested for flexural, the following conclusions can be drawn:-

1 From the tests conducted , the bubble deck beam were not as efficient as the conventional slab, (having lesser load bearing capacity) But it can improve by making change in the design

2. Advantage of Bubble Deck beam is the cost saving, because of plastic spears used.

3. The deflections under load of Bubble beam specimens were less than that of conventional beam..

VI. REFERANSES

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