iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VIII **Month of publication:** August 2022

DOI: https://doi.org/10.22214/ijraset.2022.46540

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VIII Aug 2022- Available at www.ijraset.com

Strength of RC Beam Using Geo Polymer Concrete and Adoption Bubble Technology

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Abstract: ***Bubble Deck technology first time in European countries provide consumption of high-density polyethylene hollow spheres to replicate the unproductive material in the mid of the slab, consequently diminishing the deceased burden and escalating the competence of the flooring. This process be used in the concrete floor system. Concrete is superior in firmness and thus is further constructive in the compression section than in the tension section. The diminution in concrete can be done by replacing the tension region concrete. Keeping the equal design in intellect, an effort has been ended to discover out the efficiency of plastic bubbles by replacing concrete in the tension region of Ordinary Portland Cement Concrete (OPCC) and Geo polymer Concrete (GPC) beam. Geo polymer Concrete does not figure calcium- silicate-hydrates (CSHs) for matrix configuration and potency like OPCC however utilizes the poly condensation of silica with alumina precursors to achieve structural potency. In this job, M25 concrete mix is used to practice both OPCC and GPC beams. The trial mix is experienced for compressive potency. Flexure test is completed for 28 days of curing of the beams.***

The process is repetitive for beam samples with bubble mesh and bubble mesh beside with shear strengthening. Proportional study of the OPCC and GPC beams are prepared to scrutinize the percentage decrease in self-weight and cost efficiency. Examination of performance of GPC beam in evaluation with that of OPCC beam is also conceded out.

I. INTRODUCTION

Reinforced concrete beams are structural elements that designed to carry transverse external loads. The loads cause bending moment, shear forces and in some cases torsion across their length. Moreover, concrete is strong in compression and very weak in tension. Geo polymer concrete is a type of concrete that is made by reacting aluminate and silicate bearing materials with a caustic activator, such as fly ash or slag from iron and metal production. It can be a suitable substitute for ordinary Portland cement (OPC).

Bubble Deck is the patented integration technique of linking air, steel, and concrete in a two-way structural slab. Hollow plastic balls are inserted into the slab and held in place by reinforcing steel.

Bubble deck slab has not got widespread in India because most of the design is based on the DIN code provision and lack of BIS codes and specifications regarding the use of technology which is discussed only in IRC SP 64-2005, meant for bridge superstructures.

II. OBJECTIVES

1) To evaluate and analyse the behaviour of geopolymer concrete (GPC) beam with that of Ordinary Portland Cement Concrete (OPCC) beam.
2) To analyse the behaviour of geopolymer concrete beam by replacement of tension zone concrete with non-conventional supplies like plastic balls.
3) Expenditure proficient examination by fractional substitution of tension region concrete in beam by the plastic balls.

III. METHODOLOGY

1) Learning of Mix Design of M25 concrete and collection of ingredients of concrete mix as for every the Mix Design (both OPCC and GPC). Ingredients elected are cement, sand and coarse aggregate for OPCC and for GPC cement is totally replaced with 70% fly ash, 15% GGBS and 15% glass powder. NaOH solution of 12M is supplementary in position of water for GPC.
2) Preparation of beam samples with predictable concrete and geopolymer concrete.
3) Testing of RC beam (750mm x 150mm x 150mm) for bending and deflection.
4) Preparation of test samples of Ordinary Portland cement and geopolymer cement concrete beam with plastic balls as partial tension zone replacement.
5) Testing of samples for bending and deflection.
6) Preparation of sample beams with replacement of tension zone concrete with bubble mesh and provision of shear reinforcement.
7) Comparing the results of OPCC and GPC beams to draw conclusions.

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IV. RESULTS

Concrete beam of size 750mm x 150mm x 150mm with replacement of concrete below neutral axis with bubble mesh and shear reinforcement were tested for OPCC and GPC beams. Based on the test results, the following conclusions are made. The replacement of tension zone concrete with bubble mesh has caused a decrease in flexural strength for both OPCC and GPC beams. However, the strength has been maintained for beams with bubble mesh replacement with shear reinforcement.

V. CONCLUSION

It is experimental that the position of bubble mesh in concrete beam does not entail any supplementary time. Though, precise assignment of the mesh lacking displacement while pouring the concrete is a provocation. Another challenge is allowing for adequate concrete to be present connecting lower portion of bubble mesh and tension region reinforcement to allow upper limit transfer of tensile forces from concrete to reinforcement. Economy and decreasing of weight is upto 15% in OPCC and 13% in GPC beams. GPC beams can be used for sustainable and atmosphere welcoming construction work as it decreases the emission of carbon dioxide during the production of cement. However, hand mix of concrete does not provide the required compressive strength.

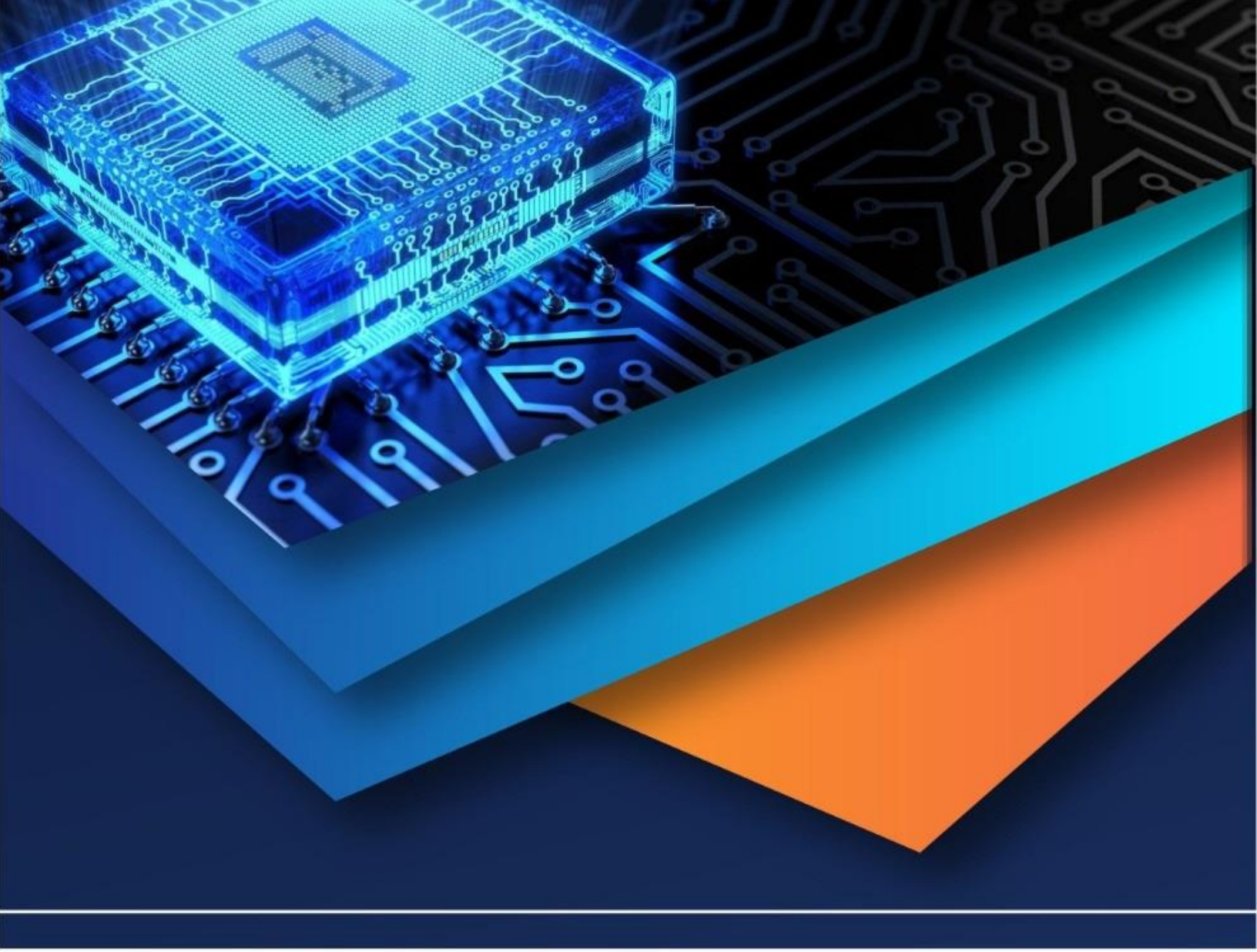
1) 28 days compressive strength for conventional concrete obtained was about 54.44 MPa and for GPC 12 MPa.
2) After adopting bubble technology flexural strength of beam remains almost same.
3) Saving in concrete is about 15% by weight.

VI. FUTURE SCOPE

The following could be some of the areas for future work:

1) Analysis may be carried out considering cracking load instead at breaking load to get the exact behaviour of concrete.
2) Optimum mix proportions for geopolymer concrete can be developed to achieve higher strength.
3) Geopolymer concrete beams with optimum molarity may give better results.
4) Durability test may help in long term effect on strength

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10.22214/IJRASET

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