

Review Paper on Response of Geogrid in Concrete Structures

Prof. K. S. Patil¹, Ajit Kakade²

^{1,2}JSPM College of engineering, Wagholi,412207, India.

Abstract- *These days, the structures are having very less life span than they are designed for. That might have many reasons such as environmental conditions, material quality, improper execution, etc. Due to this beam and slabs of the structures are having reduction in their flexural and shear strength which is prone to failure before the span they designed for. In this paper an alternate material for steel reinforcement of the beam is suggested. These paper assess the experimental studies concrete beam with geogrid reinforcement. Totally 6 beams and 4 slabs were tested for 7 days and 28 days of curing period. 2 beams are tested without geogrid and with conventional reinforcement in the interval of 7 days and 28 days respectively. Rest of the 6 beams is tested with single layer geogrid and double layer geogrid. And these results are compared with each other based on their achieved strength.*

Keywords- Geogrid, Reinforcement, experimental studies, reinforced concrete beam

I. INTRODUCTION

Geo synthetic material named geogrids being used for reinforcement of soils and similar materials. Geogrids commonly used for sub soils under roads as well as reinforced retaining walls. It is very strong to withstand in tension as compared to soil. Due to this fact its allows to transfer the forces to a larger area of soil than would otherwise be the case. Geogrids may be heat-welded from strips of materials, produced by punching a regular pattern of holes in sheets of materials or woven or knitted from yarns, then stretched into grid. These geogrids can also be used as stabilization and reinforcement element in various civil and infrastructural projects, using geogrid as inter layers to mitigate reflective cracking in asphalt overlays of jointed plain concrete pavement has become widely used, particularly as it relates to geotechnical engineering. Some researches have been performed on their use as reinforcement in thin PCC members and overlays. In the concrete sections with the geogrid instead of conventional reinforcement steel fibers can be used for shear reinforcement. Discontinuous, randomly oriented fibers used for shear reinforcement have long been recognized to provide post cracking tensile resistance to concrete. These act as effective shear reinforcement and increases shear-friction

strength of concrete due to their dispersed position. Moreover, Fibers also prevent the crack propagation.

II. LITERATURE SURVEY

P.Maheswar Reddy, J.Ravi Kumar(2018)¹: -This paper deals with the experimental investigation on concrete beams reinforced with geogrid in uniaxial and biaxial directions. The use of geogrid in concrete sets a new dimension for employing geo-synthetics in structural engineering. Geogrids are being used in providing stabilization, confinement, and reinforcement of asphalt concrete layers, further to reduce reflective cracking in pavement applications. The objective of study is to assess the feasibility and benefit of using geogrid in thin concrete overlays. The experimental investigation consists of casting and testing 6 geogrid concrete beams and 1 control beams subjected to two-point bending. The two-point bending test on geogrid beams reveals that strength of geogrid and number of layers plays a crucial role in enhancing load-deflection behavior and flexural strength. Test result indicate that geogrid can be used an alternative material for steel in structural members.

S. Ramakrishnan et al(2018)²: -This paper illustrates the behaviour of reinforced concrete (RC) beam with biaxial geogrid as an additional reinforcement. The purpose of examining the behaviour of geogrids in structural members gives opportunity to observe benefit and feasibility of using geogrid in thin concrete layers. The experimental investigation consists of one control beams (CB) and five geogrid reinforced concrete beams (GB) with varying geogrid layer from one to five. These beams were subjected to gradually increased two-point load until collapse occurred. The first crack load, ultimate load carrying capacity and behaviour was observed till collapse occurred. The behavior and flexural strength of these geogrid beams were compared with that of a control beam that had the steel reinforcements alone. The test result indicates that geogrid can be used as an alternative material for steel in structural members.

Martin Ziegler(2017)³: -In this paper author represented the case study on to understand the functioning of geogrid-reinforced constructions. it is helpful to have a look on the principal behaviour of soil under different stress conditions.

The objective of this paper is to study the principal behaviour of soil under different stress conditions. To get an insight in the “secret” of geogrid reinforced constructions he first considered the large tri axial test. This is 110 cm high and 50 cm in diameter, and the tests were conducted unreinforced, and reinforced with up to five layers of geogrids. The confining pressure was applied using a vacuum, so that only low stress levels could be investigated, but these covered the range usually prevailing in sub-base layers.

Amarnath Yerramala (2014)⁴: -In this paper, it describes the use of poultry waste in concrete through the development of concrete and studied the Properties of concrete with eggshell powder (ESP) as cement replacement. Different ESP concretes were developed by replacing 5-15% of ESP for cement. Test are taken, compressive strength and split tensile strength test was higher than normal concrete for 5% of ESP replacement and it had lower strength than normal concrete with more than 10% of replacement at the age of 7 & 28 days. The results demonstrated that irrespective of ESP percentage replacement there was good relationship between compressive strength and split tensile strength.

D.Gowsika (2014)⁵: -In this paper reports the results of experiments evaluating the use of egg shell powder from egg production industry as partial replacement for ordinary Portland cement in cement mortar. The chemical composition of the egg shell powder and compressive strength of the cement mortar was determined. The cement mortar of mix proportion 1:3 in which cement is partially replaced with egg shell powder as 5%, 10%, 15%, 20%, 25%, 30% by weight of cement. The compressive strength was determined at curing ages 28 days. There was a sharp decrease in compressive strength beyond 5% egg shell powder substitution. In this direction, an experimental investigation of compressive strength, split tensile strength, and Flexural strength was under taken to use egg shell powder and admixtures as partial replacement for cement in concrete.

S. Karthikeyan (2012)⁶: - Reduce and Reuse of the alternative materials is much important to sustain our energy resources. In the field of construction, the use of admixtures and re-utilization of available wastage materials is not a new one. But it is deals with a study of Egg Shell Powder as a partial replacement of cement in concrete to make two advantages, to improve the strength as well as to reuse & reduce the egg shell wastage. The various characteristics of ESP are examined and it is allowed to concrete as a partial replacement of cement. The various proportions such as 2.5, 5, and 7.5% are tried in this investigation and the strength achieved by ESP concrete is much better than a nominal concrete. Every admixture has its own strength. There was a

sharp decrease in the strength when the proportion of ESP is beyond the level of 5%.

Praveen Kumar (2006)⁷: - Experimentally investigated the Partial Replacement of Cement with Egg Shell Powder. The aim of this study is to study the chemical composition of the egg shell to find its suitability of replacement in the concrete. To examine the feasibility of utilizing the egg shell and silica fume as cement replacement material. To study the strength parameters of the egg shell powder mixed specimens and to compare it with conventional specimens. The scope of the study is to cast the concrete specimens and conduct the compressive strength test, split tensile strength test and flexural strength test at 7th & 28thday, with the specified combinations of egg shell powder and compare it with the controlled concrete specimens. In this project M30 Concrete is designed for various combinations. A combination of Egg shell with silica fumes are used in different combinations to find the feasibility of using the Egg shells as an alternate to cement Egg shell powder replaces 10%, 20% and 30% in addition with the silica fume by 5%, 10%, 15% of weight of cement. Concrete is cast and Compressive test, Tensile and Flexural tests were carried out to find the best combination which results in optimum percentage of strength.

III. CONCLUSION

This paper focuses only on the literature review of previously published studies. The findings of this study an egg shell is used in different combinations to find the feasibility of using the egg shells as an alternate to cement. According to literature it is found that the compressive strength, split tensile strength and flexural strength are increased with addition of 5% and 10% of replacement and sharply decreases beyond 10% of replacement.

REFERENCES

- [1] Manzoor Ahmad Allie' A Review Study of Egg Shell Powder as A Cement Replacing Material in Concrete 'May 2018 Ijsdr | Volume 3, Issue 5
- [2] Pradeep Sharma' an experimental investigation on partial replacement of cement with egg shell powder and fine aggregate with copper slag in concrete 'Volume 5, Issue 10, June-2018
- [3] N. Parthasarathi' Experimental Study on Partial Replacement of Cement with Egg Shell Powder and Silica Fume Vol. 10 | No. 2 |442 - 449 | April - June | 2017
- [4] Amarnath Yerramala, Properties of concrete with eggshell powder as cement replacement. The Indian Concrete Journal October 2014.

- [5] D.Gowsika. Experimental Investigation of Egg Shell Powder as Partial Replacement with Cement in Concrete, International Journal of Engineering Trends and Technology (IJETT). Volume 14 Number 2. Aug 2014.
- [6] J. Karthick, R. Jeyanthi, M. Petchiyammal (2012), Experimental Study on Usage of Egg Shell as Partial Replacement for Sand in Concrete. International Journal of Advanced Research in Education Technology, Vol.1, Issue 1, pp. 7-11.
- [7] Isaac O. Igwe, Genevive C. Onuegbu, Studies on Properties of Egg Shell and Fish Bone Powder Filled Polypropylene. American Journal of Polymer Science 2012, 2(4): 56-61.
- [8] M.O.A. Mtallib and A. Rabi, Effects of Eggshells Ash on the Setting Time of Cement. Vol3, 12 January 2011.
- [9] Jayasankar.R, Mahindran.N, Ilangovan.R (2010), Studies on Concrete Using Fly Ash, Rice Husk Ash and Egg Shell Powder., International Journal of Civil and Structural Engineering, Vol. 1, Issue No 3, pp. 362-373.