"EXPERIMENTAL STUDIES AND RESPONSE OF GEOGRID IN CONCRETE STRUCTURES"

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ABSTRACT

The point of the review is to figure out the impact of geogrid in radiates. The reason for utilizing geogrid in radiates at different focuses to notice its advantages over the design. Presently a days structure having short life expectancy reason for material quality, ill-advised execution, natural condition and so forth. In light of these reasons structures having decrease in their compressive strength and flexural qualities which prompts its disappointment. Various examinations have been performed to bring answers for development industry, which shows extraordinary interest in geogrid material. Geogrid is a geosynthetic material like geonets which is utilized in street developments, holding dividers, dams, water repositories, building development, establishment and some more. In this review putting geogrid in primary individuals like shafts is to test whether geogrid is expansion or substitution to steel in the part. Geogrids are included the shafts and resuls are determined in this review.

INTRODUCTION

A geogrid is a geosynthetic material with normal for its solidness. It is regularly utilized as sub bases or dirt underneath the streets and designs, to build up holding dividers. Geogrids are solid in pressure. Geogrids comprised of polymer materials like polyester, polyvinyl liquor, high-thickness polyethylene and polypropylene. In light of which bearing the extending is finished during make, geogrids are delegated uniaxial geogrids, biaxial Geogrids and triaxial geogrids. Uniaxial geogrid has a rigidity in one course.

Different opening sorts are formed in view of the manner in which the polymer sheet is attracted possibly at least one different ways. Drawing one, two and three headings results in uniaxial, biaxial and triaxial geogrid separately. They are effectively accessible in market including welded geogrid, woven geogrid and expelled geogrid.

PROBLEM STATEMENT

These days because of addition in human progress enormous measure of designs are built with concrete. The substantial individuals are fragile materials to endure the rigidity of individuals as they are supported by steel bars as of late because of natural wellbeing idea the substitution of development materials are generally done in investigate field specifically, halfway substitution of concrete and steel has got more huge in research field on account of its high outflow of carbon vaporous during the creation. In research mechanical applications, utilization of Geo-textures materials have acquired significance in Civil Engineering works Geo-Technical, transportation frameworks and different applications like bank, water system structures and so forth. So we need to examine conduct of Geo-Grid support in cement to track down it as elective support material and legitimize its reasonableness pivots at explicit locales .

Fig.1 Uniaxial geogrid.

The disappointment locales are soffit of crystal and spiral if there should arise an occurrence of parted tractable test. Likewise, if there should arise an occurrence of 3D shapes, Geo-Grids are set over the soffit of part, In every one of the particulars, Geo-Grids are put opposite to the stacking of examples. The geogrid layer will be put at 30 mm over the base surface of the bar. A similar arrangement will be taken on for different bars and blocks.

1. GEO-GRID APERTURE

Geogrid opening can be classified in three fundamental gatherings in view of their gap uniaxial, biaxial and triaxial. Uniaxial geogrid has an elasticity in one heading. Biaxial geogrids have elasticity in two aspects and they are frequently utilized for support of asphalts including unpaved streets, rail lines, and adaptable asphalts. Dong et al. (Dong, Han, &Bai,

2010) uncovered that biaxial geogrid can't give steady elastic qualities when exposed to strain in multiple headings, and it has rigidities in only two bearings. This is one the limits of biaxial geogrids.

II. TESTS FOR GEOGRID PROPERTIES

Physical Properties	Mechanical Properties	Degradation properties
Structure	Single Rib test	Temperature effects
Junction type	Junction strength	Oxidation effects
Aperture size	Wide width tensile strength	Hydrolysis effects
Thickness	Shear test	Chemical effects
Mass per unit area	Pullout test	Radioactive effects
Flexural rigidity	Endurance properties	Biological effects
Stiffness	Installation damage	Sunlight (UV) effects
	Tension- Creep behavior	Stress- crack resistance

Table.1 Test for geogrid

III. TESTING PROGRAM AND MATERIALS

The total specimens will be tested under monotonic constant displacement rate loading until failure. Types of specimens & their dimensions are as follows:-

1. Conventional Beam– (B-150mm x D-150mm xL-700mm).
2. Beams with geogrid–(B-150mm x D-150mm xL-700mm).
   - Single Layer.
   - Double Layer
3. Conventional Cube- (L-150mm x B-150mm x D-150mm).
4. Cube with geogrid- (L-150mm x B-150mm x D-150mm).
   - Single Layer.
   - Double Layer.

PCC mixtures having normal strength with target strength of 35 MPa will be used in the study. Eighteen specimens will be fabricated: one beam, one cube with conventional reinforcement to serve as control, and other beams and cubes with Biaxial geogrid, and Uniaxial geogrid as described above.

IV. PLACING OF GEOGRID

Geo-Grids putting play an Important job to additionally work on the nature of substantial individuals. In this work the Geo-Grids can be put regarding exploratory examination on control examples. It flops because of most extreme burden and development of plastic on the substantial part

V. PORTLAND CEMENT CONCRETE.

The Concrete Mixture is made utilizing Portland Concrete, fine totals comprising of regular sand, medium-size totals with 10 mm, and coarse totals with 20 mm. The Ratio extents by mass were 1:1.6:2.907 with a water-concrete proportion of 0.45 for concrete. It was plan for 7 and 28 Days to check the compressive strength of 35MPa The substantial blend was intended for creating substantial cube to test compressive strength of 35MPa at 7 days and 28 days.12

Fig.2 geogrid

FLEXURAL STRENGTH TESTING OF BEAM

Fig.3 Testing of Beam.

VI. GEOGRIDS

Every one of the 3 sorts of geogrids will be firm geogrids. They comprise of firm, unwoven, punch-drawn geosynthetic material the uniaxial type is made of high-thickness polyethylene, while the two different sorts are made of polypropylene. The uniaxial type is made of high-thickness polyethylene, while the two different sorts are made of polypropylene. Varieties present in the opening math and aspects and in the physical and mechanical properties.

Varieties exist in the gap math and aspects and in the physical and mechanical properties and are introduced in tables given beneath.

VII. ADVANTAGES

1. Ease of Construction: Geogrid can be installed in any weather conditions, this makes it more demanding & placement techniques are simple.
2. In structural components, the geogrids are used as additional reinforcement and as shear reinforcement.
3. To achieve good strength fibers like polypropylene and steel are used.
4. The geogrid reinforcement results in high ultimate load-bearing capacity, improved energy absorption and reduced slippage, shear and bond strength.

VIII. ENVIRONMENTAL BENEFITS

1. Geogrid reinforced constructions are increasingly used as safe, ecological and economical solutions as Compared to conventional solutions with concrete, they often have the benefit of lower costs and less environmental impact.
2. Geogrids are also used for Dewatering Drainage Filtration, Landfill and Environmental Barrier and Surfacing Reinforcement.
3. It has high durability reducing maintenance cost. They are highly resistant against environmental influences.
4. Geogrid provides quality construction & excellent flexural strength.

PHYSICAL AND MECHANICAL PROPERTIES OF THE UNIAXIAL GEOGRIDS USED

Component	Description	Unit
Aperture size MD	220	mm
Aperture size TD	13/20	mm
Mass per unit area	400	g/m^2
Strength at 2% strain	17	kN/m
Strength at 5% strain	32	kN/m
Peak tensile strength	60	kN/m
Yield point elongation	13	%
Junction strength	50	kN/m
Long term design strength	28.3	kN/m

Note: MD = machine direction; TD = transverse direction.

Table.2 properties of uniaxial geogrid.

PHYSICAL AND MECHANICAL PROPERTIES OF THE BIAXIAL GEOGRIDS USED

Component	Description	Unit
Tensile strength at 2% Strain	14	kN/m
Tensile strength at 5% Strain	28	kN/m
Maximum tensile strength MD/CMD	40/40	kN/m
Elongation at nominal strength MD/CMD	11/10	kN/m

Note: MD = machine direction; CMD = cross machine direction.

Table.3 properties of biaxial geogrid.

PROPORTIONING :

- Grade designation : M35
- Type of Cement : OPC 53 grade conforming to IS 8112
- Maximum nominal size of : 20mm aggregate
- Minimum cement content : 320 Kg/m3
- Maximum Water cement ratio : 0.45

- Workability : 100 mm (slump)
- Exposure condition : sever
- Method of concrete placing : Pumping
- Degree of supervision : Good
- Type of aggregate : Crushed Aggregate
- Maximum cement content : 450kg/m3

Fig.3 Placing of Geogrid.

Fig.4 Beam Specimen

LITERATURE REVIEW:

1]. S. Ramakrishnan, M. Arun, S. Loganayagan, M. Mugeshkanna (2018)

This paper illustrates the behaviour of reinforced concrete (RC) beam with biaxial geogrid as an additional reinforcement. They have done 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 behaviour and flexural strength of these geogrid beams were compared with that of a control beam that had the steel reinforcements alone.

2]. El Meski and Chehab (2013)

Have conducted an experimental program on plain and geo-grid reinforced beam specimens under four-point bending. Results from testing confirm that the reinforcing benefit of the geo-grids are evidenced from the load-deflection response in terms of post peck behavior, load capacity, crack mouth opening displacement, and failure mode.

RESULTS

7 DAY CURING PERIOD.

1. CONVENTIONAL BEAM-

Sr. No.	Size of beam (mm)			Span (mm)	Applied Load (KN)	Flexural Strength (N/mm²)	Avg. Flx Strength (N/mm)
	L	B	H				
1	700	150	150	600	24	4.35	4.39
2	700	150	150	600	25.1	4.46	
3	700	150	150	600	24.6	4.37	

2. BEAM WITH SINGLE LAYER OF GEOGRID–

Sr. No.	Size of beam (mm)			Span (mm)	Applied Load (KN)	Flexural Strength (N/mm²)	Avg. Flx Strength (N/mm²)
	L	B	H				
1	700	150	150	600	33	5.86	5.84
2	700	150	150	600	32.45	5.76	
3	700	150	150	600	33.3	5.92	

3. BEAM WITH DOUBLE LAYER OF GEOGRID–

Sr. No.	Size of beam (mm)			Span (mm)	Applied Load (KN)	Flexural Strength (N/mm²)	Avg. Flx Strength (N/mm²)
	L	B	H				
1	700	150	150	600	35.9	6.38	6.45
2	700	150	150	600	36.75	6.53	
3	700	150	150	600	36.3	6.45	

28 DAY CURING PERIOD.

1. CONVENTIONAL BEAM-

Sr. No.	Size of beam (mm)			Span (mm)	Applied Load (KN)	Flexural Strength (N/mm²)	Avg. Flx Strength (N/mm²)
	L	B	H				
1	700	150	150	600	41.2	7.32	7.42
2	700	150	150	600	42.3	7.52	
3	700	150	150	600	41.9	7.44	

2. BEAM WITH SINGLE LAYER OF GEO-GRID–

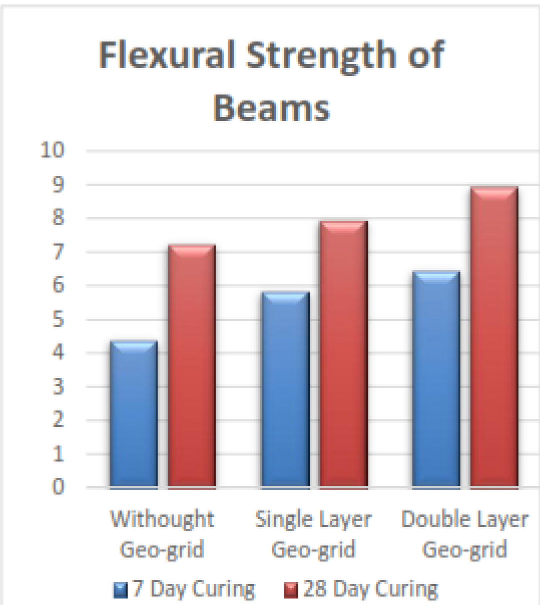
Sr. No.	Size of beam (mm)			Span (mm)	Applied Load (KN)	Flexural Strength (N/mm²)	Avg. Flx Strength (N/mm²)
	L	B	H				
1	700	150	150	600	42.9	7.98	7.95
2	700	150	150	600	43.7	7.90	
3	700	150	150	600	42.5	7.97	

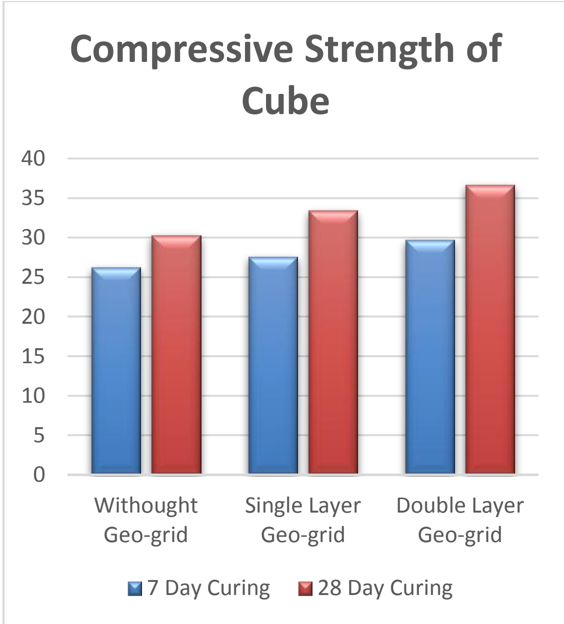
3. BEAM WITH DOUBLE LAYER OF GEOGRID–

Sr. No.	Size of beam (mm)			Span (mm)	Applied Load (KN)	Flexural Strength (N/mm²)	Avg. Flex Strength (N/mm²)
	L	B	H				
1	700	150	150	600	50.10	8.9	8.95
2	700	150	150	600	50.45	8.96	
3	700	150	150	600	50.5	8.98	

Graph.1 Flexural Strength Of Concrete Beam Without Geogrid , With Single & Double Layer Of Geo-Grid

(At 7th Day & 28th Day).





Graph.2 Compressive Strength Of Concrete Cube Without Geo-Grid , With Single & Double Layer Of Geo-Grid

(At 7th Day & 28th Day).

CONCLUSION

Experimental investigation concluded the beams proportioned with layers of biaxial geogrid shows luminously rise in compressive strength and significantly increment in flexural strength. Geogrid in concrete act as a ductile member by taking tensile load. Also geogrid layer shows increase in bending strength of beam. Geogrid found to be economical source and no harm to the environment follows:-

- Compressive strength at full age of concrete rise significantly.
- Flexural strength shows significant increment above 18%.
- By placing Geo-grid in concrete it act as a ductile member by taking tensile loads.
- Using geogrid beams compare to Conventional beam can help to increase Flexural strength as per above results.
- Geo-grid in concrete can found to be economical source in concrete members.
- As layer of geogrid increased towards the CG of beam the bending strength of beam increases.

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