PERFORMANCE OF GEOCOMPOSITE CONCRETE

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ABSTRACT

This paper focuses on geosynthetics product, their applications and elegance methodologies needed for reinforcing soil and environmental protection work. From decades Geosynthetics area unit wide used construction materials for geotechnical and environmental applications in most elements of the world, as a result of they represent factory-made materials, new product and applications area unit developed on a routine basis to provide solutions to routine and necessary issues alike. Results from recent analysis and from watching of instrumented structures throughout the years have semiconductor diode to new style strategies for varied applications of geosynthetics.

Keywords: Geocomposite , concrete , strategies

INTRODUCTION TO GEOSYNTHETICS OR GEOCOMPOSITES

Geosynthetics area unit usually designed for a specific application by considering the first operate that may be provided. As seen within the incidental to table their area unit 5 primary functions given, however some teams recommend even additional. the foremost functions of Geocomposites area unit reinforcement, filtration, evacuation containment and separation. It has been recognized that the addition of tiny, closely spaced and uniformly distributed geo-fibre to concrete would act as crack restraint and would considerably improve its and dynamic properties. This kind of concrete is thought as fibre concrete. Plastic fiber's do an equivalent impact and perform higher than the other fiber's. plastic concrete will be outline as a stuff consisting of mixtures of cement, mortar or concrete and discontinuous, discrete, uniformly distributed geo-fibres. Fiber concrete is concrete containing fibrous material that will increase its structural integrity. It contains short separate fibers that are uniformly distributed and arbitrarily orienting. Fibres embrace steel fibres, glass fibres, artificial fibres and natural fibres. inside these completely different fibres that character of fibre concrete changes with varied concretes fiber materials, geometries, distribution, orientation and densities. It's true that plain cement concrete possesses a awfully low durability.

ADVANTAGES OF GEOSYNTHETICS:

1. Less sensitive to environment.
2. Improved performance and more sustainable.
3. More compatible with field conditions.
4. Cheaper in product cost, transportation and installation.

LITERATURE REVIEW

1. Uma Shankar. K, Arun Prakash. K & Pradeep Kumar. S14 in their paper titled as "Rehabilitation and Retrofitting of Building Structures" stated that fiber-reinforced polymer (frp) composite materials provide an outstanding means for rehabilitating and strengthening existing reinforced and prestressed concrete bridges, buildings and other structures. These advanced composites may be designed to act as flexural, shear, and confinement reinforcement. Use of these composites requires less disturbance to building occupancy, bridge traffic, and other functions than rehabilitation that uses additional steel reinforcement.

2. Yetimoglu and Salbas, 2003, studied Experimental Study on Effect of Geosynthetic Fibres on Compressive and Tensile Strength of Cement Concrete and teach us that, in comparison with conventional geosynthetics (strips, geotextile, geogrid, etc.), the advantages of using discrete fibre are as follows, (i) The discrete fibres are simply added and mixed randomly in mixing with cement, lime, or other additives. (ii) Randomly distributed fibres limit potential planes of weakness that can develop in the direction parallel to the conventionally oriented reinforcement. (iii) The inclusion of fibre only changes the physical properties of soil and has no impact on the environment. For these reasons, researchers have shown an increasing interest in mechanical behaviors of fibre. Yetimoglu et al., 2005, Consoli et al., 2007, Ibrahim et al., 2012 and EL, 2012. The results indicate that the discrete fibre reinforcement can significantly improve the mechanical performances. They concluded that the fibre reinforcement benefit on the mechanical properties is governed by the interfacial friction and cohesion. Perkins S.W. (2000) During past decades, application of geosynthetics for stabilization has become wider and wider. Various types of synthetics are used right now in different cases of soil improvement like geotextiles, geogrids, geonets, geofibers and etc. There have been wide efforts on reconnaissance of geosynthetic application effects on geotechnical properties of reinforced soil such as Constitutive modeling of geosynthetics.

3. Khalid Bashir, Rayees Ahmad Bala, Arif Ahad and Riya Gungnia4, 2012 in their paper titled "Experimental Study on Shallow Funicular Five Layered GFRP Shells over Square Ground Plan", studied that the deflection of shallow funicular composite shell decreases with the increase in rise within the elastic range. The ultimate load carrying capacity increases with the increase in rise.

4. Ciprian Cozmanciuc, Ruxandra Oltean and Vlad Muntean1, 2001 in their paper titled "Strengthening Techniques of RC Columns using Fibre Reinforced Polymeric Materials", stated that the most utilized techniques of performing composite confining systems for reinforced concrete columns are wet lay-up method, automated method and the method based on using prefabricated elements. For developing efficient composite confining systems, it is required to respect the technological steps that lead to a corresponding transfer of stresses from concrete to the composite membrane. These steps include priming of the concrete substrate, of the application surface, execution of the resin mixture, application of the composite system and of the protection layers.

MATERIAL AND METHODOLOGY

In easy terms, concrete is that the mixture of rock and soil. Through a series of chemical reactions known as association, the paste hardens and gains strength to make the rock-like mass referred to as concrete. at intervals this method lies the key to a motivating attribute of concrete: it's plastic and malleable once new mixed, sturdy and sturdy once hardened. These qualities make a case for why one material, concrete, will build skyscrapers, bridges, sidewalks and superhighways, homes and dams. The compressive strength of the concrete cubes test provides an idea about all the characteristics of concrete. By doing this single test, one can judge that whether concreting has been done properly or not. Concrete Compressive strength for general construction varies from 15 Mpa to 30 Mpa depend on the needs. As we all know concrete compressive strength depends on various factor like water cement ratio, workability and admixtures.This test is carried out either on a cube or a cylinder**.** Various Codes recommend a concrete cube as the standard specimen for the test.**Compressive Strength Formula-:** It is the load applied at a point of failure to the cross section area of the face on which load was applied.

Compressive strength =Load/Cross sectional area.

APPARATUS USED FOR THE DETERMINATIONS/TESTS :-

1) Vibration machine,
2) Cube moulds of 150mm,
3) Test sieves conforming IS : 460-1920,
4) Gauging towel,
5) Containers for mixing concrete and materials,
6) Stop Watch
7) Water Bath,
8) Weighing device

9) Rulers etc.

Compressive Strength may be defined as the ability of material or structure to carry the load on its surfaces without any crack or deflection.

This mixed can be done in two ways:

i. Hand Mixing
ii. Mechanical Mixing

But for casting our cubes we use hand mixing.

Hand Mixing

1. Mix the cement and aggregates on a watertight none absorbent platform until the mixture is thoroughly mixed and is of uniform color.

2. Add the coarse aggregate and mix with cement and fine aggregates until the coarse aggregates is uniformly distributed throughout the batch.
3. Add water and mix it until the concrete appear to be homogeneous and of desired consistency.

a) **Workability:** Slump check is that the most ordinarily used technique of activity consistency of concrete which might be used either in laboratory or at web site of labor. it's not an acceptable technique for terribly wet or terribly dry concrete. It doesn't live all factors causative to workability, neither is it perpetually representative of the placability of the concrete. The pattern of slump is shown in Fig. It indicates the characteristic of concrete additionally to the slump worth. If the concrete slumps equally it's known as true slump. If one 1/2 the cone slides down, it's known as shear slump. just in case of a shear slump, the slump worth is measured because the distinction tall between the peak of the mould and therefore the average worth of the subsidence.

b) **Workability of Fresh Concrete by Compaction Factor Test:**

Methodology

Compacting Factor Test: The compacting issue check is meant primarily to be used within the laboratory however it may also be utilized in the sector. it's additional precise and sensitive than the slump check and is especially helpful for concrete mixes of terribly low workability as area unit commonly used once concrete is to be compacted by vibration. The strategy applies to plain and air-entrained concrete, created with light-weight, traditional weight or significant aggregates having a nominal most size of forty millimeter or less however to not aerated concrete or no-fines concrete.

c) **Compressive Strength of Concrete Cubes:**

The compressive strength of hardened cement is that the most vital of all the properties. Therefore, it's not shocking that the cement is often tested for its strength at the laboratory before the cement is employed in necessary works. Strength tests aren't created on neat cement paste thanks to difficulties of excessive shrinkage and resulting cracking of neat cement.

Calculations and Data Analysis:

Sieve Size	Weight Retained (In kg)	Cumulative Weight retained (In kg)	Cumulative % Retained	Cumulative % passing
80mm	0	0	0	100.000
40mm	0	0	0	100.000
20mm	1.517	1.517	30.245	69.210

10mm	3.412	4.970	99.210	0.714
4.75mm	0.333	5.000	100.000	0.000
2.36mm	0.000	5.000	100.000	0.000
1.18mm	0.000	5.000	100.000	0.000
600 micron	0.000	5.000	100.000	0.000
300 micron	0.000	5.000	100.000	0.000
150 micron	0.000	5.000	100.000	0.000
TOTAL	**5.262**		**729.455**	

Sl. No.	**Description**	**Trail 1(Kg)**	**Trail 2(Kg)**
1	Wt. of empty container W1	2.5	2.5
2	Wt. of container with material W2	4.79	7.08
3	Wt. of container + material + water W3	5.46	8.375
4	Wt. of container + water W4	3.98	5.710

Sl No.	**Wt. of cement taken (In gm)**	**Wt. Of water Taken (In gm)**	**Plunger Preparation**	**Time Taken**	**Consistency**
1	300 gm	90	27	4 min	30%
2	300 gm	102	11	4 min	34%
3	300 gm	105	5.5	4 min	35%

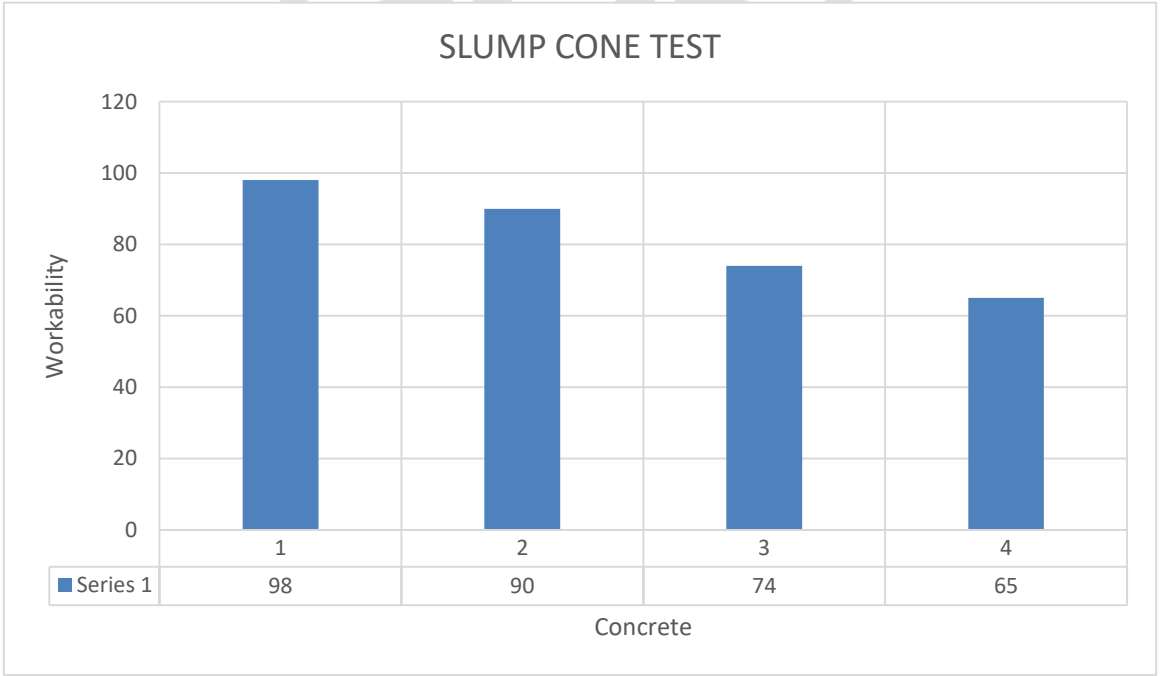
•Results and Analysis:

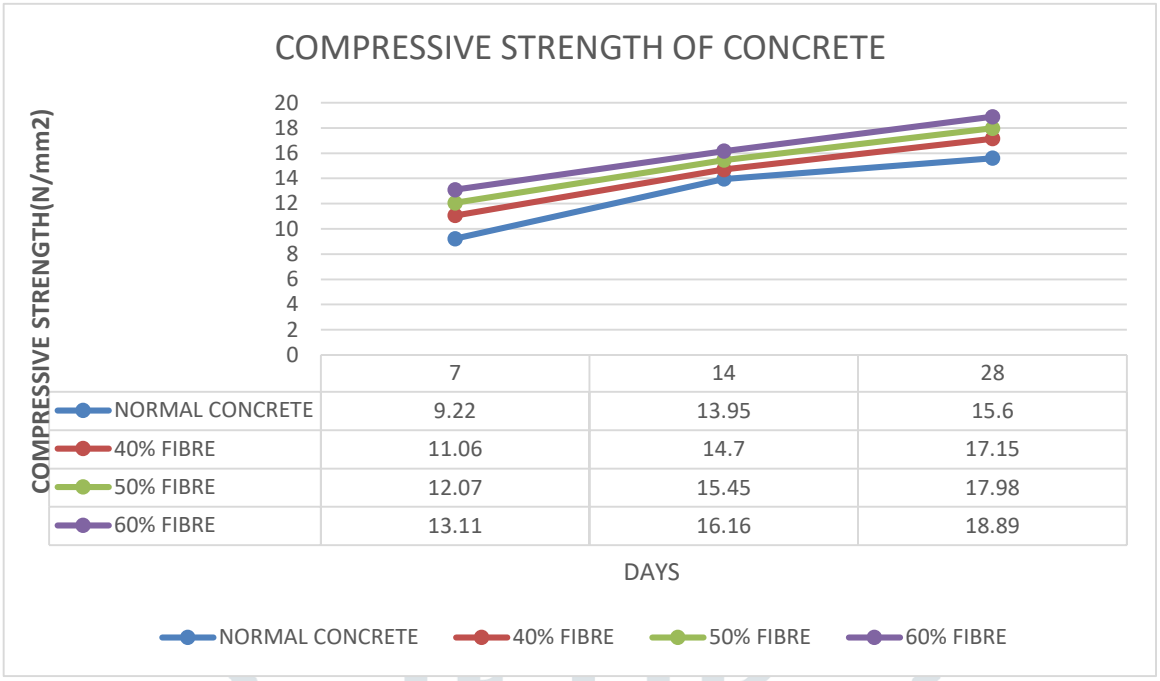
The compressive strength of the concrete cubes test provides an idea about all the characteristics of concrete. By doing this single test, one can judge that whether concreting has been done properly or not. Concrete Compressive strength for general construction varies from 15 Mpa to 30 Mpa depend on the needs. As we all know concrete compressive strength depends on various factor like water cement ratio, workability and admixtures. This test is carried out either on a cube or a cylinder. Various Codes recommend a concrete cube as the standard specimen for the test.

Compressive Strength Formula-: It is the load applied at a point of failure to the cross-section area of the face on which load was applied.

Compressive strength = Load/Cross sectional area

- Machine used for compressive testing is Compression Testing Machine.
- Load should be applied gradually at the rate of 140kg/cm2 per minute till the specimen fails.
- Firstly, the Geocomposite concrete performed quite well. The materials required were Cement, Sand, Aggregate and fiber mesh. To begin with the casting process, we had to cast 7 normal concrete cubes of Grade M15 with a nominal mix ration of 1:2:4, so to compare the strength of normal cubes with the Geocomposite Cubes.
- The compressive strength of normal concrete cubes after 7th and 14th day came out to be 9.22/mm2 and 13.95N/mm2.
- Now, with the addition of fiber mesh, we casted 21 concrete cubes with increase in addition of fiber mesh w.r.t total mix ration.
- For next 7 cubes, we added 40% of glass fiber to M15 concrete, which resulted in reduction of sand and aggregates volume by 20% each. After casting ad compaction by hand, it became quite difficult to mix.
- After 7th, 14th and 28th day, the compressive strength of fiber reinforced concrete came out to be more as compared to normal concrete cubes.
- Subsequently, with increase in addition of fiber mesh in concrete mixture, the required volume of sand and aggregate decreased.
- With addition of 50% of glass fiber to normal M15 concrete, we casted 7 cubes and after compaction, curing ad resting them for 7, 14, 28 days the compressive strength increased.
- Lastly, with addition of 60% of fiber mesh with normal M15 concrete, the compressive strength increased.





Conclusion and Future Scope:

- This research presents a new cost-effective method to develop a low-cost concrete having high tensile strength. This helps in detection of increasing strength require for different purposes.
- This project paper also presents a detailed view on geocomposite concrete based on its mix proportions.
- With increase in percentage of fibre, the wet density of fiber reinforced concrete increases.
- The main purpose of adding fibre to concrete is not add strength but to prevent it from cracking from plastic shrinkage or drying shrinkage.
- The slump test and dry matrix compaction factor of fibre reinforced concrete provides a better result of workability.
- The temperature of fresh concrete is reduced with addition of fibre i.e., hydration reaction slows down. Also, the fresh mix becomes dry with increase in percentage of fibre.
- With the selection of good quality fibre, the right FRC can reduce voids and increase tensile strength.
- Also, fibre reinforced concrete is heavier than non-fibre concrete as fibre absorbs more water.
- This project also discusses the advancement of concrete mixing technique ad its effective way to absorb the fibre easily and stabilizing the structure quite effectively.
- The paper further analyses the performance of concrete and fibre with increase in strength over time.

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