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INCREASE THE STRENGTH OF POROUS ROAD BY USING GEO CELL

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Abstract : An experimental work was carried out to investigate the strength of the Porous concrete which have the combination non organic . In this experiment we have some variable parameters for finding the difference in the concrete strength . These properties include compressive strength and split tensile strength. The effects of three variable parameters on these properties were carefully studied, we have removed the fine aggregate in order to make the concrete porous and added geocell inside it and studied the placement of geocell inside the rosd like the points intersecting each otherthe concrete inside the geocell and the ordinary porous concrete which have been in curing for 7 days and 14 days and 28 days . Hardened concrete properties such as compressive strength split tensile strength of the concrete on 7, & 14 & 28 days has been achieved. A comparative study was also done based on the obtained results and the variations will be plotted

IndexTerms - **Porous concrete, Geo cell, economical concrete, etc**

I. INTRODUCTION

The concrete is the most important factor in the civil industry, concrete is made of combination of several materials, Here the new methodology of the concrete work is introduced and developed. The new methods are encouraged and preferred by many upcoming engineers, one of the important methods to reduce heat of emission during the mix of cement water. The material (geocell) which is used in the concrete gives high strength and durability. The geocell have the ability to keep the aggregates stable in all weather conditions. This study is to find the possibility of replacing the impervious road with porous roads, the compressive strength and the split tensile strength should be carried out for checking the strength of the porous concrete and porous concrete with geocell.

II. MATERIALS USED

2.1. Cement

Cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is manufactured through a closely controlled chemical combination of calcium, silicon, aluminum, iron and other ingredients. Common materials used to manufacture cement include limestone, shells, and chalk or combination with shale, clay, slate, blast furnace slag, silica sand, and iron ore.

2.2. Fine Aggregate

Fine aggregates generally consist of crushed stone for porous road or concrete with most particles passing through a 4.75 mm sieve. Fine aggregates are used in projects where a smooth yet highly compacted surface is desired. Fine aggregates are ideal for use underneath pavers, path fines, track fines, atheletic infield material and can even be used as a soil amendment.

2.3. Coarse Aggregate

In this present investigation, logically available crushed gradient aggregate was used, as per IS 383-1970, course aggregate in sieve 20mm passing and 4.75mm retaining in saturated surface dry (SDD) combination were used.

2.4. Water

Water is an important ingredient of mortar as it actually participates in the chemical reaction with cement. Since it helps to form the strength giving cement gel, the quantity and quality of water are required to be looked into very carefully. A tap water available in the concrete laboratory was used in manufacturing the mortar. The qualities of water samples are uniform and potable. pH value lies between 6 to 8 and the water is free from organic matter and the solid content. It should be within permissible limit as per IS 456-2000 and conforming to IS 3025-1964.

2.5. Geocell

Geocells Made from High Density Polyethylene Strips (1) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of five test specimens each direction. Yield elongation is calculated using a gage length of 33 mm. Break elongation is calculated using a gage length of 50 mm. (2) Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established. (3) Carbon black dispersion (only near spherical agglomerates) for 10 different views: 9 in Categories 1 or 2 and 1 in Category 3. (4) Actual geocell strip against well graded sand (see Section 5.3). (5) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geo membrane and followed by 4 hr condensation at 60°C. (6) The condition of the test should be 20 hr UV cycle at 75ºC. (7) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples. (8) UV resistance is based on percent retained value regardless of the original HP-OIT value.

Fig 2.1: Ordinary Portland Cement

Fig 2.2: Fine Aggregate

Fig 2.3: Coarse Aggregate

Fig 2.4: Geocell (a)

Fig 2.4: Geocell (b)

III. RESEARCH METHODOLOGY

3.1 Experimental Work

The concrete blocks created by using the geo cell instead of sand, the mix ratio of the concrete is taken as 1:0:3. Here we used hand mixing where we used 3 batch of aggregate and 1 batch of cement. And compacted by hand which consists of rodding, raming or tamping. It is preferred since it maintains the consistency of concrete. After compaction of concrete, since it is porous it losses its moisture quickly evaporates than ordinary concrete so it is covered with a plastic or any kind of wrapper that captures the moisture. The pieces used for test is cutted by core cutting machine which are ordinary porous road and porous road which is reinforced . The Pieces are ordinary porous road, Porous road with geo cell where it is compacted at the center and at the intersections and the pieces cutted after curing for 7 and 14 and 28 days.

The Compressive strength test and tensile strength test carried out by the Universal Testing Machine (UTM). The results will be compared with the sample of ordinary porous pavement and porous pavement with geo cell.

Fig 1 Placement of concrete and geo cell

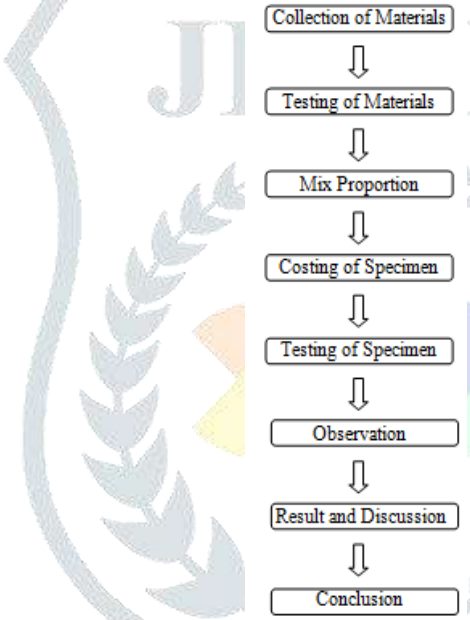
Fig 2 Cutting of specimen

Fig 3 Cutted specimen

Fig 4 Compression test in UTM

In this test the cylinders are casted using cylinder molds with geocell and the concrete. Which are cured for 7 & 14 & 28 days. Where the Cylinders are coated with oil on there inner surface

Flow Chart 3.1: Methodology



3.2 Physical Properties

Table 3.2.1: Properties of Cement

S. No.	Property	Result
1	Consistency	30%
2	Specific Gravity	3.16
3	Fineness	5%
4	Grade	53 OPC

Table 3.2.2: Properties of Coarse Aggregate

S. No.	Property	Result
1	Impact	27.02%
2	Specific Gravity	2.64
3	Abrasion	26.68%
4	Water Absorption	5.25%

Table 3.2.3: Properties of GeoCell

S. No.	Property	Result
1	Length	27.02%
2	Width	2.64
3	Height	26.68%
4	Weight	5.25%
5	Strength at Yield	19 KN/m
6	Type of Material	HDPE

IV. RESULTS AND DISCUSSION

4.1 Results of Compression and Flextural strength test:

Table 4.1: Test Results

Specimen	Day	Compression (KN)	Flextural (N/mm^2)
Porous Road	7^{th}	11.5	2.9
	14^{th}	13.4	3.2
	28^{th}	20.6	4.8
Porous Road in intersection of geo cell	7^{th}	4.5	0.8
	14^{th}	9.5	2.0
	28^{th}	10.51	2.2
Porous Road which is inside the geocell	7^{th}	12.9	1.5
	14^{th}	16.4	3.5
	28^{th}	23.6	5.1

This concrete is poured and cutted with the help of coar cutter. After 24 hours, the test specimens are put in water for curing. The top surface of these specimen should be made even and smooth. This is done by placing cement paste and spreading smoothly on the whole area of the specimen. These specimens are tested by compression testing machine after seven days curing or 28 days curing. Load should be applied gradually at the rate of 140 kg/cm2 per minute till the Specimens fails. Load at the failure divided by area of specimen gives the compressive strength of concrete 27 Test for compressive strength is carried out either on a cube or cylinder. Various standard codes37 recommend a concrete cylinder or concrete cube as the standard specimen for the test. American Society for Testing Materials ASTM C39/C39M provides Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens. Compressive strength is the ability of material or structure to carry the loads on its surface without any crack or deflection. A material under compression tends to reduce the size, while in tension, size elongates.

Charts

Chart 4.1: Compression Strength

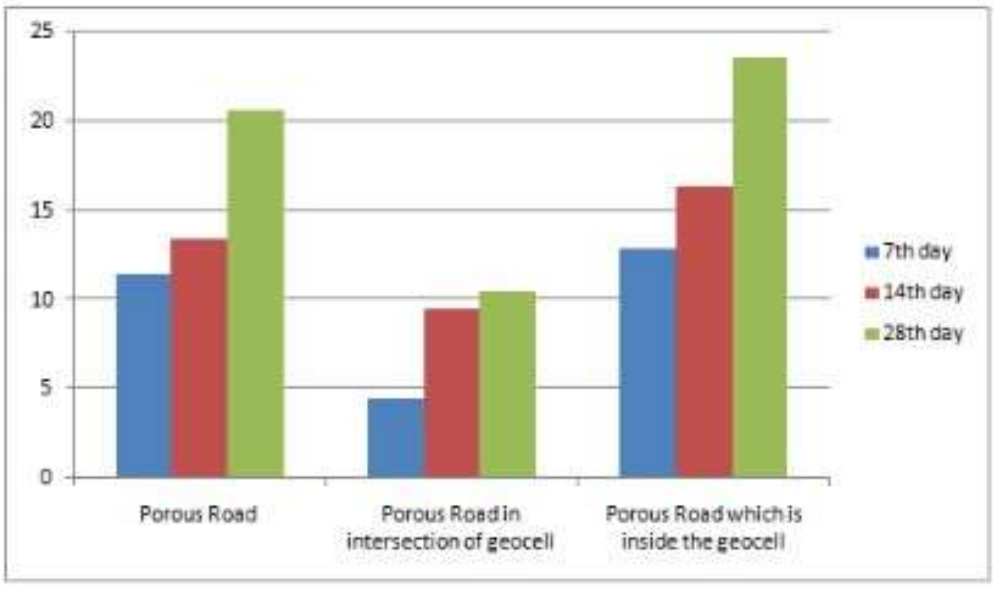
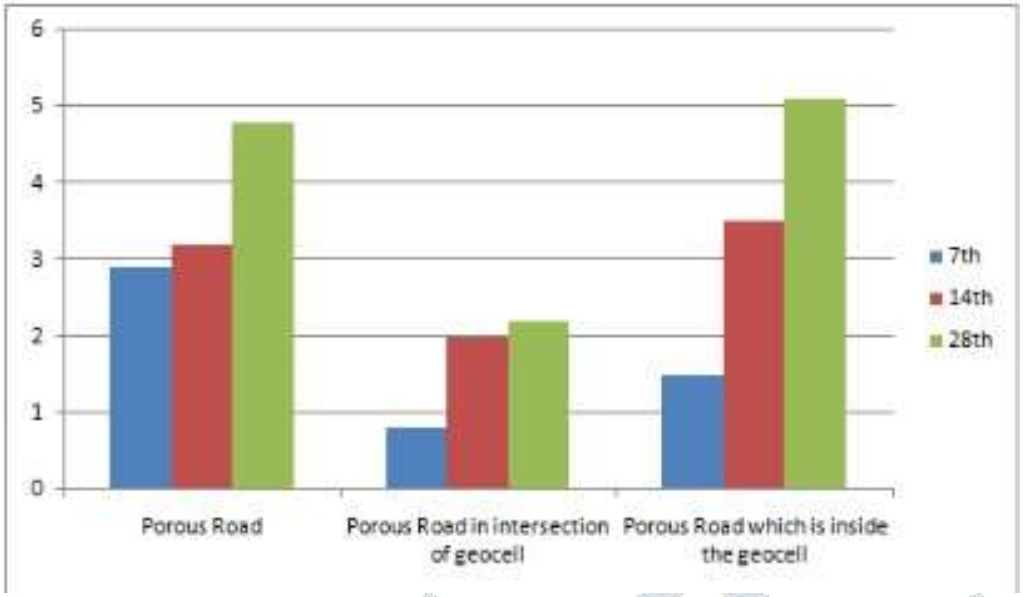


Chart 4.2: Flextural Strength



IV. Acknowledgment

The test results shows that increasing the curing days increases the strength of concrete. The 28 days curing holds good results when compared with 14 days curing. The Porous Road which is inside the geocell gives optimal results when compared to ordinary porous road.

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