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EXPLICIT DYNAMIC ANALYSIS OF PERVIOUS CONCRETE

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ABSTRACT

A Due to roads are impervious in nature, it won't allow water to penetrate in ground. This is one of the major reasons for decreasing the water table. In this paper, the pervious concrete has been substituted for this problem with different proportionate of steel fibers. At 1.5% it has been noticed the pervious concrete had obtained optimized strength. By obtaining the experimental properties, Explicit Dynamic Analysis has been carried out in ANSYS & the von-mises stresses obtained has been projected.

Keywords: *Pervious Concrete, Steel Fibers, ANSYS, Explicit Dynamic Analysis*

I. INTRODUCTION

Pervious concrete is also known as porous, no-fines, Permeable and gap-graded concrete. Its Enhance porosity concrete has been found to be a reliable storm water management tool [1]. The density of pervious concrete varies from 1600 kg/m3 to 2000 kg/m3 and its void content ranges from 20 to 25% respectively. The infiltration rate ranges from 80 to 720 litres per minute per square meter based on the aggregate size & density [2].

The main disadvantage of pervious concrete is it is not as strong as conventional concrete or asphalt pavements. If excessive pressure is applied on it, pores of the concrete will collapse [3]. To increase the strength steel fibers has been added along with the mix which at certain proportion it will increase the strength and prevent the pores collapse [4].

II. EXPERIMENTAL ANALYSIS

The following testings has been carried out for cement & Aggregate.

1. Initial Setting Time
2. Final Setting time
3. Soundness of Cement
4. Slump Test
5. Aggregate Crushing value

Steel fibers of length 60mm & dia 1mm has been considered for the analysis. The steel fibers have been introduced with proportionate of 0.5%, 1.0%, 1.5% and so on. The mix design was done by referring ACI522 R-10[5]. The following values have been obtained from mix design.

Table -2.1: Mix Design obtained from ACI 522 R-10

Materials	Proportions (kg/m^3)
OPC	270
Aggregate	1190
Water-Cement Ratio	0.27
Fine aggregate	0

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Table -2.2: Mix Design obtained from ACI 522 R-10

Materials	Proportions (kg) (per cube)				
	0 %	0.5%	1.0%	1.5%	2.0%
OPC	2.10	2.10	2.10	2.10	2.10
Aggregate	5.94	5.94	5.94	5.94	5.94
Fine aggregate	0	0	0	0	0
Steel Fibers	0	0.04	0.08	0.12	0.16

The compressive strength & Permeability tests have been carried out after 3 days, 7 days & 28 Days.

III. EXPLICIT DYNAMIC ANALYSIS

An explicit dynamics analysis is used to determine the dynamic response of a structure due to stress wave propagation, impact or rapidly changing time-dependent loads. Momentum exchange between moving bodies and inertial effects are usually important aspects of the type of analysis being conducted.

This analysis has been carried out by ANSY software.

In this analysis a slab of dimensions (12 X 7.5 X 0.2) m has been considered [6]. The compressive strength obtained from Experimental analysis has been incorporated.

The support considered here is fixed & pressure of 60kN/m2 has been given.

IV. RESULTS & DISCUSSIONS

The following results were obtained from Experimental analysis

4.1. Compressive strength of pervious concrete:

Table -4.1: Compressive Strength of Cube after 3 days

% of Steel Fibres	Cube:1 (MPa)	Cube:2 (MPa)	Cube:3 (MPa)	AVERAGE (MPa)
0%	7.30	6.90	7.10	7.10
0.5%	9.80	9.60	9.10	9.50
1.0%	10.60	10.70	10.90	10.72
1.5%	11.20	12.10	11.60	11.63
2.0%	10.50	10.40	10.60	10.50

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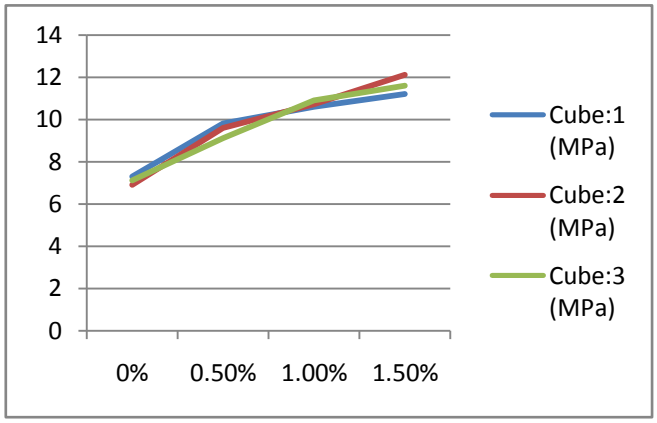

Fig 4.1: Compressive Strength of Cube after 3 days

Table -4.2: Compressive Strength of Cube after 28 days

% of Steel Fibres	Cube:1 (MPa)	Cube:2 (MPa)	Cube:3 (MPa)	AVERAGE (MPa)
0%	12.60	12.40	12.10	12.36
0.5%	14.20	14.60	14.10	14.30
1.0%	15.80	15.20	15.30	15.43
1.5%	16.20	15.90	16.30	16.13
2.0%	13.20	14.10	13.60	13.63

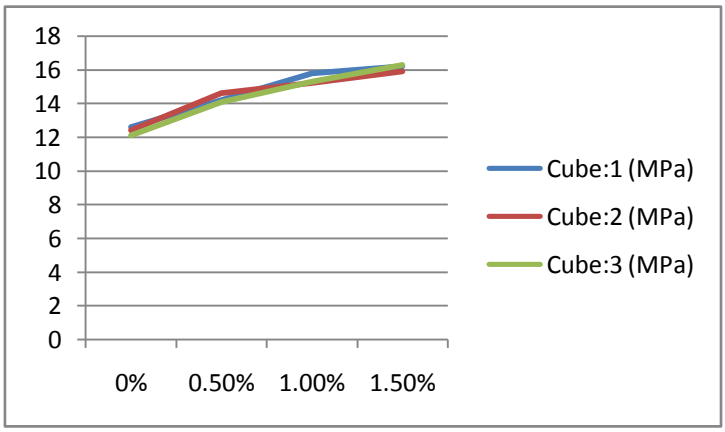

Fig 4.2: Compressive Strength of Cube after 28 day

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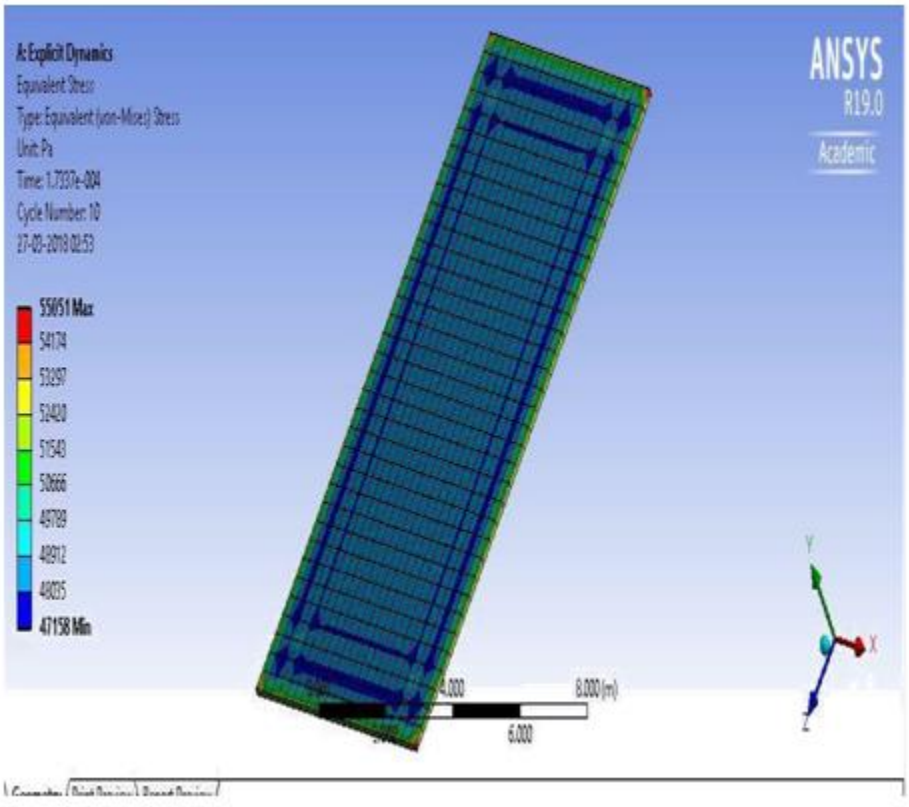

Fig 4.3: Von-mises Stresses

V. CONCLUSIONS

The use of pervious concrete in urban road pavement would alleviate the problem of flash flooding due to heavy rain. This study investigated the use of discrete hooked-end steel fibres in enhancing the compressive strength of pervious concrete without compromising its permeability and porosity. The incorporation of 1.5% of steel fibers by volume of concrete was found adequate in achieving the target strength of 16.2 MPa. And von misses stresses obtained from explicit dynamic analysis has been shown.

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