Pervious Concrete

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Abstract— No fine Concrete is a light-weight concrete produced by removing the fines from conventional concrete. Also known to as "Pervious Concrete" or "Porous Concrete" is material comprised of well graded coarse aggregates, cement materials, water and admixture. Particularly in a country like India where flooding and water logging problems are the Major environmental issues sustainable development has become a necessity. Various sustainable and eco-friendly means are being implemented to these problems where No fine concrete pavement is one of them. In this paper No fine concrete using the only admixture and well proportion of constitute is used to analyze the strength property.

Key words: No Fine Concrete, Casting, Permeability, Water Cement Ratio

I. Introduction

No fine concrete is a mixture of cement, water and a well graded coarse aggregate combined to produce a porous structural material. It has a high volume of voids, which is the factor responsible for the lower strength and its lightweight nature. No fine concrete has many different names including zero-fines concrete, pervious concrete and porous concrete. No fine concrete consists of coarse single sized aggregate covered with a thin layer of cement paste approximately 1.3 mm thick.

II. Objectives

1) Conduct some initial mix design test to evaluate some possible alternatives. This will include using different water/aggregate/cement ratios.
2) Investigate some existing No fine concrete pavement designs, construction specifications and maintenance procedures.
3) Determine suitable tests to assess the strength, durability, skid resistance and cost of the above found mix design and normal concrete road surfaces
4) Conduct the tests and analysis the results to form a conclusion as to the effectiveness of No fine concrete as a road pavement.

III. Literature Review

Malhotra (1976) stresses that in situations where normal conditions are not achieved during placement and curing, the formwork should not be removed after 24 hours as with conventional concrete. No fine concrete has very low cohesiveness and formwork should remain until the cement paste has hardened sufficiently to hold the aggregate particles together. However, this is more of a consideration in low temperature conditions and when used in non-pavement applications where the concrete is not sufficiently supported by the ground or other means.

IV. Materials Used

A. Cement

Ordinary Portland cement (OPC) of M53 grade was used for casting the No fine concrete.

B. Aggregate

The coarse aggregate was natural gravel of 10mm-20mm maximum size was selected. For Experimentation work 10 and 12mm size aggregate are used.

C. Water

Drinkable clean water that is good for making ordinary concrete should be used. For Mixing, Casting and Curing Purpose

D. Admixture

Retarder Admixture can be used in this project. This Admixture Reducing the water content in a concrete mixture should be done in such a way so that complete cement hydration process may take place and sufficient workability of concrete is maintained for placement and consolidation during construction. Admixture increase in paste quality will yield higher compressive and flexural strength, improve the bond of concrete.

V. Methodology

1) First collect and grading of aggregate.
2) Evaluating the ratio of water, cement, aggregate and admixture.
3) Evaluation of Cohesion and Surface texture.
4) Preparation of mixture to plot a mix design.
5) Estimate the compressive strength, porosity and Permeability.

VI. Mix Proportion

The cement: aggregate ratio by volume is in the range of 1:4 to 1:6 by volume. The water-cement ratio needs to be kept low, 0.28- 0.40, to secure the cement paste coats the aggregates and does not run off.

A. Mix Design

- Assume percentage of voids by volume - 20 %
- Specific Gravity of coarse aggregate - 2.6
- Water cement ratio w/c - 0.28%
- Size of coarse aggregate -10mm to 20mm.
- Water absorption of course aggregate - 0.206 %

Sr. No.	Materials	Quantity(Kg/m3)
1.	Cement	390.85
2.	Aggregate	1758.82
3.	Water	117.25
4.	Admixture	1.95

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VII. RESULTS

The specimens were tested for Concrete Block with admixture for compressive strength at 7, 14 and 28 days. The results of those tests can be found in the table below.
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Cement Aggregate Ratio	Compressive Strength (N/mm^2)		
	7 Days	14 Days	28 Days
1:4	9.84	11.73	13.62
1:4.5	11.82	12.68	14.67
1:5	8.43	10.33	12.96
1:6	7.28	9.84	11.12

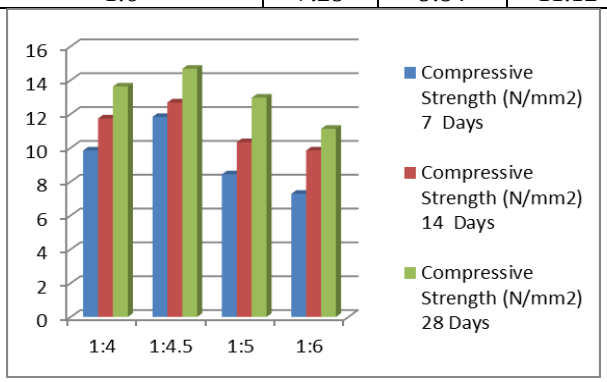
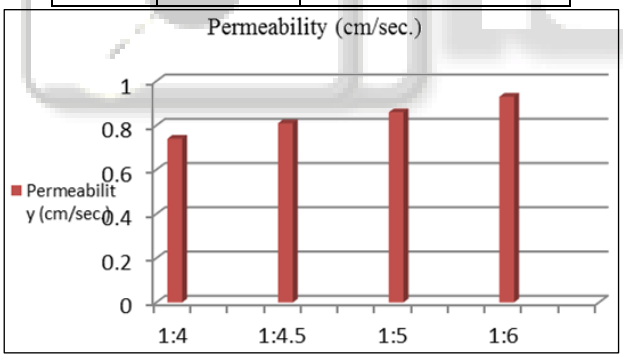


Fig. : Proportion

A. Permeability Results:

Sr. No.	Proportion	Permeability (cm/sec.)
1	1:4	0.74
2	1:4.5	0.81
3	1:5	0.86
4	1:6	0.93



VIII. CONCLUSION

Research background information relating to the use of No fine concrete in pavement and non-pavement applications. A detailed literature review was undertaken at the commencement of this project to gain an understanding of the work previously completed on No fine concrete in pavement and non-pavement applications. It was found that a limited amount of work had been undertaken assessing the properties of No fine concrete and its current usage. The research found that No fine concrete has favourable properties for road pavement applications.

Determine suitable tests to assess the strength, durability, and cost of the above found mix design and normal concrete road surfaces.

Conduct some initial mix design test to evaluate some possible alternatives. This will include using different water, aggregate, and cement ratios. The research showed a wide range of aggregate-cement ratios previously used. The aggregate-cement ratios chosen to be trialed were 6:1, 5:1, 4.5:1 and 4:1. The concrete possessing the most strength was the 4.5:1 mix.

The total cost of No fine concrete is less than conventional concrete. Hence, it is Economical.

REFERENCES

[1] Macintosh, H., Bolten, J. D. & Muir, C. H. D. 1965. No-fines concrete as a structural material. Proc. Instn. Of Engrs. London. England. 5(part I). pp 677-694.
[2] Malhotra, V. M. 1976. No-Fines Concrete – Its Properties and Applications.Journal of the American Concrete Institute. Vol 73. No. 11. pp 628 – 644.
[3] Meininger, Richard C. 1988. No-Fines No fine concrete for Paving. Concrete International: Design and Construction. Vol 10. No. 8. August. pp 20-27.
[4] Neville, A. M. 1996. Properties of Concrete. John Wiley & Sons. Inc. New York. USA. pp 711-713.
[5] Orchard, D. F. 1979. Concrete Technology, 4th Edition. Properties of Materials, Applied Science Publishers Ltd, London. pp 160-161.
[6] Pervious Pavement. 2005.
[7] http://www.perviouspavement.com/defalt.html
[8] Stoney Creek Materials, L.L.C. 2005. Stoneycrete – Pervious Pavement System. http://www.stoneycreekmaterials.com

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