DETAILED ANALYSIS OF PERVIOUS CONCRETE

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Abstract

Pervious concrete is a special type of concrete with high porosity. It is used for concrete flatworks applications that allow the water to pass through it, thereby reducing the runoff from a site and allow in ground water recharge. The high porosity is attained by a highly inter connected void content. Typically pervious concrete has water to cementitious material ratio of 0.28 to 0.4. The mixture is composed of cementitious materials, coarse aggregates and water with little or no fine aggregate. Addition of a small amount of fine aggregates will generally reduce the void content and increase the strength. The present report deals with the study and comparison of mechanical properties, workability density and permeability of different grades of pervious concrete (M-20,M-25).

Introduction

Pervious concrete is a composite material consisting of coarse aggregate, Portland Cement, and water. It is different from conventional concrete in that it contains no fines in the initial mixture, recognizing however, that fines are introduced during the compaction process.
One of the disadvantages of concrete is the high self-weight of concrete. Density concrete is in the order of 2200 to 2600 kg/m3. This heavy self-weight will make it to some extent an uneconomical structural material. Attempts have been made in the past to reduce the self-weight of concrete to increase the efficiency of concrete as a structural material. The light weight concrete density varies from 300 to 1850 kg/m3. Light weight concrete has become more popular in recent years and have more advantages over the conventional concrete.

Pervious concrete is nothing but no fines concrete, which is also known as porous, gap graded or permeable concrete mainly consists of normal Portland cement, CA, water. In which fine aggregate are not existent or present in very small amount i.e.< 10% by weight of the total aggregates.

In general for making porous concrete, we will use the aggregates of size which passes through 12.5mm sieve and retained on 10mm sieve. In this project we have taken single size aggregates i.e. 12.5mm the single size aggregates make a good no-fines concrete, which addition to having large voids and hence light in weight, also offers architecturally attractive look.

LITERATURE REVIEW

General

To create a pervious concrete structure with optimum permeability and compressive strength, the quantity of water, amount of cement, type and size of aggregate, and compaction must all be considered. a mess of experiments are previously conducted throughout the past few decades by a spread of researchers comparing some or all of those elements. The results are presented during a series of tables and graphs.

Previous studies

Malhotra et al. (1976) discussed pervious concrete because it relates to applications and properties. He provided details on such properties as consistency, proportions of materials, unit weight, compatibility, and curing in an effort to maximise permeability within the previous concrete. Malhotra also conducted multiple experiments on various test cylinders in an effort to seek out a correlation between compressive strength and any of the material's properties. He concluded that the compressive strength of pervious concrete was hooked in to the water cement ratio and therefore the aggregate cement ratio.

Meininger et al. (1988) released results on laboratory experiments he had conducted on pervious concrete. Research was carried out on huge samples with varying material properties. These properties included water cement ratio, aggregate cement ratio, compaction, and curing time. Results were similar to those found by Malhotra in 1976. Meininger discovered a relationship between the 28 day compressive strength and water content while utilizing aggregate 3/8" in size and an aggregate cement ratio equal to 6.

Ghafoori et al. (1995) The extensive research was conducted on various aspects of pervious concrete. In one study, he investigated various sites throughout the us that have utilized pervious concrete paving systems. His investigation led to a comparison of compressive strength attained at each of these sites. He also examined failures in the various pavements if any had occurred along with the water cement and aggregate cement ratiosHe deduces that compressive strength depends on the water cement ratio the aggregate ratio, compaction, and curing. He also provides a chart which displays the consequences of varying the mixture cement ratio and compaction energy wear the compressive strength and permeability.

Klieger et al. (2003) performed experiments studying the effects of entrained air on the strength and durability of conventional concrete. Although never utilizing the number of voids seen in pervious concrete (15-35%), his research clearly shows the impact the presence of air has on the performance of concrete. He concluded that the reduction in compressive strength with the presence of air decreases because the size of aggregate decreases and because the cement content decreases. These are both thanks to the reduction in water.

Results of aggregate

S NO.	Name Of Aggregate test	%value
1.	Impact Test	18.84%
2.	Abrasion Test	19.74%
3.	Crushing Test	17.36%

Results Of Aggregate

5.2 Results of Concrete

M 20 Normal Mix Design

S No.	Age	Compressive Strength(N/mm2)
1.	3 Days	13.87
2.	7 Days	17.66
3.	28 Days	22.66

Results Of Normal Concrete M20

M 25 Normal Mix Design

S No.	Age	Compressive Strength(N/mm2)
1.	3 Days	14.08
2.	7 Days	19.21
3.	28 Days	26.25

Results of Normal Concrete M25

M 20 Pervious Mix Design For 5% Sand

S No.	Age	Compressive Strength(N/mm2)
1.	3 Days	7.18
2.	7 Days	13.20
3.	28 Days	18.02

Results Of M20 Pervious Concrete 7.5% sand

M 20 Pervious Mix Design For 10% Sand

S No.	Age	Compressive Strength(N/mm2)
1.	3 Days	8.88
2.	7 Days	16.21
3.	28 Days	20.45

Results Of M20 Pervious Concrete 10% Sand

M 25 Pervious Mix Design For 5% Sand

S No.	Age	Compressive Strength(N/mm2)
1.	3 Days	8.5
2.	7 Days	12.62
3.	28 Days	24.44

Results Of M25 Pervious Concrete 5% Sand

M 25 Pervious Mix Design For 7.5% Sand

S No.	Age	Compressive Strength(N/mm2)
1.	3 Days	10
2.	7 Days	13.99
3.	28 Days	25.26

Results Of M25 Pervious Concrete 7.5% Sand

M 25 Pervious Mix Design For 10% Sand

S No.	Age	Compressive Strength(N/mm2)
1.	3 Days	10.80
2.	7 Days	15.64
3.	28 Days	26

Results Of M25 Pervious Concrete 10% Sand

Comparison of M20 OPC and Pervious Concrete

S No.	Age of Cubes (Days)	Compressive strength(N/mm2) of Normal M-20 Conc.	Compressive strength (N/mm2) at sand Ratio For 5%	Compressive strength (N/mm2) at sand Ratio For 7.5%	Compressive strength (N/mm2) at sand Ratio For 7.5%
1.	3	13.87	7.186	7.72	8.22
2.	7	18.68	9.573	10.7	11.02
3.	28	21.66	15.72	17.95	18.56

Comparison of M20 OPC and Pervious Concrete

Comparison of M25 OPC and Pervious Concrete

S No.	Age of Cubes (Days)	Compressive strength(N/mm2) of Normal M-20 Conc.	Compressive strength (N/mm2) at sand Ratio For 5%	Compressive strength (N/mm2) at sand Ratio For 7.5%	Compressive strength (N/mm2) at sand Ratio For 7.5%
1.	3	14.08	6.56	8.52	9.40
2.	7	19.21	12.62	12.99	15.93
3.	28	24.25	20.44	22.26	23.02

Comparison of M25 and pervious concrete

Results of Permeability For M20

Age of Cube (days)	Permeability (in%) for sand ratio 5%	Permeability (in%) for sand ratio 7.5%	Permeability (in%) for sand ratio 10%
3	93%	92%	89%
7	93.5%	92.50%	88%
28	93.7%	91%	87%

Results of Permeability M-20

Results of Permeability For M25

Age of Cube (days)	Permeability (in%) for sand ratio 5%	Permeability (in%) for sand ratio 7.5%	Permeability (in%) for sand ratio 10%
3	93.6%	93%	88%
7	93.8%	92.50%	89%
28	93.2%	92%	88.5%

Conclusion

- Permeability of pervious concrete at 7.5% sand ratio is better than 10% and almost equal to 5%.
- We concluded that the compressive strength of 7.5% and 10% of sand pervious concrete is almost same.
- Since permeability of 7.5% is almost same as 5%, and its strength equals the desired strength. We suggest use of porous concrete with sand ratio of 7.5%.

REFRENCE

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