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PERVIOUS CONCRETE

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ABSTRACT

Pervious concrete is a special type of concrete with a high porosity used for concrete flatwork applications that allows water from precipitation and other sources to pass directly through, thereby reducing the runoff from a site and allowing groundwater recharge. It is also called as porous concrete, permeable concrete, no fines concrete and porous pavement. Pervious concrete is made using large aggregates with little to no fine aggregates. The concrete paste then coats the aggregates and allows water to pass through the concrete slab. This type of concrete having a high void content of about 30%, is becoming popular nowadays due to its potential to reduce the runoff to the drainage systems which can provide a water flow rate around 0.34 cm/second. It is an important application for sustainable construction and is one of many low impact development techniques used by builders to protect water quality . Pervious concrete also find its effective application in low loading intensity parking pavements, footpaths, walkways and highways. The pervious concrete is considered as an Environmental Protection Agency (EPA) for providing pollution control, storm management and suitable development. It is a composite material produced by mixing cement, inert matrix of sand and gravelor crushed stone. This concrete has a light colour and open-cell structure because of which they do not absorb heat from the sun; they also do not radiate the heat back into the atmosphere, which reduces heating in the environment. Pervious concrete has low installation costs. In addition, it filters the storm water thus reducing the number of pollutant sentering the rivers and ponds. Pervious concrete also improves the growth of trees. In the present study the behaviour of pervious concrete has been studied experimentally. The water-cement ratio was kept at different ratios 0.35, 0.40, 0.45. Different properties of pervious concrete e.g. workability, compressive strength, split tensile strength, flexural strength test at 7, 14 & 28 days have been studied experimentally. The mix proportions with aggregates size (4.75 mm to 10 mm) gives higher strength when compared to mixes with aggregates size (10 mm to 20 mm) and (4.75 mm to 20 mm) respectively.

Keywords: Porous Concrete, Rainwater Management System, Permeability, Mix Design, Mechanical Properties.

I. INTRODUCTION

Pervious concrete is an important type of concrete used in the construction of structures. It is also known as Pervious Concrete. It contains many aggregates with small fine aggregates, and concrete's porosity is very high. It is used to pass water from concrete. It is extensively used in the areas of parking and low traffic conditions and also greenhouses. It is used earlier in the year of 18th Century (1800). It was first used in Europe and popular in the 19th Century, and in India, it was famous in the 20th Century. It is mostly used for the management of stormwater and control of pollution. The first used pervious Concrete is Scotland after that England. It was also very famous in the US in the middle of the 19th Century. Now, this concrete is used worldwide, and it contains a wide range of applications. Following is the figure of Pervious Concrete

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.

II. PROJECT OBJECTIVE

In this report, the effects of varying the components of pervious concrete on its compressive strength are investigated. The goal is to achieve a maximum compressive strength without inhibiting the permeability characteristics of the pervious concrete. This will be accomplished through extensive experiments on test cylinders created for this purpose. Experiments include specific gravity ISSN: 2455-2631 © March 2018 IJSDR | Volume 3, Issue 3IJSDR1803030 International Journal of Scientific Development and Research (IJSDR) www.ijsdr.org 139tests, permeability tests, and compression tests. Loadings on pervious concrete are also an area of concern. Existing pervious concrete pavements are studied.

Foremost objective of this paper is listed as

1. To study the performance and behavior of the open structure of pervious concrete in Indian Climatic Condition.
2. To study the strength properties of conventional concrete with pervious concrete.
3. To study the influence of fine aggregate, w/c ratio, admixture on the properties of pervious concrete

III. METHODOLOGY

3.1 GENERAL MATERIAL

The present chapter deals with the presentation of results obtained from various tests conducted on material used for the concrete.

In order to achieve the objectives of present study, an experimental program was planned to investigate polyvinyl chloride on

compression strength and split tensile strength of concrete. The various steps involved in our thesis are as follows,

1. Need for safety
2. Literature review
3. Identification of materials
4. Collection of materials
5. Testing of materials
6. Mix design preparation.
7. Specimen casting
8. Results and conclusion

3.2 MATERIALS

The properties of materials used for making concrete mix are determined in laboratory as per relevant codes of practice. Different materials used in present study were cement, coarse aggregates, and fine aggregates, in addition to crushed PVC pipes. The aim of studying of various properties of material is used to check the appearance with codal requirements and to enable an engineer to design a concrete mix for a particular strength.

3.2.1 Ordinary Portland cement

Ordinary Portland cement is the most important type of cement and is a fine powder produced by grinding Portland cement clinker. The OPC is classified into three grades, namely 33 grade, 43 grade, 53 grade depending upon the strength of 28 days. It has been possible to upgrade the qualities of cement by using high quality limestone, modern equipment's, maintaining better particle size distribution, finer grinding and better packing. Generally use of high grade cement offers many advantage for making stronger concrete.Ordinary Portland cement (OPC) of 53 Grade (Ambuja cement) was used throughout the course of the investigation. Cement was carefully stored to prevent deterioration in its properties due to contact with the moisture. The various tests conducted on cement are initial and final setting time, specific gravity, fineness and compressive

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strength.

3.2.2 Aggregates

Aggregates constitute the bulk of a concrete mixture and give dimensional stability to concrete. To increase the density of resulting mix, the aggregates are frequently used in two or more sizes. The most important function of the fine aggregate is to assist in producing workability and uniformity in mixture. The fine aggregate is to assist the cement paste to hold the coarse aggregate particles in suspension. This action promotes plasticity in the mixture and prevents the possible segregation of paste and ISSN: 2455-2631 © March 2018 IJSDR | Volume 3, Issue 3IJSDR1803030 International Journal of Scientific Development and Research (IJSDR) www.ijsdr.org 141coarse aggregate, particularly when it is necessary to transport the concrete some distance from the mixing plant to placement. The aggregates provide about 75percentage of the body of the concrete and hence its influence is extremely important. They should therefore meet certain requirements if the concrete is to be workable, strong, durable and economical. The aggregate must

be proper shape, clean, hard, strong, and well graded.

Coarse Aggregates:

The aggregates which is retained over IS sieve 4.75mm is termed as coarse aggregate. The coarse aggregates may be of following types Crushed graves or stone obtained by crushing of gravel or hard stone .Uncrushed gravel or stone resulting from the natural disintegration of rocks .Partially crushed gravel obtained as product of blending of above two types .The normal maximum size is gradually 10-20 mm; however particle sizes up to 40mm or more have been used in self compacting concrete. Regarding the characteristics of different types of aggregate, crushed aggregates tend to improve the strength because of interlocking of angular particles, while rounded aggregates improved the flow because of lower internal friction .Locally available coarse aggregate having the maximum size of 20mm was used in this work. The aggregates were washed to remove dust and dirt and were dried to surface dry condition. The aggregates were tested as per IS: 383-1970

In this concrete there are two important materials are used, they are as follows. The first one is Cement, and the second one is Coarse aggregates fibers and water, Fly ash, etc., and in this, no fine aggregates are used. This water-cement ratio normally varies between 0.2 to 0.4, and the voids ratio normally 20 percentage. A rapid air system is used to measure air content in the structure

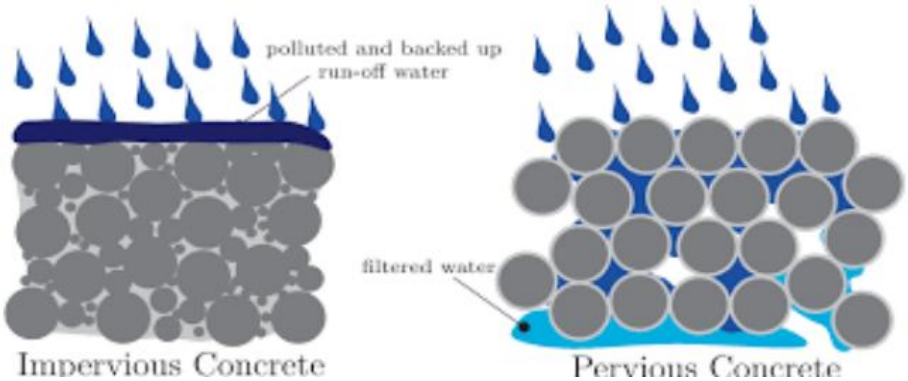

Fig: Pervious concrete

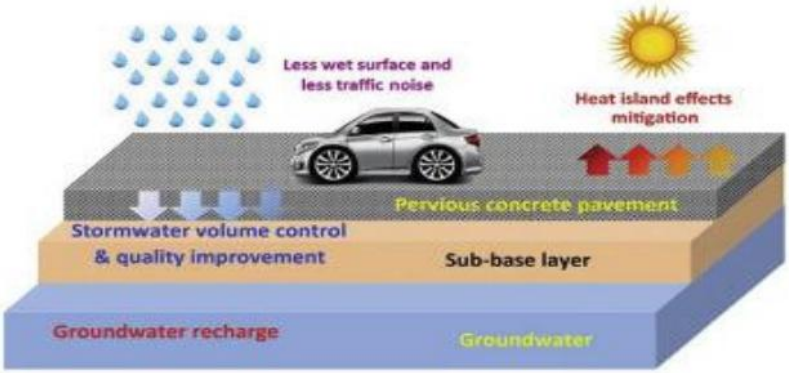

Fig: Pervious Concrete in roads

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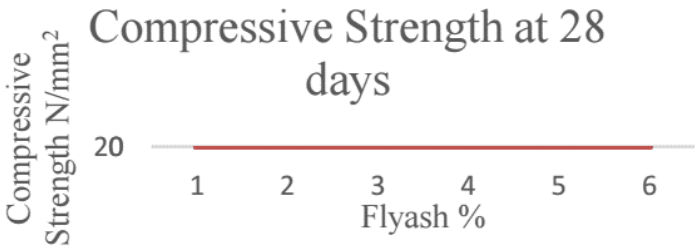
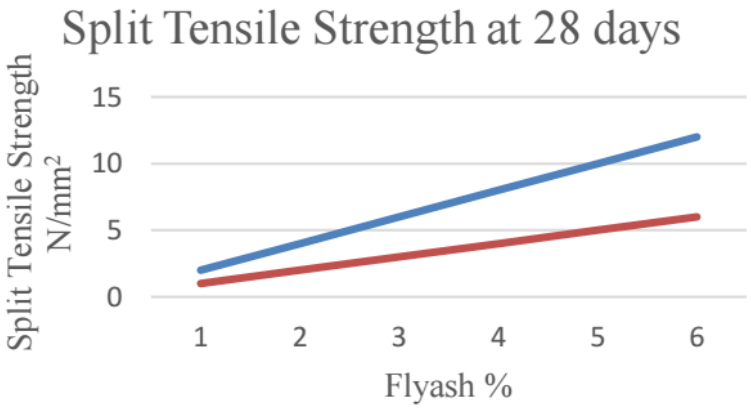
IV. RESULTS AND DISCUSSION

In this, we got results of compressive strength of pervious concrete at 28 days are plotted below. The results are approximately and also satisfactory. The below graph clearly understands about compressive strength of concrete concerning fly ash percentage.



We got results of split tensile strength of pervious concrete at 28 days are plotted below. All these results are satisfactory and acceptable. The below graph clearly understands the split tensile strength of pervious concrete concerning fly ash percentage



V. FUTURE SCOPE AND APPLICATION

SCOPE

1. Porous Concrete pavement system can offer a valuable storm water management tool.
2. Storm water retention areas could also be reduced or eliminated.
3. Ground water level & aquifer recharge can be increase by allowing the rainfall to infiltrate.

APPLICATIONS

- Multi-story buildings
- High rise structures
- Load-bearing walls
- Roads
- Parking
- Linings
- Walls
- Swimming pools
- Noise barrier

VI. CONCLUSION

Pervious concrete is one of the excellent materials, and it is used worldwide. The main importance of pervious concrete is to improve the ground runoff and improve water storage in the structure or system. It gives better results than conventional concrete. So, the strength difference between Pervious Concrete and Conventional Concrete is also the same. It is also used for low traffic volumes and pavements and roofs, so the study of pervious concrete is necessary to understand ground recharges of water.

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