

# A REVIEW PAPER ON AN EXPERIMENTAL STUDY ON STRENGTH AND PROPERTIES OF THIRSTY CONCRETE

Prof. Shilpi S. Bhuinyan<sup>1</sup>, Shreyance Luniya<sup>2</sup>, Mithila Mane<sup>3</sup>, Smit Modi<sup>4</sup>, Rushikesh Tapkir<sup>5</sup>

<sup>1</sup>Assistant Professor, Civil Engineering Dept, Aissms Coe Pune, India

<sup>2,3,4,5</sup>Student, Civil Engineering Dept, Aissms Coe Pune, India

**Abstract**— Pervious concrete is a special high porosity concrete used for flatwork applications that allows water from precipitation and other sources to pass through, thereby reducing the runoff from a site and recharging ground water levels. Its void content ranges from 18 to 35% with compressive strengths of 2.74 to 27.56 MPa . Typically, pervious concrete has little or no fine aggregate and has just enough cementitious paste to coat the coarse aggregate particles while preserving the interconnectivity of the voids. Pervious concrete is traditionally used in parking areas, areas with light traffic, pedestrian walkways, and greenhouses and contributes to sustainable construction. In this project we are using scrap marble to make pervious concrete and also checking various parameters like permeability and compressive strength with respect to different types of aggregate like angular, rounded, and flaky type. Cubes made from all types of aggregate where casted and compressive strength test (at 7 and 28 days) along with infiltration test (at 28 days) where carried out. This project was successfully completed under the guidance of J. Kumar RMC plant PUNE.

## I. INTRODUCTION

Our cities are being covered with building and the airproof concrete road more and more. In addition, the environment of city is far from natural. Because of the lack of water permeability and air permeability of the common concrete pavement, the rainwater is not filtered underground. Without constant supply of water to the soil, plants are difficult to grow normally. In addition, it is difficult for soil to exchange heat and moisture with air; therefore, the temperature and humidity of the Earth's surface in large cities cannot be adjusted. This brings the phenomenon of hot island in city. At the same time, the splash on the road during a rainy day reduces the safety of traffic of vehicle and foot passenger. The pervious concrete pavement possesses many advantages that improves city environment.

The last century in the construction industry has shown an increasing interest in pervious concrete, an environmentally friendly material. Although emphasis has been placed on the relationship between compressive behaviour of conventional pervious concrete and total porosity, not much research has been carried out to characterize the relationship between compressive behaviour of pervious concrete with varied aggregate type and almost no research has been done using scrap marble as aggregate. In this research cubes using different types of aggregate where casted for M40 grade of concrete in which aggregate size vary from 4.75mm to 12.5 mm.

## II. LITERATURE REVIEW

*Jing Yang*(2003) showed in their paper that, a pervious concrete pavement material used for roadway is introduced As aggregate size decreases compressive strength increases while water absorption decreases. Silica Fume and Super plasticizer can be used to produce high strength and good water penetrable pervious concrete. Samples are tested for Compressive strength, Flexural strength, Split tensile strength, Abrasion resistance and freezing and thawing durability. Void percentage determines compressive strength and permeability of pervious concrete. Cement quality must be adjusted according to smaller size aggregate to enhance strength. By using SF, SP and organic polymer can enhance strength of pervious concrete. But it is difficult to ensure relation between them and water absorption.

*Ming-Gin Lee* found that ability of Pervious concrete material to eliminate pollutants and purify water is effective in dilute sulphuric acid, artificial seawater and motor oil tests. After flowing through pervious concrete pavement, a diluted sulfuric acid

solution (pH value 2.0) could dramatically increase its pH value to approximately 7.0. A pervious concrete pavement system could greatly decrease the content of an artificial seawater solution (salinity 36%) to about 1%, and the oil content of motor oil combined with certain types of water could also be significantly decreased to 1%. The study demonstrates that pervious concrete pavement holds potential for environment conservation and hydrologic consideration.

*Maguesvari* says that due to impermeability of impervious pavement surface and urbanization Ground water table reduces. Thirsty concrete is an environment friendly material and identified for its capability of draining water. Its area of application consist lower traffic roads, Pedestrian ways, shoulders and parking areas Void in thirsty concrete decreases with decrease in aggregate size and with increasing proportion of FA replacing CA. with decrease in size of CA compressive strength of concrete increases. Also replacing percentage of CA with FA increases compressive strength. This is due to increase in contact area. Flexural strength And split tensile strength are increase with increase in percentage of FA. Permeability decreases with decrease in aggregate size and increase in FA percentage. This study illustrates angularity number, which influence properties and behavior of pervious concrete with fine aggregate and coarse aggregates. However, the influence of angularity number on the abrasion value of the pervious concrete could not be established.

*Arun H.(2016)* found that water logging and reduction in ground water level are two main problems society is facing worldwide. Various methods and processes are implemented to resolve this problem. Thirsty concrete is one of the effective ways to reduce these problems. It not only absorbs water but percolate water to soil beneath it. In these, Effects are taken for increasing strength of thirsty concrete by replacing mix ingredients. Here % of cement replace by nanosilica And % concrete is replace by polypropylene. W/c ration is considered in range 0.4-0.46. Mix ratio is considered as 1:6. Concrete is made by dry mixing followed by wet mixing.

*Rui Zhong(2016)* found that the three matrices are designated in accordance to their strength as normal strength matrix (NSM), high strength

matrix (HSM) and ultra-high strength matrix (UHSM). White cement was selected as a constituent for the design of ultra-high strength matrix due to its high amount of tricalcium silicate (C3S) and dicalcium silicate (C2S), as well as its low quantity of tricalcium aluminate (C3A). The compressive strength of pervious concrete was determined based on ASTM C39. The measured effective porosity, useful for predicting the hydraulic conductivity, is smaller than total porosity. Porosity is a necessary, but insufficient parameter, for predicting the compressive strength of pervious concrete. An increase in matrix strength linearly increases the compressive strength of pervious concrete within the range investigated here. A decrease in aggregate size increases the strength of pervious concrete. The aggregate to binder ratio affects the strength of pervious concrete only through altering the total porosity.

*Ivana Barišić(2018)* said that the hydrologic and mechanical properties of six mixtures of single-sized pervious concrete prepared with three different types of aggregates were studied, it is concluded that the optimal aggregate type for preparing pervious concrete from the hydrologic point of view is diabase because of its sharp grain edges, which allow the water to pass smoothly through the pore system. However, noticed that a coarser aggregate fraction will result in better hydraulic and mechanical properties of pervious concrete.

*B.V.R.Murthy* says the objective of his work is to improve compressive strength at which the strength achieves better permeability. The design mix is prepared for m25 consisting of 53 grade cement, two different sizes of coarse aggregate which are passing through 25mm I.S sieve size and retained on 16mm I.S sieve size as s1 and aggregates passing through 10 mm and retained on 6mm named as s2 were taken for this work river sand and robo sand were selected as fine aggregate and w/c ratio maintained as 0.35 in all the cases. In this present study the strength of pervious concrete is improved by adding 5% robo sand as Fine aggregate and 100%(80% s1+20% s2) coarse aggregate in the mix. The durability test results may help for further study whether the strength varied or not.

### III.OBJECTIVES OF PROPOSED WORK

Objectives of proposed work would be:

- 1.To enhance compressive strength of pervious concrete by using different shaped coarse aggregates and replacing aggregate with marble.
- 2.To study water penetration property of pervious concrete by varying shape of coarse aggregates and replacing aggregate with marble.
- 3.To study abrasion resistance property of pervious concrete pavement.
- 4.To check which type/shape of aggregate used for making pervious concrete gives maximum rate of infiltration

### IV.FUTURE SCOPE

1. The rainwater can quickly filter into ground, so the groundwater resources can renew in time.
2. As the pavement is air permeable and water permeable, the soil underneath can be kept wet. It improves the environment of road surface.
3. High noise absorption properties. Owing to its high porosity, pervious concrete is able to reduce environmental noise. Noise and noisy environment can cause various kinds of diseases related to living in such an unpleasant environment.
4. Ability to reduce urban heat islands. Heat island refers to the development of higher urban temperatures within an urban area, compared to the temperatures of the surrounding suburban and rural areas.

### V.MATERIALS AND METHODOLOGY

Different types of course aggregates are used namely

1. Rounded
2. Flaky
3. Angular
4. Scrap marble

Physical properties of aggregates:

1. Specific gravity
2. Water absorption
3. Flakiness index
4. Elongation index
5. LA abrasion test
6. Aggregate crushing value test
7. Aggregate impact value test

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