

Analysis of pervious concrete on various parameters

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Abstract - Earth surface is covered by almost 71 percent of water whereas, human body consists of 75 percent of water, which make water one of the key element responsible for life on earth. Population on earth is increasing day by day thus increasing the need of saving it and reusing it. Use of Pervious Concrete as building material can be proved as effective method for reusing water. Pervious Concrete a mixture of water, cement, sand (if required) and gravels, is a porous material which allows the liquid to percolate down through it. Pervious Concrete provides the cell structure which allows the air and water to pass through it. Pervious Concrete can be used in solving many problems such as environmental issues, water balancing issue, reuse of rain water and many more. It can be used in pavement which could percolate rain water down into soil thus fulfilling the need of water to grow plants, and as human defender against natural attack such as, Landslide. The mixture of pervious concrete can be formed by adjusting the water to cement ratio with the aggregates and the plasticizers. The previous studies on Pervious Concrete results that Bulk Density Test can be done with the use of fine aggregates to improve the mixture. Vebe Test, Slump Test and Compression Test are best suitable to check the workability of Concrete. Test by Pycnometer on the basis of IS: 2386-3(1963) is efficiently used to get specific gravity of coarse aggregate.



Fig -1: Pervious Concrete [1]

Key Words: Pervious Concrete, Porosity, Strength, Aggregates and Plasticizer

1.INTRODUCTION

Pervious concrete is a combination of stone or gravel, water and if required sand which provides cell structure which allows air and water to pass through it. Pervious concrete is a mixture which has high porosity and strength. Porosity on otherhand, is the ability of material to pass any liquid. In this case the material is concrete. Concrete is the basic material which is used to construct walls, columns, pavements, bridges and many more. Figure 1 shows the Porous Pervious Concrete.

There are various advantages associated to the use of pervious concrete due to its ability of passing water. It allows the rainwater to penetrate through the ground which could help plants to grow normally.

On other hand, rain water if penetrates through the ground into the soils helps to exchange heat and moisture with air, therefore, humidity and temperature of earth can be maintained. Pervious concrete can reduce the risk of slipping of vehicle due to water, and splash of water on nearby areas. Therefore, it improves the safety measures of traffic for vehicles and foot passengers. It also reduces the storm water runoff, eliminates the need of detention ponds, helps in efficiently development of land and also prevents water from getting polluted.

Pervious concrete can be proved as a material of interest, if it is used as a building material in the retaining wall in hilly area. One of the natural disasters in hilly terrain is Landslide. Landslide is the mixture of rocks, sand, gravels with rain water. If retaining wall is placed against the area of Landslide, the water can easily pass through it resulting into less destruction. Other applications concerned with Pervious Concrete [2] are slope stabilization, Road pavement, Sidewalks, Hydraulic structure and many more. Thus, it can be stated that Pervious Concrete is a unique method for environmental issues and growth which provides motivation to the researchers to work on improving the porosity and strength.

2. METHODOLOGY AND DESIGN PHILOSOPHY

The advantages associated with Pervious Concrete have motivated many researchers in the past to work on it by performing different methodologies. Some of the methodology has been stated which has motivated us to take the Pervious Concrete Research a step ahead.

Kevern [3] states the methodology of biomechanical evaluation to estimate slipping behavior of pervious concrete pavements for icy circumstances. The subject mobility of wet pervious is analyzed by using Gait Motion and Embedded Force plates, tracking videography and electromyography. This technique further uses the pervious concrete for controlled gait cycles and has also reduced slipping.

This paper [4] uses various mixtures using various types of fine aggregates by varying the quantity of aggregates. Further, this paper uses two kinds of fine aggregates namely River Sand (RS) and Crushed Stone (CS). The properties of Pervious Cement Concrete (PCC) mix investigates the compressive strength, abrasion resistance, flexural strength, permeability, and clogging potential. The advantages of how pervious pavement can improve the water cycle, vehicle performance, and plant growth have been described by the author.

Latex polymer is used [5] to improve the strength of pervious concrete. This study focuses on balancing the relationship between strength and the permeability properties of pervious concrete. Three single sized Limestones aggregates (12.5mm, 9.5mm, and 4.75 mm) are used with one type of polymer (SBS Latex). Various sample preparation, mix designs, materials, air void test with permeability test are performed. Air void test is used to get information on air content in concrete.

This paper [6] determines the effects of gradation and aggregate size as the volume on paste of unit weight tensile and compression strength, permeability and porosity, of pervious concrete. Three different kind of coarse aggregate are used. Further various binary combinations of these aggregate are used to get packing density values and Uniformity Coefficients (UC). Then these PC mixtures are mixed with fixed ratio of water to cement i.e. 0.30 to determine inter particle void index, which is further used as design parameter. Various experiments of Paste Volume over Inner Particles Void (IPV) are used to determine which ratio is best to increase strength and density.

The strength and permeability test are performed by the authors [7], depending on the size of particle and proportions of the materials. The permeability is made on coarse aggregate. Authors have done Sieve Analysis of coarse aggregate and compressive strength test on the concrete and found that smaller size of coarse aggregate are useful for pavement construction.

Author [8] performs different admixtures test in addition with the steel fiber and silica (10% approximately) to increase the strength of the Pervious Concrete.

3. CONCLUSIONS

From the previous work done on Pervious Concrete and advantages integrated concludes that pervious concrete can be used efficiently as building material. And by performing test such as Vebe, Slump test and Compassion Test accurate material for construction can be designed. Further plasticizer can also be used to increase the strength of the material. Since the mixture is porous in nature therefore strength issues are of main concern. Building cannot sustain unless the strength is present. Therefore, material such as steel fiber and plasticizer can be used to increase the strength.

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