PERVIOUS CONCRETE

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Abstract- *Pervious concrete is a zero-slump, open graded material consisting of hydraulic cement, Coarse aggregate, admixtures and water. Because pervious concrete contains little or no fine aggregates such as sand, it is sometimes referred to as "no-fines" concrete. It is a special 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. Pervious concrete has a large open pore structure hence less heat storage and faster. Pervious concrete also find its effective application in low loading intensity parking pavements, footpaths, walkways and highways. Pervious concrete can also be used for making a fountain as the water will pass through the concrete and can be instantly used again. Using pervious concrete in fountain will reduce the need of looking after the fountain for any kind of leakage or overflowing of the water and the time needed for the water to be reused can be decreased. The fountain will be able to work on less water consumption and it can also give a better and aesthetic appearance. The pervious concrete is considered as an Environmental Protection Agency (EPA) for providing pollution control, storm management and suitable development. Here, pervious concrete mix is designed without sand and adding silica fume as an admixture using ACI 522R-06 code, the mechanical strength of the concrete is increased to an extent. The aim of this project is to lay the pervious concrete in platform and car parking thus transmitting the water to the underground surface very easily for maintaining the ground water table even in all the places*

I. INTRODUCTION

Concrete is a mixer of cement, water, sand, aggregate. Most concretes used are lime-based concretes such as Portland cement concrete. In Portland cementconcrete, when the aggregate is mixed together with the dry cement and water, they form a fluid mass that is easily molded into shape. The cement reacts chemically with the water and other ingredients to form a hard matrix which binds all the materials together into a durable stone-like material that has many uses. Often, admixtures are included in the mixture to improve the physical properties of the wet mix or the finished material. Most concrete is poured with reinforcing materials embedded to provide tensile strength, yielding reinforced concrete. Concrete is a construction material produced by mixing materials such as cement, sand, aggregate and water. It is widely used in the construction industry as it has good potential for being a structural member. It has high strength and durability in order to stabilize or strengthen any building structure.

Concrete is strong with compression but weak by tension. The behaviour in fire protection and high density are making it suitable in building constructions such as wall, column, foundation, and slab. The quality of concrete is depends on the quality of raw materials used, the mixture, mixing method, the compression method used and the method of preservation.

Concrete is by far the most versatile and most widely used construction material worldwide. It can be engineered to satisfy a wide range of performance specifications, unlike other building materials, such as natural stone or steel, which generally have to be used as they are. Because the tensile strength of concrete is much lower than its compressive strength, it is typically reinforced with steel bars, in which case it is known as reinforced concrete.

II. PERVIOUS CONCRETE

Pervious concrete (also called porous concrete, permeable concrete, no fines concrete and porous pavement) is a special type of concrete with a high porosity used for concrete flat applications allows water from precipitation and other sources to pass directly through, thereby reducing the runoff from a site and allowing groundwater recharge. 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. Pervious concrete is traditionally used in parking areas, areas with light traffic, residential streets, pedestrian walkways, and green houses. It is an important application for sustainable construction and is one of many low impact development techniques used by builders to protect water quality. The basic ingredients of pervious cement concrete mix are not very different from the conventional cement concrete mix, except in the proportion of ingredients. The main ingredients are cementations material, water, aggregate and if required, admixtures.

It seemed that po ous concrete was the best material for that period. Porous concrete c ontinued to gain popularity and its use spread to areas such as Venezuela, West africa, Australia, Russia and the Middle East. After World War II,porous concrete became wide spread for applications such as cast-in-place load bearing walls of single and multi-storey houses and, in some instances in high-rise buildings, prefabricated panels, and stem-cured blocks. Also applications include walls for two-story houses, load-bearing walls for high-rise buildings (up to 10 stories) and infill panels for high-rise buildings. This allows the planner/designer to achieve pre-development storm water goals for pavement intense projects. Pervious concrete reduces the runoff from paved areas, which reduces the need for separate storm water retention ponds and allows the use of smaller capacity storm sewers. This allows property owners to develop a larger area of available property at a lower cost. Pervious concrete also naturally filters storm water and can reduce pollutant loads entering into streams, ponds and rivers. Pervious concrete functions like a storm water infiltration basin and allows the storm water to infiltrate the soil over a large area, thus facilitating recharge of precious groundwater supplieslocally all of these benefits lead to more effectiveland use. Pervious concrete can also reduce the impact of development on trees.A pervious concrete pavement allowsthe transfer of both water and air to rootsystems allowing trees to flourish even in highly developed areas.

Materials of Pervious concrete

The key to high-performance concrete is the use of SCMs. Silica fume, fly ash, & blast furnace slag all increase durability by decreasing permeability & cracking

Silica Fume:

Silica fume is a by-product of silicone production. It consists of superfine spherical particles which significantly increase the strength & durability of concrete. Uses frequently for high rise building, itproduces concrete that exceeds 20,000 psi compressive strength. Silicafumecan replace cement inquantities of 5-12%

Fly Ash:

Fly ash is the waste by-product of burning coal in electrical power plants; it used to be land filled, but now a significant amount is used in cement. This material can be used to replace 5-65% of the Portland cement.

Blast Furnace slag :

Blast furnace is the waste by-product of steel manufacturing. It imparts added strength & durability to concrete, & can replace 20-70% of the cement in the mix.

Advantages:

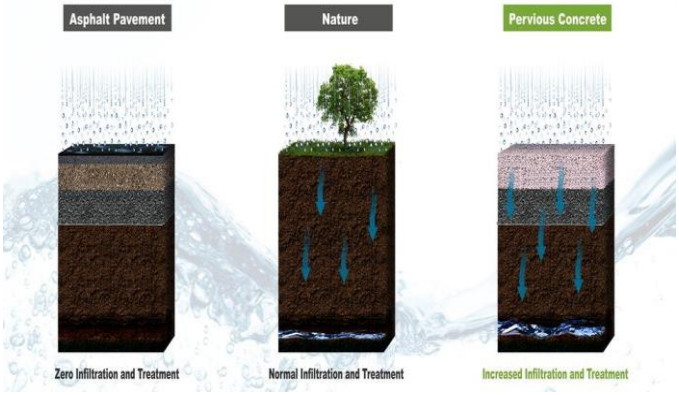
- Recharge of local aquifer
- Water budget retention and pollution removal
- Less need for storm sewer
- Green building alternative suitable for many application
- Natural run-off allows rainwater to drain directly to sub-base
- Reduced construction requirements for drainage structures
- Reduced pollution prevents environmental damage
- Protects streams and lakes and allows local vegetation to thrive.

Why Pervious Concrete is used?

Pervious concrete (also called porous concrete, permeable concrete, no fines concrete and porous pavement) is a special type of concrete with a high porosity used for concrete flat applications allows water from precipitation and other sources to pass directly through, thereby reducing the runoff from a site and allowing groundwater recharge. 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. Pervious concrete is traditionally used in parking areas, areas with light traffic, residential streets, pedestrian walkways, and green houses. It is an important application for sustainable construction and is one of many low impact development techniques used by builders to protect water quality. The basic ingredients of pervious cement concrete mix are not very different from the conventional cement concrete mix, except in the proportion of ingredients. The main ingredients are cementations material, water, aggregate and if required, admixtures The initial use of porous concrete was in the United Kingdom in 1852 with the construction of two residential houses and a sea groaned. Cost efficiency seems to have been the primary reason for its earliest usage due to the limited amount of cement used. It was not until 1923 when porous concrete re surfaced as a viable construction material. This time it was limited to the construction of 2-story homes in areas such as Scotland, Liverpool, London and Manchester. Use of porous concrete in Europe increased steadily, especially in the World War II era. Since porous concrete use. less cement than conventional concrete and cement was scare at that time.

Pervious concrete functions like a storm water infiltration basin and allows the storm water to infiltrate the soil over a large area, thus facilitating recharge of precious groundwater supplies locally. All of these benefits lead to more effective land use. Pervious concrete can also reduce the impact of development on trees.

A pervious concrete pavement allows the transfer of both water and air to root systems allowing trees to flourish even in highly developed areas.



How Pervious Concrete can Reduce Problems

- In rural areas larger amount of rainwater ends up falling on impervious surfaces such as parking lots, driveways, sidewalks, and streets rather than soaking into the soil.
- This creates an imbalance in the natural ecosystem and leads to a host of problems including erosion, floods, ground water level depletion and pollution of rivers, as rainwater rushing across pavement surfaces picks up everything from oil and grease spills to de-icing salts and chemical fertilizers.
- A simple solution to avoid these problems is to stop constructing impervious surfaces that block natural water infiltration into the soil.

- Rather than building them with conventional concrete, we should be switching to Pervious Concrete or Porous Pavement, a material that offers the inherent durability and low life-cycle costs of a typical concrete pavement while retaining storm water runoff and replenishing local watershed systems.

III. CONCLUSION

By performing this tests and by its results we can say that pervious concrete can be more helpful if it is used as a replacement for R.C.C or bitumen roads. The main problem like the recharge of underground water table can be easily done without any supervision and many other problems can be solved. As pervious concrete becomes more applicable to light and medium traffic loading, the need for a fatigue analysis is going to become important. Much of the applications for pervious concrete involve parking lots, pedestrian walkways, and other lightly loaded areas.

To be able to incorporate pervious concrete in wider applications, fatigue analysis will be needed. Pervious concrete is a green material but it does consume natural resources. Using recycled aggregates in pervious concrete could be another added environmental benefit. Concrete recycling is gaining popularity since it reduces the need for consuming natural resources as well as waste disposal. Several factors that play a pivotal role in the quality of recycled aggregates are size, type, and gradation of aggregates. These factors can affect the overall structural performance as well as permeability of pervious concrete. Various types, sizes, and gradation of recycled aggregate in pervious concrete could be studied to determine optimal recycled aggregate mixes.

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