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Editorial Note

South Asian Journal of Management Research (SAJMR), is a scholarly journal that publishes scientific research on the theory and practice of management. All management, computer science, environmental science related issues relating to strategy, entrepreneurship, innovation, technology, and organizations are covered by the journal, along with all business-related functional areas like accounting, finance, information systems, marketing, and operations. The research presented in these articles contributes to our understanding of critical issues and offers valuable insights for policymakers, practitioners, and researchers. Authors are invited to publish novel, original, empirical, and high quality research work pertaining to the recent developments & practices in all areas and discipline.

Cross-functional, multidisciplinary research that reflects the diversity of the management science professions is also encouraged, the articles are generally based on the core disciplines of computer science, economics, environmental science, mathematics, psychology, sociology, and statistics. The journal's focus includes managerial issues in a variety of organizational contexts, including for profit and nonprofit businesses, organizations from the public and private sectors, and formal and informal networks of people. Theoretical, experimental (in the field or the lab), and empirical contributions are all welcome.The journal will continue to disseminate knowledge and publish high-quality research so that we may all benefit from it.

Dr. Pooja M. Patil
Editor

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C O N T E N T S

Pervious Concrete for Rainwater Harvesting: A review

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Abstract

Water scarcity along with water logging are one of the major environmental problems in recent years. In a developing country like India, sustainable development is of utmost importance. For the above-mentioned environmental problems, various environment-friendly solutions are given. Pervious or Porous concrete is one of such solutions. It is lightweight concrete also known as No-fine concrete due to absence of fine aggregate. Pervious concrete is an environment friendly solution for rainwater harvesting also as it allows the water to percolate thus, increasing the level of groundwater table. It significantly helps in reduction of runoff and proves to be one of the best alternatives for stormwater management. The porous concrete pavements can be used for parking lots, sidewalks, residential streets, walkways and also for apartment walkways where the traffic load and intensity are quiet low. This review paper includes the previous work carried out in pervious concrete. From this paper it can be concluded that the porous concrete can be used for rainwater harvesting in pavements, where there is minimum traffic load.

Keywords: Concrete, Pervious, Porous, Traffic, Walkways

Introduction

In an era marked by environment friendly materials and sustainable construction practices, use of new innovative materials and techniques has increased considerably. Among all these green porous concrete has emerged as a promising solution for critical problems like water scarcity, storm water management and urban flooding.

Due to global warming and climate change, many regions across the world are facing unpredictable rainfall patterns which further cause droughts and floods both. Traditional used pavement surfaces in urban areas are impermeable in nature. This property of pavement prevents rainwater from naturally infiltrating in the ground. Due to this groundwater is not getting recharged. Porous concrete plays an important role here to recharge groundwater by collecting storm water and allowing it to seep into the ground thus reducing storm water runoff Use of green porous pavement can also reduce the effective cost of project. The green porous concrete mixture contains little or no sand; creating voids. It is a very lightweight concrete also known as no-fine cement. The green porous concrete is mainly used for making pavements.

The excessive use of impervious covering has left series with challenges of increase in runoff volume, back erosion flooding, and deputation of water poverty. Today this problem post considerable risk to the sustainable development of cities and suburbs. Permeable concrete is special type of concrete with high porosity use for concrete flatwork application that allows water from precipitation and other resources to pass through it, thereby reducing the runoff from a site and recharging ground water levels. A few new fast draining concrete pavement solution, it rapidly directs excess water away from streets, parking surfaces, driveways and walkways. Unlike conventional concrete, it has a high void content of between 20 – 35%. This allows surface water to drain through in to the sub-strata and dissipate naturally, reducing the risk of surface water flooding and water course contamination. Permeable concrete is a concrete paving solution with improved permeability characteristics compared to convectional permeable concrete. A permeable solution offers significant benefits over traditional solutions. The combinations of trafficking surface and drainage system in a single element creates benefits in construction process and in construction and environmental costs.

Review on Past Work Done

Anurag Prabhakar Rangankar, Dr. S. G. Makarande, Prof. R. S. Kedar (2022), " Making Green Porous Concrete for Rain Water Harvesting and Urban Pavements" International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), Volume 2, Issue 4, May 2022, pp 303-307 have developed a strong pervious concrete. A comparative study between conventional and pervious concrete is also done based on workability, compressive strength, split tensile strength of concrete. Tests are carried out on M20 and M25 concrete on 7 days, 14 days and 28 days. According to them pervious concrete has less strength than conventional concrete by 14.5%for M20 and 12.6% for M25; also, the tensile values are also comparatively lower than the conventional concrete by 30%. It can be ideally used at parking areas and at residential areas where the movement of vehicles is very moderate. No fines concrete is an environmentally friendly solution to support sustainable construction. Presently, there is an acute shortage of natural sand all around. Elimination of fines correspondingly decreases environment related problems. Use of this concrete can effectively control the run off as well as saving the finances invested on the construction of drainage system. Hence, it can be established that no fines concrete is very cost effective apart from being efficient.

Prof. B.A.Hase, Vaibhav Bhandwalkar, Tejas Dere, Vaibhav Patekar, Sangram Magar (2020) "Making Porous Concrete For Rain Water Harvesting And Urban Road" International Research Journal of Modernization in Engineering Technology and Science, Volume:02, Issue:05, May-2020, pp 411-413 have made cubes of pervious concrete with varying percentage of fine aggregate. The properties of concrete studied is porosity, compressive strength, weight loss in drying and water permeability test. Pervious concrete has no fine aggregate or very little amount of sand used in it. Pervious concrete is also known as porous concrete. It is sustainable construction and no any effect on environment. Many builders can use these pavement blocks for increasing ground water table. Hence, they have concluded that addition of 8% fine aggregates to the pervious concrete will satisfy, both strength of concrete and permeability of concrete.

C.R.Shah, R.A.Jadhv, S.S.Patil, A.C.Agrawal, S.N.Patil and K.P.Sawant (2017) "International Journal of Modern Trends in Engineering and Research (IJMTER)" Volume 04, Issue 3, March–2017, pp 150-154 They have prepared 3 cubes with the proportion as –1:0.36:2.70 (Cement : Water Content : Coarse Aggregate).We have adopted the I.S standard for mixing the proportion, transporting, placing, compaction, curing for 28 days. To achieve the required strength for M20, marble dust is used as admixture. The average 28-day compressive strength obtained is 24.39 N/mm^2. The cost of permeable concrete is 25-30% less as compared to conventional concrete due to absence of fine aggregate. In order to increase the strength, they have used marble dust as an admixture which is economical. The problems of water logging faced during monsoon particularly in metropolitan cities can considerably be reduced by use of porous concrete. The surface of porous concrete is not as smooth as the conventional concrete. They have created a model of size (2ft* 1.5ft* 2ft) with base as an impermeable layer then boulders are used as sub-base layer. For drainage purpose perforated pipe is used in the subbase layer. On top layer permeable concrete is used. The water from the permeable concrete is collected through the perforated pipe. That water can be stored and reused for various purposes.

Harshith, ShashivendraDulawat, Dr. Esar Ahmad "Experimental Investigation of Porous Concrete for Concrete Pavement" (2020) International Journal of Engineering Research & Technology (IJERT), Volume- 9, Issue- 08, August-2020 they have used metakaol in as an admixture in the M40 porous concrete blocks. They have done five mix designs based on varying proportions of water and the admixture. The compressive and split tensile tests are conducted on 7, 14 and 28 days. They have concluded that the compressive strength of the pervious concrete is less as compared to conventional concrete. According to them pervious concrete can not be used where the vehicle load is on the higher side. They have suggested using them where the vehicular load is less. Hence, if the compressive quality and flexural nature of porous concrete is extended, it can be used. At present, the utilization of penetrable concrete is limited to light traffic lanes due to its low compressive strength. If the properties are improved with addition of admixtures or changing the mix proportions, it can similarly be used for medium and significant traffic inflexible pavements. Porous concrete helps for groundwater recharging.

Prof. Pallavi Kharat, Prashant Nagawade, Omkar Jadhav, Sumit Ubale, Vaibhav Chavan (2022), "Porous pavements block for rain water harvesting" Journal of Emerging Technologies and Innovative Research (JETIR), volume- 9, Issues- 5, May 2022, pp 763-767 they have made

porousconcretepaving blocks with different sizes of coarse aggregate. The three different sizes of coarse aggregate were used, namely passing through 10 mm - retained on 5 mm, passing through 8 mm - retained on 5 mm and passing through 10 mm - retained on 8 mm. Furthermore, a series of tests were conducted in this study such as compressive strength, porosity and permeability. It was found that the size of coarse aggregate affects the strength and porosity of the specimens. The result also shown that PCPB caused in low strength, but high in porosity and permeability compared to the other blocks. All PCPB with different size of coarse aggregate cause a great reduction in the water volume during permeability test. However, differences in this reduction between the samples are depending on the coarse aggregate size and porosity. The permeability results indicate that there are large differences in permeability for all samples when the curing duration increases. Furthermore, the permeability of sample with 28 days curing was lower than the sample with 7 days curing; indicating that age is a factor affecting permeability.

Raj N, Ranjith V, Subash (2014) "Utilization of Pervious Concrete in Rain Water Harvesting" The Master builder April 2014 According to them, rainwater harvesting refers to the collection of rain water into the ground to raise the ground water level. Harvested water can make an alternative source to reduce the demand for the drinking water. This paper focus on the special type of concrete called as "Pervious concrete" which can take part in the rainwater harvesting system for the effective use of the storm water. In doing so, pervious concrete has the ability to lower the overall cost on the other harvesting practice. They have prepared test specimens based on three trials with varying size of coarse aggregate, varying percentage of fine aggregate and varying w/c ratio. Compressive strength and permeability test are carried out on the prepared test specimens. They have concluded that use of pervious concrete will be an ideal contribution to increase the usage of storm water in recharging of ground water, and sustainable land management.

S.O. Ajamu, A.A. Jimoh, J.R. Oluremi "Evaluation of Structural Performance of Pervious Concrete in Construction" (2012) International Journal of Engineering and Technology Volume- 2, Issue- 5, May, 2012 In this paper they have carried out a performance evaluation study of pervious concrete. For this, the effects of varying the aggregate size on the porosity, compressive strength and specific gravity of pervious concrete are studied. The study covers the use of pervious concrete as pavement material in the construction of pedestrian walkways and parking lots. Three batches of test specimens were produced from each of the aggregate size representing aggregate cement ratios of 6:1, 8:1 and 10:1 with no fine aggregate. Two different sizes of coarse aggregate were used in this study. The sizes are 3/8-inch (9.375mm) and 3/4-inch (18.75mm). All the materials are hand-mixed to achieve the homogeneity. Total 24 cubes were cast for each aggregate size of varying mix proportions of coarse aggregate and cement. The casted blocks are tested for compressive strength for 7, 14, 21 and 28 day and permeability. They have concluded that the aggregate/cement ratio of 10:1 produced pervious concrete of higher co-efficient of permeability of 3.12x10-3 cm/sec and 3.89x10-3 cm/sec for aggregate size 9.375mm and 18.75mm respectively. Also, the smaller the size of coarse aggregate, higher the compressive strength along with higher permeability rate. The mixtures with higher aggregate/cement ratio 8:1 and 10:1 are considered to be useful for a pavement that requires low compressive strength and high permeability rate. Further study should be conducted on the pervious concrete pavement produced with these material proportions to meet the condition of increased abrasion and compressive stresses due to high vehicular loading and traffic volumes.

Conclusions

Most of our states face acute shortage of water in summer; particularly in cities. Use of pervious concrete can prove a boon to smart cities in India. They can be in parking lots, pedestrian walks in green spaces, morning walkways and also in rural areas. Pervious concrete is a cost-effective and environment friendly solution for sustainable development. There is a lot of study carried out by many researchers in past to improve the strength of porous concrete. Greater strength and higher permeability can be achieved by reducing the size of aggregate used. One of the most important component in porous concrete is cement paste binder. Various types of additives are used to strengthen the cement paste binder. Periodic cleaning is important to increase the life of pervious pavement. This can be achieved by pressure cleaning. Pervious concrete is used by many industries for storm water management. For sustainable development pervious concrete is the only way. Energy and resource conservation can also be achieved by use of porous concrete.

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Prof. B.A.Hase, Vaibhav Bhandwalkar, Tejas Dere, Vaibhav Patekar, Sangram Magar (2020). "Making Porous Concrete For Rain Water Harvesting And Urban Road" International Research Journal of Modernization in Engineering Technology and Science, Volume:02, Issue:05, May-2020, pp 411-413

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S.O. Ajamu, A.A. Jimoh, J.R. Oluremi "Evaluation of Structural Performance of Pervious Concrete in Construction" (2012). International Journal of Engineering and Technology Volume- 2, Issue- 5, May, 2012