International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 9 Issue 9 ǁ 2021 ǁ PP. 11-13

Improvement of Compressive strength of pervious Concrete

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ABSTRACT
This review paper includes literature reviews related to pervious concrete and effects of mineral admixtures (Fly ash and silica fume) on properties of concrete. Various research papers, articles and thesis have been referred to understand various aspects of the pervious concrete, viz., basic behavior, advantages, limitations, effects & mechanical properties. Various research papers published till date on different aspects of pervious concrete

KEYWORDS *Pervious concrete, Porous material.*

Date of Submission: 09-09-2021 Date of acceptance: 24-09-2021

I. INTRODUCTION

1.1 Pervious concrete

Conventional normal cement concrete is generally used as construction material of buildings. The impervious nature of concrete contributes to the increased water runoff into drainage system, over-burdening the infrastructure and causing excessive flooding in built-up areas. Pervious concrete has become significantly popular during recent decades, because of its potential contribution in solving environmental issues. Pervious concrete is a high-performance concrete which has relatively high-water permeability compare to conventional concrete due to interconnected pore structure. Pervious concrete is also termed as porous concrete and permeable concrete. It can be produced using conventional concrete-making materials, namely cement, cement supplementary materials, all types of coarse and no fine or less fine aggregates, and water. Pervious concrete is a type of concrete with significantly high-water permeability compared to normal weight concrete.it has been mainly developed for draining water from ground surface, so that stormwater runoff is reduced. Due to high water permeability then normal concrete, pervious concrete has very low compressive strength.

1.2 Mineral admixtures

Mineral admixtures are finally divided siliceous materials, which can be added to concrete in relatively large amounts, generally in the range of 15 to 60% by weight of cement. They may be pozzolanic or cementitious or both. Benefits of using mineral admixtures in concrete are improvements in high ultimate strength, resistance to thermal cracking and chemicals effects, better durability and economy.in this review paper, effects of fly ash andsilica fume on concrete are referred

II. METHODOLOGY

2.1 Compressive strength of pervious concrete

In the laboratory, pervious concrete mixtures have been found to developcompressive strengths in the range of 3.5 MPa to 28 MPa, which is suitable for a widerange of applications. Typical values are about 17 MPa. As with any concrete, theproperties and combinations of specific materials, as well as placement techniques and environmental conditions, will dictate the actual in-place strength. However, currently there is no ASTM test standard for compressive strength of pervious concrete.Testing variability measured with various draft test methods has been found to be high

and therefore, compressive strength is not recommended as an acceptance criterion.Rather, it is recommended that a target void content (between 15% to 25%) as measured by ASTM C 1688: Standard Test Method for Density and Void Content of Freshly Mixed Pervious Concrete be specified for quality assurance and acceptance.

2.2 Density and porosity:

The density of pervious concrete depends on the properties and proportions ofhe materials used, and on the compaction procedures used in placement. In-placedensities on the order of 1600 kg/m3 to 2100 kg/m3 are common, which is in the upperrange of lightweight concretes. A pavement 125 mm thick with 20% voids will be ableto store 25 mm of a sustained rainstorm in its voids, which covers the vast majority of rainfall events in the U.S

2.3 Permeability of pervious concrete

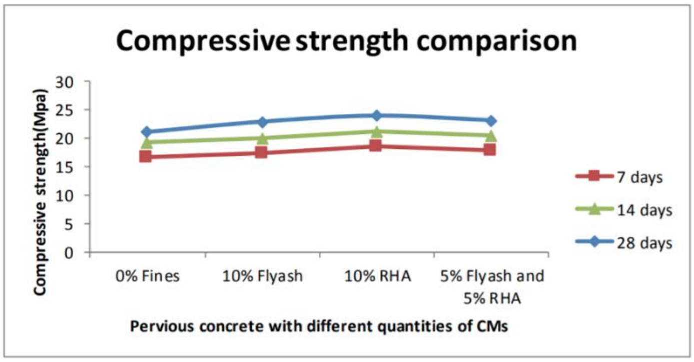
The permeability of pervious concrete was determined using a falling headpermeability set up Figure 8. Water was allowed to flow through the sample, through aconnected standpipe which provides the water head. Before starting the flow measurement, the samples were wrapped with polythene inside the cylinder. Then thetest started by allowing water to flow through the sample until the water in the standpipe reached a given lower level. A constant time of 5seconds was taken for the water to fallfrom one head to another in the standpipe. The standpipe was refilled and the test was
repeated when water reached a lower. The permeability of the pervious concrete sample was evaluated from the expression given below:

Formula: K=2.303 aL/A (t2-t1) log (h1/h2)

Where,
a = the sample cross section area
A = the cross section of the standpipe of diameter
(d) = 0.95cm2 L = the height of the pervious concrete
(t2 - t1) = change in time for water to fall from one level to
another (5secs.)
h1= upper water level
h2= Lower water level
D= diameter of sample (10.5cm) d= diameter of standpipe
(1.1cm)
Theoretically, the coefficient of permeability generally in the order of 1mm/sec for avoid ratio of 20% and the rate of flow is in the range of 120 liters/min/m2 to 200litres/min/m2In general, the concrete permeability limitation is not a critical design criterion.Consider a passive pervious concrete pavement system overlying a well-draining soil.Designers should ensure that permeability is sufficient to accommodate all rain fallingon the surface of the pervious concrete. For example, with a permeability of 140L/m2/min, a rainfall in excess of 0.24 cm/s would be required before permeabilitybecomes a limiting factor. The permeability of pervious concretes is not a practicalcontrolling factor in design. However, the flow rate through the sub grade may be morerestrictive.

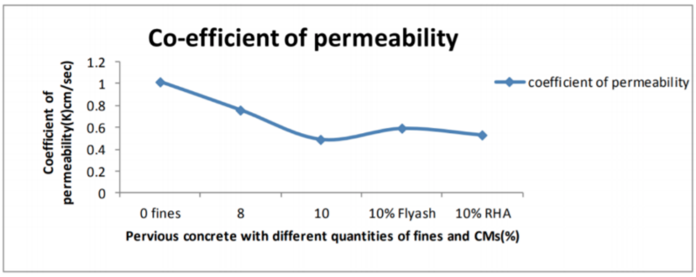
III. RESULT

The pervious concrete with 10% Rice husk ash as cement replacement gives highest value of compressive strength when compared to fly ash replacement and standard pervious concrete.
The pervious concrete with mixture of fly ash and rice husk ash given least value of compressive strength. This may due to non-homogeneity between the two cementitious materials



The co-efficient of permeability is maximum of 1.02 cm/sec for standard pervious concrete with 0% fine aggregates and minimum of 0.49 cm/sec for pervious concrete with 10% fine aggregates

The pervious concrete with 10% fly ash has minimum co-efficient of permeability of 0.59 cm/sec and that of rice husk ash is 0.53 cm/sec. The reason for least values of permeability is due to fineness of cementitious materials.



IV. CONCLUSION

- The size of coarse aggregates, water to cement ratio and aggregate to cement ratio plays a crucial role in strength of pervious concrete.
- The void ratio and unit weight are two important parameters of pervious concrete in the context of mix design.
- The compressive strength and co-efficient of permeability of pervious concrete are inversely proportional to each other up to addition of 8% of fines.
- The addition of fines and replacement of Cementitious will reduce the permeability capacity of pervious concrete.
- The compressive strength of pervious concrete is increased by 4.36% when 5% fine aggregates were added to the standard pervious concrete.

REFERENCES

[1]. ACI 552R (2010): "Report on Pervious Concrete", American Concrete Institute, Farmington Hills, Michigan
[2]. Ajamu S.O., Jimoh A.A. "Evaluation of structural Performance of Previous Concrete in Construction", International Journal of Engineering and Technology Volume 2 No. 5, May, 2012
[3]. Darshan S. Shah, Prof. J.R.Pitroda, "Assessment for use of Gravel in Pervious Concrete", International Journal of Engineering Trends and Technology (IJETT) ISSN No. 2231-5381, Volume: 4, Issue: 10, October 2013, Page: 4306 – 4310
[4]. Ghafoori, N., and Dutta, S., "Building and Non-pavement Applications of No-Fines Concrete," Journal of Materials in Civil Engineering, Volume 7, Number 4, November 1995
[5]. IS 8112:1989. Specifications for 53grade Portland cement, New Delhi, India: Bureau of Indian Standards.
[6]. IS: 2386 (Part III) – 1963, Indian Standard, Method of Test for Aggregates for Concrete, (Part III); Specific Gravity, Density, Voids, Absorption and Bulking, (Eighth Reprint); Bureau of Indian Standard, New Delhi, India. March 1997.
[7]. IS: 2386 (Part IV) - 1963, Indian Standard, Method of Test for Aggregates for Concrete, (Part IV); Mechanical Properties, (Tenth Reprint);
[8]. J.T. Kerven, V.R. Schaefer, Mixture proportioning considerations for improved freeze- thaw durability of pervious concrete, J Mater Civil Eng (2013) 25:886–892.
[9]. Leming, M.L., Rooney, M.H., and Tennis, P.D., "Hydrologic Design of Pervious Concrete," PCA R&D.
[10]. Narayanan Neithalath, Milani S. Sumanasooriya& Omkar Deo. (2010). Characterizing pore volume, sizes, and connectivity in pervious concretes for permeability prediction. Materials Characterization.
[11]. National Ready Mixed Concrete Association (NRMCA), Freeze Thaw Resistance of Pervious Concrete, Silver Spring, MD, May 2004. 79
[12]. NRMCA, "What, Why, and How? Pervious Concrete," Concrete in Practice series, CIP 38, Silver Spring, Maryland, May 2004b, 2 pages.
[13]. Obla K., Recent Advances in Concrete Technology, Sep. 2007, Washington DC3.
[14]. Pervious Concrete: Hydrological Design and Resources, CD063, CDROM, PCA, Skokie.
[15]. Pervious Pavement Manual, Florida Concrete and Products Association Inc., Orlando, FL.
[16]. Sri Ravindrarajah R. and Aoki Y. (2008),"Environmentally friendly porous concrete", Proceedings of the Second International Conference on Advances in Concrete and Construction, Hyderabad, India, Feb 2008
[17]. Storm water Phase II Final Rule Fact Sheet Series, United States Environmental Protectin