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EFFECT OF POLYCARBOXYLATE ON COMPRESSIVE STRENGTH OF PERVIOUS CONCRETE

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ABSTRACT

Pervious Concrete which is also known as porous Concrete is motley of cement, body of water and a particular sized coarse aggregate combined to form a porous structural material. Application of pervious concrete in pavements mainly focuses on storm water ascendency mostly in urban areas where scarcity of land is high gear. Permeable Pavement allows water from precipitation and other informant to liberty chit through it and therefore reduces the runoff from a site which final result in the recharge of land water and increase the level. This Pavement is made using coarse sum with no fine aggregates. The main objective is to study about the applications of pervious concrete and also develop a strong and durable Pervious cement concrete mix using additive polycarboxylate as addition.

Key words: pervious concrete, permeable pavement, polycarboxylate, porous structural material, ascendency.

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1. INTRODUCTION

As urbanization increases in India and also in many contribution of the humanity there is a problem of water logging 5 senses of there is a huge requirement of drainage facility. This is due to impervious nature of the bituminous and concrete pavement s in minor aspect. Pervious concrete which has feasible surface quad service significantly to provide high permeability due to its interconnected pores. Pervious concrete (called porous concrete, permeable concrete) is a special case of Concrete with a high porosity used for concrete flatwork application that allows water from precipitation and other sources to passing game directly through and therefore reduces the overspill from a site and allowing groundwater

recharge. Pervious concrete is made by using large sized aggregate without sum. Pervious concrete has been used in the United State for over thirty ages. Pervious concrete was first used in the 1800s in Europe as pavement surveneer and load bearing walls[8]. It became popular again in the 1920s for two story homes in Scotland and England. It became most efficient in Europe after the Second World War due to the scarcity of cement. India is facing a typical problem of ground water table falling at a fast rate due to reduced recharge of rainwater into under soil and unplanned water secession for factory farm and industry by pumping. Pervious concrete if adopted for construction of pavements, platform, and parking lots designed for lighter load.

2. MATERIALS AND EXPERIMENTAL PROCEDURES

2.1. Cement

In this Deccan cement of 53 grade is used (OPC) is used. Appearance of cement is gray and free from lumps. As per IS: 12269:2013.

Table 1 Characteristics of Cement

Property	Result	Requirement	Remarks
Fineness (sq m/kg)	245	225 minimum	passed
Soundness (mm)	7	10 maximum	passed
Setting time	30,480	30,600 maximum	passed
Compressive strength (N/mm^2)			
3 days	30	27	
7 days	39	37	passed
28 days	55	53	

2.2. Polycarboxylate

The basic ingredient of CEMCRETE SP are synthetic polymers, which allow mixing piddle to be reduced considerably and concrete intensity level to be enhanced significantly, particularly at the early historic period . CEMCRETE SP is chloride free people ware. In chemistry, Poly-carboxylate-based is an organic and polymeric electrolyte. It belongs to a polymer surfactant. Therefore, it can also be applied in other paste materials such as gypsum products and ceramic products to reduce water content.

Advantages

CEMCRETE SP makes the concrete highly flow able, with low water/ cement proportion and improves enduringness of concrete when compared with normal concrete with same workability. The increment in strength especially evidently at early ages remains at later ages. Initial and final sets remain same when compared to normal concrete. Due to the reduction in water cement ratio, all other dimension like permeability, shrinkage, creep, workability and modulus elasticity will be improved.

Typical Properties

CEMCRETE SP is a brown free flowing liquid.

Specific gravity: 1.20+0.035

Chloride content: Nil to BS 5075 to I.S:456-78

Nitrate content: Nil

Freezing point: 0°C can be reconstituted if stirred after thawing.

Air entrainment: Maximum 0.5%

Dosage : 0.2 to 0.5% by weight of the cement depending upon the condition of the materials and conditions. Trail mixes are recommended prior to production of concrete

3. PREPARATION OF SAMPLE AND TESTING

Mechanical property on hardened concrete is find out along with compressive persuasiveness, flexural strength, tensile strength, porosity[7-15]. For the calculation of compressive strength piston chamber of proportion 100*200 mm are used. The sample is then mixed and poured in the cylinder in two layers by giving twenty-five blows with a modified proctor hammer for every layer and is then kept for curing for about 7,14,28,56,91 days. Now the compressive strength of the specimen is found out by placing it in the ACTM.

3.1. Coarse aggregate properties

Table 2 Mechanical properties of coarse aggregate

Characteristic	Result obtained	Requirement
Aggregate Impact test	15%	Shouldn't exceed 30% for wearing course
Aggregate crushing test	9%	<10% Exceptionally strong >35% Weak
Los angels abrasion test	22%	40% max for WBM base course 35% max for Bituminous pavements
Specific Gravity	2.65	2.5-2.9
Water absorption	0.56	0.1-2.0%

3.2. Mix Proportion

Table 3 Mix Proportion for Pervious concrete

Mix	Cement (kg/cu.mt)	Aggregate (kg/cu.mt)	Water (lit/cu.mt)
Ratio	1	4	0.33
Quantity	450	1800	135

4. RESULTS

Normally pervious concrete is a mixture of cement, coarse aggregate and water. The compressive strength values of plain pervious concrete are less when compared to conventional concrete. Pervious concrete with usage of admixture high range water reducer (HRWR) for 10mm and 11.2mm size of aggregate by changing different quantities (such as 2ml, 3ml, 4ml, 5ml, 6ml) for 7 days and 28days compressive strengths are

Table 4 Shows 10mm aggregates 7days and 28 days strength with plain pervious concrete

Cement–aggregate ratio	Water-cement ratio	Size of aggregate (mm)	Curing period (days)	Average strength (n/mm^2)
1:4	0.33	10	7	8.58
			28	9.48

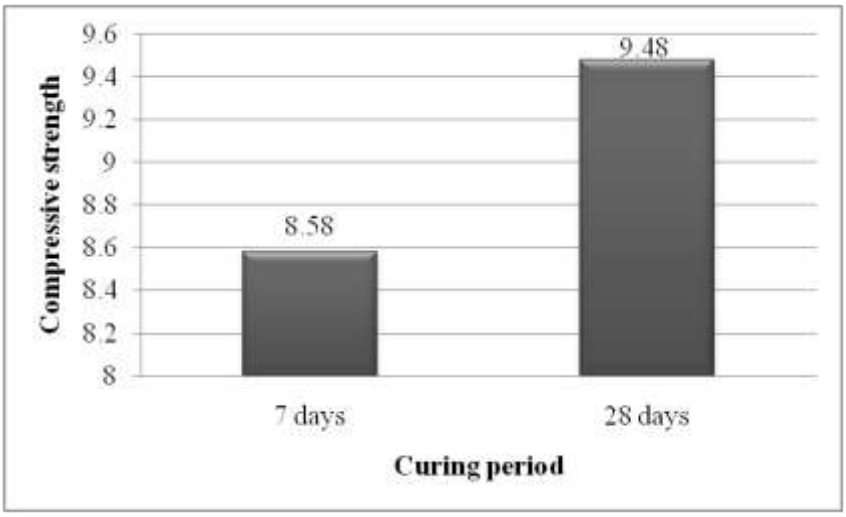

Figure 1 Shows compressive strength of plain pervious concrete with 10mm size aggregate

Table 5 Shows compressive strength of 10mm aggregates at various quantities of polycarboxylate

Serial no:	Size of aggregate (mm)	Aggregate to cement ratio	Water cement ratio	Polycarboxylate (ml)	Curing period (days)	Compressive Strength (n/mm^2)
1	10	1:4	0.33	2	7	5.92
2				3		6.36
3				4		5.15
4				5		5.21
5				6		7.13

Table 6 Shows compressive strength of 10mm aggregates at various quantities of polycarboxylate

Serial no:	Size of aggregate (mm)	Aggregate to cement ratio	Water cement ratio	Polycarboxylate (ml)	Curing period (days)	Compressive Strength (n/mm^2)
1	10	1:4	0.33	2	28	7.2
2				3		7.81
3				4		9.38
4				5		10.04
5				6		9.18

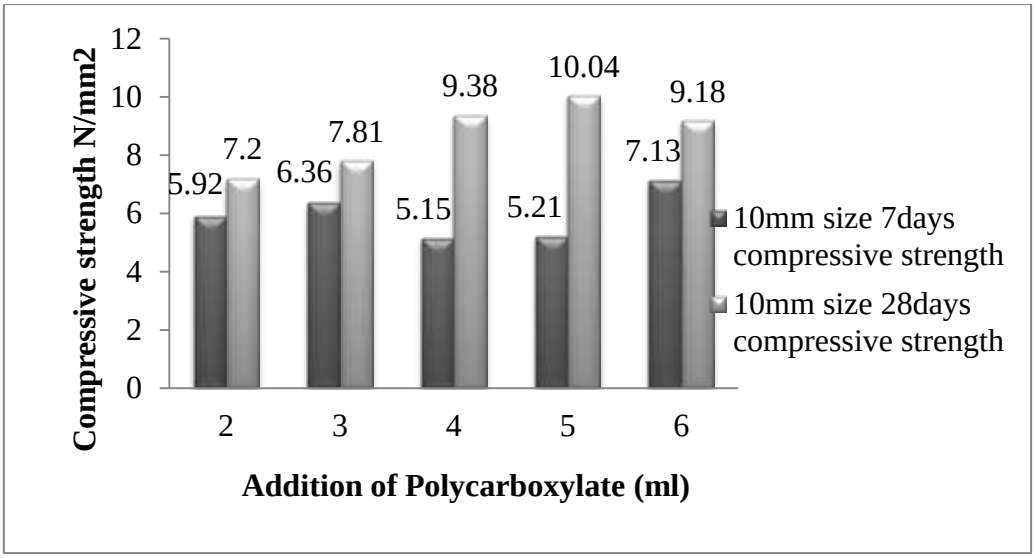

Figure 2 Shows compressive strength of 10mm aggregates at various quantities of polycarboxylate

Table 7 Shows 11.2mm aggregates 7days and 28 days strength with plain pervious concrete

cement –aggregate ratio	water-cement ratio	Size of aggregate (mm)	curing period (days)	Average strength (n/mm^2)
1:4	0.33	11.2	7	9.91
			28	5.63

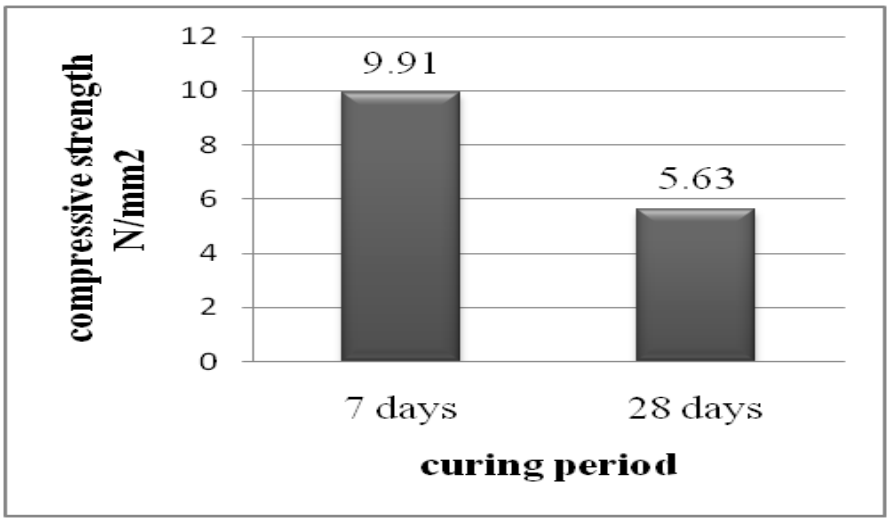

Figure 3 Shows compressive strength of plain pervious concrete with 11.2mm size aggregate

Table 8 Shows compressive strength of 11.2mm aggregates at various quantities of polycarboxylate

Serial no:	Size of aggregate (mm)	Aggregate to cement ratio	Water cement ratio	Polycarboxylate (ml)	Curing period (days)	Compressive Strength (n/mm^2)
1	11.2	1:4	0.33	2	7	5.12
2				3		8.59
3				4		7.96
4				5		8.64
5				6		7.64

Table 9 Shows compressive strength of 11.2mm aggregates at various quantities of polycarboxylate

serial no:	size of aggregate (mm)	aggregate to cement ratio	water cement ratio	polycarboxylate (ml)	curing period (days)	compressive strength (n/mm^2)
1	11.2	1:4	0.33	2	28	8.91
2				3		9.05
3				4		10.87
4				5		12.76
5				6		10.80

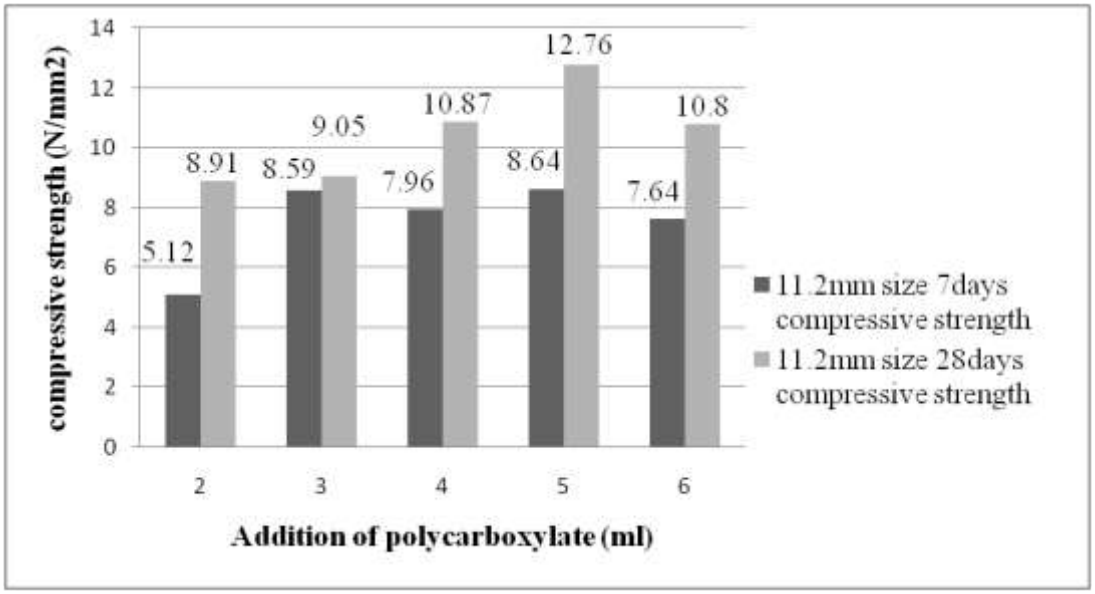

Figure 4 Shows compressive strength of different admixture quantities with 11.2mm size aggregate

5. CONCLUSIONS

The compressive strength of plain pervious concrete for 10mm size aggregate at 7days is 8.58 and for 11.2 size is 9.91 if we observe for 28 days values are 9.48 and 5.63 respectively. When we compare with 28 days strength of modified pervious concrete for 5ml it is 10.04 and in 11.2 sizes 12.76 at 5ml. This observation tells addition of polycarboxylate at 28 days gives increment in strength values. The compressive strength results of 10mm and 11.2mm sizes of aggregate explains about the chemical reaction between polycarboxylate and cement gives high compressive strength at 5ml admixture content. However the Compressive strength values of modified Pervious Concrete are according to the standards and are applicable for constructions. Usage of pervious concrete with addition of such admixtures can improve the strength and can be used for construction of low load bearing pavers.

REFERENCES

[1] Akshay Tejankar, Mr.Aditya Lakhe, Mr.Manish Harwani and Prem Gupta(September 2016)- "The Use of Permeable Concrete for Ground Water Recharge, International Journal of Engineering Research and Application, Vol 6, issue 9, pp 60-63

[2] Ammar A.Muttar, Improving the Mechanical properties of Pervious concrete, Journal of Babylon University/ Engineering Sciences / No.(2)/ Vol.(21): 2013

[3] Carmen T.Agouridis, Mr.Jonathan A.Villines and Mr. Joe D.Luck(2011), Permeable Pavement for Storm water Management, University of Kentucky College of Agriculture, Lexington 40546

[4] Anush K. Chandrappa, Krishna Prapoorna Biligiri, Constr. Build. Mater,111, 262(2016)

[5] Govind Ravish and Mr. Er .V.K.Ahuja (2015) No fines concrete as a road pavement, International Journal of Engineering Trends and Technology, Volume 24, pp 187-190

[6] Vikram, Mahla R.P. experimental Study of Pervious Concrete Pavement Volume 3, Issue VII, (2015) in International Journal for Research in Applied Science & Engineering Technology

[7] M.Neamitha , T.M.Supraja Influence of Water Cement Ratio and The Size of Aggregate on The Properties Of Pervious Concrete International Refereed Journal of Engineering and Science (IRJES) Volume 6, Issue 4 (April 2017), PP.09-16

[8] Compressive Strength of Pervious Concrete Pavements A Joint Research Program Submitted by Manoj Chopra Marty Wanielista Ann Marie Mulligan Stormwater Management Academy University of Central Florida Orlando, FL 32816

[9] K. S. B. Prasad, G. Anand 2017 "Experimental study on addition of Red mud and cement kiln dust in Pervious concrete" International Journal of Civil Engineering and Technology (IJCIET), Volume 8, Issue 7, July 2017, pp. 780–788,

[10] K. S. B. Prasad,N.V.L.N. Pavan Kumar, M.Pavan Kumar "Experimental Study On Compression Strength Variation On Low Grade Aggregates In Pervious Concrete" International journal of Civil Engineering and Technology (IJCIET)Vol. No.9, Issue No.10,pp. 1265-1270,October 2018,ISSN No. 0976-6316.

[11] Darshan S.Shah and Jayeskumar pitroda, (2014) An experimental study on Hardened properties of Pervious concrete, Journal of International Academic Research for Multidisciplinary Volume 2