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EFFECT OF MAGNETIZED HARVESTED RAIN WATER ON PROPERTIES OF CEMENT CONCRETE

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Abstract - *Concrete is most widely used man made building material on the planet. Increasing the compressive strength of concrete is an aim which is the most researchers are looking for, in this research, the effect of magnetic water on mechanical and durability of concrete properties such as workability strengths and porosity in the concrete have been study. Also the other strengths and durability properties of concrete were improved by using the magnetic harvested rain water in concrete. For this the water was exposed to magnetic field of 985 Gauss strength, with different magnetic poles. For usage of magnetic water as mixing water in concrete, 24 hours of magnetic field exposure time to water is found to be optimum. The Chemical reaction that takes place between cement and water is called as hydration of cement.*

Key Words: Hydration, Compressive strength, Harvested rain water, Magnetic water.

1. INTRODUCTION

Concrete is most widely used man made building material on the planet and cement is used to make approximately 2.5 tone cover one cubic meters of concrete per person per year. Hydration is the reaction between the silicates and aluminates present in the cement powder with water by which the cement becomes a bonding agent to form a firm and hard mass called the hydrated cement paste. Reaction between the cement particles and the water can take place in two ways, in the first type the direct addition of some water molecules takes place, this is the reaction of hydration and the second type is hydrolysis .(when this hydrated cement paste gets in contact with water shows stability and his hydrated products are very less soluble). The reaction between the cement particles and the water can take place in two ways, in the first type the direct addition of some water molecules takes place, this is the reaction of hydration and the second type is hydrolysis. The strength studies shows that magnetic water concrete also behaves like a normal magnetic concrete developing very high strength at early ages and less strength at later ages. One such technique is using magnetized harvested rain water. For manufacturing of concrete in this technology by passing water through a magnetic field.

1.1 METHODOLOGY

Cement

Locally available 53 grade ordinary Portland cement (OPC) has been used in the present investigation for all concrete mixtures.

Fine Aggregate

In the present investigation, river sand available in the local market was used as fine aggregates. The physical properties of fine aggregate such as gradation.

Coarse Aggregate

In the present investigation, coarse aggregate available in the local market was used as a coarse aggregates the physical properties of coarse aggregate such as gradation.

Water

Water is the important ingredient of concrete as it actively participates in the chemical reaction with cement. Potable water with pH value 7 and magnetized harvested rain water with pH value 7.2 is used for mixing and curing throughout the experiment.

Harvested Rain Water Sampling Location

To identify the sampling points of Bidadi, AIeMS campus for collection of Harvested rain water during the monsoon season. It can be even used for portable consumption. Importantly, it is a free source can be collected in a considerable quantity from roof catchments and other pavement areas which can be used for various purposes.

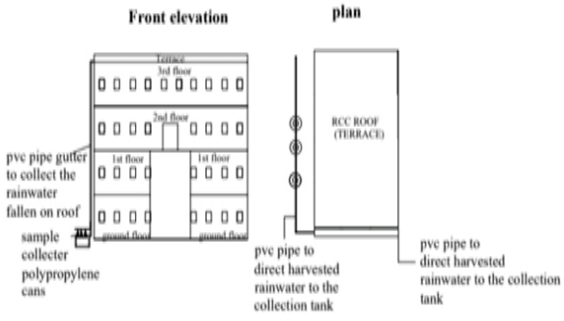

Fig 1: Harvested Rain Water Sampling Location

1.2 MAGNETIC WATER

Magnetic water is prepared by retaining water in a glass beaker over a circular magnet of 985 gauss which is obtained from scientific store. The magnetic water is obtained by placing the beaker filled with water over the magnets for a period of 24 hours. During this time magnetic field

penetrates through the glass into the water, which absorbs the magnetism and this magnetized water is used for making concrete.

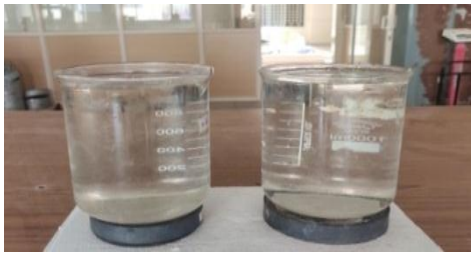

Fig 2- Magnetic Water

2. Experimental Investigation

Mix Proportioning

Mix Proportioning The grade of concrete M25 and M40 is used further proportion of 1:2.31:3.43 and 1:2.56:3.25 respectively. Characteristic compressive strength required at the end of 28 days is 30 N/mm2.

Slump Cone Test

To determine consistency of concrete, with varying water content the concrete mix (M25 and M40) by weight with suitable water/ cement ratio prepared and conducting Slump Test.

Casting of Specimen

Casting of Specimen As the aggregate of size less than 20 mm and greater than 12.5 mm are used, cubes mould of 150x150x150 mm are used. Cylindrical mould of size 150 mm diameter and 300 mm height and beam mould of size 50x10x10cm are used for casting specimen.

Curing of Cubes

The method use for curing in this work is the total immersion of the cubes in water for specific age of 7, 14, and 28 days from the day of casting.

Compressive Strength Test

The compressive strength of concrete is one of the most important properties of concrete. Comparative strength if M30 grade of concrete for the partially replacement of fine aggregate by glass powder and palm kernel shell fiber was found. In this test 150x150x150mm concrete cubes were cast, by using 30 N/mm2concrete. The mixing was done by cubes were remolded and placed under water and cured for 28 days. Then the cubes were tested for their crushing strength at 7 and 28 days.

Split Tensile Strength Test

The test is carried out in a cylindrical specimen of 150mm diameter and 300mm length. The cylindrical specimen is placed horizontally between the loading surface of a compression testing machine and the load is applied until failure of cylinder, along the vertical diameter.

3. RESULT AND DISCUSSIONS

Totally 12 cubes, 6 beams, 6 cylinders were cast. Cylinders were tested for split tensile strength by applying load of 25 tonnes, Beam were tested for four points loading and ultimate load carrying capacity and flexural strength of beam is determined. Compressive strength is determined by cubes. Water curing done for the cubes with 28 days. And next 28 days were exposed to natural atmospheric condition later cube were tested.

Table 1: Harvested Rain Water and Magnetized Rain Water Quality Analysis

SL.NO	PARAMETERS	HARVESTED RAIN WATER	MAGNETIZED RAIN WATER
1	pH	6.8-7	7-7.2
2	TDS mg/l	55-90 mg/l	20-30 mg/l
3	Sulphate mg/l	1.8-2.8 mg/l	1.2-1.5 mg/l
4	Bicarbonate mg/l	40-75 mg/l	30-50mg/l
5	Calcium mg/l	50-85 mg/l	40-70 mg/l
6	Magnesium mg/l	1-2 mg/l	0.5-1 mg/l

Table 2: Compressive Test for M25

SL NO	CONVENTIONAL WATER		HARVESTED RAIN WATER		MAGNETIZED HARVESTED RAIN WATER	
	7 days	28 days	7 days	28 days	7 days	28 days
M25	18.86	25	9.61	25.71	20.1	26.5

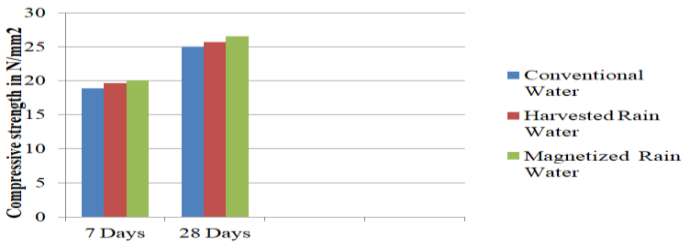

Fig 3: Compressive strength development in CW and HRW and MHRW for M25 grade

Table 3: Compressive Test for M40

SL NO	CONVENTIONAL WATER		HARVESTED RAIN WATER		MAGNETIZED HARVESTED RAIN WATER	
	7 days	28 days	7 days	28 days	7 days	28 days
M40	27	40	27.5	42.3	29	45

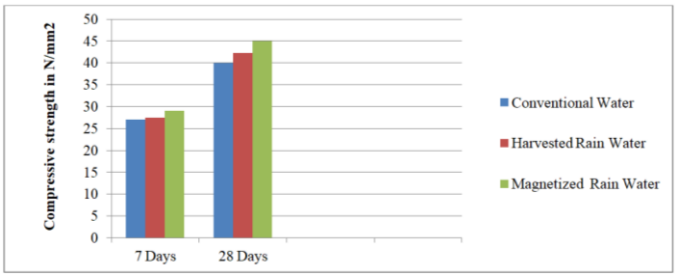

Fig 4: Compressive strength development in CW and HRW and MHRW for M40 grade

Comparing with normal water concrete the strength of magnetized harvested rain water increases the compressive strength up to 14%. The increase in strength of concrete is due to more hydration of cement in magnetized harvested rain water, which fills up the pores in the concrete making the concrete microstructure dense.

Table 4: Flexural Strength Test for M25

Sl.No	Conventional Water		Harvested Rain Water		Magnetized Harvested Rain Water	
	7 days	28 days	7 days	28 days	7 days	28 day
M40	3.6	8.02	4.1	8.71	4.6	9.5

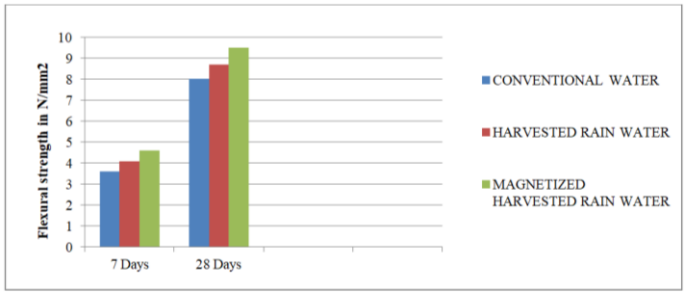

Fig 5: Flexural Strength development in CW and HRW and MHRW for M25 grade

Table 5: Flexural Strength Test for M40

SL. NO	CONVENTIONAL WATER		HARVESTED RAIN WATER		MAGNETIZED HARVESTED RAIN WATER	
	7 Days	28 Days	7 Days	28 Days	7 Days	28 Days
M40	12.2	24.3	12.9	24.8	14.4	26

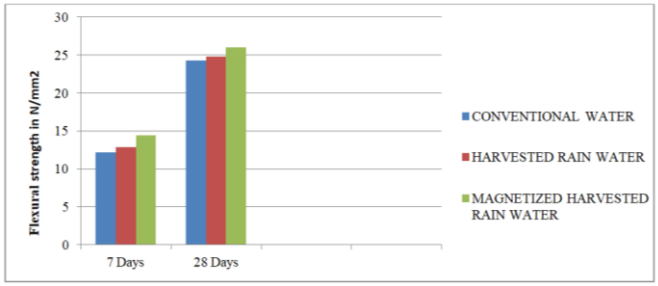

Fig 6: Flexural Strength development in CW and HRW and MHRW for M40 grade

The flexural strength increases is about 21.5% in magnetic water. This increase of flexural strength in magnetized water concrete is due to filling up of voids or pores in concrete with the more products of hydration.

Table 6: Splitting Tensile Strength Test For M25

Sl.No	Conventional Water		Harvested Rain Water		Magnetized Harvested Rain Water	
	7 days	28 days	7 days	28 days	7 days	28 day
M25	3.1	4.2	3.9	4.8	4.6	5.4

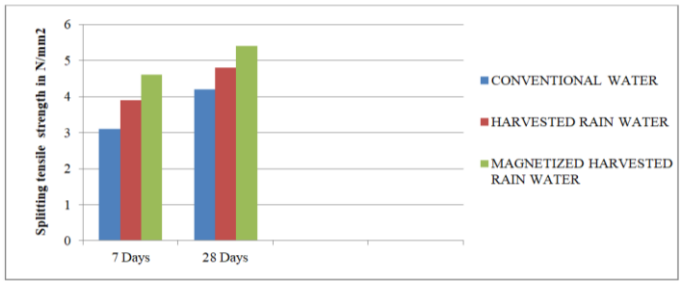

Fig 7: Splitting Tensile Strength development in CW and HRW and MHRW for M25 grade

Table 7: Splitting Tensile Strength Test For M40

Sl.No	Conventional Water		Harvested Rain Water		Magnetized Harvested Rain Water	
	7 days	28 days	7 days	28 days	7 days	28 day
M40	5.2	6.4	5.8	6.9	6.2	7.4

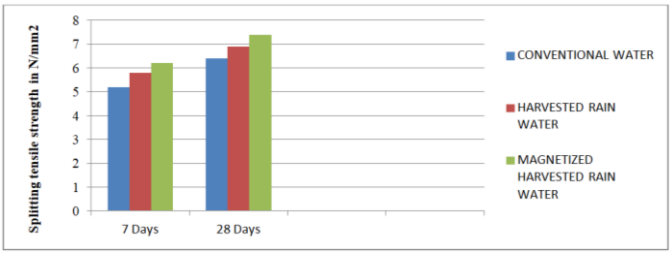

Fig 8: Splitting Tensile Strength development in CW and HRW and MHRW for M40 grade

4. CONCLUSIONS

- The effect of magnetized water on compressive strength of concrete was studied.
- This test was carried out was two different grades of concrete which are M25, M40 for this grades of concrete mixes were prepared by using magnetized harvested rain water, the compressive strength test were carried out for the different grade of concrete it was found out that concrete produced by magnetic technology it is easy to operate without affecting the compressive strength of the concrete.
- In early ages, the increase in compressive strength of concrete prepared with magnetic water was more significant.
- It is included that magnetized harvested rain water will have the higher life span compared to normal water concrete because the magnetized water enhances the hydration which makes the specimen impermeable.

- It increases of flexural strength in magnetized harvested rain water attributes to fill up the voids / pores in concrete with hydrated cement particles.

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