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Effect of Waterproofing (Admixture) on Concrete

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Abstract:- The use of high [1]strength concrete is expected to increase as we move into next [2]century in all areas of world. In recent years there has been a rapid growth of interest in high strength concrete. Concrete is a material used in building construction, consisting of a fine aggregate and a coarse aggregate that is bounded by cement and water with various types of admixtures which are available in market or from the waste materials. A design mix is specified by the designer principally in terms of strength cement content and water cement. Since [3]economical parameters and compressive strength are fundamental properties of concrete in two different stages of production, the correlation between costing parameters and compressive strength has been used instead of using water-cement ratio versus compressive strength relationship. If we maintain the water-cement ratio and by adding various types of admixtures in concrete we can improve the [4]compressive strength of concrete and also get more strength which will be very economical. In the proposed method, the designer is able to estimate parameters like compressive strength and economical costing at the design stage for a given target strength, in addition to [5]ingredients of concrete.

Keywords:- *[1]strength, [2]century, [3]economical, [4]compressive, [5]ingredients.*

I. INTRODUCTION

Ability of solid concrete, without severely impairing the action of topics, makes it an ideal building material for water control, storage and transportation. One of the reasons for the success of concrete was the ease with which structural concrete elements could be formed into different shapes and sizes. This is due to the fact that freshly made concrete displays plastic consistency, which allows the material to flow into prefabricated framework. When the concrete solidifies and hardens to become a strong mass, the framework can be removed for reprocess, once the concrete solidifies post several hours. It is usually the most accessible material on the job. Concrete also showcases the finest properties of waste minimization and long life. Whether cast in place or predefined, the concrete can be used on the necessary basis. Concrete is a durable material, gaining strength over time. Also, reducing the need for maintenance and restructuring, resources are largely protected.

II. NECESSITY OF WATER PROOFING

The purpose of waterproofing is to convert wettable capillaries into non-watertable varieties which will ultimately reduce the penetration of water into the system. Capillary theory and the concept of capillary growth and capillary stress provide the basis for the working of hydrophobic waterproofing materials.

The requirements for water retaining structures are only for dense and durable concrete that withstands a great deal of resistance to hydrostatic pressure without being drained by a solid. Concrete usually contains voids. Cracks are also formed internally due to external loading conditions, stress, internal. Thermal and shrinking stresses and structural movements etc.

III. OBJECTIVES OF THE STUDY

One of the most important requirements of concrete is that it must be impervious to water under two conditions, first, when it is subjected to water pressure on the one hand, and secondly, to absorb surface water by capillary action, which Increases the strength of concrete. Concrete that is carefully designed, well made with good materials, will be water resistant. However, the need for general design, placement, treatment and the various tasks typically performed on the job site are greatly reduced.

The aim of the project is to study the effect of increasing compressive strength and water resistant joints.

IV. MATERIALS AND MIX

The materials used in this investigation are:

- Ordinary Portland cement
- Coarse Aggregate
- Fine Aggregate
- Potable Water
- Admixtures

Physical Properties	Test Values	Requirements as per IS 8112-1987
Initial Setting Time	47 Minutes	Minimum of 30 minutes
Final Setting Time	296 Minutes	Maximum of 600 minutes
Specific gravity	3.15	-
Compressive strength in N/mm^2 at 3 days	23.00	Not less than 22.00
Compressive strength in N/mm^2 at 7 days	34.50	Not less than 33.00
Compressive strength in N/mm^2 at 28 days	43.00	Not less than 43.00

Table 1: Physical Properties of 43 Grade Ordinary Portland Cement

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I.S. Sieve Size	Weight Retained (grams)	Cumulative Weight Retained (grams)	Cumulative Percentage Weight Retained	Cumulative Percentage Weight Passing
10 mm	2	2	0.004	0.996
4.75 mm	6	8	0.016	0.984
2.36 mm	20	28	0.056	0.944
1.18 mm	76	104	0.208	0.792
600 microns	224	328	0.656	0.344
300 microns	114	442	0.884	0.116
150 microns	54	496	0.992	0.008
<150 microns	4	500	1.000	0.000

Table 2: Grading of Fine Aggregate Weight of sample taken 500 g

Remarks: Conforming to Zone II of Table 4 of IS: 383-1970

Physical properties	Values
Specific gravity	2.60
Fineness Modulus	2.83
Water Absorption	0.75%
Free moisture content	0.10%

Table 3: Physical Properties of Fine Aggregate (Tests as per IS: 2386– 1968: Part III)

- **Admixtures**

The following integral waterproofing chemicals are used in accordance with the features and a specification given in IS 2645-1975.

Acrylic copolymer (BENDITO SUPERS + {PLUS}) used for modifying hydraulic mortars, flexible coating waterproofing, cementations coating and laying tiles.

Acrylic copolymer (BENDITO SUPER +) is used externally as a coating on concrete or plaster

Sl. No	Name of the Admixture	Supply Form	Color	pH	Viscosity	Film
1.	Copolymer Based	Liquid	Milky White Emulsions	8.74	3.0 Poise	Clear

Table 4: Physical Properties of Waterproofing Admixtures (BENDITO SUPER +)

V. TESTS ON FRESH CONCRETE

A. WORKABILITY STUDIES

The rheological properties of concrete are very important in functional studies The sag test was performed in accordance with IS: 7320 - 1974. The sag was measured in "millimeters".

B. TESTS ON HARDENED CONCRETE

Normal concrete has very low compressive strength, limited density and low crack resistance. The presence of micro-cracks is responsible for the weakness of ordinary concrete, so the properties and advantages of concrete with sealants are better than those of conventional concrete. The following studies were performed to investigate the characteristics of resistance.

C. COMPRESSIVE STRENGTH

That compression tests on cube were carried out in accordance with the specifications of Indian Standards (IS: 516 - 1959). As a rule, samples are cast in steel or cast in a layer of 150 mm x 150 mm x 150 cast iron. Millimeters, confirming their solid form. Dimensions and simplicity must be within tolerance. After compressing, the upper surface is flush with the edges of the mold and the upper surface is covered with a trowel. The finished surface remains intact for 24 hours. After 24 hours, the sample is safely removed from its mold and submerged in water for a further hardening of 7 with a water / cement ratio of 0.55. For comparison, solid samples were also tested for 7. Similarly for the chemical (mixture) on doses I, II and III, tests were performed for 7 days for grade M20 one day later and for 7 days.

Fig. 1: (Compressive Strength testing machine)

D. PERMEABILITY TESTING IN CONCRETE

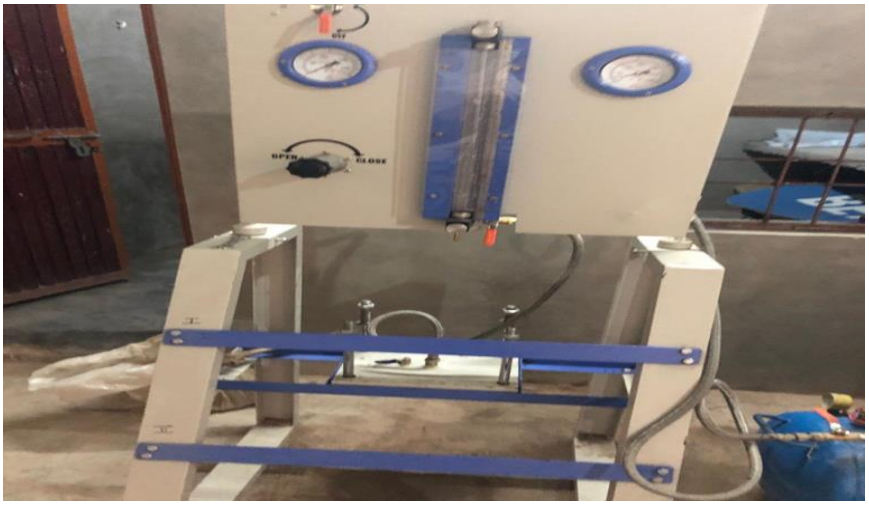

Fig. 2: (Setup of Permeability Unit)

Fig. 3: (Air Compressor)

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E. Experimental set up

The water tank consists of a cylindrical metal pipe with a diameter of 150 mm and a length of 600 mm and the tank contains water volume, compressed air and exhaust valves. It is equipped with two manometers to display the pressure

Water (test pressure) and air pressure inside the bottle are allowed. It is provided with an adjustable valve to maintain the test pressure at constant value. The water tank is connected to the convection cell by means of a small pressure hose. The tank uses clean, dehydrated water.

After 7 days of treatment, the samples were properly placed in a mercury-capable cell. A rubber sheet was taken to be 8 mm thick and 150 mm x 150 mm and a hole of 100 mm x 100 mm was made in the center. This rubber sheet was then placed in the familiar cell on the upper and lower surface of the b. The cover plate was then tightened properly. The rubber sheet acts like a washer and prevents water from leaking through the annulus between the sample and the cell.

After the water tank was completely filled, the required test pressure was applied. At the same time, a hygienic collection bottle was weighed and placed in a position to collect water through the sample. The amount of packing was recorded from time to time. Previously, the rate of water consumption was higher than the rate of output. When the flow rate approaches a steady state, the two currents become equal and the outflow rises and stabilizes. Over time, arrivals and flows generally decrease gradually. The permeability test is continued for about 100 hours after the arrival of the continuous state flow. All outgoing streams will then be taken as a measure of the amount that is measured during this 100 hour period. After 100 hours, the cub was removed from the cell again. If there was any diffusion of water, the amount of wastewater was measured and the K value is calculated using the continuous flow method.

If there was no parameter, that the left was divided, the depth of penetration was measured and the value of K was calculated using the depth of penetration method. Due to the moisture content of the water penetration, the depth of color is obtained by measuring the depth of penetration.

VI. RESULTS

Name of the admixture	**Compressive strength in N/mm^2**					
	Curing period 7 days			**Curing period 28 days**		
	S I	**S II**	**S III**	**S I**	**S II**	**S III**
Polymer based	19.99	22.98	26.45	27.91	29.11	29.30
	21.08	21.98	24.53	27.22	29.40	30.01
	18.87	20.84	24.01	28.52	28.63	30.09
Conventional concrete(CC)	**Trial 1**	**Trial 2**	**Trial 3**	**Trial 1**	**Trial 2**	**Trial 3**
	16.56	16.99	16.49	24.9	24.62	25.11

Table 5: Compressive strength of concrete with and without admixtures

SAMPLE NAME	**Trial 1 N/mm^2**	**Trial 2 N/mm^2**	**Trial 3 N/mm^2**	**Mean N/mm^2**	**Variance of 7 days Compressive strength N/mm^2**			**Standard Deviation**
					Trial 1	Trial 2	Trial 3	
CC	16.56	16.99	16.49	16.68	-0.12	0.31	-0.19	0.27
S I	19.99	21.08	18.87	19.98	0.01	1.10	-1.11	1.11
S II	22.98	21.98	20.84	21.93	1.05	0.05	-1.09	1.07
S III	26.45	24.53	24.01	25.00	1.45	-0.47	-0.99	1.29

Table 6: Statistical analysis of compressive strength values test for 7 days

VII. CONCLUSIONS

Based on this experimental research, important conclusions were drawn as follows: The addition of waterproofing admixtures modifies the workability of the concrete without changing the w / c ratio (i.e. 0.55) and the lubricating actions may be due to the surfactants present in the admixtures. The 2.5time increase in slump values over conventional concrete after addition of the above admixtures indicated that the cohesion of the cement concrete mix increased. It also improves the pumping characteristics of the concrete. Waterproofing is the result of better dispersion of cement particles during mixing. It enhanced mechanical properties, like compression, even after 7 days and 28 days of hydration. Because the increase in strength is more due to adaptation, it is easier to remove the farm work at an early age. Addition of admixture chemical reduces the multiplicity of translucency from 7 to 21% for 7 days and from 12 to 23% for 28 days depending on the dose. This may be due to the reduction of the pores present in the concrete which are better compressed in conjunction with the adaptation. The combination of waterproofing mixtures also enhances the modulus of concrete elasticity at 7 days and 28 days compared. This is due to the dense concrete with fewer pores well obtained by compression which has increased the strength of the concrete. The 28-day modulus of concrete elasticity is checked with a regular equation using a compressive

strength of 28 days. It has been found to be less erroneous when comparing with and without compatibility. The best performance is achieved by adapting to stear in 7 days and 28 days concrete. As waterproofing admixtures improve the properties of concrete in terms of strength and durability, the final product is also suitable for an aggressive environment. The dosage of the mixture is limited to 0.12% to 0.40%. Within this range, increasing the adaptability-to-cement ratio improves the various properties of concrete.

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