A Review Paper on Different Methods to Increase the Strength of Concrete

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Abstract: - The strength of the concrete is very important. It is maintained and affected by many things. Strength can be increased by mixing appropriate material into the concrete, by taking proper water resources, by adding some chemical mixtures, and curing. This paper presents a review on different approaches for increasing the strength of concrete. Curing has important for regaining moisture losses in concrete for doing proper hydration of cement without curing concrete dose not gain its full strength and generate some minor cracks which make concrete weak. Superplasticizer (SP) is important to enhance the workability and setting time of concrete under hot weather. Water quality on the compressive strength properties of concrete using secondary and tertiary waste water treatment source, borehole and distilled water sources.

Key Words: ***Concrete, Curing, Curing method, Water sources, Superplasticizer, compressive strength.***

I. INTRODUCTION

Curing ensures that the mix water is available for cement hydration. A minimum of 80% humidity is required for hydration of cement. The permeability of the surface concrete may increase five to ten folds if concrete is insufficiently cured. High wind and temperature increase the drying of concrete skin. Therefore, the recommendations i.e., minimizing the rate of water evaporation, such as lowering concreting temperature, increasing the humidity by water spraying, and erecting wind barriers, should be adopted. The protection of concrete against corrosion of steel, which is mainly due to the ingress of chloride ions, is greatly decreased with an increase in the period of curing. Curing becomes even more important if it contains supplementary cementing materials, such as fly ash, ground granulated blast furnace slag, or silica fume, and it is subjected to hot and dry environments immediately after placement and consolidation.

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However, concretes moist cured for only two days exhibited significant improvement in strength and other characteristics, as compared with concrete without any curing. Concrete is mostly cured by covering it with wet burlap. The most effective method of curing is to keep the exposed concrete surfaces continuously moist by pounding or spraying with water. In this method, the concrete is kept fully saturated during the period, the ideal condition for strength development and hydration of cement. Another curing method is to cover the surface with an impermeable sheet, such as polyethylene. Curing is the maintenance of a satisfactory moisture content and temperature in concrete for a period of time immediately following placing and finishing so that the desired properties may develop. The need for adequate curing of concrete cannot be overemphasized. Curing has a strong influence on the properties of hardened concrete; proper curing will increase durability, strength, water-tightness, abrasion resistance, volume stability, and resistance to freezing and thawing and deicers. Exposed slab surfaces are especially sensitive to curing as strength development and freeze-thaw resistance of the top surface of a slab can be reduced significantly when curing is defective. Curing methods may be divided broadly into four categories: (1) Water curing a) Immersion b) Pounding c) Spraying or Fogging d) Wet covering (2) Application of heat a) Steam curing at ordinary pressure. b) Steam curing at high pressure c) Curing by Infra-red radiation d) Electrical curing. (3) Membrane curing a) Using polyphone sheets (4)

Miscellaneous Water Curing a) curing by Calcium chloride, b) Moist Sand Curing c) Air Curing. (Amit Kumar Dewangan, Dr. Lokesh Singh, Virat Kantode, Pritam Verma,2019).

II. LITERATURE SURVEY

The influence of super plasticizer is considerable on concrete. The adverse effects of elevated temperatures are more on concreate. Superplasticizer (SP) is important to enhance the workability and setting time of concrete under hot weather. The properties such as compressive strength, porosity. water absorption, permeability and initial surface absorption were determined. besides determining the workability and setting time of the fresh concrete. Over dosage of SP were found to deteriorate the properties of concrete with indication of lower compressive strength and higher porosity. Increase in admixture dosage might help to enhance the concrete characteristics. Using different doses of superplasticizer were formed. To conclude this, the following conclusions are offered- a) Setting time is enhanced when superplasticizer is added to the concrete. b) Compressive strength is improved by superplasticizer for all ages compared with control. c) Water absorption and porosity reduces when dosage of superplasticizer increases. However, beyond the optimum dosage, water absorption/ porosity increases with increase of superplasticizer dosage. d) Permeability presents similar trend as water absorption/ porosity does, increase in dosage will increase the permeability, when the dosage exceeds. optimum value. e) Initial surface absorption test indicates that inclusion of superplasticizer able to reduce the flow due to lower porosity. Any dosage that beyond the optimum value, not only cannot improve the pore structure of concrete, on the other hand, increases the flow by producing less dense concrete. (Muhsen Salam Mohammed, Salahaldein Alsadey Mohamed, Megat Azmi Megat Johari, 2016).

To use the fly ash in concrete, cement is replaced partially by fly ash in concrete. In this experimental work concrete mix prepared with replacement of fly ash by 0%, 25%, 50%, 75% and 100%. Effect of fly ash on workability, setting time, compressive strength and water content are studied as well as the properties of concrete. To conclude this study with saying that, the cement replacement by fly ash is useful in lower grades of cement such as M20. It can be stated that at 25% of replacement of cement by fly ash there is considerable increase in strength properties. Incorporation of fly ash in concrete can save the coal and thermal industry disposal cost and produce a “greener” concrete for construction. With the use of mineral admixture, the cost is considerably reduced due to no use of mechanical vibrators plus viscosity modifying admixtures also avoided. The strength of concrete decreases with increases in percentage of fly ash first and again increases as the percentage of fly ash increases. (Khushal Chandra Kesharwani, Amit Kumar Biswas, Anesh Chaurasiya, Ahsan Rabbani, 2017).

A concrete may differ by base of plasticizers used. The set of concrete contained four concrete recipes manufactured as traditional vibrated concrete containing identical basic components of concrete. The experiment conducted which is focused on monitoring the resulting properties of hardened concrete, specifically the primary strength and modulus of the concrete elasticity. Two types of concretes with different plasticizers were studied. Relatively constant values of compressive strengths and static moduli of elasticity were registered. 1. From the obtained results it is possible to accept the preposition based on assumption of increasing moduli of elasticity depending on growing compressive strength. 2. In the compressive strength setting phase the values were in average by 8.5 MPa higher with concretes containing superplasticizer. The same trend was found also with values of modulus of elasticity development when they got moduli by approx. 2.0 GPa higher at all monitoring periods. 3. Comparison of static moduli of elasticity of all concrete formulas showed the trend of higher value with concretes containing superplasticizer. 4. Reduction of water cement ratio showed as suitable for increase of modulus of elasticity. A simple conclusion of this study is that, it is reasonable to apply highly efficient superplasticizer which together with increase of compressive strength may also increase the modulus of elasticity to certain extent. Lower amount of mixing water may reduce the risk of decrease of modulus of elasticity. (Klara Krizova, Petr Novosad,2015).

The results of the research described in this paper reveal that aggregates can play an important role in the cement content of concrete mixtures. Specifically, the following conclusions can be assumed: Aggregate type shows effect on the compressive strength of normal concrete. It is clear from the above investigation, that, Poor Graded and Light weight and Pours Aggregate give Poor compressive strength. The fine aggregate is normal sand obtained from a locally area. The various tests performed like sieve analysis, bulk density, and specific gravity. ASTM mix design was adopted for the work and mix compositions were calculated by absolute volume method. Test result shows that concrete made from a type aggregate has higher compressive strength. The method concluded that the 1) Aggregate type shows effect on the compressive strength of

normal concrete. 2) It is clear that, Poor Graded and Light weight and Pours Aggregate give Poor compressive strength. (Mushtaque Ahmed Pathan, Rafique Ahmed, Maryam Maira, 2019).

Described the influence of mixing-water quality on the compressive strength properties of concrete using secondary and tertiary waste water treatment source, borehole and distilled water sources. Simple criteria for water quality assessment for concrete works involves the impression that once it is fit for consumption or drinking, but it's not true. Statistical comparative-analysis techniques are required to evaluate the effects of water from control or referenced source of absolute quality with those of questionable quality so as to validate its usage for concrete works. The physiochemical characteristics of the water samples were ascertained before they were utilized for the concrete production and the setting time characteristics were derived, showing longer setting time results SWWT and TWWT due to high level of COD compared to DW and BW. Statistical evaluation carried out on the experimental data using ANOVA and Dunnet post-hoc test to validate the experimental findings and the details derived from the computations explains the importance of ascertaining the quality of water used for concrete production so as to achieve better overall concrete performance in terms of mechanical and durability properties. Conclusions can be drawn like 1. The concrete strength increases with prolonged period of hydration which was observed from the experimental results and the increment gets higher after the initial of days of curing. This is due to the rate of formation of cementitious products. As a result, the compressive strength continues to increase with prolonged hydration period. 2. Water quality used for mixing and curing of the concrete had significant effect on the strength development, setting time and its overall performance. A distilled water mixed concrete which contains very little or insignificant level of impurity in it performs better than concrete produced with borehole water and wastewater treated sources. This is due to the presence of impurities in the form of dissolved salts, oil or grease which retards the hydration reaction and in turn reduces the compressive strength of the concrete. 3. The water sources evaluated in this study were characterized in the laboratory to ascertain their physicochemical properties and the level of concentration of impurities before mixing with the cement and from the result, the waste water treatment sources possessed higher level of impurities compared to borehole water with the distilled water possessing little or no impurity concentrations. 4. The concrete mixture ingredients were perfectly designed for M20 concrete using Indian code specifications to provide the appropriate ratios for the constituents in accordance with the required slump and exposure condition. The outcome of the design mix was utilized for the mixing of the concrete after which the fresh concrete was then placed in the cube mould, compacted and vibrated adequately to eject air bubbles. 5. The results obtained from this research study indicates the negative impact of poor water quality in the compressive strength property of concrete and helps to enlighten engineers and professionals in the construction industries the importance of evaluating the quality of water used for concrete production. (Ikpa, C.C., Alaneme, G.U., Mbadike, E.M. , Nnadi, E. , Chigbo, I.C., Abel, C., Udousoro, I.M. & Odum, L.O.).

III. CONCLUSION

Strength of the concrete is very important. In this review paper we tried to presents a review on different approaches for increasing the strength of concrete. Curing is the process of maintaining water content in cement for completing the hydration process. If curing is not done properly than concrete is not gaining proper strength and cracks may be developed. Increase in admixture (i.e., super plasticizer) dosage might help to enhance the concrete characteristics. Any dosage that beyond the optimum value, not only cannot improve the pore structure of concrete, on the other hand, increases the flow by producing less dense concrete. With the use of mineral admixture i.e., fly ash the cost is considerably reduced in lower grade of cements which increase the strength. Mixing-water quality increases compressive strength properties. It is clear from the above reviews that to increase the strength of concrete it is necessary to use all the approaches like mixing the eco-friendly material, proper water resources and adequate amount of chemical (super plasticizer).

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