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Study of Different Admixtures and their Effects on Concrete

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Abstract: ***In newborn decennary, enormous success has been achieved in the advancement of chemical admixtures for cement concrete. Many efforts have been made on improving the property of concrete so that it can be strongly economical. This approach has resulted in construction cost reduction and universally accepted ready- made remedes for unexpected problems during construction . The behaviour of Plasticizers, Super plasticizers, Retarders, Accelerators supplement is studied.***
Keywords: Admixtures, Plasticizers, Super plasticizers, Retarders, Accelerator.

I. INTRODUCTION

Materials scientists , Chemist , Engineers and Manufacturers , Technical representatives have helped the concrete industry to improve our ability to control work times, workability, strength, and durability of cement concrete by adding some supplementary substances named Admixtures. Admixtures is defined as a material other than cement, water and aggregates that is used as an ingredient of concrete and is added to the batch immediately before or during mixing. These days concrete is being used for wide varieties of purposes to make it suitable in different conditions. In this condition ordinary concrete may fail to exhibit the required quality performance or durability. I n such cases admixtures is used to modify the properties of ordinary concrete so as to make it more suitable for any situation . Until about 1930 additives and admixtures though used, were not considered an important part of concrete technology. Since then, there has the use of admixtures and additives is being frowned upon or scorned by some technologists, there are many of the contrary, who highly commend and foster the use and development of admixtures as it imparts many desirable characteristics and effect economy in concrete construction. It should be remembered , however, that admixtures are no substitute for good concreting practices.

II. ADMIXTURES AND THEIR TYPES

A. History of Admixtures

It is as old as the history of concrete. It embraces a very vast field. But a few type of admixture called water reduces or High Range Water Reduces, generally referred as plasticizers & super plasticizers, are of recent interest. They are specifically developed in Japan and Germany around 1970. Later on they were made popular in USA and Europe even in Middle East and Far East.The use of plasticizers & superplasticizers have not become popular in India till (1985).

B. To better Understand the Admixtures Few of them are Reviewed below

1) *Plasticizers*: Plasticizers were commonly known as Water Reducers. These can help the difficult condition for obtaining higher workability without using excess of water. The practice of using plasticizers for almost all the reinforced concrete and even for mass concrete to reduce the water requirement for making concrete of higher workability or flowing concrete. These are used in the amount of 0.1% to 0.4% by weight of cement. At these doses, at constant workability the reduction in mixing water is expected to be of the order of 5% to 15%. This naturally increases the strength.
2) *Superplasticizers or sometimes (High Range Water Reducers).* These are the improved version of plasticizers and are chemically different from normal plasticizers .Use of this permit the reduction of water to the extent upto 30% without reducing workability as reduction up to 15% in case of plasticizers. These were developed for use where the amount of water reducer admixtures required to reach a desired slump or flow resulted in unacceptable reductions of other critical properties.

High range water reducers are classified as: Sulphonated Malanie formaldehyde condensater (SMF) , Sulphonated naphthalene formaldehyde condensates (SNF), Modified lignosulphonate (MLS) , other types which may include sulfonic acid esters or carbohydrates esters (carboxylates). Superplasticizers deflocculate the cement particles in a similar manner but much more efficient than conventional water reducer admixture.

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3) *Retarder:* Retarder is an admixture that slows down the chemical process of hydration so that concrete remains plastic and workable for a longer time than concrete without the retarder. These are used to the accelerating effects of overtake high temperature on setting properties of concrete in hot weather concreting. The most commonly used retarder is Calcium Sulphate. In addition to gypsum there are number of other materials found to be suitable for this purpose.

They are: Starches, Cellulose products, Sugar, acids or salts of acids. Other additives which has been successfully used as retarders are Ligno Sulphonic acids their salts, hydroxylated Carboxylic acids and their salts. They also increase 28 strength by 10 to 20%.

4) *Accelerators:* Accelerating admixtures are added to concrete to increases the rate of early strength development of concrete. In past decades commonly used material as accelerator was Calcium Chloride but it is not in use. Inspite, of some soluble carbonates, silicates flurosilicates and some of the organic compounds such as triethenolamine are used. In the recent studies done by our chemists, researchers, engineers and designers. Calcium Chloride is harmful for reinforced concrete. It may be used for plain cement concrete in comparatively high dose. The accelerating materials added to plasticizers or superplasticizers are triethenolamine chlorides, Calcium nutrite, nitrates and flousilicates etc.

5) *Air- Entraining Admixtures:* Since 1930 there has been an ever increasing use of air entrained concrete all over the world especially in the United States and Canada. These are made by mixing a small quantity of air entraining agent or by using air entraining cement. These air entraining agents incorporate millions of non-coalescing air bubbles, which will act as flexible bull bearing and will modifies the properties of hardened concrete regarding its resistance to frost action and permeability.

Natural wood resins , Animal and vegetable fats and oils, and such as tallow, olive oil and their fatty acids such as steric and obic acids, various wetting agents such as alkali silica or sulphated and animal and vegetable fatty acids ,Miscellaneous materials such as the Sodium salts of petroleum Sulphonic acids, hydrogen peroxide and aluminium powder are the types of air entraining agents used for making air entrained concrete.

III. CONCLUSIONS

A. Adding 1-2% plasticizers per unit weight of cement is sufficient. Excessive adding leads to excessive segregation of concrete. Depending on the particals chemical Used ,use of too much plasticizers results in retarding effect .

B. The workability of concrete can be increases by addition of superplasticizers and retarders . However very high dosages of both admixtures tends to impair the cohesiveness of concrete.

C. Compressive strength is improved by SP for all ages. On the other hand , retarders present lower compressive strength compared with control at early age, even kits ultimate strength is higher than the desired characteristics strength.

D. The workability and compressive strength of concrete increases with the use of super plasticizers.

E. Plasticizers are used in the amount 0.1% to 0.4% by weight of cement . At these dosage reduction in mixing water is expected to be 5% to 15% which increases the strength.

F. Superplasticizers produce a homogeneous cohesive concete generally without And tendency for segregation and bleeding.

G. Retarding agents like Ligno Sulphonic acids and their salts, Hydroxylated Carboxyic acids and their salts with addition to reatarding effect also increases 28 days compressive strength by 10 to20%.

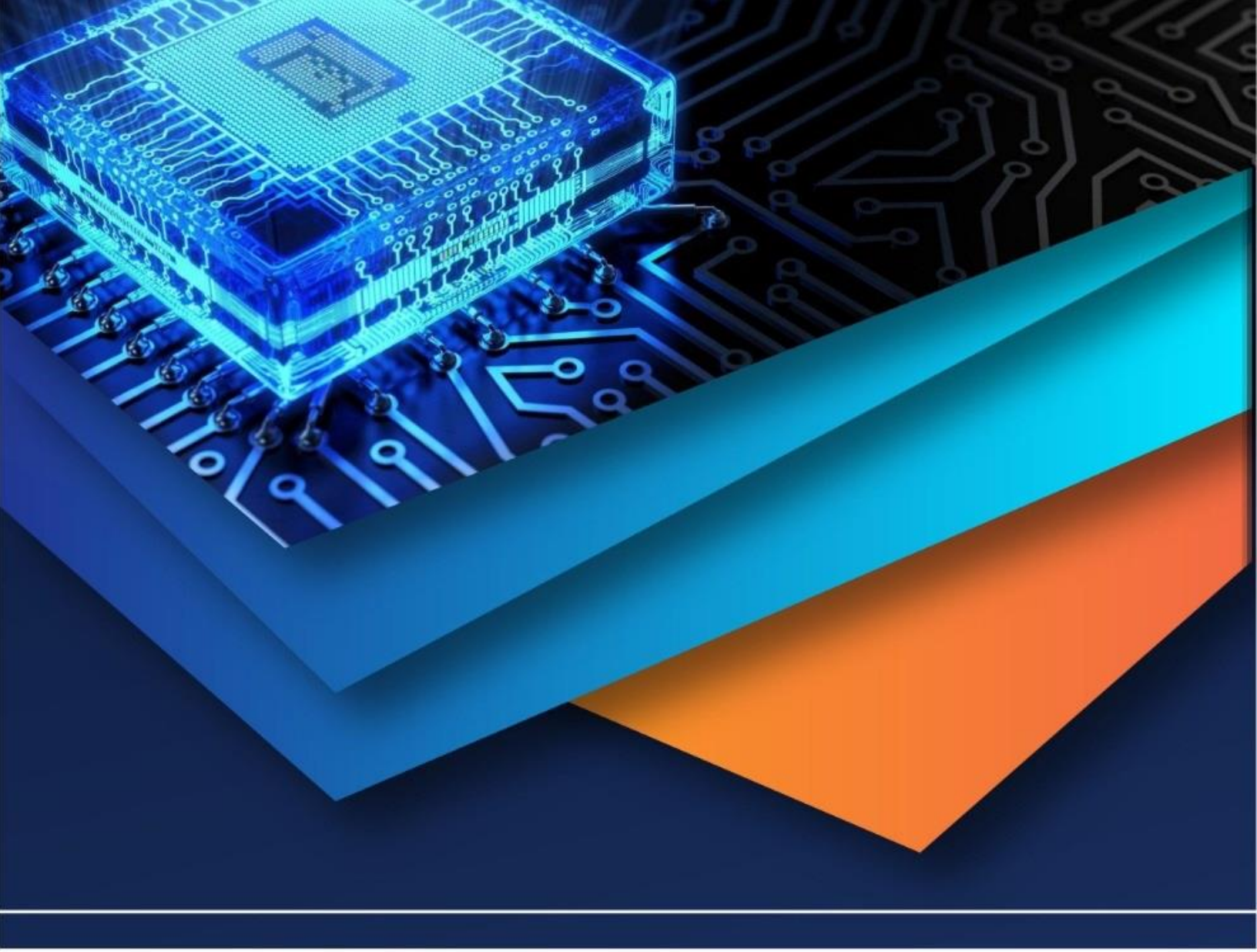
H. Calcium Chloride is harmful for reinforced concrete but can be used in plain concrete.

I. Air-entraining admixtures increases the resistance to chemical attack improves placeability , early finishing and reduction in strength.

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