

Factors Involved in the Assessment of Durability of Concrete

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Abstract-In this study, the factors involved for accessing the durability of the concrete structures, now the day's construction field has grown up with lots of advancement of techniques & technologies. We are making structures touching the height of the sky as well as achieved the success to build the structures beneath the ground. While constructing these structures, the durability of the structure is an important phenomenon that we have to keep in mind while adopting the construction method. We should have to be aware of the Structure's durability or the life of the structure, some important parameters to be considered before its construction that the structure should be ecofriendly, economic & durable, So many researches were done on the durability of concrete structures, SEM testing is one of the methods to get any information about the deterioration stage in a particular structure as it provides us the information of pore structures of the concrete specimen in image form which is helpful for us to study the necessary details of structures durability.

Keywords- Durability, Water Absorption, Soeptivity, Compressive Strength.

I. INTRODUCTION

Over the last few years, civil engineering is focusing more upon the serviceability of the structures which is directly proportional to the term Durability. It is very necessary to access the factors affecting the durability of concrete structures at the time of construction by doing Assessments like material used, mix used during construction, environmental condition, etc.

The durability of concrete is defined by different test methods like OPI, Sulfate attack, chloride penetration, Electrical Resistivity, Water Sorptivity, carbonation, etc. Concrete structures are the porous structure and if any kind of fluid flows through the concrete layer it will decrease its life as the fluid contains some kind of acid or base substance which when comes in contact with the concrete layer reacts and make federal salt which gets deposit at the surface and slowly gets expand till the structure got deteriorate or damaged.

Permeability is the parameter through which we can know the amount of fluid penetration within the concrete layer as Concrete contains pores that can allow these substances to enter or depart whether the Sorptivity is the measurement of the rate of absorption

II. DISCUSSION

S.P. Zhang, The durability of the concrete structures depends on the water absorption, this research paper is based on the different types of the chemical attack which affects the concrete structure by penetrating the concrete layer as they are contained by the fluid flowing which gets

in touch with the structure (either in submerged condition or by flowing through the concrete surfaces exposed to water), it guides that there is a difference between surface water absorption and internal water absorption as the value of surface water absorption is high in comparison with internal water absorption and there is no relationship between internal water absorption and strength of the concrete. Absorption and strength do not correlate them whereas, it helps to determine the effect of sulfate attack, chloride ion diffusion, and permeability of concrete.

Alen Sikacova, Based on this particular research paper we got to know that water absorption is the main parameter that affects the durability of concrete. According to this if the building mix contains the finer particle as a filler material then as a result finer material or small size aggregate particle have lower water absorption than the larger aggregate size, In their research, they had used glass powder and brick powder as a substitute filler material and concrete powder, among all these concrete powder, provides the positive result in reference with the glass powder or brick power whereas curing time effects the durability of time.

Maa Nu Nagyuen, The Durability index for quality classification of Cover concrete plays an important role in the durability of concrete, the outer layer, or we can say the first layer of the concrete structure. Structures remaining in the water having pores that come in contact with the fluid affecting the cover concrete and reinforcement, so this paper provides the information of water ingress into the structure with the help of water spraying index test and others tests. Amount of water that penetrates the first layer defines the durability related to it

because the penetration of water shows the pore and permeation study about the structure. Several test methods are used to determine the water absorption & this directly results in the durability of structure quality, through the total amount of sprayed water index (rN) "repetition number of water spraying (rW)" index, and the coefficient of air permeability (kT).

Yong Yi, The durability of marine structures is a great challenge in civil engineering work as it is found that have less life in comparison with their design period due to chemical attacks and wave effects. It has been seen that porosity and durability are based on the type of binding material used and aggregate in this paper it has been known to us that the structure built in the year 1943 with the cover concrete of 25 mm thickness is having higher strength whether the structure built up in 1968 and 1993 with more cover concrete are deteriorating it is also found that seawater has almost same ions whereas contained different amount of salinity. The penetration occurs in three layers within the concrete components: a thin layer of magnesium (generally less than 1 mm) on the surface of the concrete, a sulfate-rich layer (several millimeters of thickness) in the outer layer and a relatively wide chloride-rich layer extends to the inner of the concrete.

Jemimah Carmichael, Study of sorptivity and compressive strength of concrete with nano size cement material, in this paper author, has replaced the cement concrete with the nano sized cementitious material or fly ash in some percentage and as a result the quantity of nano sized material is increased in the cement concrete it increases the properties of concrete ie. work ability and provides good strength, it also lowers the material cost and lower the permeability of concrete structure, and have less sorptivity and water absorption.

Hailong Yi, In this research paper the author has given two different types of study Series A & Series B. In series A, the study is done of the capillary action of concrete with the addition of SCMS in the different-different curing condition and in Series B the author has performed the concrete durability analysis focusing on chloride penetration, and has used gravimetric method and Electronic method for the capillary test and chloride penetration analysis.

The curing Condition which has been considered in this paper is based on three different regimes:

- Regime I: sample will be soaked in 20°C considering the environment of harbor structure or partially tidal zone.
- Regime II: Sample curing was done by covering the stack of humidity sponges 20°C & RH 95%, as in some of the construction sites uses gunny bags for the curing purpose.
- Regime III: Sample curing is done at the temperature of 40°C - 48°C & RH 25-43% with the airflow of 1.67-1.75m/sec, the naturally inappropriate curing condition of concrete which is available on most of the sites.

The author concluded that incorporation of SCM'S can reduce sorptivity when the concrete specimen has been cured in, sufficient moisture condition, the electronic method shows that the sorptivity consistently decreases as NaCl concentration increases.

Suresh Thokchom, In this paper, the author has introduced the Geopolymer mortar basically of waste materials and fly ash and in his study, he concluded that the Geopolymer mortar with OPC binder performance better as it gives early high strength and has a resistance against the sulfur attack and acid attacks, by his practical approach we got to know that the specimen casted considering the Geopolymer as they are having low water absorption and low sorptivity value and have higher residual strength.

Davood Mostofinejad, Through this paper, the author concluded the result of the durability index for different concentrations of magnesium sulfate in the water and their compressive strength. The durability of 36 concrete mix designs was investigated in three sulfate environments at different intervals of 140, 210 & 280 days, Durability of the concrete was compared using a proposed durability index. Replacing 10% cement with micro-silica reduced the durability in magnesium sulfate Replacing 15% cement with limestone powder increased the durability of concrete. The 5% magnesium sulfate solution was the most deteriorating environment. The High durability (HD) concretes with DI between 500 and 750, average durability (AD) concretes with DI between 250 and 500, and low durability (LD) concretes with DI of less than 250. Based on the durability index (DI) proposed in this study, it was specified that the most durable concrete in all three magnesium sulfate environments has the lowest water cement ratio.

Mohammad Sheikh Hassani, According to this paper, the author has derived the conclusion for manufacturing the concrete sample through the sewage water and portable water and comparison in compressive strength is done for both the conditions and concluded that concrete specimen manufactured by sewage having low compressive strength with a minimum number of freeze and thaw cycle as it demonstrated many pores in the sample which also increases the permeability as compared with the portable water.

Muazzam Ghous Sohail, In this literature author has done the study for some parameters of durability and comparison study of NSC Normal Strength Concrete) HSC (High Strength Concrete) & UHPC (Ultra-High-Performance Concrete) which employs high cement content and SCM's, according to this comparative study we found that the UHPC is more efficient in every parameter like electrical resistivity, porosity, sorptivity, chloride penetration, and in the case of UHPC there was

no carbonation penetration after 6 months of exposure to a 50% CO₂ environment.

Nazanin Alaghebandian, In this research, the paper author has expressed his views on the durability of self-compacting concrete and mortar blended with Silica Fumes, Natural Zeolite, a form of limestone powder that behaves like a marine environment, and assessment of durability is done in different exposure as tidal, splash and submerged environment, according to author the natural zeolite reduced the blend's conductivity and free chloride ions penetrability by using NZ with SF can be considered beneficial to Regarding porosity and properties, in all conditions, the performance of self-consolidating mortars was better than vibrated types the deterioration was more in splash conditions samples followed by tidal and submerged conditioned samples.

M. Papachristoforou, In this paper, the author has investigated the performance of concrete with Electric Arc Furnace (EAF) steel slag as coarse aggregate and steel fiber reinforcement. EAF slag was tested for suitability as concrete aggregate regarding chemical properties, granulometry, apparent specific density, water absorption, and flakiness index. Test concrete mixtures were prepared with EAF slag as coarse aggregate with either no reinforcement or with 30 mm or 60 mm steel fibers at a volume ratio of 0.7%. results show that although EAF slag aggregates tend to form micro-cracks at temperatures higher than 600 C and the rate of strength loss is increased, there is a reduced risk of spalling, fibers do not improve the compressive strength of they have been reported to improve flexural strength and post cracking behavior, increasing the toughness of concrete.

III. RESULTS

This review article describes the parameters which can affect the durability of concrete components in different situations or in different environmental condition & also defines the advantages and disadvantages in reference with the durability of concrete components in different exposures by using various methods and techniques.

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