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Application of Concrete

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Abstract

Conventional cement concrete has a long way in the journey of building materials of about 30 decades has served number of applications. Depending up on the application of concrete, the mix proportion, admixture and mode of transport varies. Let us discuses about various application of concrete in this paper.

Keywords: *Light weight aggregate, Chemical admixtures, Super plastizer, Fiber reinforcement*

INTRODUCTION

Cement concrete is considered as a very old material in modern building industry being used depending upon the application where it used, conventional cement concrete suffers a serious deflects on the application in some place . Thus attempts to overcome these deficiencies new modern concrete technology found various types of concrete using various admixtures. Let us discuss some of the most common concretes used in the field of construction industry

STRUCTURAL LIGHT WEIGHT CONCRETE

According to ACI 213R-87, light weight concrete is define as the concrete having 28 day compressive strength in excess of 17 Mpa. And having unit weight not exceeding 18.5N/mm3

This lower unit weight is due to the use of light weight aggregate or a combination of both normal and light weight aggregate. But with a standard practical workability issues,

light weight concretes are made with normal fine aggregate and light weight aggregate of maximum 19mm. Due to lower density, rough texture and porous nature of aggregate a saviour attention on workability should be taken even a value of 50-75mm slump is ok, for a normal concrete of 100-125mm slump comparatively.

Floating of coarse aggregate is a main criteria to be rectified due to high slump and vibrator use in light weight concrete. Thus causes a separation of mortar with coarse aggregate and loss in homogeneity and can be rectified by batching the aggregate in damp condition.

Though the aggregate has porous permeability of concrete is low, as it acts as air entered concrete and is durable.

The application of these structural light weight concrete lies in the lower overall cost of structure by reducing the self weight of structure and thus in turn reduces the foundation cost. In light weight concrete bridges there is a possibility of reduction of steel for reinforcement especially is high rise buildings.

HIGH STRENGTH CONCRETE

For the last 4 decades there is a huge demand on high range water reducing admixtures called superplasticizer consist of salts of naphthalene sulfonate or mellanine sulfonate or mellanine sulfonate results in reducing water cement ratio ultimately increases the strength.

Until 1970's 40 Mpa concretes are considered as high strength later 60 to 120 Mpa concretes are available commertially. Thus ACI (American concrete instrate) in 2002 said concrete with design strength 55Mpa or more as high strength concrete.

These concrete results in choosing RCC as stable material rather than steel for high rise building. The crowding of columns are also reduced in bottom floors in high rise buildings.

Autogenous shrinkage is the most common problem in high strength concrete, which is define japan concrete instrute as "A macroscopic volume reduction of cement asious materials when cement hydrates after initial setting " which has to be taken care on account of high strength concrete.

SELF CONSOLIDATION CONCRETE

It is define as the concrete that can be cast into a place without use of vibrators to form a product free of honeycombs and hug holes. It is commertially called self compacting concrete, self consolidating concrete self levelling concrete or rheoplastic concrete.

These concrete comes to play in action when the material segregation in concrete especially great in heavily reinforced structures or with excessive use of vibrators during construction result in stability issues

Anti washout chemical admixtures, viscosity modifying admixtures contain hydrolysed starches and biopolymer such as welum gum. Which result in high viscous self compacting nature of concrete. The application of these type of concrete in the high dense reinforced structures, under water construction, precast units and conjugated area.

HIGH- PERFORMANCE CONCRETE

The concrete possess following three property considered as high performance concrete,

i) high workability
ii) high strength and
iii) high durability

As per ACI, It is define as " a concrete meeting special combination of performance and uniformity requirement that cannot always achieved using conventional mixing, placing and curing practices" But FMWA (U.S Federal highway Administration) State first. Brings the high durable than high strength. Second use of local material in term of economy is being highlighted.

It's application lies in the place where durable high strength are needed. Highly loaded structure in a extreme enlist

SHRINKAGE COMPENSATING CONCRETE

It is define by ACI expansible concrete which concrete which when properly restrained by reinforcement of other mean will expand amount equal to or slightly higher than anticipated drying shrinkage.

In these concrete, Type k cement hydrate large amount of ettringite are formed. When it start set it starts bond with reinforcement and also start expansion. When expose to dry condition, it will start shrink like normal Portland cement concrete, however shrinkage first relieve pre-compression then

tension in concrete due to drying shrinkage is thus reduced.

In general concrete structure releases cracks to relieve tensile stress due to drying shrinkage . This is due to the fact that C-S-H gel formed as a main component of cement hydration undergoes drying which causes shrinkage .This can be satisfied using this expansive concrete.

These type of concrete has its application in water retaining structures where cracks are not allowed, and other application such as parking structures, runway, storage structures and more. Thus the cost of K-cement has been tallied by reduction in reinforcement.

FIBER-REINFORCED CONCRETE

In this concrete fibers are added to the mortar or concrete to increase the tensile strength of concrete. This can be achieved by using any type of fibers like glace, steel, plastic, or natural fibre materials.

As the concrete itself contain micro cracks binder loading get interconnected and forms a macrocracks. This can be reduced by introducing random fibres in the concrete resulting in increased tensile as well as flextural strength of concrete . Advancement in fibre reinforcement concrete results in compact reinforced composites (crc), reactive powder concrete(Rpc), slurry infilitrated fibered concrete (sifcon), Engineered cementitious composites multiscale scale fiber reinforced concrete (MSFRC)

POLYMERS IN CONCRETE

Based on the use of polymer concrete may be

i) polymer concrete
ii) Latex-modified concrete and
iii) polymer impregnated concrete

Polymer concrete

It is a mixture of aggregate with a polymer as binder. The polymer binder may be methyl methacrylate with benzoyl peroxide or epoxy resin.

These concrete are well known for chemical resistant, high modulus &Initial strength so mainly used in industrial and repair works. It has a very high thermal and electrical resistant so used in transmission lines.

LATEX- MODIFIED CONCRETE

Latex are colloidal polymer added to water to make latex modified concrete. Elastomeric or rubber like polymer made from styrenebutadiene and polyacrylate copolymers are more commonly used as latex. Dry curing is mandatory as internal moisture loss due to hydration of cement. It mostly used in the rehabitation works of floor pavements and decks

POLYMER-IMPREGNATED CONCRETE

This is a procedure of eliminating voids and cracks in existing concrete using polymer, Important of these concrete is the processes of polymerisation of polymer in any one of following three method

i) Promoter and catalyst added to monomer but is slow in room temperature.

ii) Gama radiation induces polymerisation but health hazadards made it un-favourable in practice.

iii) Use heat of concrete to 90 degree c polymerisation occur

HEAVY WEIGHT CONCRETE

This concrete is produced by using heavy weight aggregates. The unit weight of concrete ranges from 33.60 to 38.40 KN/m3. This ranges about 50% higher than the conventional concrete using normal aggregates.

The biological shields are use to protect aganist neutron, X ray and gamma rays from power house , nuclear plant atomic research institute . These shield can be made with different materials, heavy weight concrete provides a better resistant and economical comparitevely.

Segregation of coarse aggregate due to high density is one of the major issues in heavy weight concrete. Aggregate may be forate ore, magnetite barite ilmeniate posses high density and are used for heavy weight concrete.

MASS CONCRETE

ACI Committee 116 has defined mass concrete as massive structure which needs to consider the generation of heat and subsequent volume change. Even in normal beam and wall construction of several mortar thick and are made of high strength concrete heat of hydration prevails.

The procedure of post cooling, pre-cooling and surface insulation are most important in mass concrete most of the mass concrete used in dam has result in increase of 50 degree c at massive dam base is to be reduced by using low heat cement concrete.

CONCLUSION

Advancement in concrete technology as a result of increasing demand in construction industry need to a invention of new concrete type. This paper attempted to list the development in concrete use and the advantage and disadvantage to a limited extent.

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