UNIT IV SPECIALITY POLYMERS Polymer concrete

 Polymer concrete is the composite material made by fully replacing the cement hydrate binders of conventional cement concrete with polymer binders or liquid resins, and is a kind of concrete-polymer composite. The binder phase for polymer concrete consists only of polymers(Added in monomeric form) and does not contain any cement hydrates. The aggregates are strongly bound to each other by polymeric binders.

 Advantages of PC in comparison with ordinary cement concrete, its properties such as strength, adhesion, water tightness, chemical resistance, freeze-thaw durability and abrasion resistance are generally improved to a great extent by polymer replacement. On the other hand, its poor thermal and fire resistance and its large temperature dependence of mechanical properties are disadvantages

 It can be divided into three types. a) Polymer-Portland Cement Concrete (PCC), (b) Polymer impregnated Concrete (PIC) and (c) Polymer ConcretePC

**1 Polymer modified concrete PMC or PCC ( polymer Cement Concrete)(cement+latex)**

 It uses soluble polymer and cement as binders and is mixed with sand or other aggregates. Such concrete polymers can evenly distribute inside concrete to fill the pores between cement hydrates and aggregates.It sets quickly ,low water absobption,high durability.Mainly used in repair and water leaking prevention purposes ,Lowtemperature floor application,steel bridges, for cementing ceramic tiles

**Manufacturing**-polymers in form of dispersion,latex or emulsion are added to cement and concrete during mixing.It can be cast at field.It consists cement+polymer+ aggregates+ water.Polymer content 1-4% there are two types

a.Latex modified(LMC)-NR,SBR,CR,NBR LATEX USED, Curing time1-7 day

b.Pre polymer modified-Unsaturated polyester resin,epoxy fururan curing time 1 day

2 **Polymer Concrete (**monomer diffused into aggregates no cement)

Polymer concrete, also called resin concrete is a kind of concrete that uses synthetic resin act as binder for (instead of cement) sand and stone aggregates.

**Manufacturing** .Firstly reduce the void volume of aggregates so as to reduce the quantity of polymer needed for binding the aggregates ,for reduce voids the graded aggregates are packed and vibrated in a moulds. Monomer is then diffused up through the aggregates and polymerisation is intiated by radiation or chemical means. Silicone coupling agent is added to the monomer to improve bonding between polymer and aggregates.the resin content is 10-25% by weight of PC

Application swimming pools,chemical container,kitchen tops,waste containers, outdoor furniture,pre cast tanks

3 **Polymer Impregnated Concrete PIC (monomer diffused into concrete no cement or water)**

It is the widely used method to making Polymer based concrete. Polymer impregnated concrete is made by diffusing organic monomers into pre cast concrete, and curing them with heat or radiation, Polymer concrete contains no cement or water.

**Manufacturing** Firstly cast the concrete and remove moisture by heating in an air oven @120-150°c for 6-8 hrsand and remove air in the open cell is by apply vacuum. Then a low viscosity monomer is diffused through the open cell of concrete by soaking the concrete in monomer solution. The commonly used monomers are methyl methacrylate, styrene, cyanide propylene. Moreover, catalyst and cross-linking agent should be added.then concrete cover with sheet to prevent monomer evaporation . Then the monomer is polymerised by application of radiation or heat@60- 150°C depends on polymer.Then polymer formed and fill the innerpores of concrete.at last it is cooled. The aggregates are bounded together by the polymer matrix

Application bridge decks.under water and marine field

 **GEO POLYMER CEMENT CONCRETE**-Inorganic polymer concrete,good resistance to chemical attack.Attain high strength in 24 hrs ths contain fly ash,funace slag,Aggregates,alkaline solutions,monomer,water

 **FIBER REINFORCED CONCRETE( FRC)**

 Fiber Reinforced Concrete can be defined as a composite material consisting of mixtures of cement, mortar or concrete and discontinuous, discrete, uniformly dispersed suitable fibers. It contains short discrete fibers that are uniformly distributed and randomly oriented. Fibers include steel fibers, glass fibers, synthetic fibers and natural fibers. carbon and steel( ultra high modulus fibres) coconut, banana fibers, sugar cane bagasse, cellulose are used.Fracture properties can be improved by addition of short glass or carbon fibers. Fiber reinforced composites (FRC) have a reputation for being superior in their stiffness, strength, and creep resistance. It reduce the air voids and water voids the inherent porosity of gel.It increases the durability of the concrete. The use of fibers increase the flexural strength, fatigue resistance, toughness and ductility of concrete

Application - structural civil engineering, automotive applications, and high temperature corrosive environments. . Fibre-reinforced normal concrete are mostly used for on-ground floors and pavements, but can be considered for a wide range of construction parts (beams, pliers, foundations etc) either alone or with hand-tied rebars

Prepration-the fibres are added randomly at the time of mixing. The amount of fibres added to a concrete mix is measured as 0.1 to 3%. It is important that the fibers are dispersed uniformly throughout the mix; this can be done by the addition of the fibers before the water is added. When mixing in a laboratory mixer, introducing the fibers through a wire mesh basket will help even distribution of fibers Carbon fibers from the most recent & probability the most spectacular addition to the range of fiber available for commercial use. Carbon fiber comes under the very high modulus of elasticity and flexural strength.