Unit – V

Special concretes

Light weight concretes:
Density of normal concrete is the order of 2300 to 2300 kg/m³. This self weight will make it to some extend an uneconomical structural material.

Self weight of light weight concrete varies from 30 to 1850 kg/m³. It helps reduce the dead load, increase the progress of the building and lowers the hauling and handling cost.

Classification of light weight concrete:
Light weight concrete can also be classified on the purpose for which it is used, such as:

1. Structural light weight concrete.
2. Unit weight concrete.
3. Low weight concrete.
Non-load bearing concrete,
Insulating concrete.

Advantages:

- The dead weight of the structure is reduced resulting in smaller sections.
- There is a better thermal insulation than ordinary concrete.
- Light weight concrete are very economical for non-load bearing walls.
- The durability is satisfactory but water absorption resistance is low.

This is produced by using light weight aggregates both natural and artificial.

Applications:

Light weight concrete have it use generally in situations like.
Fire and corrosion protection
Heat insulation on roofs
Filling for floors and roof slabs
Insulation water pipes

High strength concrete:

Concrete of higher strengths than usually employed in construction of reinforced concrete structure is called high strength concrete.

The high strength concrete is to be used in the construction of prestressed concrete structures.

Methods for Making High Strength Concrete:

There are some special methods for making HSC which are follows,

- Seeding,
- Re-vibration,
- High speed slurry mixing,
- Use of admixtures
Inhibition of coaks,
* Use of cementious aggregate.

Materials used for HSC
* Flyash
* Ground Granulated Blast Furnace Slag (GGBS)
* Silica fume
* Super plasticizers
* Aggregate.

Properties of HSC
* High flow ability,
* High modulus of elasticity,
* High flexural strength,
* Good durability

Advantages of HSC:
* Earthquake resistance due to high tensile strength
* Low weight
* High flexibility
Fibre Reinforced Concrete (FRC)

Fibre reinforced concrete is defined as concrete made with hydraulic cement, containing fine and coarse aggregate and discontinuous discrete fibers.

The fibers can be made from natural materials like asbestos, sisal or a manufactured product such as glass, steel, carbon and polymers like polypropylene.

Advantages:
- Mix becomes cohesive and possibility of segregation are reduced.
- Strength, ductility, impact resistance, tensile and bending strength are improved.

Disadvantages:
- Fibers reduce the workability of a mix and may cause the entrainment of air.
Applications:

- Road pavements,
- Industrial floors,
- Bridge decks,
- Canal lining,
- Pipes,
- Staircase steps,
- Wall and roof panels,
- Manhole covers.

Types of FRC:

- Steel fibre reinforced concrete (SFRC)
- Polypropylene » » » (PFRC)
- Glass fibre reinforced concrete (GFRC)

Ferro cement:

Ferro cement is a composite material in which the filler material (called matrix) cement mortar is reinforced with fibers, usually steel mesh dispersed throughout the...
Composite, which results in better structural performance than individual ones.

Materials Requirements for Ferrocement:

- Reinforcing wire
- Wire netting
- Cement
- Mortar
- Sand
- Water

Casting Techniques:

- Hand plastering
- Semi-mechanized process (using hand plastering)
- Centrifuging
- Spraying

Advantages:

- Easy availability of raw materials
- Reduction in weight consequent on thin section
Disadvantages:-

* Structures made at it can be punctured by collision with pointed objects.
* Large number of labors required.
* Cost of semi-skilled and unskilled labors & high.

Applications:-

* Over head water tanks.
* Septic tanks

Polymer concrete composites:-

A monomer is an organic molecule which is capable of combining chemically with similar or different molecules to form a high molecular weight material known as polymer.

Polymer cement concrete is made by mixing cement, aggregate, water and monomer.
such plastic mixture is cast in moulds, cured, dried and polymerised.

The monomers that are used in PCC are
a) polymer styrene,
b) Epoxy-styrene,
c) Furans
d) Vinylidene chloride.

The result obtained by the production of PCC shown relatively modest improvement in strength and durability.

Advantages:
- Greater failure strain,
- Good bond with old concrete,
- Improved resistance to abrasion
- Improved durability

Applications:
- For repair of old or damaged concrete,
- Factory floors,
- For surfacing steel bridges.
High performance concrete:— (HPC)

High performance concrete (HPC) is defined as a concrete using special combination of performance and uniformly requirements that cannot always be achieved routinely using constituents and normal mixing, placing, and curing practices.

Properties:—

* Higher resistance towards abrasion,
* Chemical resistance,
* Compaction without segregation,
* Resistance to impact,
* High modulus of elasticity
* Durability.

Classification of HPC

HPC is classified into five divisions based on the compressive strength. The classification of HPC is shown in below table.
Applications:

* Long span bridges
* Bridge decks, pavements and parking structures
* Highway bridges
* Offshore, oil drilling platforms

Slurry infiltrated – Fibered concrete (SIFCON)

* The processing of this composite consists of placing the fibres in a framework and then infiltrating a high W/C ratio mortar slurry to coat the fibres.

* Fibres with high surface area are used. Compressive and tensile strengths up to 120 and 110 MPa, respectively, have been obtained.
Factors affecting Efficiency of SFRC:

* Slurry strength
* Fiber volume
* Fiber alignment
* Fiber type

Advantages:

* Impact resistance
* Abrasion resistance
* High ductility
* Deflection is less and hence it act as a rigid body.
* Good durability.

Applications:

* Repair, Rehabilitation and strengthening of structures;
* Coastal area works;
* Refractory structures such as furnaces, saddle piers etc.;
* Offshore platforms, long span structures.
Shotcrete:-

Shotcrete is the name given to mortar or concrete conveyed through a hose and pneumatically projected at high velocity onto a back-up surface.

Shotcrete is more formally called pneumatically applied mortar or concrete. It is also known as Gunite.

The shotcrete can utilize wet-mix applications and Gunite as utilizing dry-mix applications.

Applications:-

- Thin shells,
- Floored plate roofs,
- Pre-stressed concrete tanks,
- Spill ways,
- Bridge piers,
- Sewerage pipes.