UNIT - V

SPECIAL CONCRETES

SYLLABUS

Light weight concretes - foam concrete- self compacting concrete – vacuum concrete - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete – SIFCON - Shotcrete – Polymer concrete - High performance concrete - Geopolymer Concrete

SPECIAL CONCRETES

Special concrete are the concretes, which are prepared for specific purposes. Concrete is very strong in compression, however it has the following disadvantages.

- Low tensile strength
- Heavy weight etc.
- Low durability
- High permeability
- Low corrosive resistance
- Low resistance to chemical attack

Hence special concretes are prepared to rectify these disadvantages based on its application.

Following are the special types of concrete.

1. Light Weight Concrete
2. Aerated Concrete
3. High Density Concrete
4. Ready Mixed Concrete (RMC)
5. Recycled Aggregate Concrete (RAC)
6. Fibre Reinforced Concrete (FRC)
7. Fibre Reinforced Polymer Concrete (FRP)
8. Polymer Concrete

9. Shotcrete (or) Gunite
10. Ferro-Cement
11. Self-Compacting Concrete (SCC)
12. High Performance Concrete (HPC) etc.

5.1 LIGHT WEIGHT CONCRETE

The concrete having the density value of about 300 kg/cum – 2100 kg/cum is called light weight concrete or low density concrete.

The density of ordinary concrete is about 2100 kg/cum – 2650 kg/cum.

Light Weight Aggregates

Light weight aggregates are used to reduce the density of the concrete.

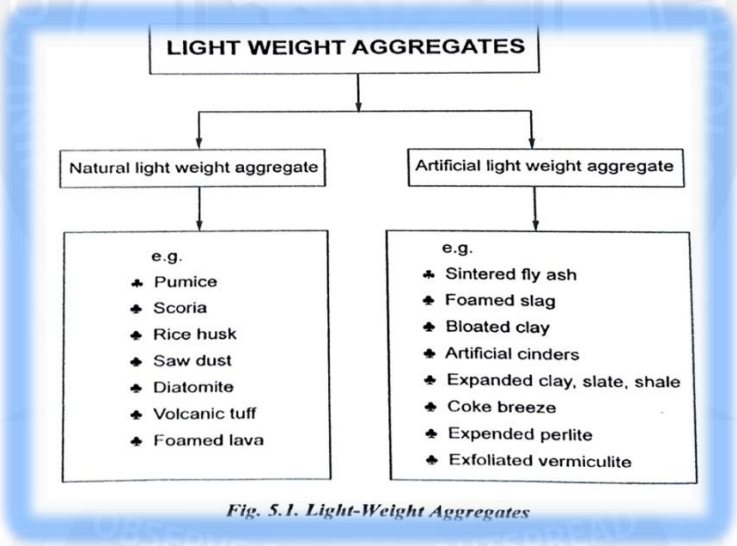

Fig. 5.1. Light-Weight Aggregates

Properties of LWC

- ✓ Due to the low density and rough texture of porous aggregate, the workability of concrete needs special attention.
- ✓ The density of LWC is 300 kg/cum -2100 kg/Cum.
- ✓ It provides the compressive strength as Normal concrete.
- ✓ The modulus of elasticity differs from Normal concrete.
- ✓ Creep is approximately same to the normal weight concrete.

- ✓ Shrinkage of LWC, is higher than the normal weight concrete.
- ✓ It have high fire resistant and insulator.
- ✓ It is typically dark grey, brown, reddish brown, rust colored or even orange.

Classification of LWC

i. Based on Method of Production

1. Light weight aggregate concrete

Concrete manufactured by using porous light weight aggregate of low specific gravity.

2. Aerated, Cellular, Foamed or Gas Concrete

Special type of concrete is prepared by introducing air bubbles into the plastic cement mortar mix, the make the cellular structured material.

3. No fines concrete

Produced by omitting the fine aggregate – large number of voids are present.

ii Based on purpose of use

1. Structural light weight concrete
2. Insulating concrete
3. Masonry units

iii Based on Density

1. Low density concrete

- ✓ Used for insulation purpose
- ✓ Unit weight exceeds 800 kg/cum.
- ✓ Insulation value are high
- ✓ Compressive strength ranges from 0.69 to 06.89 Mpa.

2. **Moderate density/strength concrete**

   - ✓ Compressive strength are approximately 6.89 to 17.24 Mpa
   - ✓ Insulation value are medium.

3. **Structural concrete**

   - ✓ Minimum compressive strength is 17.24 Mpa
   - ✓ Maximum compressive strength is 34.47 Mpa
   - ✓ Insulation efficiency is low
   - ✓ Thermal insulation values for structural LWC are substantially better than NWC.

Advantages of LWC

- ✓ Light in weight.
- ✓ Lower cost for handling.
- ✓ High fire resistance.
- ✓ Can be prepared with industrial waste materials such as fly ash, clinker, slag, etc.
- ✓ Can be applied for seismic design of structures.
- ✓ Low thermal conductivity etc.

Application of LWC

- ➢ Decks of long span bridges
- ➢ Fire and corrosion protection
- ➢ Covering for architectural purposes
- ➢ Heat insulation on roofs
- ➢ Insulation of water pipes
- ➢ Filling for floor and roof slab

- Construction of partition walls and panel walls in framed structures
- Production precast building blocks and low cost housing.

Uses of LWC

- Good fire and corrosion resistant
- Heat insulation in roofs
- Insulating water pipes
- Construction of partition walls and panel walls in framed structures.
- General insulation of walls
- Surface rendered for external walls of small houses.

5.1.1 Foam concrete

This is a kind of LWC, which is prepared by adding air bubbles into the plastic cement mortar mix, to make the cellular structured material. It is also termed as Gas concrete or Cellular concrete or Aerated concrete.

5.1.1.1 Methods of preparing foam concrete

1. Forming gas by chemical reaction during plastic-stage.
2. Adding pre-foamed stable foam with slurry.
3. Adding finely powdered expansive solid matter.