Raw material in Rcc

Cement

Sand

Concrete

Steel

Water

CEMENT

Cement in its broadest term means any substance which acts as a

binding agent for materials natural cement (Roman Cement) is obtained

by burning and crushing the stones containing clay, carbonates of lime

and some amount of carbonate of magnesia. The clay content in such

stones is about 20 to 40 percent. Natural cement resembles very closely

eminent hydraulic lime. It is not strong as artificial cement, so it has

limited use in practice.

Artificial cement is obtained by burning at very high temperature

a mixture of calcareous and argillaceous materials in correct proportion.

Calcined product is known as clinker. A small quantity of gypsum is

added to clinker and it is then pulverized into very fine powder is known

as cement. Cement was invented by a mason Joseph Aspdin of leeds in

England in 1824. The common variety of artificial cement is known as

normal setting cement or ordinary cement or Portland cement.

3.1 Ingradeints – Functions

Ordinary Portland cement contains two basic ingredients,

namely argillaceous and calcareous. In argillaceous materials,

clay predominates and in calcareous materials, calcium carbonate predominates. Good ordinary cement contains following ingradients.

1. Lime (cao) ……. 62%
2. silica (Sio2) ……. 22%
3. Aluminca(Al2 u3) ……. 5%
4. Calcium sulphate (CaSo4) ……. 4%
5. Iron Oxide (Fe2 O3) ……. 3%
6. Magnescia (Mgo) ……. 2%
7. Sulphur ……. 1%
8. Alkalies ……. 1%

Functions of Ingradients:

1. Lime: Lime is the important ingredient of cement and its proportion is to be maintained carefully. Lime in excess makes the cement unsound and causes the cement to expand and disintegrate. On the other hand, if lime is in deficiency the strength of the cement is decreased and it causes cement to set quickly

2. Silica: This also an important ingredient of cement and it gives or imparts quick setting property to imparts strength to cement.

3.Alumina: This ingredient imparts quick setting properly to cement.

Express alumina weakens the cement.

4. Calcium Sulphate: This ingredient is in the form of gypsum and its function is to increase the initial setting time of cement.

5. Magnesia: The small amount of this ingredient imparts hardness and colour to cement.

6. Sulphur: A very small amount of sulphur is useful in making sound cement. If it is in excess, it causes the cement to become unsound.

7. Alkalies: Most of the alkalies present in raw material are carried away by the flue gases during heating and only small quantity will be left. If they are in excess in cement, efflorescence is caused.

Types of Cement

In addition to ordinary cement, the following are the other varieties of cement.

a. Acid Resistance Cement: This is consists of acid resistance aggregates such as quartz, quartzite's, etc,

additive such as sodium fluro silicate (Na_2SiO_6) and aqueous solution of sodium silicate. This is used for acid-resistant and heat resistant coating of installations of chemical Industry. By adding 0.5 percent of unseed oil or 2 percent of ceresil, its resistance to water is increased and known as acid water resistant cement.

b. Blast Furnace Cement: For this cement slag as obtained from blast furnace in the manufacture of pig iron and it contains basic elements of cement, namely alumina, lime and silica. The properties of this cement are more or less the same as those of ordinary cement and prove to be

economical as the slag, which is waste product, is used in its manufacture.

c. Coloured Cement: Cement of desired colour may be obtained by intimately mixing mineral pigments with ordinary cement. The amount of colouring may vary from 5 to 10 percent and strength of cement if it is exceeds 10 percent. Chromium oxide gives brown, red or yellow for different proportions. Coloured cements are used for finishing of floors, external surfaces, artificial marble, windows

d. Expanding Cement : This type of cement is produced by

adding an expanding medium like sulpho – aluminate and a stabilizing agent to ordinary cement. Hence this cement expands where as other cement shrinks. Expanding cement is used for the construction of water retaining structures and also for repairing the damaged concrete surfaces.

e. High alumina Cement: This cement is produced by grinding clinkers formed by calcining bauxite and lime. The total content should not be less than 32 percent and the ratio by weight of alumina to lime should be between 0.85 and 1.30.

Advantages

1. Initial setting time is about 31/2 hours therefore, allows more time

for mixing and placing operations.

2. It can stand high temperatures.

3. It evolves great heat during setting therefore not affected by frost.

4. It resists the action of acids in a better way.

5. It lets quickly and attains higher ultimate st

Disadvantages:

1. It is costly

2. It cannot be used in mass construction as it evolves great heat and as

it sets soon.

3. Extreme care is to taken to see that it does not come in contact with

even traces of lime or ordinary cement.

f. Hydrophobic Cement: This type of cement contains admixtures,

which decreases the wetting ability of cement grains. The usual

hydrophobic admixtures are acidol napthene soap, oxidized

petrolatum etc when hydrophobic cement is used, the fire pores

in concrete are uniformly distributed and thus the frost resistance

and the water resistance of such concrete are considerably

increased.

g. Low Heat Cement: Considerable heat is produced during the

setting action of cement. In order to reduce the amount of heat,

this type of cement is used. It contains lower percentage of tri

calcium aluminates C3A and higher percentage of dicalcium

silicate C2s. This type of cement is used for mass concrete works

because it processes less compressor strength.

h. Pozzuolona Cement: Pozzuolona is a volcanic powder and the

percentage should be between 10 to 30.

Advantages

1. It attains compressive strength with age.

2. It can resist action of sulphates.

3. It evolves less heat during setting.

4. It imparts higher degree of water tightness.

5. It imparts plasticity and workability to mortar and concrete

prepared from it.

6. It offers great resistance to expansion

7. It possesses higher tensile strength

Disadvantages:

1. Compressive strength in early days is less.

2. It possesses less resistance to erosion and weathering action.

i. Quick Setting Cement: This cement is prepared by adding a

small percentage aluminum sulphate which reduce the

percentage of gypsum or retarded for setting action and

accelerating the setting action of cement. As this cement hardness

less than 30 minutes, mixing and placing operations should be

completed. This cement is used to lay concrete under static water

or running water.

j. Rapid Hardening cement: This cement has same initial and

final setting times as that of ordinary cement. But it attains high

strength in early days due to

1. Burning at high temperature.

2. Increased lime content in cement composition.

3. Very fine grinding.

Advantages:

1.Construction work may be carried out speedily.

2.Formwork of concrete can be removed earlier.

3. It is light in weight.

4. It is not damaged easily.

5. This cement requires short period of curing.

6. Use of this cement also higher permissible stresses in the

design.

7. Structural member constructed with this cement may be

loaded earlier.

k. Sulphate Resisting Cement: In this cement percentage of

tricalcium aluminates is kept below 5 to 6 percent and it results in

the increase in resisting power against sulphate. This cement is

used for structure which are likely to be damaged by sever

alkaline condition such as canal linings, culverts, siphons etc.

l. White Cement: This is a variety of ordinary cement and it is

prepared form such raw materials which are practically free from

colouring oxides of Iron, manganese or chromium. For burning

of this cement, oil fuel is used instead of coal. It is used for floor

finish; plaster work, ornamental works etc.

Uses of Cement:

1. Cement mortar for masonry work, plaster, pointing etc

2. Concreter for laying floors, roofs and constructing lintels,

beams, weather sheds, stairs, pillars etc.

3. Construction of important engineering structure such as

bridges, culverts, dams, tunnels storage reservoirs, light

houses, deckles etc.

4. Construction of water tanks, wells, tennis courts, septic tanks,

lampposts, roads, telephone cabins etc.

5. Making joints for drains, pipes etc.

6. Manufacture of pre cast pipes, piles, garden seats, artificially

designed urns, flowerpots, etc dustbins, fencing posts etc.

7. Preparation of foundations, watertight floors, footpaths etc.

Admixtures – Uses.

These are the ingredients or substance, which are added to

concrete to improve its properties like strength, hardness, water

resisting power, workability etc. Many admixtures like alum etc are

commonly used for this purpose.

1. Ordinary cement conatins

i) Lime (Cao) -62%

ii) Silica (Sco2) – 22%

iii) Alumina (Al2O3) – 5%

iv) Calcium Sulphate (CaSo4) – 4%

v) Iron Oxide (Fe2O3) – 3%

vi) Magnesia (MgO) – 2%

vii) Sulphur & Alkalies – 1% each

2. The main types cements are

i) Acid resistance cement

ii) Blast furnace cement

iii) Coloured cement

iv) Expanding cement

v) High alumina cement

vi) Hydrophobic cement

vii) Low heat cement

viii) Pozzolona cement

ix) Quick setting cement

x) Rapid hardening cement

xi) Sulphate resistance cement

xii) White resistance cement

3. The cement is used for

i) Masonary work

ii) Floors, roofs of concrete

iii) Bridges, culverts, dems, tunnels etc

iv) Water tanks, wells , septic tanks, roads, telephone

cable etc

v) Making joints for drains, pipes

vi) Manufacture of pipes, piles etc

vii) Preparation of foundation, water tight floors etc.

4. Addition of admixture in cement concrete increases strength,

harness, water resisting power, work ability etc.