Building Material

① Cement

→ Cement is artificial material which is used to impart binding property in buiding construction

→ Cement broadly consist of Calcereous & Argillaceous compound

→ Ingredients of cement const of following

		% composition
Lime	(CaO)	62-67
Silica	(SiO_2)	17-25
Alumina	(Al_2O_3)	3-8
Calcium Sulphate	($CaSO_4$)	3-4
Iron oxide	(Fe_2O_3)	3-4
Magnesia	(MgO)	2-3
Sulphur	(S)	2-3
Alkalies	(K_2O, Na_2O)	0.2-1

Calcareous Compound-[Ca] → Lime, Chalk, Marine Shell
Argillaceous Compound-[Si] → Clay, Marl, shale

→ Functions of ingredients of cement are as follows.

Lime(CaO)-
- It imparts strength & soundness to the cement
- If it is in excess it makes the cement unsound possess it to expand & finally disentegrate
- If it is in deficiency it reduces the strength of the cement & causes it to set quickly.

Strength - Resistance against gradually applied load.
Soundness - ——"—— change in volume. change in volume result in strength development if exist cracks developed & at cracking area of grain to grain contact reduces & stress concentration will be there & value will reach upto strength value & failure occur.

If cracks are there we have to do pressurised cement grouting - concrete body offers resistance to cement to overcome it we have to give energy to cement hence pressure applied. OPC has more setting time hence it will not withstand in crack & flows back out of crack ∴ It is not used.

② Silica (SiO_2) -

- It also impart the strength to the cement.
- If it is in excess it increases the strength & setting time of cement. (Advantage of increase in setting time depends upon construction type)

③ Alumina (Al_2O_3) -

- It imparts quick setting property to the cement.
- It act as a flux & helps in reducing Clinkering temprature (Temp. at which cement clinkers are formed → 1400°C - 1600°C)
- If it is in excess it weakens the cement

(

④ Calcium Sulphate ($CaSO_4$) -

- It is generally added in the form of Gypsum ($CaSO_4 \cdot 2H_2O$) helps in increasing the initial setting time of the cement. (Initial setting should be slow to allow all operations easily & Final setting time should be minimum to increase speed of constn)

⑤ Iron Oxide (Fe_2O_3) -

- It imparts strength, Hardness & colour to the cement

⑥ Magnesia (MgO) -

- It also imparts the strength, Hardness & colour to the cement. But if it is excess it makes the cement unsound.
- Pr-

⑦ Sulphur (S) -

- Presence of Sulphur also responsible for volume change thereby causes unsoundness of the cement