

Cihan University Sulaymaniya
Faculty of Engineering
Architectural Engineering Department



Building Materials

Chapter Five (Plastering)

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Chapter Five Cement Plastering

Introduction:

Applying mortar coats on the surfaces of walls, columns, ceiling etc. to get smooth finish is termed as plastering. Mortar used for plastering may be lime mortar, cement mortar or lime-cement mortar. Lime mortar used shall have fat lime to sand ratio of 1: 3 or 1: 4. If hydraulic lime is used mix proportion (lime: sand) is 1 : 2. Cement mortar of 1: 4 or 1: 6 mix is very commonly used for plastering, richer mix being used for outer walls. To combine the cost effectiveness of lime mortar and good quality of cement mortar many use lime-cement mortar of proportion (cement : lime : sand) of 1 : 1 : 6 or 1 : 1 : 8 or 1 : 2 : 8.

There are numerous plastering techniques used to plaster ceilings and walls. It all depends on the requirements of the client as well as the nature of the area that needs plastering.

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The objectives of plastering are:

1. To conceal defective workmanship
2. To give smooth surface to avoid catching of dust
3. To give good appearance to structure
4. To protect the wall from rain water and other atmospheric agencies

Requirement of good plaster are:

- It should adhere to the background easily.
- It should be hard and durable.
- It should prevent penetration by moisture.
- It should be cheap and economical.
- It should possess good workability.

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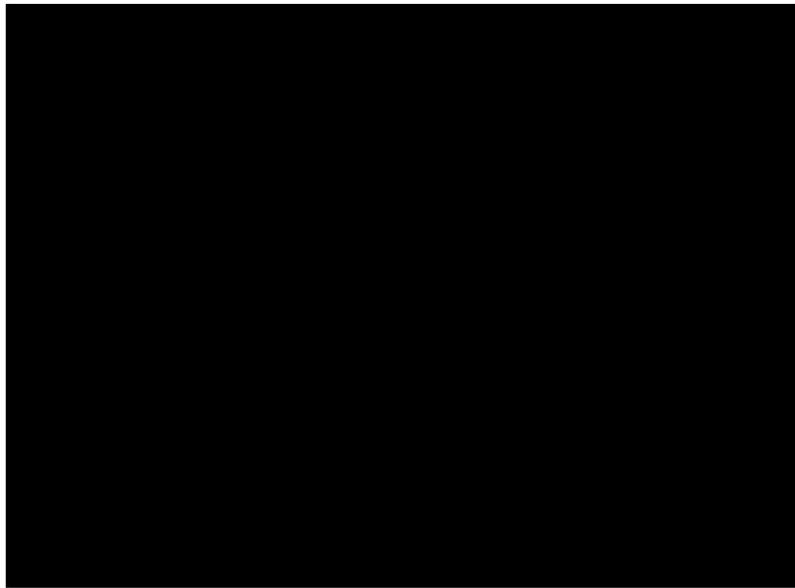
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Cement Plastering Process



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Materials for plastering:

Lime mortar is usually applied in 3 coats while cement mortar is applied in two or three coats for the stone and brick masonry. For concrete surfaces cement mortar may be applied in two or three coats. For concrete building blocks many times only one coat of cement mortar is applied. The first coat provides means of getting level surface. The final coat provides smooth surface. If three coats are used second coat is known as floating coat. The average thickness of first coat is 10 to 15 mm. Middle coat thickness is 6–8 mm. The final coat is just 2 to 3 mm thick. If single coat is used its thickness is kept between 6 to 12 mm. Such coats are used on concrete surfaces not exposed to rain.

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The mortar used for plastering work can be classified into three categories:

- **Lime mortar:** it consists of equal volume of lime and sand these two materials are carefully ground in mortar mill. Fat lime is recommended for plastering work.
- **Cement mortar:** the cement mortar consists of one part of cement to four part of clean, coarse and angular river sand. The materials are thoroughly mixed in dry condition before water is added to them. The mixing of materials is done on a watertight platform.
- **Water proof mortar:** This mortar is water proof and it is prepared by mixing one part of cement and two parts of sand and pulverised alum at the rate of 120 N per m^3 sand.

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Lime Mortar

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Cement Mortar

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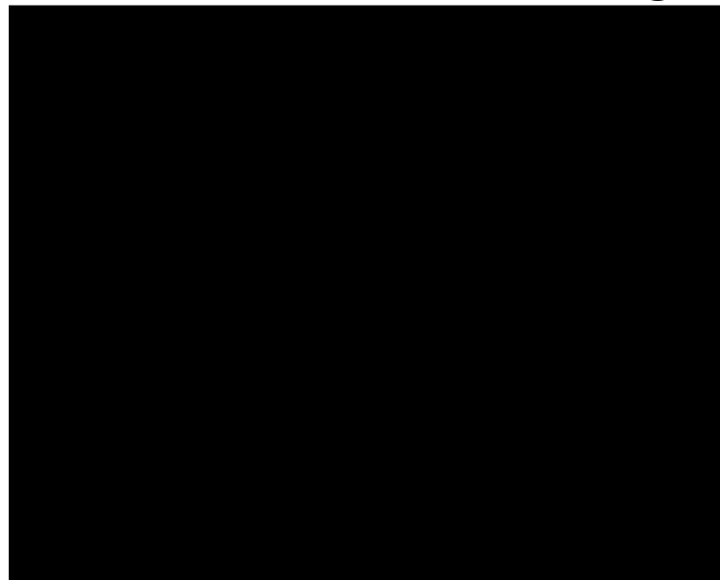
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Water Proof Mortar

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Problems in Cement Plastering



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Problems in Cement Plastering

- Defects in plaster affects the aesthetics although they don't endanger the safety of the building.
- Most of the plastering defects can be avoided by:
 - Using well graded sand
 - Avoiding rich mortar mix
 - Avoiding over trowelling
 - Avoiding use of pure cement while finishing
 - Timely and adequate curing

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Chapter Five Gypsum Plastering

Introduction:

- Gypsum is a non-hydraulic binder occurring naturally as a soft crystalline rock or sand. Pure gypsum is a white in colour and is so soft that it can be scratched by a finger nail.
- When heated to 205°C, pure gypsum loses its luster and its specific gravity is increased from 2.3 to 2.95 due to the loss of water of crystallization.
- Gypsum has a unique property of moulding. When heated it gives up combined water and easily turns into powder. On adding water to the powder it can easily be shaped and moulded, and in a short time it hardens again and becomes similar to what it was in its natural state.

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Chapter Five Gypsum Plastering

Introduction:

- There are two commercial varieties of crude gypsum, rock gypsum and gypsum or gypsite, used for the manufacture of gypsum binding material. These substances consist principally of a hydrous sulphate of lime ($\text{CaSO}_4 + 2\text{H}_2\text{O}$) with varying percentages of silica, carbonate of lime, carbonate of magnesia, and iron oxide.
- Building gypsum is an air-setting binder composed mainly of semi hydrate gypsum and obtained by processing gypsum at temperatures 150°C – 160°C .

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Composition (Raw materials) – Gypsum rocks:

➤ Pure gypsum is a hydrous lime sulfate ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), the composition of which by weight is:

Lime sulfate	↙	Lime CaO	– 32.6%
	↘	Sulfur trioxide SO_3	– 46.5%
Water H_2O			– 20.9 %
Total =			– 100 %

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Gypsum plaster advantages and applications:

Gypsum plaster has several advantages such as **strength** and **quick setting time** which cuts the work period; **it gives a fine finish without cracks**; and **it is simple to work with** as it is ready for use by mixing it with aggregate and water.

Lightweight aggregates like vermiculite, perlite or pumice mixed with plaster produce a stronger material as well as efficient sound absorption surface. When gypsum is used indoors there is no problem of weather ability but due to the fact that cast-gypsum is porous and wettable it is not recommended to be used outdoors without any surface coating, that in some cases may delay the dissolving effect of rain and soaking up of water have on gypsum surfaces.

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Gypsum plaster advantages and applications:

The advantages for using gypsum in building are:

- It is easily converted in a cementitious material.
- It is quick setting and eliminates the need for formwork.
- It has fire-resisting quality, rapid drying and heat insulation.
- It is a good sound absorbing material.
- Small bulk density.
- Incombustibility.
- Hardening with negligible shrinkage.
- Superior surface finish.
- Resistance to insects and rodents.

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The major disadvantages are :

1. Its poor strength in wet state
2. High creep under load.

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Gypsum Plastering Process



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Chapter Five Gypsum Plastering

Gypsum has many types which are used for various purposes, one of them is **ordinary plaster**.

Uses:

1. It is used as a wall plaster in first and second coat.
2. It is used as a mortar masonry construction.

Physical requirements in accordance with Iraqi standard No. 28/1988:

1. Fineness: The percentage retained on 1.18mm sieve not more than 8%.
2. Setting time should be between 8-25 minute.
3. Compressive strength: Not less than 3 MPa for standard cube 50*50*50mm.

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Properties of gypsum plasters:-

Setting and hardening:

The term “ setting “ is meant the initial loss of plasticity, whereas “ hardening “ means the subsequent gain in strength and in ability to resist indentation or abrasion.

Percentage of water in plaster:

The water-plaster ratio is greatly affecting the strength of plaster. The higher the water plaster ratio, the greater are the plasticity and flow ability of plaster, but when it exceed the optimum value, part of water remain between paste particles and tends to pull the particles apart, reducing the cohesion between them and between the plaster and building units and leading to a reduced strength and durability.

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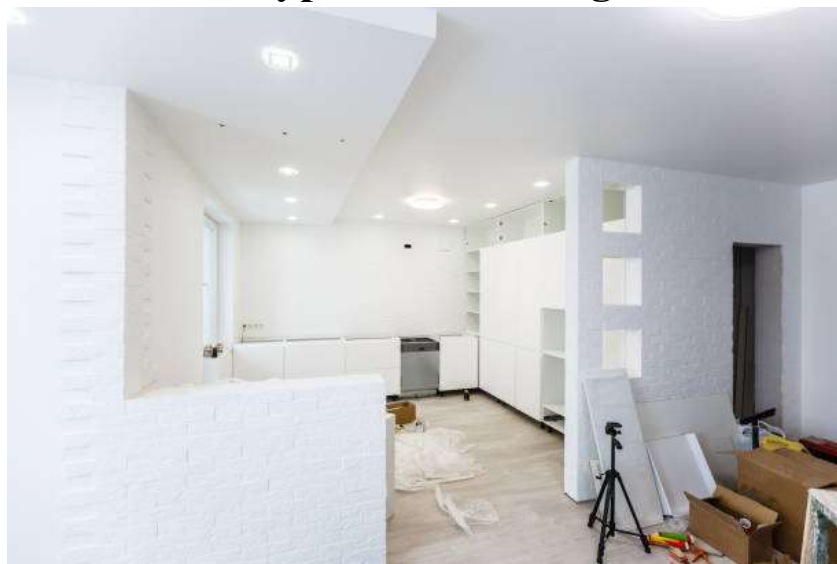
Properties of gypsum plasters:-

Condition of setting:

The strength of plaster drops to a large degree when the plaster remains wet for a long period exceeding 3-days after setting. The reason is due to decomposition of some of plaster crystals in water, leading to reduced chemical adhesion.

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End of Chapter Five

Thank You

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