PLASTER OF PARIS OR STUCCO

Although plaster of Paris is widely used today its origins date back to more than 9000 years ago. Anatolia and Syria are regarded as being the birthplace of this beneficial substance. About 5000 years ago the Egyptians started making their own version of the plaster of Paris. They would heat gypsum in open-air fires and then crushed it to make it into a powder form. This would then be mixed with water in order to serve as the jointing material for their bricks and blocks.

The ancient Greeks have also experimented with gypsum to create something like plaster of Paris. They would use it for creating windows in their temples. The kind of plaster they used was in its transparent form. Similarly the Romans made use of plaster of Paris to cast statues. With the passage of time many different civilizations experimented with gypsum calcinations and much expertise was gained through trial and error. By the1700s the city of Paris had become the center for this kind of plaster.

At that time houses in Paris used to be made of wood. Plaster of Paris would be applied to these wooden walls in order to make them fireproof. This was the law enforced by the King of France who had taken heed from the big London fire which destroyed the city in 1666. Since then continuous excavation of large gypsum deposits close to Paris has been taking place.

It is produced by incompletely dehydrating pure finely ground gypsum at a temperature some what lower than 185°C. Most plasters theoretically approach — $CaSO_4 + 1/2\ H_2O$ which contains about 6.2 per cent of water.

The setting of plaster of paris is attributed to the formation of gypsum crystals from a supersaturated aqueous solution. When substances of colloidal nature (for example glue) are mixed with the plaster the formation of crystals is hindered and the time of set retarded. In hardening, Plaster of Paris first shrinks then expands. The latter property makes the material suitable for making casts, since a sharp impression of the mould can be secured. For the same reason it forms an excellent material for filling cracks, holes in the plastered surfaces and also on the wooden surfaces before painting/polishing. Owing to the rapidity of set and difficulty in

working, its use in structures is limited to ornamental works. Being unstable in water it should be used for indoor works only.

Properties

1. White in colour
2. Setting time is 5 to 10 minutes
3. Specific gravity is 2.57.

Uses:

1. It is used as a wall plaster in finish coat.
2. It is used as a mortar for masonry construction.
3. It is used for casting ornamental work.

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

1. The sum of soluble salts expressed as (Na_2O+MgO) not more than 0.25% by weight of plaster.
2. The percentage of chemically combined water should be between 4-9%.
3. The percentage of impurities not more than 5%.
4. The percentage of SO_3 not less than 45%
5. The percentage of CaO not less than 30%.

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

1. Fineness: The percentage retained on 1.18mm sieve not more than 0%.
2. Setting time should be between 8-25 minute.
3. Mechanical resistance: The diameter impression resulted by a dropping ball not more than 5mm.
4. Compressive strength: Not less than 5MPa for standard cube 50*50*50mm.
5. Modulus of rupture: Not less than 1.5MPa

GYPSUM WALL PLASTER

Gypsum wall plasters gain one-half of their one-month strength in a day. Plaster and sand mortars of 1:1 proportions may be expected to develop 80 per cent of the neat strength at corresponding ages, while those of 1:2 proportion generally possess one-half to two-third of the neat strength. The dry set density of gypsum wall plaster is 850–1040 kg/m^3, and compressive strength of 1:2 gypsum wall plaster is 6 to 15 N/mm^2. Gypsum wall plasters are divided into following four categories.

- ***Gypsum neat plaster:*** is 60.5 per cent or more of calcined gypsum (plaster of Paris) with material added to control workability, time of set and cohesiveness.
- ***Gypsum wood fiber plaster***: is 60.5 per cent or more of calcined gypsum and, wood fiber 1.0 per cent or more to increase cohesiveness, and the remaining material to control workability and time of set.
- ***Calcined Gypsum:*** is used for finishing coat. It may or may not carry a retardant. Calcined gypsum may be white or grey.
- ***Gypsum ready sanded plaster:*** consists of cementing material, predominantly calcined gypsum, which has been mixed at the mill with the proper proportions of sand and other desirable constituents. It is prepared for use simply by adding water. There are two grades of Gypsum Ready Sanded Plaster, the *scratch* or first coat, and the *browning* or second coat.

HARD FINISH PLASTER

When gypsum is burnt at considerably high temperature than that for calcining of cement plaster, and treated with certain solutions like alum and Glauber's salt (Na_2SO_4), the plasters so produced show slow setting but ultimately become very hard. Such plasters may be polished to form a smooth surface and make a very satisfactory finish for interior walls. Often walls of these plasters are marked to imitate tiling with pleasing effects. Two commercial hard finish plaster cements are available.

Keen's cement: is made by burning a very pure rock gypsum at a red heat (700°C), cooling, and then adding 1.0 per cent of potassium and aluminum sulphates to accelerate the set. Subsequently the material is ground so that 90 per cent or more passes No. 100 sieve. It is pure $CaSO_4$ of pure white color. Keene's cement is not injured by storage and mortars of it may be retempered. Set occurs between 20 minutes to 6 hours. At 7 days the tensile strength is 3.16 N/mm^2. It is used as a finish plaster only where a greater resistance to moisture and surface abrasion is required.

Mack's cement: is made by burning gypsum at a very high temperature and adding about 0.4 per cent of burnt Glauber's salt or potassium sulphate. It is said to form unusually hard, dense and durable surface which will take paint very well.

GYPSUM PLASTER BOARDS

It is a gypsum product of recent origin made of thin layers of card board or wood cemented together with wall plaster, used for lining walls and ceiling of buildings. The boards may be strengthened by incorporating fibres as fibrous gypsum plaster boards. Sisal or coconut fibers are generally used. The weight of plaster in the later variety is 10 kg/m^2 of board and that of fiber is 250 g/m^2 of board. They are very light weight and have high fire resisting properties. Gypsum plaster boards can be sawn to desired size and shape.

NON LOAD BEARING GYPSUM PARTITION BLOCKS

These can be solid or hollow, rectangular with straight and square edges and true surfaces. The compressive strength of these partition blocks should not be less than 50 N/m^2 on gross area.

PYROCELL

It is finely ground powder containing an admixture, forms a gas on being mixed with water and expands the mixture to 3 or 4 times its volume. This inflated paste hardens into a light, cellular, fire resistant mass possessing good acoustical and insulating properties.

Gypsum plaster or comprise all that class of plastering and cementing materials which are obtained by partial or complete dehydration of natural gypsum and to which contain materials that serve as retarders or hardeners, or that impart greater plasticity to the product, may not have been added during or after calcinations.

Extraction

Gypsum is extracted from open air or underground mines, using specific drilling machinery and non-polluting explosives. Rock size may reach up to 50 cm in diameter.

Crushing

Primary crushing aimed at reducing rocks to a size of less than 10cm, subsequently easier to handle, is carried out in the quarry or at the entrance to the plaster manufacturing station.

Storage

Rock that has undergone primary crushing is stored to ensure production continuity, and optimal homogeneity between rock extraction batches.

Sifting

It is necessary to separate and control gypsum particle size in order to obtain the exact product properties required for the plaster being manufactured.

Calcination

Calcium sulphate hemihydrate ($CaSO_4.½H_2O$) or plaster is obtained through the partial or total dehydration of gypsum at a temperature ranging from 120° to 400° C The structure and properties of the final product are directly dependent on the chosen calcination conditions (temperature, pressure, rapidity).

Grinding

Following the calcination process, the plaster is ground to obtain a powder. Particle size distribution is an important factor in the product properties.

Mixing

With the plaster now in finely ground form, the final mixing stage is possible. A choice of additives will finely tune the products properties to match the customer's needs, in terms of setting time, viscosity, porosity, colour, and mechanical strength.

Testing

Laboratory testing is carried out at several production phases, to ensure all products meet the strict product specifications before being bagged and shipped.

Packaging

Feasibility studies are carried out to ensure the packaging item chosen for each product gives optimal protection and guarantees the product quality all the way to the end-user.

The drying gypsum plant operation consists of circulating a flow of hot air in order to extract the water which is in excess of that required to reconstitute the gypsum from the plaster. Drying has to be totally uniform despite the different thicknesses of wallboard (which vary depending on the later use of the wallboard). Wallboard which retains too much water will present storage problems, and overdried wallboard will lose mechanical strength due to separation between the wallboard paper and the plaster.

SBM can offer gypsum powder machine for gypsum plaster plant in USA, Saudi Arabia, Tanzania, Canada, Haiti, India, Pakistan, France, Turkey and Uganda. SBM can also design the gypsum powder plant process for gypsum plaster plant.

Pre: Gypsum manufacturing machinery and process
Next: Mobile Quarry Crushing Machine for sale and the price