Aam Aadmi Series - 8

HOUSE BUILDING DIGEST

(Plastering)

bmtpc

Creating Enabling Environment for Affordable Housing for All

This is an attempt by BMTPC to provide useful but often ignored information about multifarious activities involved in house construction and other technical and non-technical matters associated with building materials and construction technologies. The series is being brought out with a specific rationale to reach out to common people of our nation and make them acquainted about building construction. Every individual has a dream of owning a house and through this series which is aptly named Aam Adami Series, we will slowly unravel myths and misconceptions about building construction. The language used here is lucid and simple to comprehend. The complicated technicalities are explained in a parlance which can be understood by one and all.

1. Plastering

Plastering is an element which gives an appreciative appearance to the house, protects it from the vagaries of nature, dampness etc. Accordingly, the home owner should acquaint himself with the process of plastering and carry it out with care. It involves covering of rough surfaces of superstructure walls or underside of ceilings so as to obtain an even, smooth and durable surface.

Plaster protects the wall against wind, rain, abrasion, and improves the thermal performance and appearance. Plasters should be easy to apply without the use of expensive and elaborate tools. All types of plasters, especially those on external surfaces, need to offer erosion resistance, impermeability to moisture, impact resistance, and be well bonded to the wall.

A proper Plastering will give good look & require less maintenance

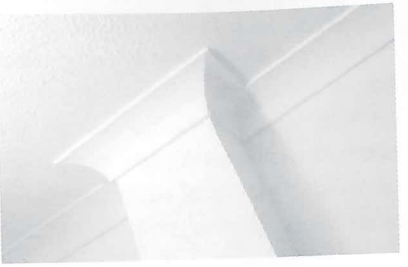
Plaster has important requirements in the fresh and hardened states. In the fresh state, plaster must be workable and cohesive. In the hardened state, plaster must be:

- Strong enough to hold paint and withstand local impact and abrasion.
- Free of unsightly cracking.
- Well bonded to the base to which it is applied.
- Have an acceptable surface texture.
- Have acceptable surface accuracy (with reference to a plane or curved surface).

There are number of ways in which plastering can be done in a house. The choice of the type of plastering to be provided is dependent upon the architectural features of the house, local availability of materials as also the budget of the owner.

The thickness of the plaster to be applied is dependent upon the side of the wall being plastered. The plaster thickness on the 'rough side'

of the wall is kept more than that on the 'smoother side' of the wall.



Wall and Roof Corner Plastering

When the mason raises a 23 cm (9") wall, then the side of the wall on which he works gets a smoother surface and hence it is called 'smoother side'. Since his hand cannot reach the other side of the wall a rough surface is obtained and hence it is designated as 'rough side'.

Pointing is yet another way of providing protection to the walls and the process involves application of mortar on the joints of the brick/stone or block work. There are a number of ways in which pointing can be done on the walls. Usually pointing works out economical than plastering and accordingly it is adopted as a cost saving measure.

In the case of pointing, the bricks/blocks remain exposed to rain etc, and accordingly the performance of the walls is not as good as that of the plastered surface. Nowadays some of the architects advise pointing on the inner walls to give a non-conventional look to the interiors of the house.

2. Types of Plaster

There are many alternatives for providing plaster in a house and each one has its own distinguishing feature. The type of plastering to be provided is also dependent upon its location i.e. interior, exterior underside of a ceiling etc. The most common types of plasters in India include:-

a. Mud Plaster
b. Lime Plaster
c. Gypsum Plaster
d. Cement Plaster

a. Mud Plaster

Provision of mud plasters is an age old method for protecting the walls and the practice is found in almost all parts of the world. Mud plasters can practically be used for any surface including mud or burnt bricks, stones etc.

Plasters out of mud are usually adopted in village houses as they are made out of local material employing local masons and are also economical. Thermally mud plasters are more comfortable than other types of plasters.

Making of Mud Plaster

Mud plasters often use earth in combination with other natural materials such as wheat-straw or cow-dung. Additives like bitumen, improve the basic qualities of the mud as they act as stabilisers, hardeners, and provide water proofing properties. Even without additives, mud plasters give excellent results provided that they are made and applied with skill and care, and maintained regularly.

Mixing of Mud Plaster

The composition of mud plaster varies from place to place and is an important factor in determining durability. If the clay content is too low, the plaster will lack strength and cohesion, and if it is too high there will be a risk of cracking due to shrinkage. A suitable clay content is usually around 10 to 15 per cent, but values outside this range could also be suitable depending on the type of clay. The sand-to-silt ratio is also very important in determining the quality of a plaster.

The amount of fibres required will vary depending on soil characteristics and the requirement can vary from place to place.

Typically paddy straw (bhusa) is added at a rate of 6 per cent by weight of mud.

Application of Mud Plaster

Mud plasters can be applied in two coats, the first coat may be thicker containing more clay, while the second coat, which may be thinner, may contain more sand. The second coat is usually applied in a thinner layer. The second coat helps to close the micro-cracks in the first layer, provided the surface has been lightly dampened before plastering. Finally, whitewash can be applied to give some additional weather proofing.

If a cement or lime stabiliser is mixed in the mud, the plaster surface should be sprayed with water at least two to three times a day during the initial period to reduce the development of cracks.

Application of Mud Plaster

In general, plaster work should be shaded from the sun, and plastering work should be avoided on hot and windy days. In all cases, it is advisable to try out different mixes to find which one gives the best results with a given soil.

Daub is yet another form of wall finish, which is made from mud, animal dung and straw. It is applied to a structure of 'wattle', or slim interwoven lengths of wood.

b. Lime Plaster

Plastering the wall surfaces with lime as a binder has been in vogue historically. The lime to be used can be either 'fat' or 'hydraulic'. Fat lime is said to make a good plaster as it makes good putty after slaking. Hydraulic lime on the other hand makes a stronger and hard

plaster although if it contains some unslaked particles, they may slake over a period of time, displaying blisters on the plastered surface.

Advantages

Lime plasters have the following main advantages:-

- It has light reflecting qualities, creating unique aesthetics.
- It has the quality of absorbing moisture and can regulate temperatures (keeping warm in winter and cool in summer) and humidity levels.
- It has good weather proof properties.
- Use of hydraulic and non hydraulic lime creates good water resistant properties.

Constituents of Lime Plaster

Lime plasters have two main constituents viz. Lime and Fine Aggregates. The types of lime and fine aggregates to be used are as under:-

Lime

Normally two types of lime are available in the market viz. Quick Lime and Hydraulic Lime. Quick Lime (Non Hydraulic Lime) is supplied in the form of lumps and is slaked by addition of water and converted into lime putty before use. Slaking is done in large tanks where water is added to convert the quicklime to hydrated lime.

Plaster Enhances Aesthetics

On the other hand Hydraulic Lime is available in the form of dry powder and is normally supplied in jute bags having a water proofing

membrane. The bags have markings indicating the class of lime, date of manufacture etc.

Due to the delays involved in the slaking process of quicklime, hydrated lime is mostly used in construction. Normal hydrated lime is converted into lime putty by soaking it for at least 16 hours.

Lime, of whichever form, is to be stored in weather proof sheds as it can be damaged by moisture and air slaking.

Fine Aggregates

For the purpose of preparation of mortar for lime plaster, fine aggregate has to be added to lime. The fine aggregate can be in the form of natural sand, crushed stone sand, stone dust, marble dust, flyash or surkhi. The aggregate should be hard, durable, chemically inert, free from organic impurities etc. The silt content in the aggregate should be within prescribed limits. In case, however, the silt content is higher, the fine aggregate should be washed till the desired levels are achieved.

Proportions of Lime and Fine Aggregates

The proportions of various materials to be used are dependent upon the properties of lime, the requirements of strengths etc.

Lime mortars for plastering can be made adding the aggregates in various proportions depending upon the requirement and local availability of materials. Typical proportions by volume, which have commonly been used are 1:1:6 (cement: lime: sand), 1:2:9 (cement: hydraulic lime: sand), 1:1:2 (lime: pozzolana: sand), 1:2:8 (cement: lime: surkhi) etc.

Mixing of Materials

There are a number of ways in which different materials can be mixed for mortars for the purpose of plastering. Most commonly,

to mix cement-lime plaster, the cement, lime and sand are mixed dry in the required proportions. More often, the lime and sand are mixed together first followed by addition of cement. Water is then mixed in sufficient/ required quantity to give the desired consistency.

Tools for Plastering

The mix so obtained should be used for plastering within the specified time after mixing. Partly set mortar should not be used for plastering.

Thickness of Lime Plasters

The thickness of the lime plasters may be 12 mm, 15 mm or 18 mm. The 12 mm thickness is applied on the smooth side of the wall whereas 15 mm thickness is applied on the rough side. The 18 mm plaster is applied in two coats, the first being of 12 mm thickness and the second coat being of 6 mm thickness.

Curing of the plastered surface should commence after 24 hours of its application and should be carried out for upto 7 days depending upon the climatic conditions.

The house owner is advised to consult the architect/engineer for finalization of the specifications and the type of lime and proportions of other materials to be used for plastering.

c. Gypsum Plaster (Plaster of Paris)

Research has shown that gypsum in conjunction with lime has been in use since the 16th century for flooring, walling and ceilings, although gypsum was mixed in small quantities only. Over the last 200 years, gypsum has been predominantly used for casting decorative elements.

Gypsum Plaster requires small proportions of sand and other aggregates and sets with little change in volume and with negligible shrinkage or drying. It is light in weight, thus ideally suited for use in multistoried buildings.

The plaster can be used with ease and without any waste. Since, it dries up quickly the finishing coat can be applied immediately after the undercoat has set, usually the same day.

Decorative Ceiling Plaster

Gypsum plaster should not be used in humid areas and for external work as it has an inherent affinity of absorbing dampness. Further, bags containing gypsum plaster should not be kept in humid surroundings for long periods as it absorbs moisture from the atmosphere. Prolonged storage hastens the rate of setting leading to reduction of strength of the set plaster.

Storage for three months of gypsum plaster, even in a dry place, results in the deterioration of the quality.

d. Cement Plaster

Portland cement plaster, or stucco, as it is often called, is an excellent plaster for all locations. It is strong and durable, and can be furnished in a wide range of colors and textures. Cement can be mixed with fine or coarse sand although other materials like lime, flyash etc can also be added in different proportions to get the mortar for plaster. The water-to-cement ratio is also critical for such type of plasters.

Materials

The main materials for preparation of cement mortar for plaster works are cement and aggregates.

Cement

Normally 43 grade cement is used for construction of building and houses. The cement is usually supplied in bags of approved quality which should have the name of the manufacturer, date of manufacture, grade and type of cement. Cement brought to site should not be more than six weeks old from the date of manufacture.

Fine Aggregates

Fine aggregate is an aggregate which passes through 4.75 mm IS sieve. It can consist of natural sand, crushed stone sand, sand stone dust or marble dust etc. The aggregate should be hard and durable and should not have more than the specified amounts of organic impurities and harmful chemicals.

Sand is by far the major constituent of a plaster mix and has a significant influence on its performance and cost.

Water

In a plaster, water performs two functions. First, it transforms the dry ingredients into a plastic workable mix. Second, it combines with the binder to induce hardening. A fixed quantity of water per unit of cement (binder) is required for complete hydration; and water cement ratio, as desired, should be maintained in the mortar mix. Excess over this amount reduces the plaster strength.

The water to be used should be potable and containing no dissolved chemicals that might accelerate or retard the setting time.

The amount of water to be added for workability depends on several factors: the characteristics and age of the binder, application method, drying conditions, and the tendency of the base to absorb water.

Mix Proportions

Plaster Mixing

Cement and sand mortars for plastering can be in the ratio of 1:3, 1:4, or 1:6 by volume; the ratio representing cement : sand. The sand to be used can either be fine or coarse depending upon the construction specifications, prepared by the architect if, however, lime is to added in the mix, the proportion may be 1:2:9 (cement : lime : sand). In case stone dust is being used the proportion can be 1:2 (cement : stone dust)

Mixing

Cement plasters can be mixed either by hand or by using a machine. Hand mixing is usually done when the quantum of plastering is limited, say in the case of a house, whereas machines are used when the quantum of mortar is of a higher order.

Hand Mixing

In hand mixing the dry ingredients, i.e. cement, aggregates etc, are thoroughly blended in the dry state, in required quantities, preferably on a plain GI or other such sheet or board. A pile of the dry ingredients is made and an inverted cone is made in the middle and water poured into the cone.

The mixing is commenced by pulling the dry material into the water. Mixing is continued until the materials have been thoroughly blended and proper consistency has been attained. Mixing should not be continued for more than 10 to 15 minutes after the materials have been thoroughly blended.

Machine Mixing

For a quicker, more thorough mix a plaster mixing machine is used. In this case the water is added in the first instance followed by adding half the quantity of sand. Cement and any admixture desired is then added followed by the remaining quantity of sand.

Mixing takes place either by rotation of the drum or by rotation of the blades inside the drum. The drum is tilted to discharge plaster into a wheelbarrow or other container. The batch is mixed until it is uniform and has attained the proper consistency. Usually 3 to 4 minutes of mixing is sufficient for achieving the desired results.

In either case, i.e. hand mixing or machine mixing, the plaster must be used within two hours of mixing and no set plaster should be remixed with water and used.

Application of Plaster

Application of Plaster

The building surface to be plastered must be cleaned free from paint, oil, dust, dirt, etc before commencement of plastering. It is advisable on brick and block building walls to rake out the joints by about ½" to provide a mechanical key. Joints should be raked while the mortar is still soft.

Thickness

Thickness of plaster to be applied depends upon the surface being plastered. For example, if plastering is being done on a half brick wall, which has a smooth surface on both sides, a 12 mm thickness may be sufficient. On the other hand on a 23 cm (9") brick wall, the smooth side can have a 12 mm thick plaster and the rough side of the wall can have 15 mm thickness or so.

Plastering on the underside of the ceiling is usually done in 6 mm thickness.

Curing

After the plaster has been applied and finished, it is essential to protect it from the sun and wind by covering it with a plastic sheet and keeping it moist for a minimum of 7 days.

3. Good Plastering Practice

The following procedure will help in the application of a good plastered surface:-

a. The constituents for plaster say cement, lime, sand etc should be available in adequate quantity to finish the day's job. It may be remembered that lime needs soaking; clay needs to be screened and straw needs to be shredded and the like.

b. The area to be plastered should be planned in advance. It is advisable to plaster a full section of the wall in a session.

c. It is advisable to keep the surface being plastered in shade to avoid cracking on the plastered surface. If possible the surface being plastered should not be exposed to direct sunlight.

d. The sand to be used in plastering should be kept dry in order to achieve good results.

e. The tools for plastering should be absolutely clean before commencement of plastering work.

f. If plastering onto masonry or brickwork, a stiff brush should be used to remove any dust and loose debris.

g. As a guide for thickness and a flatness, small plasterer patches may be applied on the wall at intervals of 900mm (3ft) to 1200mm (4ft).

Trowel

h. When plastering the wall, work from the bottom left-hand corner upwards, filling a complete vertical section.

i. As each section between plaster patch is completed, run the straightedge from the bottom upwards in a left-to-right sawing motion to level off.

j. After about 20 minutes, run a clean float over the wall to remove any marks and flatten it to a smooth finish.

k. On the final layer of plaster, i.e. after flattening and a further 30-40 minutes, splash the wall with a little clean water using the brush and then run a clean float over it. The water acts as a lubricant to allow the trowel to run over the surface, picking up any loose particles and depositing them in any tiny holes. This produces a silky smooth finish.

4. In Conclusion

Plastering is a tricky trade to master, and practice definitely makes it perfect. A good quality plaster finish is the result of managing the tools and materials in response to the changing conditions of the plaster that is being applied. Plastering walls and plastering ceilings are important jobs and have to be done with great care.

Most professionals recommend that each layer of plastering be done in two applications to achieve the best results. The second layer of plaster has to be applied when the first has just gone stiff, but not dry. Experienced plasterers are of the opinion that it costs 3 times as much to re plaster a terrible surface as it does to get it right the first time.

This is the eighth of BMTPC 'HOUSE BUILDING DIGEST SERIES' for creating awareness about construction of a house.

BMTPC

The Building Materials & Technology Promotion Council (BMTPC) was setup in 1990 as an inter ministerial organisation under the Ministry of Housing and Urban Poverty Alleviation to bridge the gap between the laboratory research and field level application.

VISION

BMTPC to be world class knowledge and demonstration hub for providing solutions to all with special focus on common man in the area of sustainable building materials, appropriate construction technologies & systems including disaster resistant construction.

MISSION

To work towards a comprehensive and integrated approach for promotion and transfer of potential, cost effective, environment-friendly, disaster resistant building materials and technologies including locally available building materials from lab to land for sustainable development of housing.

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