

5.7 FINISHINGS

1. INTRODUCTION

Building finishes are used to give protective coating to the surface which preserves and protects the materials used in building from weather effects such as rain water, heat, frost, etc. and to provide decorative finishes which add to the appearance of the material surfaces and building as a whole. Plastering, pointing, white washing and color washing, painting, varnishing, and distemping, etc. are among the various types of building finishes and are discussed in the following sections.

2. PLASTERING

Plastering is the process of covering various surfaces of structure with a plastic material such as cement mortar, lime mortar or composite mortar, etc. to obtain an even, smooth, regular clean and durable surface. Plastering conceals inferior quality materials and defective workmanship and also provides a protective coating against atmospheric effects. It further provides a base or receiving other decorative finishes such as painting and white washing. Tools used in plastering works include: laying trowel, float, floating and rule and gauging trowel.

2.1 Plastering Materials

The major materials used for plastering are binders and sand. Hydrated lime, gypsum or Portland cement is used as a binding medium. The only aggregate used in plastering is sand. It forms the greatest proportion of the plaster mix. The sand particles should be so graded that the binder can act as an adhesive and not merely as a filler. The sand is also used to reduce the shrinkage of the binders. The porosity and strength of the plaster depend, to a large extent on the quality of the sand. The sand used for plastering work should be free from any organic matters, or harmful impurities.

2.2 Background for plastering.

The durability of plastering depends not only on the properties of the mixture itself but also its adhesion with the background. A good background must be plain enough for suitable application

of plaster and should have enough strength. The usual types of backgrounds that are used for plaster work are:

- i) Solid background – For instance brick work, concrete blocks, heavy clay blocks, etc.
- ii) Lathing – These include wood laths, expanded metal lathing, wire meshes etc.,
- iii) Boards and slabs in non-mortar construction, e.g. slabs of gypsum plaster, fiberboards, etc.

2.3 Requirements of a Good plaster

Some requirements of a good plaster are:

- 1) It should provide a smooth, non-absorbent and washable surface.
- 2) It should not contract in volume while drying and setting otherwise it will crack and give an unsightly appearance.
- 3) It should adhere firmly to the surface and resist the effects of weather agencies such as rain, heat, etc.
- 4) It should offer good insulation against sound and high resistance against fire.
- 5) It should provide the surface with the required decorative effect and durability.

2.4 Defects in plastering

Some of the defects in plastered work include cracking, blistering, efflorescence and falling out of plaster.

a) Cracking in plastering

The major causes of cracking in plastering can be, but not limited to the following reasons

- i) Structural defects in building and discontinuity of surface.
- ii) Plastering on very wet background,
- iii) Old surface not being properly prepared.
- iv) Movement in the background due to thermal expansion or rapid drying of backing

- surface,
- v) Movements in the plaster itself, due to expansion as in the case of gypsum plaster or due to shrinkage of plasters coat during, drying as in the case of lime-sand plasters,
 - vi) Excessive shrinkage of the plaster due to thick coat,
 - vii) Due to faulty workmanship or method of application.

b) Blistering or blowing of plaster

This consists of formation of one or more swelling in small patches over the finished plastered surfaces. It is caused due to faulty slaking of lime particles in the plaster after its application. To prevent this defects, the lime should be properly slaked before use.

C) Falling out of plaster

Some portion of the surface comes off (peeling) due to one or more of the following reasons:

- i) Due to lack of adhesion,
- ii) Excessive moisture in the background,
- iii) Excessive thermal changes in the background
- iv) Rapid drying of plaster coats,
- v) Insufficient drying between each coat of plaster.

d) Efflorescence on plaster surface:

Efflorescence is the whitish crystalline substance, which appears on the surface of walls due to the presence of salts in the lime, cements, and bricks and sometimes even in water used in the construction work. When a newly constructed wall dries out, the soluble salts dissolved by moisture are drawn to the surface through the pores. These soluble salts absorb moisture from atmosphere and on drying they get deposited in patches of white crystalline substance. The surface gets disfigured by ugly damp patches of efflorescence.

Efflorescence can be rectified or checked by the following measures.

- i) By scrubbing with brushes. It can also be removed by applying a solution of 1:5 HC:H₂O or H₂SO₄ and spraying with clean water,
- ii) By using burnt bricks and clean water, which is free from salt,
- iii) Using a mortar, which is waterproof, is also useful in preventing efflorescence.

e) Faulty workmanship

The following points can be cited as major workmanship error in plastering:

- i) Excessive trawling may cause the binder to come to the surface
- ii) The interval between successive application may be short,
- iii) The coats may have been too thick,
- iv) Addition of water to hydraulic lime after initial set has taken place may prove to be harmful.

3. POINTING

Pointing is the process of finishing of mortar joints in exposed brick or stone masonry, which is achieved through two operations. Initially, joints are raked out to a depth of 15 mm and then the space is filled up by a suitable mortar of richer mix. Pointing gives good appearance and water resistance. Typical pointing types are discussed previously in the chapter dedicated for Wall Systems.

4. WHITE WASHING

The complete process of white washing can be carried out under the following three operations: preparation of whitewash, preparation of surface and application of whitewash.

4.1 Preparation of Whitewash

The whitewash is prepared from fresh burnt shell lime or pure limestone mixed with water. Shell lime is preferred to pure lime (white stone) as it is white and slakes more perfectly to a smoother paste.

To prepare a whitewash, fresh lime is slaked at site of work and is dissolved in a tub with sufficient quantity of water. After slaking, it is allowed to remain in the tub of water for two days and stirred up with a pole until it attains the consistency of thin cream. This mixture is then strained or screened through a clean coarse cloth. Clean gum dissolved in hot water is then added at the rate of 2kg/m^3 of lime to the white wash water. The solution so formed is known as whitewash.

To prevent the glare effect due to whitewash, sometimes, copper sulfate is added at the rate of 4Kg/m^3 of the thin cream. In order to have better adhesive properties alum or common salt may be added in the same proportion as gum.

4.2 Preparation of Surface

Before applying whitewash to new wall surface, it is essential that the background surface should be cleaned, and made free from loose materials and any other foreign matter. If the surface to be coated is extra-smooth, then coats will not stick to it. In such a case: the surface should be rubbed with sandpaper to ensure proper adhesion of whitewash.

In case of re-whitewashing, all loose materials and scales should be scrapped off. The old loose whitewash is removed by rubbing with sandpaper. All holes in wall, irregularities of surface, minor repair, etc. are corrected in advance by filing with lime putty. All greasy spot should be treated so that the finishing wash may stick to the surface.

4.3 Application of whitewash

The whitewash is applied to a specified number of coats with a jute brush. Usually three coats are required for new work and for scrapped surface, while one or two coats are considered sufficient for old work.

5. COLOR WASHING

A color wash is usually prepared by adding the necessary coloring pigments in suitable quantities to the screened whitewash or liquid mixture or whitewash. It should be ensured that the coloring pigment is not affected by the presence of lime.

The color wash is applied in exactly similar manner as whitewash. The quantity of color wash is constantly stirred with a stick during the use. The quantity of color wash, which is just enough for a day's work, should be prepared at a time in the morning.

New or scrapped surfaces are given one coat of whitewash and one or two coats of color wash. Old surface having satisfactory white or color wash should be given one coat of color wash.

6. PAINTS AND PAINTING

Paints are coating of fluid materials, which are applied as a final finish to all surfaces such as walls, ceilings, woodwork, metalwork, etc. The process of application of paint as a coating is termed as painting.

6.1 Objects of Painting

The objects of painting can be summarized as to:

- Protect the surface from weathering effects of the atmosphere,
- Protect the decay of wood and corrosion of metals,
- Provide a decorative finish to obtain a clean, colorful and pleasing surface.

6.2 Characteristics of a Good paint

A good paint should have such a consistency that it can be applied easily and freely on the surface with a brush or spray. Besides a good paint should be in initial cost and prove economical in the long run. The paint color should neither fade nor change by atmospheric influences in its designed service life and should not show any signs such as brush marks, shrinkage marks, cracks, patches, etc. on drying.

6.3 Types of paint

There are several varieties of paints, which are readily available in the market in various colors, among which the following are widely used in construction industry.

- a) **Aluminum paint:** This paint consists of finely ground aluminum suspended in either quick-drying varnish or slow-drying varnish or slow-drying oil varnish as per the requirements. Aluminum paint has the following qualities:
 - 1) It protects the iron and steel from corrosion in a better way than any other paint.
 - 2) It possesses a good weather-resisting and water proofing qualities,
 - 3) It is visible even in darkness and also provides a good appearance to the surface being painted due to its brilliant silvery shiny texture.
 - 4) It offers good resistance to heat and electric current,
 - 5) It possesses a high spreading or covering power.

- b) **Anti-corrosive paint:** This paint mainly consists of oil, a strong drier and a coloring pigment mixed with very fine sand. Anti-corrosive paint lasts for a long period and gives black appearance to the surface being painted. It is used to protect and preserve the structural steel work against the adverse effects of weather, fumes, acids, corrosive chemicals, etc.

- c) **Asbestos paint:** It possesses the qualities of retarding the action of fire and of resisting the effect of water, steam and acidic gases. Asbestos paint is used in repairing metal roofs and painting gutters.

- d) **Bituminous and tar paint:** These paints consist of bitumen or tar dissolved in naphtha, or petroleum or white spirit. The color of paint is modified by adding certain coloring pigment, like red oxide, etc.

- e) **Cellulose paint:** It hardens by evaporation of thinner or solvent used, whereas ordinary paints harden by oxidation. The cellulose paint is made from celluloid sheets, nitrocotton,

photographic films, etc. Nitro-cotton is used for making superior paint. Cellulose paints are far superior to ordinary oil paints though less expensive. These paints can be more easily washed and cleaned. They stand extreme degrees of heat and cold, and are not affected by contact with hot water. Moreover, these paints dry very quickly and possess greater hardness, smoothness and flexibility cellulose paints are used for painting motorcars, airplanes and other superior works.

- f) **Cement paint:** It consists of boiled linseed oil into which dry good cement (65-70% Portland, white or colored cement) has been mixed or stirred to an amount that a paint of workable consistency is obtained. Cement paint possesses better waterproofing qualities, good strength, hardness, density, durability and exhibits excellent decorative appearance.
- g) **Oil paint:** Oil paints are cheap, fairly workable and possess the qualities of good capacity, good appearance, sufficient durability and enough resistance against weather elements. Oil paints are used in general for all types of surface such as woodwork, walls, ceilings, metalwork, etc. However, they are preferably used for internal works. Oil paints are normally applied in three coats of varying composition, and are named as priming coats, under coats and finished coats.
- h) **Plastic paint:** This paint essentially consists of a variety of plastics as the base, which forms the main constituent for the paint. When these paints are thinned with water, they are known as plastic-emulsion paints. Plastic paints have the qualities of quick drying, high covering power and decorative appearance. These paints afford good adhesion to the surfaces being painted and are widely used for painting showrooms, auditoriums, offices, cinema halls, etc., where attractive appearance is desired.
- i) **Synthetic rubber paint (or rubber base paints):** These paint consists of synthetic resins dissolved in suitable solvents and then mixed with other pigments. Synthetic rubber paints have excellent acid, alkali and moisture resistance properties; dries quickly and has a high covering power and it is moderate in cost and can be applied easily on surface. They are, therefore, used for application over fresh and lime-plastered surface and as a protective coating on concrete floors and for masonry surfaces.

6.3.1 Defects in painting work

Some of the usual defects in painting works are discussed below:

- 1) **Blistering:** This defect occurs by formation of bubbles under the paint film. It is generally caused due to excess of oil in final coat and imperfect seasoning of timber. This defect can be rectified by applying water paint finished with oil paint mixed a little copal varnish.
- 2) **Crawling:** This occurs due to application of too thick coat. It can be rectified by sandpapering the surface.
- 3) **Grinning:** This is clear reflection of the background due to lack of opacity of final coat of paint.
- 4) **Fading:** This is the loss of paint color due to the effect of sunlight on pigments of paint.
- 5) **Flashing:** This is appearance or reflection of glossy patches on the painted surface due to either workmanship or cheap paint used or due to weather effect.
- 6) **Saponification:** This is the chemical formation of soap patches on the painted surface due to chemical action of alkalis.

7. VARNISH AND VARNISHING

Varnish is a solution of resinous substance in oil, turpentine or alcohol. The varnish solution on drying or evaporation forms or leaves a hard, transparent and glossy film of resin on the varnish surface. Varnishing is the process of applying varnish to the wooden surfaces and also to the painted surface in order to improve their appearance and protect them from atmospheric action.

The objects of varnishing are to:

- Brighten the ornamental appearance of the grains of the unpainted wood surfaces,
- Protect the structural wooden surfaces from atmospheric action,
- Give brilliancy to the painted surface and also to papered walls and

- Protect the painted surface from atmospheric actions in order to increase the durability of the paint film.

A good varnish should have the following characteristics or qualities:

- 1) It should dry rapidly or quickly.
- 2) On drying, it should form a protective film, which should be hard, tough, resistance to wear or durable.
- 3) It should exhibit a glassy surface.
- 4) The finished surface should be uniform in nature and pleasing in appearance.
- 5) The color of the varnish should not fade or change when exposed to atmospheric action.
- 6) It should not crack in drying and should have sufficient elasticity.

8. DISTEMPERS AND DISTEMPERING

Distempering is the process of applying distempers over the various surfaces more easily and with less cost than paints and varnishes, to safeguard them against weather effects and improve their appearance.

Distempers are considered to water paints, consisting of whiting (i.e. powdered chalk), glue or casein as a binder, and suitable proportion of coloring pigments if desired. These distempers form a cheap, durable and easily applied decoration for internal use on plastered, cement concrete and various wall board surfaces.

9. MISCELLANEOUS FINSHES

1. **Wall tiling:** It is the process of lining or finishing the walls with special tiles either for height varying from 60 to 120 cm above the floor level or up to the ceiling.
2. **Papering:** It is the process of pasting the papers on the walls and ceilings for improving the aesthetic values of the interior of rooms and buildings as a whole.

3. **Whitening:** It is the process of whitening the walls and ceilings by a mixture of white fine powder, glue and water.
4. **Coal tarring:** it is the process of applying the coating of local tar to woodwork or iron work for preserving them.
5. **Wax-polishing (or waxing):** It is done on varnished surface to improve their elegance and also to protect the under coats. Wax-polishing presents a highly pleasing luster.
6. **Wood oiling:** It is normally used as a substitute for painting on woodwork not exposed to weather, because the former one is much cheaper. Oiling is done to increase the durability and improve the appearance of the surface being oiled.
7. **Glazing:** It is the work of fixing panels of glass in window, door and other frames. These frames may be made of iron, steel or wood.

10. OTHER EXTERNAL FINISHES

For high quality external finishes, considerable emphasis is usually given to the need for good workmanship, but this alone is not enough, for it ignores the influence of the architect, the structural engineer and the formwork designer, all of whom can affect the appearance of the concrete. The success of concrete construction relies very largely upon the combined efforts of all members of the building team. Close cooperation between designers and contractors, and an understanding of the contribution which each of them can make, is necessary for the full potentials of concrete as a visual material to be achieved.

The following external finishes are considered to be important in the application of various finishing qualities.

1. **Pebble-dash or dry-dash:** This is the finish in which small pebbles or crushed stone of suitable sizes are thrown on to a freshly applied final coat of mortar and left exposed. The pebbles are sometimes lightly pressed or tapped into the mortar after throwing.

2. **Rough cast:** This is a finish in which the final coat containing a proportion of fairly coarse aggregate is thrown as a wet mix and is left in a wet condition. The coarseness of the texture depends mainly upon the type and size of the coarse aggregate.
3. **Scarped finishes:** In this type of finishes the final coat of mortar, after being leveled and allowed to stiffen, is scraped with the a steel straight edge , or a board studded with nails or any other form of tool convenient for this surface, so as to give a rough surface.
4. **Textured finishes:** with the aid of suitable tools, ribbed stucco or fun textures can be created in the final coat. Thin slabs of expanded polystyrene and rigid foamed polyurethane can be used as lining to produce textured finished to concrete.
5. **Smooth finish:** this type of finish has got a level and a smooth surface. The wooden float normally used as a steel float, gives surface much more liable to craze.
6. **Machine applied finishes:** A variety of finishes in which the final coat is applied by machine, which throws or spatters the material on the wall can be adopted. The machines may be manually operated or mechanically operated and a sort of gun is used to throw out the material.
7. **Board marked concrete:** A variety of surface textures and overall patterned effects can be achieved by casting concrete against suitably prepared rough sawn boards.
8. **Exposed aggregate concrete finishes:** Removal of the Cement-Sand mortar from the surface of concrete to reveal the underling coarse aggregate produces a durable textured finishes. There are there methods, which are commonly used to remove the surface mortar without causing significant damage to the coarse aggregate:

✚ exposure by washing and brushing, ✚
the use of surface retarders, and ✚ abrasive
blasting of concrete.

Exposed aggregate finishes can be made by either precast or in situ concrete, although precast concrete manufacturers have developed a considerable amount of experiences in the production of exposed aggregate finishes. Factors affecting the execution of exposed aggregate finishes include, among other things: formwork; behavior of fresh concrete: aggregate shape, grading and sizes; concrete placing and compaction.

9. **Tooled concrete finishes:** By tooling hardened concrete, the outer surface is broken away to leave a rough textured durable finishes. There are basically four types of finishes which come into this category based on the tools used to produce them. These are:

- i. the needle-gun finish,
- ii. the bush-hammered finish,
- iii. the point-tooled finish, and
- iv. the hammered ribbed finish.

The formwork for concrete that is to be tooled must be of the highest standard so that the concrete mix should be designed as visual concrete. During tooling, the cover to reinforcement is reduced by the removal of a layer of concrete. Additional cover must be provided to allow for the loss demanded by the process. The actual type of finish and the depth of tooling required must be determined in advance in order to provide the appropriate extra cover.

11. SELECTION OF FINISHING TYPES

In making the decision for the selection of a suitable finish, its specifications and color, the following major factors need to be considered.

- 1) the appearance required,
- 2) the maintenance necessary for giving the satisfactory appearance,

FINISHINGS

- 3) the degree of protection against rain penetration to be provided by the finish,
- 4) the severity of exposure to atmospheric and climatic agencies affecting durability,
- 5) the time of year during which the finish is applied,
- 6) the background materials on which the finish is to be applied, and
- 7) the cost.