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## 15 . FINISHES

### 15.1 PLASTER

Plaster is a material used in a plastic state, which can be trowelled to form a hard covering for interior or exterior surfaces, walls, ceilings, etc., in any building or structure.

#### 15.1.1 BASE

Plasters are applied to bases of bricks, stones, hollow tiles, or concrete masonry and to wood laths, metal laths and gypsum laths or similar materials finished in sheets.

#### 15.1.2 SURFACE PREPARATION

A stiff wire brush is used to remove all loose dust from joints, and the surface is then thoroughly washed with water. Plastering should not be done' on too much wet walls, because the results will not be satisfactory.

A good key is essential to a successful rendering and to avoid cracking and crazing. All joints in masonry are raked to a depth of at least half an inch with a hooked tool specially made for the purpose and not with trowel or hammer. This is to be done while the mortar is still green and not later than 48 hours of the time of laying. After raking, the brickwork is brushed to remove all loose dust from the joints and thoroughly washed with water. (In case of old walls, it may sometimes be advisable to ensure a good key for the new rendering by destroying the smooth surface, of the brickwork with some tool.) If the walls are washed with a solution of 1 part hydrochloric acid to 10 parts water, it will bring the grains in brickwork to the surface. This solution is left on for about quarter of an hour and then washed off with water.

#### 15.1.3 COATS

Plaster may be applied in one, two or three coats; two are usually sufficient, but three should be applied only on wood or metal lathing or on a very rough, uneven background. The thickness of the first coat has to be just sufficient to fill up all unevenness in the surface. The second and subsequent coats are thinner than the first, and no single coat has more than half an inch of thickness, because thick coats shrink more and crack. Under-coats of coarse stuff are allowed to dry and shrink properly before subsequent coats are applied; otherwise cracking and crazing is bound to occur. A good key for all stages of, plastering is essential. The freshly plastered surface is scratched or roughened before it has fully hardened, to form a mechanical key for the second coat. The method of application of the mix influences the adhesion; the mix sticks better if thrown on than if applied by trowel.

#### 15.1.4 MATERIALS

Various materials employed for plastering have been described here below. A rich mortar mix tends to develop large cracks; a weaker one develops finer and distributed cracks. A strong coat is never applied over a weaker one since the latter would be unable to restrain its movement.

Mortar is defined as a material composed of fine aggregate and cementing material which forms a hardened mass when mixed with a suitable proportion of water. It is used for plaster work and for bonding bricks and masonry solidly together so that stresses from super-imposed loads are evenly distributed. The cementing material are clay and portland cement for mud mortar and cement mortar respectively. Sand is the aggregate used for cement mortars. The constituents of all mortars should be mixed thoroughly to ensure a uniformity of composition.

Mortars are usually defined by their composition rather than properties, and the proportions of ingredients are generally taken by volume. The following are the different types of mortars commonly used.

#### **15.1.4.1 MUD MORTARS**

Mud mortar is used in brickwork, masonry and plaster work, provided these works are not likely to remain under water. The mud mortar shall comply with the provisions of clause 11.7.2(i), Mud Mortar, Section 11 – Brickwork.

#### **15.1.4.2 CEMENT MORTAR**

Cement mortar is used in brickwork, masonry plaster work and concretework. Its Ingredients are cement and sand whose proportions may be 1:2, 1:3, 1:4, 1:5, 1:6, 1:7, 1:8 and so on by volume as specified and shall comply with the provisions of clause 11.7.2(ii), Cement Mortar, Section 11 - Brickwork.

#### **15.1.4.3 MORTAR OF FIRE CLAY BRICK WORK**

Fire-clay or alternatively fire-cement is suitable for setting firebricks. Generally the joints are the most vulnerable part of fire brickwork and when they crumble away, the arises of these bricks become vulnerable to heat. Fire-clay can be used just as it comes out of hearth but it tends to contract on cooling and again on exposure to heat; so the best way is to use fire-cement that is especially prepared to resist construction under heat. Burnt clay, made by crushing ordinary fire bricks does not expand or contract markedly and therefore constitute a suitable aggregate for fire brick mortar mixed with high alumina or other bauxite cement.

The proportion of alumina cement to crushed fire brick is 1:1. The mortar is prepared in the same manner as described for cement mortars.

#### **15.1.4.4 CEMENT MORTAR WITH PLASTICISER/ADDITIVES**

The proprietary plasticizer approved by the Engineer-in-Charge, shall be used with cement and sand to improve the workability and durability of cement mortar. The dosage and mixing of the plasticizer shall be in accordance with the recommendations of the manufacturer for plasticizer.

The other additives used could be pigments for the required color, water proofing agent and washing soda. The procurements shall be made and mixing done as approved by the Engineer-in-Charge.

### **15.1.5 CEMENT PLASTERING**

#### **15.1.5.1 GENERAL**

- a) Plastering or pointing shall not commence until all electric conduits, drainage and sanitary pipes, inlets to tanks, brackets, clamps, doors and window frames and all sorts of inserts and embedded items are fixed in position. It shall be the responsibility of the Contractor to make sure that all such work is carried out by other contractors before starting of plaster or pointing work, chiseling and repairing of cement plaster or pointing shall not be permitted without the approval of the Engineer-in-Charge.
- b) Sample of materials shall be submitted to the Engineer-in-Charge for his approval prior to use in the works.
- c) Tolerances

Surfaces of plaster work shall be finished with a true plane to correct line and level with all angle and corners to a right angle unless otherwise specified and with walls and reveals plumb and square.

The maximum permitted tolerances shall not exceed 3 mm in 2m variation from plumb or level in any exposed line or surface and 1.5 mm variation between planes of abutting edges or ends.

d) **Cleaning and Protection**

Rubbish and debris shall be removed as necessary to make way for work of other trades and as directed by the Engineer-in-Charge. As each room or space is completed, all rubbish, debris, scaffolding and tools shall be removed to leave the room clean.

**15.1.5.2 PRECAUTIONS IN PLASTERING**

Unless otherwise specified or directed by the Engineer-in-charge the following measures shall be adopted to remedy defects and faults incidental to plaster work.

- i) Fine aggregate (sand) shall be clean and free from all impurities. It shall be washed before use.
- ii) A proper key shall be provided between the plaster and the surface to be plastered.
- iii) The background shall be kept moist but excessive moisture shall be avoided.
- iv) Proper curing shall be done to eliminate excessive and rapid thermal changes.
- v) Each coat shall be allowed to dry before the next is applied.

**15.1.5.3 SCAFFOLDING**

The scaffolding for plaster shall always be double.

**15.1.5.4 INSPECTION OF PLASTERING**

Plastering shall be inspected by the Engineer-In-charge or his authorized representative when the work is in progress and after its completion. The following points will be kept in view while making the inspection.

- i) If wood skirting are specified, the plastering has been finished tight, on to them.
- ii) The surface checked by mean of straight edge and tips of the fingers is perfectly even.
- iii) All intricate places like soffits, cupboard and their recesses, specified to be plastered, have been properly plastered.
- iv) The work has been properly finished at the junction with other materials, such as woodwork at windows and door openings fireplaces and similar other places
- v) If wood angle-beads are specified they are of proper section under cut for key. Securely fixed and the plaster has been finished up to them in a proper manner.
- vi) Special care has been taken of cornices, and moulding sections. The templates shall be thoroughly checked and compared with the approved drawing.
- vii) All ornamental work and other details as specified are true to design and securely fixed and bonded.
- viii) In external stucco, rough cast, or pebble-dashing, the coats are of even thickness and are uniformly laid.
- ix) The plastered surface struck with the knuckles does not give hollow sound. If it rings hollow, it is an indication of insufficient adhesion between various coats of plaster.

**15.1.6 PLASTERING.**

- i) Unless otherwise specified or directed by the Engineer-in-Charge or his authorized subordinate in writing, wooden screeds 8 cm wide and having a thickness equal to the plaster shall be fixed vertically 2.5 meter to 3 meter apart to act as gauges and guides in applying the plaster.

- ii) The arises shall then be plastered for a space of 10 cm on each side and up to the ceiling, except in case of openings where it shall run around them. This plaster shall also serve as a guide for thickness etc. Unless otherwise specified or directed by the Engineer-in-Charge all corners and arises shall be rounded off to a radius of 20mm only and no more.
- iii) The mortar shall be laid on the wall between the screeds, using a plasterer's float for the purpose and pressing mortar so that the raked joints are properly filled. The plaster shall then be finished off with a wooden straight-edge reaching across the screeds. The straight-edge shall be worked on the screeds with an upward and sideways motion, 5.5 cm or 7.5 cm at a time. Finally the surface shall be finished off with a plasterer's wooden float. Metal floats shall not be used.
- iv) The plaster shall be laid to a true and plumb surface and tested frequently with a straight - edge and plumb-bob. The straight - edge shall not be less than 3 meters in length. As the work proceeds, all horizontal lines and surfaces shall be tested with a level, and all jambs and corners with a plumb-bob.
- v) All mouldings decorations details and finishes shall be worked true to template and shall be neat, clean, level, and parallel, or truly plumb, as the case may be.
- vi) Unless otherwise specified, plaster shall not exceed 12 mm in thickness and shall not be less than 6 mm at the thinner part.
- vii) Protection During Curing  
After completion, plaster shall be kept wet for 10 days and shall be protected (during that period from extreme fluctuations of temperature and weather).

#### 15.1.7 DEFECTS IN PLASTER

Various defects observed on plaster alongwith their causes are given below:

- a) CRACKS:  
Cracks briefly occur on account of (i) Structural defects in building and discontinuity of surface. (ii) Plastering on very wet background. (iii) Old surface not properly prepared. (iv) Over-rapid drying. (v) Excessive shrinkage of the plaster owing to thick coats and richer mixes.
- b) PITTING AND BLOWING:  
These defects are noticed In case of faulty slaking -and hydration of the lime particles in the plaster.
- c) FALLING OUT:  
Plaster falls out mainly on account of (i) lack of adhesion for not having formed a proper "key" in the background (ii) Excessive moisture in the background (iii) Excessive thermal changes either in the background or in plaster itself. (iv) Rapid drying. (v) Insufficient drying between each coat of plaster.

#### 15.1.8 REMEDIES OF DEFECTS

Hair-cracks on fresh plaster normally disappear after whitewashing. But wide cracks shall be filled in by forcing down mortar consisting of plaster of paris, cement and sand in the proportion of 1:2:7 unless otherwise specified or directed by the Engineer-in-charge. Surface areas showing pitting, blowing, popping and blister shall be remedied by cutting out patches in rectangular shape, under cutting the edges to form a dovetail key and making good on a portland cement ground.

All these remedial measures shall be carried out by the contractor at his own expense.

## **15.1.9 PLASTERING ON LATHING OR EXPANDED METAL**

### **15.1.9.1 GENERAL**

Lathing constitutes a convenient base in some form of construction for plastering on walls and ceilings. Metal lathing, the most commonly used, is fixed to timber support by galvanized wire nails or staples at short distance. It is also often used to bridge the junction of two dissimilar backgrounds, or to provide a suitable key for plastering over a wooden beam. Metal lathing may be of expanded metal or woven wire etc., which should weigh not less than 12 lbs per 100 square feet, except when used to provide the key. Lathing is stretched tight with the help of some tension device such as mild steel rods since plaster would crack on a loose lathing. After cleaning the rust, if any the lathing is brushed with cement slurry. Most common defects in plaster on metal lathing are extensive cracking, particularly along the line of fixing of the lathing to its support or unevenness of the finished plastered surface.

### **15.1.9.2 PREPARATION OF SURFACE**

- i) Expanded metal or similar metal fabric or lathing shall be free from all rust, grease or other surface impurities, before plastering can be done.
- ii) When wooden lathing is used the wood shall be cleaned, slightly roughened and two coats of (creosote) or other wood preservative shall be given. Lathing shall be erected to break joints.

### **15.1.9.3 MORTAR**

Unless otherwise specified two coats of plaster shall be applied. The mortar for both the coats shall be 1:3 cement mortar prepared as per Specifications No. 15.1.4.2 except that for the first coat  $\frac{3}{4}$  lb of fine chopped jute or hemp shall be added and thoroughly mixed with each cubic foot of mortar.

### **15.1.9.4 FIRST COAT**

The first coat shall be applied in such a way as to enclose the fabric completely or in the case of wooden lathing, to form a secure key between the lathes. The coat shall be worked to an even surface half an inch behind the screeds and kept wet for four days or till it sets.

### **15.1.9.5 FINISHING COAT**

Before the first coat has set the surface shall be scratched with a sharp tool both ways to give a key to the floated coat. All dust and loose plaster shall be washed off, the surface shall be cement-washed and floated coat shall then be applied and finished according to provisions of Clause 15.1.5 as approved by the Engineer-in-Charge.

### **15.1.9.6 OTHER RESPECT**

In all other respects, it shall conform to relevant portions of Clauses 15.1.5 and before.

### **15.1.10 MORTARS FOR PLASTERING**

The mixing proportion (by volume) of dry material for preparation of mortar shall be corresponding to relevant CSR item.

### **15.1.11 NIRU PLASTER**

The niru plaster is a cement wash compressing a solution of cement & water in proportions as specified. The solution is freely applied on prepared surfaces by simple spraying or by application with brush.

## **15.1.12 MUD PLASTER**

### **15.1.12.1 PREPARATION**

Mud mortar for plastering shall be prepared as per Specifications No. 15.1.4.1.

### **15.1.12.2 APPLICATION OF PLASTER**

The plaster shall be spread evenly over the wall so as to be not more than 3/4 inch thick. In case of roofs and floors, its thickness shall be 1 inch. After spreading, the plaster shall be floated with a straight-edge, till the surface is perfectly smooth, level and true. Any cracks that open out during drying shall be filled with liquid cow-dung.

### **15.1.12.3 FINISH**

- i) When the surface has dried, it shall be leeped over and finished off with a trowel or float in the case of walls and roofs. In the case of floors, it shall be applied and finished by hand.
- ii) The leeping shall be done with a preparation described below:-  
Cow-dung is steeped in water to render it free from grass, straw, seeds and other impurities. If considered necessary, it shall be passed through a fine sieve. An equal part of finely powdered clay shall then be mixed with it thoroughly in the tub.

## **15.2 POINTING**

### **15.2.1 GENERAL**

The surface of the work is prepared as explained under "Plastering". When commencing masonry each day the first thing to be done if the surface is to be subsequently pointed, is to rake out the face joints of all masonry finished the previous day. The joints are properly wetted in old work before pointing; for the mortar will not stick to a dry surface. The work pointed is kept wet for at least three days.

### **15.2.2 MORTAR MIX**

The mortar for pointing shall be cement sand mortar in proportion as specified and shall be prepared as per provisions of Clause 15.1.4.2.

### **15.2.3 PREPARATION OF SURFACE**

- i) Before pointing old brickwork or new brickwork in mud, the joints shall be raked out with a hook (not hammer) to a depth of half an inch. If, for any reason, the joints in new brickwork and stone masonry are not struck as the work proceeds they shall be raked out before the mortar sets.
- ii) All earth and mortar dust coming out of the joints as a result of raking shall be washed off and the brickwork watered for 24 hours. The face shall once again be washed just before starting pointing.
- iii) The surface prepared in the manner described above shall be inspected by the Engineer-in-charge or his authorized subordinate and shall be approved by one of them before actual pointing begins.

### **15.2.4 TYPES OF POINTING**

Unless otherwise specified various types of pointing suitable for different situations shall be as follows:

#### **a) DEEP OR STRUCK CEMENT POINTING**

- i) This type of pointing, shall be done to all un-plastered faces of brickwork in mud where the brickwork is liable to be affected by dampness and saltpetre such as in plinths of buildings.
- ii) The mortar shall be prepared as per Specifications Cement Mortar, Section 11 - Brickwork.



- iii) The mortar shall be filled in the joints flush with stone masonry or brickwork with a pointing trowel and then pressed in with proper pointing tools. Lining with a spike on a mass of mortar shall not be allowed.

**b) FLUSH CEMENT POINTING**

- i) This type of pointing shall be done to all brickwork and stone masonry with an exposed face when the finish of the face is not important or when a flush floor surface is required or when the floor or brickwork is subject to wear or to the effects of dampness and saltpetre.
- ii) The mortar shall be prepared as per Specifications Cement Mortar, Section 11 - Brickwork..
- iii) The mortar shall be filled and pressed into the joints with a pointing trowel and finished off level with the edges of the bricks to give the smoothest possible appearance to the work.

**c) RULED POINTING**

- i) This type of pointing shall be done when specified to brickwork and stone masonry not liable to be flushed with Water.
- ii) The cement mortar as actually specified shall be used. These mortars shall be prepared as per Specifications Cement Mortar, Section 11 - Brickwork.
- iii) The mortar shall be filled and pressed into the joints with a pointing trowel and finished off level with the edges of the bricks and shall then be ruled along the centre of all joints with a half round tool 1/2" wide.

**d) STRIKING JOINT**

- i) All new un-plastered faces of work in cement mortar shall be finished by striking joints as the work proceeds according to the relevant part of Section 11 contained under brickwork.
- ii) In case of walls, joints shall be struck by raking out the green mortar after the brickwork has been laid and finished with a pointing tool.

**15.2.5 POINTING TOOLS**

The pointing tools for horizontal joint shall be such as to form weathered and struck joints, and for vertical joint, triangles so as to make a (V) notch in the joints care shall be taken not to develop a cutting edge in the tools since the idea is to compress the green mortar into the joints and not to cut it away.

**15.2.6 EDGES OF BRICK**

The mortar shall not be spread irregularly over the edges and corners of the bricks, which shall be left clearly visible. The practice of smearing mortar, over defects in bricks, to hide them, shall not be allowed and shall render the whole brick work liable to be rejected.

**15.2.7 WASHING AFTER POINTING**

After pointing, the face of the work shall be cleared off all surplus mortar sticking to the face. No washing shall be done till the pointing has set.

**15.2.8 CURING**

The cement pointed work shall be kept wet for 10 'days after completion. The work shall be protected during that period from extreme fluctuations of weather.

**15.3 WHITEWASH**

**15.3.1 PREPARATION**

Whitewash, which is the cheapest water paint and has the desirable sanitary properties, is prepared from pure fat lime (white stone) or shell lime. Preferably, un-slaked lime is brought to the site of work and slaked there. After slaking it is kept in a tank of water for at least two days and then stirred up with a pole till it attains the consistency of a thin cream. Where

necessary, gum or rice water (2 Ozs. of gum for 1 Cu.ft of lime) is added. Sometimes flour, skimmed milk, glue, molasses or other substances are mixed in the slaked lime to increase its adhesion. Preservatives such as salt or formaldehyde are added to keep these substances from spoiling. White ash may be tinted by using pigments and should be strained through a coarse cloth or a fine wire gauze before use.

### **15.3.2 PREPARATION OF SURFACE**

All loose material and dirt on the surface must be removed with a brush. Holes and, irregularities of surface are repaired with lime putty, and the surface is allowed to dry before applying whitewash or color-wash. Similarly dusting and repair are done, to walls which have been whitewashed several times before. All greasy spots are given a coat of rice, water and sand. Surfaces discolored by smoke are washed with a mixture of wood ashes and water or yellow earth before being whitewashed.

### **15.3.3 APPLICATION**

Each coat of whitewash comprises four strokes applied vertically and horizontally. One stroke is given from the top downwards and the other from the bottom upwards over the first stroke before it dries up, and similarly one stroke from the right and another from the left over the first brush. Each coat is allowed to dry up before the next is applied. Normally three coats are applied on the new surface.

Keeping in view the various principles on which the hydration of quicklime depends, the following methods are employed for slaking different types of lime:

#### **a) HAND SLAKING**

- i) By drowning: High calcium lime or fat lime is slaked by, drowning the particles in a tub containing enough quantity of water. The tub is covered to preserve the heat.
- ii) By Immersion-Feeble hydraulic limes are slaked by immersion. They are put in a basket which is immersed in, a tub filled with water. The basket is withdrawn when the sound of the reaction becomes apparent. The exact period of immersion is a matter of experience.
- iii) By sprinkling-Hydraulic limes are usually slaked by this manner. They are spread on a specially prepared non-ferrous platform and water is sprinkled by mean of a can with a rose. Simultaneously the limes are turned over with spades. The slaking operation is accelerated, if the limes are initially pulverized in grinding mills.
- iv) Air Slaking-According to this method lime takes moisture from the air when kept in an exposed condition. This process of hydration is also accompanied by the formation of a certain proportion of calcium carbonate by taking carbon-dioxide from the air and in this way lime is spoiled. Besides, it is difficult to control this process.

#### **b) MECHANICAL SLAKING OR HYDRATING:**

Hydrated lime is produced on a large scale with the aid of various types of mechanical appliances. It may be produced in a specific quantity each time or the process kept continuous.

By whatever method, the hydration is done the following points must be observed:

- Only the necessary quantity of water should be added to the lime at a uniform rate.
- Lime and water must be thoroughly mixed. The temperature of hydration should be properly controlled by a suitable cooling method.

A hydrating plant essentially consists of a crusher and a hydrator with a suitable storage tank and silos, and contains devices for conveying the material from one unit to the other.

Hydrated lime is then passed through a sieve of 20 to 30 meshes to an inch to yield a powder of the required fineness.

#### **15.3.4 WHITEWASHING CEMENT CONCRETE**

Cement concrete surface requires treatment prior to whitewashing. Surface is scraped off with a wire brush to remove greasy patches if any and washed with soap-suds. A coat of sodium silicate and water in the ratio of 1:5 is given to avoid any future scaling or flaking off.

Half to one part (by weight) of tallow in small lumps is added to 16 parts of quick lime, slaking it with only just sufficient water to form a thick paste stirring occasionally to assist in dispersing the tallow, and allowing it to stand till it cools down. The resultant paste is thinned down to a required consistency, is strained and applied on the surface in the usual manner. In the absence of tallow other oils or fats (for example, linseed oil or castor oil or some common vegetable oil) about 10% of the weight of dry lime are added to serve this purpose. If oil does not incorporate with the lime, the mixture is boiled a little till the oil disappears. In this way it becomes an insoluble soap which when once dry cannot be washed off even with heavy rains.

#### **15.3.5 CEMENT WASH**

Cement wash is simply a thin grout made of Portland cement and water and of such a consistency that it can be applied with a brush. Fine sand is sometimes added. This wash may be colored, if desired, but with certain tints it is desirable to use white Portland cement. Paints consisting of two parts of Portland cement to one part of lime are usually used.

### **15.4 COLOR-WASHING**

#### **15.4.0 GENERAL**

Color-washing is nothing more than a lime-wash colored with suitable pigments and treated to give a desired tint. It is applied exactly in the same fashion as the whitewash. The old paint is scraped off or a coat of whitewash is applied before the new color is given. Gum or rice water is added as in whitewashing.

#### **15.4.1 PREPARATION**

The surface to be color-washed shall be prepared according to the specifications No. 15.3.2 for Whitewashing.

#### **15.4.2 PREPARATION OF COLOR-WASH**

The color-wash shall be prepared by adding the necessary coloring pigment to the whitewash which has been strained. The mixture shall be stirred thoroughly and passed through a clean, fine cloth. Only such quantity of wash shall be prepared as can be consumed in a day's work.

#### **15.4.3 APPLICATION**

- i) New or scraped surface shall be given a coat of whitewash, prior to color-wash.
- ii) Old surface when the color-wash is satisfactory shall be given only one new coat of color-wash.
- iii) When replacing one color with another of a lighter shade the old color - shall be thoroughly scraped and a coat of whitewash given before the new color is applied.
- iv) Each coat color-wash shall be allowed to dry and shall be inspected by the Engineer-In-charge or his authorized subordinate. The next coat shall not be applied unless the previous one has been approved by either of them.
- v) The completed wall shall be of a uniform color free from blots lines or cut shades and shall present a smooth regular surface which shall neither crack nor come off readily on figures when rubbed.

- vi) Each room shall be finished in one operation and work shall not start in a room so late that it cannot be finished the same day.

#### **15.4.4 OTHER RESPECTS**

In all other respects not specified here, it shall strictly conform to Specifications No. 15.3 for Whitewashing.

### **15.5 DISTEMPERING**

#### **15.5.1 GENERAL**

- i) Unless otherwise specified or directed in writing, a newly plastered wall shall not be distempered earlier than 12 months after the plastering if distempered earlier the plaster shall be treated with damp proof compound.
- ii) Distempering shall not be done in damp weather nor when the weather is excessively hot and dry.

#### **15.5.2 PREPARATION OF SURFACE**

- i) Newly-plastered surface when absolutely dry shall be sand-papered to remove all irregularities, making good inequalities and holes with gypsum which shall be allowed to set hard. Unless the surface is perfectly clean and smooth, no pleasing effect shall result from distemper.
- ii) Old plastered surfaces shall be thoroughly cleaned if it is whitewashed or color-washed, it shall be rubbed off with sand-paper or cocoanut fibre in case it is loose and then stopped and sized.
- iii) After rubbing and cleaning, all plastered surface, old or new, shall be sized with a coat of equal parts of size and alum dissolved in hot water. Decomposed size shall not be used under any circumstances. Where the makers of the distemper recommend a special priming coat only that coat shall be applied.
- iv) If the existing surface is cleanly distempered all the distemper shall not necessarily be removed. The surface shall be smoothed down with glass paper or any firm distemper on the wall after such rubbing shall be left.

#### **15.5.3 PREPARATION OF DISTEMPER**

- i) Unless otherwise specified ready-made distempers as specified and approved by the Engineer-in-Charge shall be obtained from the market as they are easily available.
- ii) Distempers shall be mixed strictly in accordance with the maker's instructions or as directed by the Engineer-In-charge, and the quantity shall be just sufficient for the day's work.

#### **15.5.4 APPLICATION**

- i) Distemper shall be applied only with proper brushes as supplied or recommended by the maker. The brushes shall be washed in hot water after work each day and hung up to dry. Old brushes caked with dry distemper shall not be allowed to be used on the work.
- ii) Distemper shall be applied quickly and boldly leaving no dry edges. The brush shall be dipped in distemper and stroked cross-wise on the wall, then immediately stroked up and down and stopped.
- ii) Unless otherwise specified or directed two men shall work on a wall together, one working from the ceiling, downwards as far as he can reach and the other following him applying the distemper from below. No patchy overlap shall be allowed under any circumstance. .
- iv) Unless otherwise specified, the following number of coats of distempers shall be applied:
  - a) On newly plastered walls two coats over one coat of priming.

- b) On old plastered walls covered with one or two coats of hard dry whitewash free from efflorescence or kalar, one coat without priming coat.

## **15.6 CEMENT RENDERING**

### **15.6.1 PREPARATION OF SURFACE**

- i) The surface to be rendered shall be thoroughly cleaned and dust loose particles, grease and oil stains shall be removed by washing, using a wire brush, if necessary.
- ii) Brickwork, stone masonry or concrete shall be prepared to receive the rendering by raking out joints to a small depth not more than ½", or in the case of hardened concrete by beating a thoroughly saturated surface by 1:6 solution of hydrochloric acid and water, washing down within six hours and wire brushing so as to expose the aggregate. If the Engineer-in-charge thinks that the surface so prepared provides a good key, a single coat of rendering 3/8" to ½ " thick shall suffice.
- iii) If, however, a good key is not obtained, a base coat of coarse sand and cement in the proportion of 1-1/2" parts sharp sand 1/4" down to 1 part cement, mixed in sufficient water, shall be applied. The mixture shall be dashed on to the wall in an uneven manner.

### **15.6.2 PREPARATION OF MORTAR FOR RENDERING**

- i) Fine Aggregate, Cement and water shall conform to Specifications of Cement Mortar referred in Clause 15.1.4.2.
- ii) The grading of aggregate shall be ½" down for key coat and 1/8" down for finishing coat.
- iii) The proportions of cement and aggregate for key coat shall be 1:3 and for backing or finishing coat 1:1-1/2". A mortar of required consistency shall be prepared by adding water from 12 to 16 per cent of the total volume of aggregate and cement for backing coat and 14 to 18 per cent for finishing coat, unless otherwise specified or directed by the Engineer-In-Charge.

### **15.6.3 APPLICATION**

#### **i) BACKING COAT:**

It shall be laid to a uniform thickness of 3/8" and just, after the material has started to set, it shall be scored in wavy lines by a wire-nail comb to form a bond for the next coat, and the work then allowed to set for at least 30 hours. It shall be kept damp for that period.

#### **ii) FINISHING COAT:**

Unless otherwise specified or directed, the finishing coat shall be 1/8" thick. The backing coat (base coat) shall be washed clean and the finishing coat applied evenly with care.

### **15.6.4 CURING**

The finishing coat shall be protected from the sun, hot winds or rain by wet screens till it has hardened sufficiently to remain unaffected by the external application of water. It shall then be watered and kept damp for a period of at least seven days and allowed to dry as slowly as possible.

### **15.6.5 PROTECTION AGAINST CRACKING AND CRAZING**

The surface shall be divided by joints to prevent cracking, and these joints shall be placed horizontally at the sill and Lintel level of windows and vertically at opening in wall angles and corners.

## **15.7 EMULSION PAINTING**

### **15.7.1 SCOPE**

The work include the provision of all materials, labour, plant and equipment and completion of work as specified and approved by Engineer-in-Charge

**15.7.2 MATERIALS**

Emulsion paints shall be of make and type as specified and approved by the Engineer-in-Charge.

**15.7.3 EMULSION PAINT APPLICATION**

For emulsion paint application the specifications laid for distempering under clause 15.5 shall apply.

**15.8 SYNTHETIC FINISH**

Synthetic finishes consist of application of synthetic finishes like Rockwall, Durock Graphic, Cemec or equivalent as specified and approved by the Engineer-in-Charge. The work shall be carried out according to supplier's instructions.

**15.9 STUCCO CEMENT PLASTER**

**15.9.1 SCOPE**

It shall cover placing 1:2:4 (Cement, Sand and Shingle) mix, 51 mm thick, as a plaster including furnishing of all labour, materials, plant, equipment, accessories and services as required to complete the plastering item as shown on the Drawings, specified herein and/or as directed by the Engineer-in-Charge. The materials herein specified shall be proportioned, mixed, formed and placed in accordance with the herein stated requirements. The stipulations and requirements herein set forth shall apply except when such stipulations and requirements are specifically modified by the Engineer for this particular item of work.

**15.9.2 MATERIALS**

a) Cement

Portland cement shall conform to ASTM C 150-94 Type 1 or BSS – 12.

b) Sand

All sand required under these specifications shall be composed of particles with a maximum size of 5 mm. Sand shall be processed from natural deposits or manufactured from quarried rock.

The grading of sand for this item of work shall be as under:

100 % shall pass through sieve NO.4  
2 to 10% shall pass through sieve NO.1 00

c) Aggregate

The aggregate shall comprise shingle having grading as shown on the Drawings and or as directed by the Engineer. Generally reasonable grading is as under:

5mm to 9mm size	upto 25%
9mm to 10mm size	upto 75%
Above 18mm	NIL

d) Water

Water required to be used shall conform to the stipulations and requirements set-forth Section 11 – Brickwork mortar.

**15.9.3 MIX PREPARATION**

The mix shall conform to the mix design specified in the Drawings. Mix used in Stucco Cement Plastering, as a general principle, shall be so mixed that it is firm enough to stay in place when plastered. The net water-cement ratio of the concrete (exclusive of water within or absorbed by the aggregates) shall range from 0.53 to 0.58 based on the climatic temperature. Temperature of mix when it is placed, shall not be more than 32 degree C and not less than 5 degree C. Tests of the mix shall be made by the Engineer-in-Charge and the

mix proportions shall be changed, whenever necessary, for the purpose of securing the required workability, density, impermeability, durability or strength.

#### **15.9.4 THICKNESS**

Unless otherwise specified, the thickness of the plaster shall conform to the approved design/drawings. Generally, the thickness of Stucco cement plaster is taken as 51 mm. The plaster having thickness less than the specified thickness shall be rejected.

#### **15.9.5 APPLICATION OF PLASTER**

The plaster shall be done in two coats. The surface of first coat shall be made rough before the second coat is applied

#### **15.10 GYPSUM PLASTER**

Gypsum Plaster shall be provided wherever shown on the Drawings or as directed by the Engineer-in-Charge. The work shall be carried out strictly in accordance with the manufacturer's instructions.

Gypsum is naturally occurring material which is quarried or mined. When it is heated to a comparatively low temperature (150-170°C), it is called plaster of Paris or calcium sulphate hemihydrates. When it is mixed with water it sets quickly to form a hard mass. This setting period is too short to permit the material to be used as plastering material. The setting time may be lengthened by adding retarders and the amount of retarders is adjusted by manufacturer's instructions to suit the purpose of plaster.

Simple precaution which should be taken includes storing before use in a dry place. Calcium sulphate plasters in general are not suitable for use under persistently damp conditions because they will slowly dissolve in water. Plaster of Paris should not be applied to backgrounds containing large amounts of water, should not be used with clayey sand which tends to retain water and should be given adequate drying conditions once they have hardened.

#### **15.10.1 GYPSUM PLASTER BOARD**

Gypsum plaster board consists of a core of set gypsum enclosed between and firmly bonded to two stout lining papers. It is covered by British Standard, 1230:1955. This includes the following main type;

- Gypsum base board
- Gypsum wall board
- Gypsum lath
- Gypsum plank

Gypsum base board, Gypsum lath and Gypsum plank are used as a base for plaster. Gypsum wall board is designed to receive a direct decorative finish, but it may be plastered on its reverse side.

##### **15.10.1.1 UNDERCOAT:**

The undercoat of specified thickness and proportion shall be applied strictly in accordance with the specification of plaster as described in 15.1.5. The surface, however, needs not to be smooth.

##### **15.10.1.2 APPLICATION:**

Gypsum plaster board of specified thickness shall be fixed by nailing to wood joists or studs at 14" to 18" centre or as directed by Engineer-In-charge.

**15.11 TILE FACING**

The tile facing shall be as shown on drawings and approved by the Engineer-in-Charge. The work shall be carried in accordance with the applicable provisions of tile laying in Section 14.

**15.12 ORNAMENTAL PLASTER**

Ornamental plaster shall be provided wherever shown on the Drawings or as directed by the Engineer-in-Charge. It could be either original imported cement, or colored cement or cement mixed with coloring pigment as provided in the item of work. The work shall be carried out strictly in accordance with 15.1.5.

**15.13 MEASUREMENT AND PAYMENT**

**15.13.1 COMPOSITE RATE**

The measurement and payment for the items of the work of Brickwork hereof shall be made corresponding to the applicable CSR items as provided in Contract Agreement and shall constitute full compensation, for procurement, transportation, performance in all respects and completion of work as specified including the site clearance as approved by the Engineer-in-Charge.

**15.13.2 LABOUR RATE**

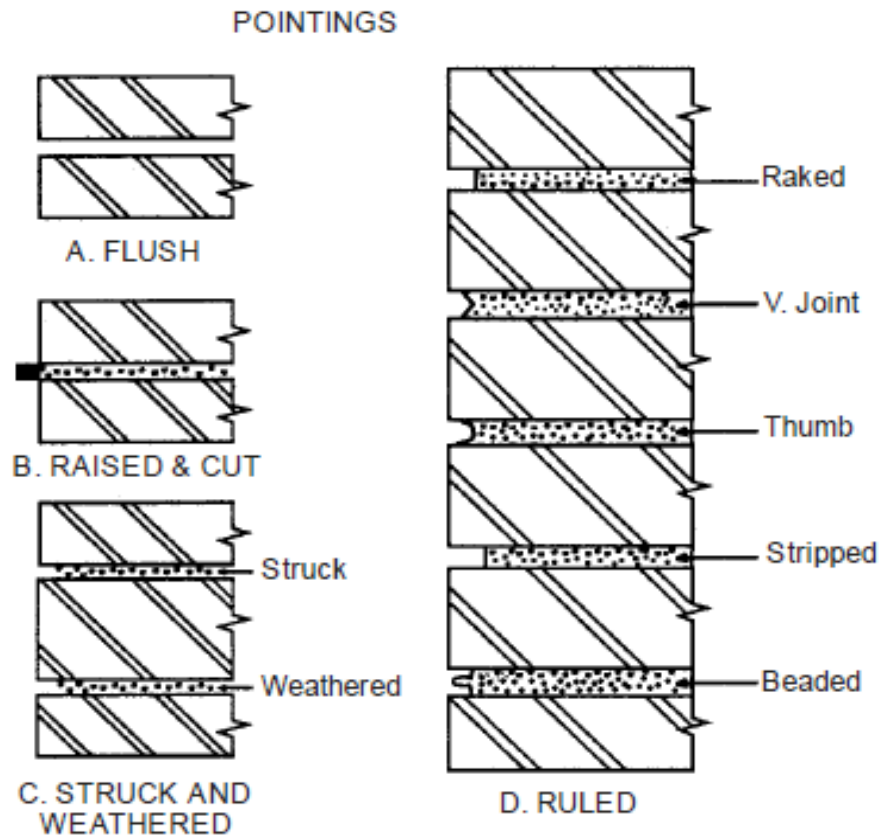
The measurement and payment for the items of the work of Brickwork hereof shall be made corresponding to applicable CSR item as provided in Contract Agreement and shall constitute full compensation for procurement transportation, performance in all respects and completion of work as specified including site clearance, as approved by the Engineer-in-Charge except the cost of materials to be provided by Department at designated location as defined in the Contract Agreement.

**15.13.3 QUANTIFICATION**

The unit of measurement shall be measured as mentioned below in accordance with corresponding CSR items.

1. For surface area items, the quantity of work shall be measured by surface area. The unit of measurement shall be Square Foot or Square Metre. Following item of CSR are measured according to this criteria;  
Item No.: 15-1 to 15-9, 15-16 to 15-18, 15-21 to 15-66
2. For linear items, the quantity of work shall be measured linearly along centre line of structure. The unit of measurement shall be running meter or running foot. Following items of CSR are measured according to this criteria;  
Item No.: 15-10 to 15-13
3. The following Items of CSR shall be measured as Weight units i.e. Kilogram or Pound  
Item No.: 15-15,15-14,15-19, 15-20





**FIG 15.1 TYPES OF POINTING**