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17. PAINTING AND VARNISHING

17.1 INTRODUCTION

Painting is meant the application of paint, varnish, enamel and other protective coating in a liquid form to the surface of wood, metal, brick, or other materials to form a thin coating or film which solidifies and sticks to the surface. This coating is applied for one or more of the following reasons:

To protect the surface from the elements and from wear;

To improve its appearance and give it the desired color and finish;

To facilitate cleaning: To improve the lighting of interiors of buildings, stains are applied to wood surface to produce the desired color.

To emphasize the grain or to protect the wood. Metal surfaces may also be galvanized, sherardized, tin-plated, tern-plated, chrome-plated, or nickel-plated for their protection or improving their appearance.

17.1.1 PAINTING NEW WOODEN SURFACE

The surface to be painted must be properly prepared because a large number of defects, appearing afterwards can be attributed either to faulty preparations or to the improper seasoning of wood.

17.1.2 PREPARATION OF SURFACE

Assuming the wood to be properly seasoned, the surface is prepared by carrying out following operations in succession.

a) RUBBING WITH PUMICE OR MEDIUM & FINE GRADE SAND PAPER:

This rubbing is continued till the surface becomes perfectly smooth.

b) KNOTTING:

This is done before the application of a priming coat to cover all knots in wood so as to prevent any exudation of resin or any mark from showing, through the three common methods of knotting:

- i. Lime knotting
- ii. Ordinary size knotting and
- iii. Patent knotting. Knots in deodar or other resinous woods are painted over with hot lime and scraped off after 24 hours. The knots are primed with red lead and glue is laid hot on them. A coat of knotting varnish is then applied and the surface is rubbed smooth with pumice stone or sand paper.

Ordinary size knotting is applied in two coats. The first is made by grinding red lead in water and mixing it with strong glue size used hot. The coat dries in about ten minutes. The second coat consists of red lead ground in oil and thinned with boiled linseed oil and turpentine.

Patent knotting consists of two coats of a varnish made by dissolving shellac in methylated spirit or naphtha. Knotting may be composed of 5 oz. of pure shell as dissolved in a pint of methylated sprit. After it has been thoroughly dissolved 1/2 oz. of red lead is put into it and stirred. This is suitable for general purpose.

c) PRIMING:

Priming coat is the first coat applied to fill the pores of wood and prepare a smooth base for the subsequent coats, of paints. It also quickens their drying. It should be done before the woodwork is fixed in place. A priming coat may be of red lead or red and white lead mixed in double boiled linseed oil (7 Lbs.. of red lead or 7 Lbs.. of red and white lead mixed with 3/4 of a gallon of oil) and may be applied with a brush or spraying machine.

The following are the alternatives for priming:

1. For Inside Woodwork
 - 1/2 Lb. of red lead
 - 8 Lbs. of white lead
 - 2 points boiled linseed oil
 - 1-1/2Lbs. patent driers.
 - 1 pint raw linseed oil
2. for Outside Woodwork
 - 10 Lbs. of white lead
 - 4 pints raw linseed oil
 - 1 ounce red lead
 - 2 ounce litharge or patent driers

And left for 12 hours and then it will be worked up-till quite soft and smooth.

d) STOPPING:

This means the tilling up of nail holes cracks and other inequalities to level the surface. Stopping is done as soon as the priming coat dries up, with ordinary putty made of 2 parts of whiting, 1part of white lead mixed together in linseed oil and kneaded (3 oz. linseed oil to 1 Lb. of whiting). High class interior work can be stopped with a mixture of 1/3 of white lead and 2/3 of ordinary putty. In the case of varnishing the wood surface is usually stopped with hot weak glue size (one Lb. of glue making about one gallon of size). When the surface dries up ,it is thoroughly sand papered. Stopping out wax is also a very useful preparation for concealing defects in wooden surfaces to be polished. It is applied hot and sets quite hard. As it does not take stains after setting it should be colored during its preparation to suit the finished work.

17.1.3 PAINTING

After having prepared the surface in the manner described above a second coat of paint of the desired quality and color is applied exactly in the same fashion as the priming coat. As soon as it dries up the surface is rubbed with pumice stone or glass paper. This is followed by second and subsequent coats. Each coat is allowed to dry completely before the next is applied. Thin coats of paint are preferable for thick coats not only take longer time to dry up but also scale off after some time in the form of blisters. .

Turpentine instead of oil is used for the surface which is exposed to strong sunlight because oil paints show up all defects. The proportions used are 2Lbs. of white zinc, 1 Lb. of turpentine and 1/2lb of boiled linseed oil. For painting white, white lead is used for the surface exposed to weather and white zinc for interior works. If lead paint has been used, dry rubbing of surface should not be done on any account, since it causes lead poisoning among painters. Instead, waterproof sand papers or flint paper and cloth should be used.

Note: Woods having an excess of resin or oils are unsuitable for polished or painted work e.g. the resin of deodar shows itself up in the discolored patches even through a number of coats of paint.

17.1.4 REPAINTING WOOD WORK

Repainting of wooden surface is done in the same manner as the original painting; the difference lies only in the preparation of the surface.

17.1.5 PREPARATION OF SURFACE FOR REPAINTING

If the old surface is firm and sound, it is rubbed with pumice or soap stone and washed thoroughly with soap, washing soda and water. Afterwards all those processes like knotting, priming stopping and rubbing are carried out to obtain a properly prepared surface for second and subsequent coats of repainting. If the old paint is in a blistered, cracked or perished condition it has to be completely removed and the surface prepared afresh for painting. Surface marked with smoke or otherwise dirty is cleaned by applying a coat of 3 Lbs. glue and 3 oz un-slaked lime boiled in one gallon of water. Greasy places are brushed over with turpentine and then washed with lime/soap and water.

17.1.6 PAINT REMOVERS

There are a number of ready-made paint removers. If none is available, anyone of the following methods can be used for removing the old paint.

- a) A coat of caustic soda (2Lbs. of caustic soda to a gallon of water) may be applied very carefully with a piece of cloth securely tied on one end of a long wooden stick. It is very dangerous and harmful to the eyes and skin, and, therefore, should never be touched by hand. A few hours after it has been applied the surface is thoroughly washed with clean water and neutralized with a weak acid solution or vinegar.
- b) Old paint may be softened by repeated application of naphtha. The surface can be then rubbed and cleaned.
- c) One Lb. of country soda (saji) may be dissolved in hot water and mixed with stone lime to make a creamy paste. The surface to be cleaned is well coated with it and kept moist for at least 3 hours. The paint would become soft and can be easily rubbed off. To quicken the action un-slaked lime may be used and the mixture applied hot.
- d) One part of soft soap may be mixed to two parts of potash and the mixture dissolved in boiling water. Then lime is added to it. This mixture may be applied while it is still hot, with a brush on the surface of the old paint and left on for 12 to 18 hours. It would soften the paint which can be easily removed by washing with hot water.
- e) Sodium carbonate or washing soda diluted with water would clean greases and fats from the old painted surface. (One lb of washing soda is sufficient for one gallon of water) Hot water would quicken the action of washing soda.
- f) Two parts of quicklime may be mixed with one part of washing soda and made to the consistency of a cream. A coat of this cream would soften the old paint very quickly.
- g) Burning the paint preferably with a blow pump and scraping.

17.1.7 NOTES FOR GUIDANCE

Thick layers of old paints are generally burnt with a blow lamp and scraped. Flame of blow lamp cracks window glasses for which proper precautions must be taken:

Painting should be avoided during wet season.

No painting should be done on a stormy or rainy day on outside open surfaces.

Painted surface should not have any brush marks, runs or specks.

If the wet painted surface is spoiled by any weathering action It should be rubbed and painted afresh. The paint should have a proper consistency. It should not be thinned down so much that it flows off the brush when it is being applied.

If defects like bleeding, blistering, brush marking, chalking etc. shall be rectified at contractor's own cost and rectified work shall be approved by Engineer-in-charge

17.1.8 FIRE PROOF PAINTS FOR WOOD WORKN

A coating of paint of insulating and non-combustible type sodium silicate or ammonium phosphate acts as an efficient fire retardant. These chemicals decompose on painting and give out non-combustible gases and water-vapors which dilute the inflammable gasses and retard the combustion of wood. They also form readily a dense layer of charcoal and a fused viscous mass and protect the wood from radiant heat. The surface of wood is thus cut off from the supply of oxygen.

17.1.9 VARNISHING

Varnishing and painting are similar operations; painting is generally prescribed for exterior works and varnishing for Interior works. In both the cases, the surface is prepared in almost the same way. Woodwork when prepared is sized with a coat of thin clean glue. If the wood is of oily nature a little brown earth and ochre is added. That is why varnish does not dry up readily. This is applied hot and rubbed smooth. A second coat of thin clean glue with necessary quantity of staining color having equal parts of burnt umber and burnt sienna is then applied, and rubbed smooth with fine sand paper when it dries up. Two coats of boiled linseed oil can be given instead of glue size. Varnishes are applied in thin coats over the surface prepared in the above fashion as soon as it dries up. Of all the varnishes available English Copal varnish is considered the best. Normally for an old work a single coat would do, but for a new wood work a second coat is applied after the first has completely dried and rubbed with fine sand paper. Rubbing is done before and after each coat of varnish except the last. One pint of varnish covers about 150 square feet of surface in a single coat. Wood varnish dries up and is free from stickiness within two days.

17.1.10 FRENCH POLISH (SPIRIT POLISH)

It is a spirit varnish applied to the prepared wood surface with a polishing pad of soft cloth and not with a brush with quick and light strokes along the grain. The cloth contains absorbent cotton filling. Several coats will be necessary before the desired shine and finish is achieved. The pad may be dabbed with a drop of olive or mustard oil after each coat to allow a smooth working and finish. The wood to be polished is first painted with a filler composed of 5 Lb. of whiting mixed with 1/2 gallon of methylated spirit and then sand papered, when dried. Fillers can also be made in any of the following ways:

- i) Whiting mixed with water.
- ii) Linseed oil and bee's wax (3:1) boiled.
- ii) Plaster of Paris either in water or raw linseed oil.

French polish is worked upon the surface of hard wood to obviate the effect of grain.

17.1.11 WAX POLISH

The surface of wood work is smeared with wax polish and rubbed with a soft flannel to a fine polish after 24 hours of its application. Wax polishing is mostly used for polishing the cement concrete floors.

17.1.12 WHITENING

Whiting mixed with zinc and water is used for whitening ceilings and walls. Whiting is made by reducing pure white chalk to a fine powder.

17.1.13 PAINTING IRON WORK (NOT UNDER WATER)

In order to protect metallic products from corrosion, surface treatment is extremely essential, and painting is one of the many methods employed for this purpose. In addition, it improves the appearance of the article or structure.

PREPARING IRON WORK FOR PAINTING-

It is essential to remove all rust, scale and dirt and have the surface absolutely cleaned before painting. Special attention is paid to the cleaning of corners and re-entrant angle. Usually anyone of the following methods is employed depending upon the nature of surface to be cleaned:-

- 1) Loose dust is removed by bristle or wood fiber.
- 2) Rust scale and perished old paints are burnt off by the application of flat oxy-acetylene flame and then rubbed off with wire brushes and scrapers,
- 3) Oil and grease can be removed by gasoline (petrol) or benzene, excess of which shall be wiped off from the surface.
- 4) Old paint can be loosened by applying a solution of country soda and fresh slaked lime in equal parts.

No chemical of any kind will be allowed to be used for cleaning the metal.

PRIMING OR UNDER COAT:

Priming coat can be a mixture of pure linseed oil and dry red lead in the proportions of 1 gallon of oil to 33 Lbs..of red lead. It is applied by brush or spraying machine immediately after cleaning the surface of the metal when it has completely dried up. If this coat is spoiled by rain within 24 hours of its application, it is removed and another coat is applied.

SECOND AND SUBSEQUENT COATS:

The second coat is applied when the priming or first coat has thoroughly dried and set i.e. after about four days. It may be red oxide paint or paint with aluminum or graphite base (red oxide paint may consist of 6 Lbs. of red oxide paint, 1lb of lamp black and 1 gallon of boiled linseed oil). The third coat is applied when the second coat has dried completely. It may consist of 7 Lbs. of red oxide paint, and 1 gallon of boiled linseed oil. For less important iron works or for roof coverings red oxide paint can be made up of the following constituents.

- | | |
|-------------------------|--------------------|
| a) Red oxide powder dry | 10 parts by weight |
| b) Raw linseed oil | 4 parts by weight |
| c) Boiled linseed oil | 1 parts by weight |
| d) Turpentine | 1 parts by weight |

One gallon of this paint will cover about 400 square feet of surface in two coats. Standard paints available in market should be used as specified and approved by the Engineer-in-Charge.

17.1.14 GUARDING RUSTING OF STEEL WORK

All structural steel work is primed and preferably given a coat of red oxide paint before erection, except the surfaces to be riveted in contact and the surfaces which have to remain in contact with concrete. Iron and steel work can be protected from rust as a temporary measure by means of a coat of whitewash or by covering it with slaked lime. Iron exposed to weather can be protected temporarily by a coat of paint made with pulverized oxide of Iron, linseed oil, and a drier. A coat of cement wash is also beneficial.

Painting Galvanized Iron

Paint does not adhere to the new galvanized iron surface. It is exposed to weather for at least one year before painting. If it is necessary to paint it earlier the galvanized surface is treated with anyone of chemical mixtures mentioned below.

The mixture will turn the surface black. The compositions of these chemical mixtures are:-

i)	Copper acetate	6-8 Ounces
ii)	Water	1 Gallon
	or	
i)	Muriatic Acid	2 Ounces
ii)	Copper Chloride	2 Ounces
iii)	Copper Nitrate	2 Ounces
iv)	Sal-Ammonia	2 Ounces
v)	Hydrochloric Acid	Small quantity
vi)	Soft Water	1 Gallon

Besides, the galvanized surface can be treated by washing it with vinegar or slaked lime and washing soda. .

The surface treated by any of the above methods can be painted with a priming coat after about 12 hours. The paint may either be obtained ready-made specified paint from the market or prepared by mixing red lead with linseed oil and turpentine in equal proportions.

17.1.15 PAINTING IRON WORK (UNDER WATER)

Unprotected Iron work suffers an average reduction in thickness of face by 0.003 inch per, year if it is submerged in sea water and 0.002 inches per year if it is submerged in fresh water. From these figures it is obvious that painting of Iron work under water is essential to safeguard against this recurring waste.

Iron or lead oxide paint is sometimes satisfactory but Khankl mixture is the most durable paint known so far for Iron work under water. The mixture is applied hot, and two to three coats are sufficient. Subsequent coats are given only after the previous ones have dried up. Anti-corrosive black enamel paints and asphalt paint (asphaltum dissolved in naphtha or benzine) are also used for this purpose.

17.1.16 COAL TARRING

Tar is applied as hot as possible. If practicable, the article is dipped into the tar. Preferably the Iron article to be painted is heated red hot and then tar is brushed over. One Lb. of tar

would cover 10 square feet. Tar paints are prepared in the following manner: For every gallon of tar 2 Lbs. of un-slaked lime is added and the mixture heated till it begins to boil. It is removed from the fire and kerosene oil equivalent to 1/4th of its volume is added very slowly. Instead of kerosene oil, country spirit can be added in a proportion of 1/2 pint of country spirit to 1 gallon of tar. Solignum or creosote is also used sometimes. These too are also to be applied very hot.

17.1.17 PAINTING WALLS AND OTHER CEMENT SURFACES

For painting walls, Ceiling etc., rubber paints or alkali resisting primers and plastic emulsions or cement paints are usually employed. A brief description of their application is, given below:-

- i) The free alkali in new lime and cement plaster rapidly destroys the oil in paint and prevents it from drying. For this reason, it may not be possible to paint a plastered wall till after 12 months of its completion. In such cases the walls whitewashed in the first instance.
- ii) All loose and flaking material is removed from old walls by scraping or wire brushing. All dust, dirt, oil, grease or efflorescence are carefully removed.
- iii) The walls are primed with boiled linseed oil or glue size (glue mixed with water); glue size is not used if the walls have been whitewashed.
- iv) First two coats normally consist of white lead and boiled linseed oil. The third coat can be of white lead tinted to approach the desired color and mixed with raw linseed oil and a small proportion of turpentine.
- v) The finishing coat should contain a large proportion of turpentine with a little varnish to serve as a binder and applied when the previous coat is still sticky. This will give a flat finish as a glossy finish coat shows up the irregularities in the plaster.
- vi) If a wall is to be painted immediately after it is cement plastered, without waiting for a period of 12 months as mentioned in No. (i) above, a solution of 5 Lbs of zinc sulphate in a gallon of water should be applied on it and when it dries up a coat of pure raw linseed oil should be given Alternatively the surface can be treated with dilute sulphuric or hydrochloric acid (1 part acid to 50 parts water) and then washed with water. Two coats of paint thinned with turpentine and having a little varnish as a binder are then applied in succession. For the third coat, paint is thinned with a mixture of 3 parts of boiled linseed oil to 1 part of turpentine.

A few varieties of ready-made paints are available in the market which need no such formalities of surface treatment or waiting for 12 months and can be applied directly on newly-plastered walls. The paints shall be as specified and approved by the Engineer-in-Charge.

17.1.18 PAINTING DAMP WALLS

Before painting damp walls they should be treated as described below, since otherwise the paints would not stick to them.

Take paraffin 2-1/2 gallons, benzoline 2 gallons, pale resin 14 Lbs. in a vessel and shake them well. When completely dissolved add 24 Lbs whiting and grind the whole mixture thoroughly. This mixture is kept airtight to prevent drying and 1 or 2 coats, depending upon the dampness of the wall, are applied as ordinary paint. It will dry up hard and then any suitable variety of paint can be applied, which will stick to it.

17.1.19 PAINTING BRUSHES

The brushes should be of bristle and not horse hair. Bristles can be distinguished by the fact that each bristle is split at end. A good brush has springiness in the bristles, and usually following sizes of brushes are employed:

- | | | |
|----|-----------------|--------------------------------|
| 1. | 12 to 14 inches | For dusting large flat surface |
| 2. | 8 inches | For greater work |
| 3. | 6 inches | For wood work |
| 4. | 2 to 4 inches | For fine work |

A round brush is considered the best for painting. New brushes should be placed in water for 2 to 3 hours and then allowed to dry for 1 hour before use. When a brush is used for another color or is no longer required, it should be cleaned at once by dipping into kerosene oil. Old brushes should be kept in water or raw linseed oil (covering the bristle only) when not in use.

17.1.20 PAINTING WITH BRUSH

The paint should be applied by the end of the hair, and not by the sides. Application by the sides is not satisfactory, and the brush wears out more rapidly. Brush should be reversed at frequent intervals so that it wears down evenly. A free easy stroke should be cultivated. Short and jerky strokes result in uneven surface. Stretching the stroke too far also results in uneven surface.

17.1.21 PAINTING WITH SPRAYING MACHINE

When spraying machines are being used for painting the instructions given below should be followed.

- a) The gun should be held 6 to 10 inches from the object to be painted. Gun should be moved across the surface with steady and even strokes made with a free arm action. The gun should be kept perpendicular to and at an equal distance from the surface throughout the operation. Before actual work, gun should be tried on a cardboard surface, etc.
- b) The adjusting screw on the gun should be closed while starting and opened gradually till the spray runs right. A distorted spray indicates dirty air caps in which case it should be taken off and washed carefully in a clean solvent.
- c) Spray painting should not be employed for paints containing lead or for painting joinery work which should be done invariably by brush to obtain proper penetration into joints, cracks. etc.

17.2 PAINTING AND VARNISHING (GENERAL)

17.2.1 GENERAL

For painting and varnishing the provisions of Clause 17.1 as pertinent shall apply.

17.2.2 WEATHER

Unless otherwise specified, no painting shall be done during wet, foggy or dusty weather or in the direct rays of the hot sun.

Paint or finish to any surface shall be applied when ambient temperature is 10 degrees centigrade or above and less than 43 degrees centigrade unless otherwise recommended by manufacturer of paint. No painting shall be done above 90% humidity.

17.2.3 NUMBER OF COATS

Unless otherwise specified all wood and iron work shall be given three coats including the priming coat. Color of priming coat shall be lighter than finish coat. All paints shall be of make where specified and as approved by the Engineer-in-Charge.

17.2.4 CLEANING AND PREPARATION OF SURFACE

Surface shall be thoroughly cleaned of all dust, rust, dirt, oil, grease, etc., and rendered smooth and dried before preparing it for painting or varnishing.

17.2.5 PRIMING KNOTTING AND STOPPING

A priming coat without coloring matter shall first be applied, after which all holes, cracks, knots, etc., shall be stopped with the specified putty.

17.2.6 PAINT

Paint and varnish shall be of an approved make and quality, ICI, Berger, Nippon or equivalent as approved by the Engineer-in-Charge.

17.2.7 PAINTING

- i) Paints shall be applied with proper brushes of approved quality or spraying machine as specified..
- ii) Paint shall be constantly stirred, while it is being applied. It shall be stirred with a smooth stick and under no circumstances with a brush.
- iii) When more than one coat has to be given, every coat must be completely dry, rubbed and all dust removed before the next is applied.
- iv) Each coat shall differ slightly in tint from the preceding one, to distinguish quickly between each coat. The last coat shall be of the tint required for the finished work.
- v) Each coat shall be approved by the Engineer-in-charge before the next is applied.
- vi) All coats shall be applied evenly and properly so that the work does not show any hair or brush marks or drops of paints. The method of crossing and laying off shall be normal applied, the latter in the direction of grains in the case of wood work.
- vii) Paints, when not in use, shall be kept away from the air. The surface of the kegs of ground and mixed paints which have been partly used shall be covered.
- viii) Drop cloths shall be placed to adequately protect all finished work.

17.3 PAINTING NEW WOOD WORK

17.3.1 PREPARATION OF SURFACE

- i) **PLANING AND RUBBING:**
Unless otherwise specified wood work to be painted shall be finished smooth with the plane, but free from plane marks of every kind and rubbed smooth with sand paper, first with 2-1/2 grade and then with 1-1/2 grade or pumice stone.
- ii) **KNOTTING:**
After rubbing all knots in the wood it shall be killed or covered with:-
 - a) Two coats of patent knotting (shellac dissolved in naptha) or

- b) Shellac varnish (5 oz shellac mixed with 1 pint of methylated spirit of vine thoroughly dissolved and stirred with 1/2oz red lead) or
- c) A preparation of red lead and glue size in equal weight applied hot. Knots in deodar or other resinous wood shall be painted over with hot lime. This paint shall be scraped off after 24 hours, the knots primed with red lead and glue laid hot. Then one coat of knotting varnish shall be applied.

iii) RUBBING:

After knotting, the surface shall be rubbed again with pumice stone, or fine sand paper before the priming coat is applied.

iv) PRIMING OR FIRST COAT OF PAINT:

All new wood work shall be properly primed before being fixed in position. The priming paint shall be of type and make as specified. Alternatively it shall be prepared by mixing the following ingredients:-

a) For inside work (except in white and very pale shade):

1.	White lead	10 Lbs.
2.	Red lead	¼ Lbs.
3.	Boiled linseed oil	4 pints
4.	Raw linseed oil	2 pints
5.	Turpentine	1 pint

b) For outside work:

1.	White lead	10 Lbs.
2.	Red lead	¼ Lbs.
3.	Balled linseed oil	4 pints
4.	Raw linseed oil	2 pints
5.	Turpentine	1 pint

c) For white or light shade:

1.	White lead	16 Lbs.
2.	Lamp black	½ Lbs.
3.	Raw linseed oil	5 pints
4.	Turpentine	1 pint

d) Genuine white lead:

1.	Genuine red lead	7 Lbs.
2.	Boiled linseed oil	7 Lbs.

or

1.	White lead	15 Lbs.
2.	Red lead	0.30 Lbs.
3.	Litharge (Drier)	0.30 Lbs.
4.	Linseed oil	6.50 pints

The priming paints shall be applied either by brushes or by spraying machines as specified.

v) **STOPPING:**

After priming, all holes, cracks, gapping joints and similar other defects shall be stopped with an approved putty made from pure whiting mixed to the proper consistency with raw linseed oil. A little white lead shall be worked in after mixing to help the hardening of the putty.

17.3.2 SECOND AND SUBSEQUENT COATS

Unless otherwise specified, second and subsequent coats shall be applied as per Specifications No. 17.2 for Painting (General).

17.4 REPAINTING WOODWORK

17.4.1 PREPARATION OF SURFACE

- i) If the old paint is firm and sound the surface shall be rubbed with pumice stone and washed thoroughly with soap washing soda and water till all dirt grease projections and blisters, if any are removed and the surface is rendered smooth.
- ii) Surfaces spoiled by smoke shall be cleaned by the application of a coat of 3 Lbs. Glue and 3 ozun slaked lime boiled in one gallon of water, unless otherwise specified.
- iii) Greasy surfaces shall be cleaned by applying a coat of turpentine over them and then washing them with soap and water.
- iv) When the old paint is in blistered cracked or perished condition, it shall be completely removed by burning off with a blow lamp or by means of a paint remover as specified or directed by the Engineer-In-charge. The blow lamp shall not be used on curved surfaces or surfaces adjoining glass, such as sashes etc. Care shall be taken that the wood surfaces are not charred.
- v) When a ready-made paint remover of an approved quality is not available anyone of the following recipes shall be used, unless otherwise specified.
 - a) Naptha shall be applied repeatedly till the paint has softened. The surface shall then be rubbed and cleaned.
 - b) A coat of caustic soda (2 Lbs. of caustic soda to a gallon of water) shall be applied very carefully by means of a piece of cloth securely tied on one end of a long wooden stick. After a few hours of its application the surface shall be thoroughly washed with clean water and neutralized with a weak acid solution or vinegar. This paint remover shall be applied only when particularly specified and permitted by the Engineer-In-charge and shall not be touched by hand or allowed to come in direct contact with the wood.
 - c) One Lb. of country soda (sajji) shall be dissolved in hot water and mixed with lime stone reducing the whole to a creamy paste. The surface shall be coated with it and kept moist for at least 3 hours. If the lime used is un-slaked and the mixture is applied hot, the action shall be quickened.

- d) One part of soft soap shall be mixed to two parts of potash and the mixture dissolved in boiling water. Four parts of lime shall then be added to it and applied (while it is hot) with a brush on the surface of the paint and left on for 12 to 18 hours.
- e) Sodium carbonate or washing soda diluted with water cleans grease and fat from the old painted surface. One Lb. of washing soda shall be sufficient for one gallon of water. Hot water quickens the action of washing soda.
- f) Two parts of quick lime shall be mixed with one part of washing soda and made to the consistency of a cream. A coat of this cream shall soften the painted surface.
- g) A coat of this cream shall soften the surface.

1.	Palmatic acid (vegetable)	25 parts by weight
2.	Benzine	35 parts by weight
3.	Amyleaccerate	40 parts by weight

- h) This solution shall be applied by brush.

1.	Caustic Soda	14 Lbs.
2.	Whiting	9 Lbs.
3.	Flour	2-1/2 Lbs.
4.	Petroluem	2-1/2 gallons
5.	Water	7 gallons

The solution shall be applied by any approved method on the surface.

- (vi) After the paint has been removed the surface shall be rubbed smooth with sand paper, washed down and allowed to dry completely. It shall be wiped clean before paint is applied.
- (vii) After rubbing all holes, cracks and other inequalities, the surface shall be properly stopped in the manner specified under "Painting New Wood Work".

17.4.2 PAINTING

After preparing and treating the surface it shall be painted according to Specifications No. 17.3for Painting New Wood Work.

17.4.3 OTHER RESPECTS

In all other respects it shall conform to Specifications No. 17.3for Painting New Wood Work.

17.5 VARNISHING

17.5.1 PREPARATION OF SURFACE

- i) New wood work to be varnished shall be finished smooth with the plane making sure that no marks are visible on the finished surface. It shall be rubbed perfectly smooth with sand paper or pumice stone.
- ii) Knotting shall be done as specified under Clause 17.2 – Painting & Varnishing.
- iii) STOPPING:
The surface of the wood shall be then stopped, with hot weak glue size (1 Lb. of glue making about 1 gallon of size) so as to close up the holes. The surface when it dries up shall be again thoroughly sand papered. After rubbing the surfaces another coat of the same glue size shall be applied cold.
- iv) If the wood work is to be stained, the staining color shall be mixed with second coat of size which shall be applied regularly, evenly and quickly keeping the color on the flow.
- v) If the wood work is of an oily nature, a little 'Multani Mitti' and ochre shall be added to the first coat of size (otherwise varnish would not dry readily)

- vi) The sized wood shall then be rubbed with sand paper leaving the color even and rubbing, with the grain.

Varnish shall then be applied in very thin coats with a special fine-haired varnishing brush, and not with an ordinary paint brush. Unless otherwise specified, the best Copal varnish, shall be used. If more than one coat have been specified the first coat shall be rubbed with the fine sand paper. Other coats shall be applied as directed by the Engineer-In-charge.

17.6 WAX POLISHING

17.6.1 SCOPE

Wax polishing shall be done where a dull polish, which shall not destroy the natural color and graining of teak or shisham, is required.

17.6.2 PREPARATION OF SURFACE

- i) New wood work to be polished shall be finished smooth with the plane making sure that no plane marks are left after finishing.
- ii) The surface shall be made perfectly smooth by rubbing it with sand paper or pumice stone.
- iii) It shall then be stopped and rubbed perfectly smooth first with medium grained sand paper and then with fine sand paper. The final rubbing shall be done with sandpaper which has been slightly moistened with linseed oil and rubbed up-to required smoothness of surface.

17.6.3 PREPARATION FOR WAX POLISHING

The bee's wax polish shall be prepared by mixing two parts of bee's wax with two parts of boiled linseed oil over a slow fire. When it is dissolved, but is still warm, one part of turpentine shall be added.

17.6.4 FIRST COAT

Bee's wax polish as prepared above shall be applied with a clean cloth pad and rubbed continuously for at least half an hour.

17.6.5 SECOND COAT

When the surface is quite dry, the second coat shall be applied in the same manner and rubbed continuously for one hour, or till the surface has dried.

17.6.6 FINAL COAT

The final coat shall then be applied and rubbed for two hours (more if necessary), till the surface has assumed a uniform gloss and is quite dry, showing no signs of stickiness when touched. The final polish depends largely on the amount of rubbing which shall be done continuously with uniform pressure and with frequent change in direction.

17.6.7 OTHER RESPECT

In all other respects it shall conform to Specifications No. 17.5 for Varnishing.

17.7 FRENCH POLISHING (SPIRIT POLISH)

17.7.1 PREPARATION

Unless otherwise specified, the wooden surface to be polished shall be prepared according to the Specification 17.5.1 for Varnishing.

17.7.2 POLISHING

- i) After the surface has been prepared it shall be first painted with filler composed of 5 Lbs. of whiting mixed with 1/3 of a gallon of methylated spirit and then rubbed with sand paper. A thin coat of the polish shall then be applied. The surface shall then be rubbed with sand paper before the second and subsequent coats are applied.

- ii) Alternatively, plaster of Paris, red ochre (sufficient to tint it), and linseed oil are mixed together to form a stiff paste which shall be applied sparingly and rubbed hard on the surface to fill up the pores of the wood. Prior to this a piece of rag moistened with linseed oil shall be rubbed on the surface.
- iii) The surface shall be rubbed smooth with fine glass paper a few hours later and then polished.
- iv) Unless otherwise specified, two coats of French polish of an approved type shall be applied.
- v) To finish off, the surface shall be rubbed lightly and quickly with a circular motion by means of a piece of flannel rolled into the form of a rubber, covered with a piece of rag slightly damp with methylated spirit. If the rag sticks, the surface shall be touched with linseed oil.

17.7.3 OTHER RESPECT

In all other respects, it shall conform to Clause 17.5 for Varnishing.

17.8 OILING WOOD WORK

17.8.1 SCOPE

Wood work not exposed to weather shall be oiled with linseed oil or sweet oil preparations as specified.

17.8.2 LINSEED OIL PREPARATIONS

One Lb. of bee's wax shall be mixed with 3 Lbs. of boiled linseed oil and heated over a slow fire till the wax is melted. After the mixture has cooled one Lb. of turpentine oil shall be added.

17.8.3 SWEET OIL PREPARATION

Country sweet oil shall be mixed with equal parts of vinegar and turpentine oil and shall be employed where a darker effect is required or when particularly specified.

17.8.4 OILING

The specified oil preparation shall be applied after cleaning and allowed to soak

17.9 PAINTING WOOD WORK WITH SOLIGNUM OR CREOSOTE OR COAL TAR

17.9.1 QUALITY

Solignum, creosote or tar, whichever has been specified shall be of an approved quality.

17.9.2 HEATING AND PREPARING PAINT

- i) Before applying Solignum /creosote/tar shall be heated to just short of boiling.
- ii) If tar is specified it shall be thinned with kerosene oil or common country spirit in the following proportions:-
 - 4 parts tar to 1 part kerosene or 1 gallon tar to 1/2 pint country spirit;
 - 2 Lbs. un-slaked lime shall be mixed with 1 gallon of tar to, prevent its running
 - The mixture shall then be heated to a near boiling point.
- iii) It shall be then applied with a stiff flat brush or a spraying machine as specified and approved by Engineer-in-Charge.
- iv) The paint shall be stirred occasionally while it is being applied.
- v) The ends of the timber pieces shall be liberally coated and, where possible dipped in the hot solignum or creosote.
- vi) Where more than one coat has to be applied subsequent coats shall be applied when the previous one has dried.

17.10 PAINTING IRON WORK ABOVE WATER

17.10.1 WEATHER

- i) Painting of iron work shall not be done in damp wet, stormy or extremely hot weather.
- ii) Too quick drying in the baking heat of a summer sun shall also be avoided.

17.10.2 PREPARATION OF SURFACE AND APPLICATION OF PAINT

- i) If the iron has not been painted previously it shall be thoroughly cleaned of all rust and scale by means of steel scrapers, chisels, or steel wire brushes till the bright shining surface of the iron appears.
- ii) The surface shall then be cleaned with dry cotton waste and the paint applied immediately.
- iii) Each small patch shall be painted as soon as cleaned if the painting is being done in damp weather since Iron begins to rust within a few minutes after it has been cleaned.
- iv) In repainting Iron work whose old paint is sound, the surface shall be rubbed with wire brushes and scrapers and all loose paint that comes away shall be taken off. If the paint in a bad condition it shall be burnt off with a blow lamp or by other means as specified.
- v) If it is necessary to paint galvanized iron, a coat composed of eight ounces of copper acetate added to a gallon of water shall be applied first. Unless otherwise specified the first coat of paint shall be composed of genuine red lead mixed with raw linseed oil and turpentine in equal proportion.
- vi) Second and subsequent coats shall be applied more uniformly with the paintbrush in long strokes evenly drawn or with a spraying machine as specified.
- vii) Sufficient time shall be allowed between the coats to allow the paint to dry up. Unless otherwise specified an interval of 24 hours shall be sufficient.

17.10.3 NUMBER OF COATS

- i) On new work three coats shall be applied but on old work it is sufficient to have two coats only.
- ii) Each coat shall preferably vary slightly from the preceding one in shade, in order to ascertain that full number of coats have actually been applied.

17.10.4 PAINTS

The paint used shall be as given in BOQ or approved by the Engineer-in-Charge.

17.11 PAINTING IRON WORK WHICH REMAINS UNDER WATER

17.11.1 SCOPE

- i) Unless otherwise specified, the surface shall be prepared according to Clause 17.10.2 for Painting Iron Work above Water.
- ii) The paint shall be applied hot as soon as the surface is cleaned;
- iii) Subsequent coats shall be applied only after the previous one has dried.

17.11.2 PAINTING MATERIAL

Unless otherwise specified, khanki mixture or any other approved paint shall be used.

17.11.3 NUMBER OF COATS

Two to three coats as actually specified shall be given.

17.11.4 PROTECTION

Work thus painted shall not be immersed in water until it has dried up; one week shall be generally sufficient for this purpose depending upon the weather.

17.11.5 OTHER RESPECT

In all other respects not specified here it shall conform to Clause 17.10 for Painting Iron Work Above Water.

17.12 COAL TARRING IRON WORK

17.12.1 PREPARATION OF SURFACE

- i) The surface to be coal-tarred shall be cleaned off all dust, rust, scale and grease, etc.
- ii) It shall be dry and clean.

17.12.2 HEATING AND PREPARING TAR

To each gallon of tar 2 Lbs. of un-slaked lime shall be added and the mixture heated till it begins to boil. Then it shall be taken off the fire and kerosene oil added to it slowly in the proportion of 1 part of kerosene to 4 parts of tar.

17.12.3 APPLICATION

- i) Tar shall be applied as hot as possible with a brush. On no account rags shall be used for applying tar.
- ii) Where possible the article to be tarred shall be dipped in the hot tar.

17.12.4 OTHER RESPECTS

In all other respects the painting shall conform to the relevant parts of the Clauses 17.10 & 17.11 for Painting Iron Work.

17.13 PAINTING PLASTER

17.13.1 GENERAL

- i) Unless otherwise specified or directed in writing by the Engineer-in-charge, a plastered wall shall not be painted till 12 months, have elapsed since plastering work was completed.
- ii) In the absence of special primers and wall paints, the plastered surfaces shall be prepared, and painted as specified below:

17.13.2 PREPARATION OF SURFACE

- i) All loose and flaking material shall be removed from old walls by scraping or wire brushing and the surface shall be carefully smoothed and cleared.
- ii) All dust, dirt, oil grease or efflorescence shall be carefully removed.

17.13.3 PRIMING COAT

- i) Having prepared the surface a priming coat composed of equal parts of white and red lead mixed in boiled linseed oil that shows easy brushing, good flowing and spreading and good leveling properties shall be applied. Coats that have shown poor or fair spreading and leveling properties will not be acceptable.
- ii) When the priming coat dries up all crack holes and such other defects shall be filled up with a mixture of 1 part white lead and 3 parts ordinary putty.
- iii) The surface shall then be rubbed with pumice stone or sand paper and dusted clean.

17.13.4 SECOND AND THIRD COAT

- i) Second coat shall consist of the paint as specified. In the absence of such specifications a mixture of white lead and linseed oil shall be applied.
- ii) Third coat shall consist of the paint as specified. In the absence of such specification it shall consist of white lead tinted to approach the desired color and mixed with raw linseed oil as a carrier and a small proportion of turpentine as drier.

17.13.5 FOURTH OR FINISHING COAT

The finishing coat shall consist of paint as specified. In the absence of such specification, it shall consist of a large proportion of turpentine with a little varnish to serve as a binder and applied when the previous coat is still sticky and shall be evenly stippled over the surface with a stippling brush so as to dry flat with a velvet-like surface.

17.13.6 TREATMENT OF NEWLY CEMENT PLASTERED SURFACE

- i) In case it has been specified or directed in writing by the Engineer-In-charge to paint a newly cement plastered surface without waiting for 12 months a solution of 5 Lbs. of zinc sulphate dissolved in a gallon of water, shall be applied to the surface and when it dries up a coat of pure raw linseed oil shall be given.
- ii) Alternatively, the surface shall be treated with dilute sulphuric acid or hydrochloric (one part acid to 50 parts water) and then washed down with water.
- iii) Unless otherwise specified or directed in writing by the Engineer-In-charge, after treating the surface, two coats of paint thinned with turpentine and having a little varnish as a binder, shall be applied.
- iv) The third coat of the specified paint shall be thinned with a mixture of three parts of boiled linseed oil to one part of turpentine.
- v) The fourth and finishing coat shall be given as specified in Clause 17.13.5.

17.14 MEASUREMENT AND PAYMENT

17.14.1 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.

17.14.2 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.

17.14.3 SURFACE AREA

The area of one face doors, windows and partition etc. measured on flat surface shall be further multiplied by the following factors to give the total area for payment in case both faces are painted. In case only one face has been painted, the area paid will be half the area so obtained:-

- a. Paneled framed, battened and braced or framed and battened or ledged and braced doors and windows. The area shall be multiplied by 2-1/4.
- b. Doors and windows fully glazed. The area shall be multiplied by 1.
- c. Partly glazed doors, windows and partitions. The area shall be multiplied by 2.
- d. Iron bars or grills works. The area shall be multiplied by 1.
- e. Doors and windows fixed with wire nettings;
- f. If the wire netting is not painted. The area shall be multiplied by 1.

- g. If the wire netting is paint. The area shall be multiplied by 1-1/4.
- h. Partly wire netted doors and windows. The area shall be multiplied by 1-1/2.
- i. Trellis work. The area shall be multiplied by 2.
- j. Louvered or Venetian shutters and partitions. The area shall be multiplied by 3.
- k. Balustrades. The area shall be multiplied by 1-1/2.

17.14.4 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 meter or Square foot. Following item of CSR are measured according to this criteria;
Item No.:17-1 to 17-18, 17-20 and 17-22 to 17-46
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 item of CSR are measured according to this criteria;
Item No.: 17-19
3. The following item shall be measured as Each Letter:
Item No.: 17-21
4. Following item shall be measured as %age increase:
Item No.: 17-47