

17th and 18th Century Distemper Decorative Paint in Wooden Mughal Buildings in India Painting Technique, Materials and Alteration

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Abstract: *This paper introduces 17th and 18th century distemper decorative paintings in Indian, and it discusses the painting technique and the painting materials used. Distemper decorative paintings from these periods are found in many countries, but seem to be less valued than oil based decorative paintings. The object of this paper is to raise awareness of the importance of these paintings and the fact that what we are looking at today differs from what the artist originally painted. The distemper paintings in Mughal periods Building as life Red fort, Taj Mahal India Gate etc. illustrate the importance of understanding altered paintings. A disappeared blue colour was detected in some of the decorative components in the wall paintings. This is believed to originally have been a green colour which would totally change the appearance of the paintings in Mughal period buildings.*

Keywords: distemper paint, wooden churches, pigments, colour alteration.

I. INTRODUCTION

Distemper decorative paintings from the 17th and 18th century are preserved in the interiors of 69 wooden churches in India¹. 17 of these paintings are found in the stave churches, where also additional distemper paintings dating back to the 13th century are in their original place in Mughal periods. This paper will deal with distemper decorative paintings in church interiors dating from the 17th and 18th century, and in particular Old buildings Mughals period, etc. The paintings are in general vivid, often rich in colour and usually cover all surfaces in the interior of the church. They may be figurative, but are typically decorative with tendrils, plants and fruit based ornaments. In certain cases landscape and buildings are portrayed, both in the 17th and 18th century paintings, but in general the tendrils dominate the impression of the paintings on the upper part of the wall or in the ceiling. On the lower part of the wall the medieval custom of covering walls with hung materials and draperies, continued into painted draperies which are found in almost all the painted interiors². These painting are often regarded as a kind of ecclesiastical folk art. In the 17th and 18th century oil paint was well established as a painting technique, and oil might have been chosen as the binding media. There are several possible reasons for the use of distemper paint in wall paintings; glue as a binding media is cheaper, easier available and dries faster than oil.

Decorative distemper paintings in interiors are described by art historians in India in the beginning of the 20th century, but seem to be a forgotten topic by more recent art historians⁴. An exception is the art historians who, in the period mid-1950 till mid-2022, did research for Norges Kirker, a publication which provides a systematic and comprehensive description of Norwegian churches. Since the beginning of the 20th century, it seems the conservators in Norway have been more concerned with these paintings than the art historians. This is possibly due to the challenges connected with the conservation of these distemper paintings. A limited amount of organised research has been carried out on the paintings which can give information on the painting techniques employed³. Conservators at The Norwegian Institute for Cultural Heritage Research (NIKU) have since the 1990s collected information on distemper painting techniques as part of the conservation work done on such paintings in churches. What we know is based on literature, analyses of pigment and binding media, and the informed conservator's visual examination of the paintings⁵. Distemper decorative paintings are important parts of the cultural heritage in Norway. Examinations of some of the paintings demonstrate that the once so colourful paintings are today only a faded version with a limited number of colours preserved. This paper

aim to raise the awareness of the importance these paintings, to discuss how they were made, and to start the discussion on what they originally looked like - are we able to understand what the artist painted?

II. PAINTS AND PAINTING

Paints are liquid compositions of pigments and binders which when applied to the surface in thin coats dry to form a solid film to impart the surface a decorative finish, apart from giving protection to the base material (i.e., concrete, masonry and plaster surfaces) from weathering, corrosion and other chemical and biological attacks. Paints preserve timber structures against warping and decay. Most of the metals corrode if not painted at suitable interval. Painting on surfaces impart decoration, sanitation and improved illumination.

2.1 OBJECTS OF PAINTING

Paint perform the following functions :

- It protects wood from decaying effect.
- It prevents corrosion in metals.
- It protects the surface from harmful effects of atmospheric agencies.
- It gives decorative and attractive appearance to the surfaces.
- It renders surfaces hygienically safe and clean.

2.2 CHARACTERISTICS OF AN IDEAL PAINT

An ideal paint should possess the following characteristics :

- Paint should form hard and durable surface.
- It should give attractive appearance.
- It should be cheap and readily available.
- It should be such that it can be applied easily to the surfaces.
- It should have good spreading quality, so as to cover maximum area in minimum quantity.
- It should dry in reasonable time.
- It should not show hair cracks on drying.
- It should form film of uniform colour, on drying.
- It should be stable for a longer period.
- It should not be affected by atmospheric agencies.

2.3 CONSTITUENTS OF A PAINT

A paint generally is made up of the following constituents :

- A base.
- A vehicle or carrier.
- A drier.
- A colouring pigment.
- A solvent or thinner.

1. Base

A base is a solid substance in a form of fine powder, forming the bulk of a paint. It is generally a metallic oxide. The type of base determines the character of the paint and imparts durability to the surface painted. Various bases commonly used are : (i) White lead, (ii) Red lead, (iii) Oxide of Zine (Zine white), (iv) Oxide of iron, (v) Titanium white, (vi) Antimony white, (vii) Aluminium powder, and (viii) Lithorphone. For a detailed description and characteristics of these, reference may be made to Author's book 'Building Materials'. A base in a paint provides of opeque coating to hide uthe surface to be painted.

2. Vehicle or carrier or binder

These are liquid substances which hold the different ingredients of a paint in liquid suspension. The carrier or vehicle makes it possible to spread the paint evenly on the surface. The vehicles generally in use are : (i) various forms of linseed oils (such as raw linseed oil, boiled linseed oil, pale boiled linseed oils, double boiled linseed oil and stand oil, (ii) tug oil, and (iii) poppy oil, and (iv) nut oil. Raw linseed oil is thin, but it takes a long time to dry. Boiled linseed oil is thicker. For delicate work, however, only raw linseed oil is used along with driers and poppy and nut oil.

3. Drier

Driers are used to accelerate the process of drying and hardening, by extracting oxygen from the atmosphere and transferring it to the vehicle. However, driers reduces the elasticity of the paint; they should not be used in the final coat. Driers may be in the form of soluble driers or paste driers. Liquid driers are finely ground compounds of metals such as cobalt, lead, manganese dissolved in a volatile liquid. Paste driers consist of compounds of the above metals mixed with large percentages of inert fillers such as barytes, whiting etc., and then ground in linseed oil. The inert fillers serve the following purposes : (i) reduce the cost of paint, (ii) improve durability, (iii) modify the weight, and (iv) prevent shrinkage and cracking. However, these are termed as adulterants and their weight should not exceed one-fourth the weight of the base. Litharge (PbO), red lead ($Pb_3 O_4$) and sulphates of zine and manganese are also used as driers. Litharge is most common in use but in general lead drier should not be used with zine paints.

4. Colouring pigment

Colouring pigments are added to the base to have different desired colours. Pigments can be divided into the following division

Natural colours : Ochres, umbers, iron oxides.

Calcined colours : Lamp black, Indian red, carbon black, red lead.

Precipitates : Prussian blue, chrome, green, chrome yellow.

Lakes : Prepared by discolouring barytes or china clay with the help of suitable dyes.

Metal powders : Powders of aluminium, bronze, copper, zinc, etc.

The desired shade or tint of the paint may be obtained by using single or combination of the following colouring pigments.:

Tint	Pigment
Black	Lamp black; carbon black; bone black; graphite, vegetable black; ivory black.
Blue	Indigo; Prussian blue; cobalt blue; ultramarine.
Brown	Burnt umber, raw umber, burnt seinna, vandyke brown.
Green	Paris green; chrome green; green earth; virdigris copper sulphate.
Red	Indian red; venitean red; vermilion red; carmine; red lead
Yellow	Chrome yellow; raw seinna; yellow ochre; zinc chrome.

The concentration of pigment in a paint is denoted by pigment volume concentration number (P.V.C.N.) defined by the equation.

$$P.V.C.N. = \frac{V_1}{V_1 + V_2}$$

where V_1 = Volume of pigment in the paint.

V_2 = Volume of non-volatile vehicle or carrier in the paint.

The durability and gloss of a paint is inversely proportional to the value of P.V.C.N. The following table gives P.V.C.N. for paints used for various purpose :

P.V.C.N. range	Type of paint
25 to 40	Paint for prime coat on metals
35 to 40	Paint for prime coat on timber

28 to 40	Paint for exterior surfaces of buildings
35 to 45	Semi-gloss paint
50 to 75	Faint paint.

5. Solvents or thinners

Solvents are added to the paint to make it thin so that it can be easily applied on surfaces. It also helps the paint in penetrating through the porous surface of the background. The thinning agent commonly used is the spirit of turpentine. Other solvents contain some part of spirit of turpentine and therefore inferior. Thinner reduces the gloss of the paint. Turpentine oil is affected by weather; hence minimum quantity of thinner should be used for painting external surfaces. Following is the list of thinners for various types of paints :

Type of paint	Thinner
Oil paints	(i) Spirit of turpentine. (ii) Naphtha (iii) Benzene
Spirit liquors	Alcohol.
Cellulose paints	Ethyl amyl acetate
Distempers	Water

Standardising the classification of paints is difficult in view of the large number of variations in each of the constituents, but a simple classification based on the media or binder and on the basis of its ultimate use and performance is given here.

(a) Classification based on binders

- Oil paints
- Paints based on non-oil resins.
- Cellulose paints.
- Water based paints.
- Miscellaneous paints.

(b) Classification based on ultimate use

- General purpose paints, including primers, under-coat paint and finishing coat paints.
- Acid and alkali resistant paints
- Fire resistant paints
- Fungicidal paints
- Miscellaneous paints, such as fire resistant paint, anti-condensation paint etc.

(c) Mixed classification : types of paints

- Aluminium paint.
- Anti-corrosive paints
- Asbestos paints
- Bituminous paints
- Bronze paints
- Casein paints
- Cellulose paints
- Cement-based paints
- Colloidal paints
- Emulsion paints
- Enamel paints
- Graphite paints
- Inodorous paints

- Oil paints
- Plastic paints
- Silicate paints
- Synthetic rubber paints

Aluminium paints :- It consists of finely ground aluminium suspended in either quick-drying spirit varnish or slow-drying oil varnish, as per actual requirements. A thin metallic film of aluminium is formed when the spirit or oil evaporates. It is used for painting wood work or metal surfaces. This paint has following advantages: (i) Weather resistant, (ii) Water proof, (iii) Highly heat reflective, (iv) Corrosion resistant, (v) High electrical resistance, (vi) High covering capacity, (vii) Visibility in darkness, (viii) Better appearance.

Anti-corrosive paints :- It is used to protect metal structures against adverse effects of moisture, fumes, acids, corrosive chemical ravages of rough weather. It consists of oil and a strong drier and a colouring mixed with very fine sand. Due to this, it is cheaper than white/lead paints. It lasts longer. However it gives black appearance. Linseed oil is generally used as vehicle.

Asbestos paints :- This is a special-purpose paint used for painting surfaces which are exposed to acidic gases and steam and also for patch work or stopping leakage in metal roofs. It is also used for painting gutters, pouts, flashings etc., to protect them from rusting. The paint consists of fibrous asbestos as the main ingredient.

Bituminous paints :- These paints are prepared by dissolving asphalt, tar or mineral pitches in naphtha, petroleum or white spirit. These paints are alkali resistant and are mainly used for painting structural steel under water and iron water mains. The paint gives black appearance and deteriorates when exposed to the direct sun rays.

Bronze paints :- These paints are also used for painting interior and exterior metallic surfaces. The paint consists of nitro-cellulose lacquer as vehicle and a aluminium bronze or copper bronze as pigments. Because of its high reflective property, the paint is used on radiators.

Caesin paints :- Caesin, a protein substance extracted from milk curd, is mixed with a base consisting of white pigments to form the paint which is available in powder or pasty form. The paint can be applied on walls, ceilings, wall boards etc. to enhance the appearance. It can be tinted in any desired shade of colour. For painting exterior surfaces, a little quantity of drying oil or varnish is added to make it weather well.

Cellulose paints :- This paints is different from the ordinary oil paints. It is prepared from nitrogen-cotton, celluloid sheets, photographic films and amyl-acetate substitutes. The paint hardens by evaporation of thinner or solvent, while oil paints harden by oxidation. The paint gives very smooth finish which remains unaffected by hot water, smoky or acidic atmosphere etc. Due to its high cost, it is used for painting motor cars, aeroplanes etc.

Cement-based paints :- This paint is type of water paint in which white or coloured cement forms the base. No oil is used. It is available in powdered form, consisting of cement, pigment, accelerator and other additives; it is available in different trade names such as snow-cem etc. The paint is readily made by mixing water to the powder to obtain thick smooth paste and then diluting it to the required consistency. The paint is very much useful for painting external surfaces, since it is water proof. For new surfaces, it is applied in three coats while for old surfaces, it is applied in two coats.

Colloidal paints :- This paint does not contain any inert material. Because of its colloidal properties, it takes more time to settle. In the process of settlement, it penetrates through the surface on which it is applied.

Emulsion paints :- This paint contains binding materials (vehicles) such as polyvinyl acetate, styrene, alkyd resin and other synthetic resins. The vehicle imparts alkali-resistance to the paint. The paint dries quickly, within 1 1/2 to 2 hours. It has good workability and high durability. The principle film forming constituent of this paint is emulsified in water, so that it may be thinned with water instead of solvent. The painted surface can be washed with water. It is recommended for use on stuccoplaster, bricks and masonry surfaces which contain free alkali.

Enamel paints :- Enamel paint contains four basic constituents- metallic oxide (white lead or zinc white), oil, petroleum spirit and resinous matter. The paint dries slowly, but on drying, it produces a hard, impervious, glossy, elastic smooth and durable film. Different types of enamel paints are available in readymade forms, in a variety of colours. The painted surface is not affected by acids, alkalies, fumes of gas, hot and cold water, steam etc. It is commonly used on doors, windows, metal grills, porches, decks, stairs, concrete stairs etc.

Graphite paints :- This paint has black colour and is used for painting iron surfaces which come in contact with ammonia chlorine, sulphur gases. It is also used for mines and underground structures.

Inodorous paints :- This paint contains white lead or zinc white mixed with methylated spirit. Shellac with some quantity of linseed oil and castor oil is dissolved in methylated spirit. No turpentine is used. The paint dries very quickly, due to evaporation of methylated spirit, leaving behind a thin film of shellac.

Oil paints :- Oil paint is an ordinary paint consisting of two principal constituents : a base and a vehicle. However, driers and colouring pigments are also added. Vehicles that are generally used in oil paints are : linseed oil (raw), boiled linseed oil, linseed oil pale boiled, tung oil etc. The base pigment generally used are white lead, red lead, zinc white, lithophone and titanium oxide. Driers commonly used are litharge, red lead, and sulphates of zinc and manganese. Oil paints are generally used in three coats: prime coat, intermediate coat and finishing coat, each having varying composition. Oil paints are cheap, easy to apply and possess good capacity and low gloss. They are used in general for all types of surfaces such as walls, ceilings wood work, metal work etc. However, oil paint should not be applied during humid and damp weather. Oil paints possess all the characteristics of a good paint, therefore are commonly used.

Plastic paints :- These paints contain plastic as the base which forms the main constituent of the paint. These paints have the qualities of quick drying, high covering power and decorative appearance. Plastic emulsion paint has become very popular these days. The emulsion, which is a liquid having fine suspended particles of a substance, is composed of a plastic compounds such as vinyl acetate and acrylate which are held in water. A litre of plastic emulsion paint, weighing about 1.4 kg, contains about 0.20 kg of binder, 0.50 kg pigments, 0.10 kg other solids and 0.60 kg water. One litre of plastic emulsion paint can cover 15 m² of wall surface per coat. It is applied in two coats. either with the help of a brush or a spray gun.

Silicate paints :- A silicate paint is prepared by mixing calcined and finely ground silica with resinous substances. Silica imparts good adhesion to the paint. It forms very hard and durable surface on drying. It can withstand extreme heat. It is not affected by alkalis. The paint has no chemical action on metals.

Synthetic rubber paints :- These paints consist of synthetic resins dissolved in appropriate solvents and mixed with suitable pigments. The paint has excellent acid, alkali and moisture resistance properties. It is little affected by rain, sunlight and other weather changes. It dries quickly and uniform colour is maintained. It has moderate cost and can be applied on cement concrete more and interior and exterior masonry surfaces.

III. CONCLUSION

The appearance of polychrome decorative paint often changed due to the alteration of certain painting materials. The colours of the past are communicated as we see them today, not as they were intended originally. 17th and 18th distemper decorative paint in wooden Mughal Buildings in India Decorative distemper paints from the 17th and 18th century is preserved in the interiors in wooden materials and is an important part of the cultural heritage in India. Examinations of some of these paintings demonstrate that the once so colourful paintings are today only a faded version with a limited number of colours preserved.

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