

# Experimental Study on Ecofriendly Natural Chalkboard Paint

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**Abstract** - *The Natural Paint and Natural Plaster are important from modern preservative as the pollution is on its highest level as the population is increasing along with ever increasing and due to expanding Industrialization, Globalization, etc. The Natural Paints and Natural Plaster can reduce the CO<sub>2</sub> emission, Volatile Organic Compound (VOC) emission etc to a large extent. They have become an essential combat tool to overcome the various pollution issues.*

*Chalkboard slates can cost upward of 200 rupees per sq feet as per online market survey conducted, and our paint only costs 18.3337 rupees per sqfeet. The Chalkboard paint gives the user the option to make chalkboard colour of any colour of his choice.*

**Key Words:** Total Volatile Organic Compound (TVOC), Formaldehyde (HCHO), Chalkboard Paint, Ecofriendly Paint.

## 1.INTRODUCTION

This The Plastering and Painting are concerned with finishing building operations. The plastering and Painting are the last activity in the building construction process. Since the ancient times Plastering and Painting have played a vital role in the building process as the Plaster and Paints are the footprints of our ancestral past. The Plaster and Paint not only protect the wall from the interior and exterior environment but also play an important role in introducing a pleasing aesthetic beauty. It the Plaster and Paint that provided the artist the freedom to express their art form on wall, structures etc via murals, drawings etc.

The Painting operation is carried out after 3 to 4 weeks after Plastering at the time of Painting the wall surface shall be completely dry so that the Paint will adhere to the plaster properly as shown in Figure no 2. Wall putty of white colour is mostly applied to Plaster first in one or two coats and post drying of putty the wall is Painted with Paints and the Paint is finished as per the requirement of the owner/client. (There are five different finish and sheen options to choose from when

buying interior paint: matte, eggshell, satin, semi-gloss and high-gloss).

Chalkboard Paint: Chalkboard paint is a specialized paint that creates a chalkboard like coating that can be utilized as a writing surface as shown in Figure no 4, in the same manner as a traditional chalkboard or blackboard or greenboard.

### 1.1 MIX DESIGN

- 1) Ingredients 1 part water, 2 part Plaster of paris, 3 parts acrylic paint (1:2:3). (as shown in Figure no 1).
- 2) Mix the water and plaster of paris thoroughly till smooth consistency has occurred.
- 3) Now add the acrylic paint to the plaster of paris and water mix and mix it thoroughly. Now apply the paint on surface and let it dry for at least 3 hour.

### 1.2 ADVANTAGES

- 1) The Chalkboard of any colour as per the liking of children, adult can be made such as yellow, pink, green, blue, black, red etc.
- 2) It is easy to prepare.
- 3) It is an ecofriendly option to plastic whiteboard stickers.
- 4) Ideas can be jotted on it easily, children can use it for studying and practice on it to improve hand writing.
- 5) It can be used on wood, wall plaster.
- 6) It is a cheaper alternative to chalkboard paint, chalkboard slate with respect to cost.

### 1.3 DISADVANTAGES

- 1) Plaster of paris shall be handled properly during mixing, wear safety gloves, use mixing brush while dry and wet mixing as shown in Figure no 3.

### 1.4 APPLICATIONS

- 1) It is used in Colleges, Schools, Office, Hotels, Parks etc.
- 2) It is used in green buildings.



Figure 1 Ingredients of Chalkboard Paint



Figure 2 Application of Chalkboard Paint on Lime Plaster



Figure 3 Air Quality Meter Test on Chalkboard paint



Figure 4 Writing on Chalkboard Paint with Chalk

### 1.5 OBJECTIVES

- 1) To develop and compare Natural Chalkboard paint which will be a (safer and more local alternative to conventional, chemical paints). As Conventional chemical paints can be high in Volatile Organic Compounds and Natural Paints are low in Volatile Organic Compound (VOC) content.
- 2) To develop and compare low cost Chalkboard paint with conventional Chalkboard paint.

## 2. LITERATURE REVIEW

1) Anjali Sharma et. al., The objective of this paper was to shed light on the history of ancient paints made from

natural paints. In this paper they have discussed on Earth paints and there various types in derail along with an discussion on Earth Pigments Used in India's Wall Paintings. They have provided Chronological development of pigment used in Indian mural painting with techniques with respect to time. In there concluding remark they have stated that pigments such as (iron) ochres, green earth, wads and white earth etc were mostly used.

2) Mariia Rochikashvili et. al., The objective of this study was to study various factors which influence the selection of the natural wall paints. The research objective of this study was to developing a decision-making model which could characterise the behaviour of the potential users of sustainable construction products with regard to the sustainable decorative wall paints. In the research methodology, the life cycle assessment principles are not taken into consideration, since the possibility that non-expert users take them into consideration for their decision-making for construction products is very low.

3) Poorvi Rai et. al., The objective of this study was to study the Impacts of toxic paints on environment and human health. They have discussed about low Volatile Organic Compound Voc and high Volatile Organic Compound (VOC) paints in India. The have discussed about following Indian companies that sell eco-friendly and non-toxic paints - Asian Paints, Berger Paints, Dulux India, Kansai Nerolac. In there final concluding remark according to them the Government shall mandate the private companies should organise 3 Rs (reduce, reuse and recycle) schemes like other countries around the world have. To control the disposition of paints in garbage, roads, open areas etc. which can easily come in contact with the environment. The excess of paint should be used in government departments, houses of people who cannot afford or the paint can be returned to the retailers for recycling and disposing at the place which does not harm the environment. A better solution for paint disposal shall be provided.

4) Munui Kim et. al., The objective of this research was to establish the necessity of natural paints in todays urbanization driven world. They have also developed their own natural sericite clay material. They have done Analysis of toxic substances. Total volatile organic compounds (TVOC) analysis showed that trace amount of Total Volatile Organic Compound (TVOC) was detected in Natural Wall Paint (NWP); paint B showed 0.286 mg/m<sup>2</sup>h, and paint C is 0.555 mg/m<sup>2</sup>h,

respectively. Recommendations based on indoor air quality are 0.5 mg/m<sup>2</sup>h, where as natural wall paint and paint B are below the standard, where paint C was little beyond the standard. In general majority of the Volatile Organic Compound (VOC) emission was from the organic binder used in the preparation of paint. Compared with commercial paints B and C, Natural Wall Paint (NWP) has exhibited trace amount of Total Volatile Organic Compound (TVOC) this is because it contains a very low amount Volatile Organic Compound (VOC). The constituents of Sericite (54%) + water (39%) may include ecofriendly chemicals as well total Volatile Organic Compound (VOC) analysis data resulted trace amount of Volatile Organic Compound (VOC). They have attained satisfactory results with respect to low Volatile Organic Compound (VOC) natural paint mix design and implementation.

5) Suman Sahu et. al., The main objective of this study was to discuss in detail about Natural dyes. The researcher has given literature review about various articles. The natural gulal can be prepared from beetroot. The beetroot prepared gulal can be used in natural paints as a pigment admixture and it can be used in textile industry as well. Wet Mixture of Beetroot in combination with wheat flour and rice flour and water is prepared and dried for 3 to 4 days to get gulal.

### 3. COSTING AND RATE ANALYSIS

Chalkboard Paint: To paint 100 sqfeet area in Double Coat.

Assume 1 liter paint is able to cover 80 sqfeet area in Double Coat.

Now,  $1/80 \times 100 = 1.25$  liter

Table No 1 Costing Rate Analysis of Chalkboard Paint

Sr No	Item	Quantity	Rate in rupees	Amount in rupees
	<b>Material</b>			
1	1) Plaster of Paris	0.417 kg	100 rs/kg	41.7 rs
2	2)Green Acrylic Paint	0.625 liter	200 rs/liter	125 rs
3	3) Water	0.208 liter	-----	-----
	<b>Labour</b>			
5	1) Painter	2	500 rs/day	1000 rs
6	2)Contingencies, tools, and plants	Lump Sum	Lump Sum	500 rs
			<b>Total</b>	<b>1666.7 rs</b>

Total Cost of paint material and labour = 1666.7 rs

Add contractors profit 10% total = 166.67 rs

Gross total = 1833.37 rs

Final Rate per m<sup>2</sup> =  $1833.37/100 = 18.3337$  rs/sqfeet

### 4. RESULTS

Table No 2 Results of Air Quality Meter for Natural Paints

Sr No	Parameter	Herbal Paint	Milk Paint	Chalkboard Paint	Earth Paint	WHO Standard Permissible Limit
1	Formaldehyde (HCHO)	0.04 mg/m <sup>3</sup>	0.003 mg/m <sup>3</sup>	0.005 mg/m <sup>3</sup>	0.001 mg/m <sup>3</sup>	< 1mg/m <sup>3</sup>
2	Total Volatile Organic Compound (TVOC)	0.016 mg/m <sup>3</sup>	0.019 mg/m <sup>3</sup>	0.015 mg/m <sup>3</sup>	0.011 mg/m <sup>3</sup>	< 1mg/m <sup>3</sup>

As per Table No 2 The Chalkboard Paint is well within the permissible limits of WHO World Health Organization Standard Limits for Indoor Air Pollutants. As compared to other natural paints which we have also mix designed, applied on plaster and tested for TVOC, HCHO the Chalkboard Paint we have prepared gives off negligible amount of HCHO, TVOC.

Table no 3 Comparison of Chalkboard paints and chalkboard slate

Sr No	Type of Paint/Slate	Rate in rupees
1	Our Chalkboard Paint (including labour and tools,plants)	18.3337 rs/sqfeet
2	Our Chalkboard Paint (without labour and tools,plants)	2.08 rs/sqfeet
3	Magicwall Dark chalkboard paint (including labour and tools,plants)	39.37 rs/sqfeet
4	Magicwall Dark chalkboard paint (without labour and tools,plants)	20.62 rs/sqfeet
5	Chalkboard Slate	200 rs/sqfeet

As per Table No 3 we can say that our Chalkboard Paint is much more cheaper than the Slates and other Chalkboard Paints available in the market currently.

### 5. CONCLUSIONS

The Chalkboard Paint converts any plastered wall surface into a Chalkboard which costs less as compared to an actual chalkboard. Any good quality Chalkboard slates can cost upward of 200 rupees per sq feet as per online market survey conducted, and our paint only costs 18.3337 rupees per sqfeet as shown in Table no 1 and Table no 3. The Chalkboard paint emits low Formaldehyde (HCHO) and Total Volatile Organic Compounds (TVOC) as compared to other natural paints

as shown in Table no 2. The Chalkboard paint gives the user the option to make chalkboard colour of any colour of his choice. The mix design we have prepared gives satisfactory results when applied on Gypsum and Cement plaster.



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