

Use of Plaster Of Paris Debris in Decorative Concrete

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Abstract: Ganesh Chaturthi is one of the most important festivals celebrated in India. In this festival, after predetermined period, the Ganesh idols are immersed in the water bodies i.e. river, lake, ocean, etc. Day by day the demand for Ganesh idols made from Plaster of Paris is increasing exponentially. This Plaster of Paris causes water pollution on large scale affecting the underwater life and quality of water in respected water bodies. This is mainly because the Plaster of Paris does not dissolve in water and remains as it is for years. This leads to blockage in internal stream links of water bodies. Also they disturb the food chain of fishes in water body. This water pollution can be reduced by reusing the Plaster of Paris debris for other purposes. This debris of Plaster of Paris after immersion of Ganesh idols in water bodies can be used in Decorative Concrete. As decorative concrete is not subjected to any structural load, less compressive strength of concrete with low density is desirable. This objective of decorative concrete can be achieved by using Plaster of Paris debris in concrete as coarse aggregates. Also the Plaster of Paris, being one of the main constituents of concrete and a waste material, will reduce the overall cost of decorative concrete. After the immersion ceremony of Ganesh idols in water body, the debris can be removed from water bodies mechanically or manually within 48 hours and dried in the sunlight. The dried debris of Plaster of Paris can be crushed into desirable size of aggregates and can be used in production of lightweight concrete.

Keywords: Ganesh Chaturthi, Plaster of Paris debris, Decorative Concrete, Ganesh Idols, Water Pollution

I. Introduction

The overall pollution of water in rivers, lakes and oceans is increasing exponentially because of immersion of idols in water bodies. There are two types of soils are available in market for the production of the Ganesh idols i.e. Plaster of Paris and Modeling Clay. In the current scenario, people are choosing Plaster of Paris idols over the traditional Modeling Clay idols. This is because of physical properties that idol acquire and economy for the idol makers. For example, the density of idols made from Modeling Clay is much more than density of idols made from Plaster of Paris. Another fact is the number of idols that can be made from one bag of Plaster of Paris is very large as compared to the number of idols made from one bag of Modeling Clay. Because of such reasons, idol makers as well as customers, both are choosing the Plaster of Paris idols instead of Modeling Clay idols. But this is leading to large amount of water pollution in India. The Plaster of Paris does not disintegrate in water for years; it remains in solid form in water. These solid particles of Plaster of Paris disturb the food chain of aquatic life resulting in death of fishes and other aquatic life. This problem of pollution can be reduced if the immersed Plaster of Paris debris are segregated from the water and reused in decorative concrete.

II. Objectives Of Present Work

Following are the main objectives of the presented work:

- a) Use of waste Plaster of Paris.
- b) Reduce the water pollution.
- c) Enhance the strength of Decorative Concrete.
- d) Make Decorative Concrete economic.

III. Methodology

3.1 Preparation of Plaster of Paris aggregates

In order to use Plaster of Paris debris in concrete, first they are needed to be separated from the water. 24 hours after the immersion ceremony of the idols, Plaster of Paris waste is removed out of water from the water body manually or mechanically. This waste of Plaster of Paris is completely dried in the sunlight for at least 12 hours. The dried Plaster of Paris is then crushed into aggregates of size 10 mm to 20 mm.

3.2 Concrete Mix Design

M53 grade concrete is used for concrete mix design. The Concrete Mix design is described in Table – 1. The admixture used in this Mix design is ‘CAC Hyperflume + G’.

Table – 1: Design Concrete Mix Proportions

Material	Dry Weight for 1 m ³ (Kg)	Dry Weight for 0.015 m ³ Batch (Kg)
Ordinary Portland Cement	250	3.75
Fly Ash	250	3.75
Plaster of Paris	366	5.5
Crush Sand	833	12.5
Air Entering Agent @ 2%	1	0.015
Admixture	6	0.090
Water	250	3.75

3.3 Cube Casting and Testing for Compressive Strength

According to the concrete mix design explained in Table – 1, six cubes of size 150mm X 150mm X 150mm are casted. The casted cubes are cured for 28 days in normal water. Three cubes out of six casted cubes are tested for their compressive strength after 7 days of curing and remaining three cubes are tested for their compressive strength after 28 days of curing.

IV. Observations

Table – 2 shows the observations regarding compressive strength of decorative concrete (Mix design as per Table – 1) for curing period of 7 days and 28 days.

The flow acquired by the trial mix after 60 minutes is 500 mm.

Table – 2: Observation Table for Compressive Strength

Cube Number	Duration of Curing	Compressive Strength (MPa)
1	7 days	12.67
2	7 days	14.78
3	7 days	15.03
4	28 days	15.80
5	28 days	13.18
6	28 days	15.63

Therefore, average compressive strength of concrete for 7 days curing was found to be 14.16 MPa and average compressive strength of concrete for 28 days curing was found to be 15.20 MPa

V. Conclusion

The Plaster of Paris debris can be used in light weight decorative concrete effectively. Average compressive strength of concrete with Plaster of Paris debris as aggregates is 14.16 MPa for 7 days curing period and 15.20 MPa for 28 days curing period which is desirable for decorative concrete to use it for architectural purposes in buildings. The flow of concrete prepared was found to be 500 mm after 60 minutes which is desirable to use the concrete on site. This concludes that workability of concrete with Plaster of Paris is very good and can be placed effectively on the site.

One more important thing about using Plaster of Paris in concrete is reduction in water pollution. As plaster of Paris in water bodies is causing serious pollution, if it is removed from water and used in concrete then this pollution can be reduced to considerable extent. Also, it will help the decorative concrete to become more economic as Plaster of Paris used is a waste material.

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References

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