

# Sustainable Construction: Study of Water Use, Comparing Conventional Plaster to Ready Mix Plaster

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**Abstract** - Building construction industry has shown tremendous growth over a period both technically and innovatively. As building materials consume natural resources, the industry moved focus towards sustainable and eco-friendly materials. Water is being a natural resource; use of water should be optimum. During the construction stage, water is used for preparation, casting and curing in traditional/conventional method. The aim of the paper is to put light on alternative materials which in turn help to **reduce use of water** during plastering of walls.

**Key Words:** Natural Resource, Water, Traditional Construction, Alternative, Optimum

## 1. INTRODUCTION

In conventional method of construction plastering of walls is done majorly with cement mortar. For internal plaster, gypsum can be used. Cement mortar requires water at stages of preparation, casting/applying, and curing. It has been observed that curing activity has more water requirement with more wastage of water. There is no document or a thumb rule for water usage on site. It happens because the cost of water is **0.5% of total cost** of project. Many times it has been noticed that scarcity of water is being one of the reason for project delay. The research paper includes study of alternative materials with respect to water requirement. It is important to identify optimum use of water can be done by **change in materials**. This makes the sustainable construction practice which gives additional positive aspect to project.

### 1.1 Cement Plaster:

Cement Plaster gives a finished surface that is smooth and uniform. Plaster is a layer of cement sand mortar applied over the masonry work which acts as a damp proof coat. The mixing proportion of cement and sand depends on type of work on which it is going to apply and coat. Water requirement during mixing is not controlled. Also additional water is consumed for intense equipment washing.

### 1.2 Curing Period:

Curing is the important activity which consumes more water. Mostly, it is done by using buckets & jar or directly

with water pipe. Curing period is analyzed both as per IS specification & on site.

**Table -1:** Conventional Water Requirement

Activity	Mixing Proportion water cement ration(ltrs)	Curing Days	
		Standard	On Site
Plaster (CM)	30*	15	3
Int. Plaster (Gypsum)	15	0	0

Note:

\*W/C differs for different grades of cement

## 1.3 Dis-Advantages of Conventional Plaster:

- **Quality control** is an issue as mixing is done on site.
- **Time and cost:** it involves labor to carry materials for mixing. Hence surges cost of labor with time.
- **Water cement ratio:** is not followed accurately. Hence improper mixing with less strength.
- **Cracks on surface:** After few days, cracks are developed on surface. It is due to excessive moisture in background, thickness of coat, rapid drying, and poor joint filling.
- **Rebound loss** is more.
- Hence, **Wastage of material**.

## 2. ALTERNATIVE MATERIALS:

As alternative materials, there are options with ready mix dry plaster (also with self-curing) and wet mix plaster with self-curing. Ready mix dry plaster is mixture of cement, fine graded sand, polymers, accelerators and binding agents. As like conventional plastering, the plaster provides the same physical and chemical properties. It requires 5 to 7 days of curing that is half of conventional plastering. Also requires about approx. 7 liters of water per 40kg of bag for

mixing on site. Ready mix plaster is suitable for walls constructed with concrete, clay bricks and blocks walls.

**Table -2:** Alternative material specification

Name With Product	Ready Mix Plaster	Self-Cure Ready Mix Plaster
Ingredients	High quality cement, well graded fine sand and special performance powder additives	good quality cement, properly selected fine aggregates, Fibers & additives with additional Self Curing Compound as the integral part of the product
<b>Product Specification</b>		
Packaging Size	40Kgs	40 Kgs
Bulk Density	1.6 kg/ltr – 1.8 kg/ltr	Dry Mix - 1.6 kg/ltr Wet Mix - 1.8 kg/ltr (mixed with water)
Brand	ACC	Mcon Rasayan Pvt. Ltd.
Coverage Area	15-20sq.ft	18 - 20 sq. ft
Form	Power	Powder
Binder	High grade ACC cement	Grey Portland Cement 53 grade cement
Water Intake	5-6 litres approx.in a bag of 40kg	150 - 200 ml per kg (approx 8 Liters in a bag of 40 kg)
Pot Life	30-50 Minutes	100 Minutes
Thickness	10-12mm	10 - 15 mm per single coat
Area Of Application	Internal & external surface with brick, blocks etc. Also used for repair and rehabilitation work.	Block work, brick work and concrete substrates. External and Internal plastering application for repair and rehabilitation works.

Features & Benefits:	Excellence workability, less rebound, save time, 5-7 days of curing.	Self-curing hence reduces labor cost for curing and also saves water. <b>Thus a Green Product initiative.</b> Excellent waterproofing characteristics, Crack free surface
Method Of Application	Mix 5-6 ltrs of water per 40kg bag. In clean tray on site. Apply on Clean and pre-wetted surface. Use a mixture within 1 hr. of mixing water. 5-7 days of curing is done.	Mix 6-8 ltrs of water per 40kg bag. In clean tray on site. Apply on Clean and pre-wetted surface. Use mixture within 1 hr. of after adding water. Over coated with other material after 3 days of plastering. In very high temp.7 days curing is require.
Cost	Rs.250 per bag	Rs.600 per bag

### 2.1 Advantages :

- **Save Time & Cost:** As it is a ready to use mixture, eliminates labor & time required for dry mixing of material on site.
- **Quality Controlled:** Packed product with defined quantity so mixing is quality achieved.
- **Crack controlled:** As excellent workability and higher strength.
- **Rebound is less.**
- **Less Material Wastage.**
- **Water consumption is optimum** while mixing, curing and equipment washing.

### 3. COMPARATIVE ANALYSIS:

Basically comparison is done between the conventional plastering and alternative materials i.e. ready mix plaster. Analysis based on water requirement for various stages is tabulated. Color code suggests,

Red- maximum use of water,

Bottle green- minimum and

Light Green- Moderate.

Bottle/light Green color recommends the materials more **sustainable and ecofriendly**.

Stages	Conventional Plaster		Ready Mix Dry Plaster		Self-Curing Ready Mix Plaster	
Preparation/mixing	Yes	w.r.t mix proportion used	Yes	5-6 ltrs per 40kg bag	yes	6-8 ltrs per 40kg bag
Casting/ Application (surface )	yes	Surface curing	Yes	Surface curing	yes	Surface curing
Curing	Yes	15 day	Yes	5-7 days		No *

- Water requirement in dry ready mix plaster is very much controlled and less than cement mortar.
- In case of ready mix plaster, 5-7 days of curing is done which is 50% less as compare to conventional plastering.
- Curing is **totally eliminated** in self-curing ready mix plaster.
- Ready mix plaster saves **cost and time** compare to conventional plastering.
- Hence execution and completion of work and project **hassle free**.

### 3. CONCLUSION:

With the use of ready mix plaster is very much understood that optimum water is used. Curing period gets reduce to 50% where as it is zero percent in self-curing ready mix plaster. It takes a step closer to sustainable construction practice. Government organizations are encouraging for ecofriendly and sustainable use of materials in construction.

Ready mix plaster does not require any special tools and labors for application. No curing helps to reduce cost with time.

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