



Study of Alternative Material in Gypsum Boards for False Ceiling and Composite Wall Panel

Prof. Abhijeet jadhav, P. S, Patil², S. S. Sid³, A. A. Ghorpade⁴, S. S. Patil⁵, M. S. Karande⁶

Asst. Prof., Department of Civil Engineering, AITRC, Vita, India¹

Students, Department of Civil Engineering, AITRC, Vita, India²⁻⁶

Abstract: The concept of Gypsum based false ceiling sheet and composite wall panel has been commonly used in foreign countries for new and also renovation work. It has also been adopted in India nowadays in some areas. The actual concept is that the converting nonstructural member to structural member by using alternative material. It is a very good replacement to conventional type in false ceiling and composite wall construction because it does not require finishing work. The effect of gypsum board as material on the environment is very less because the waste material generated during construction and demolition is very less Study focused on the techno-economic feasibility of use gypsum boards for false ceiling and also for composite wall by gypsum based wall panels over conventional techniques which accelerates construction speed, reduces manpower and money too.

Keywords: Gypsum Plaster, fibers, water, rise husk, cement bag threads, baggase, coconut coir, jolting test .

I. INTRODUCTION

A false ceiling is a ceiling that is suspended from the main ceiling. The suspension is fixed to the walls, roof or beam of the superstructure. In simpler words, a false ceiling is a second ceiling created below the original. The area above the false ceiling is termed as plenum surface. It can practically be used in every building, be it residential, commercial, industrial, academic, institutional, etc. false ceiling is an obligatory requirement due to a multitude of its uses.

Times have changed and so have ceilings. No one wants to see exposed cables wire, ducts and cracks in the ceiling. Wires are being hidden, fancy lighting fixtures are being used, and central air-conditioning is being provided, all through the false ceiling.

To conceal service lines, such as air-conditioning systems, electrical wiring. To give thermal insulation. To soundproof room such as meeting rooms, auditoriums, etc, which require a quite environment to accommodate lighting systems.

A dropped ceiling is a secondary ceiling, hung below the main (structural) ceiling. It may also be referred to as a drop ceiling, false ceiling or suspended ceiling and are a staple of modern construction and architecture. A typical dropped ceiling consists of a grid-work of metal channels in the shape of an upside-down "T", on wires from the overhead structure

II. OBJECTIVES

1. To achieve low cost fibrous gypsum based false ceiling boards.
2. To enhance physical properties of gypsum board.
3. To use gypsum wall panels for construction of composite wall and their effect.
4. To study the effect of gypsum based false ceiling sheet and composite wall panel insustainable development.

III. EXPERIMENTAL WORK

Properties of used materials

1. Gypsum plaster

For the ordinary fibrous and GRG gypsum plaster boards, the gypsum plaster shall comply with requirements of IS 8272:1984. For high strength GRG Boards, Gypsum plaster of Properties:



1. Fineness- Not more than 5 percent retained on BIS sieve (75 micron).
2. Normal Consistency - M in 60 percent and
3. Compressive Strength- M in 16.0 MPa

2. Fibers

The reinforcing fiber may be sisal or a mixture of such sisal fiber and coconut containing not more than 20 percent by mass of coconut fiber. It shall be of the approved quality, thoroughly teased and free from dust, grease or other substances likely to affect strength of the fibrous plaster boards

3. Water

Potable waters are generally considered satisfactory for mixing plaster.

PROPOSED MATERIAL

Gypsum (Plaster of Paris), Rice husk, Cotton net, Threads of cement bag, Baggase, Glass fiber etc.

1. Gypsum :

Gypsum is one of the oldest known synthetic Building material, it was used by the Egyptians at least 4000 year ago in the construction of the pyramids, and the Greeks were producing decorative plaster work by 500 BC. The chemistry of the conversion of gypsum to plaster was also investigated early on by chemists such as Le Chatelier (1850-1936) and Vant Hoff.



Photo 4 Gypsum

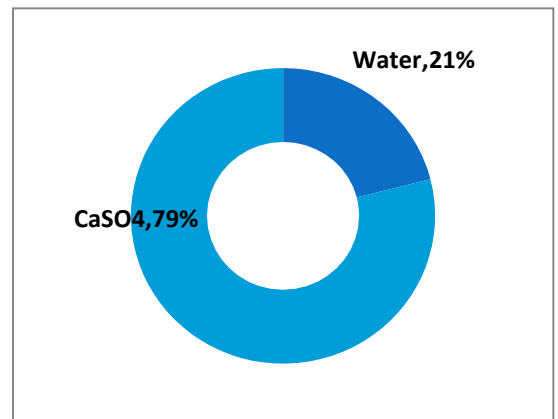
Gypsum has two sources as following.

1. Naturally occurring.
2. Artificially.

➤ **By weight** - 79% Calcium Sulfate
-21% water

➤ **Gypsum** -23% Calcium
-18% Sulphur

- Its solubility is 150 times that of limestone



IV. PROPERTIES OF MATERIALS

• RICE HUSK

Properties

Rice husk is an irregular boat-like particle. The typical size of rice husk used in experimental studies is about 8-10 mm in length, 2-3 mm in width and 0.2 mm in thickness. It is very light, with packing density of 122 kg/m³. Rice husk is also characterized by a high volatile content, a nearly uniform size and high ash melting points



Photo Rice Husk



Role of rice husk in POP Boards:

Boards Rice husk is In POP act as weight reducer

- **CEMENT BAG THREADS**

Properties

This are made from polythene material. That
treads having width of 2 to 2.5 mm and length of several meters



Photo : Cement Bag Thread

Role of cement bag threads in POP Boards:

In POP Boards cotton threads are act as Reinforcement. As weight reducer and to reduce water absorption.

- **BAGGASE**

Properties:

This is light weight material, white in color.
It absorbs more water and inflammable



Photo : Bagasse

Role of Bagasse in POP Boards:

In POP Boards Bagasse is act as weight reducer.

- **COCONUT COIR**

Properties:

These are the fibers having length nearly
10 to 15 cm, brown in color. It absorbs less water and inflammable.



Photo : Coconut Coir

Role of coconut coir in boards:

It used as fibrous material in boards as reinforcement purpose



V. TESTING

Test means a procedure intended to establish the quality, performance or reliability of something.

5.1 DIFFERENT TESTING ON GYPSUM BOARD: As per IS: 2542 (part 2/Sec 1 to 8) -1981-

- MEASUREMENT OF DIMENSION
- DETERMINATION OF MASS
- TRANSVERSE STRENGTH
- WATER ABSORPTION

As per IS: 2095 (part 1)-1996

- JOLTING TEST

5.2. INDIAN STANDARD METHOD OF TESTING OF GYPSUM – IS 2542(part 2/Sec 1 to 8)-1981

Out of these five tests we have apparatus required for all tests except for that of transverse test. For we don't have standard test set up. To overcome these problem we made test set up as described in the IS Code which show in picture and we conducted tests .



Photo; Setup for transverse Test

A. MEASUREMENT OF DIMENSION

The average of the three measurements of length and width of each board shall be reported.

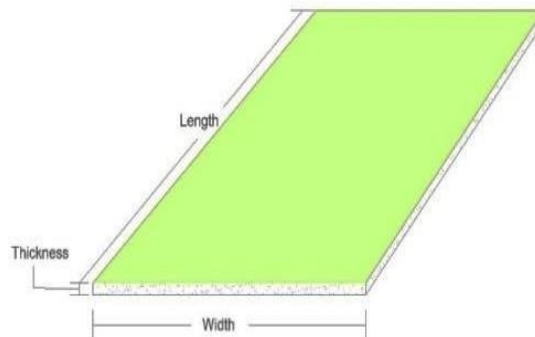


Figure : Measurement of Dimensions

B. DETERMINATION OF MASS

The average of the weighing shall be taken and mass in kg/m² shall then be determined and reported unit of measurement: kg/m²



Photo : Determination of Mass

C. TRANSVERSE STRENGTH

the report shall indicate for each individual test specimen

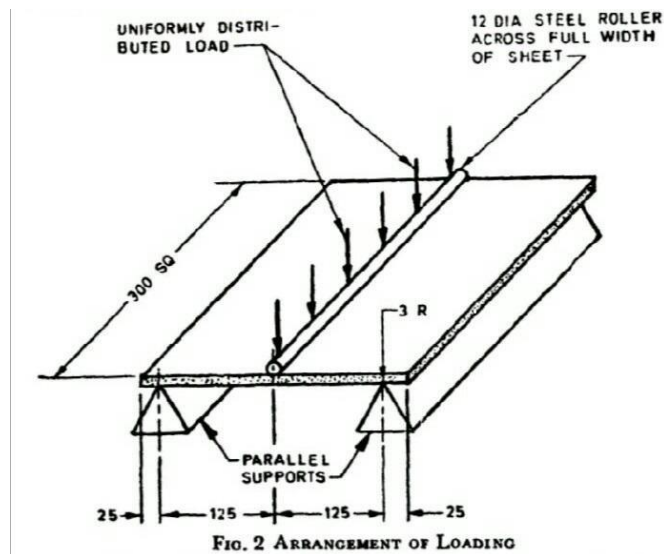


FIG. 2 ARRANGEMENT OF LOADING

Figure : Transverse Test

D. WATER ABSORPTION

The percentage water absorption of the specimen shall be reported

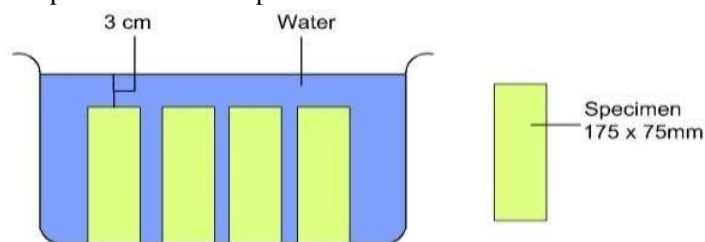
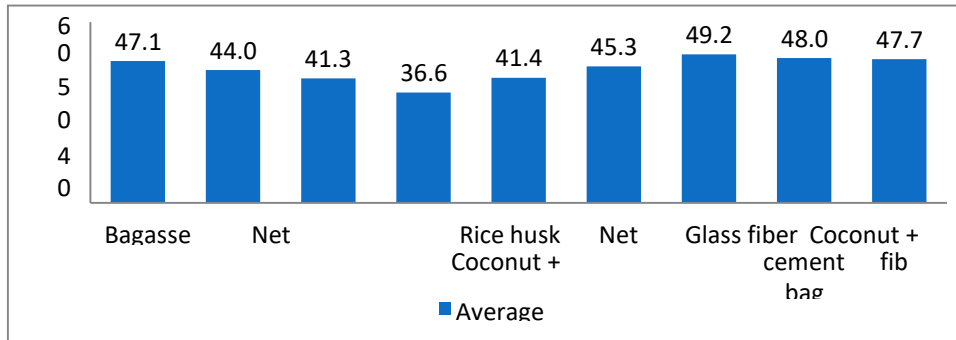


Figure : Water Absorption Test



Graph : Water Absorption Test

E. JOLTING TEST

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off.

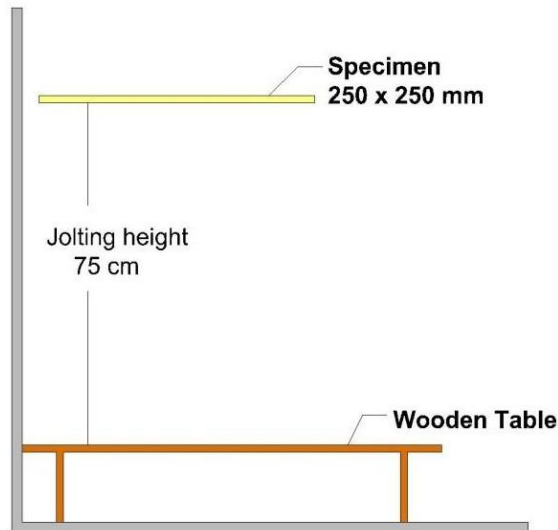


figure : Jolting Test



Figure : view of Jolting test showing HT 75 Cm



Figure : Breaking Pattern after Jolting test



Figure : Jolting Pattern (Net)

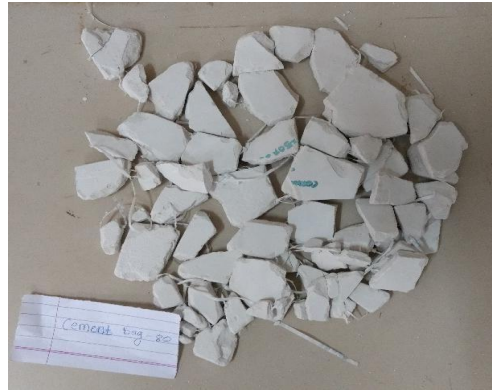


Figure : Jolting Pattern (Cement Bag Threads)

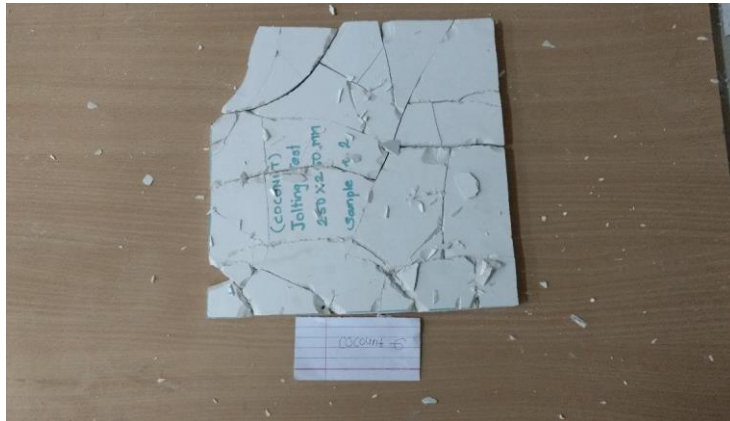


Figure : Jolting Pattern (Coconut Coir)



Figure : Jolting Pattern - All Material

VI. CONCLUSION

From result achieved Glass fiber, Coconut Coir, Cement Bag Thread and Rise husk can be conveniently use as fiber/ flake to make Gypsum based false ceiling boards so as to achieve desire strength and substantial cost saving. Result may be improved if there is improvement in manufacturing process. Regarding composite wall panel, it more cost effective and very beneficial in all direction and easily adoptable for internal wall construction if properly promoted



REFERENCES

- [1] “A new design recycle agricultural waste materials for profitable use rice straw and maizehusk in wall” N. Padkho Elsevier 25 November 2011.
- [2] “A review of unconventional sustainable building insulation materials”. Francesco Asdrubali, Francesco D'Alessandro, Samuele Schiavoni, Published by Elsevier 2015
- [3] “Controlling Set Times during Gypsum Board Production: Advanced Additive Solutions” Markus Müller, Christina Hampel
- [4] “Plasterboard Assemblies Exposed to Real Building Fires”, Bevan H Jones, Department of Civil Engineering University of Canterbury Christchurch, New Zealand
- [5] INDIAN STANDARD METHOD OF TESTING OF GYPSUM – IS 2542 (part2/Sec 1 to 8)-1981
- [6] INDIAN STANDARD METHOD OF TESTING OF GYPSUM – IS 2095 (part1)-1996 for Jolting Test