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Dry Wall: Necessity Under the Indian Construction industry

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Abstract – Construction industry plays vital role in the Indian economy, which is rapidly growing in the current market scenario. The demand of the construction is continuously increasing. The construction time and cost is the major factor in the construction industry, which may affect the delay and other several impacts on the contractor or builder. Secondly the quality of the work/ finished also required for the client. So its important to maintain the constant quality and services. In these case study the dry wall analysis and technical evaluation is concluded by case study. In these case study the different types of green construction material and their market analysis, comparative analysis between the masonry bricks Vs drywall as by considering the various aspect for the Indian construction. Where the delay and skilled labour is the major concerned for the construction industry.

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INTRODUCTION

In different countries in the world the name of the dry wall is different. Dry wall also called Gyprock, Gyp Board or Gypsum board, plaster board, wall board these names reflect that the construction of the wall is dry wall. There is 2 sorts of gypsum wallboard standard and fire-evaluated (or Type X as it's come to be called). A noteworthy normal for gypsum drywall is its capacity to oppose fire.It does this through its substance creation. Gypsum (calcium sulfate) contains artificially consolidated water around half by volume. At the point when presented to flame, the water, because of warmth, halfway changes over to steam, which viably opposes fire. The contrary side of the gypsum board divider stays cool until the point that all water in the gypsum center has been changed over to steam or until the point when the gypsum board itself is ruptured by the flares.

The new drywall will be filled with tiny beads of paraffin that would absorb heat during the day, and release it at night. It could be the latest thing in green building technology. This type of construction is suitable and can be applied for all commercial and residential projects, such as: Model houses/ apartment, studio apartments, Residential homes, office building, factories, departmental stores, etc. These are light weight systems – 8 to 10 times lighter than conventional systems like Brick / Block work, comparatively much faster construction, almost – five to eight times faster along with smooth finish, aesthetically beautiful crack free surfaces. Besides the newly mined material, up to 20% of the gypsum used to manufacture drywall can be recycled from waste generated at the manufacturing plant or at construction sites. The content covered in this paper gives a highlight on the overall system of dry wall and the concept has been diverted in the viewpoint of sustainable development and managerial benefits at construction sites

REVIEW STAGE

A. Aim of the study:

By using the comparative analysis method study the traditional methods (Bricks/ Block) to Dry wall, considering the variable parameter with respect to time, cost and quality for the Indian construction industry.

B. Objective:

1. The main objective of this study is to analyze the necessity of the dry wall under the Indian construction industry.
2. To study on different types of dry wall and green construction material based on the market survey.
3. To evaluate the conventional construction industry (Brick/blocks) to the dry wall by using the comparative analysis method.
4. To study economical aspect under the Indian industrial, commercial and residential industry.

5. To study the sociological and eco-friendly, recyclable alternatives.

C. Scope of Work:

1. Introduction to green construction materials in construction.

2. Comparison of drywall to the traditional methods (brick/block).

3. Analysis of amount of time & cost saved by use of drywall technique.

4. Analysis of risk factors in execution of drywall.

5. Preparation of checklists onsite for drywall technique.

D. Methodology:

- The study of conventional brick construction industry and availability of the green construction material in the market.
- To visit the site, where dry wall is already installed.
- Selection of area for the study i.e. Case Study.
- Surveys required for the research work: Preliminary survey which include the collection of traditional brick/block construction data and dry wall

E. Necessity of the Dry wall:

Deferrals are one of the most concerning issues development firms confront. Deferrals can prompt numerous negative impacts, for example, claims amongst proprietors and temporary workers, expanded costs, loss of profitability and income, and contract end.

F. Delay Causes:

(1) Contractor's improper planning.

(2) Contractor's poor site management

(3) Inadequate contractor experience

(4) Inadequate client's finance and payments for completed work

(5) Problems with subcontractors

(6) Shortage in material

(7) Labor supply

(8) Equipment availability and failure

(9) Lack of communication between parties, and

(10) Mistakes during the construction stage.

Six main effects of delay were:

(1) Time overrun,

(2) Cost overrun,

(3) Disputes,

(4) Arbitration,

(5) Litigation, and

(6) Total abandonment.

G. Project Delay report by "ASSOCHAM":

The study by the (Assocham) has found: Out of 886 delayed "Associated Chambers of Commerce and Industry of India" projects, 826 delayed projects are for housing construction and 60 for the commercial complex.

Major states, Maharashtra saw delay of 39 months, Punjab has recorded the maximum delay of 48 months in construction and real estate projects followed by Telangana (45 months), West Bengal (44 months), Odisha (44 months) and Haryana (44 months), a study by Assocham has found.

H. Market Survey:

1. Straw Bales
2. Grasscrete
3. Rammed Earth
4. Hemp Crete
5. Bamboo
6. Recycled Plastic
7. Wood
8. Mycelium
9. Ferrock
10. Ash Crete
11. Timbercrete

12. Dry Wall

Above eco-friendly construction material is available in market.

I. SITE SURVEY:

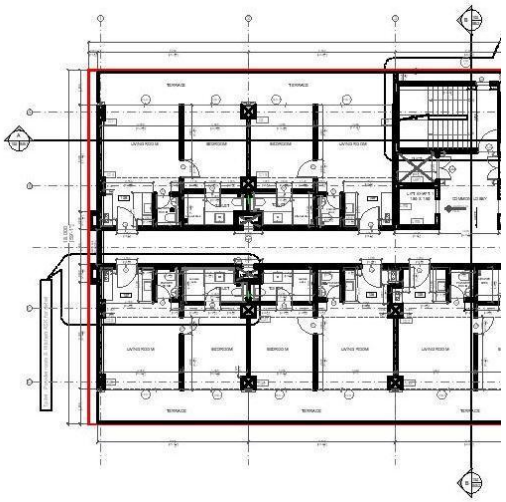
1) Novotel Hotel Pune.

2) The residences oxford golf resort.

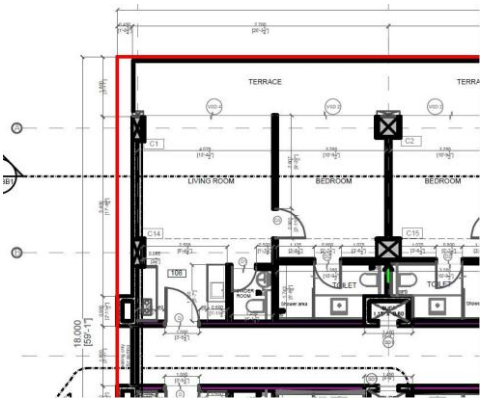
Site Address: Mumbai-Bangalore Highway, Next to Crystal Honda Showroom, Bavdhan, Pune, Maharashtra 411045

Case Study : The residences oxford golf resort.

Site Plan:



Floor Details:



I. SITE AREA CALCULATION:

Flat 1BHK.

Sr. No.	Type of wall	Thickness of wall (mm)	Length (m)	Height (m)	No.	Area (sqm)	Total	Remark
1	W4	144	6.741	3.14	1	21.17	18.51	Corridor side
2	W4	144	1.05	2.53	-1	-2.66		
3	W1	123	3.83	3.14	1	12.03	10.00	Partition Between living & bed room
4	W1	123	0.8	2.53	-1	-2.02		
5	W2	122.5	3.349	3.14	1	10.52	10.52	Partition between toilet & Bedroom
6	W2	122.5	1.25	3.14	1	3.93		
7	W2	122.5	0.8	2.53	-1	-1.90		Partition Between living & Powder room
8	W2	22.5	0.75	2.53	-1	-2.02		
9	W3	128	3.08	3.14	1	9.67	12.77	Common wall between two flat
10	W3	128	0.988	3.14	1	7.75		
11	W5	122	2.53	3.14	1	7.94	13.28	Partition wall of powder room
12	W5	122	1.7	3.14	1	5.34		
13	W6	75	2.625	2.5	1	6.56	8.78	Toilet
14	W6	150	0.96	1.26	1	1.21		Powder room
15	W6	150	0.8	1.26	1	1.01		Powder room
16						78.52	73.87	

Sr No	Type of wall	Area (Sq m)
1	W1	10.00
2	W2	10.52
3	W3	12.77
4	W4	18.51
5	W5	13.28
6	W6	8.78

Summary of wall for 1BHK

Dry wall Cost Calculation by considering the given rate:

Cost = Material cost + Labour cost

Type of wall	Rate in Rs / Sq m
W1	2853
W2	3300
W3	3133
W4	3524
W5	3546
W6	1788

II. Dry wall cost calculation:

Sr. No.	Type of wall	Type of wall	Thickness of wall (mm)	Area (Sqm)	Rate in Rs / (Sq m)	Cost in Rs
1	Dry wall	W1	123	10.00	2853	28,530
2	Dry wall	W2	122.5	10.52	3300	34,716
3	Dry wall	W3	128	12.77	3133	40,008.41
4	Dry wall	W4	144	18.51	3524	65,229.24
5	Dry wall	W5	122	13.28	3546	47,090.88
6	Masonry wall	W6	150	8.78	1788	15,698.64
Total						2,31,273.17
					Masonry wall	15,698.64
					Dry wall cost	2,15,574.53

III. Masonry wall cost calculation:

Sr. No.	Type of wall	Type of wall	Thickness of wall (mm)	Area (Sqm)	Rate in Rs / (Sqm)	Cost in Rs
1	Masonry wall	W1	123	10.00	1788	17,880
2	Masonry wall	W2	122.5	10.52	1788	18,809.76
3	Masonry wall	W3	128	12.77	1788	22,832.76
4	Masonry wall	W4	144	18.51	1788	33,095.88
5	Masonry wall	W5	122	13.28	1788	23,744.64
6	Masonry wall	W6	150	8.78	1788	15,698.64
Total						1,32,061.68

IV. Load Calculation

A. Brick Masonry:

B. Wall Thickness = 150 mm

C. Density of brick masonry = 1920 kg/m3

D. Load per sqm = 0.15 x 1920 = 288 Kg/m2

E. Total weight = 288 kg/m2

Brick Masonry:

Wall thickness (mm)	Density of Brick Masonry (kg/m3)	Load per Sqm (Kg/m2)	Total weight (Kg/m2)	Area (Sq m)
150	1920	288	2880	10.00
122	1920	234.24	3030	10.52
144	1920	276.48	3678	12.77
128	1920	245.76	5330	18.51
122.5	1920	234.24	3825	13.28
123	1920	236.16	2528	8.78
Total			**21,271**	

Dry wall :

52 kg/m2

Total area of dry wall = 73.86 x 52 kg/m2 = 3840.72 kg/m2

Masonry wall :

288 kg/m2

Total area of masonry wall = 73.86 x 288 kg/m2 = 21271 kg /m2

C. Summary of wall for 1BHK

Sr. No.	Type of wall	Area (Sqm)
1	W1	10.00
2	W2	10.52
3	W3	17.43
4	W4	18.51
5	W5	13.28
6	W6	8.78

V. Cost Estimation:

By considering Labour + Material cost

Type of wall	Rate in Rs / Sqm
W1	2853
W2	3300
W3	3133
W4	3524
W5	3546
W6	1788

VI. Result analysis:

This work consists of Comparative analysis between dry wall and brick wall by using the Site data and traditional bricks/blocks construction techniques.

	Drywall	Brick wall
Speed of installation	40-50m2/day	10m2/day
Water saving	Yes	No
Weight	Lightest - 52Kg/m2 (non load bearing)	288Kg/m2 (load bearing)
Fire Rating	Can be designed to provide stability, integrity and insulation	Weak in terms of insulation
Usage in Wet Areas	Yes	Yes
Wall Surface	Smooth and crack free surfaces	Difficult to get very smooth surfaces even with skilled labour
Sound insulation	Upto 65db possible with insulation	35-40db
Heat insulation	Four times less heat convection K=0.16W/m K	High heat convection, K=0.81W/m K
Quality of Material	Standard quality, supply from single source	Difficult to control, various sources of supply
Quality of Wall	Standard installation, easy to control	Depending on labour skills
Services	Easy through cavity	Chasing in wall is required

VII. About Microsoft Project:

Microsoft Project is a project management software program developed and sold by Microsoft, which is designed to assist a project manager in developing a plan, assigning resources to tasks, tracking progress, managing the budget, and analyzing workloads. Project creates budgets based on assignment work and resource cost. As resources are assigned to the task and the program calculates the cost equal to the work times the rate, which rolls up to the task level and then to any summary tasks level and finally to the project level. Resource definitions (Labour, equipment and materials) can be shared between projects using a shared resource pond. Each resource can have its individual calendar, which defines what days and time is resource present. Resource rates are used to calculate resource assignment costs. Each resource can be assigned to multiple tasks in multiple projects and each task can be assigned numerous resources.

VIII. Study Case :

In order to get the clear view of difference between the traditional way of Project Management and Modern way of managing the project with the help of software called as Microsoft Project the actual example was taken from the Construction organization in Pune, India that uses that uses the Microsoft Excel for the Scheduling and Execution of the project.

IX. Interview:

The interview was arranged with the Senior Engineer and Project Coordinator of the respective Construction Organization in Pune, India to identify the Problem they had occurred during the actual execution of the project like Duration, Resource Over allocation, Labour fatigue due to overtime of the work, reaching of threshold limit due to working of Labour during holidays etc. Also to know the arrangement of activities they had used while executing a building project.

X. Data Collection:

Data like the Activities Starting Date, Finish Date, Duration of Activities and their Delays, Relationship of Activities and task, Amount of Resources used for the Activities etc. was collected from the Construction Organization of Pune, India to analogize the data and make the data use in the Microsoft Project with the proper changes were made

XI. Data Analysis:

The main activities from the data collected from organization was divided into sub activities for the proper functioning of the project and identification of the Parallel activities, Slacks and crushing of Non-Critical activities was recognized from the given data and appropriate alterations were made to meet the goals of the research.

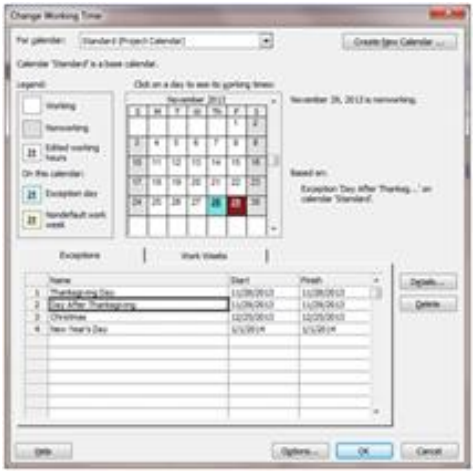
XII. Analytical Facts And Results:

Scheduling technique using network models with the help of Microsoft Project, it's easily to understand and visualize the flow and network of the project. One can easily see the Critical Path which is the Longest Path of the Project, Parallel Activities, Slack which is also called as Total Float of the Activity can be visualized, Relation between activities is understood by networking. Owing to this there are

fewer obligations while executing and project and right measure can be taken easily.

XIII. Ease of work for Labour:

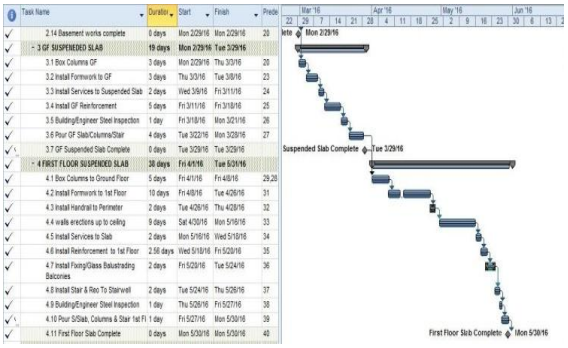
By providing all the governmental holidays of India workers, it makes good environment for Labour to work in the organization. While on other hand, making workers to work for fix timing 9AM to 6PM with one hour of break helps stress free surrounding for workers which makes them willingly work on the field.



XIV. Block Work:

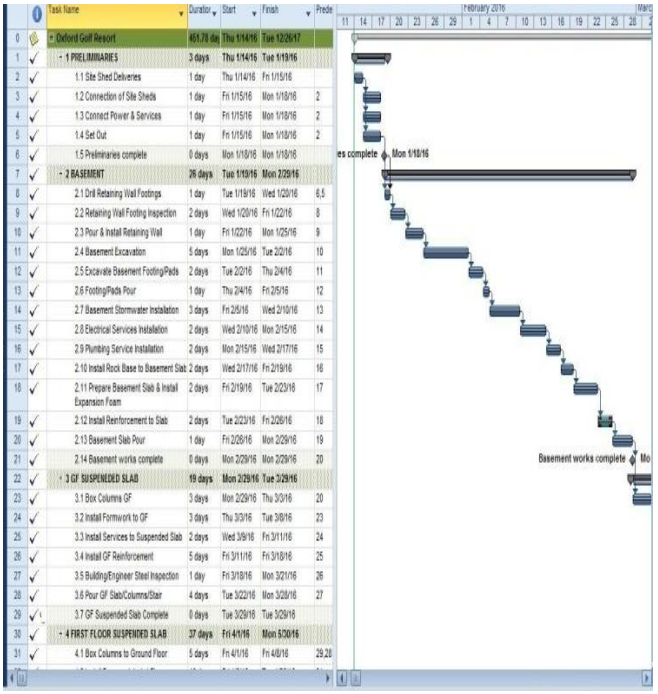
As per the project co-coordinator and site engineer from the oxford golf resort, the approximate conventional construction technique (Bock work) project scheduling, project planning and other necessary details gathered from the expertise and interviews and from internet.

	Task Name	Duration	Start	Finish
0	Oxford Golf Resort	506.56 day	Thu 1/14/16	Wed 3/21/18
1	+ 1 PRELIMINARIES	3 days	Thu 1/14/16	Tue 1/19/16
7	+ 2 BASEMENT	26 days	Tue 1/19/16	Mon 2/29/16
22	+ 3 GF SUSPENEDED SLAB	19 days	Mon 2/29/16	Tue 3/29/16
30	+ 4 FIRST FLOOR SUSPENDED SLAB	38 days	Fri 4/1/16	Tue 5/31/16
42	+ 5 SECOND FL SUSPENDED SLAB	34 days	Mon 5/30/16	Thu 7/21/16
54	+ 6 THIRD FL SUSPENDED SLAB	27 days	Mon 7/11/16	Mon 8/22/16
66	+ 7 FOURTH FL SUSPENDED SLAB	27 days	Fri 8/19/16	Fri 9/30/16
78	+ 8 GROUND FLOOR	130 days	Fri 9/30/16	Mon 4/24/17
109	+ 9 FIRST FLOOR	142 days	Fri 4/21/17	Thu 11/30/17
137	+ 10 SECOND FLOOR	119 days	Fri 4/21/17	Wed 10/25/17
168	+ 11 THIRD FLOOR	119 days	Fri 4/21/17	Wed 10/25/17
199	+ 12 FOURTH FLOOR	119 days	Sat 9/16/17	Wed 3/21/18
230	+ 13 LOBBY & EXTERNAL WORKS	66 days	Sat 9/16/17	Thu 12/28/17



XV. Dry Wall:

In the Dry wall construction techniques the Major task are as shown in figure.



By using the Microsoft Project software the project planning and execution of the project will be solve by MSP. With both the techniques 1) Dry wall and 2) Block work

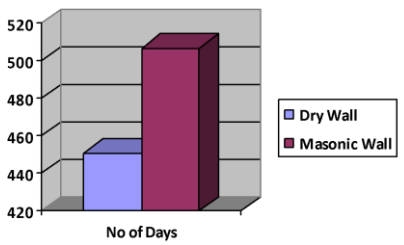
XVI. Comparative Analysis : (w.r.t time) :

1) Total Time required for the completion of masonry wall construction with same structure:

507 Days

1) Total time required for the completion of the dry wall construction with same structure:

451 Days



As per the simple calculation the construction time of the same structure of **56 days** will be save by using dry wall construction technique.

XVII. Recycling material dry wall

1) We have already developed a new recycling system for high water content mud such as construction sludge by using paper debris (fragments of the newspaper) to increase the recycling rate of the construction sludge. However, recently, the price of old newspaper is increasing. Therefore, development of inexpensive fiber materials are strongly desired in order to reduce the recycling cost. In this study, the applicability of waste gypsum board paper instead of paper debris was experimentally investigated. The waste gypsum board paper was crushed by the hammer mill and crushed paper was used in fiber-cement-stabilized-soil method. It was found through the unconfined compression tests that the failure strength and failure strain of modified soils by using crushed board paper are almost the same as those of modified soils by using paper debris.

XVIII. CONCLUSION

1. In the preliminary analysis the drywall gives progress of work as per the schedule and there is no delay in the construction work for completion of work with less dead load as compare to brick work with minimum wastage and superior smooth finishing is achieved.

2. This technique gives faster construction that is 3 to 4 times masonry construction.

3. It reduces dead load of structure it gives 8 to 10 times lighter than masonry work.

4. It gives use of recyclable material which is made of environment friendly material.

5. It gives smooth finishing seamless & crack free surface, allowing ease of decoration via paint, tiles or wallpapers.

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