



A High Performance Lightweight Construction Material for Interior Wall Gypwall

Ayaj E. Tamboli¹, Hussain S.Pathan², Saurabh N. Hande³, Niraj S. Jadhav⁴, Mayur B. Kale⁵, Ashutosh U. Yadav⁶
Lecturer¹, Student^{2,3,4,5,6}

Department of Civil Engineering
Jayawantrao Sawant Polytechnic, Hadapsar, Pune, India

Abstract:

Gypwall is known by different names in different parts of the country and world. Also called Gyprock, Gyp Board or Gypsum board, plaster board, wall board these names reflect that the interior, gypsum plaster, is sandwiched between two thick sheets of paper. A Gypwall is a high-performance lightweight interior wall system consisting of a GI steel frame, encased in gypsum plasterboard on either side attached with self drilling Gypwall screws. The joints are then tapped and finished with gypsum jointing compounds. Gypwall can be built three to four times faster than conventional masonry (brick/block) walls. Gypwall name implies it is a water free process and hence can be put up much faster. Gypwall is easy to put up and need less labour. Gypwalls are eight to ten times lighter than masonry walls, reducing the dead load. This assumes significance in high-rise structures, resulting in not only structural cost saving, but a reduction in the burden of moving up material. This boards are used for construction of internal wall and partition walls in residential as well as commercial building to serve the purpose of internal and partition wall. Gypsum (calcium sulfate) is the main constituent of dry wall and it consist 50 percent water by its volume. this adds fire resistance capability to wall. use of this material will reduce the dead load of wall up to 90 percent as compare to brick masonry. Use of this material in construction of partitions or internal walls will speed up the construction and will help to avoid delays thus it will achieve economy. As this boards are easy to erect and dismantle this is possible to shift easily, this property made it reusable many times as and when required by doing some alterations and dimensional changes as per site condition. Being much advantageous the use of such material is the need of time

Keywords: Gypwall ,Gyprock ,Gypboard , plaster board , masonry, Gypsum

1. INTRODUCTION

Gypwall is known by different names in different parts of the country and world. Also called Gyprock, Gyp Board or Gypsum board, plaster board, wall board these names reflect that the interior, gypsum plaster, is sandwiched between two thick sheets of paper. There are two kinds of gypsum wallboard regular and fire-rated. A major characteristic of gypsum Gypwall is its ability to resist fire. It does this through its chemical composition. Gypsum (calcium sulfate) contains chemically combined water about 50% by volume. When exposed to fire, the water, as a result of heat, partially converts to steam, which effectively resists fire.

The new Gypwall will be filled with small pieces of paraffin. that will result in absorption of heat during the day, and releases this heat at night. It could be the latest thing in green building technology. And this will be beneficial in the construction of affordable housing schemes also. 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 Gypwall can be recycled from waste generated at the manufacturing plant or at construction sites. The content covered in this paper clarifies the feasibility of the gypsum

plaster boards in construction industry by keeping in mind the point of sustainable development & benefits of this materials in construction industry.

Thermal Insulation

A building that is thermally efficient reduces the amount of energy required to maintain a comfortable living/working environment. Any building with an internal temperature higher than external temperature will lose heat. Thermal insulation reduces heat loss and therefore conserves energy. The term thermal insulation can refer either to materials used to reduce the rate of heat transfer, or the methods and processes used to reduce heat transfer. Thermal insulation can keep an enclosed area, such as a building, warm. In home or office insulation, the U-value is an indication of a complete system's (wall's) ability to transfer heat under static conditions including air space. Optimum level of thermal insulation can be achieved by using cavity construction using gypsum wall and the right insulation. It helps in maintaining an effective ambient temperature. Generally dense material has higher thermal conductivity which leads to ineffective thermal insulation. Lightweight materials have lower thermal conductivity and better thermal insulation properties.

2.OBJECTIVES OF THE GYPWALL

1. The main objective of this study is to analyze the necessity of the gypwall under the Indian construction industry.
2. To study on different types of dry wall and green construction material based on the market survey.

- To evaluate the conventional construction industry (Brick/blocks) to the gypwall by using the comparative analysis method.
- To study economical aspect under the Indian industrial, commercial and residential industry.
- To study the sociological and eco friendly, recyclable alternatives.

3.COMPONENTS OF GYPWALL CONSTRUCTION

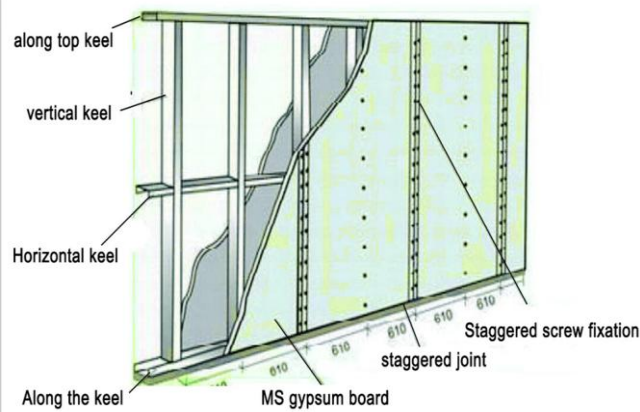


Figure .1. Components of Gypwall

Main keel:-It is the steel keel provided at bottom in which vertical keel and gypsum boards are fixed .

Top keel:- It is the steel keel provided at the top of the wall on the vertical keel in which vertical keel and the gypsum board at top is fixed.

Vertical keel:-Vertical keel makes the vertical support for the gypsum board and facilitates screwing for fixation of board in vertical direction

Horizontal keel(middle keel):- This is provided in the middle of top and bottom keel to hold the vertical keel equidistance from each other and to avoid buckling of vertical keel.

Staggered joint & Staggered screw fixation:-The boards are fixed to the vertical keel in staggered manner and two boards on one side of vertical keel are fixed by screwing in staggered pattern .this pattern provides stability to the wall

4.Features of Gypsum board(GypWall)

Gypsum Board is made up of “Pressing gypsum plaster together very tightly between two very thick sheet of paper / fiber glass. Gypsum is a mineral found in sedimentary rock formations in a crystalline form known as calcium sulfate dehydrate $CaSO_4 \cdot 2H_2O$. 100 pounds of gypsum rock contains approx 21 pounds of chemically combined water. it is mined or quarried & transported to the manufacturing facility. The manufacturer receives quarried gypsum & crushes the large pieces before any further processing takes place. Crushed rock is then ground into a fine powder & heated to about 350 degrees F, driving off 3/4 of the chemically combined water in a process called calcining. The calcined gypsum $CaSO_4 \cdot \frac{1}{2} H_2O$ is then used as the base for gypsum plaster, gypsum board & other gypsum products.

- Gypwall is very easy to installation
- It has good Fire Resistance capacity
- The Sound Isolation capacity of Gypwall is up to 75db
- It is a very Versatile material

5.It is Economical, thus save cost.

5. PROCESS OF GYPWALL CONSTRUCTION:-



Step-1- Mark out the starting line-

To ensure starting line and level as per approved shop drawings. Starting line should be marked on end wall or column, slab soffit and floor slab. Opening locations should be marked out.

Step-2- Install top track-

To ensure evenness of slab soffit before installing the top track. Tracks should be fastened to structural elements by using anchor bolt or fastener. Joints in the tracks shall be butt jointed.

Step-3- Install bottom track-

Floor is to be leveled before installing. The bottom track. Tracks should be fastened to structural Elements by using anchor bolt or fastener. Joints in the tracks shall be butt jointed.

Step-4- Mechanical &Electrical concealed services-

Install bottom track to incorporate all M&E concealed services are within the track.

Step-5- Install starter stud-

To ensure verticality of the end wall use a spirit level or laser marker. Gap to be allocated at top track to allow for deflection of top slab. Place studs in direct contact with doors frame jambs, abutting

partitions, partition corners/edges, and existing construction elements.

Step-6- Install intermediate stud-

Studs to be installed at interval as per approved shop drawings. Intermediate studs must face same direction to allow for adjustment when fixing plasterboard. Do not splice vertical metal stud members. To check overall verticality of studs.

Step-7- Install bracing-

Horizontal bracing for all stud partitions to be as per manufacturer's recommendation. Provide all braced framing of load bearing steel stud framing as detailed in approved shop drawings.

Step-8- Install metal box studs to secure door frame -

To secure the door frame, form a metal box stud to fix into back of starter stud

6.RECYCLABLE PRODUCT

Recycling Gypwall waste typically involves a collection of waste from manufacturing, construction, and deconstruction or reconstruction sites, and subsequent transportation to material recovery facilities (MRFs). At a MRF, Gypwall waste is sorted manually using a sorting belt to remove metals, plastics, and other debris. Gypwall waste that is highly contaminated, for example, with mould and paint, unsuitable for the manufacturer's feedstock, is also removed. The minute ferrous metal fragments are removed from the sorted material by magnetic separation. The paper liner is separated from the gypsum core in an enclosed processing area. The recycled gypsum is then transported for use in a wide variety of applications. After adequate recycling, the material contents are recovered, typically consisting of about 93% gypsum material, 6% paper, and <1% waste. The use of recycled Gypwall for new wallboard manufacturing will help lower the need for virgin raw materials and reduce both energy and transportation costs. Gypwall manufacturers have strict requirements for recycled gypsum incorporation into new Gypwall manufacturing. The paper content of Gypwall waste impacts the amount of recycled gypsum permitted for new Gypwall, as the paper content directly affects the fire rating. Therefore, the separation of paper and other contaminants from Gypwall waste is desired by Gypwall manufacturers. Gypwall waste from both construction and manufacturing has fewer contaminants and can therefore be recycled and used for soil amendment purposes. As soil amendment, it can be used for general agriculture, golf courses, mushroom growing, forestry and mine reclamation, nurseries, city parks and recreation areas, compost amendments, and residential lawns.

Millions of tons of gypsum are mined each year in North America, and gypsum board is the principal product in which it is used. Besides the newly mined material, up to 20% of the gypsum used to manufacture Gypwall can be recycled from waste generated at the manufacturing plant or at construction sites. Gypsum produced as a byproduct of the flue-gas desulfurization process at electric power plants provides an economical, environmentally sound raw material for making high-quality gypsum board. Two types of paper are used in the production of most Gypwall, and both types are made from recycled newspaper.

6. APPLICATION

Generally this type of construction is preferred as an alternative available for partition walls within a structure because of its several advantages as stated and explained in

proceeding sections. Anyways 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, hospital and restaurant etc.

8.SCOPE OF WORK

1. Introduction to green construction materials in construction.
2. Comparison of Gypwall to the traditional methods (brick/block).
3. Analysis of amount of time & cost saved by use of Gypwall technique.
4. Analysis of risk factors in execution of Gypwall.
5. Preparation of checklists onsite for Gypwall technique.

9. ADVANTAGES

Gypwall construction has the following advantages as compared to convention wall construction:

- Light weight systems – 8 to 10 times lighter than conventional systems like Brick / Block work.
- Faster construction – Five to eight times faster.
- Superior acoustics performance in terms of insulation with insulation rating upto 74 dB.
- Tested and certified systems to give between ½ – 4 hour fire ratings.
- Smooth finish, aesthetically beautiful crack free surfaces.
- Flexibility in terms of modifications and refurbishment at some point in time.
- Green and recyclable product.

10. CONCLUSION

As above study shows the advantages of the Gypwall in construction industry. Till in India this is not adopted widely. It has lot of advantages as keeping in view of sustainable development as lot natural resources consumed in large quantity in conventional construction methodologies can be reduced by adoption of this technology commonly in commercial and also in residential constructions as an internal partitions. On other hand this are readymade boards which are to be installed at site in particular manner with the help of some tracks, bracings, studs and screws. This will helps in increased speed of construction by reducing much time required in conventional masonry construction. This technology requires fewer labours for its installation. More important advantage of this system is that it is energy efficient also as the addition of paraffin pieces in gypwall will result in absorption of heat during day, and emission of this heat during night which will maintain the temperature at the time of sunlight and help to keep the place cool. One more important thing to be noticed that its selfweight, It is 8-10 times lighter than stone or brick masonry. If this technology is started to be adopted in residential apartments and commercial complexes the it will minimize the load on the earth surface. One more thing is it is recyclable product again it makes this economical as 93 percent of gypsum can be reused for manufacturing of Gypwall. So having this much advantageousness this should be the mostly adopted technology in India. This will make our construction industry faster, more reliable with quality development, minimized cost and sustainable approach.

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