

# Study of the Use of Drywall as the Wall Cover Material Reviewed from Cost and Time Aspects

Ni Kadek Sri Ebtha Yuni, I Wayan Sudiasa and I Nyoman Suardika  
*Civil Engineering Department, Bali State Polytechnic, Bali, Indonesia*

**Keywords:** Dry Wall, Cost, Time, Wall Work.

**Abstract:** To the date, a lot of wall works still use materials in the form of red bricks, light bricks, bricks, and panels. Likewise, seen from research related to value engineering, most of them examine the use of these materials. From the cost view, red brick material is cheaper than using lightweight brick and precast panels. Meanwhile, in terms of labor productivity, precast panel is better than red bricks and light bricks. The rukom system building uses a lightweight steel frame and fiber cement which is earthquake resistant. The application of the use of lightweight steel frame materials and fiber cement is known as the drywall system. The purpose of this study is to calculate the unit price of the work, namely the coefficient of project resources (materials, labor, and tools). In this research, the method of drywall installation work is also developed, therefore the completion time of the work can be determined. The long-term goal of this research is to examine the quality of the work and compare it with other wall materials. This research begins by studying the shop drawing drawings, then calculations are carried out to determine material requirements including the need for waste materials. Furthermore, observations were made to determine the need for labor, the need for tools, the method of installation. Through the installation method in the field, it can be seen the time needed to complete the work. The result of this research is the cost required to install a double-installed drywall truss is Rp. 172,198.64 per m<sup>2</sup>. For the installation of the layer using soundstop gypsum material, it is Rp. 121,641.74 per m<sup>2</sup>. Installation of the wall layer with GRC including the installation of soundproofing is IDR 341,803.02 per m<sup>2</sup>. The price includes materials, wages and fees as well as 5% overhead. For the tool does not use heavy equipment so that the cost of the tool is Rp. 0.0. The total cost of drywall work per 1 m<sup>2</sup> is Rp 635,643.41. This price does not include finishing work such as painting. 2. To complete the drywall installation work with a module measuring 3 meters x 6 meters, it takes 1 day to install the frame, wall covering, wall covering each. The overall drywall work with a volume of 6,068 m<sup>2</sup> requires 30 days to complete the preparation and marking work, 90 days for frame installation, 90 days for wall covering, 90 days for walls. So the total time needed to complete the drywall work is 121 days.

## 1 INTRODUCTION

Wall material continues to develop along with the demands of the need to achieve the most effective and efficient cost, time, quality (Rori, 2020). Currently, various types, brands and products of building materials are circulating in the market. This is an alternative, and make it to be easier for people to determine the type of building material to be used and also easier to control costs in the process of building a house or building. The emergence of several brands with various specifications is solely aimed at producing better buildings with optimal cost, quality, and time. In the past, people tended to use bricks or red bricks for wall work, but now people are familiar

with lightweight bricks and precast panels (Yuni, 2018). Wall materials continue to develop along with the demands of the needs in achieving the most effective and efficient cost, time, quality. Currently, in addition to lightweight brick which is quite popular as a wall material, now there are other alternative materials using drywall.

Drywall is a drywall work that does not involve cement, sand and water. Drywall offers a lighter system than conventional wall systems. The main components of drywall are gypsumboard frames, J Track, E-Stud. Additional components are compound, sealant, insulation, spindle pin. The use of drywall components is determined based on the installation area. Wet areas such as bathrooms,

kitchens, and walls will be selected for waterproof gypsumboard materials. Furthermore, after the drywall is installed, proceed with wall finishing. Finishing can be in the form of paint, ceramic tile, marble, and wallpaper (Plasterboard, 2018).

It is important to pay attention to the selection of wall constituent materials because the decrease in the foundation structure is also caused by the heavy load of the walls(Plasterboard, 2018). Gypsum is one example of a mineral with a dominant calcium content in the mineral. Gypsum board consists of a core of gypsum material wrapped with reinforcing paper around it. The thickness of gypsum varies, the average in the market is 9 mm, 12 mm and 15 mm for the standard type of gypsum. Currently, in addition to lightweight brick which is quite popular as a wall material, now there is another alternative material, namely using drywall. Based on research (Madutujuh, 2016), when viewed from the strength of the structure, buildings using light steel frames and fiber cement are earthquake resistant.

Development engineering is basically an activity based on an analysis of various aspects to achieve the goals and objectives specific goals with results optimally possible. To determine the cost of a unit of work as part of project activities, a cost estimate is carried out (Husen, 2011). In determining the project resource requirements, the formula for the volume of work multiplied by the unit price analysis coefficient is used (Husen, 2011). The coefficient of analysis is obtained through the calculation of the realization in the field. For the labor coefficient, it is necessary to calculate the productivity. In general, productivity is defined as a comparison between the output and input or output: input (Husen, 2011). The definition of output includes volume and quality, while input includes materials and energy, labor and capital equipment. The labor coefficient is determined to determine the amount of labor and the time used to complete one work item with a certain volume (Messah et al., 2013).

Project scheduling is one of the elements of planning results, which can provide information about the planned schedule and project progress in terms of resource performance in the form of costs, labor, equipment and materials as well as project duration plans and time progress for project completion. In the implementation of construction projects, the availability of labor affects the completion of construction projects (Messah et al., 2013). The implementation schedule can be arranged in the form of a barchart. The length of the beam indicates the duration of the activity and usually the activities are arranged according to the chronology of

the work (Messah et al., 2013). Completion of work on a project can run according to the target time, cost, quality and quality if it is supported by good implementation and supervision methods (Messah et al., 2013).

## 2 METHOD

The research method is field observation to obtain field data in the form of material needs, tools, labor, implementation time requirements and work methods used. Secondary data in this study is shop drawings. In addition, secondary data is also obtained from reports/brochures about drywall that have been implemented. Primary data obtained through field observations. Observations were carried out by directly observing field conditions. Determine the productivity of workers who work in bulk units, determine the type of heavy equipment used in the work, look for material prices and wholesale prices per unit of work. Furthermore, the data is analyzed to

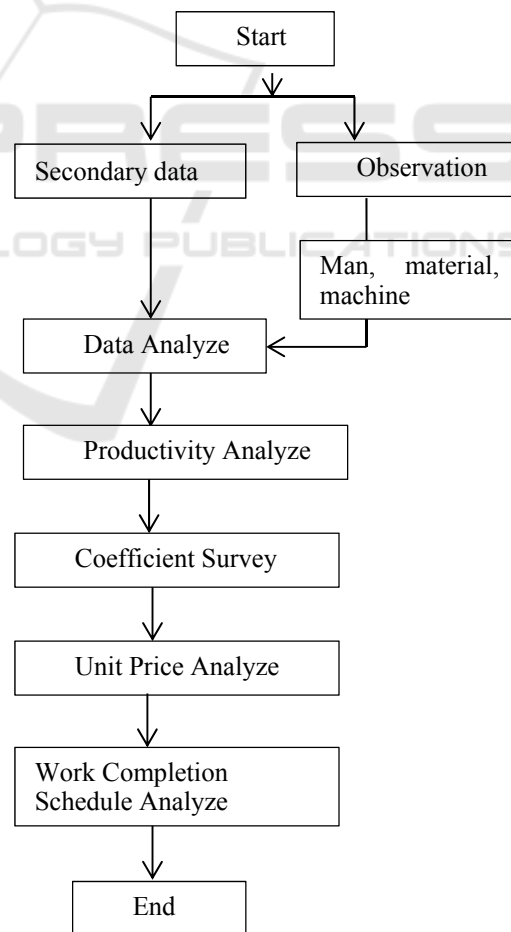


Figure 1: Research Stage.

determine the job index and resource requirements of the project. The result is an analysis of the unit price of work. Furthermore, to determine the duration of work based on data on the ability of workers to complete work per unit m<sup>2</sup>.

This research will be carried in as following steps:

1. Collecting data in the form of shop drawing. From the shop drawing, the volume of work is calculated, then the material requirements are calculated.
2. Determine the productivity of workers who work in bulk units. This productivity is to determine the ability to complete work in one piece.
3. Looking for material prices and wholesale prices per unit of work. Furthermore, these figures are made in the form of a work unit index or an analysis of the unit price of work.
4. Calculating project resource requirements, tool materials, labor based on field unit index. The volume of resource requirements is the product of the job index with the volume of work.
5. From the cost analysis above, it is obtained an analysis of the unit price of the drywall installation work per unit m<sup>2</sup>.
6. Prepare a work implementation schedule based on labor productivity and field work methods.

### 3 RESULT AND DISCUSSION

Drywall is a dry wall covering job, meaning that it does not involve water, cement and sand. In general, wall coverings are in the form of red brick, light brick, brick and precast panels. Drywall itself uses gypsum material as a cover along with frames and other accessories. The components of drywall are the frame, covering and covering. The frame consists of 2 types, namely single frame and double frame.

#### A. Drywall Component

Installation of drywall consists of 3 stages, which use components of different materials. The components are the frame, the inner cover, and the outer cover. The drywall specification in this study is to use a double frame, the inner cover uses 12 mm Soundstop gypsum, and the outer cover uses 12 mm GRC Board.

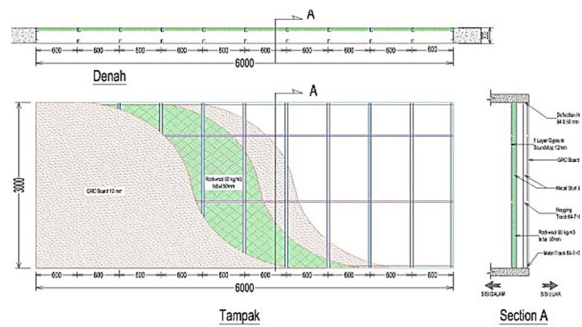


Figure 2: Drywall Section.

#### B. Material Requirement Survey

Drywall work has specifications that vary according to the needs and the desired design. Material requirements are the number of material components needed in the installation of drywall in 1 m<sup>2</sup>. To obtain these needs, the data obtained through direct observation in the field. The observations were made on the module or the drywall installation area with a size of 6,000 meters x 3,000 meters. The drywall studied in this study is for wall coverings outside the building with the following specifications: The wall thickness is 250 mm, using a double frame system with a frame distance of 400 mm, installing gypsum on 2 sides, 2 faces and 1 layer, using gypsum soundstop with a thickness of 12 mm on the inside, using 12 mm GRC on the outside, using rockwool silencer.

#### C. Manpower Coefficient

Drywall works uses the wholesale system. One group of contractors consists of 1 worker, 1 handyman and 1 foreman. Productivity is the ratio between the volume done and the amount of time needed to do the work. The average productivity per hour of drywall frame installation using materials as described in the truss component table using 1 worker, 1 handyman, and 1 foreman is 2,250 m<sup>2</sup>/hour. Next is the calculation of the labor coefficient. The coefficient of unit price analysis is the numbers of the amount of material and labor needed to do a job in a certain unit. The average productivity per hour of installing gypsum inside walls using 2 workers, 2 builders, and 1 foreman is 2,250 m<sup>2</sup>/hour. Next is the calculation of the labor coefficient. The coefficient of unit price analysis is the number of material and labor requirements needed to do a job in a certain unit. The average productivity per hour of external wall installation using GRC using 2 workers, 3 craftsmen, and 1 foreman is 2,250 m<sup>2</sup>/hour. Next is the calculation of the labor coefficient. The coefficient of

unit price analysis is the numbers of the amount of material and labor needed to do a job in a certain unit.

**D. Project Resource Cost**

Project resources consist of materials, tools, and labor. The price of each project resource is obtained through a field survey. The results of the following material prices are obtained based on a survey of several shops or suppliers of building materials and a survey of wages for the foreman who works on drywall.

**E. Unit Price of Drywall Works**

Based on the results of the need for wood materials and the coefficient of labor can be calculated analysis of the unit price of work. The specification of drywall work to the installation of walls with gypsum without finishing work. The workforce uses workers from outside of Bali. Analysis of unit prices with specifications for the installation of the frame using bullet nails, hanging elbows, Metal Track 64 0.50 mm BMT @ 3m, Metal Stud 64 0.50 mm BMT @ 3m, Head track 64 0.50 mm BMT @ 3m, Screw 6 3/8, Nails 3 cm concrete, and sealant. Harga per 1 m2 pekerjaan pemasangan rangka ganda drywall adalah Rp 172,198.64. Harga tersebut sudah termasuk profit dan overhead sebesar 5%.

Analysis of unit prices with the specifications for interior wall installation is Gypsumboard Soundstop 12 mm, screw, paper tape, coumpond, sandpaper, and sealant. The price per 1 m2 of interior wall installation with gypsum is Rp 121,641.74. This price includes 5% profit and overhead. Unit price analysis with specifications for external wall installation including sound suppression installation are GRC Board 12 mm, screw, U list, sealant, Rockwool density 60 kg/m3 t=5 cm, Spindle pin and glue. The price per 1 m2 of external wall installation with GRC is IDR 341,803.02. This total price includes 5% profit and overhead.

Table 1: Drywall wall work unit price recapitulation.

No	Item	Total (Rp)/m2
11	Installation of double frame drywall	172,198
22	Installation of inner play wall with Gypsum Soundstop 12 mm	121,641
33	Installation of outer wall with GRC inclusive of silencer with rockwool	341,803
	TOTAL	635,643

The cost required to install a double-installed drywall wall truss is IDR 172,198 per m2. For the installation of the cover using soundstop material, it is Rp. 121,641 per m2. Installation of the wall layer with GRC including the installation of soundproofing is IDR 341,803 per m2. The price includes materials and wages. For the tool does not use heavy equipment so that the cost of the tool is Rp. 0.0. The total cost of drywall work per 1 m2 is Rp 635,643.41

**F. Work Completion Analysis**

Drywall work started by installing the frame. The components of wall frame installation are bullet nails, hanging elbows, Metal Track 64 0.50 mm BMT @ 3m, Metal Stud 64 0.50 mm BMT @ 3m, Head track 64 0.50 mm BMT @ 3m, Screw 6 3/8, Concrete Nails 3 cm, and sealants. Next step, continued with the installation of the indoor wall covering with 12 mm soundstop gypsum. The last step is the installation of the outer wall with GRC includes a damper from Rockwool. Based on the sequence of work above, the completion time of drywall work can be determined. The field or module observed is 6 meters x 3 meters in size. To complete the work required 1 to 2 workers, 1 to 2 builders and 1 foreman.

The frame consists of mounting bullet nails, hanging elbows, Metal Track 64 0.50 mm BMT @ 3m, Metal Stud 64 0.50 mm BMT @ 3m, Head track 64 0.50 mm BMT @ 3m, Screw 6 3/8, 3 cm Concrete Nails, and sealant takes 1 day or 8 hours. Similarly, the installation of the wall covering with gypsum takes 1 day or 8 hours. The wall covering including rockwool also takes 1 day or 8 hours. The time to complete the preparation and marking work is 30 days, frame installation 90 days, wall covering 90 days, wall 90 days. So the total time needed to complete the drywall work is 121 days.

**4 CONCLUSIONS**

Total cost to install a double-installed drywall truss is IDR 172,198.64 per m2. For the installation of the cover using soundstop material, is Rp. 121,641.74 per m2. Installation of the wall layer with GRC including the installation of soundproofing is IDR 341,803.02 per m2. The price includes materials, wages and fees as well as 5% overhead. For the tool does not use heavy equipment so that the cost of the tool is Rp. 0.0. The total cost of drywall work per 1 m2 is Rp 635,643.41. This price is not included with finishing work (painting).

To complete the drywall installation work with module size 3 meters x 6 meters, requires duration to install the frame, inner wall cover, outer wall cover is 1 day for each work. The overall drywall work with a volume of 6,068 m<sup>2</sup> requires 30 days to complete the preparation and marking work, 90 days for frame installation, 90 days for indoor wall covering, 90 days for. Therefore, total duration to complete drywall work is 121 days. walls. So the total time needed to complete drywall work is 121 days.

Waluyo, R. (2017). Pengaruh Resource Leveling Terhadap Alokasi Tenaga Kerja Pada Proyek Konstruksi. *Jurnal Ilmiah Teknik Sipil*, 21, 2.  
Widiasanti. (2013). *Manajemen Kontruksi*. Bandung: PT Remaja Rosdakarya.

## ACKNOWLEDGEMENTS

The authors thank to institutions that have supported this research. The authors also thank project teams that have been created to conduct research. Thanks also to the research team who have always been supported each other to complete this research

## REFERENCES

- Abrar, H. (2011). *Manajemen Proyek, Perencanaan, Penjadwalan, & Pengendalian Proyek*. Yogyakarta: Andi Yogyakarta.
- Ibrahim, B. (1993). *Rencana Dan Estimate Real Of Cost*. Jakarta: Bumi Aksara.
- Madutujuh, N. (2016). *Perencanaan Rumah Prefabrikasi Tahan Gempa dengan Sistem Rangka Baja Ringan dengan Dinding Papan Serat Semen (Rukom)*. Bandung: Universitas Parahayangan.
- Messah, Y., Sina, D., & Manubulu, C. (2013). *Analisa Indeks Biaya Untuk Pekerjaan Beton Bertulang Dengan Menggunakan Metode Sni 7394-2008 Dan Lapangan (Studi Kasus Pada Proyek Pembangunan Asrama Stikes Chmk Tahap III)*.
- Onibala, E. (2018). *Metode Pelaksanaan Pekerjaan Konstruksi dalam Proyek Pembangunan Sekolah SMK Santa Familia Kota Tomohon*. *Jurnal Sipil Statik*, 16.
- Plasterboard, P. P. B. (2018). *Technical Manual Jayaboard Versi 5*.
- Rafik, A., Muhammad Humaidi, & Firman, R. (2018). *Pengaruh Penggunaan Bata Merah dan Bata Ringan Terhadap Dimensi Pondasi dan Harga Rumah Tipe 54*. *Jurnal Intekna*, 18.
- Rori, G. (2020). *Analisis Perbandingan Biaya Material Pekerjaan Pasangan Dinding Bata Merah dengan Bata Ringan*. *Jurnal Sipil Statik*. *Jurnal Sipil Statik*, 3.
- Umar, H. (1998). *Riset Sumber Daya Manusia Dalam Organisasi*. PT. Gramedia Pustaka Utama.
- Yuni, N. K. S. E. (2018). *Analisis Penerapan Rekayasa Nilai pada Pekerjaan Dinding Ditinjau dari Aspek Biaya dan Waktu Pelaksanaan*. *Prosiding Sentrinov 2018*.