

Comparative Analysis of Time and Cost in the Work Installation of Walls outside the Building Using Red Brick Walls and Light Brick Walls in the City of Kaltim Post Tenggara

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Abstract - The use of red brick as a wall filling material has been seen in various buildings from the past until now. This material, until now seems to still have a place in people's hearts even though there have been many civil technology strikes with various construction engineering such as lightweight bricks. The length of time on the red brick pair work by using the composition of labor 1 foreman, 3 masons and 2 mason assistants, on the red brick pair work is 41 days while for red brick plastering work takes 35 days. The length of time for light brick masonry work with a workforce composition of 1 foreman, 3 masons, and 2 mason assistants for light brick masonry work is 30 days while for light red brick plastering work it takes 26 days. So the time difference between the two work pairs of red brick walls and lightweight masonry walls is $76 - 56 = 20$ days. The total cost for the pairing of red brick walls added to the cost of plaster is Rp. 217,295,997.9 and the total cost of the light brick pair work added to the cost of plastering is Rp. 170,453,329.0 and the difference in cost of the two works is Rp. 46,842,266.8.

Keywords - Red Bricks, Bricks Light, Time and Cost.

I. INTRODUCTION

The use of red brick as wall filling material has been seen by us in various buildings from the past until now. This material, until now seems to still have a place in people's hearts even though there have been many civil technology strikes with various construction engineering such as lightweight bricks. Understandably enough, red bricks are still more widely used than light bricks, because in addition to having tested their strength, also getting it is not difficult.

Almost every area uses this red brick as one of the building construction materials. Red brick with a size of 24x12x6 cm is quite cheap and easy to obtain, is a conventional brick that has a basic material in the form of clay (clay), where the manufacturing process is usually done traditionally (manually) or if it is an industry sometimes there is a work done at the factory, even though the factory also using a traditional machine. Due to manual brick making, the size and shape of the texture of the brick is often inaccurate. But because it is inside the wall, sometimes this is not a problem.

Civil technology continues to develop to improve the effectiveness and efficiency of construction work. It is against this background that light bricks are created. Light brick is a material that resembles concrete and has strong, waterproof and fire resistant, durable properties made in factories using machines. This brick is quite light, smooth, and has a good level of flatness.

This lightweight brick was created in order to ease the structural load of a construction building, speed up its implementation, and minimize the residual material that

occurs during the wall mounting process. Then the question that circulates in the community of course is whether lightweight brick can replace the red brick both in terms of price, strength, ease of getting it. Location studies will be made in the study per comparative thesis this time is in the construction of buildings kaltim post.

In writing the thesis, the author tries to calculate the cost and time comparisons of buildings that are focused on the work of installing red brick walls replaced by using lightweight brick raw materials in the East Kalimantan Post building project.

II. LITERATURE REVIEW

Roughly starting in 8000 BC in Mesopotamia, humans discovered the first time that clay could be formed and dried in the sun to produce building materials. The Tower of Babel was built using sun-dried bricks. Also used in many parts of the Middle East, North Africa and Central and North America. In the Babylonian civilization (4000 BC) which was built in the valley between the Tigris river and the Euphrates river. The thick mud and clay from these rivers was very suitable for brick making, which later became a general building material for these civilizations. Kingdoms and temples were built from bored bricks, and their surfaces.

Use brick-lined / shiny excavation lately in Egypt, shows that at the time of the ancient Egyptians had used sun-dried bricks and burned using a furnace for the construction of houses and shrines. The Romans also spread the use of bricks, including making bricks into Britain after the Roman attack in

54 BC, such as for the construction of Colchester Castle which was built from 1080 used bricks. Now this castle is used as a historical museum. Roman Brick has a very thin thickness compared to its length. Where the bricks were placed on a thick layer of mortar. After the fall / collapse of Rome in 410 AD, the art of making bricks was lost throughout Europe until the beginning of the 14th century. The brick industry returned to bloom after Flemish entered Britain in that century and later, this expertise entered Australia with First Disposal (The First Fleet). The first brick buildings on the North American continent were built in 1633 on Manhattan Island using bricks imported from Dutch and English.

However, its utilization is only maximized until it is found burning stone with a furnace that produces bricks that are truly durable.

The first brick stoves operated in the United States were around 1650. Bricks produced in the past may have been somewhat difficult to recognize because of very different specifications. For example, an Assyrian baton, in the middle of Mesopotamia weighs more than 18 kilograms, or a brick in the form of a triangle is used to build the Roman colosseum, and the general bricks on the market are very thin like floor tiles today.

A. Types - Types of Bricks

- *Red brick*

Bata red is a kind of wall charger of the most widely used on old buildings like any modern building, and is still used by many people in spite of the new invention to fill the house like a brick wall or Hebel. The factor that causes this material is still in great demand by many people is because it is proven to be durable, strong, inexpensive and easy to obtain, right? Besides the advantages of red brick is to make the room in the house cool, not easily cracked and resistant to fire. But the lack of this material is heavy and burdens the supporting structure, requires a lot of adhesive so it is rather wasteful because the shape is not uniform so it is difficult to install neatly.

- *Clay Brick*

Clay brick which has color and texture and uneven surface is often used to fill the walls which later still need finishing in the form of plaster and painting. While the bricks that are used to form walls and still show the texture and color as a model of the wall, are called exposed bricks. Exposed red bricks are indeed neater in shape than red bricks of clay but are more expensive.

- *Brick Mixture of Sand and Lime*

The bricks made from a mixture of sand and lime in the manufacturing process the ratio is 1: 8 by the way water is pressed into the material so as to allow a solid brick to form. This brick is often used on walls that are submerged in water so it must be very strong and not porous.

- *Lightweight Brick Or Hebel*

If many red bricks are made traditionally by human power, then lightweight bricks or hebel are manufactured by using machines. The purpose of making hebel is to reduce the burden on building structures rather than using red bricks. In addition, the rapid and regular form will speed up the

installation and saver material used to glue the material. In addition, lightweight brick can also reduce the remaining material at the time of the construction of the walls of the house. Furniture bricks can make the construction of the walls run faster and neater because of their standard size and shape. As the name implies, this brick is lighter than ordinary red brick, thereby reducing the buffer load.

III. RESEARCH METHOD

A. Data

There are 2 types of data used for the analysis of calculations, namely:

a.) *Primary data*

Primary data is a source of data obtained directly from the original source (not through an intermediary media). Primary data can be in the form of an individual or group subject (person) opinion, observations of an object (physical), event or activity, and test results. The methods used to obtain primary data are: (1) survey methods and (2) observation methods.

b.) *Secondary data*

Secondary data is a source of research data obtained indirectly through intermediary media (obtained and recorded by other parties). Secondary data are generally in the form of evidence, notes or historical reports that have been compiled in archives (documentary data) that are published and not published.

B. Analysis Phase

In the preparation of this machine, the stages of work carried out are as follows:

a.) Calculate the workmanship volume of the two designs then multiplied by the current unit price list so that the total cost of the wall pair design using raw brick and light brick material can be determined using the Microsoft excel program.

b.) After the total cost of the two designs is obtained then after that we do by calculating the weight of the work by dividing the total cost by the unit cost of the work then the results are multiplied by one hundred percent.

c.) From the weight of the work units carried out during the first week and subsequent weeks we can find out the amount of work volume that can be completed and also the time needed to complete the project.

d.) The results of the calculation of cost and time between a pair of red brick walls and light bricks we compare which is more efficient and faster time.

This is the final stage of the work process, which consists of preparation and reviewing the conclusions of the work to interested parties.

IV. ANALYSIS AND DISCUSSION

TABLE 4.1

LIST OF WORK VOLUME			
No	Job description	Volume	Unit
1	Ground floor		
	Red brick pair work 1: 3	123.63	m2
	Plaster 1: 3	247.25	m2
2	1st floor		
	Red brick pair work 1: 3	160.70	m2
	Plaster 1: 3	321.39	m2
3	2nd Floor		

	Red brick pair work 1: 3	251,755	m2
	Plaster 1: 3	503.51	m2
4	3rd floor		
	Red brick pair work 1: 3	69.68	m2
	Plaster 1: 3	139.36	m2

Source: Analysis

- The volume that can be done with 1 foreman, 2 masons, and 2 stone helpers per day for a pair of red brick walls is ± 15 m2
- The volume that can be done for plastering work per day is ± 30 m2

A. Unit Price of Work

TABLE 4.2

no	Kind of work	Unit	Co-digger	Unit price	Price
1	Red brick pair				
	Red brick	Fruit	70,000	1,100	77,000.00
	PC	Zak	0.2874	75,000	21,555.00
	Sand tide	m3	0.0400	175,000	7,000.00
	the worker	OH	0.3000	85,000	25,500.00
	Bricklayer	OH	0.1000	100,000	10,000.00
	Head mason	OH	0.0100	125,000	1,250.00
	Foreman	OH	0.0150	135,000	1,250.00
			HSPK Price:		144,330.00
2	Plastering				
	PC	Zak	0.2700	75,000	20,250.00
	The worker	OH	0.400	85,000	34,000.00
	Bricklayer	OH	0.200	100,000	20,000.00
	Head mason	OH	0.020	125,000	2,500.00
	Foreman	OH	0.020	135,000	2,700.00
			HSPK Price:		79,450.00

Source: Analysis

The price of building materials and the value of the coefficient are obtained from the national standard (SNI) which applies the unit price calculation used as the standard price used as the benchmark price of construction project work items.

B. Cost Analysis

The next analysis of the costs for the red brick wall work will be displayed in the table below:

TABLE 4.3

ANALYSIS OF RED BRICK WORKING COST					
No	Job description	volume	Unit	Unit price	Total price
1	Ground floor				
	Red brick pair work 1: 3	123.63	m2	144,330.00	17,842,940.58
	Pleteran 1: 3	247.25	m2	79,450.00	34,281,489.80
2	1st floor				
	Red brick pair work 1: 3	160.70	m2	144,330.00	23,193,109.34
	Plaster 1: 3	321.39	m2	79,450.00	44,560,723.50
3	2nd Floor				
	Red brick pair work 1: 3	251,755	m2	144,330.00	36,335,799.15
	Pleteran 1: 3	503.51	m2	79,450.00	40,003,869.5
4	3rd floor				
	Red brick pair work 1: 3	69.68	m2	144,330.00	10,005,914
	Plaster 1: 3	139.36	m2	79,450.00	11,072,152
	Total				217,295,997.9

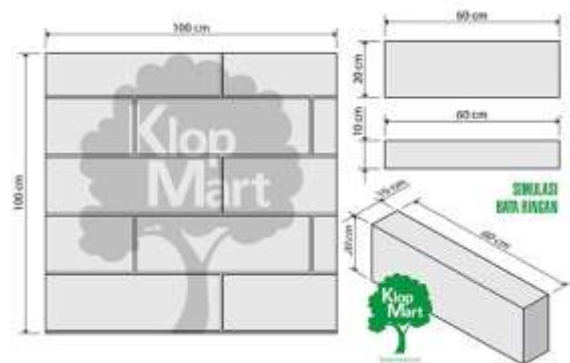
Source: Analysis

So the total cost for the work of the red brick wall pair is Rp. 217,295,997.9

C. Lightweight Brick Workers

The last wall material is lightweight brick or often called hebel or celcon. This lightweight brick material has been made very modern where this material is made using factory machinery. This brick is quite lightweight, smooth and has a good level of flatness. This lightweight brick was created in order to ease the structural load of a construction building, speed up its implementation, and minimize the residual material that occurs during the wall mounting process.

D. Characteristics of Lightweight Brick Pair



Light brick is made by machine in the factory. This brick is quite light, smooth, and has a good level of flatness. It can be immediately given aci without having to be plastered first, using special cement. The basic ingredients of the acian / cement are silica sand, cement, filler and additives. To use them, this cement is only mixed with water. But it can also use materials such as lightweight brick mounting. Generally it has a size of 60 cm x 20 cm with a thickness of 8-10 cm.

TABLE 4.4

LIST OF WORK VOLUME			
No	uuuhxhx Job description	Volume	Unit
1	Ground floor		
	Light brick pair work 1: 5	123.63	m2
	Plaster 1: 5	247.26	m2
2	1st floor		
	Light brick pair work 1: 5	160.70	m2
	Plaster 1: 5	321.40	m2
3	2nd Floor		
	Light brick pair work 1: 5	251.76	m2
	Plaster 1: 5	503.51	m2
4	3rd floor		
	Light brick pair work 1: 5	44.71	m2
	Plaster 1: 5	89.42	m2

Source: Analysis

- The volume that can be done per day with 1 foreman, 3 artisans and 2 helpers for the work of light brick wall pairs ± 20 m2.
- The volume that can be done per day for light brick wall plastering ± 35 m2

E. Unit Price of Work

TABLE 4.5

No	Kind of work	Unit	Co-digger	Unit price	Price
1	Couple lightweight brick				
	Light brick	Fruit	15,000	2,500	37,500,000
	PC	Zak	0.1250	75,000	9,375.00
	Sand tide	m3	0.4000	175,000	7,000.00
	the worker	OH	0.5000	85,000	42,500.00
	Bricklayer	OH	0.2000	100,000	20,000.00
	Head mason	OH	0.0200	125,000	2,500.00
Foreman	OH	0.0300	135,000	4,050.00	
			Price of HSPK		122,925.00
2	Plastering				
	PC	Zak	0.1660	75,000	12,450.00
	The worker	OH	0.4000	85,000	34,000.00
	Bricklayer	OH	0.2000	100,000	20,000.00
	Head mason	OH	0.0200	125,000	2,500.00
	Foreman	OH	0.0220	135,000	2,970.00
				Price of HSPK	

Source: Analysis

The price of building materials and the value of the coefficient are obtained from the national standard (SNI) which applies the unit price calculation used as the standard price used as the benchmark price of construction project work items.

F. Cost Analysis

Cost analysis for the cost of installing lightweight bricks will be displayed in the table below:

TABLE 4.6

ANALYSIS OF LIGHT BRICK WORKING FEES					
No	Job description	Volume	Unit	Unit price	Total price
1	Ground floor				
	Light brick pair work 1: 5	123.63	m2	122,925.00	15,197,217.75
	Plaster 1: 5	247.26	m2	131,390.00	32,487,491.4
2	1st floor				
	Light brick pair work 1: 5	160.70	m2	122,925.00	19,754,047.5
	Plaster 1: 5	321.40	m2	131,390.00	42,228,746
3	2nd floor				
	Light brick pair work 1: 5	251.76	m2	122,925.00	30,946,983.38
	Plaster 1: 5	503.51	m2	131,390.00	96,099,918.60
4	3rd floor				
	Light brick pair work 1: 5	44.71	m2	122,925.00	5,495,976.75
	Plaster 1: 5	89.42	m2	131,390.00	17,066,701.20
	Total				170,453,329.0

So the total cost for a lightweight brick wall pair work is Rp. 170,453,329.0

G. Calculation of Working Time for Red and Light Brick Pairs

The length of time at red brick pair work by using the composition of labor 1 foreman, 3 masons, and 2 assistant masons at red brick pair work was 41 days while for red brick plastering work required 35 days. The length of time for light brick masonry work with a workforce composition of 1 foreman, 3 masons, and 2 mason assistants for light brick masonry work is 30 days while for light red brick plastering work it takes 26 days. So the time difference between the two

jobs The pair of red brick walls and light stone masonry walls is 76-56 = 20 days.

V. CONCLUSIONS AND SUGGESTIONS

Based on the data obtained from the project location in the form of data - image data, survey data and based on the calculation results, it can be concluded:

1. The magnitude of productivity and coefficient in the construction work of the East Kalimantan building obtained 1 foreman and 3 masons 2 assistants red bricklayers per day ± 15 m2 while work using light bricks is ± 20 m2.
2. The length of time required for the work of wall and plaster masonry is 76 days while the time required for light work and masonry plaster work is 56 days, so the time difference between the two work of wall and plaster pairs is 76-56 = 20 days .
3. The total cost for the pairing of red brick walls added to the cost of plaster is Rp. 217,295,997.9 and the total cost of the light brick pair work added to the cost of plastering is Rp. 170,453,329.0 and the difference in cost of the two works is Rp. 46,842,266.8

5.1 Suggestions

Suggestions proposed by the authors relating to the preparation of this thesis are:

1. In determining the material from the work of wall pairs, it can also be used as an alternative comparison in addition to red bricks and light bricks, such as glass walls and metal cladding.
2. Can also be used as an alternative comparison by using lightweight brick walls and stone brick.

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