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Study Of Implementation Of Lightweight Concrete Wall Panels From The Aspect Of Cost And Time In Banjarmasin City

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ABSTRACT
The impact of technological developments encouraged people to innovate creatively, effectively, and efficiently. People do innovation work in various fields including in the area of construction. One of the new lightweight concrete methods includes methods of concrete masonry wall panel systems. Concrete masonry wall panel in Indonesia is still not widely known in Indonesian society. So the manufacturers still focus on Java Island. In writing this how to make a lightweight concrete panel model using lightweight concrete with local ingredients that are outside Java Island, particularly in Borneo Island especially in Banjarmasin City to be used on cheap housing projects. This research was conducted by creating a model design design the floor plan of the building housing with type 64. The floor plan of the design made the model design of the wall panel with lightweight concrete compositions CLC. From the aspect of the installation cost of the wall panel using modeling wall panels acquired for residential type wall volume 64 is 105.51 m2 and Rp. 14.566.000,00 (fourteen million five hundred sixty-six thousand rupiahs). The time of the installation of the wall panel with the resulting design model was 3.50 days.
Keywords: *concrete masonry wall panels, concrete masonry wall panel model CLC.*

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I. INTRODUCTION

There are many types and products of lightweight concrete on the market, each type of lightweight concrete has different implementation methods, advantages and disadvantages, and prices. The most basic difference is the way it is made and the filling materials. One of the new lightweight concrete methods includes the lightweight concrete panel wall system method. In Indonesia, especially on the island of Java, this method is only popular and is used on a large scale project such as the construction of hotels, malls, universities and other large commercial projects. Meanwhile, the use of lightweight concrete wall panels in Indonesia, especially outside Java, is still not well known and used by the public. Even if there is demand from areas outside Java, especially on the island of Kalimantan, the cost of making wall panels is higher. This is because there are quite a lot of inter-island mobilization costs, making the price many times higher than the price on the island of Java. The aim of this research is to create a model of lightweight concrete wall panels using local materials on the island of Kalimantan, especially in the city of Banjarmasin to be applied in the construction of low-cost housing in terms of cost and time.

II. THEORITICAL REVIEW

Lightweight concrete is concrete that has a lighter density than concrete in general. Lightweight concrete can be called aerated lightweight concrete (Aerated Lightweight Concrete/ALC) or often also called (Autoclaved Aerated Concrete/AAC) which has the main raw materials consisting of silica sand, lime, cement, water, plus a developing agent which is then treated. with water vapor pressure. Unlike ordinary concrete, the weight of lightweight concrete can be adjusted according to needs. In general, the weight of lightweight concrete ranges from 600 – 1600 kg/m3. Therefore, the advantage of lightweight concrete is mainly in weight,

so that when used in high rise building projects it can significantly reduce the building's own weight, which in turn has an impact on foundation calculations (Asiyanto, 2005).

Lightweight Concrete Autoclaved Aerated Concrete (AAC) is cellular concrete consisting of quartz sand, cement, lime, a little gypsum, water, and aluminum paste as a developer (chemical air filler) which results in air bubbles in the mixture (Ervianto and Wulfram, 2002). Unlike ordinary concrete, the weight of lightweight concrete can be adjusted according to needs. In general, the weight of lightweight concrete ranges from 650 – 1600 kg/m3. Therefore, the advantage of lightweight concrete is mainly in weight, so that when used in high rise building projects it can significantly reduce the building's own weight, which in turn has an impact on foundation calculations. CLC lightweight concrete is cellular concrete that undergoes a natural curing process, CLC is conventional concrete where the coarse aggregate (gravel) is replaced by air, in the process it uses organic foam which is very stable and there is no chemical reaction when mixing the dough, the foam/foam functions as a medium for enveloping air (Kristanti, N. & Tansajaya, A., 2008). Lightweight concrete panel walls are a new type of building material. Lightweight concrete panel walls are a development of lightweight concrete which is made in larger sizes like boards. Because it is made from lightweight concrete, lightweight concrete panel walls also have the same advantages and disadvantages as lightweight concrete.

III. RESEARCH METHODOLOGY

This preliminary study was carried out to identify the problems to be researched, then interviews were conducted with local lightweight brick manufacturers on the island of Kalimantan. Next, literature studies, at this stage, the material related to this research is deepened and the required problem-solving is formulated. The material studied is about panel wall design models, analysis of unit price calculations for panel wall work, and work productivity. The process research can be seen in Figure 1.

Based on its approach, this research uses quantitative research which aims to test hypotheses from data that has been collected by previous theories and concepts. Quantitative research is research carried out using an inductive deductive approach that departs from a theoretical framework, expert ideas, or the researcher's understanding based on his experience which is then developed into problems and solutions which are proposed to obtain justification in the form of empirical data support in the field (Tanzeh, 2009).

Based on its type, this research is included in research and development. According to Sugiyono (2012), research and development is a research method used to produce certain products, and test the effectiveness of these products. According to Sukmadinata (2006), research and development is a research approach to produce new products or improve existing products. So development research is a method to produce certain products or improve existing products and test the effectiveness of these products.

Primary data in this research was created using several instrument models obtained directly from sources through interviews. The interviews carried out were by conducting conversations between researchers and CLC lightweight concrete producers in Banjarmasin to obtain information regarding production cost data, manufacturing duration, selling prices, product yields, and implementation methods for making CLC lightweight concrete. The data compilation carried out in this research collected data from primary data and secondary data regarding aspects of cost and time in making wall panel design models. Analysis of the panel wall design model, namely regarding the detailed dimensions of the panel wall design model, the costs of each panel wall design model, and the installation time of the panel wall design model. The output from this stage will be time and cost based on the wall panel design based on suitability for one type of house. So we will know whether the design is possible if mass produced.

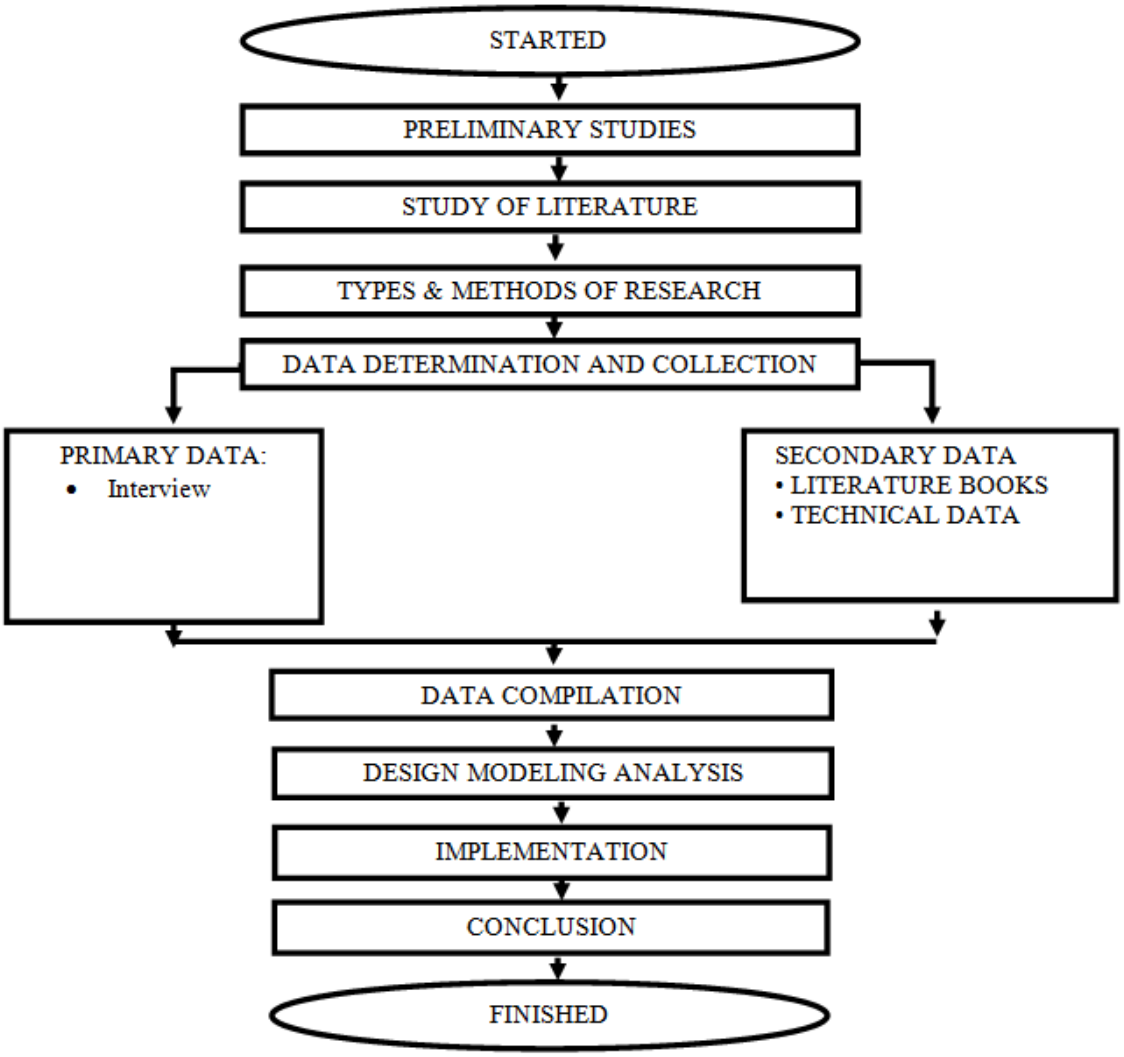

Figure 1. Research Procedure Chart

IV. RESULT AND DISCUSSION

The total cost calculation for installing wall panels in this study was obtained from the unit price/m2 multiplied by the entire volume of wall work, which can be seen in Table 1.

Table 1. Calculation of the cost of installing panel walls

No	Description	Total Volume (m^2)	Unit Price of Work/m^2 (Rp)	Amount (Rp)
1	Front views	17.88	138.054,70	2.468.418,04
2	Right-side view	10.06	138.054,70	1.388.830,28
3	Left Side View	23.85	138.054,70	3.292.604,60
4	Back view	20.28	138.054,70	2.799.749,32
5	Inner Walls	33.44	138.054,70	4.616.549,17

	Total	14.566.151,40
	Rounding	14.566.000,00

To obtain the total cost calculation for installing red bricks in this study, it is obtained from the unit price/m2 multiplied by the entire volume of wall work, which can be seen in Table 2.

Table 2. Calculation of Costs for Installing Red Brick Walls

No	Description	Total Volume (m^2)	Unit Price of Work/m^2 (Rp)	Amount (Rp)
1	Front views	17,88	92.747,60	1.658.327,09
2	Right-side view	10,06	92.747,60	933.040,86
3	Left Side View	23,85	92.747,60	2.212.030,26
4	Back view	20,28	92.747,60	1.880.921,33
5	Inner Walls	33,44	92.747,60	3.101.479,74
			Total	9.785.799,28
			Rounding	9.785.000,00

The calculation of implementation time is obtained from the volume of wall area divided by the productivity of wall workers. The volume of wall area is obtained from analysis of previous panel wall design drawings, so the calculation of panel wall area can be seen in Calculating the cost of installing panel walls.

Data on the productivity of wall panel work was obtained through interviews, discussions and experience from experienced parties concerned. The productivity of wall panel work has a productivity of 30 m2/effective working day. This productivity is a combination of the average ability of the tools and worker group in completing the installation of wall panels. Calculating the duration of activity time is closely related to the productivity of lightweight concrete panel wall work. Review of the calculation of the duration of work activities including light concrete panel wall work including installation of tools and materials needed to finishing light concrete panel wall work.

Duration calculation formula:

$$\text{Durasi} = \frac{\text{Volume Pekerjaan}}{\textit{Produktivitas per Pekerja}}$$

Worker productivity using 1 worker and 2 helper in installing lightweight concrete panel walls has a capacity of 30 m2/day. Calculation of the duration of installation of wall panels is presented in Table 3.

Table 3. Calculation of Wall Panel Installation Duration

No.	Description	Total Area (m^2)	Productivity /Day (m^2)	Duration (day)
1	Front views	17.88	30	0.60
2	Right-side view	10.06	30	0.34
3	Left Side View	23.85	30	0.80
4	Back view	20.28	30	0.68
5	Inner Walls	33.44	30	1.11
			Total	3.52

As a comparison material in this study, the calculation of the duration of installing red bricks with the area using the wall volume recap is calculated as in Table 4.

Table 4. Calculation of duration for installing red brick walls

No.	Description	Total Area (m^2)	Productivity /Day (m^2)	Duration (day)
1	Front views	17,88	10	1.79
2	Right-side view	10,06	10	1.01
3	Left Side View	23,85	10	2.39
4	Back view	20,28	10	2.03
5	Inner Walls	33,44	10	3.34
			Total	10.55

V. CONCLUSION

Based on the results of the research and analysis that have been carried out to achieve the research objectives, the following conclusions can be drawn:

1. The calculation result of the volume requirement for lightweight concrete panel walls for the plan is 105.51. The total simulation cost for panel wall work is Rp. 14,566,000.00 (fourteen million five hundred and sixty-six thousand rupiah). Meanwhile, the implementation time for panel walls is 3.52 days.
2. The calculation result of the volume required for red brick, plaster, and plaster for the plan is 105.51. The total simulation cost for panel wall work is Rp. 9,785,000.00 nine million seven hundred and eighty-five thousand rupiah). Meanwhile, the implementation time for panel walls is 10.55 days.

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