Value Engineering In Construction Method Rusunawa Prototype Building 5 Floor

by Dwi Dinariana

Value Engineering In Construction Method Rusunawa Prototype Building 5 Floor

Dwi Dinariana
University of Persada Indonesia YAI, Jl. Salemba 7 Central Jakarta *Email : dwidinariana@yahoo.com*

Imia Lukito
IAPPI (Indonesian Association of Precast and Prestressed Engineers), the Secretariat : West Cilandak 23 Jl.Pangeran Antasari, South Jakarta

Abstract: Since the introduction of the National Movement of One Million Houses Development (GNPSR) by the Government in 2004, the achievement of development Rusuna (Rumah Susun Sederhana = Simple Flats) until mid-2006 a new range ± 5,000 units / year from a target of 60,000 units Rusunawa (Rumah Susun Sederhana Sewa = Simple flats rent for low-income communities). The government target is of course requires no small amount of the budget, it would require effort - an effort to suppress the price of Value Engineering (VE) such that but without reducing the quality and the quality of the building itself. And for the achievement of these targets needs to be done the business - business development acceleration Rusuna. One attempt was to compare two methods of acceleration implementation the conventional method and the method of precast. Based on these problems required a study to calculate the VE in a Prototype Development Project Rusunawa 5 Floors in terms of implementation methods, to reduce production costs without reducing the quality of the building and create a project plan based on the VE by using Microsoft Project to get the most efficient time planning and fast . Analysis carried out calculations on the method of implementation of the methods of precast concrete systems and conventional systems. From the comparison of the methods of implementation precast construction and conventional construction, selected the most efficient price, then do the planning of the VE was selected to plan a schedule for implementing the most efficient. From the results of the analysis, it is observed that for the method of implementation, the method selected precast concrete system with an efficiency of 26.84% price structure and time schedule for implementation is faster than conventional methods of Implementation.

Keywords: Value Engineering, Construction Methods, Building.

1 GENERAL INFORMATION

Since 2004, the Government launched the One Million Houses Development National Movement (GNPSR) which is a moral movement to all elements of the nation to jointly responsible and work towards accelerating the provision of decent homes occupied primarily for the MBR (Low-Income Communities). In the period 2004 - mid 2006, new waking Rusuna Rusuna (Rumah Susun Sederhana = Simple Flats) the range ± 5,000 units / year. While the target of the Government is 60,000 units and 25,000 units Rusunawa (Rumah Susun Sederhana Sewa = Simple flats rent for low-income communities)/Rusunami (Rumah Susun Milik = Simple flats owned by a designated low-income communities). Then in mid 2006, the Government initiated the accelerated development program Rusuna. Based on Presidential Decree No. 22 In 2006, on the Coordinating Team to Accelerate Development in Urban Flats, the Coordination Team agreed to use precast concrete systems in development with the aim of producing Rusuna a quick but quality.

But until today often complain that the quality of the building itself is not satisfactory Rusuna. Because of its construction which is massive and dedicated to the Low-Income Communities (MBR) and Medium-Income Communities (MBM), so that not a few rogue contactor-building contractors Rusuna so long alone. Often found in Rusuna that have been built and that has been inhabited, the components - there are still many structural components are easy to collapse when hit by an earthquake in 2009. Many also found materials that are not good quality, water seepage, leaks and other things that make Rusuna performance is not good.

To that end, the study tries to present how the budget could be reduced such that the resulting building, but the quality remains the applicable standard. The application of VE in Indonesia itself began much done on construction projects.

2 RESEARCH OBJECTIVES

The purpose of this study are:

- Calculating Value Engineering Rusunawa Prototype Development Project 5 Floor Type 36 Kemenpera terms of implementation methods and building materials, to reduce production costs without reducing the quality of the building.

3 THEORETICAL BACKGROUND

3.1 Definitions and Basic Definition of Value Engineering

Value Engineering (VE) or in Indonesian called value engineering, is an organized creative approach to optimize the cost and quality of a facility (Dell 'Isola, 1982). VE was first developed in the manufacturing industry in the aftermath of World War II to make the change and the search for alternative methods of product / other components made at the time as a result of lack of resources during World War II. Efforts made to make these changes increase the value of a product by focusing on the function of the product (Megeorge and Palmer, 1997).

The application of VE in the construction field is a systematic approach taken by a team of multiple disciplines who focus on value and function. The application of VE in construction projects have considerable potential savings from the project budget. From research conducted in America by Palmer, Kelly and Male indicate that savings achieved in the application of VE in construction projects is quite large, reaching 34-36% of the total project budget of each discipline (Palmer, Kelly and Male, 1996).

3.2 Precast Concrete Systems

Precast concrete system is a system of building components fabricated construction / printed first in the factory or in the field, then arranged on the ground to form a single unit buildings.

a Structural Design Concepts With Precast Systems

Precast systems are divided into:

1. Frame system (columns and beams)
2. Bearing Wall System (wall)
3. System Cell
4. Precast Flooring
5. Precast Roof

Another consideration in the change of the building with precast method:

1. Joint System
   - Dry Joint (Las embeded, Bolts)
   - Wet Joint (Grouting, Concrete)
2. Erection System
   - Capacity of lifting equipment
   - Dimensions and weight of precast concrete
   - Equipment removal of precast concrete
   - Scaffolding Equipment

b Excess Precast Systems

Objective basis the efficiency of the precast system for conventional systems are:

1. This system has good quality control because:
   - Producing a component on the ground so that the production process becomes easier and the results can be measured with good production
   - Installation of precision components to better ensure the quality of structures in building construction.

2. Shorter in the implementation due to:
   - Implementation of the structure in conjunction with the production of components
   - Implementation of the structure along with the implementation of architectural finishing work.

3. More environmentally friendly because:
   - Use of wood material is very minimal
   - Waste material is almost no
   - The development process to minimize disruption of air and noise pollution.

4. More economical to fee because:
   - Allowing use security numbers are more efficient in planning for better quality control and secure
   - The reduction in the use of molds and scaffolds
   - Shorten the total construction time
   - Labour productivity in the field is higher.

c. Terms of Use Precast Systems Rusuna In Development

Minimum requirements of the construction site conditions that can be simple flats using precast system if the production activities carried out in the field are:

1. Casting needed Area / Land Production. Is a land with a certain extent prepared for the place of production of precast components, which can be made on site or in the specific manufacturing site outside the development.
2. Stocking needed Area / Land buildup.

Is a land with a certain extent prepared for the accumulation of temporary precast components, arranged in the field prior to forming a unity building.
3. Necessary room for maneuver heavy equipment, the need for broad room for maneuver depends on the type and capacity of the tool.
4. Land area of production and accumulation of land to be provided depending on production schedules and the number of tools.

This special is a consideration in the procurement of precast components:

1. Site
2. System Mould / Mold
3. Dimensions and weight
4. Engineer and the workers
5. Heavy equipment and utility site.

Component regulatory system and optimization of precast or precast components minimizing type will greatly affect the preparation of site layout on the:

1. Storage Planning
2. Transfer Planning
3. Erection of planning.

3.2 Conventional System

Conventional system is a system of development that all components of the building is directly done / in the field cast (cast in situ).

4 RESULTS AND DISCUSSION

4.1 Comparison of Price Structure And Precast Systems Using Conventional and

Precast calculations obtained from the Budget Plan (RAB) with a unit price analysis of the city fiscal year 2010 and refers to the calculation procedure RSNI unit price work for construction of precast concrete structures gedung. Budget Plan Work Prototype Development Rusunawa 5 Floor Type 36 Kemenpera by using the system shows the conventional rate of Rp. 4,971,570,141.13, - whereas when using precast system, showing the number of Rp. 3,637,108,245.76, -. Efficiency is:

Efficiency = (the price structure of a conventional system - the price structure of the system of precast)/(pricing structure of a conventional system) x 100%

Then the efficiency of the price of precast concrete system is 26.84%.

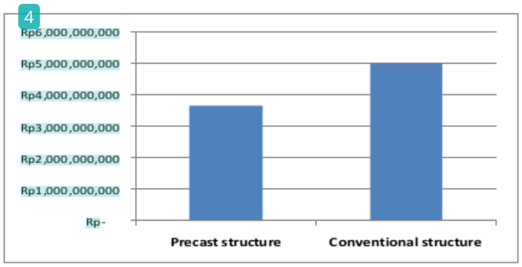

Figure 1. Price comparison chart of the structure using precast and conventional systems

4.2 Alternative Building Materials Wall

At this stage of creativity to do is look for precast building materials that can be used as a substitute / alternative for the same function. Alternative materials that will be precast in trying to apply as a building material Rusunawa Prototype is a wall. Serves as a retaining wall of light, wind, rain, floods, and others. Materials alternative building that will try to use is:

1. Block
2. Brick, size 22 x 11 x 5 cm
3. Lightweight brick, size 60 x 20 x 7.5 cm
4. Kalsiboard partition, size 244 x 122 x 0.8 cm
5. Wall panels, size 60 x 10 x 10 cm
6. Facade wall (produced by PT. Beton Elemindo Perkasa)

Of materials - materials above, try the wall material mix design alternatives, namely the outer walls of buildings and walls in the (inter-space) of the building.

Table 1. Mix Design Material Wall Alternative

No.	Outside of the walls	Inner Wall (Space Shuttle)
1	Batako	Batako
2	Batako	Light brick
3	Batako	Brick
4	Batako	Partisi Kalsiboard
5	Batako	Panel Dinding Hebel
6	Light brick	Light brick
7	Light brick	Batako
8	Light brick	Brick
9	Light brick	Partisi Kalsiboard
10	Light brick	Panel Dinding Hebel
11	Brick	Brick
12	Brick	Batako
13	Brick	Light brick
14	Brick	Partisi Kalsiboard
15	Brick	Panel Dinding Hebel
16	Fasade (Beton Elemindo Perkasa)	Brick
17	Fasade (Beton Elemindo Perkasa)	Batako
18	Fasade (Beton Elemindo Perkasa)	Light brick
19	Fasade (Beton Elemindo Perkasa)	Partisi Kalsiboard
20	Fasade (Beton Elemindo Perkasa)	Panel Dinding Hebel

Unit price of building materials based on the Retail Price Capital City in 2010 and refers to the SNI procedure for the calculation of unit prices for construction work and residential buildings can be seen in the table 2 :

4.3 Calculation of Combined Alternative Building Materials Wall

Alternative combinations of the calculated wall construction materials (interior and exterior) on the architectural work, it can be seen that the cost of the smallest job is located on the outer walls and concrete block walls in use at a price of Rp. 3,962,939,025.54. As for the cost of work is greatest in light brick with a price of Rp. 5,061,604,121.29. Recapitulation of the mix design calculations can be seen in the table 3 :

From the above table Budget Plan combination of architectural building materials building wall Rusunawa Floor Type 36 Prototype 5 Kemenpera by using lightweight bricks indicate the number of Rp. 5,061,604,121.29 while when using concrete blocks, showing the number of Rp. 3,962,939,025.54, -. Efficiency is:

Efficiency = (Total price of light brick architecture – Total price of brick architecture) / (Total price of light brick architecture) x 100%

Then the efficiency of the architecture by using the price of building materials are brick to brick light of 21.71%.

4.4 Budget Plan (RAB) Construction Work

Based on the price of construction work on buildings VE Rusunawa Floor Type 36 Prototype 5 Kemenpera, can be seen that the construction cost of the least of which is contained in the structure of the work done with precast system and the combination of inner and outer walls of brick with a price of Rp. 11,221,235,505.00. As for the cost of most major construction is done on the job structure with precast system and the combination of inner and outer brick wall light with a price of Rp. 12,429,767,110.33. While the specifications in the field, material of construction materials is a light brick wall. Efficiency is:

Efficiency = (Total Budget Plan lightweight precast and brick-Total Budget Plan precast + concrete blocks) / (Total Budget Plan lightweight precast and brick) x 100%

Then the efficiency of methods of implementation of the system of precast concrete and concrete block wall building materials to building materials brick wall of light is 9.72%.

Table 2. Wall Unit Price Alternative Materials

	1m2 install brick (batako)	1m2 install red brick (bata merah) (5 x 11 x 22)	1m2 install lightweight brick (bata ringan) (60x20x7,5)	1m2 Fasade concrete (Beton Elemindo Perkasa)	1m2 Hebel Wall Panels (Panel Dinding Hebel) (3x0,6x0,075 m)	1m2 partition Calsiboard (Partisi Kalsiboard) (1220x2440x8)
	1	2	3	4	5	6
Wage + Material Price	Rp 51.315,23	Rp 128.255,23	Rp 215.200,58	Rp 375.000,00	Rp 148.236,28	Rp 112.747,00
Aci + Plastering	Rp 32.222,84	Rp 32.222,84	Rp 32.222,84	-	-	-
TOTAL	Rp 83.538,06	Rp 160.478,07	Rp 247.423,42	Rp 375.000,00	Rp 148.236,28	Rp 112.747,00
(%) against the brick (batako)	1,00	1,92	2,96	3,89	1,77	1,35

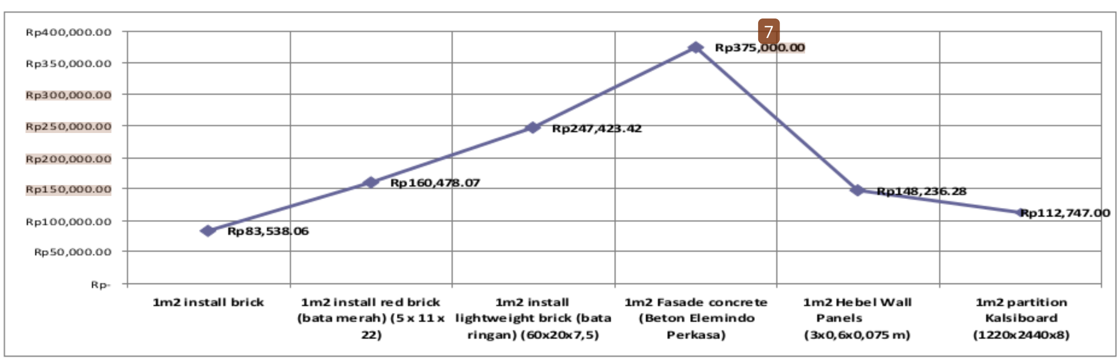

Figure 3. Unit Price Graph for Wall Material Alternatives

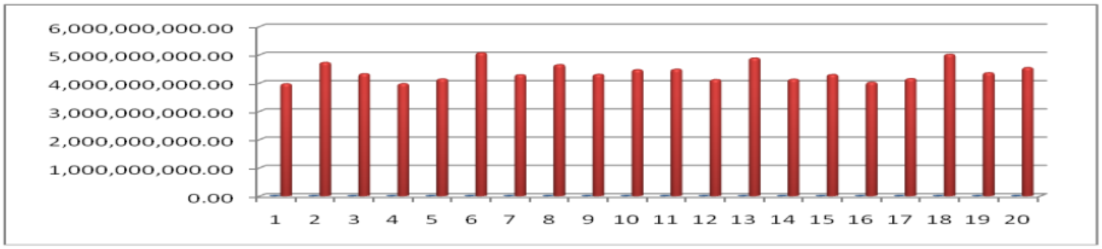

Figure 4. Graph Total Price Combination Wall Material Alternatives

Table 3. Alternative Calculation of Wall Material Combinations

No.	Descriptions	Total Price	
1	Batako	Rp	3.962.939.025,54
2	Batako + Light brick	Rp	4.720.685.446,76
3	Batako + Brick	Rp	4.316.547.403,13
4	Batako + Partisi Kalsiboard	Rp	3.968.728.065,87
5	Batako + Panel Dinding Hebel	Rp	4.133.745.747,38
6	Light brick	Rp	5.061.604.121,29
7	Light brick + Batako	Rp	4.282.182.748,88
8	Light brick + Brick	Rp	4.639.937.576,26
9	Light brick + Partisi Kalsiboard	Rp	4.295.992.970,46
10	Light brick + Panel Dinding Hebel	Rp	4.461.010.651,97
11	Brick	Rp	4.478.734.332,13
12	Brick + Batako	Rp	4.110.616.033,28
13	Brick + Light brick	Rp	4.872.648.445,46
14	Brick + Partisi Kalsiboard	Rp	4.124.691.880,29
15	Brick + Panel Dinding Hebel	Rp	4.289.443.936,37
16	Fasade (Beton Elemindo Perkasa) + Brick	Rp	4.015.394.797,43
17	Fasade (Beton Elemindo Perkasa) + Batako	Rp	4.145.483.892,77
18	Fasade (Beton Elemindo Perkasa) + Light brick	Rp	5.003.569.627,41
19	Fasade (Beton Elemindo Perkasa) + Partisi Kalsiboard	Rp	4.352.800.179,12
20	Fasade (Beton Elemindo Perkasa) + Panel Dinding Hebel	Rp	4.535.905.884,25
	Total Price VE Combination Wall Material Material LOWEST PRICE		
	Total Price VE Combination Wall Material Material HIGHEST PRICE		

5 CONCLUSIONS

From the analysis and calculation of VE and project planning on building Rusunawa 5 Floor Type 36 Prototype Kemenpera terms of implementation methods and building materials, can be deduced as follows:

1. Construction by using precast system implementation method based on the price structure of 26.84% more efficient than conventional systems.

2. For wall materials, the price of building architecture by using materials more efficiently brick wall material of 21.71% (against the highest price, the cost of material architecture of a light brick wall) and 9.72% more efficient (for the highest price, the total cost of the project by using a light brick building materials).

3. By using precast system implementation time is faster because the precast component manufacturing jobs can be done early on when the land is ready, the production of overlapping can be done with the foundation work of erection, erection work of precast components can be done a day after the components are manufactured and architectural work can begin on time The next floor of the structure of work is being done because there is not much use precast system scaffold. Quality control is guaranteed because of the work or the production of components in the factory or in the site.

4. Owner sets a period of Prototype Development Rusunawa 5 floor is for 180

calendar days is very possible. On the planning schedule with the implementation of the method of precast concrete systems using Microsoft Project, Rusunawa construction can be completed within 170 days (not including the maturation of the land) so that the planning schedule ahead of time specified.

REFERENCES

Ashworth, Allan (1994). "Perencanaan Biaya Bangunan Tingkat Tinggi." PT Gramedia Pustaka Utama, Jakarta.

Bull, Jho W (1993). "Life Cycle Costing for Contruction." Blackie Akademic & Proffesional, London.

Collier, A. Courtland and Ledbetter, B William (1982). "Engineering Cost Analysis." Harper & Row, Publisher, New York.

Departemen Permukiman dan Prasarana Wilayah (2003). "Perencanaan dan Pengelolaan Rumah Susun Sederhana.*" (Modul C-57)*, Jakarta

Departemen Permukiman dan Prasarana Wilayah (2004). "Pedoman Umum Penyelenggaraan Rusunawa Tahun 2004 tentang Badan Pengelola dengan Pola UPTD, Tata Laksana Pengelola dan Tata Laksana Penghunian Rusunawa." Jakarta.

Fabrycky, W.J and Benyamin S Blanchchard (1991). "Life Cycle Cost and Economic Analysis." Prentice Hall Inc, Englewood Cliffs, New Jersey.

Juwana, J.S. (2005). "Panduan Sistem Bangunan Tinggi." Erlangga, Jakarta

Kelly, J and Stephen Male (1993). "Value Management in Design and Construction, E & FN." Spon, London

Kirk, SJ and Alphonse J, Dell'Isola (1995). "Value Engineering Practical Applications, for Design, Construction, Maintenance & Operations." Mc Graw Hill Inc, New York.

Value Engineering In Construction Method Rusunawa Prototype Building 5 Floor

ORIGINALITY REPORT

13%	13%	3%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	proceeding.unisba.ac.id Internet Source	5%
2	thesis.binus.ac.id Internet Source	3%
3	Gustavo Henrique Nalon, Rodrigo Felipe Santos, Gustavo Emilio Soares de Lima, Igor Klaus Rocha Andrade et al. "Recycling waste materials to produce self-sensing concretes for smart and sustainable structures: A review", Construction and Building Materials, 2022 Publication	1%
4	docplayer.info Internet Source	1%
5	eprints.undip.ac.id Internet Source	1%
6	docu.tips Internet Source	1%

Submitted to Universitas Darma Persada

7	Student Paper	<1 %
8	Dwi Dinariana, Yuki Yohana. "Redesign effect on the time performance and cost performance project design and build house in Chinatown Kelapa Gading Jakarta", AIP Publishing, 2017 Publication	<1 %
9	www.researchgate.net Internet Source	<1 %

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		