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COST AND TIME EFFICIENCY ANALYSIS ON LATEI BEAMS AND WALL WORK: CASE STUDY OF GLT4 AND GKU2 PROJECTS AT SUMATRA INSTITUTE OF TECHNOLOGY

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ABSTRACT

Engineering Laboratory Building Project 4 (GLT4) and Public Lecture Building (GKU2) at the Sumatra Institute of Technology, South Lampung, is part of constructing a lecture building where this development aims to facilitate and provide comfortable learning infrastructure for all students. This study evaluates the cost of later beams and walls. The method used is to calculate the cost of implementation and time evaluation to change the conventional implementation method to precast / precast through the Cost and Time Evaluation Method. The research objective was determining the cost efficiency between conventional and precast beam and wall work methods. Types of qualitative research use the cost and time evaluation method, one of the well-known methods, and has considerable potential for success in controlling costs and time. This technique uses an analysis approach to its function. The process is to reduce costs as much as possible while paying attention to the desired quality and reliability. The results of this study indicate that in the Construction of the Engineering Laboratory Building (GLT) 4 and General Lecture Building (GKU) 2 projects for late beam work, it was found that the cost of later beam work had a profit of 24% with a value of Rp. 95,090,232 and has an efficiency of 6% with a value of Rp. 25,145,911. The amount of efficiency occurs due to changes in material use, reducing wages and material costs by negotiating with suppliers. Wall work has an efficiency of 11% or Rp. 309,214,847 and has a profit of 20% or Rp. 686,542,006. Efficiency occurs by reducing wages and material costs by negotiating with suppliers.

Introduction

In developing lecture buildings, it is essential to create a comfortable and conducive lecture atmosphere, as well as the identity of a campus. Its development must consider several aspects: architectural, structural, and building utilization (Wulandari, 2020). In building planning, whether multilevel or not, we must pay attention to strength, comfort, economy, and environmental impact. These aspects must be carefully planned and calculated (Ismet et al., 2023).

The components contained in the building itself consist of foundations, roofs, columns, beams, and floor plates (Ching, 2020). Each component must go through careful calculations to identify the amount and type of material to be used. The material should withstand the maximum load and be efficient (Saputra, 2019).

This study raises the development path of the Sumatra Institute of Technology (ITERA), one of the South Lampung campuses. The Sumatra Institute of Technology continuously upgrades, renews, and adds lecture buildings (Frima et al., 2020). This is also in line with the increasing interest of the younger generation to continue their education at the ITERA campus. New facilities for ITERA students are being built, namely the General Lecture Building (GKU) 2 and the Engineering Laboratory Building (GLT) 4. The GKU 2 building will be used for the lecturing process for ITERA students and the ITERA student administration management process while building four will be used as a multi-purpose building that has many technical practice classrooms for ITERA students to study and carry out practicals their respective study majors.

Research Methods

Research objects and subjects

The research was conducted in one of the Construction Engineering Laboratory Building (GLT) 4 and General Lecture Building (GKU) 2 projects of the Sumatra Institute of Technology.

Research data

The data needed in this study, namely:

1. Data primer

The primary data in this study are:

a. Building location data
b. List of prices for materials, wages, and equipment

2. Data seconds

The data obtained outside the primary data is considered complementary data. These data are data from the study literature and previous research studies (Muhammad Syahrum, 2022).

Data processing and analysis techniques

Processing and analysis of data will use the method and Time Evaluation by making an analysis of alternative changes or replacement dimensions on the superstructure by reviewing the existing loads on the initial design, as well as creating an alternative superstructure design model, namely conventional superstructures and precast superstructures, with the following steps (Sukamulja, 2021):

1. Stage Prastudi
2. Study Stage (Value Job Plan)
3. Information Stage (Information phase)
4. Evaluation Stage (Evaluation Phase)

Results and Discussion

Pre Study Stage

The pre-study stage includes gathering information regarding the design of the implementation method and general data on construction work, which in this study used

a case study of the Public Lecture Building Project (GKU) 2, the Sumatra Institute of Technology (Prihatiningsih, 2021).

The contract system for the Public Lecture Building Project (GKU) 2 of the Sumatra Institute of Technology is Unit Price (Unit Price), so the responsibility of the service provider or contractor is only in the construction implementation process (Rianto, 2021).

Study Stage (Value Job Plan)

Implementation study stage cost and Time Evaluation consists of six stages: the information stage, the function analysis stage, the creative stage, the evaluation stage, the development stage, and the recommendation stage (Diptera et al., 2018).

Information Stage (Information phase)

This study applies the cost and Time Evaluation method in the Public Lecture Building (GKU) 2 architecture work construction project at the Sumatra Institute of Technology (Maharani, 2022). The construction of these flats includes reinforced concrete structures, roof structures, roof coverings, architectural, mechanical, electrical, plumbing, and landscape areas (Sukamulja, 2021).

Figure 1 Project Locations for the Public Lecture Building Project (GKU) 2, Sumatra Institute of Technology

Information on the Public Lecture Building (GKU) 2 Sumatra Institute of Technology project information as follows (Rahma et al., 2021):

Table 1
General Project Information

GENERAL DATA	INFORMATION
Job name	Construction of engineering laboratory building (GLT) 4 and Construction of public lecture building (GKU) 2 ITERA
Project Location	South Lampung
Employer	Sumatra Institute of Technology

Source of Funds	State Sharia Securities (SBSN) for Fiscal Year 2022-2023
Planning Consultant	CV. Dwintara Mega Consultant
Construction Management Consultant	Yodya- surya-sayovi-KSO
Initial Contract Value	Rp.100.907.879.600,-
Addendum Contract Value 1 & 2	Rp.110.998.657.000,-
Contract Type	Combined unit price and lumpsum
Implementation Time	June 03, 2022-November 24, 2023 (540 calendar days)
Maintenance Period	180 days calendar

(source: project data, PT. Brantas Abipraya)

The contract value of the architectural work package for this project is IDR 22,156,162,114. The contract value represents revenue for the contractor related to the execution of the work, namely preparatory work and architectural work consisting of flooring, walls, plastering, later beams, doors, windows, ceilings, sanitary, others, and outside work (Wicaksono, 2021). Recapitulation of the contract value is a reference in architectural work on the Public Lecture Building (GKU) 2 Sumatra Institute of Technology.

Evaluation Stage (Evaluation Phase)

Table 2
Architectural Cost Recapitulation

No	Work item	Total Contract
1	Preparatory work	
2	1st Floor Architectural Work	4,221,115,630
3	2nd Floor Architectural Work	4,204,615,627
4	3rd Floor Architectural Work	4,208,255,627
5	4th Floor Architectural Work	3,483,692,960
6	Rooftop Architecture Jobs	1,528,146,151
7	Work Architecture Ladder Roof Top	25,623,024
8	WorkArchitecture Wall Roof	180,882,772
9	WorkInstallation ArchitectureRailling	741,760,250
10	Work Installation Sunshading	493,590,903
11	ACP Installation Jobs	2,000,832,970
12	Roof Work	1,161,934,502
13	Concrete Rebate Work	104,209,696
14	Open Waterworks	516,489,226
15	Other Jobs	213,814,826

	Total Architectural Cost	**22,591,373,266**

Table 3
Recapitulation of beam working time comparison

No	Floor	Need for Latei Beams (Pcs)	Time (days)			
			Conventional Method(6 pcs/day)	Metode Precast (10 pcs/day)	Day Difference	Percentage Difference (%)
1	1st floor	133	22	14	8	38%
2	2nd Floor	215	36	22	14	38%
3	3rd floor	215	36	22	14	38%
4	4th floor	186	31	19	12	38%
5	Roof floor Top	6	1	1	0	0%
Amount		**755**	**126**	**78**	**48**	**+ 38%**

The comparison of the time duration shows that using sandwich panels can increase work speed by 44%.

Table 4
Recapitulation of beam working time comparison

No	Floor	Volume (m2)	Time			
			Pair n Light Bricks	Sandwich Panel	Day Difference	Percentage Difference (%)
1	1st floor	133	59	33	26	44%
2	2nd Floor	215	62	35	27	44%
3	3rd floor	215	62	35	27	44%
4	4th floor	186	47	26	21	45%
5	FloorRooftop	6	25	14	11	44%
Amount		**755**	**255**	**143**	**112**	+44%

Conclusion

Based on the analysis and discussion of Value Engineering (Cost and Time Evaluation) of the implementation of later beam work and wall work in the Construction of the Engineering Lab Building (GLT) 4 and General Lecture Building (GKU) 2 Building projects as follows:

By carrying out a cost and time evaluation of the latei beam work, latei beam work has a profit of 24% with a value of Rp. 95,090,232 and has an efficiency of 6% with a value of Rp. 25,145,911. Efficiency occurs by switching the use of materials and reducing wage and material costs by negotiating with suppliers, while wall work has an efficiency of 11% with a value of Rp. 309,214,847 and has a profit of 20% with a value of Rp. 686,542,006. Efficiency occurs by reducing wage costs and material costs by negotiating with suppliers

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