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ANALYSIS OF LABOR COEFFICIENT IN COLUMN STRUCTURE WORK (CASE STUDY OF THE CONSTRUCTION PROJECT OF THE HIGH PROSECUTOR'S OFFICE OF SOUTH KALIMANTAN PROVINCE)

Nadiya Maharani, Abdul Karim, S.T., M.T.
Civil Engineering Study Program, Lambung Mangkurat University
Jl. Jenderal Achmad Yani Km 35.5 Banjarbaru, South Kalimantan – 70714
E-mail : maharani.nadiya02@gmail.com abdulkarim@ulm.ac.id

ABSTRACT

Along with the development of the times, the construction of buildings is also increasing rapidly. In a project, planning the budget of a project using the method of analyzing the price of the unit of work is very necessary as a reference. In the analysis of the unit price of work, there is also a labor coefficient planning which aims to measure the efficient use of labor in a construction project and can optimize the use of human resources in a construction project.

The data collection method used is using *the work sampling method. Work Sampling* is a method that can be used to measure productivity. The productivity value of the workforce can be seen from the results of the standard time calculation. Standard time is the time that can be completed by the workforce in completing work under standard conditions.

The results of the research conducted on the South Kalimantan Provincial High Prosecutor's Office Construction project obtained the value of the labor coefficient in the column structure work in the field which was compared with the labor coefficient in the planning column structure work. Between the two analyses there is a clear difference due to the difference in work methods carried out in the field. This results in the value of the labor coefficient in the field tending to be smaller than the value of the planned labor coefficient.

Keywords: Coefficient, Labor, Column

1. INTRODUCTION

In a project, human resources have an important role in the success of the project so that if the use of human resources is wrong, it can cause losses for a project. Therefore, planning the budget of a project using the method of analyzing the price of the unit of work is very necessary as a reference. In the analysis of the unit price of work, there is also a labor coefficient planning which aims to measure the efficient use of labor in a construction project and can optimize the use of human resources in a construction project.

The labor coefficient is a number or ratio that can show the relationship between the number of labor required and the volume of work produced in a construction project. This coefficient can measure how efficiently the labor used to complete a job and can also affect several things such as being able to save labor costs and improve the quality of work.

2. THEORETICAL FOUNDATIONS

According to the Minister of PUPR Regulation No.8 of 2023, the labor coefficient is the number or quantity of working hours per unit of measurement. This coefficient is a factor that shows the length of labor dart required to complete a certain unit of work volume. Factors that affect the labor coefficient include the number of workers and the skill level of the workforce, as well as work methods. Productivity calculations in certain work groups consist of workers, handymen, chief craftsmen and foremen. Labor productivity is expressed in Person-Hours (OJ) or Person-Han (OH) to produce one specific unit of measurement of work.

According to the Minister of PUPR Regulation No.8 of 2023, the measurement of the labor coefficient can be done using the formula below:

1. Determine *the time factor* for each job description.

   The time factor is calculated to determine the value of the productive time index of the workforce. The *time factor value* is calculated by the following equation:

   $$Time\ Factor = \frac{Waktu\ Produktif}{Total\ Waktu\ yang\ disediakan} \quad \text{..... (2.3)}$$

2. Calculate the value of the labor coefficient.

   The labor coefficient is calculated to find out the amount of labor and time used to complete one work item with a certain volume. It can be calculated by the equation below:

   $$\text{Man Hour } Coefficient = \frac{Time\ Factor}{Volume\ Pekerjaan} \quad \text{..... (2.4)}$$

   $$\text{Man Day } Coefficient = \frac{Jumlah\ Tenaga\ Kerja\ x\ Koefisien\ Man\ Hour}{Jumlah\ Jam\ Kerja\ dalam\ 1\ hari} \quad \text{.....(2.5)}$$

3. METHOD

Research Location

This research was carried out in the construction project of the South Kalimantan High Prosecutor's Office (Continued) located on Jl. Dharma Praja, South Kalimantan Provincial Government Office Area.

Figure 3. 1 Project Location

Research Procedure

From the observations carried out for 3 (three) days, the results of the observation of *the Man day* / Person per day (OH) coefficient will be obtained and then averaged to

obtained the results of the study and compared with the planning labor coefficient. The coefficient analysis was in accordance with the AHSP of the observed planning, namely workers, handymen, chief craftsmen and foremen. The difference in coefficient analysis factors was obtained from the results of direct observation of interviews with field supervisors based on experience in the field.

4. RESULTS AND DISCUSSION

Duration of Work

The duration of the work that the researcher observed on July 27-29, 2024 in the South Kalimantan Provincial High Prosecutor's Office Construction project is in the description of each column structure work as shown in the table below:

Table 1. Column Structure Job Duration

Date to	Job Type	Volume of Work	Job Duration (minutes)				Time Provided (minutes)
			Worker	Craftsman	Head Builder	Foreman	
27	Installation of Column Ironing	6,37	360	360	90	90	480

28	Column Formwork Installation	72,8	340	340	240	180	480
29	Column Casting	9,61	340	240	60	60	480

Labor Coefficient

In the description of each column structure work which includes the installation of column bending, column beksiting installation, and column casting, for each job there is a total workforce of 4 people, namely 1 worker, 1 handyman, 1 chief handyman, and 1 foreman. The results of the calculation of the labor coefficient can be seen as follows:

A. Labor Coefficient of Column Iron Installation Work

The Column Iron Installation Work carried out by 1 worker on July 27, 2024 can produce a column iron installation volume of 6.37 kg in 360 minutes with an effective time of 45 minutes and a provided time of 8 hours. The effective time is obtained from the duration of the work divided by the time provided, which is 360 divided by 8 hours.

$$\textit{Time Factor} = \frac{Waktu\ efektif}{Waktu\ yang\ disediakan} = \frac{45\ menit}{60\ menit/jam} = 0{,}313\ jam$$

So *Man Hour* for 1 kg volume of Column Iron Installation

$$\textit{Man Hour} = \frac{Time\ factor}{Volume\ pekerjaan} = \frac{0{,}313\ jam}{6{,}37\ kg} = 0{,}049\ jam/kg$$

$$\textit{Curtain} = \frac{Jumlah\ Tenaga\ Kerja\ x\ Koefisien\ Man\ Hour}{Jumlah\ Jam\ Kerja\ dalam\ 1\ hari}$$

$$= \frac{1\ orang\ x\ 0{,}049\ jam/kg}{8\ jam/hari} = 0{,}006\ orang/hari$$

The results of the calculation for the type of labor in the installation of column ironing for the foreman, the head of the foreman, the foreman can be seen in Table 4. 1

Table 4. 1 Labor Coefficient of Column Iron Installation Work In A Day

Labor Coefficient of Column Iron Installation Work								
Number of Employees	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	360	6	480	8	45	6,37	0,313	0,049	0,006
Number of Blacksmiths	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	360	6	480	8	45	6,37	0,313	0,049	0,006

Labor Coefficient of Column Iron Installation Work									
Number of Blacksmith Heads	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	90	1,5	480	8	22,5	6,37	0,031	0,0049	0,0006
Number of Foremen	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	90	1,5	480	8	11,25	6,37	0,031	0,0049	0,0006

B. Labor Coefficient of Column Formwork Installation Work

The installation of column formwork carried out by 1 worker on July 28, 2024 can produce a column formwork installation volume of 72.8 in 340 minutes with an effective time of 42.5 minutes and a provided time of 8 hours. The effective time is obtained from the duration of the work divided by the time provided, which is 340 divided by 8 hours.m^2

$$\textit{Time Factor} = \frac{Waktu\ efektif}{Waktu\ yang\ disediakan} = \frac{42{,}5\ menit}{60\ menit/jam} = 0{,}708\ jam$$

So *Man Hour* for 1 m^2 volume of Column Iron Installation

$$\textit{Man Hour} = \frac{Time\ factor}{Volume\ pekerjaan} = \frac{0{,}708\ jam}{72{,}8\ m^2} = 0{,}010\ jam/m^2$$

$$\textit{Curtain} = \frac{Jumlah\ Tenaga\ Kerja\ x\ Koefisien\ Man\ Hour}{Jumlah\ Jam\ Kerja\ dalam\ 1\ hari}$$

$$= \frac{1\ orang\ x\ 0{,}010\ jam/m^2}{8\ jam/hari} = 0{,}0012\ orang/hari$$

The results of the calculation for the type of labor in the installation of column ironing for the builder, the head of the builder, the foreman can be seen in Table 4. 2.

Table 4. 2 Labor Coefficient of Column Formwork Installation Work In A Day

Labor Coefficient of Column Formwork Installation Work									
Number of Employees	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	340	5,6	480	8	42,5	72,8	0,708	0,010	0,0012
Number of Carpenters	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	340	5,6	480	8	42,5	72,8	0,708	0,010	0,0012
Number of Carpenter Heads	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	240	4	480	8	30	72,8	0,500	0,007	0,0009

Labor Coefficient of Column Formwork Installation Work									
Number of Foremen	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	180	3	480	8	22,5	72,8	0,375	0,005	0,001

C. Column Casting Job Labor Coefficient

The column casting work carried out by 1 worker on July 29, 2024 can produce a column casting volume of 9.61 in 340 minutes with an effective time of 42.5 minutes and a provided time of 8 hours. The effective time is obtained from the duration of the work divided by the time provided, which is 340 divided by 8 hours.m^3

Time Factor = $\frac{Waktu\ efektif}{Waktu\ yang\ disediakan} = \frac{42{,}5\ menit}{60\ menit/jam} = 0{,}708\ jam$

So *Man Hour* for 1 m^3 volume of Column Iron Installation:

Man Hour = $\frac{Time\ factor}{Volume\ pekerjaan} = \frac{0{,}708\ jam}{6{,}37\ kg} = 0{,}074\ jam/m^3$

$Curtain = \frac{Jumlah\ Tenaga\ Kerja\ x\ Koefisien\ Man\ Hour}{Jumlah\ Jam\ Kerja\ dalam\ 1\ hari}$

$= \frac{1\ orang\ x\ 0{,}074\ jam/m^2}{8\ jam/hari} = 0{,}009\ orang/hari$

The results of the calculation for the type of labor in the installation of column ironing for the builder, the head of the builder, the foreman can be seen in Table 4. 3.

Table 4. 3 Labor Coefficient of Column Formwork Installation Work In A Day

Column Casting Job Labor Coefficient									
Number of Employees	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	340	5,6	480	8	42,5	9,61	0,708	0,074	0,009
Number of Bricklayers	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	240	4	480	8	30	9,61	0,708	0,074	0,009
Number of Head Masons	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	60	1	480	8	7,5	9,61	0,125	0,013	0,002
Number of Foremen	Duration of Work		Provided time		Effective Time	Volume of Work	*Time Factor*	*Man Hour*	*Curtain*
1	60	1	480	8	7,5	9,61	0,125	0,013	0,002

Comparison of Labor Coefficients in the Field and Planning

After obtaining the value of the labor coefficient for each job, the obtained value is put into a table and projected into a graph to see the size of the comparison based on the field and planning. The following is a comparison of labor coefficients for each job description.

Table 4. 4 Difference in Column Structure Labor Coefficient Values

	Ironing		Formwork		Casting	
	Field	Planning	Field	Planning	Field	Planning
Worker	0,006	0,007	0,0012	0,66	0,009	1
Blacksmith	0,006	0,007	0,0012	0,33	0,009	0,25
Blacksmith Head	0,0006	0,0007	0,0009	0,033	0,002	0,025
Foreman	0,0006	0,0007	0,001	0,033	0,002	0,01

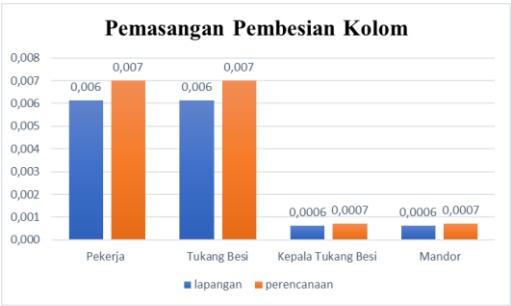

Figure 4. 1 Comparison Chart of Column Ironing Installation Coefficient Value

Figure 4. 2 Comparison Chart of Column Formwork Installation Coefficient Value

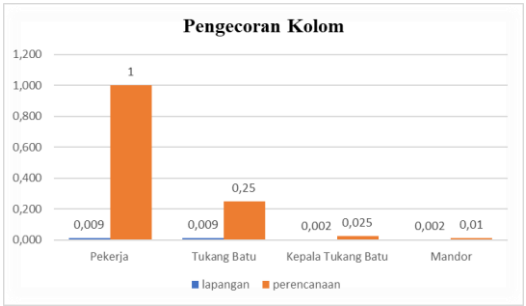

Figure 4. 3 Comparison Chart of Column Casting Coefficient Value Comparison Chart

Factors Affecting the Difference in the Value of Labor Coefficient in the Field and Planning

- Experience and Skill Level

  Based on the results of interviews with the field supervisors, the workers in the column structure work in this project decided to take advantage of the workforce

from outside the island, because based on the respondents' experience, the workers from outside the island have diverse skills. From what the workforce has, it can increase the value of the labor coefficient in the field.

- Working Method

  The work method or technique carried out in the field in the column structure work in this project for concrete reinforcement material uses concrete reinforcement that has been assembled so that when in the field what is done is only the installation and for the column formwork also uses the material that has been assembled so that when in the field what is done is only the installation, and for the casting of columns using ready mix concrete from PT. Nusantara Jaya Mix.

5. CONCLUSION

From the results of the research that has been carried out by researchers on the South Kalimantan Provincial High Prosecutor's Office Development project, the following conclusions are drawn:

1. The comparison of the value of the labor coefficient in the field was obtained smaller than the planning for each column structure work, namely, for work 1 Column Iron Installation, namely Workers, field (kg0.006OH) planning (0.007OH); Field blacksmith (0.006OH) planning (0.007OH); Head of field blacksmith (0.0006H) planning (0.0007OH); and foreman, field (0.0006OH) planning (0.0007 OH). For work 1, the installation of column formwork is Workers, field ($m^2$0.0012OH), planning (0.66OH); Carpenter, field (0.0012OH) planning (0.33OH); Head carpenter, field (0.0009OH) planning (0.033OH); and foreman, field (0.001OH) planning (0.033OH). For 1 column casting work, namely workers, field ($m^3$0.009OH), planning (1 OH); Masons, field (0.009OH) planning (0.25OH); Head mason, field (0.002OH) planning (0.025OH); and foreman, field (0.002OH) planning (0.01OH).
2. One of the factors that affects the difference in the value of the labor coefficient in the field and the planning in the column structure work in this project is the difference in the work method in the description of the work of installing column iron and column formwork, where the iron and formwork materials use rebar and formwork that have been assembled, so that this can shorten the work that will be carried out in the field and because the work time carried out is less Therefore, the value of the

labor coefficient in the field is also smaller than the value of the planned labor coefficient.

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