

Unit Price Comparison Analysis Study on Job Couple of Stone with Mortar

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ABSTRACT

Procurement of building work cannot be done haphazardly, there are special standards that must be met by workers involved in implementing the project. In a project work to calculate construction costs, it is necessary to make a detailed analysis/calculation of the amount of materials used and the wages of workers. This calculation is usually known as construction cost analysis, which is needed as a means to improve the efficiency and effectiveness of development activities in the construction sector. The purpose of this study was to determine the percentage difference in the unit price of materials and wages for masonry and mortar work between the SNI analysis method, and the field, and to determine the dominant component that differentiates and equals in the preparation of unit price analysis. The research method uses quantitative analysis. Where the SNI analysis data is compared with field analysis data. The results of this study indicate that in the component of the tool there is a ratio of the largest percentage difference, which is 12.341% and in the ratio of the percentage of the smallest difference to the component of the material, which is -0.167%. In the description of the concrete mixer material, there is a large index difference ratio of 12.210% and the decomposition of rock material, there is a small index difference ratio of -0.1%. So that the percentage difference in the total unit price of materials, wages and tools is -0.143%. There is a difference in the description of the tool components between the SNI and field analysis methods. That is, there are additional descriptions such as other materials in the field analysis, while in the SNI analysis there is no description of other materials. And also there is a difference in overhead + provision where in the field analysis it is 10% while in the SNI analysis it is 15%.

Keywords: unit price of work, comparison, SNI analysis, field analysis, materials, wages and equipment.

1. INTRODUCTION

The Construction cost analysis is a procedure for calculating the unit cost of construction work, which is described in a multiplication index of work materials and work wages with the price of work materials and standard wages for workers, to complete construction work. Construction cost analysis refers to SNI analysis. The Indonesian National Standard (SNI) is the only standard that applies nationally in Indonesia. SNI is formulated by a technical committee and determined by the National Standardization Agency (BSN). SNI is used as the basis for calculating price analysis to plan a construction work. However, contractors in general also make bid prices based on the results of their own analysis obtained from previous experiences in completing a construction work. Because of the many methods of analyzing unit prices, it is necessary to conduct research in terms of increasing efficiency in terms of construction financing, so that analytical calculations are obtained that are more relevant to current conditions. Research purposes. To find out the percentage difference between the unit price of materials and the wages of masonry and mortar work between the SNI and field analysis methods. To find out the dominant components that are the differentiators and similarities in the preparation of unit price analysis.

2. METHODS

Literature Review

"Comparative Analysis Study of Building Costs Using Methods About SNI and BOW". This research was conducted by Yan [1] which aims to analyze the Kwarda Pramuka Lampung building budget plan (RAB), by recalculating the unit price using the SNI and BOW methods with unit prices for wages, materials, and rent. the same tool for the 2013 output in the Bandar Lampung area. So that the results of the budget plan from the two methods can be compared whether there is a difference or not. "Comparison of Budget Plans Between BOW and SNI Methods in Building Expansion Works" This research conducted by Hidayat [2] emphasizes the skills of contractors in making cost estimates in order to obtain financial benefits. Where if the bid price submitted in the auction process is too high, it is likely that the contractor will experience defeat. On the other hand, if you win an auction with a price that is too low, you will experience difficulties later in life. Therefore, cost estimates have an important role in project implementation to control resources such as materials, labor, services and time. So we need a basic means of calculating unit prices, namely the analysis of construction costs that have been known, including SNI and BOW. "Analysis of the Budget Plan (RAB) for a Simple Healthy House (RSH) Type 42 Using Calculations Using the SNI Method Based on Hasar Prices and Medan City Government Unit Prices". This research was conducted by Siregar [3] aims to determine the calculation of the cost budget based on the unit price of wages and materials for the city of Medan and the unit price of the market/panglong. The author emphasizes efficient price comparisons while maintaining a simple and healthy building quality. The data collection method used in this research is to make observations to the marketing place for materials to one of the Panglong in Medan and then apply for a permit to obtain a unit price list of materials from the Medan-North Sumatra Public Works office. After that, the analysis was carried out using the SNI method. "Analysis of Work Unit Prices Using BOW, SNI, and Field Methods" This research was conducted by Fatchur [4]. This study aims to reduce the contractor's skills in choosing the construction cost analysis method between SNI, BOW and field/contractor analysis, to increase efficiency in project implementation to plan and control resources such as materials, labor, services and time. Where the three methods are compared to get an efficient and accountable cost. The method used in this thesis is a quantitative and comparative method, namely calculating the unit price based on the analysis method of the PUPR Ministerial Regulation No. 28 of 2016 then compared with field analysis. Data collection. In the analysis of unit prices for building works used secondary data obtained from field implementation data and analysis of the Minister of Public Works and Public Housing No. 28 of 2016. The data consists of: List of unit prices used in the research area, list of unit prices for wages for the research area, budget plan project review, list of analysis guidelines based on the PUPR Ministerial Decree No. 28/2016. Analysis Procedure To make it easier to carry out calculations, a flowchart for writing the final project was made, including the following: Collecting data obtained from the project implementing contractor, calculating the unit price analysis of materials, wages and equipment using the analytical method of PUPR Ministerial Regulation No. 28 of 2016, calculating the price work unit using the analytical method, comparing the two methods, namely the field analysis method and the Minister of Public Works and Public Housing Regulation No. 28 of 2016 and discussions and conclusions.

3. RESULTS AND DISCUSSION

Field method analysis

No	Component	Estimated	Unit Quantity	Unit Price (Rp.)	Total Price (Rp.)
A Power					
1	Workers (Lo1)	Orsak	2.0080	9,285.71	18,646.01
2	Builder (Lo2)	Orsak	1.0040	13,571.43	13,625.93
3	Foreman (Lo3)	Orsak	1.0040	13,571.43	13,625.93
Total Energy Price					45,897.88
B Material					
1	Stone (M02)	M3	1,080	273,800,000	295704.00
2	Cement (PC) (M12)	kg	161,280	2175.46	350,858.98
3	Sand (M01)	M3	0.0483	716,308.15	345,886.76
Total Material Price					992,449.75
C Equipment					
1	Concrete mixer	Orsak	1.0040	60,390,24	60632.77
2	Device	ls	1.0000	600.00	600.00
Total Equipment Price					61232.77
D Total Price of Materials and Equipment (A + B + C)					1,099,580.40
E Overhead & Profit			10.0% XD		109,958.04
F Work Unit Price (D + E)					1,209,538.00

From the field unit price analysis data above, the unit price used in masonry with mortar work is obtained, with a work volume of 119.10 m³ on the Mukun-Ladok-Mbata road project, East Manggarai NTT. Data analysis based on RAB compiled by the project contractor. Analysis of the SNI Method (Permen PUPR no 28 of 2016).

No	Component	Estimated	Unit Quantity	Unit Price (Rp.)	Total Price (Rp.)
A Power					
1	Workers (Lo1)	Drocek	1,800	9,285.71	16,714.30
2	Builder (Lo2)	Drocek	0.900	13,571.43	12,214.30
3	Foreman (Lo4)	Drocek	0.180	13,571.43	2,442.85
Total Energy Price					31,371.45
B Material					
1	Split stone (M05)	M3	1,200	273,800,000	328,560
2	Cement (PC) (M12)	kg	252	2175.48	548,215.92
3	Sand (M01)	M3	0.440	716,308.15	315,175.80
Total Material Price					1,191,951.52
C Equipment					
1	Concrete mixer	Drocek	0.076	60,390.24	4,589.70
Total Equipment Price					4,589.70
D Total Price of Materials and Equipment ($A + B + C$)					1,227,912.87
E Overhead & Profit			10.0% XD		184,186.90
F Unit Price of Work ($D + E$)					1,412,009.59

From the data analysis of the unit price of the SNI method above, it is obtained the unit price used in masonry work with mortar, on the Mukun-Ladok-Mbata road project, East Manggarai NTT. The analysis data was obtained from the author's analysis calculations based on the SNI analysis method, with the coefficients following the standard SNI analysis method.

Comparative Analysis of Material Unit Prices. From the table, the results of the comparison of the unit prices of materials on masonry with mortar work are obtained, that the analysis of the SNI price has a higher price of Rp. 1,191,951,52 compared to the price in the field analysis which only obtained a price of Rp. 992,449.75. In addition, the comparison in the table above also obtains differences in coefficient values so that there are differences in price differences, and a little description of the materials used such as stone and split stone. The index value of the field material is obtained from the assumption data and calculated using the formula as follows:

1) Stone coefficient

$$\text{coef. Stone} = \frac{113}{2} \quad 1$$

Where:

Bt = ratio of stones

$D1$ = density of masonry with mortar

$D2$ = specific gravity of the stone

$Fh1$ = loss factor (stones)

Then obtained:

$$\text{Stone} = \frac{60\% \cdot 2.40 \cdot 113 \cdot \text{Coef.}}{1.60} \times 1.20$$

2) Cement coefficient (PC

$$\text{coef. cement} = \left\{ \frac{113}{3} \right\} \times D5 \times 1000$$

Where :

Sm = cement ratio

Mr = mortar ratio

$D1$ = density of masonry with mortar

$D3$ = specific gravity of mortar (mortar)

$Fh2$ = loss factor (cement)

$D5$ = specific gravity of cement

Then obtained:

$$\begin{aligned} \text{coef. Cement} &= \left\{ \frac{20\% (40 \times 2.40 \times 1m^3)}{1.80} \cdot 1.05 \right\} \cdot 1.44 \times 1000 \\ &= 161.28 \end{aligned}$$

3) Sand coefficient

$$\text{coef. Sand} = \frac{113}{4} \quad 2$$

Ps = sand ratio

Mr = mortar ratio

$D1$ = density of masonry with mortar

D_4 = specific gravity of sand
 F_{h2} = loss factor (cement)

Then obtained:

$$\text{coef. Sand} = \frac{80\% (40 \cdot 2.40 \cdot 1.3)}{1.67} \cdot 1.05$$

$$= 0.4829$$

To calculate the difference in the material index between SNI analysis and field analysis, you can: the following formula is used:

$$\text{difference between field material index vs SNI} = \frac{\text{field index} - \text{SNI index}}{\text{SNI index}} \times 100\%$$

Then obtained as follows:

a. Stone

$$\text{the difference between the field material index vs Sni} = \frac{1000000 - 1000100}{1000100} \times 100\%$$

$$= -0.1\%$$

b. PC cement

$$\text{difference between the field material index vs Sni} = \frac{1000000 - 1000360}{1000360} \times 100\%$$

$$= -0.360\%$$

c. Sand

$$\text{difference between the field material index vs Sni} = \frac{1000000 - 1000890}{1000890} \times 100\%$$

$$= -0.890\%$$

Then the following results are obtained:

$$\text{difference in the price of field materials vs. Sni} = \frac{31371.45 - 45897.88}{45897.88} \times 100\%$$

$$= -0.1674\%$$

From the calculation results obtained a comparison of the difference in the unit price of materials between the SNI - Field method, has a percentage which is -0.1674%.

Comparative Analysis of Wage Unit Prices. From the comparison of wage unit price analysis between SNI and field analysis, it is obtained that the SNI analysis has a lower price of Rp.31,371.45 compared to the field analysis which only obtained a price of Rp.45,897.88. Differences in coefficient values that cause differences in prices for SNI and field analysis. There is no difference in the components used in the SNI and field analysis. The value of the field wage index is obtained from the assumption data and calculated using the formula as follows:

a) Workers

$$\text{Index value} = \frac{7.00 \ 2.00}{6.97}$$

$$= 2.0080$$

b) Builder

$$\text{Index value} = \frac{7.00 \ 1.00}{6.97}$$

$$= 1.0040$$

c) Foreman

$$\text{Index value} = \frac{7.00 \ 1.00}{6.97}$$

$$= 1.0040$$

To calculate the difference in the wage index between the SNI analysis and the field analysis, you can: the following formula is used:

difference between field wage index vs SNI = _____ x 100%
 Then the following results are obtained:

a. Worker

$$\text{the difference between the field material index vs SNI} = \frac{?}{?} \times 100\%$$

$$= 0.120\%$$

b. Craftsman

$$\begin{aligned} \text{the difference between the field material index vs Sni} &= \frac{\quad}{\quad} \times 100\% \\ &= 0.120\% \end{aligned}$$

c. Foreman

$$\begin{aligned} \text{the difference between the field material index vs Sni} &= \frac{\quad}{\quad} \times 100\% \\ &= 4.57\% \end{aligned}$$

To calculate the wage difference between the SNI method and the field, the following formula is used:

$$\text{difference in the price of field wages vs Sni} = \frac{\quad}{\quad} \times 100\%$$

Then the following results are obtained:

$$\begin{aligned} \text{difference in the price of field wages vs SNI} &= \frac{\quad}{\quad} \times 100\% \\ &= 0.463\% \end{aligned}$$

From the calculation results obtained a comparison of the difference in the unit price of wages between the method SNI – Field, has a percentage of 0.463 %. Comparative Unit Price Analysis Tool. From the comparison of unit price analysis between SNI and field analysis above, it is found that the price of SNI analysis has a low price of Rp. 4,589.70, compared to the higher field analysis price of Rp. 61,232.77. The difference in the value of the coefficient that causes the difference in the number of prices. And there are additions to the description of the tools in the field analysis, namely tools. To obtain the index value of the tool, calculations are carried out based on the assumption data using the following formula:

$$Q1 = \frac{60}{1000} \times 1$$

Where :

Q1 = production capacity/hour

V = tool capacity

Fa = 9ias99 device efficiency

Ts1 = cycle time (stirring, waiting, pouring etc.)

Then obtained:

$$\begin{aligned}
 Q1 &= \frac{300.00 \cdot 0.83 \cdot 60}{1000 \cdot 15.00} \\
 &= 0.996 \\
 \text{Tool index/m}^3 &= \frac{1}{0.996} \\
 &= 1.0040
 \end{aligned}$$

To calculate the difference in the wage index between SNI analysis and Field analysis the following formula can be used:

$$\text{difference in index of field tools vs SNI} = \frac{\text{Field Index} - \text{SNI Index}}{\text{SNI Index}} \times 100\%$$

Then the following results are obtained:

a. Concrete mixer

$$\begin{aligned}
 \text{difference in index of field tools vs SNI} &= \frac{12.210 - 0}{0} \times 100\% \\
 &= 12,210\%
 \end{aligned}$$

To calculate the wage difference between the SNI method and the field, the following formula is used:

$$\text{the difference in the price of field tools vs SNI} = \frac{\text{Field Price} - \text{SNI Price}}{\text{SNI Price}} \times 100\%$$

Then the following results are obtained:

$$\begin{aligned}
 \text{difference in the price of field equipment vs SNI} &= \frac{12.341 - 0}{0} \times 100\% \\
 &= 12,341\%
 \end{aligned}$$

From the calculation results obtained a comparison of the difference in the unit price of the tool between the SNI method – Field, has a percentage of **12.341%**

4. CONCLUSION

The percentage of the difference in unit prices of materials and wages for masonry and mortar work between SNI and field analysis methods. In the tool component, the largest percentage difference ratio is 12.341%. And in the ratio of the percentage of the smallest difference in the material components, which is -0.167%. In the description of the concrete mixer material occurs the ratio of the large index difference is 12.210% and the decomposition of rock material occurs in the small index difference ratio is -0.1%. The percentage difference in the total unit price of materials, wages and tools is -0.143%. Dominant components that become differentiators and similarities in the preparation of unit price analysis. There is a difference in the description of the tool components between the SNI and field analysis methods. That is, there are additional

descriptions such as other materials in the field analysis, while in the SNI analysis there is no description of other materials. There is a difference in overhead + provide where the field analysis is 10% while the SNI analysis is 15%.

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