

# Analysis of Worker Productivity Based on Work Wage Costs in Laboratory Construction Dinas Pekerjaan Umum Nagan Raya

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**Abstract:-** One of the most important factors in a construction project is labor wages. To find out labor wages, a measurement of labor productivity is needed which will later help contractors in improving project planning, which is one of the steps in getting a cost budget. Productivity can be used as a parameter in determining activity duration, number of workers, and costs. The main problem is analyzing or measuring the value of productivity/hours/people for each type of work in determining wages. The target of construction cost analysis using SNI 2007 is recalculated into SNI 2008. Based on the results of research on the Laboratory building construction project Dinas PU Nagan Raya The results obtained for bricklaying work according to the 2007 SNI planner's wages were not more efficient when compared to the 2008 SNI contract with details of the 2007 SNI work unit price of Rp. 18,000,-/person/m<sup>2</sup> and according to SNI 2008 it is Rp. 15,000,-/person/m<sup>2</sup>, while from the results of work productivity in the field Rp. 21,085,- /person/m<sup>2</sup>. If for brick wall plastering work, the wage calculation according to the 2007 SNI planner is IDR. 7,000/person/m<sup>2</sup> is not more efficient when compared to the 2008 SNI piece rate of Rp. 16,000,-/person/m<sup>2</sup>, while productivity in the field is Rp. 11,820,-/person/m<sup>2</sup>. For painting work according to the 2007 SNI planner Rp. 3,500,- /person/m<sup>2</sup>, not more efficient compared to the 2008 SNI wholesale rate of Rp. 3,000,-/person/m<sup>2</sup>, from productivity results in the field Rp. 11,975,- /person/m<sup>2</sup>.

**Keywords:-** Worker Productivity; Brick; Wages; Dinas PU; Nagan Raya.

## I. INTRODUCTION

Wages are one of the most important factors in construction projects. To find out labor wages, a measurement of labor productivity is needed which will later help contractors in improving project planning, which is one of the steps in getting a cost budget. The labor factor is a necessity in carrying out construction. Contractors are faced with the decision to determine the number of workers because it relates to costs or work scheduling.

Productivity can be used as a parameter to determine activity duration, number of workers, and costs. The costs for

work on buildings and other structures are something that needs to be known by everyone who is involved in the construction profession, namely by owners, consultants and contractors. The construction costs referred to here can be interpreted as costs of every type related to construction work. So that you will get a price that is appropriate for construction workers' wages in accordance with the current conditions and circumstances. This is a reference benchmark or standard to complete the payment of workers' wages contained in the cost analysis according to SNI (Indonesian National Standard) issued by the residential research and development center, while the BOW (Burgerlijk Openbare Werken) standard is no longer suitable for use in the current situation because Many BOW coefficients are no longer suitable or irrelevant (for example cost overruns in labor coefficients) according to entrepreneurs in the construction services sector.

Laboratory Construction Project Dinas Pekerjaan Umum Nagan Raya is a type of physical construction that is carried out within a limited time period and uses limited human resources as well. Laboratory Construction Project Dinas Pekerjaan Umum Nagan Raya is located in the office complex, Nagan Raya Regency, with a permanent building area measuring 344 m<sup>2</sup> for the first floor and second floor.

### ➤ Formulation of the Problem

Based on the background description above, the main problems related are:

- How to analyze or measure the value of productivity/hour/person for each type of wall work in Laboratory Construction Dinas Pekerjaan Umum Nagan Raya?
- How to determine wages for workers on wall work in Laboratory Construction Dinas Pekerjaan Umum Nagan Raya?

### ➤ Research purposes

Based on the problem formulation above, the objectives of this research are as follows:

- Know the productivity value of wall work in the construction of the Laboratory building Dinas Pekerjaan Umum Nagan Raya.
- Know how to determine work wages in the construction of a laboratory building Dinas Pekerjaan Umum Nagan Raya in accordance with work wage standards.

➤ *Scope of problem*

The limitations used to make this research more focused include:

- Review of activities in the Laboratory Construction project Dinas Pekerjaan Umum Nagan Raya in the Suka Makmu Nagan Raya office complex.
- Analyze labor wages based on measures of worker productivity on wall work.
- This research reviews the productivity problem of workers who are directly involved in the field, such as craftsmen and helpers.

## II. LITERATURE REVIEW

➤ *Productivity*

Productivity is a factor that greatly influences the success of a project in achieving the required time, quality and cost targets. So it is important to pay attention to worker productivity information considering the unique characteristics of construction projects, namely that there are never any similarities between one project and another. Productivity can also be said to be a rough measure of the effectiveness of the use of very important productive resources. Generally, the factor used as a measure of work productivity is labor, this is due to the large costs sacrificed for labor as part of the largest costs for procuring production or services (Soedrajat, 1994).

➤ *Wages*

A wage system based on productivity is a system of paying wages to workers according to the productivity of each worker or group of workers and the conditions of the company. The condition and productivity of the company are influenced by the productivity of each worker. If the overall productivity of each worker increases, then the company's productivity will also increase. If the company's productivity increases, the company should increase wages. In other words, when the company's conditions are bright, employees deserve to receive high wages. On the other hand, when a company is sluggish because worker productivity generally decreases, fair wages are reduced (Moekijat, 1992).

➤ *Wall Filling Material*

Wall construction is an important component in every physical construction process of housing and buildings. The wall functions as a room divider. According to Ibrahim (2007), material is the amount of material needed to complete a part of a job. In general, the known wall filling materials include bricks, concrete blocks and foam bricks.

Bricks are a type of wall filling material made from clay with or without other materials, which are burned at high temperatures, so they do not crumble when soaked in water. Generally, red bricks are in the form of blocks with dimensions of 220 mm x 110 mm x 50 mm. However, this size differs from one region to another. This is because the dimensions and processing techniques are not adhered to (Daryanto, 2001).

➤ *Plastering*

Plastering each wall is not always the same, usually the ratio of the mixture of species for plastering is the same as the ratio of the mixture of species used to install the plastered wall. If it is desired that the surface is hard, the material for the final finish (finishing) is added with sufficient portland cement (PC).

Huntington and Mickadeit (1975), stated that plaster is applied by hand or machine. If using hands, the cement mixture is piled on a board (base) where the cement mixture is placed after being stirred with a stirrer such as a molen or stirred using a shovel and hoe. The cement or mortar mixture is transported from the piling board onto the wood or metal hawk using a metal trowel, transferred from the metal hawk to the wall and spread with the trowel.

Daryanto (2001), states that making plaster is coating a pair of bricks, both river stone and printed stone (brick) so that the surface is not easily damaged, and also so that it looks neat and clean. According to its nature, plaster is divided into 3 types:

- *Rough plastering*

To cover the surface of bricks or split stone masonry that cannot be seen from the outside, for example walls above ceiling frames, foundation pairs that are eventually filled in.

- *Half smooth or half rough plaster*

For warehouse floor surfaces, sports field floors, terrace floors, bathroom floors, and so on.

- *Smooth plastering*

As a coating for the walls of a house which is related to the beauty or neatness of the view.

➤ *Labor*

Labor is the amount of energy needed to complete parts of the work in one work unit (Ibrahim, 2007). Labor is every person who has the ability to do work to produce goods or services. A worker is qualified if he is deemed to have the necessary physical characteristics and abilities, has intelligence, certain experience, and has sufficient skills and knowledge (Kartasapoetra, 1988). Meanwhile, according to Napitulu (1987), what is meant by standard workers are skilled workers (skilled labor) who can only do one type of work.

## III. RESEARCH METHODS

This chapter will briefly describe the location and situation of the project as well as troubleshooting procedures. Apart from that, the analysis methods and data completion steps are also explained.

- ❖ *Method of collecting data*

The data needed in this research consists of primary data and secondary data. Observation of brick wall plastering work starts in the morning when the workers start working until the afternoon when the workers finish their work.

- *Primary data*

Primary data is data obtained from observations of ongoing work in the field or called measurements. The data collection method uses a direct observation system which is carried out manually. Primary data that will be observed and collected are:

- ✓ The characteristics of workers from which data is collected are name, age, origin, experience and wages. Carried out using the interview method;
- ✓ Layout the workplace situation to get the layout of the material, mortar mixing;
- ✓ Effective working time, calculated based on working hours per day for each worker, without taking into account rest time;
- ✓ The visible area of the wall is m<sup>2</sup> which is successfully plastered in 1 day;
- ✓ Thick layer of plaster.

- *Secondary data*

Secondary data is data obtained in finished form from related agencies. Secondary data collection was carried out before primary data collection was carried out. This secondary data is in the form of work photos, a map of Aceh Province, a map of Johan Pahlawan District, and bestek images.

- *Data processing stages*

Data obtained from direct observations in the field is made into a work observation table in the field. The data is:

- ✓ Type of work, to find out the type of work that was observed at that time, namely brick masonry installation.
- ✓ Observation time.
- ✓ Duration of observation, from the difference between the start and end times of the observation and the duration of the observation, which is 7 hours because there is 1 hour of rest time for workers during the day, namely 12.00-13.00 WIB.
- ✓ Quantity of work, to find out the amount or quantity of work that can be produced during the observation.
- ✓ Number of workers, to find out the number of workers involved in the process of carrying out the work.
- ✓ Relations between workers, to find out the working relationship between the workers themselves so that there is no conflict between the workers with good coordination so that the work can run smoothly.
- ✓ Material distance, to find out how far the material is from the location where the work is being carried out.
- ✓ How to transport materials, to find out how to transport materials to the location where the work is being carried out.
- ✓ Field conditions, to find out the circumstances and conditions in the field.
- ✓ Productivity, to find out the productivity obtained during these observations. This productivity is obtained from dividing the quantity of work by the duration of the work.

After obtaining productivity data from the work observation table in the field, a manhour table will be created. Manhour is the number of workers in one unit of work for one hour. The data that will be presented in the manhour table are:

- ✓ Time of observation, is the date on which the observation of a type of work was carried out.
- ✓ The number of workers is the number of foremen, craftsmen and helpers working on a job.
- ✓ 1 day's wages, is the amount of wages a craftsman receives for one day's work, usually a worker works for 7 hours per day.
- ✓ The conversion value for craftsmen is the comparison of the value of wages in one day with the wages of craftsmen. Here it is considered that the craftsman is a standard in calculating productivity.
- ✓ Productivity is the quotient of the quantity of work by the duration of that work. It is divided into two, namely productivity for 1 hour and productivity for 7 hours.
- ✓ Rupiah for 1 manhour, is the wage given to one worker for one hour of work.
- ✓ Work units are divided into two, namely work wages and manhours. Work wages are wages given to 1 person in one unit of work.

- *Data processing methods*

Department Laboratory building construction project, is the 2007 SNI to calculate the contractor's contract analysis, calculated back into the 2008 SNI to calculate the standard wages issued by the government using the formulas of equation 2.1 and 2.2 regarding productivity and number of workers which have been explained in chapter II to look at broader targets for building construction, so that the wages paid to workers by contractors are adequate or meet the standards determined by the Indonesian government according to each type of work.

The target of this construction cost analysis, which is used in the Nagan Ray Public Works Department Laboratory building construction project, is the 2007 SNI to calculate the contractor's contract analysis, calculated back into the 2008 SNI to calculate the standard wages issued by the government using the formulas of equation 2.1 and 2.2 regarding productivity and number of workers which have been explained in chapter II to look at broader targets for building construction, so that the wages paid to workers by contractors are adequate or meet the standards determined by the Indonesian government according to each type of work.

The use of work unit price analysis according to SNI in this research is after obtaining the work unit price according to a formula calculation from data obtained in the field, it is compared with the work unit price according to SNI (Indonesian National Standard) 2008. The work unit price is the price that must be paid to one worker in completing one type of work.

#### IV. RESULTS AND DISCUSSION

The results of data processing are based on the methodology stated in the research method and data from observations in the field. The discussion is directed at unit price analysis of brick wall work on the Nagan Raya Public Works Department Laboratory building construction project.

➤ *Results*

In this research, brick wall masonry work, brick wall plastering work, wall ceramic work and painting work will be explained.

➤ *Data analysis*

As a result of observing data in the field, a table was created regarding the processing results of each type of work observed. Observations for the Nagan Raya Public Works Department building construction project include brick installation work, wall plastering work, ceramic masonry work and painting work.

• *Brick installation work on wall work*

For brick installation work on the Nagan Raya Public Works Department building project, the brick masonry used is half (1/2) brick with a mixture of 1 PC : 4 PP. Observation results for brick installation work can be seen in table 1 as follows:

**Table 1 Brick Masonry Results**

No	Karakteristik	Deskripsi
1	Pekerjaan	Pasangan bata
2	Waktu Pengamatan	10 September 2013 Jam 08.30 - 17.30 WIB
3	Durasi Pengamatan	5,63 Jam
4	Kuantitas Pekerjaan	35,77 m <sup>2</sup>
5	Jumlah Pekerja	21 orang
6	Hubungan antar pekerja	Tidak terjadi konflik
7	Jarak Material	2 - 40 m
8	Cara Pengangkutan Material	Timba dan kereta sorong
9	Kondisi Lapangan	Tanah
10	Produktivitas	6,41 m <sup>2</sup> /jam

• *Brick wall plastering work*

Brick wall plastering work Laboratory building construction project on Dinas Pekerjaan Umum Nagan Raya, brick plastering using a mixture of 1 PC : 4 PP. Observation results for wall plastering work can be seen in table 2 as below:

**Table 2 Plastering Results**

No	Karakteristik	Deskripsi
1	Pekerjaan	Plesteran
2	Waktu Pengamatan	26 September 2013 Jam 08.30 - 17.30 WIB
3	Durasi Pengamatan	6,25 Jam
4	Kuantitas Pekerjaan	100,99 m <sup>2</sup>
5	Jumlah Pekerja	16 orang
6	Hubungan antar pekerja	Tidak terjadi konflik
7	Jarak Material	2 - 40 m
8	Cara Pengangkutan Material	Timba dan kereta sorong
9	Kondisi Lapangan	Tanah
10	Produktivitas	16,88 m <sup>2</sup> /jam

• *Painting work*

Wall painting work on the Nagan Raya Public Works Department Laboratory building construction project. Observation results for wall painting work can be seen in table 3 as below:

**Table 3 Painting Results**

No	Karakteristik	Deskripsi
1	Pekerjaan	Pengecatan
2	Waktu Pengamatan	17 Oktober 2013 Jam 09.00 - 17.30 WIB
3	Durasi Pengamatan	6,33 Jam
4	Kuantitas Pekerjaan	137,65 m <sup>2</sup>
5	Jumlah Pekerja	13 orang
6	Hubungan antar pekerja	Tidak terjadi konflik
7	Jarak Material	2 - 40 m
8	Cara Pengangkutan Material	Timba dan katrol
9	Kondisi Lapangan	Tanah
10	Produktivitas	22,00 m <sup>2</sup> /jam

**V. CONCLUSIONS AND RECOMMENDATIONS**

➤ *Conclusion*

Based on the results of research and data analysis, it can be concluded as follows:

- Based on research on the Laboratory building construction project Dinas Pekerjaan Umum Nagan Raya the results obtained for bricklaying work according to the 2007 SNI Analysis planner wages are not more efficient when compared to the 2008 SNI Analysis piece rate with details of the 2007 SNI work unit price of IDR 18,000/person/m<sup>2</sup> and according to the 2008 SNI it is IDR. 15,000,-/person/m<sup>2</sup>, Meanwhile, from the results of research analysis of worker productivity based on the cost of work wages that should be paid is Rp. 21,085,-/person/m<sup>2</sup>.
- Brick wall plastering work resulting from the calculation of unit wages for work according to the 2007 SNI planner Rp. 17,000,-/person/m<sup>2</sup> while the piece rate according to SNI 2008 is Rp. 16,000,-/person/m<sup>2</sup>. From the results of the analysis, it is better to pay wage costs because work productivity results can be paid at 11,820/person/m<sup>2</sup>, which is more efficient because the cost difference is not too great.
- Meanwhile, the piece rate for wall painting work from the calculation of unit wages for work according to the planner using SNI 2007 is Rp. 3,500,-/person/m<sup>2</sup> is no better compared to the 2008 SNI of Rp. 3,000,-/person/m<sup>2</sup>. Meanwhile, from the research results of the analysis of worker productivity based on the cost of work wages that should be paid is Rp. 11,975,- /person/m<sup>2</sup>.

➤ *Suggestion*

After making direct observations in the field and analyzing the data, there are several suggestions for further research into productivity in the future, namely:

- There is a need for research on the decline in productivity towards midday and the end of working hours.

- There is a need for research on productivity during overtime hours, considering that the wages for overtime work are twice the wages for daily work.

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