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Evaluation of The Implementation of The Periodic Maintenance of The Road Project Limit-Kudangan-Penopa West Kalimantan Province Republic Indonesia

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Abstract: To support the integrated urban infrastructure development, the Government through the Ministry of public works and public housing perform periodic maintenance of road projects to promote the smooth progress of the economy. One of the national roads in the Lamandau Regency Central Kalimantan is the road of West Kalimantan Limit – Kudangan – Penopa. Current road conditions are inadequate for the development of traffic. The goal of the research is to (1) Obtain the required fee for the Periodic maintenance of the project Boundary Road West Kalimantan – Kudangan – Penopa, Regency Lamandau, (2) get the most appropriate time required implementing periodic alimony in the streets the street boundaries of West Kalimantan – Kudangan – Penopa in the Lamandau Regency. The location of the research is the implementation of section roughness of the road the Road West Kalimantan Limit – Kudangan – Penopa, Regency Lamandau. Periodic Road Maintenance Package Program limit of West Kalimantan – Kudangan – Penopa, with a contract value of Rp 9.75 billion, contract no. HK. At 02/PPK. Penopa-Wil. 1/KTRK/IV/2015/37, 30 April 2015 and long road km. 7.846

Keywords: Maintenance intervals, Critical Path, National Road

1. Introduction

1.1. Background

To support the integrated urban infrastructure development by the Central Government through the Ministry of public works and Housing conducted periodic maintenance project of the road to promote the smooth progress of the economy, especially in the area Lamandau Regency. One of the national roads in the Lamandau Regency Central Kalimantan is the road of West Kalimantan Limit – Kudangan – Penopa. Current road conditions are inadequate for the development of traffic, arising out of damage layers of aus, i.e., horizontal crack, crack, crack the edge of crocodile skin, cracked the connection, the connection road widening crack, crack, crack, shrink reflection crack skid and Groove. It becomes a problem that merely interferes with the user of the road Department of West Kalimantan – Kudangan – Penopa.

Direktoral General of Bina Marga as one of the relevant agencies anticipate holding a regular road maintenance project boundaries of West Kalimantan – Kudangan –

Penopa. Thus the capability and capacity of the road on the road is expected to be maintained to support the smoothness and comfort of berjalulintas so that all obstacles can bereduced. Of these problems need to be evaluated for the periodic maintenance of the roads in West Kalimantan Boundary roads – Kudangan – Penopa in the Lamandau Regency, that Periodic Road Maintenance Package Program limit of West Kalimantan – Kudangan – Penopa, with contract No.: HK. At 02/PPK. Penopa-Wil. I/KTRK/IV/2015/37, on April 30, 2015, by which time the implementation of 180 calendar days starting from the date of April 30, 2015, until January 2015.

1.2. The formulation of the problem

From the background of the wording of the question can be made as follows:

1. What is the cost required for the periodic maintenance of the project Boundary Road West Kalimantan – Kudangan – Penopa Lamandau Regency?
2. How much time is necessary for the implementation of periodic maintenance of the roads in the West Kalimantan Boundary roads – Kudangan – Penopa in the Lamandau Regency?
3. What work Activities is critical work?

1.3. Research objectives

Research objectives are as follows:

1. Get the cost of the necessary expenses for periodic Boundary road maintenance project of West Kalimantan – Kudangan – Penopa Lamandau Regency.
2. Get the time required for the implementation of regular maintenance of the roads in West Kalimantan Boundary roads – Kudangan – Penopa in the Lamandau Regency.
3. Getting the activity work that is critical work.

2. Literature Review

2.1. Previous Research

1. Fleet's son Tommy [1][2][3]

Title test is in this research is Economic analysis of road repair Palembang – Betung Kab. Betung Against Value loss due to congestion, the conclusion is as follows: 1. Get the economic value of improvements to road Kilkenny – Betung Kab. Betung. 2. loss due to overcrowding and comparison between them

2. Amin Khairi [4]

The title of the thesis in this research are: the evaluation of the type and degree of damage by using the method of Pavement Condition Index (PCI), the conclusion is as follows: In this study aims to evaluate the time required for periodic maintenance utilizing the technique of Pavement Condition Index (PCI).

2.2. Basic Theory

The road is one of the infrastructures of transport links are vital for economic growth and social society. Ground transportation supported by an extensive road network serves as the physical infrastructure facilities for the benefit of the people[5][6].

2.2.1. Definition Of The Road

The highway is the main road that connects one region with the area of the other. Usually the way this big has the following characteristics[7][8]:

1. used for motor vehicles
2. Used by the general public
3. Financed by State enterprises
4. The laws of the transport govern its use

The existence of the road infrastructure is excellent and smooth for an essential role in the continuous flow the movement of commodities that will be able to move the development of peri's social life and improve the economy of the community.

2.2.2. *Parts Of The Road*

Part-road section consists of space benefits the street right of way, space, space surveillance of the road[9][10][11].

1. Road Benefits Space

Space road benefits include road, a street, and the threshold of security. Road benefits space is the space along the way which is limited by the width, height, and depth of a specific set by organizers of the road in question based on the guidelines set out by the Department of authorities.

2. Spaces Of Way

Space right of way is comprised of spaces one-lane roads and benefits of certain land in outer space benefits the way. The power of way is space spaces along the road which is bounded by the width, depth, and height[12][13].

3. Space Surveillance Road

Space surveillance of the road is specific space in outer space belongs to the way that its use under the supervision of the organizers of the way. Space surveillance of the form reserved for a free view of the driver and road construction as well as the safeguarding of the function of the security road[14][15].

2.2.3. *Road Construction*

Basically road construction is the process of opening traffic space that overcomes various geographic obstacles. This process involves the transfer of the face of the earth, the development of bridges and tunnels, even the transfer of vegetation and also the removal of forests. Water drainage is one of the factors that must be taken into account in the construction of roads. Water that collects on the road surface after rain does not only endanger road users, it will even erode and damage the road structure[16][17].

2.2.4. *Roadworks*

Road works include the work of installing edge stones and onderlaag, work of slytlaag stone layered work, penetrating stone and penetration pavement with a thickness of 4 cm in solid with 4.5 kg / m² asphalt, 3 cm thick lataston emission work, work on the left and right sides of the road[18][19][20].

3. Research Methods

The population of this study is a project in the area of the National Road Implementation Unit of Region I of Central Kalimantan Province. The sample of this study is an increase in the boundary of the boundary of Kalbar - Kudangan - Penopa, Lamandau Regency with contract no. : HK.02. 03 / PPK.Penopa-Wil.I / KTRK / IV / 2015/37, dated 30 April 2015, with an implementation time of 180 calendar days starting from 30 April 2015 to 26 October 2015.

4. Discussion and Data Analysis

4.1 *Planning Periodic Maintenance Activities*

a. Data collection of periodic maintenance plans and metrics used

The ideas for periodic and meterial maintenance activities used are as follows:

Table 1. Activity Plan for Periodic Maintenance Work and Materials Used (*in Indonesia*)

Uraian Pekerjaan	Satuan	Kuantitas	Harga Satuan (Rp)	Jumlah Harga (Rp)
1. Umum				
Mobilisasi	Ls	1,00	57.742.165,05	57.742.165,05
2. Pekerjaan Drainase				
Pasangan Batu dengan Mortar	m ³	810,00	880.021,00	712.817.010,00
3. Pekerjaan Tanah				
Timbunan Pilihan Dari Sumber Galian	m ³	900,00	89.517,00	80.560.800,00
4. Pelebaran Perkerasan dan Bahu Jalan				
Lapis Pondasi Agregat Kelas S	m ³	3.008,80	550.751,00	1.657.099.608,80

b. Job weight assessed in a percentage of activities towards all activities

$$\text{"Work Weight" (\%)} = \text{"Activity Fee"} / \text{"Project Cost"} \times 100\%$$

c. Periodic Maintenance Activity Plans From table 2, we then make a weight distribution in the schedule of the regular maintenance activity plan and calculate the progress plan of the activity with the formula:

$$\begin{aligned} &\text{"Progress Plan" (\%)} \\ &= \text{"Cost of Activities That Have Been Used"} / \text{"Project Cost"} \times \text{"100\%"} \end{aligned}$$

4.2 Determination of Critical Pathways (Critical Path)

In Table 3, it has known that the schedule for a regular maintenance activity plan with an implementation time of 180 calendar days starting from 30 April 2015 to 26 October 2015. When the periodic maintenance activities are carried out, it is still possible to accelerate to less than 180 days. To speed up the regular maintenance activities the determination of critical paths is carried out.

The steps for determining a critical path are:

a. Making a schedule plan for periodic maintenance work activities with Microsoft Project

Table 2. Periodic Maintenance Activities Plan with Microsoft Project

ID	Name	Duration	Start	Finish	Predecessors
1.	Mobilisasi Awal	18 days	Thu 4/30/15	Mon 5/25/15	-
2.	Pasangan Batu dengan Mortar	61 days	Mon 7/27/15	Thu 9/17/15	7
3.	Timbunan Pilihan Dari Sumber Galian	17 days	Mon 8/3/15	Tue 8/25/15	10
4.	Lapis Pondasi Agregat Kelas S	17 days	Fri 9/18/15	Sat 10/10/15	3, 5, 6, 9
5.	Lapis Perekat - Aspal Cair (Tack Coat)	83 days	Tue 5/26/15	Thu 9/17/15	1
6.	Lataston Lapis Aus (HRS-WC) (gradasi senjang / semi senjang)	55 days	Fri 7/3/15	Thu 9/17/15	7
7.	Lataston Lapis Aus Perata (HRS-WC) (L) (gradasi senjang / semi senjang)	11 days	Thu 6/18/15	Thu 7/2/15	8
8.	Lataston Lapis Pondasi Perata (HRS-Base(L)) (gradasi senjang / semi senjang)	17 days	Tue 5/26/15	Wed 6/17/15	1

9.	Bahan Anti Pengelupasan	83 days	Tue 5/26/15	Thu 9/17/15	1
10.	Pasangan Batu	33 days	Thu 6/18/15	Sun 8/2/15	8
11.	Marka Jalan Termoplastik	17 days	Fri 9/18/15	Sat 10/10/15	2
12.	Mobilisasi Akhir	6 days	Mon 10/19/15	Mon 10/26/15	4, 11

b. Network diagrammaking of the schedule of periodic maintenance work activities is as follows:

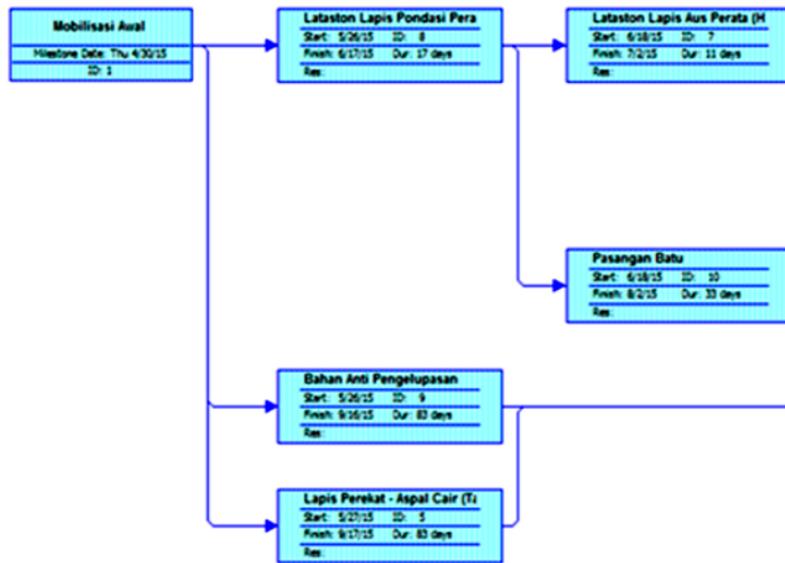


Figure 1. Network Diagram Schedule of Periodic Maintenance Work Activities with Microsoft Project

From the network diagram the plan for regular maintenance work activities with Microsoft Project can be determined as a critical path, and the time periodic maintenance activities are accelerated.

In Figure 2. shows the network diagram after the advanced calculation and countdown calculation, then the time needed to complete the periodic maintenance work activities is 130 calendar days, can be accelerated 50 days or 27.78% of the original planning 180 calendar days. Periodic maintenance work activities that should not delayed (critical work) are:

- 1: Initial mobilization, for 18 days
- 8: Grading Base Lataston (HRS-Base (L)) (slope / semi-gap gradation), for 17 days
- 7: Straight-level Auspicious Lataston (HRS-WC) (L) (gap / semi-gap gradation), for 11 days
- 2: Stone pair with Mortar, for 61 days
- 11: Thermoplastic Road Markings, for 17 days
- 12: Final Mobilization, for six days

e. Final Mobilization, for six days

Although Periodic Maintenance Activities accelerated to 130 calendar days, most activities are by the plan. This indicated by the deviation indicator has a value of 0, and the project work packages that implemented are more than the program. The deviation indicator suggests this has a positive value.

The suggestions that need to be submitted are as follows:

1. Use of network diagrams, beneficial for analyzing time and costs.
2. To get more optimal results, it is recommended to shift the schedule of work activities first, if it is not possible to add new working days.

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