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ANALYSIS OF CONSTRUCTION MANAGEMENT MAIN ROAD IN THE CISUMDAWU STA.21+200 – STA.22+825 TOLL ROAD PROJECT

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ABSTRACT

Construction management is an attempt to use limited resources efficiently, effectively and timly in completing a project that has been palnned. There are 3 kinds of basic functions of construction management including planning, implementation, and control. Of three of these activities to control the resources on aproject that includes worker, equipment, material, money, and method.

The research method used was qualitative research, as a way of collecting data on the study is how the study of the literature, interviews and direct observation in field. And this method is a method that is done to get a foundation theory in analyzing data, namely the analysis calculation of the volume of material, analysis of labor, analysis tool, method, method of Bar Chart S Curve and Critical Path Method.

The location of the studies reviewed were Main Road in the Cisumdawu STA.21+200 – STA.22+825 Toll Road Project , located on Pamatutan Hamlet Mulyasari – Pasir Hamlet Margamukti, Sumedang. The results of this research is the budget plan costs completed the construction of Main Road in the Cisumdawu STA.21+200 – STA.22+825 Toll Road Project till the final stage more or less cost is Rp. 121.488.578.000 and analysis of the Critical Path Method (CPM) estimated completion of the Main Road in the Cisumdawu STA.21+200 – STA.22+825 Toll Road Project takes 58 weeks (406 days).

Keywords: *Construction Management, Bar Chart, S Curve, Critical Path Method.*

I. INTRODUCTION

1.1 BACKGROUND

The availability of existing infrastructure facilities in Indonesia is increasing, thus the infrastructure can be considered an important community capital. One of the infrastructure development that is currently being intensively developed is the construction of toll roads.

Cisumdawu toll road, is one of the toll road projects that cross Cileunyi – Sumedang and Cirebon Dawuan area.This road is continuation of a toll plan from the south that links the Cikampek – Purwakarta – Padalarang – and Cileunyi toll roads, which will later meet the toll road from the north of Cikampek – Palimanan Cirebon in the Dawuan region.

1.2 FOCUS OF PROBLEM

Construction management project in method of work, estimated costs and method of networking of the development main road projects Cisumdawu STA. 21+200 – STA. 22+825 Toll Road.

1.3 SCOPE OF PROBLEM

So this is not too extensive research review of and not deviate from the specified formulation of the problem, it is necessary to need for restriction on the issue under review. Limits the problem taken in this study are as follows:

1. Review and retrieval of data in the form of shop drawings.
2. Determine the volume of the building.
3. Calculate budget plan work.
4. Methods of the analysis networking used in the research project is Critical Path Method (CPM), the use of Bar Chart and S-Curve.

1.4 PURPOSE OF RESEARCH

The purpose of research in development projects Cisumdawu STA. 21+200 – STA. 22+825 Toll Road is as follows:

1. For analyze how the methods work on the construction of Cisumdawu STA. 21+200 – STA. 22+825 Toll Road.
2. To determine the cost of building construction works of Cisumdawu STA. 21+200 – STA. 22+825 Toll Road.
3. To know the methods of analysis Bar chart, CPM, S-Curve and the need for equipment, materials and man power.
4. To determine the duration of the construction work of main road in Cisumdawu STA. 21+200 – STA. 22+825 Toll Road.

1.5 USEFULNESS OF RESEARCH

1. Theoretical Uses
   - As reference materials research on project management.
   - Add the mindset of student in learning, observation and understanding the problems related to the field of civil engineering.
2. Practical Usefulness
   - Know the process of preparation of project implementation schedule due to delays in the implementation of the field (Re-Schedule).
   - Add to the understanding of knowledge management and project implementation directly determine the calculation of the volume of work.

1.6 USEFULNESS OF RESEARCH

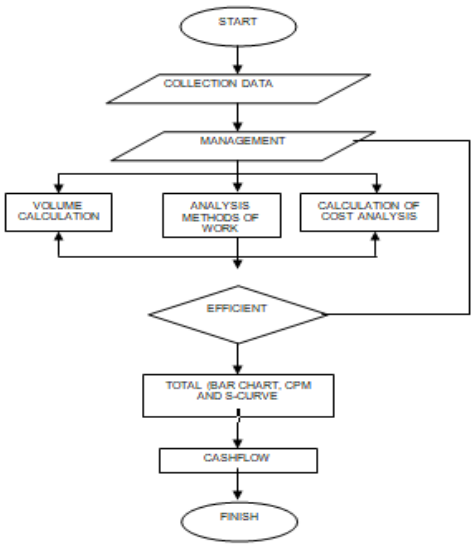


Figure 1.1 Usefulness of Research

II. LITERATURE REVIEW

The literature review is collecting scientific data and information to serve as the foundation of research, in the form of theories, findings, methods or approaches that developed and have been documented in the form of books, journals, manuscripts, records, historical recordings, documents and others. The literature review helps us in getting an idea of a topic to be considered in terms of what previous researchers have done.

2.1 PREVIOUS RESEARCH

First, research conducted by Tanto Sutanto D by title **" Analisis Manajemen Kontruksi Pembangunan Ruko Grand Orchard Cirebon "**. Its purpose of re-calculation of volume planning, time schedule, cost and implementation methods.
Second Research conducted by Deni Setiadi by title " **Analisis Manajemen Konstruksi Jembatan Kaligawe Kecamatan Susukan Lebak Kabupaten Cirebon** ". Its purpose is to analyze how implementation method, knowing the cost of implementation, work, knowing the method of Barchart analysis, CPM, S Curve, and Basic Unit Prices. The Problem faced is the delay in the work process.
Third, Research conducted by Dede Muhidin by title " **Analisis Manajemen Proyek Gedung Rumah Sakit Tiar Medika Kabupaten Cirebon"**. Its purpose is to set the work schedule and plan the progress of work.

2.2 DIFFERENCES PREVIOUS RESEARCH WITH RESEARCH NOW

In the present study entitled "**ANALYSIS OF CONSTRUCTION MANAGEMENT MAIN ROAD IN THE CISUMDAWU STA. 21+200 – STA. 22+825 TOLL ROAD PROJECT** "basically there are some similarities with previous research when viewed from the method of analysis. However, there are some differences among them at the location of research, presentation of reports and research results obtained.

This study also distinguishes the purpose of the process from beginning to end of project development such as analyzing volume calculation work, analyzing the amount of cash flow (bar chart, s-curve and cpm). So that previous research can be used as reference material to finish this thesis.

2.3 BASIC THEORY

2.2.1 MANAGEMENT

From several sources, collected definitions from several experts who put forward the definition of Management are as follows:
Peterson and Plowman (Business Organization and Management), defines that "Management as a technique in a sense, with that technique, the purpose and purpose of a particular group of people defined, classified and executed" Management in this definition emphasizes certain techniques in the framework of efforts to achieve a goal.
Terry (Principles of Management), argues that "Management is a process consisting of planning, organizing, implementing and supervising the use of science and art to achieve certain predetermined goals". In this definition, the meaning of management includes the sequence of activities undertaken to achieve a particular goal.
Furthermore Siregar et al (Management), defines that "Management is the process to utilize human resources and other resources to achieve certain goals"
While Fayol in Widiasanti&Lenggogeni defines that "Management is the functions to plan, organize, lead and control".
From the various definitions mentioned above, it can be concluded that management can be defined as a method or a way to obtain a certain goal effectively and efficiently by utilizing available resources which, as set forth in the functions, planning, organizing, implementation and control. (Widiasanti&Lenggogeni, 2013)

2.4 DATA ANALYSIS METHOD

This study uses several methods used to manage the time and resources used in the project: Bar Chart method, s-curve method and Critical Path Method and Cash Flow.

A. Bar Chart

The bar chart is a graph with a rectangle. Any length or height of a bar is proportional to the values represented by a bar. In other words, the length or height of the bar is equal to the quantity in that category. Graphs usually show comparisons between different categories. Although charts can technically be plotted vertically or horizontally, the most common presentation for bar graphs is vertical. The x-axis represents the category; The y-axis represents the value for that category. In the graph below, the value is a percentage.
A bar chart is a set of events placed in a vertical column that is temporarily placed on a horizontal row. The start and finish time of each activity along with its duration is displayed with the horizontal beam to the right of each activity. Estimated start and end times can be determined from the horizontal time scale at the top of the graph. Block length indicates the duration of

activity and is usually set in chronological work activities. (Callahan, 1992)

B. S Curve

S-curves are graphs created with the vertical axis as the cumulative value of cost or progress of activity and the horizontal axis as time (Suharto, 1997). Another definition, the S-curve is the result of the barcharts plot, which aims to facilitate the viewing of activities included in the period of observation of the progress of project implementation (Callan, 1992). S-curve can show project capability based on activity, time and workload represented as a cumulative percentage of all project activities.

The s-curve visualization provides information about the progress of the project by comparing the schedule with the plan. (Husen, 2011).

C. Critical Path Method

According to CPM or critical path method is a path that has a range of activity components with the longest total number of times and shows the fastest project completion period. Thus, the critical path consists of a series of critical activities, starting from the first activity to the final project activity. The significance of the critical path is important to the project implementer, since this pathway lies the activities which, if delayed, will result in the overall project delays. Soeharto (1999).

Sometimes it can be found more than one critical path in the network. Before creating a critical path in the network scheduling method of Activity on Arrow (AOA), it must first be known how to calculate the duration of a project divided into counts forward and countdown.

D. Cash Flow

Cash flow is a product of planning among other planning products in construction planning, such as scheduling, construction methods and implementation budget (Asiyanto, 2005). Cash flow will generate outflows of money during construction project implementation and also as a tool to forecast future financial condition.

III. METHODOLOGY

3.1 RESEARCH METHODS

Research methods used in Main Road in the Cisumdawu STA. 21+200 – STA. 22+825, are:

1) Library study method with the existence of library reviews derived from books in libraries and data coming from the internet, researchers get information related to the procurement management of construction materials.

2) The method used is a qualitative method that is done by doing the objects to collect data that will be used as data in the object, then to support it using theory as a guide to focus the research which will generate the theory of the data.

3.2 WRITING METHODS

Planning methods begin by collecting and studying the literature related to construction management. Collect field data to be used as data in the object. This research methodology is composed of several main stages, as listed below:

1. Preparation of Field Survey and Identification
2. Finding primary data and secondary data on relevant agencies and agencies needed to complete the data required in the preparation of thesis.
3. Conduct analysis of the data in the can through the identification of the problem and make the formulation.
4. Taking conclusions and suggestions from research results.

3.3 TYPE AND SOURCE OF DATA

The data source is anything that can provide information about the data. By type, the data are divided into two, namely primary and secondary data.

1) Primary data is data made by the researcher for the specific purpose of solving the problem being handled. The data is collected by the researcher directly from the first source or place of the research object is done.
2) Secondary data is data that has been collected for purposes other than solve the problem being faced. This data can be found quickly. In this study the secondary data sources are

literature, articles, journals and internet sites related to research conducted.

3.4 DATA COLLECTION

Data collection techniques that the authors use in this study are:

1. Observations directly into the field to observe directly the object examined.
2. Interview with and contractors and consultant on the project.
3. Browse and elucidate theories or methods that are in the library and the internet.

3.5 RESEARCH TIME

The time required in this study from Febuary to April 2019, approximately 3 months.

3.6 RESEARCH IN SURANCE

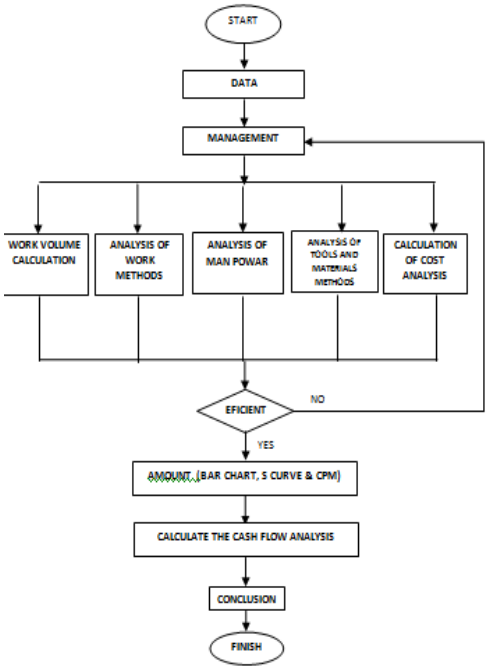


Figure 3.1 Methodology

3.7 DATA ANALYSIS METHOD

The research method used is qualitative research, because the way of collecting data on this research is how to study libraries, interviews and direct observation of the field and this method is a method that is done to get the theoretical basis in analyzing data and problems through sources obtained for consideration in thesis writing.

3.8 RESEARCH LOCATION

For research carried out on the Main Road STA.21+200 – STA.22+825 Project on the CISUMDAWU Toll Road, the following is a map of the location of the CISUMDAWU Toll Road Project and project plan profile:

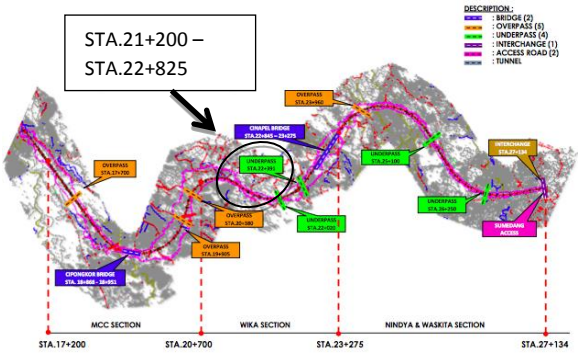


Figure 3.2 Research Location

IV. RESULT AND DISCUSSION

4.1 GENERAL DESCRIPTION OF THE PROJECT

The Main Road work is one of the development works that are in the CISUMDAWU Toll Road Construction Project. The objectives of the CISUMDAWU Toll Road Development Project are :

- Integrate Bandung and Cirebon City with the planning of West Java International Airport (BIJB) in Majalengka and Cirebon Port as the entrance to West Java Province.
- Increasing economic growth around the Toll Road.
- Encouraging the development of the Province from the East of West Java Province which is relatively less developed compared to the West.
- As an alternative to Prince Cadas road.

4.2 GENERAL PROJECT DATA

Name	:	Main Road in The Cisumdawu STA. 21+200 – STA. 22+825
Project Address	:	Pamatutan Hamlet, Mulyasari – Hamlet Pasir, Sumedang
Long	:	1,625 km
Wide	:	14,4 m
Pavement Types	:	Rigid Pavements

4.3 DESCRIPTION OF WORK

1. Preparation Work
2. Land Works
3. Road Structural Work
4. Drainage work

4.4 METHOD OF IMPLEMENTATION WORK

1. Preparation Work

The situation and measures before the construction of the Road Agency (Main Road) are work - preparation.

- Everything concerning the smooth running of the work must be prepared at the site before carrying out the work.
- Detailed schedules, time schedules, mobilization of equipment and labor as well as field administration oversight must be prepared before work begins.
- For the smooth running of previous activities the contractor must pay attention to the placement of materials or materials and traffic.

  a. Situation

  The volume of work in the previous article is a minimum limit that must be fulfilled and intended as the implementation and grip of the contractor.

  The contractor must examine the field situation, especially the condition of the land, the nature and extent of work and other matters that can affect the contractor's bid price. Negligence or shortcomings of the contractor in this case are not used as a reason for filing a claim.

  b. Size

  - The contractor is responsible for the exact implementation of the work according to the size and quality form stated in the work plan and the requirements (RKS) of this work.
  - The contractor is obliged to match the measurements with each other and immediately report to the Board of Directors if there are discrepancies in the measurements in the pictures of this RKS, and it is not acceptable to correct the measurement errors / drawings before consulting the Directors
  - If there is a size mismatch, the joint measurement is used as a benchmark.

The preparatory work includes:

a. Clearing of work land
b. Mobilization and demobilization of tools, materials and labor.
c. Keet Directors and workshops
d. Electricity requirements

2. Land Works

A. Field Clearing

The stages of implementing Field Clearing work are

1. Work on the Measurement Survey, to determine the boundaries of the area to be cleaned.
2. Cleaning and Stripping Works of Road, All trees and bushes or buildings that are inside the area to be built are cleaned using a bulldozer, Wheel Loader, then transported material that has been cleaned with a Dump Truck.

B. Field Excavation

1. The soil is excavated using an excavator, assisted by a bulldozer, a grader for analysis, with the size and depth specified in the working drawing.
2. Excavated materials including material resulting from cleaning work must be disposed of to a location that has been determined and has been prepared by the work director's team.

C. Field fill and compaction

The stages of implementing embankment work are as follows:

1. Lower the landfill from the dump truck and then spread it and spread it on the ground with an excavator.
2. After that, spread the landfill according to the height determined by using an excavator and grader.
3. Then level the land that has been spread using a bulldozer.

D. Grained Pavement Work

The stages of implementing Class A Aggregate Foundation work are as follows:

1. Remove the dump material to be spread out and assisted by a tool.
2. Laying Class A Aggregate material above the dense subbase layer and with the right slope using a motor grader with a height of 45 cm and a width of 14.40 m.
3. While the excavator helps spread the material, the water tank truck helps to water the material to adjust the moisture content of the overlay material.

4. The vibrator roller compresses coarse aggregates in a mechanical manner that is crossing the heap repeatedly, so that the desired density is obtained

E. Structural Work

1) K 125 Work Floor Work 10 cm thick

The stages of implementing the K 125 work floor work are as follows:

1. Pairing the formwork that has been prepared in advance.
2. Laying non-structural concrete with a thickness of 10 cm and width of 14.40 m.
3. Flatten the surface of the concrete overlay using jidar or ruler.

2) Reinforcement Steel

a. Cutting and bending of steel reinforcement

The stages of implementing this work are as follows:

1. Cut reinforcing steel according to the planned size.
2. Bend all reinforced steel coldly, using a bending machine.

b. Placement and Engagement

The stages of carrying out this work are as follows:

1. Clean the reinforcement just before installation to remove dirt, mud, oil, paint, rust and crust, splash mortar or other layers that can reduce or damage the adhesion with concrete.
2. Placing the reinforcement accurately according to the image and with the minimum concrete blanket requirements required.
3. Tie the reinforcing bars using a wire tie so that they are not displaced when casting. Welding of reinforcement dividers or stirrups of main tensile steel reinforcement is not permitted.

c. Rigid Pavement Class P Work 30 cm Thick

In simple terms, Class P concrete pavement workflows are as follows :

After the work of Lean Concrete is finished and the concrete has reached the required age, the Rigid Pavement Class P work can be carried out immediately. Stages of Concrete Pavement work are as follows:

1. Installing reference formwork on lean concrete floors.
2. After the Formwork is installed, it is continued by installing a bond breaker in the form of thin plastic. Plastic mounted on top. Slender concrete without overlapping 10cm in width and 30cm in longitudinal direction.
3. Preparing the dowel reinforcement & tie bar end trimming, binding the reinforcement of the joint with the rod holder must be removed not fixed or not welded.
4. Pairing the Dowel and tie bar must be neat, precise location, not overlap. In dowels, half the length must be painted asphalt or wrapped in plastic so that it is loose from concrete so that the sliding is good.
5. Pour the concrete class P on the available Paver Wirgent tool.
6. Spread the concrete using concrete Paver Wirgent.
7. Finishing Rigid Pavement

   Carrying out concrete cutting before the initial crack appears on the road surface, which is around the 4th to 24th hour and recommended at 18th hour.
8. Concrete Treatment

   After the final settlement is completed and the layer of water evaporates from the surface or after sticking with concrete does not occur then the entire surface of the concrete must be immediately closed and maintained, maintenance is carried out for 7 days or shorter time if 70% compressive or bending strength has been reached earlier. The concrete surface and paw must be completely covered with a sheet / protective sheet, before closing the cover sheet must be saturated with water. The cover sheet must be attached to the concrete surface, but should not be placed before the concrete is hardened enough to prevent sticking.
9. Work on Joint Sealants

   The top of the expansion joint and sawed connection must be covered with a cover material that meets the specification requirements before traffic is permitted to pass through the pavement.
10. Disassemble the reference formwork 8 hours after the concrete overlay

d. Drainase Box

1. Drainage Box

The work of Box Drainage here uses the Cast in Situ method where all processes are carried out on the spot without ordering to the supplier. This Drainage Box is located across the road and buried. The Drainage Box is located at 3 Stationing, namely at

STA.22 + 167, STA.22 + 223, STA.22 + 671.

The stages of work are:

a. Reinforcement
b. Formwork
c. Casting (K 250)

2. U- Ditch

a. Ds- 5

Drainage work here is the construction of waterways on both sides of the road with dimensions according to plan, the water channel uses reinforcement and uses stone pairs with mortar.

b. Ds- 8

This Drainage work is the construction of water channels on the right and left located in the slope with dimensions according to plan, the water channel uses Ds-8 which has been supplied to the supplier.

4.5 CALCULATION OF JOB VOLUME

Job Volume is to calculate the number of work contents in one unit. Volume is also referred to as cubication. Works according to shop drawing and Detail Image. Calculation of volumes is arranged systematically with lanes of tables are with grouping of preparatory work, earthworks and foundations, concrete structure work, wall work, floor and wall plastering work, frame work, doors and windows, ceiling work, painting work, roof work, work sanitary, railing work, face and yard work, electrical installation work and water installation work. (Ir. H. Bachtiar Ibrahim). The total volume of this project can be seen in **Table 4.1**.

4.6. TIME AND COST PLANNING

In determining the activities to be carried out to complete the Main Road in the Cisumdawu STA.21+200 – STA.22+825, it is necessary to pay attention to the factors that usually affect the implementation of the project. Factors that usually affect the time of project implementation are weather or season, weather identified from the survey results at the project location in addition to weather factors, the factors formulated in the calculation of time planning are holidays or national holidays, if the project period is a holiday or nationally, the holidays are included in the project planning.

1. List of estimated activity period can be seen in **Table 4.2.**
2. Project scheduling can be seen in **Table 4.3.**
3. Cash Flow Recapitulation can be seen in **Table 4.4.**

Table 4.1 Volume of Work

TABLE 4.2 VOLUME CALCULATIONS
WORK : MAIN ROAD
PROJECT : CISUMDAWU TOLL ROAD PROJECT PHASE II
STA.21+200 - STA.22+825

PAY ITEM	JOB DESCRIPTION	VOLUME	UNIT
SECTION I	PREPARATORY WORK		
1,1	Mobilization dan Demobilization	1	Ls
1.2	Documentation and Administration	1	LS
1.3	Electricity requirements	1	Ls
1.4	Measurement	1	Ls
		4	
SECTION II	EARTHWORK		
2.1	Land Clearing	19.767	m2
2.2	Land Excavation	498.971	m3
2.3	Land Fill	1.751.776	m3
		2.270.514	
SECTION III	GRAINED PAVEMENTS WORK		
3,1	Expansions and compaction agregate Base Class A (t=45) foundation layer	10.530	m3
3,2	Expansions and compaction agregate Base Class A (t=15) foundation layer	3.510	m3
3,3	Expansions Geotextile Non Woven Tensil Strength 11.5 KN/m	23.400	m'
		53.040	
SECTION IV	ROAD STRUCTURE WORK		
4,1	Lean Conrete, LC t=10cm		
	Concrete Ready Mix	2.340	m3
4,2	Rigid Pavements Concrete t=30cm	7.020	m3
4,3	Plastic t=125micron	23.400	m'
4.4	Expansions AC WC+AC BASE Layers		
	AC WC	975	m3
	AC Base	975	m3
		34.710	
SECTION V	BOX DRAINAGE WORK		
5,1	Box Drainage STA.22+167(2x2x0,5)		
5.1.1	Reinforcement	360.650	kg
5.1.2	Formswork	1.674	m2
5.1.3	Casting	334	m3
5,2	Box Drainage STA.22+223(2x2x0,5)		
5.2.1	Reinforcement	326.332	kg
5.2.2	Formswork	1.674	m2
5.2.3	Casting	334	m3
5,3	Box Drainage STA.22+671(2x2x0,45)		
5.3.1	Reinforcement	283.722	kg
5.3.2	Formswork	1.349	m2
5.3.3	Casting	254	m3
		976.323	
SECTION VI	U-DITCH DRAINAGE WORK		
6,1	U-Ditch, DS-5 installation Side Main Road	4.218	m3
6,2	Ds-8 Installation in Slope	40	m2
		51.909	

Table 4.2 Estimated Activity Period

Pay Item	DESCRIPTION	Tool and Man Power	DURATION (DAY)	Week	AMOUNT OF WORKER AND TOOL
SECTION I	PREPARATORY WORK				
SECTION II	EARTHWORK				
1,2	Land Clearing	Bulldozer	6	1	2
		Excavator	10	1	2
		Dump Truck	5	1	8
			21	3	
2,1	Soil Excavation	Excavator	35	5	15
		Buldozer	31	4	10
		Dumptruck	31	4	30
			97	14	
2,2	Soil Fill	Dump Truck	65	9	50
		Excavator	92	13	20
		Buldozer	91	13	12
			248	35	
SECTION III	GRAINED PAVEMENTS WORK				
3,1	Agregate Base Foundation Layer(t=45)	Dump Truck	20	3	1
		Excavator	11	2	1
		Vibratory Roller	6	1	1
		Sheep Foot Roller	6	1	1
		Water Tank Truck	13	2	9
			55	8	
3.3	Agregate Base Foundation Layer(t=15)	Dump Truck	4	1	1
		Excavator	2	0	1
		Vibratory Roller	2		1
		Sheep Foot Roller	2		1
		Water Tank Truck	5	1	8
			14	2	

SECTION IV	ROAD STRUCTURE WORK				
4,1	Lean Conrete, LC t=10cm	Truck Mixer	21	3	14
4,2	Rigid Pavements Concrete t=30cm				1
		Excavator	7	1	1
		Dump Truck	25	4	1
		Truck Mixer	25	4	35
			57	8	
4,3	Expansions AC WC+AC BASE Laye	Aspal Finisher	0	1	1
		Tandem Roller	1,00	1,00	1
		Pneumatic Tandem Roller	1,0	1,00	1
			2,07	1	
SECTION V	BOX DRAINAGE WORK				
5,1	Box Drainage STA.22+167				
5.1.1	Reinforcement	Labor	16	2	18
		Head Worker	4	1	2
		Foreman	18	3	1
			38	5	
5.1.2	Formwork				
		Labor	14		10
		Head Worker	9	4	8
		Foreman	7	29	1
5.1.3	Casting	Truck Mixer	6,0	1	7
			73	10	
5,2	Box Drainage STA.22+223				
5.2.1	Reinforcement	Labor	16	2	18
		Head Worker	14	2	2
		Foreman	16	2	1
	Formwork				
		Labor	12		12
		Head Worker	8,63		8
		Foreman	6,90		1
5.2.2	Casting	Truck Mixer	6,0	1	7
			79	11	
5,3	Box Drainage STA.22+671				
5.3.1	Reinforcement	Labor	12	2	20
		Head Worker	6	1	4
		Foreman	14	2	1
			33	5	
	Formwork				
		Labor	11		10
		Head Worker	14		4
		Foreman	6		1
5.3.2	Casting	Truck Mixer	5	1	7
			68	10	
SECTION VI	U-DITCH DRAINAGE WORK				
6,1	U-Ditch, DS-5 installation Side Main Road	Head Worker	16	3	20
		Foreman	3	1	1
		Worker	4	1	10
		Truck Mixer	19	3	4
		Dump Truck	15	2	8
			54	8	
6,2	Ds-8 Installation in Slope	Worker	2		4
			1	1	

Table 4.3 Scheduling Project

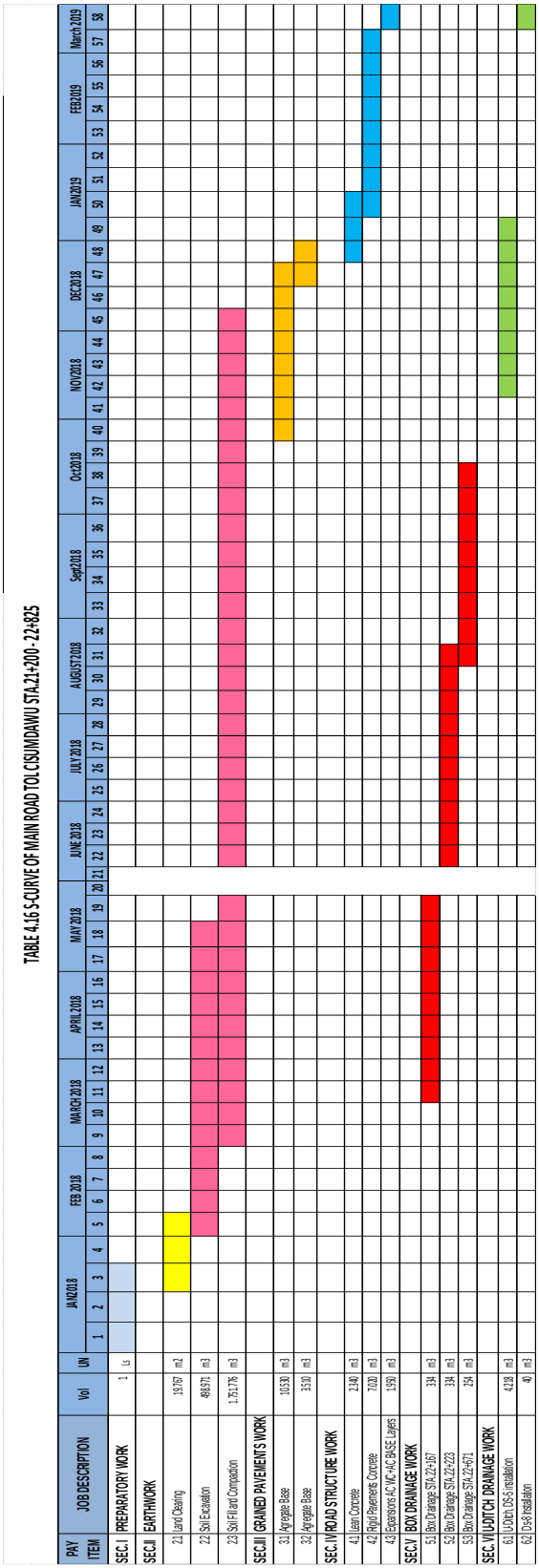


Table 4.4 Cashflow Recapitulation

WEEK	Equipment	Labor	Material	Total	COMULATIVE
3	285.423.862	8.960.000	-	294.383.862	294.383.862
4	285.423.862	8.960.000	-	294.383.862	588.767.724
5	1.604.475.762	53.760.000	-	1.658.235.762	2.247.003.486
6	1.319.051.900	44.800.000	-	1.363.851.900	3.610.855.386
7	1.319.051.900	44.800.000	-	1.363.851.900	4.974.707.286
8	1.319.051.900	44.800.000	-	1.363.851.900	6.338.559.187
9	3.320.583.455	108.640.000	-	3.429.223.455	9.767.782.642
10	3.320.583.455	108.640.000	-	3.429.223.455	13.197.006.097
11	3.320.583.455	120.890.000	569.828.535	4.011.301.990	17.208.308.087
12	3.320.583.455	120.890.000	569.828.535	4.011.301.990	21.219.610.076
13	3.320.583.455	120.890.000	569.828.535	4.011.301.990	25.230.912.066
14	3.320.583.455	120.890.000	569.828.535	4.011.301.990	29.242.214.056
15	3.320.583.455	120.890.000	569.828.535	4.011.301.990	33.253.516.045
16	3.346.244.357	133.980.000	582.036.652	4.062.261.009	37.315.777.055
17	3.320.583.455	120.610.000	12.208.118	3.453.401.573	40.769.178.627
18	3.320.583.455	120.610.000	12.208.118	3.453.401.573	44.222.580.200
19	2.001.531.555	76.930.000	282.791.858	2.361.253.412	46.583.833.612
20					46.583.833.612
21					46.583.833.612
22	2.001.531.555	64.890.000	441.948.311	2.508.369.865	49.092.203.478
23	2.001.531.555	64.890.000	441.948.311	2.508.369.865	51.600.573.343
24	2.001.531.555	64.890.000	441.948.311	2.508.369.865	54.108.943.208
25	2.001.531.555	64.890.000	441.948.311	2.508.369.865	56.617.313.074
26	2.001.531.555	64.890.000	441.948.311	2.508.369.865	59.125.682.939
27	2.001.531.555	64.890.000	441.948.311	2.508.369.865	61.634.052.804
28	2.027.192.457	79.100.000	454.156.428	2.560.448.885	64.194.501.689
29	2.001.531.555	65.730.000	12.208.118	2.079.469.672	66.273.971.362
30	2.001.531.555	65.730.000	12.208.118	2.079.469.672	68.353.441.034
31	2.001.531.555	81.620.000	820.684.742	2.903.836.297	71.257.277.331
32	2.001.531.555	67.410.000	537.892.884	2.606.834.439	73.864.111.770
33	2.001.531.555	67.410.000	537.892.884	2.606.834.439	76.470.946.209
34	2.001.531.555	67.410.000	537.892.884	2.606.834.439	79.077.780.648
35	2.027.192.457	76.580.000	549.546.641	2.653.319.098	81.731.099.746
36	2.001.531.555	61.810.000	11.653.757	2.074.995.312	83.806.095.058
37	2.001.531.555	61.810.000	11.653.757	2.074.995.312	85.881.090.370
38	2.001.531.555	62.930.000	217.345.481	2.281.807.036	88.162.897.406
39	2.001.531.555	52.640.000		2.054.171.555	90.217.068.960
40	2.214.190.275	65.520.000	344.857.500	2.624.567.775	92.841.636.736
41	2.214.190.275	65.520.000	344.857.500	2.624.567.775	95.466.204.511
42	2.214.190.275	76.650.000	399.628.291	2.690.468.566	98.156.673.077
43	2.214.190.275	85.610.000	399.628.291	2.699.428.566	100.856.101.644
44	2.214.190.275	92.330.000	399.628.291	2.706.148.566	103.562.250.210
45	2.214.190.275	67.760.000	399.628.291	2.681.578.566	106.243.828.776
46	212.658.721	15.120.000	399.628.291	627.407.012	106.871.235.788
47	410.826.041	28.000.000	859.438.291	1.298.264.332	108.169.500.120
48	403.454.537	15.120.000	2.253.980.791	2.672.555.328	110.842.055.448
49	205.287.217	2.240.000	624.170.791	831.698.008	111.673.753.456
50	60.650.907	4.480.000	1.403.025.000	1.468.155.907	113.141.909.364
51	60.650.907	3.360.000	833.625.000	897.635.907	114.039.545.271
52	60.650.907	3.360.000	833.625.000	897.635.907	114.937.181.178
53	60.650.907	3.360.000	833.625.000	897.635.907	115.834.817.086
54	60.650.907	3.360.000	833.625.000	897.635.907	116.732.452.993
55	60.650.907	3.360.000	833.625.000	897.635.907	117.630.088.901
56	60.650.907	3.360.000	833.625.000	897.635.907	118.527.724.808
57	60.650.907	3.360.000	833.625.000	897.635.907	119.425.360.715
58	87.091.707	5.600.000	1.907.025.000	1.999.716.707	121.425.077.422
TOTAL	92.534.063.120	3.226.930.000	25.664.084.302	121.425.077.422	121.488.577.422
Preparatory Work	63.500.000			121.488.577.422	

4.6 CRITICAL PATH METHOD ANALYSIS

A. Identify Activities

The first step taken compiling network planning is to identify activities, namely by doing the work and identifying the scope of the project, describing and solving it into activities in the project. The activities of Main Road In the Cisumdawu STA.21+200 – STA.22+825 :

1. Determine The Relationship Between Activities

In CPM, compile components according to the sequence of dependency logic through the basis of making the work period so that it is known for activities from beginning of the project until the completion of the overall project.

Table 4.5 Data of CPM

NO	JOB DESCRIPTION	DURATION Week	CODE OF ACTIVITY	PREDECESSOR
1	PREPARATION WORK		A	
	Decumention and Administration			
	Mobilization and Demobilization			
	Direction Keet & Workshop			
	Electricity requirements			
2	EARTH WORK			
a	Land Clearing	3	B	
b	Soil Excavation and compaction	14	C	B
c	Soil Fill and Compaction	35	D	B
3	GRAINED PAVEMENTS WORK			
a	Agregate Base Class A (t=45)	8	E	D
b	Agregate Base Class A (t=15)	2	F	E
4	ROAD STRUCTURE WORK			
a	Lean Conrete, LC t=10cm	3	G	F
b	Rigid Pavements Concrete t=30cm	8	H	G
c	Expansions AC WC+AC BASE Layers	1	I	H
5	BOX DRAINAGE WORK			
a	Box Drainage STA.22+167(2x2x0,5)	11	J	B
b	Box Drainage STA.22+223(2x2x0.5)	12	K	J
c	Box Drainage STA.22+671(2x2x0,45)	10	L	K
6	U-DITCH DRAINAGE WORK			
a	U-Ditch, DS-5 installation Side Main Road	8	M	E
b	Ds-8 Installation in Slope	1	N	M

Table 4.6 Total Float Calculation

ACTIVITY	DURATION	Forward calculation		Backward calculation		FF	TF	DESCRIPTION
		ES	EF	LS	LF			
B	3	0	3	0	3	0	0	Critical Path
C	14	3	17	24	38	0	21	Critical Path
D	35	3	38	3	38	0	0	Critical Path
E	8	38	46	38	46	0	0	Critical Path
F	2	38	40	44	46	0	6	Critical Path
G	3	46	49	46	49	0	0	Critical Path
H	8	49	57	49	57	0	0	Critical Path
I	1	57	58	57	58	0	0	Critical Path
J	9	3	12	12	23	0	11	Critical Path
K	7	12	19	23	30	0	11	Critical Path
L	8	19	27	30	38	0	11	Critical Path
M	8	38	46	49	57	0	11	Critical Path
N	1	46	47	57	58	0	11	Critical Path

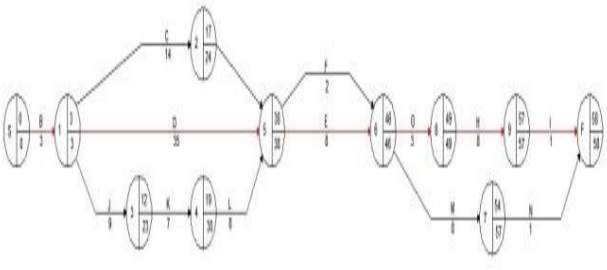
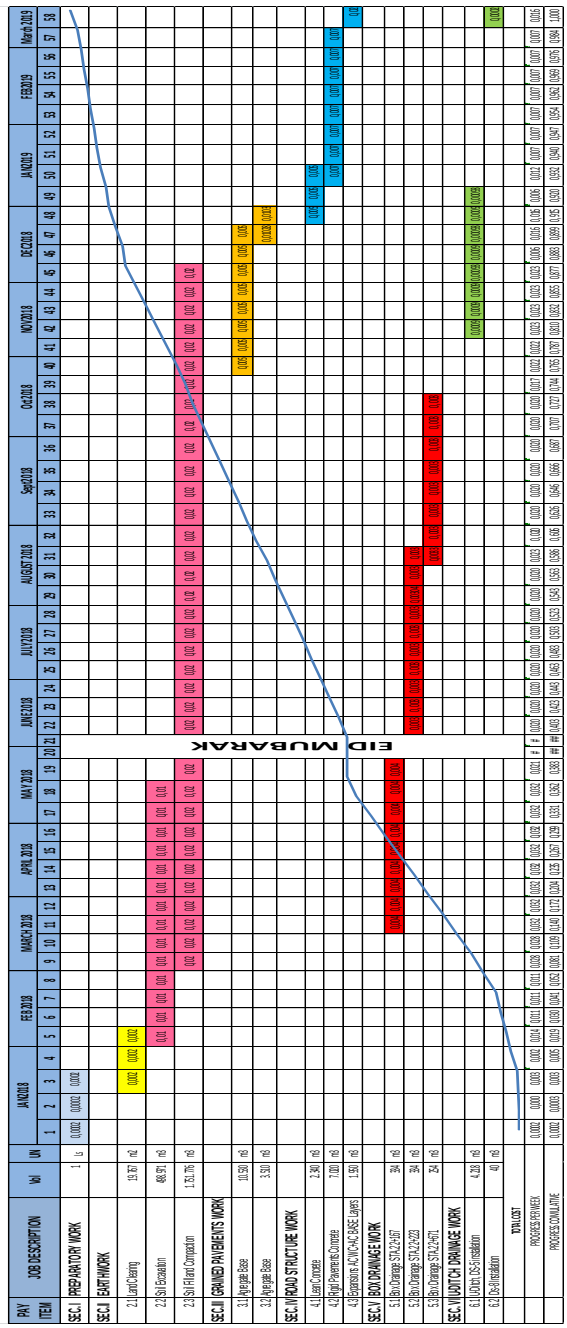


Figure 4.1 CPM Diagram

4.7. ANALYSIS OF S - CURVE

Table 4.7 S-Curve of Main Road Toll Cisumdawu



V. CONCLUSION AND RECOMENDATION

5.1 CONCLUSION

The following are some of the conclusions that the author succeeds in summarizing the results of the management activities of the main road work on CISUMDAWU Toll Road, Kab. Sumedang :

1. The results of calculating the Main Road volume on the CISUMDAWU Toll Road are as follows :
   a) Total volume of land clearing work: 19.767 m²
   b) Total volume of land excavation : 498.971 m³
   c) Total volume of land Fill : 1.751.776 m³
   d) Total volume aggregate : 14.040 m³
   e) Volume Road Structure Work: 34.710 m³
   f) Volume Reinforcing Box Drainase :980.097 m³
   g) Volume Total Uditch : 51.909 m³

2. The initial project planning is carried out at the beginning of the first week of 2018 - the march 2019. Project Schedulling uses 3 methods, namely barchart analysis, the S curve and the scheduling of the Main Road work CPM on the CISUMDAWU Toll Road take 406 days (58 weeks).
3. Recapitulation of Cash Flow to complete Main Road on CISUMDAWU Toll Road, Kab. Sumedang costs approximately Rp. 121,488,578,000, - (One hundred and threety-one billion Four hundred eighty eight million five hundred seventy eight thousand rupiahs)
4. Using the CPM method can be known critical paths that occur in the project, namely the preparation work - land clearing – Land Excavation – Land Fill - Aggregate - LC - Rigid Pavements - ACWC Layer - Box Drainage - U Ditch the side main road.

5.1 REKOMENDATION

From the result of this research analysis the suggestions that can be given by the author are as follows :

1. Need to do a detailed study in calculating the budget plan, the cost of getting the right cost arrangement.
2. It is expected that the project schedulling will be assessed using 3 method, namely barchart analysis, s-curve analysis, and cpm

analysis because in order to produce the best time.

3. The CPM method is very helpful in overcoming the time to complete the project. Companies can use the CPM method in network planning for main road work on CISUMDAWU Toll Road in Sumedang Regency to improve better effectiveness, because the company can see which activities need to be prioritized.

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