Geometry Analysis Of Prabumulih Mine Main Road At Pt. Kalimantan Prima Persada Jobsite Pelh, West Merapi District, Lahat Regency, South Sumatra

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Abstract. Coal is a resource consumed by the world as the main ingredient in power generation and the staple material for steel and cement production. Within the Priyamanaya Energi Pit (PELH), which is a mining site, PT Kalimantan Prima Persada, which is a contractor, is involved in the process of coal mining. Within the Priyamanaya Energi Pit (PELH), which is a mining site, PT Kalimantan Prima Persada, which is a contractor, is involved in the process of coal mining. Coal extraction is being carried out at the Priyamanaya Energi Pit (PELH), which is a mining facility owned and operated by PT Kalimantan Prima Persada, a contractor. An alternate path that goes through this ravine is now available for usage by the Prabumulih Road, which was once used by a significant amount of traffic. According to observations made in the field, certain sections of road do not have the optimal road shape. Starting from the Cross Slope, several sectors are not suitable, whose ideal value is 2-5%, but the actual conditions are only around 1.5 2%, there is no water rope, the road width is not ideal where it has a width of less than 25 meters with an ideal value of 25 meters, and there is no Separator (Median), there is Superelevation with an ideal value of 4% but in actual conditions only around 1.4%. However, some parameters are by the actual, such as grade and safety berm. As a result, the road geometry is not ideal, causing the road conditions to be bad, resulting in the conveyance speed not being achieved.

Keywords: Mine Road, Median, Production

1. Introduction

Coal is a resource consumed by the world community as the main ingredient in power generation as well as the staple of steel and cement production. Kalimantan Prima Persada is a company engaged in coal mining as a contractor in the mining area, one of which is in the Priyamanaya Energi Pit (PELH) Kebur Village, West Merapi Kec, Lahat Kab, South Sumatra.

The mining system applied by Kalimantan Prima Persada Jobsite PELH is a surface mining system with the open pit mining method. The mining industry is one of the capital-intensive, technology-intensive, and very risky industries. For mining business activities to run by predetermined production targets, careful planning is needed in various aspects, one of which is the mine road. The mine road serves as a link between important locations, including the mine site and the crushing plant area, processing of excavated materials, offices, and other areas in the mining area. The distinctive difference lies in the road surface, which is rarely coated with asphalt or concrete as on city haul roads, because mine roads are often traversed by mechanical equipment using crawler tracks, such as bulldozers, excavators, track loaders, and so on.

In some ways, mining roads are different from roads used for public transportation. The road geometry must match the dimensions of the conveyance used. The conveyance used in open pit mining is the Dump Truck. Road geometry that must be considered is the same as highways in general, namely the width of the haul road and the slope of the road. road geometry made must be by standardization, to get the appropriate cross slope, to find out good drainage standards, and also the need to control the condition of the haul road to be passed so that production targets and operator safety in the mining area can be maintained properly. The smoothness of the road must of course be supported by road geometry that is by standards and routine maintenance so that the road does not prevent the dump truck from transporting overburden. Therefore, I took the title "Geometry Analysis of Prabumulih Mine Main Road at Kalimantan Prima Persada Jobsite PELH, Kebur Village, West Merapi Sub-District, Kab. Lahat, South Sumatra Province".

2. Research Location

The location of the IUP carried out by Kalimantan Prima Persada Jobsite PELH is located in a province of South Sumatra, Lahat Regency, West Merapi District, Kebur Village.

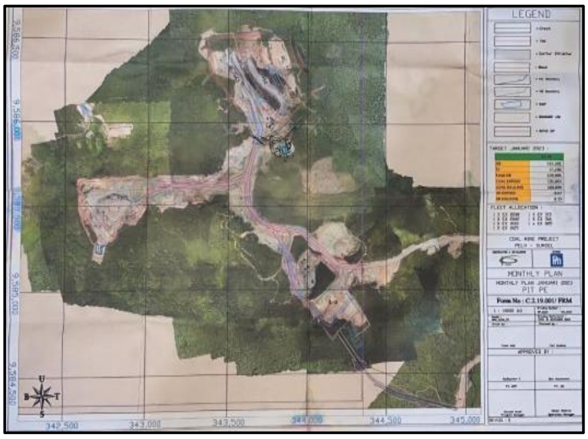
Fig 1. Location Map of IUP

The geology of the Lahat region can be found in the basins located throughout South Sumatra. The tectonic line called the Bukit Barisan can be found to the west of the South Sumatra basin, while the Sunda Shelf can be found to the east of the basin. Close to Lampung, there is a hill that separates this basin from the basin located in West Java. The basin has several distinct areas of high Pre-Tertiary bedrock as well as basins that need to be further investigated. Cracks at the base of the graben are thought to be the cause of the unbalanced bedrock relief seen. The Pendopo anticline and the Lahat fault surround the Lematang basin which lies to the northwest of the Kikim Plain. This depression is a good example of this phenomenon. It is impossible to find any obstructions within the basin in which it lies.
On a regional scale, Shell conducted coal exploration in the South Sumatra Basin, according to Mijnbouw (1978). N. Suwarna and colleagues (1990) of the Bandung Geological Research and Development Center are the only ones to have produced a Geological Map of Lahat at a scale of 1:250,000; this map covers the Kebur area.

3. Theoretical Review

In this section, we will provide a theoretical overview of the Prabumulih Tambang mainline, with particular emphasis on geometry analysis, as follows:

3.1. Over Burden Haulage

Effective coal transportation needs to be done considering that transportation is an important component of the most significant activities involving coal. This is especially true for coal mines that are located quite far from the actual mining location (Muchjidin, 2006) in mining in Indonesia, transportation generally uses trains, trucks, and barges to export coal using large capacity ships Kalimantan Prima Persada Jobsite PELH, overburden transportation using dump trucks, the smooth running of dump truck roads to disposal must of course be supported by road geometry that is by standards and routine maintenance so that the road does not hinder dump trucks in working.

3.2 Mine Support Road

Roads that are within the mining area or project area are called supporting roads. When it comes to the smooth running of mining operations and the supply of key mining infrastructure, transportation of supplies and people along these routes is necessary. Mining roads are paths used by mechanized earth movers and other construction site support units to move materials such as soil, rock, and other debris from one location to another. Mining roads are also known as mining roads.
The construction of mine roads must take into account the largest trucks that can be used for transportation. Mine roads undergo frequent inspections and repairs to ensure that transit is not impeded.

3.3 Haul Road Geometry

a. Straight Road Width
To enable one-way and two-way transit, mine haul roads are constructed in a way that takes into account the type and shape of the hauling equipment.
Vehicles used for transportation and the equipment they carry can travel more easily and smoothly across roads that are far apart. The following formula, as shown in Figure 2 below, can be used to determine the width of a straight road.

$$L_{min} = n \times wt(n + 1) \times (1/2 \times wt) \quad (1)$$

Where:
L (min) = minimum width of straight lane (m)
n = number of lanes
Wt = width of a vehicle unit (m)

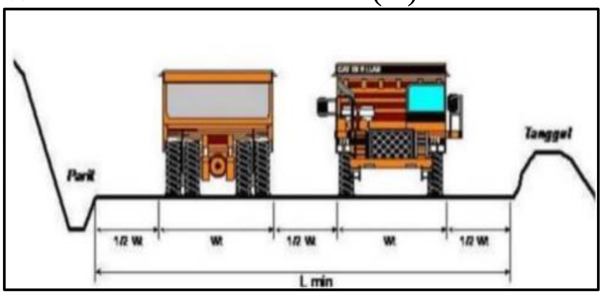

Fig 2. Road Width on Straight Roads

b. Bend Transport Road Width
The width of the mine road at the bend is always larger than the straight road. This is intended to anticipate any deviation in the width of the conveyance intended by the angle formed by the front wheels and the body of the truck when traveling around a bend.
with the truck body when crossing the bend. The calculation of the road width at the bend can use the following formula, and can be seen in Figure 3 below:

$$W_{min} = n (U + Fa + Fb + Z) + C \quad (2)$$

$$C = 1/2 \times (U + Fa + Fb) \quad (3)$$

Where:
Wmin = Road width at the bend lane (m)
U = Truck wheel track distance (m)
Fa = Front junta width (m)
Fb = Rear spacing width (m)
Z = Distance of the outer side of the truck to the edge of the road (m)
C = Distance between trucks (m)

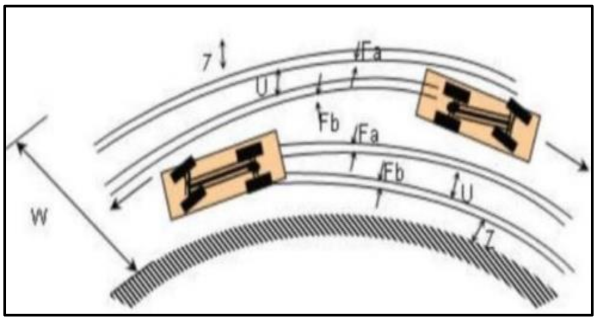

Fig 3. Road Width on Curved Roads

c. Cross Slope

Cross slope is the angle formed by the two sides of the road surface against the horizontal plane. In general, mine haul roads have a convex cross-section, made so to facilitate drainage. A good mine road has a cross slope between 20 mm/m and 40 mm/m or 2% to 4% for each m of mine haul road width. Road slope requirements can be seen in Figure 4.

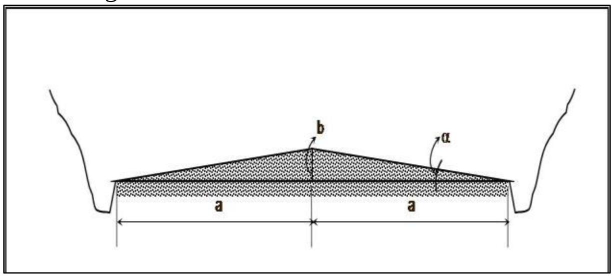

Fig 4. *Cross Slope*

The cross-slope value of the haul road can be calculated using the following formula:

$$(\alpha) = 1/2 \times \text{Lmin} \quad (4)$$

Dimana:

(α) = Cross Slope

Lmin = Minimum Road Width

d. Bend radius

The bend radius of a carrier can be determined, for example, by measuring the horizontal distance between the front and rear wheel axes of the vehicle. It is the gear design that has a direct influence on the gear dimensions.

$$R = \frac{W}{\sin \beta} \quad (5)$$

Where:

R = The turning radius of the haul road

W = Front and rear wheel axle distance

B = Front wheel deviation angle

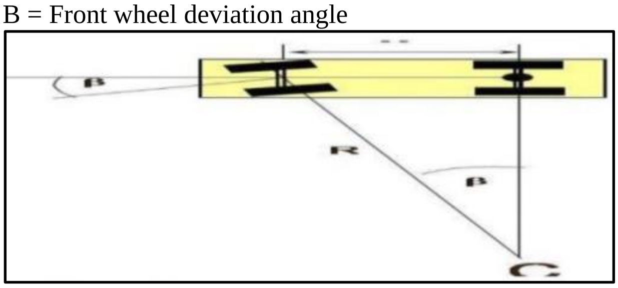

Fig 5. Bend Radius

However, the above formula is only a calculation formula for obtaining road curves without considering the speed of the conveyance, tire friction with the road surface, and superelevation, when considered the formula becomes :

$$R = \frac{V^2}{127\,(e+f)} \quad (6)$$

Where:

R = Bend radius (m)

V = Vehicle plan speed (km/h)

e = Superelevation value

f = Friction factor

e. Superelevasi

When a road curves to form the boundary between the outer and inner edges, superelevation occurs due to the difference in elevation between the two road sections. Many factors, such as the turning radius of the vehicle, its speed, and speed fluctuations, are all potential causes of the superelevation phenomenon. In this situation, the aim is to take some of the vehicle's weight if it loses grip and skids off the track. As shown in Figure 6, Suwandhi (2004) illustrates superelevation.

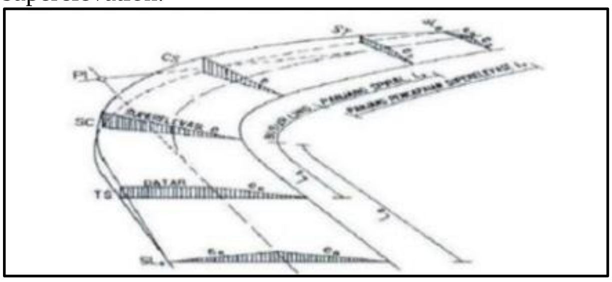

Fig 6. *Superelevasi*

$$e + f = \frac{V^2}{127 \times R} \quad (7)$$

Where:

e = Superelevation factor

f = Friction factor

V = Vehicle plan speed (km/h)

R = Bend radius (m)

There is a maximum superelevation of 10% at speeds over 30 kilometers per hour, and the flexure area often does not allow speeds over 40 kilometers per hour. Instead, the value of f is determined by the speed expected to be achieved:

For a planned speed < 80 km/h, then :

$f = (-0.00065 \times V) + 0.192$

For plan speed > 80 km/h, then :

$f = (-0.00125 \times V) + 0.24$

f. Grade

One of the most important geometric factors to consider when developing a mining track is the slope of the road. Different road grades can cause the mining track to rise or fall, depending on the circumstances. When there is a change in the slope of the road, the ability of the means of transport to go up or down is directly proportional to the slope. The percentage slope angle is 1% as stated by Kaufmann (1977). This represents a vertical rise or fall of one meter over a horizontal distance of one hundred meters.

Through the use of the formula shown in Figure 7 below, which illustrates the slope of the road, it is possible to determine the slope of the road.

$$Grade\ (\%) = \frac{\Delta h}{\Delta x} \times 100\% \quad (8)$$

Where:
Δh = Height difference between two measured points (meters)
Δx = Flat distance between two measured points (meters)

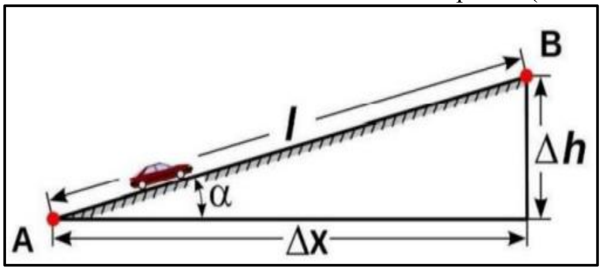

Fig 7. Grade

g. Safety Berm
Trapezoidal mud is a material used in the construction of safety embankments, which are embankments located on the shoulder of the road. Regulation 1827K of 2018 issued by the Minister of Energy and Mineral Resources stipulates that every road used for mining or production must have a safety berm on the outside of the road. Taking into account the possibility of water runoff and debris entering the road, this embankment must be at least half the diameter of the largest wheel on the vehicle. The following formula may be used to determine the ideal safety berm height:

$$Safety\ Berm = \tfrac{3}{4} \times \text{Largest wheel on the vehicle} \quad (9)$$

h. Separator
Lane splitters, sometimes referred to as separators, are long, parallel structures used to divide lanes on mining roads. They are also sometimes referred to as splitters. It is common practice to create lane splitters at intersections and curves, designate some lanes as fast or slow, and divide lanes according to their design purpose. The following regulations were approved by the Minister of Energy and Mineral Resources in 2018: At each corner and intersection of mining or manufacturing lanes, lane dividers shall be installed whose height is equal to half the diameter of the largest vehicle wheel and whose top width is equal to or more than the width of the largest vehicle wheel. Applying this formula will make it possible to estimate the optimal lane separation height:

$$Separator = 1/2 \times \text{Largest wheel on the vehicle} \quad (10)$$

4. Research Methods

Based on the type of data to be obtained, this activity is included in quantitative data collection. Quantitative data collection methods are activities that are systematized, structured, and planned very clearly from the beginning to the end of the activity design. Quantitative methods can also be defined as activities carried out starting from data collection, data interpretation, and display of data results.

4.1 Stages of Activity Implementation

4.1.1 Preparation
The initial stage before carrying out activities in the field which includes:
1) Administrative arrangements and license letters from the campus and company.
2) Consultation with academic supervisors and supervisors.
3) Collection of relevant data by the title.

4.1.2 Literature Study
Looking for literature related to the research title, which is obtained from related agencies such as data from companies and libraries (literature).

4.2 Stages of Data Collection

4.2.1 Field Orientation
Make direct observations in the field to find out the state of the research location.

4.2.2 Primary Data
Primary data is the collection and observation of data directly in the field, taking road geometry data in the form of straight road width data, bend road width, cross slope, bend radius, superelevation, grade, safety embankment (safety berm), and lane separator.

4.2.3 Secondary Data
Secondary data is data obtained indirectly but existing data such as data from company reports. The secondary data is data in the form of company IUP coordinates, company profile, and geological conditions of the research location.

4.2.4 Data Processing and Analysis
The processing of the data obtained was analyzed as follows:
1) Compilation of field data using Microsoft Excel.
2) Calculation of overburden haul road geometry.
3) Arranging the flow of implementation of overburden material transport road maintenance.
4) Perform scientific analysis of the results of geometry calculations.

The data obtained will be analyzed to obtain temporary conclusions. Furthermore, rechecking is carried out to ensure whether the conclusion is feasible to determine.

5. Result and Discussion

5.1 Road Geometry

The geometry of the mine road is adapted to the equipment used. The Dump Truck will be used to transport the front-disposal material, therefore the road geometry must be adjusted to the dimensions of the Dump Truck. Haul road geometry, which includes size, cross slope, and width (both straight and curved), will be the topic of discussion in this section. We will further elaborate on each of these concepts in the following paragraphs. Based on observations made on the Prabumulih road from front to disposal, the largest dump truck used is a Komatsu HD 785-7 Dump Truck, shown in Figure 8 below.

Fig 8. Komatsu HD 785-7

The road segments can be seen in Figure 9 below.

(Source: *Global Mapper*/25-01-2023)
Fig 9. Segment road

5.1.1 Road Width on Straight Roads
After knowing the specifications of the Komatsu HD 785-7 Dump Truck. It is possible to calculate the minimum width of the haul road that meets the standard.
standard, the following are the calculation results:

$Lmin$ = 24.09 m

Based on the findings, the normal width of a straight two-lane road is 25 meters or equivalent to 24.09 meters measured. Orthophotographic measurements were taken on 30 January 2023. Table 1 displays accurate haul road width measurements taken in a straight line from the front to the dump.

Table 1. Transport Road Width Straight Condition

Segment	Calculated Road Width Plan (m)	Actual Road Width (m)	Additional Road Width (m)
A-B	25	25,92	-
C-D	25	23,34	1,66
D-E	25	25,15	-
F-G	25	31,36	-
G-H	25	24,22	-
H-I	25	23,61	1,39
I-J	25	25,06	-
J-K	25	26,39	-
K-L	25	26,72	-
L-M	25	26, 16	-

The table illustrates that in actual circumstances, straight stretches of two lanes are often 25.79 meters wide to accommodate traffic. There are some points along the route that may be slightly wider, but in general, the road is sufficient to fulfill the requirements.

5.1.2 Road Width on Curved Roads
When it comes to haul roads, the width is usually greater than the straight sections, especially when it comes to winding journeys. The purpose is to anticipate changes in the width of the conveyance that may result from the angle created between the front wheels and the truck body when crossing a curve. Based on the Komatsu HD 785-7 Dump Truck specification [3] the following information has been considered:
Wheel Distance (U) = 5.2 m.
a. Overall truck length = 10.29 m.
b. Distance of the front axle to the front of the truck (Fa) = 2.15 m.
c. Rear axle distance with the rear of the truck (Fb) = 3.19 m.
d. Front wheelbase with rear axle (Wb) = 4.95 m.
e. Minimum turning radius (Turning Radius) = 10.1 m.
f. Wheel deviation angle (α) =

α = 29,34°

From this data, the width of the road on the bend can be calculated, namely:
a. Width of the front road
Fa = 1.053 m
b. Rear width
Fb = 1.563 m
c. Distance from the outside of the truck to the edge of the road (Z) and the distance between two trucks that will intersect.

$C = Z = 3.908\ m$

So the minimum haul road width (2 lanes) at the bend is:

W = 27,357 m.

From the calculation, the width of the bending road for 2 lanes of HD 785-7 conveyance is 27.357 m or can be rounded up to 27.5 m. The measurement results from the pit to the disposal area can be seen in Table 2 below.

Table 2. Width of Haul Road in Bend Condition

Segment	Road Width Plan Based on Calculation (m)	Actual Road Width (m)	Additional Road Width (m)
B-C	27,5	26,05	1,45
E-F	27,5	31,36	-

The table above shows that the average road width for the actual 2-lane bend condition is 28.7 m. In other words, the average has met the standardization so that when dump trucks cross the bend there is no deviation when passing.

5.1.3 *Cross Slope*
Cross Slope is the angle formed by two sides of the road surface against the horizontal plane. The purpose of a cross slope on a mining road is to allow water in the center of the road to flow to the side of the road so that it does not damage the road surface. The minimum recommended value for mining road cross slope is twenty millimeters per meter; this value is equivalent to the distance separating the center of the road from its circumference. This particular number was

used by the authors of this study. It is generally agreed that a range of 20-40 mm/m is optimal. The formula that can be used to determine the cross slope of a 25-meter-wide road at PELH Jobsite Prabumulih Kalimantan Prima Persada is as follows:
For a 2-lane haul road:

$$\alpha = 12{,}5\ m$$

So the height difference must be made:

$$b = 250\ mm = 25\ cm \text{ atau } 2.5°$$

So the cross slope that should be made on the Prabumulih road of PT Kalimantan Prima Persada Jobsite PELH with a minimum width of 25 meters is 25 cm or 2.5°. However, in the field, the author did not find a cross slope because the type of material is soft when it rains so when the cross slope is formed, the cross slope changes because the material is eroded by water.

5.1.4 Superelevasi

The superelevation of a curved road is called its pitch. Through the use of superelevation, the equipment can be carried at high speeds and round corners without risking injury. Since the field data shows that the conveyance is moving at about 35 kilometers per hour while going around the curve, the following formula can be used to determine the coefficient of friction at V = 35 kilometers per hour:

$$f = 0{,}169\ atau\ 16{,}9\ \%$$

Then the coefficient of friction for a speed of 35 km / h is 0.169 or 16.9%. The next step is to calculate the ideal bend radius for a speed of 35 km / h, to determine its value using the following formula.

$$R = 46{,}15\ m$$

At a speed of 35 kilometers per hour, the optimal bend radius is 46.15 meters. The superelevation value can be obtained simply by substituting the coefficient of friction and the ideal bend radius in the appropriate fields. Just plug the numbers into the formula, which is as follows:

$$e = 0{,}040\ m/m\ atau\ 4\%$$

Therefore, the corner should have a superelevation value of 0.04 meters per meter, which is equivalent to 4%.
Calculating the superelevation number and then using the following formula is necessary to determine the height difference between the inner and outer surfaces.

$$\tan a = e$$
$$tg\ a = 1{,}103\ meter$$

Based on the above calculations, the height difference between the inner side and the outer side is 1.103 m or 110.3 cm for the minimum width of the bend road of 27.5 m and the ideal radius of the bend for a speed of 35 km/h is 46.15 m. However, based on observations in the field, no superelevation was found due to soft materials and even though it has been formed, it will be subject to erosion if exposed to rain.

5.1.5 Bend radius

The radius of a mine road bend, also known as the bend radius, is related to the design of the conveyance, especially the horizontal distance separating the front and rear wheels of the vehicle. PELH Jobsite Kalimantan Prima Persada is configured to accommodate the bend radius as follows:

$$R = 46{,}15\ m$$

Based on the above calculations, the bend radius of 46.15 m is obtained. But in actual conditions, especially in the B-C segment which has a bend radius of only about 26 meters as a result the bend on the Prabumulih road becomes steep, so an addition of about 20.15 m is needed to match the standard.

5.1.6 Grade

On mining roads, it is important to consider factors such as road slope. The effectiveness of the anchor mechanism is determined by the road slope that causes it. The Prabumulih road has a total length of 1,200 m and has different road slopes and superelevations, so the authors divided the road into 12 segments.
The optimum haul road slope set by the company is around 8 - 10% on the Prabumulih road Kalimantan Prima Persada Jobsite PELH has a grade value of around 3 - 8% but for equipment and fuel efficiency the company sets the optimum grade at around 8%.
Since the slope value of most Prabumulih road sections is lower than 8%, it seems that many of these sections have complied with the regulations. In this case, we can determine the slope value of the road using the following formula:

$$Grade = \frac{\Delta h}{\Delta x} \times 100\%$$

The result of the grade value minus means indicating the decline of the road but the result of the grade value plus means indicating the road climb. The following results of the Prabumulih road grade value per segment with loaded and empty conditions can be seen in Table 3 and Table 4 on the following page.

Table 3. Prabumulih Road Grade Value Loaded Transport Equipment

Segment	Δh (m)	Δx (m)	*Grade* (%)	Optimum Grade (%)	*Over Grade* (%)
A-B	1.12	100	1.12	8	-
B-C	1.31	100	1.31	8	-
C-D	4.49	100	4.49	8	-
D-E	3.5	100	3.50	8	-
E-F	3.64	100	3.64	8	-
F-G	2.87	100	2.87	8	-
G-H	0.73	100	0.73	8	-
H-I	3.66	100	3.66	8	-
I-J	2.32	100	2.32	8	-
J-K	1.33	100	1.33	8	-
K-L	5.08	100	5.08	8	-
L-M	3.52	100	3.52	8	-

The following grade value of the highest loaded conveyance is in the K-L segment with a value of 5.08% and the lowest G-H with a value of 0.73% on the Prabumulih road.

Table 4. Prabumulih Road Grade Value Freight Equipment

Segment	Δh (m)	Δx (m)	*Grade* (%)	Optimum Grade (%)	*Over Grade* (%)
A-B	-1.12	100	-1.12	8	-
B-C	-1.31	100	-1.31	8	-
C-D	-4.49	100	-4.49	8	-
D-E	-3.5	100	-3.50	8	-
E-F	-3.64	100	-3.64	8	-
F-G	-2.87	100	-2.87	8	-
G-H	-0.73	100	-0.73	8	-
H-I	-3.66	100	-3.66	8	-
I-J	-2.32	100	-2.32	8	-
J-K	-1.33	100	-1.33	8	-
K-L	-5.08	100	-5.08	8	-
L-M	-3.52	100	-3.52	8	-

The following grade value of the highest conveyance is in the K-L segment with a value of -5.08% and the lowest G-H with a value of -0.73% on the Prabumulih road, the grade has met according to what the company stipulates, the longitudinal cross-section grade profile can be seen in Figure 10 below.

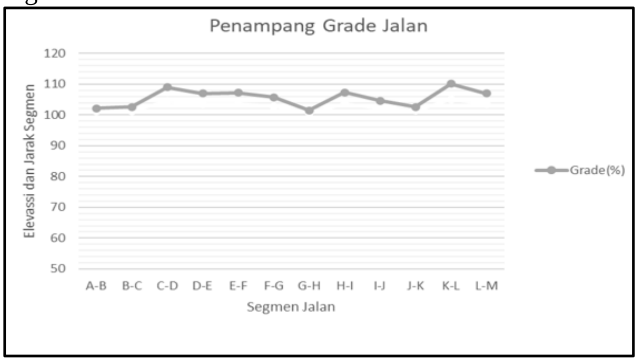

Fig 10. Longitudinal Cross-Section Grade

5.1.7 Safety Berm

Safety Berm is an embankment located on the edge of a mining road. As the name suggests, this safety berm serves to protect transport equipment that passes through the mine road and does not fall into the cliff. According to Decree No. 1827 of 2018 reads "Access is equipped with a safety berm with a height of at least 3⁄4 (three-quarters) of the largest wheel of the vehicle used.”.

The largest unit of transport equipment at Kalimantan Prima Persada Jobsite PELH is HD 785-7 which has tires with dimensions 27.00 R49 and a diameter of 2.64 m taken from the tire specifications in the Bridgestone data book, so the minimum embankment height is :

Safety Berm = 1,98 m rounded to 2 m

Based on the above calculations, the safety embankment on Prabumulih Road should have a height of 2 meters. However, the actual conditions of the author get the height of the safety embankment is only 1.57 meters so the height must be added 0.43 meters.

5.1.8 Separator

On mining roads, lanes are separated by lane dividers, which are long structures that run parallel to the lanes. These lane dividers have an important practical function, separating fast lanes from slow lanes, at crossings, and on curves. It is often used to distinguish between the two types of lanes.

Based on information obtained from tire 27.00 R49, HD 785-7 is the highest unit of conveyance that crosses the PELH line of Jobsite Prabumulih Kalimantan Prima Persada. Its height is 2.64 meters. The height of the lane separator can be calculated using the formula below:

Separator = 1,32 m

Based on the calculation, the ideal separator height on the Prabumulih Kalimantan Prima Persada Jobsite PELH road is 1.32 m and has a top width equivalent to the width of the largest unit tire, namely 0.77 m. However, in actual conditions, the height of the separator is 1.02 m so an addition of about 0.3 m is needed and the width of the section has a size of 1 meter so it is by the standard.

Based on observations in the field, there are still many things that must be repaired on the Prabumulih Kalimantan Prima Persada Jobsite PELH road because there are still many that are not by the standards that have been regulated in the ESDM Ministerial Decree 1827K of 2018.

6. Conclusions and Suggestions

6.1 Conclusions

Based on the results of Industrial Field Practice activities and observations in the field, it can be concluded as follows: Kalimantan Prima Persada was established on 9 September 2003 based on notarial deed No. 57 issued by the notary office of Noor Hasanah, S.H., and domiciled in Banjarbaru-South Kalimantan, a subsidiary of Pamapersada Nusantara, a highly developed mining contractor company in Indonesia and Asia and under Astra Affiliated Company.

One of Kalimantan Prima Persada's Jobsite is PELH Jobsite where the Owner of Priamanaya Energi uses the open mining method because of the location of coal resources close to the surface.

From the results of the Prabumulih road evaluation, the following data were obtained :

a. The theoretical width of a straight road on Prabumulih Road should be 25 meters, but in actuality 2 straight road segments do not meet the standard of < 25 meters.
b. The theoretical width of the bend on Prabumulih road should be 27.5 meters, but in actuality, there is 1 segment of the bend road width < 27.5 meters so a road widening of about 1.45 meters is required.
c. The cross slope that should be made on Prabumulih road with a minimum width of 25 meters is 25 cm or 2.5°. However, the actual conditions did not find a cross slope because the type of material is soft when it rains so when the cross slope is formed, the cross slope changes because the material is eroded by water.
d. Based on theoretical calculations, superelevation on Prabumulih road is 0.04 m/m or 4% with a height difference of 1.103 meters for a minimum road width of 27.5 meters. But the actual condition of the superelevation value is around 1.4%.
e. Based on theoretical calculations, the bend radius at the Prabumulih road bend is 46.15 meters, but the actual condition is only 26 meters.
f. The optimum road grade set by the company is 8%, the actual road grade has fulfilled what the company set.
g. Based on theoretical calculations, the height of the safety berm on the Prabumulih road is 2 meters, but the actual condition is around 1.57 meters so there must be an addition of around 0.43 meters.
h. Based on theoretical calculations, the ideal separator height on the Prabumulih road is 1.32 m and has an upper width equivalent to the width of the largest unit tire, which is 0.77 m. However, in actual conditions, the height of the separator is 1.02 m so an addition of about 0.3 m is needed and the width of the atss section has a size of 1 metre so it is by the standard.

6.2 Suggestions

Immediately increase the width of the road according to theoretical calculations, both straight road width and bent road width.

Superelevation that has not been formed is immediately repaired and maximum maintenance is carried out so that even though the type of material is not good if the maintenance is maximum, the superelevation will be optimal.

The radius of the bend must also be formed with theoretical calculations because otherwise, it will be very dangerous for the conveyance passing on the road.

The cross slope is immediately formed according to theoretical calculations and maximum maintenance so that the cross slope does not easily change its size.

For the safety berm, immediately increase the height to match the standard, and the cross slope and top width are formed to match the standard.

For the lane separator (separator), immediately increase the height and width of the top according to the standard.

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