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Evaluation of Road Pavement Performance and Conditions Simp. Duku (Ketaping) – Pariaman Section

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ABSTRACT

Road section Simp. Duku (Ketaping) - Pariaman is one of the strategic routes in the area of West Sumatra Province. This road section has the potential to be developed because it is a fast lane to the Minangkabau International Airport and the City of Padang as the center of government for the Province of West Sumatra. This study aims to determine the performance of the Simp. Duku (Ketaping) – Pariaman seen from the level of service which refers to MKJI 1997 and the value of road pavement conditions at STA 16+420 to STA 20+500 refers to the PCI (Pavement Condition Index). From the research results for the Performance of Jalan Simp. Duku (Ketaping) - Pariaman is at service level D (0.91 <93) during peak hours (17-00 to 18.00 WIB). Meanwhile, from the analysis conditions of Pavement use the Pavement Condition Index (PCI) method, a PCI value of 53.69 was obtained, which means that the pavement condition was generally poor, dominated by grain ejection damage (63.23%) and crocodile skin crack damage (20.75%).). For handling of road pavement conditions, after being correlated with the Pavement Condition Index (IKP) from the Ministry of Public Works, the type of handling is Reconstruction / Recycling.

Keywords: *Performance; Pavement Conditions; Level of Service; PCI*

INTRODUCTION

Roads are an important infrastructure in transportation that can affect progress in the economic, social, cultural and political fields in a region. However, the road age that has been planned is in fact not in accordance with what is happening in the field [1]. In general, roads are built as infrastructure to facilitate mobility and accessibility of socio-economic activities in society [2].

It is feared that the dense traffic flow and the large number of heavy vehicles passing by will result in a decrease in the condition of the road pavement. Roads that are continuously burdened by volume and traffic that are greater than planned will experience a decrease in the condition of the road pavement, for this reason an evaluation needs to be carried out [3].

Preliminary research on the condition of the road pavement was carried out visually, which then analyzed the type and level of damage as a basis for carrying out maintenance or repairs. Road damage that occurs on several roads causes enormous losses, especially for road users such as long travel times, congestion, accidents, and others [4].

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MATERIALS AND METHODS

Road Performance

The performance of the road segment can be interpreted as the ability of the road segment to serve the needs of traffic flow according to its function which can be measured and compared with the standard level of road service. The road service level value is used as a road segment performance parameter.

Analysis of the performance of urban roads, with performance indicators namely traffic flow (Q), capacity (C), degree of saturation / Degree of Saturation (DS), free flow speed which is carried out with various performance indicators namely Free Flow Speed / FV), as well as analyzing the level of service (Level of Service/LOS) on these roads [5].

An increase in traffic volume will cause a change in traffic behavior. Theoretically there is a fundamental relationship between volume and speed and density. This relationship between speed and traffic flow (volume) can be used as a guide to determine the mathematical value of road capacity for ideal conditions [6].

Outer City Road Characteristics

Out of town roads can be defined as a system of road networks that are designed with a high design speed and have good geometric planning so that road users can quickly and comfortably get to their destination. Which is characterized by the absence of continuous development on any side, although there may be intermittent permanent developments, such as restaurants, factories, or settlements. The characteristics of a road will affect the performance of the road.

Geometric Conditions

Road geometry is one of the main characteristics of the road that will affect the capacity and performance of the road when it is loaded with traffic. What is meant by the geometric of the road is the type of road, the width of the traffic lane, the shoulders/kereb and whether or not there is a median [7].

The use of the Autodesk Infraworks application for road geometric planning is considered to facilitate the implementation and depiction of work and save time [8].

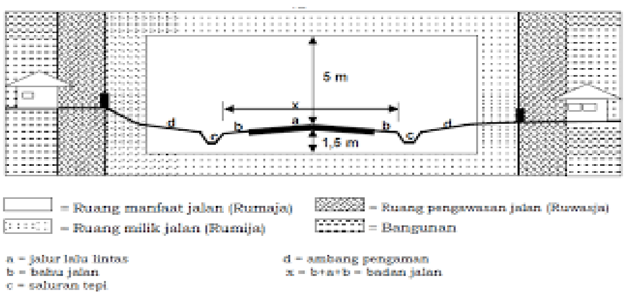

Figure 1: Road Cross Section

Side Barriers

Road side activities that can cause conflict and affect the movement of traffic flow and reduce road performance functions. The types of side barriers are divided into Outback, agricultural or undeveloped, without activity (weight <50), Outback, several buildings and roadside

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activities (weight 50-149), Village, activities and local transportation (150-249), Village, some market activities (weight 250 – 350) and Almost urban (weight > 350). To simplify the calculation procedure, the side resistance levels are grouped into five classes, namely very low, low, medium, high and very high [7].

Traffic Flow and Composition

The main function of a road is to provide transportation services so that road users can drive safely and comfortably. Traffic flow parameters which are important factors in traffic planning are volume, speed, and traffic density [7].

Volume (Q)

Volume is the number of vehicles that pass a point of observation during a certain period of time. The traffic volume value describes the composition of traffic, by expressing the flow in passenger car units (pcu) which is converted by multiplying the passenger car equivalence value (emp). Emp private cars, pick-ups, public transportation and small trucks (1) – small buses, 2 axle trucks, large buses (1.2) – large trucks (1.8) and motorbikes 0.9 or 0.6.

$$Q = \frac{N}{T} \qquad (1)$$

where,

Q = Volume (Kend/jam)

N = Number of Vehicles (Kend)

T = Observation Time (jam)

Free Flow Velocity (FV)

Free flow speed (FV) is defined as the speed at zero flow rate, which is the speed chosen by the driver when driving a motorized vehicle without being influenced by other vehicles on the road. To determine the free flow speed used equation.

$$FV = (FV_0 + FV_W) \times FFV_{SF} \times FFV_{RC} \qquad (2)$$

where:

FV = district True free flow (km/jam)

FV_0 = Basic free flow speed of the vehicle (km/jam)

FV_W = Other lane width adjustments (km/jam)

FFV_{SF} = Side friction condition adjustment factor

FFV_{RC} = Road function class adjustment factor

Capacity

Capacity is the maximum current through a point on the road that can be maintained per unit hour under certain conditions. To determine the capacity of a unit road segment using the equation.

$$C = C \times FC_W \times FC_{SP} \times FC_{SF} \qquad (3)$$

where:

C = capacity (smp/jam)

C_O = base capacity (smp/jam)

FC_W = road width adjustment factor

FC_{SP} = direction separation adjustment factor (only for undivided roads)

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FC_{SF} = side resistance and shoulder resistance adjustment factor

Degrees of Saturation

The degree of saturation (DS) is the ratio of current (Q) to capacity (C), used as the main factor in determining traffic behavior on a road segment. The degree of saturation value indicates whether the road segment will have capacity problems or not.

$$DS = \frac{Q}{C} \quad (4)$$

Level of Service

The level of service (LOS) for roads can be classified at a certain level between A to F which reflects the conditions for a particular need or volume of service [9].

Table 1: Service level index (ITP) based on traffic saturation level

Level Of Service	Traffic saturation level	Flow Description
A	≤ 0,35	In conditions of free flow, low volume and high speed, the driver can choose the desired speed according to the speed limit and the physical conditions of the road. Travel speed average 90% of free flow speed
B	≤ 0,54	The state of the traffic flow is stable, the travel speed begins to be affected by traffic conditions, the driver still gets sufficient freedom in choosing the speed. The average travel speed is 70% of the free flow speed
C	≤ 0,77	The traffic flow conditions are stable, speed and movement are determined by high volume so that the choice of speed is limited within the road speed limits which are still quite satisfactory. This amount is used for travel conditions in the city. The average traveling speed is 50% of the free flow speed
D	≤ 0,93	Indicates a situation that is close to unstable, where the desired speed can still be maintained in a limited manner although it is greatly influenced by changes in travel conditions which can reduce the speed considerably, causing low freedom of movement and comfort. The average traveling speed is 40% of the free flow speed
E	≤ 1,00	This is an unstable traffic flow and cannot be determined solely from the speed of travel, there are frequent traffic jams for a few moments. Volume is almost or equal to road capacity. The average travel speed is 33% of the free flow speed
F	> 1,00	Shows the flow of urban roads at very low speeds, very high volumes, long queues and delays occur. The average travel speed is 33% of the free flow speed

(Source: Ofyar Z Tamin, Perencanaan dan pemodelan transportasi)

Pavement Conditions

Road conditions will decrease along with the service life caused by traffic loads and several other factors so that to restore the condition to a steady state, efforts to maintain the road are needed [10]. However, due to limited funds, not all road sections can be handled, so a priority scale is needed with the right criteria in determining the road sections that need to be handled immediately. The percentage of road stability conditions is very important as an indicator of comfort and safety for road users [11]. Local environmental factors such as drainage, topography, soil conditions, material conditions and vehicle load conditions that cross the road will affect road quality degradation [12].

Types of Damage to Flexible Pavements

There are 19 types and levels of pavement damage for highways, namely: alligator cracking, bleeding, block cracking, bulges and sags, corrugation, depression, edge cracking, joint reflection, lane/shoulder drop off, longitudinal and transverse cracking, patching and utility cut patching, polished aggregate, potholes, railroad crossings, rutting, shoving, slippage cracking, swell, weathering and raveling [13].

Pavement Condition Assessment

Pavement Condition Index (PCI) is a way of assessing the condition of road pavement according to type, level of damage that occurs, and can be used as a guide in carrying out maintenance. This PCI value ranges from 0 to 100 with the classifications good, satisfactory, fair, poor, very poor, serious, and failed.

To find out a condition value on the road surface layer whose value is determined by the condition of the surface layer caused by road damage that occurs, the PCI analysis method can be used [14].

Damage Level (Density)

Density or level of damage is the percentage of the area of a type of damage to the area of a unit segment that is measured in meters long. The density value of a type of damage is also distinguished based on the level of damage.

The formula looks for the density value:

$$Density = \frac{Ad}{As} \times 100\% \qquad (5)$$

or

$$Density = \frac{Ld}{As} \times 100\% \qquad (6)$$

where:

Ad = The total area of the type of damage for each level of damage (m2)
Ld = The total length of the damage type for each damage level (m)
As = The total area of the segment units (m2)

***Total Deduct Value* (TDV)**

Total Deduct Value (TDV) is the total value of the individual deduct value for each type of damage and the level of damage that exists in a research unit.

Corrected Deduct Value (CDV)

The corrected deduct value (CDV) is obtained from the graph / curve of the relationship between the total deduct value (TDV) and the corrected deduct value (CDV) by selecting the curve according to the number of individual values of the deduct value (DV) which has a value greater than 2.

If a sample unit does not have or only one has a deduct value (DV) of more than 2, then all deduct value (DV) can be added up and the value is used as the Highets Individual deduct value (HDV), otherwise if the deduct value (DV) is more than 2 then do the iteration procedure, where you will get several corrected deduct value (CDV), take the highest CDV value as the highest individual deduct value (HDV).

Pavement Quality Classification

If the highest reduction value (HDV) is known, then the PCI value for each unit can be determined by the formula:

$$PCI(s) = 100 - HDV \qquad (7)$$

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For overall PCI value:

$$PCI = \frac{\sum PCI(s).A(s)}{A(r)} \qquad (8)$$

where:
PCI = Segment PCI Value
PCI(s) = Pavement Condition Index for each unit
A(s) = Segment Area
A(r) = Section Area

From the PCI value for each research unit, it can be seen that the quality of the segment unit pavement layers is based on certain conditions, namely good, satisfactory, fair, poor, very poor, serious, and failed.

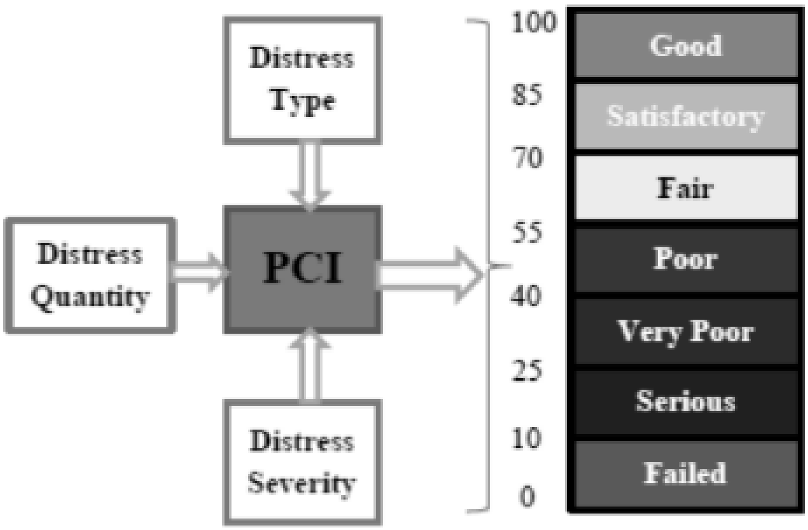

Figure 2: PCI Value Chart

Determining Maintenance Type Based on PCI Value

Determination of the type of maintenance and handling can be known based on the PCI condition values obtained.

Table 2: Use of the Pavement Condition Index to determine the type of treatment [15].

IKP	Category
> 85	Routine Maintenance
70 - 85	Periodic Maintenance
55 - 70	Structural Improvements
< 55	Reconstruction / Recycling

RESULTS AND DISCUSSION

Traffic Volume Analysis

in this analysis, we will try to calculate traffic volume from secondary data.

Table 3: Vehicle volume (smp/hour) in 2021

Time	Vehicle Volume (smp/jam)					
	MC	**LV**	**MHV**	**LB**	**LT**	**Amount (Smp/jam)**
06.00 - 07.00	277	219	5	-	-	501
07.00 – 08.00	653	317	11	-	3	983
08.00 – 09.00	311	306	4	1	-	622
09.00 – 11.00	577	317	18	1	-	913
10.00 – 11.00	569	360	9	-	3	941
11.00 – 12.00	791	380	13	-	3	1.186
12.00 – 13.00	298	349	4	1	-	652
13.00 – 14.00	719	520	11	-	-	1.250
14.00 – 15.00	626	552	11	1	3	1.193
15.00 – 16.00	827	494	16	-	3	1.340
16.00 – 17.00	986	389	11	1	-	1.387
17.00 – 18.00	923	610	12	2	-	**1.547**
18.00 – 19.00	512	420	4	-	3	939
19.00 – 20.00	340	268	6	1	-	615
20.00 – 21.00	200	264	2	-	4	470
21.00 – 22.00	130	184	7	1	-	323
Rata – Rata						929

Based on Table 3, the average LHR is 929 smp/jam and the highest LHR occurs at 17.00 - 18.00 WIB with a vehicle volume of **1.547 smp/jam**

Traffic Capacity Analysis

Based on MKJI 1997 it can be calculated the traffic capacity on the Simp. Duku (Ketaping) – Pariaman uses equation 3.

$$C = C_O \times FC_W \times FC_{SP} \times FC_{SF}$$

where:

C_O = 3100 smp/jam (flat existing condition).

FC_W = 0,58 (effective width of the carriageway 4 m).

FC_{SP} = 1,00 (direction separation 50-50).

FC_{SF} = 0,95 (conditions of low side friction with effective shoulder width 1,00).

Then the traffic capacity of the segment can be calculated.

C = 3100×0,58×1,00×0,95 = 1.708 smp/jam

Derajat Kejenuhan

Based on the data, the degree of saturation can be calculated at peak hours 17.00 - 18.00 WIB with equation 4.

$$DS = \frac{Q}{C}, DS = \frac{Q}{C} = \frac{1.547}{1.708} = 0,91$$

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Service Level

Based on the degree of saturation (DS) value of 0.91, it means that it is at a D level of 0.91 <0.93

Road Pavement Condition Analysis

To carry out an analysis of the condition of this road pavement, several stages must be carried out.

Preliminary Survey.

This stage aims to determine the general condition of the pavement, geometric data, and the types of damage that often occur in the field. This will be very helpful for further investigation because it already has an overview of field conditions.

Define Sample Units

Determination of the sample unit is carried out where it is first determined how long the segment will be reviewed so that later the number of segments from the total length can be obtained.

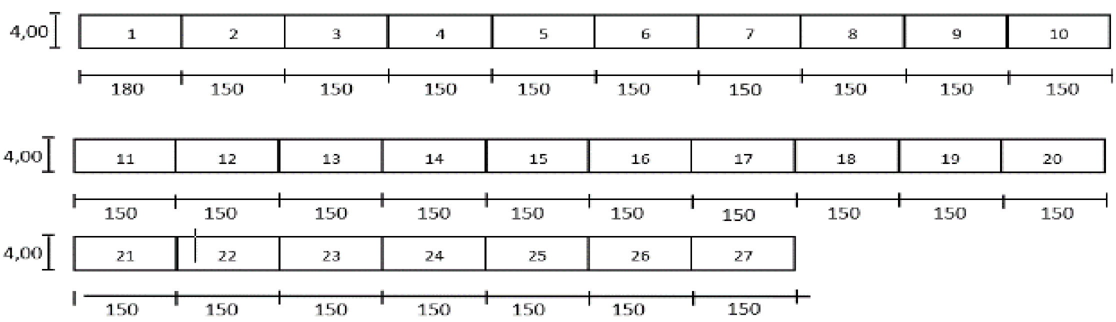

Figure 3: Distribution of sample units

Measures Every Kind of Damage

Measured based on the type of damage and the level of damage then entered into the form that has been made to make it easier to do the analysis.

Table 4: Measurement by type of damage

Unit	SL	LEBAR (M2)									
		Alligator Cracking	L & T Cracking	Land / Shoulder Off	Raveling	Photoles	Bleeding	Patching	Edge Cracking	Sleepage Cracking	Shoving
1	2	3	4	5	6	7	8	9	10	11	12
1	L	13,00	-	60,00	200,00	-	-	-	-	-	-
	M	-	0,10	-	-	-	-	-	-	-	-
	H	-	0,08	-	-	-	-	-	-		
2	L	-	-	-	566,60	-	-	-	-	-	-
	M	-	4,80	-	-	-	-	-	-	-	-
	H	11,00	17,60	-	-	-	-	-	-	-	-
3	L	-	1,00	-	40,00	-	-	-	-	-	-
	M	0,50	1,60	-	-	-	-	-	-	-	-
	H		4,80	-	-	-	-	-	-	-	-
4	L	1,20	-	2,70	200,00	0,03	240,00	-	-	-	-
	M	0,10	-	-	-	-	-	-	-	-	-
	H	-	-	-	-	-	-	-	-	-	-
5	L	-	0,80	-	-	-	10,25			-	-
	M	-	-	-	-	-	-	-	-	-	-
	H	-	-	-	-	-	-	-	-	-	-
6	L	-	-	-	-	-	-	15,50	-	-	-
	M	7,50	-	-	-	-	-	-	-	-	-
	H	89,00	-	-	-	-	-	26,00		-	-
7	L	0,02	-	-	54,50	-	-	16,56	1,00	-	-
	M	-	0,08	-	-	-	-	1,60	1,10	-	-
	H	107,42	-	-	16,00	-	-	-	-	-	-
8	L	-	-	-	570,50	-	-	-	-	-	-
	M	-	-	-	-	-	-	10,00	-	-	-
	H	19,50	-	-	-	-	-	-	-	-	-

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	H	19,50									
9	L	-	-	-	-	-	-	13,00		-	-
	M	21,50	-	-	-	-	-	-	-	-	-
	H	0,50	-	-	-	-	-	29,00	-	-	-
10	L	8,00	-	-	482,20	-	-	40,05	-	-	-
	M	22,00	-	-	-	-	-	0,25	-	-	-
	H	47,00	-	-	-	0,50	-	-	-	-	-
11	L	0,50	-	-	550,00	-	-	15,50	-	-	-
	M	16,00	-	-	-	-	-	-	-	-	-
	H	18,00	-	-	-	-	-	-	-	-	-
12	L	-	0,04	-	353,46	-	2,50	-	-	-	-
	M	-	-	-	-	-	-	-	-	-	-
	H	4,00								-	-
13	L	120,00	-	-	-	-	-	-	-	-	-
	M	22,50	-	-	-	-	-	-	-	-	-
	H	-	-	-	-	-	-	-	-	-	-
14	L	-	4,00	-	-	-	-	-	-	-	2,30
	M	-	-	-	-	-	-	-	-	6,50	-
	H	-	-	-	-	-	-	-	-	-	-
15	L	-	0,08	-	-	-	72,00	-	-	-	-
	M	-	-	-	-	-	-	-	-	-	-
	H	-	-	-	-	-	-	-	-	-	-
16	L	-	-	-	32,00	-	5,50	-	-	-	-
	M	-	-	-	-	-	-	-	-	-	-
	H	-	-	-	-	-	-	-	-	-	-
17	L	-	-	-	-	-	-	4,00	-	-	0,30
	M	-	-	-	-	-	-	-	-	-	-
	H	8,50	-	-	-	-	-	-	-	-	-
18	L	-	-	-	-	-	-	21,00	-	-	-
	M	1,50	-	-	-	-	-	-	-	-	-
	H	86,00	-	-	-	-	-	-	-	-	-
19	L	10,50	0,03	-	-	-	-	8,00	-	-	-
	M	25,50	-	-	-	-	-	-	-	-	-
	H	32,00	-	5,00	-	-	-	-	5,00	-	-
20	L	-	-	-	-	-	-	8,00		-	-
	M	111,50	-	-	-	-	-	-	-	-	-
	H	65,00	-	-	-	-	-	-	-	-	-
21	L	-	-	-	-	-	-	67,50	-	-	5,00
	M	3,00	-	-	-	-	-	-	-	-	-
	H	62,50	-	-	-	-	-	-	-	-	-
22	L	19,00	-	-	-	-	-	17,50	-	-	-
	M	18,00	-	-	-	-	-	38,25	-	-	-
	H	29,00	-	-	-	-	-	-	-	-	-
23	L	0,50	-	-	287,50	-	-	-	-	-	-
	M	6,00	-	-	-	-	-	4,00	-	-	-
	H	2,00	-	-	32,00	-	-	-	-	-	-
24	L	14,00	0,10	-	-	0,25	-	13,50	-	-	-
	M		6,50	-	-	-	-		-	-	-
	H	37,00		-	-	-	-		-	-	-
25	L	3,00	0,02	-	-	-	-	-	-	-	-
	M	32,50	-	-	-	-	-	11,50	-	-	-
	H	-	-	-	-	-	-	-	-	-	-
26	L	5,00	0,02	-	-	-	-	1,50	-	-	10,00
	M	5,00	-	-	-	-	-	-	-	-	-
	H	1,00	-	-	-	-	-	-	-	-	-
27	L	-	-	-	5,00	-	-	-	-	-	-
	M	5,50	0,07	-	-	-	-	5,00	19,50	-	-
	H	-	-	0,50	-	0,50	-	-	-	-	-

Calculating Density Value
As an example, PCI calculations are carried out for sample 1 units

- Alligator Cracking.
- Long & Tranverse Cracking

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$$L = \frac{13,00}{720} \times 100\% = 1,81\ \%$$

$$L = \frac{0,08}{600} \times 100\% = 0,01\ \%$$

$$M = \frac{0,10}{600} \times 100\% = 0,01\ \%$$

- Lane and Shoulder off

$$L = \frac{60,00}{600} \times 100\% = 8,33\ \%$$

- Ravelling

$$L = \frac{200,00}{600} \times 100\% = 27,78\ \%$$

Calculating Deduct Value

The deduct value is obtained by adjusting the density value obtained into the respective damage graph according to the level of damage.

- Aligator Cracking.

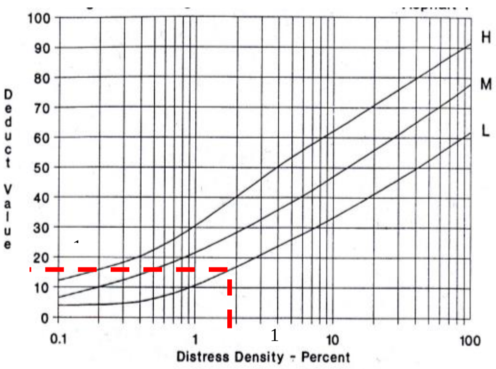

Figure 4: Graph of Deduct Value for Crocodile Skin Cracks

From Figure 4, the deduct value for a density value of 1.81% with a low severity level is 18

- L&T Cracking

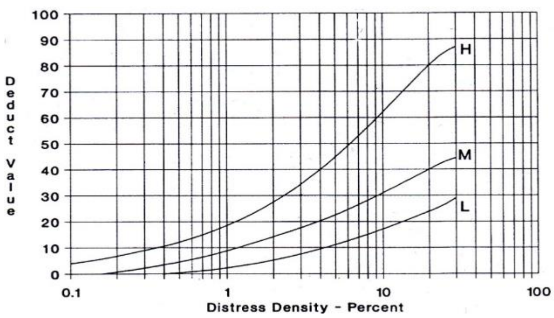

Figure 5: Graph of Deduct Value for Longitudinal and Transverse Cracks

From Figure 5, the deduct value for a density value of 0.01% with a low severity level is 0 and for a density value of 0.01% with a medium severity level is 0.

- Lane and Shoulder off.

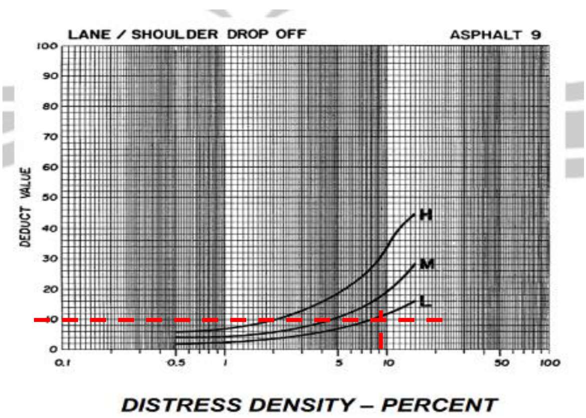

Figure 6: Graph of Deduct Value for Reducing

- Ravelling.

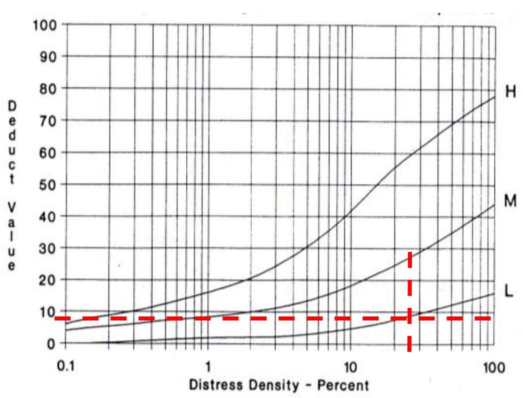

Figure 7: Graph of Deduct Value for Grain

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Road Shoulders

Release

From Figure 6, the deduct value for a density value of 8.33% with a low severity level is 10

From Figure 7, the deduct value for a density value of 27.88% with a low severity level is 8

Calculating the Total Deduct Value

All the deducted values (DV) that have been obtained are then added up to get the total deduct value (TDV).

Table 5. Deduct value and TDV Unit Sample 1

Type of Distress	**Density (%)**	**Severity Level**	**Deduct Value**
1	1,81	L	18
10 L	0,01	L	0
10 L	0,01	M	0
9	8,33	L	10
19	27,78	L	8
TOTAL DEDUCT VALUE			36

Calculating the Corecterd Deduct Value

CDV is obtained from the relationship curve between TDV and DV. The DV value used in the calculation is the DV whose value is greater than 2. If there is only one or no individual DV number that has a value of more than 2, then all TDV totals are used as HDV. If more than two individual DV have a value of more than 2 , then do the iteration step by reducing the smallest Deductible Value that is greater than 2.0 to 2.0 to q = 1

Table 6: CDV Value Unit Sample 1

Segment 1								
No	***Deduct Value***					**TDV**	**q**	**CDV**
1	18	10	8	0	0	36	3	21
2	18	10	8	0	0	30	2	22
3	18	2	2	0	0	22	1	22

Based on Table 6, the value of HDV = 22 is obtained

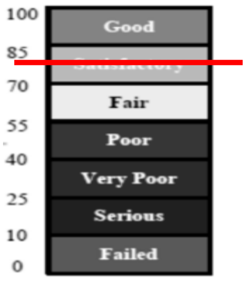
Calculating the Pavement Condition Index (PCI)

PCI value is obtained for segment 1

PCI = 100 - HD = 100 - 22 = 78

Determining Pavement Conditions

From the PCI value obtained, it is then plotted into the PCI value diagram so that the category of pavement conditions in that segment is obtained.



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Based on the PCI unit sample 1 = 78, it is known that the condition of the segment is Satisfactory. PCI value for the Simp Duku (Ketaping) – Pariaman road section at STA 16 + 420 to 20 + 500 can be calculated using.

$$PCI = \frac{\sum PCI(s).A(s)}{A(r)}$$

Table 7: Segment PCI Value

Unit	A(s)	PCI(s)	PCI(s) x A(s)	Unit	A(s)	PCI(s)	PCI(s) x A(s)
1	720	78	56.160	15	600	96	57.600
2	600	41	24.600	16	600	82	49.200
3	600	78	46.800	17	600	64	38.400
4	600	84	50.400	18	600	30	18.000
5	600	99,9	59.940	19	600	38	22.800
6	600	17	10.200	20	600	17	10.200
7	600	18	10.800	21	600	32	19.200
8	600	48	28.800	22	600	35	21.000
9	600	46	27.600	23	600	50	30.000
10	600	14	8.400	24	600	35	21.000
11	600	26	15.600	25	600	62	37.200
12	600	76	45.600	26	600	70	42.000
13	600	58	34.800	27	600	64	38.400
14	600	86	51.600				
Number of Total PCI (ΣPCI(s))				876.300			
A(r)				16.320			
$PCI = \frac{\sum PCI(s).A(s)}{A(r)}$				53,69			
Rating				POOR			

Based on Table 7 and obtained the PCI value for the Simp Duku (Ketaping) – Pariaman road section STA 16 + 420 to STA 20 + 500 is 53.69 which indicates the condition of the pavement is **Poor.**

Improvement Selection Method

Based on the type of damage that occurred on the Simp Duku (Ketaping) - Pariaman road section STA 16 + 420 to STA 20 + 500, the Repairing of each damage that occurs can be determined which is synchronized based on the Construction and Building Manual Number: 001-02/M /BM/2011 (Volume 2), Concerning Road Condition Surveys for Routine Maintenance (2011) standard repair methods.
The following shows the type of damage and Repairing or how to repair it

Table 8: Type of damage and Repairing of damage based on the type of damage

No	Type of Damage that occurred	Types of Damage Repairing that can be done	Selected method
1.	*Aligator Cracking*	- P2 (Asphalting) - P5 (Patching)	P5
2.	*longitudinal and trasverse crack*	- P2 (Asphalting) - P3 (Joint filler)	P3
3.	*lane and shoulder off*	- P6 (leveling)	P6

4.	*Patching*	- P2 (Asphalting) - P5 (patching) - P6 (leveling)	P5,P6
5.	*bleeding*	- P1 (sandsheet)	P1
6.	*Ravelling*	- P2 (asphalting)	P2
7.	*Photoles*	- P5 (Patching) - P6 (leveling)	P5
8.	*edge cracking*	- P2 (asphalting) - P5 (Patching)	P5
9.	*Slippage cracking*	- P2 (asphalting) - P5 (Patching)	P5
10.	*Shoving*	- P2 (asphalting) - P5 (Patching)	P5

Based on the analysis of pavement conditions using the Pavement Condition Index (PCI) method which is correlated with Pd 01-2016-B concerning Determination of Pavement Condition Index (IKP), the type of treatment for each segment is obtained based on the conditions shown in Table 9.

Table 9: Types of Repairing of Road Segments Based on Condition Values [15]

Unit	STA	PCI Value	Rating	Repairing Method
1	(16+420 – 16+600)	78	Satisfactory	Periodic Maintenance
2	(16+600 - 16+750)	41	Poor	Reconstruction / Recycling
3	(16+750 – 16+900)	78	Satisfactory	Periodic Maintenance
4	(16+900 – 17+050)	84	Satisfactory	Periodic Maintenance
5	(17+050 – 17+200)	99,9	Good	Routine Maintenance
6	(17+200 – 17+350)	17	Serious	Reconstruction / Recycling
7	(17+350 – 17+500)	18	Serious	Reconstruction / Recycling
8	(17+500 – 17+650)	41	Poor	Reconstruction / Recycling
9	(17+650 – 17+800)	46	Poor	Reconstruction / Recycling
10	(17+800 – 17+950)	14	Serious	Reconstruction / Recycling
11	(17+950 – 18+100)	26	Very Poor	Reconstruction / Recycling
12	(18+100 – 18+250)	76	Satisfactory	Periodic Maintenance
13	(18+250 – 18+400)	58	Fair	Structural Improvements
14	(18+400 – 18+550)	86	Good	Routine Maintenance
15	(18+550 – 18+700)	96	Good	Routine Maintenance
16	(18+700 – 18+850)	82	Satisfactory	Periodic Maintenance
17	(18+850 – 19+000)	64	Fair	Structural Improvements
18	(19+000 – 19+150)	30	Very Poor	Reconstruction / Recycling
19	(19+150 – 19+300)	38	Very Poor	Reconstruction / Recycling
20	(19+300 – 19+450)	17	Serious	Reconstruction / Recycling
21	(19+450 – 19+600)	32	Very Poor	Reconstruction / Recycling
22	(19+600 – 19+750)	35	Very Poor	Reconstruction / Recycling
23	(19+750 – 19+900)	50	Poor	Reconstruction / Recycling
24	(19+900 – 20+050)	35	Very Poor	Reconstruction / Recycling
25	(20+050 – 20+200)	62	Fair	Structural Improvements
26	(20+200 – 20+350)	70	Satisfactory	Periodic Maintenance
27	(20+350 – 20+500)	64	Fair	Structural Improvements

While the overall pavement condition value for the Simp Duku (Ketaping) - Pariaman section was obtained at STA 16 + 420 to STA 20 + 500 from the 27 sample units reviewed, namely 53.69 which means Bad (Poor) with the type of repairing carried out is **Reconstruction / Recycle.**

CONCLUSION

1. Road Performance. Simp. Duku (Ketaping) - Pariaman is at service level D (0.91 < 93) during peak hours (17-00 to 18.00 WIB) where traffic flow conditions are nearly unstable, operating speed decreases relatively quickly due to obstacles that arise , and relatively little freedom of movement.
2. From the analysis using the Pavement Condition Index (PCI) method, there were 10 damages that occurred on the Simp. Duku (Ketaping – Pariaman STA 16+420 to 20+500, it is known that the dominant types of damage are alligator cracking, longitudinal and transverse cracks, lane/ shoulder off, patching, raveling, photoles, and edge cracks. Where the damage is dominated by damage raveling (63.23%) and Alligator Cracking Damage (20.75%).
3. The results of the research on the Simp. Duku (Ketaping) – Pariaman with the PCI method reviewed at STA 16 + 420 to STA 20 + 500 the PCI value was 53.69 which means that the pavement conditions are generally poor (Poor) which after being correlated with Pd 01-2016- B regarding the Determination of the Pavement Condition Index (IKP), it was found that the type of repairing was Reconstruction / Recycling.
4. So that the damage to the road does not get worse, it is necessary to immediately take corrective action with the type of routine maintenance handling first to avoid more severe damage.
5. To overcome the unstable traffic performance efforts have been made to increase capacity by widening.

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