

ANALYSIS OF TRAFFIC CHARACTERISTICS TOTAL VOLUME, ACTIONS, QUEUE LENGTH AND DEGREES OF SATISFACTION AT THE UNSIGNIFICANT JUNCTION JL SEMARANG-BOJA, SEMARANG

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Abstract. *Unsignalized intersection Jl. Raya Cangkiran - Jl Cangkiran Gunung Pati, Tambangan kec.Mijen, Semarang is a three-way intersection that has access to the Cupan Terminal. Many people pass through this intersection. In conditions at these intersections, traffic jams occur during rush hours, and there is no traffic light which makes traffic conditions even more irregular, the safety of motorists is also threatened. Therefore, this study was carried out to analyze unsignalized intersections, planning the use of traffic lights, and knowing the traffic characteristics of Jl. Raya Cangkiran - Jl. Gunungpati Cup, Semarang. Data collection was carried out for 3 days, namely Saturday 25 February 2023, Monday 27 February 2023, and Wednesday, 1 March 2023 by taking peak hours at 06.00 WIB - 08.00 WIB, 12.00 WIB - 13.00 WIB, and 16.00 WIB - 18.00 WIB. Data collection methods used are capacity, degree of saturation, delays, queue opportunities, and Traffic Signaling Devices (APILL). The performance analysis of this unsignalized intersection uses the 1997 Indonesian Highway Capacity Manual (MKJI) to calculate the degree of saturation. As for the level of service using the Minister of Transportation Regulation No. 96 PM 2015. The results of the research are that in the existing conditions, alternative B is chosen as the best alternative for planning traffic lights with 2 phases of the 1-hour peak scenario on Saturday morning with a degree of saturation of 0.823 pcu/hour, a queue length of 103,045 m on the West approach, and a value delay of 14,784 veh/sec. From the results of the analysis, it can be concluded that the results of calculating the traffic evaluation for the current conditions obtained that the highest vehicle volume occurred on Monday, 27 February 2023. Then Jl. Raya Cangkiran – Boja, Semarang, fulfills the criteria for installing traffic lights and needs to install traffic lights or traffic control lights. As well as from the 3 planned alternatives, alternative B was chosen to install a 2-phase traffic signal light.*

Keyword: *Intersection performance, Unsignalized Intersection, Degree of Saturation, Queue Length, Delay.*

1. Introduction

The problem of transportation is a common problem experienced by every big city, because transportation problems will never be resolved or will always experience development from an urban area. Limited road construction and not optimal traffic facilities also contributed to adding to congestion, this situation was exacerbated by the lack of discipline in the community in traffic. In the high volume of traffic, especially at rush hour at the intersection of often conflicting traffic flows that can be dangerous for road users [1]. Semarang City is one of the big cities in Central Java with a high level of activity, this has an impact on high transportation movements as well. This high movement of transportation is one of the main causes of traffic jams. Traffic problems in the form of congestion are things that require more attention. This is due to the negative impact of the traffic jam. and support units. One of the points of congestion in the city of Semarang is at the intersection of three Jl. Raya cupan - Jl Cupan Gunung Pati, Tambangan Kec. Mijen, Semarang.

2. Previous research

In order to determine the originality of the research conducted, in this case previous research will be included which has the same theme or topic. Previous research regarding the owner of the same topic is

a. ANALYSIS OF THE NEED FOR TRAFFIC LIGHT AT THE FOUR-NOT junction GRABAG SIGNALING MAGELANG DISTRICT MAGELANG [2]

This study aims to overcome the problem of congestion at the unsignalized Grabag Intersection in order to obtain control over the flow of intersections and a regular traffic light system

Calculation and settlement methods for alternative plans are taken from the 1997 Indonesian Highway Capacity Manual (MKJI) issued by the Directorate General of Highways.

Based on the Traffic Light Signaling Tool (APILL), the Grabag intersection needs to be installed with a traffic light because the performance of the intersection is no longer able to serve traffic flow properly in the morning and evening. Obtained the highest degree of saturation of 0.99 which means it has exceeded the stipulated value of the degree of saturation which is 0.85 of capacity. The average total crossing current is 22994 vehicles/hour for 8 hours.

b. ANALYSIS OF TRAFFIC LIGHT PLANNING AT THE INTERSECTION OF SMB II AIRPORT, PALEMBANG, PALEMBANG [3]

This study aims to analyze and calculate the cycle time, green time of each traffic light phase at the mouth of the intersection based on volume and saturation currents at the mouth of the intersection using the Webster method. to produce excellent procedures in designing traffic lights. Calculation of traffic light is done using the webster method. The cycle plan for the four road mouths, four stages is 81 seconds with the division of the four phases of the SMB II Airport intersection, for an effective green time of 69 seconds and an actual green time of 65 seconds. The actual green time plan for the south (Kota – Tanjung Api-api) is 21 seconds, the actual time for the west (SMB II Airport) is 20 seconds and the actual north time (Tanjung Api-api) is 10 seconds and the actual east time (Jl. Prince Ayin – Airport SMB II) which is 14 seconds. Lamp timing

concerning cross-sections, lengthwise, as well as other aspects related to the physical form of the road. The following are the steps for a road geometry survey. Data collection for a road geometric survey is carried out by measuring directly in the field, such as: how wide is the approach?

number of lanes, shoulder width of the road section under review. Traffic Volume is the number of vehicles that pass a certain cross section on a certain road section in a certain time unit. The average traffic volume is the average number of vehicles calculated according to a certain time unit, it can be daily which is said to be the average daily traffic volume / LHR or in English it is referred to as the Average daily traffic volume (ADT) or daily traffic volume. annual average

In completing this task using the method of calculation and settlement for the purposes of alternative plans taken from the 1997 Indonesian Highway Capacity Manual (MKJI) issued by the Directorate General of Highways. To determine traffic characteristics (total volume, delays, queue length, and degree of saturation)

The variables in the research above are mostly the same, so this research will also use variables such as to determine traffic characteristics (total volume, delay, queue length, and degree of saturation). The difference with the above research lies in the location where the research is conducted, which the research location was not found in the research above, so it could be a new study with the latest data.

2. Methods

In this study two kinds of data are needed, namely primary data and secondary data. Primary data is obtained through direct surveys in the field, while secondary data is obtained by requesting information or data from related government agencies. Primary data or data taken from the field includes geometric conditions, environmental conditions, side barriers, traffic volume. Primary data needed include road geometric data, traffic volume data. To obtain secondary data is to request information or explanations and or data from related government agencies such as the Public Works Service (PU) which includes road map data [4,5]. The Central Statistics Agency (BPS) can obtain data on the population of the city of Boja. Road geometry is a highway structure that describes the shape/size of the highway, both in terms of cross-section, length, and other aspects related to the physical shape of the road. The following are the steps for a road geometry survey. Data collection for a road geometric survey is carried out by measuring directly in the field, such as: how wide is the approach, number of lanes, shoulder width of the road section under review. Traffic Volume is the number of vehicles that pass a certain cross section on a certain road section in a certain time unit. The average traffic volume is the average number of vehicles calculated according to a certain time unit, it can be daily which is said to be the average daily traffic volume / LHR or in English it is referred to as the Average daily traffic volume (ADT) or daily traffic volume. annual average. In completing this task using the method of calculation and settlement for the purposes of alternative plans taken from the 1997 Indonesian Highway Capacity Manual (MKJI) issued by the Directorate General of Highways [6]. To determine traffic characteristics (total volume, delays, queue length, and degree of saturation)

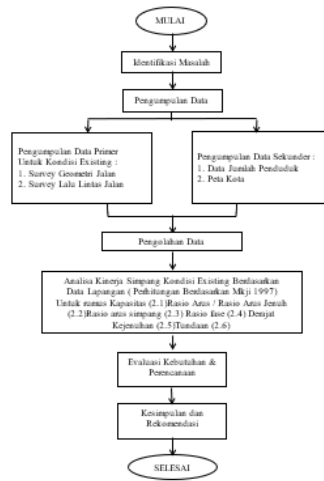


Figure 1. Research Methodology

3. Results and Discussion

This research was conducted on one of the roads in the city of Semarang, namely on Jalan Raya Cupan, where there are intersections along the way which cause traffic jams. And according to a survey of researchers this road includes

collector roads which are roads that serve first-tier inter-city trips, public transport services or distribution of vehicles with medium-distance destinations, with a moderate average speed.

Traffic Volume Data

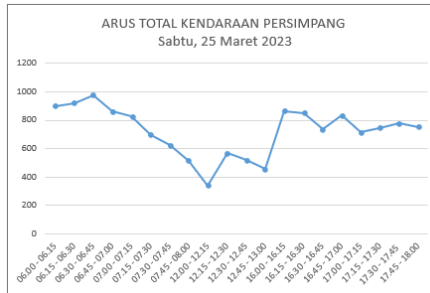
The next step is to change the unit of vehicle/hour to pcu/hour by multiplying the number of vehicles by the conversion factor based on the type of vehicle. The results obtained are summed without including non-motorized vehicles. The total number of pcu/hour for each arm is used to determine the peak hours for the morning, afternoon and evening rush hour periods. Table 4.1 and Figure 4.1 below explain the results of the traffic flow survey

obtained. The following table is the result of the total number of passing vehicles which include light vehicles, heavy vehicles and motorbikes.

Table 4.1 Total Vehicle Flow Per Intersection on Saturday, 25 February 2023

JAM	BOJA		GUNUNG PATI		MIJEN		Total Simpang
	lurus	belok kanan	belok kiri	belok kanan	belok kiri	lurus	
06.00 - 06.15	308,3	94,7	50,8	69,6	83,2	290,2	896,8
06.15 - 06.30	294,5	74,8	67,8	123,6	68,3	291,8	920,8
06.30 - 06.45	296,4	83,2	87,8	101,1	77,1	330,1	977,7
06.45 - 07.00	207,5	69,8	71,4	132,2	77,2	304,1	862,2
07.00 - 07.15	245,5	77,1	69,6	98,4	70,4	265,4	826,4
07.15 - 07.30	160,1	38,2	87	78,9	33,1	278,6	697,9
07.30 - 07.45	168,8	41	71,1	72,4	33,8	257,8	623,9
07.45 - 08.00	112,8	44	70,8	78,3	38,3	171,3	515,5
12.00 - 12.15	83,8	35,1	41,1	38	47,3	93,4	338,7
12.15 - 12.30	155,8	62	50,1	48	84	168,5	568,4
12.30 - 12.45	110,7	45,9	70,5	82	65,6	142,5	517,2
12.45 - 13.00	75,7	43,9	32,3	61,4	71,1	150,7	455,1
16.00 - 16.15	206,5	80,8	84,5	88,1	99,5	296,4	865,8
16.15 - 16.30	197,1	66,1	100,1	77,8	110,1	298,5	849,7
16.30 - 16.45	177,7	55,5	87,4	65,6	80,8	260,4	767,2
16.45 - 17.00	223,5	66,9	70,1	81,6	106,2	285,5	833,6
17.00 - 17.15	184,1	58,1	95,3	107	75,6	193,8	713,9
17.15 - 17.30	133	65,9	80,6	105,3	86,8	254,3	743,9
17.30 - 17.45	167,1	52,7	95,7	93,1	96,7	271,1	776,4
17.45 - 18.00	164,4	63,8	95,1	121,4	79,1	228,3	752,1

Table 4.1 shows the total flow of vehicles on Saturday, 25 February 2023. The following is a graph of the total flow of vehicles per intersection on Saturday, 25 February 2023



Gambar 4.1 Grafik arus total kendaraan per simpang hari Sabtu, 25 Februari 2023

From table 4.1 and figure 4.1 it can be seen that the total number of vehicle flows on the three arms of the intersection is for the morning peak at 06.30 - 06.45 WIB of 977.7 pcu/hour, the afternoon peak at 12.15 - 12.30 WIB is 568.4 pcu/hour, and the afternoon peak at 16.00 - 16.15 WIB at 865.4 pcu/hour. From the several alternatives that have been planned and the results that have been obtained, alternative B is chosen, namely the 2-phase alternative with scenario 2 of current movement as shown in Figure 5.2.6. By using 2 phases, the resulting cycle time is shorter than phase 2. This can affect queue lengths and delays.

In alternative B, the result of delays and queue lengths is shorter than alternative A, so alternative B is chosen as the best alternative for planning traffic lights with 2 phases. The following is planning signal time from alternative B.

Tabel 4.8 Arus Lalu Lintas

WAKTU	UTARA	TIMUR	SELATAN	TOTAL	
	kend/jam	kend/jam	kend/jam		
06.30 - 07.30	2677	1251	2515	6443	
12.00 - 13.00	1307	664	958	2929	
16.30 - 17.30	2627	1076	1666	5369	
Senin, 27 Februari 2023	WAKTU	UTARA	TIMUR	SELATAN	TOTAL
		kend/jam	kend/jam	kend/jam	

	06.30 - 07.30	2154	1739	4271	8164
	12.00 - 13.00	1137	812	1087	3036
	16.30 - 17.30	3172	1065	1307	5544
Rabu, 1 Maret 2023	WAKTU	UTARA	TIMUR	SELATAN	TOTAL
		kend/jam	kend/jam	kend/jam	
	06.30 - 07.30	2436	1711	4491	8638
	12.00 - 13.00	1121	894	980	2995
	16.30 - 17.30	3138	905	1265	5308

Sumber: Hasil analisis peneliti 2023

From these results it can be seen that the total traffic flow of the intersection is in the range of 2995 – 8638 vehicles per hour, these results indicate that the traffic flow at the unsignalized intersection Jl Raya Cupan - Boja, Semarang has exceeded 750 vehicles/hour for 8 hours which is one of the criteria for installing traffic lights, and these results also indicate that the intersection needs to be installed with traffic lights or traffic control lights.

4. Conclusions

From the results of the calculation of the evaluation of the current (existing) conditions and the results of calculating alternative improvements, it can be concluded: 1. The highest vehicle volume occurred on Monday, 27 February 2023, which was 3554.5 pcu/hour, with a capacity of 2864.35 pcu/hour, degree of saturation was 1.9241, maximum delay of 50,983 sec/veh. From the results of the calculation above, it shows that the road capacity is too saturated and the level of service obtained is.

It can be seen that the total traffic flow of the intersection is in the range of 3297 – 5712 vehicles per hour, these results indicate that the traffic flow at the unsignalized intersection of Jl. Raya Cupan – Boja, Semarang, has exceeded 750 vehicles/hour for 9 hours which is one of the requirements for installing traffic lights, and these results also indicate that the intersection needs to be installed with traffic lights or traffic control lights.

The suggestions that can be conveyed from the research that has been conducted and analyzed are as follows.

- a. For further research, it is expected to conduct a survey carefully. For example, in data collection, survey procedures must be systematic, collecting data on the number of surveyors and equipment needed
- b. adequate survey. Also to consider other alternative solutions that are more leverage.
- c. Drivers are expected to have the awareness to be disciplined in obeying traffic rules for safety and smooth traffic.
- d. Installing traffic signs prohibiting parking and stopping for 50 meters starting from the mouth of the intersection is addressed to the Department of Transportation.
- e. Routine evaluation of intersection performance also needs to be carried out at least once every 3 months so that the performance of the intersection is continuously monitored in the hope that it can facilitate the movement of traffic flow at the unsignalized intersection Jl. Raya Cupan - Boja, Semarang and road users can pass through the intersection safely and comfortably.

5. References

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