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Evaluation Study Of Sign And Mark Placement On Road Geometrics In Lhokseumawe City (Case Study Of Merdeka Road, Lhoseumawe City)

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Abstract. The road section Merdeka is a city road section that is a secondary road in the city, with a fairly good road surface condition with asphalt paving and most of this road still has many trees on the right and left sides of the road. The purpose of this study was to determine the amount of road equipment needed as a monitoring tool for the implementation of traffic management and engineering in the context of road safety. The analysis method used is qualitative and constitutive descriptive analysis. The type of research conducted is a combination of surveys and direct field observations as well as literature (library) related to the placement of signs and markings in accordance with urban road traffic standards. This study was conducted on the road section Merdeka with the consideration that the road section has a fairly high traffic density. Traffic signs are needed on this road segment as many as 158 units consisting of 34 command signs, 49 guide signs, 32 warning signs, and 43 prohibition signs. Keywords : *Road Markings, Traffic Signs, Road Equipment Facilities*

1. Introduction

According to Law of the Republic of Indonesia Number 38 of 2004 concerning Roads, Roads are land transportation infrastructure that includes all parts of the road, including complementary buildings and equipment intended for traffic, which are on the surface of the land and/or water, and above the surface of the water, except for railroads, lorry roads, and cable roads. Lhokseumawe City is located in the middle of Sumatra between Banda Aceh and Medan, so this city is a vital distribution and trade route in Aceh. Population growth followed by increasing socio-economic conditions of the community in Lhokseumawe City has caused an increase in the number of vehicles entering the road.

Road section Merdeka is a city road section that is a secondary road in the city, with a fairly good road surface condition with asphalt paving and most of this road still has many trees on the right and left sides of the road. Related to road infrastructure, to meet the need for road equipment as part of road infrastructure, in accordance with Article 25 of Law Number 22 of 2009 concerning Traffic and Road Transportation, it states that every road used for public traffic must be equipped with road equipment in the form of traffic signs, road markings, traffic signaling devices, street lighting, road user control and safety devices, road supervision and safety devices, facilities for bicycles, pedestrians, and the disabled and supporting facilities for traffic and road transportation activities on and off the road. Based on the provisions in this article, the government, both the central government, provincial government, and district/city government must fulfill these obligations as a form of implementing the mandate of the law.

Based on the description above, the problem in this study is how is the existing condition of the currently installed traffic signs and how many traffic signs are needed that should be

installed in accordance with the provisions or regulations in force. Meanwhile, the purpose of the study is to determine the amount of road equipment needed as a means of monitoring the implementation of traffic management and engineering in the context of road safety.

The data collection technique in this study is by direct review in the field and literature study. This is very necessary to determine the existing condition of the location and the condition of the surrounding environment. Then the data obtained from the field is processed and compared with the standard signs and markings that should be installed in accordance with the provisions or applicable laws and regulations. While the purpose of the study is to determine the amount of road equipment needed as a monitoring tool for the implementation of traffic management and engineering in the context of road safety. The primary data collection method is carried out by looking at the existing condition of road equipment and supporting facilities through observation using camera equipment. While secondary data collection is obtained based on data from related agencies, as well as literature studies of documents regarding the legality/policy and applicable provisions/regulations related to road equipment facilities. In this study, the analysis used is qualitative and quantitative descriptive analysis with reference to the legality/policy and applicable provisions/regulations, as well as referring to studies that have been conducted and literature related to road equipment facilities.

2. Research methods

The research method of this activity starts from the research preparation stage, to the creation of documentation. The preparation stage includes literature studies and field studies to identify problems. The data collection stage is carried out through direct observation in the field. The next stage is to determine the solution to the problems found. At this stage the research team discusses to find the right solution to solve the problems found.

1.1. Time and Location of the Study

The observation time was carried out for 7 days, from Monday to Sunday. The survey was conducted starting at 09.00 WIB until 16.00 WIB. This study was conducted on Jalan Merdeka Timur and Jalan Merdeka Berat, Lhokseumawe City.

1.2. Data Collection

There are two data collected in this study, namely primary data and secondary data. The primary data collection method is carried out by looking at the existing condition of road equipment and supporting facilities through observation using camera equipment. Secondary data is obtained based on data from related agencies, as well as literature studies on documents regarding the legality/policy and provisions/regulations applicable to road equipment facilities.

1.3. Data Analysis

The method used to analyze the data in this study is qualitative and quantitative descriptive analysis with reference to the legality/policy and provisions/regulations applicable to road equipment facilities, as well as referring to studies that have been conducted and literature related to road equipment facilities.

3. Results and Discussion

The road section Merdeka is 4.47 km long with varying road widths, namely 3 m (road shoulder width 0.5 m), 8 m and 16 m (road shoulder width 0.25 m each). Based on Lhokseumawe City Qanun Number 7 of 2018 concerning the Lhokseumawe City Medium-Term Development Plan for 2017-2022, it is stated that the road section functions as a City road section, namely a public road in a secondary network system that connects service centers in the city, connects service centers with plots, connects between plots, and connects between settlement centers in the city.

Meanwhile, the condition of Merdeka Street is a fairly good road surface with asphalt paving and most of this road still has many trees on the right and left sides of the road. This type of road is a Six-Lane Two-Way Divided Road (6/2 D), but in certain segments there are four and two-lane roads.

3.1. Signs

The number of traffic signs installed based on type on the road section Merdeka is 110 units consisting of 29 command signs, 27 guide signs, 12 warning signs, and 42 prohibition signs. Based on this number, the condition of the traffic signs that are clearly visible in good condition is 71 units, clearly visible in damaged condition 11 units, and covered by objects in good condition 9 units. The condition of the traffic signs installed based on type can be described as follows:

1. Command signs that are clearly visible in good condition 20 units, and covered by objects in good condition 9 units.
2. Guide signs that are clearly visible in good condition 22 units, clearly visible in damaged condition 3 units, and covered by objects in good condition 2 units.
3. Warning signs that are clearly visible in good condition 10 units, and covered by objects in good condition 2 units.
4. Prohibition signs that are clearly visible in good condition 25 units, clearly visible in damaged condition 15 units, and covered by objects in good condition 2 units.

Command signs that are clearly visible in good condition as many as 20 units including command signs to obey the indicated direction as many as 7 units in accordance with KM 61 of 1993 article 8 paragraph (5) and attachment 1 table 2B no. 1c and 1d concerning regulations on good sign conditions. U-turn command signs as many as 1 unit in accordance with table 3 no. 6d. signs entering a certain section of road as many as 6 units in accordance with table 2B no. 3b. 4 units of command signs to choose one of the designated directions in good condition according to table 2B No. 2a and 2b, and 3 units of command signs with words based on article 13 paragraphs 1, 2, and 3. 9 units of signs covered by objects in good condition, namely 1 unit of U-turn command signs, 5 units of entering the designated direction signs, 2 units of entering certain road sections signs and 1 unit of selecting one of the designated directions signs, as in article 34 paragraph (4) the installation of signs must not be obstructed by trees or other objects that can result in reducing or eliminating the meaning of the sign. 22 units of clearly visible guide signs in good condition including 4 units of guide signs indicating the intended direction in accordance with article 12 paragraph 1 and article 9 paragraph 6. 3 units of guide signs for parking facility locations in accordance with article 9 paragraph 5 and table 3 no. 8, 2 units of pedestrian crossing facility location instructions according to table 3 no. 5, 2 street name boards according to table 3 no. 10, 10 units of signage with words according to article 3 paragraphs 1 and 2. There are 3 clearly visible signs in damaged condition, namely 1 unit of pedestrian crossing facility location instructions, 2 street name boards, 1 unit of parking facility location instructions according to regulation KM 61 of 1993, the condition of the signs is good according to attachment 1 table 3 of this decision. There are 2 closed object signs in

good condition, including 1 unit of the predecessor route sign and 1 unit of signage with words according to the regulation on the installation of the position of the signs in article 34 paragraph 4.

There are 10 clearly visible warning signs in good condition, including 2 warning signs for many children pedestrians according to article 4 paragraph 6 and table 1 no. 11. Warning signs for traffic signal devices (traffic lights) as many as 4 units according to table 1 no. 15 provisions for 3-color traffic lights. Warning signs for priority four-way intersections as many as 2 units according to table 1 no. 19a good condition of signs according to article 5. Warning signs for right turns as many as 1 unit in good condition and clearly visible according to table 1 no. 1a and 1b. warning roundabouts with priority as many as 1 unit according to table 1 no. 20f. warning signs for the amount of pedestrian traffic as many as 1 unit in good condition and clearly visible. warning signs covered by objects in good condition as many as 2 units do not comply with article 34 because the sign poles are used for selling.

Prohibition signs that are clearly visible in good condition as many as 25 units in accordance with the provisions of Article 6 paragraph 2 and Article 7, namely prohibition signs for goods vehicles as many as 1 unit, prohibition of parking 2 units, prohibition of driving vehicles at speeds exceeding .... Kilometers per hour 2 units, prohibition of stopping 1 unit, prohibition with words 8 units, prohibition of U-turn 3 units, prohibition of right turn 4 units, prohibition of entry for motorized and non-motorized vehicles 4 units, signs that are clearly visible in damaged condition 15 units, namely not in accordance with the good condition of the prohibition signs contained in Article 6 and Article 7 KM 61 of 1993 including, prohibition of continuing because it is mandatory to give priority to traffic flow from the direction given priority 1 unit, prohibition of left turn 2 units, prohibition of parking 1 unit, prohibition of stopping 1 unit, prohibition with words 6 units, prohibition of U-turn 2 units, prohibition of entry for motorized and non-motorized vehicles 2 units. Prohibition signs covered by objects in good condition 2 units, this does not comply with the regulations for installing the position of signs according to article 34 paragraph 4. The signs are prohibitions with words 1 unit, and prohibitions on turning left 1 unit.

Based on the results of a survey using a camera, it is known that the need for traffic signs on the road section Merdeka is 158 units consisting of 34 command signs, 49 guide signs, 32 warning signs, and 43 prohibition signs, so there is a shortage of traffic signs of 48 units consisting of 5 command signs, 22 guide signs, 20 warning signs, and 1 prohibition sign. On this road section, the type of traffic sign that is most needed is the guide sign and the sign that is least needed is the warning sign, as well as for the type of traffic signs installed.

Table 3.1 Number of Traffic Signs Needed by Type on the road section Merdeka

NO.	Types of Signs	Total		
		Needs	Installed	Disadvantages
1.	Command	34	29	5

2.	Instruction	49	27	22
3.	Warning	32	12	20
4.	Prohibition	43	42	1
Total		**158**	**110**	**48**

Based on the results of the survey using a camera, the types and names of traffic signs installed are:

1. The most commonly installed command signs are command signs to enter the designated lane or lane,
2. The most commonly installed guide signs are guide signs with words,
3. The most commonly installed warning signs are warnings of traffic signal devices (traffic lights), and
4. The most commonly installed prohibition signs are prohibitions with words.

Table 3.2 Number of Traffic Signs Installed Based on Type and Name of Signs on Jalan Merdeka

NO.	Types and Names of Signs	Total
A.	Command Signs	
1	Commands to Obey the Directions Shown	12
2	U-Turn	2
3	Entering a Certain Section of the Road	8
4	Choosing One of the Directions Shown	4
5	Command Signs with Words	3
	Total	29
B.	Direction Signs	
1	Directional Guidelines Pointing to the Direction You Want to Go	5
2	Directions for Parking Facilities	4
3	Directions for Pedestrian Crossing Facilities	3
4	Street Name Signs	4
5	Direction Signs with Words	11
	Total	27
C.	Warning Signs	
1	Warning High Traffic Pedestrian Children	2
2	Traffic Signaling Device (Traffic Light) Warning	4
3	Priority Intersection Warning (Minor Arm Position)	3
4	Warning Right Turn Warning	1
5	High Traffic Pedestrian Warning	1
6	Roundabout Warning with Priority	1
	Total	12
D.	Prohibition Signs	
1	Prohibition of Entry for Goods Vehicles	1
2	Parking Prohibition	3
3	Prohibition of Running Vehicles at Speeds of More Than … Kilometers per hour	2
4	Stopping Prohibition	2
5	Word Prohibition	15
6	U-Turn Prohibition	5
7	Right Turn Prohibition	4
8	Entry Prohibition for Motorized and Non-Motorized Vehicles	6
9	Prohibition of Continuous Driving Because It is Mandatory to Give Priority to Traffic Flow	1

	from the Direction Given Priority.	
10	Left Turn Prohibition	3
	Total	42

Source: Analysis Results, 2021

The condition of the traffic signs installed on the road section Merdeka is mostly still good, this condition is based on 110 units of traffic signs installed where the condition of the traffic signs that are clearly visible with good condition is 79.9%, clearly visible with damaged conditions 11.8%, and covered by objects with good condition 8.1%.

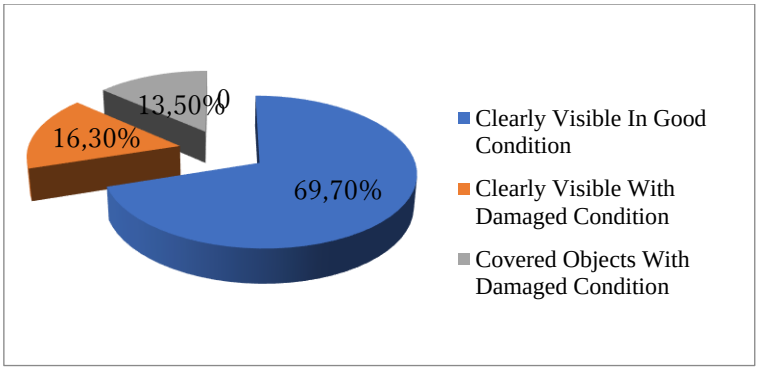

Figure 3.1 Condition of Traffic Signs Installed on Merdeka Street.

If detailed further, the condition of the installed traffic signs based on their type can be described as follows:

1. Clearly visible command signs with good and damaged conditions, 14.5% each, and covered by objects with good conditions 2.7%
2. Clearly visible guide signs with good conditions 22.7% and clearly visible with damaged conditions 2.7%, and covered by objects with good conditions 1.8%
3. Clearly visible warning signs with good conditions 10.9%, clearly visible with damaged conditions 0%, and covered by objects with good conditions 1.8%, and
4. Clearly visible prohibition signs with good conditions 31.8%, clearly visible with damaged conditions 9.1%, and covered by objects with good conditions 1.8%.

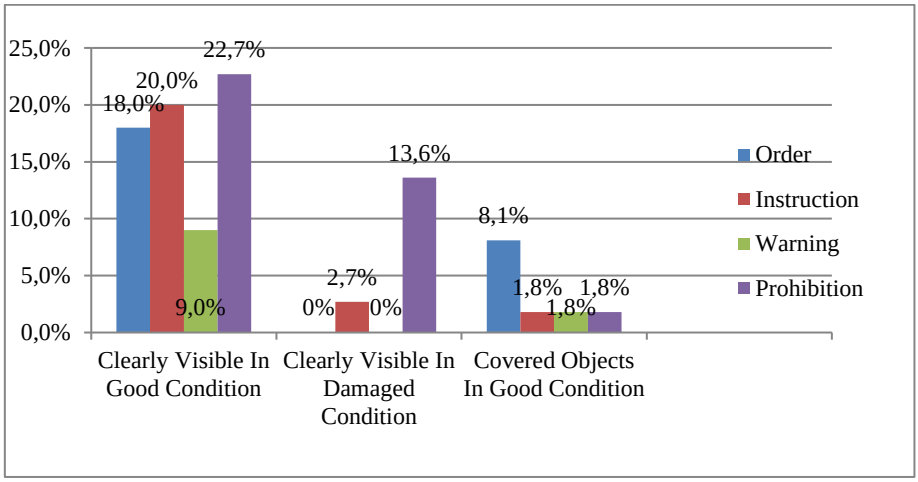

Figure 3.2 Condition of Traffic Signs Installed on the Merdeka Street Section.

Meanwhile, the types and names of traffic signs needed are:

1. The most needed guide signs are the predecessors of the route directions that indicate the intended direction,
2. The most needed warning signs are warnings (the explanation of the type of warning is emphasized using additional boards), and
3. The most needed prohibition signs are prohibitions on entry for certain types of vehicles.

Table 3.3 Number of Traffic Signs Needed Based on Type and Name of Signs on the Merdeka Street Section

No.	Types and Names of Signs	Total
A.	Command Signs	
1	Commands with Words	5
	Total	5
B.	Direction Signs	
1	Instructions for Places of Worship	1
2	Instructions for Shopping and Business Locations	3
3	Instructions for Recreation and Culture Locations	1
4	Instructions for Pedestrian Crossing Facilities	2
5	Instructions for Gas Station Locations	2
6	Predecessors of Directional Directions that Show the Direction to be Taken	11
7	Street Nameplates	2
	Total	22
C.	Warning Signs	
1	Roundabout Warning	2
2	2-Way Lane Warning	2
3	Pedestrian Crossing Lane Warning	2
4	Crossing Traffic Signal Warning	2
5	High Freight Traffic Warning	2
6	High Heavy Vehicle Traffic Warning	3
7	High Pedestrian Traffic Warning	1
8	Warnings Emphasized by Additional Signs	4
9	Roundabout Warning with Priority	2
	Total	20
D.	Prohibition Signs	

1	Prohibition of Continuous Walking	1
	Total	1

Observations are made to determine the geometric conditions of the road (road and environmental conditions) and available road equipment (signs, road markings, traffic signal devices) from the results of the road environment condition survey, then at the observed point several road facilities and signs for pedestrians and motorists/drivers will be installed. From the potential for conflict between vehicles or between vehicles with pedestrians and crosswalks and seeing the environmental conditions around the road, at this location additional facilities are needed in the form of command signs in accordance with the Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 13 of 2014 article 15 paragraph (2).

The required guide signs indicate the location of public facilities such as places of worship, shopping and business locations, recreation and cultural locations, and gas station locations where the signs are needed as referred to in article 19 paragraph (6) are placed at the designated location. The need for advance signs indicating the intended direction is in accordance with Article 48. The road nameplate as referred to in Article 18 paragraph (2) letter I is placed on a section of a road and repeated if the section of the road intersects with another section of the road, the placement position is in accordance with Article 51 paragraph (3).

The warning signs needed are in accordance with environmental conditions and road geometry, namely warning signs for heavy vehicle traffic, warning signs for goods traffic, warning signs for pedestrian crossing signals, warning signs for pedestrian crossing lanes, warning signs for pedestrian traffic, these needs are in accordance with Article 38 paragraph (4) in terms of the distance between the warning sign and the beginning of a dangerous section of the road that is not expected by road users. The need for these warning signs is supplemented with warning signs that are emphasized with additional boards.

The need for signs prohibiting continued driving is in accordance with traffic conditions, namely prohibiting continued driving on certain sections of the road and before giving way to traffic coming from the opposite direction.

Table 3.4 Condition of Markings on Merdeka Street

Marking Type	Existing Image	Ministry of Transportation Regulation (width)	Field review (width)	Description
	Longitudinal Markings			

Whole Longitudinal Marking		0,10 Meters	0,10 Meters	Meet the Standards
Broken Longitudinal Markings		0,10 Meters	0,10 Meters	Meet the Standards
Double Longitudinal Markings Whole		0,10 Meters	0,11 Meters	Meet the Standards
Transverse Markings				
Solid Line Cross Marking		0,10 Meters	0,10 Meters	Meet the Standards
Diagonal Marking				

Diagonal Marking		0,10 Meters	0,10 Meters	Meet the Standards

4. Conclusions and Suggestions

4.1. Conclusion

From the discussion of traffic signs and markings on the road section Merdeka of Lhokseumawe city that has been described previously, there are several conclusions that can be drawn, namely:

Placement of signs on road sections that are not yet complete with road equipment facilities, namely as follows, command signs with words, predecessor signs indicating the direction of destination, and warning signs that are emphasized with additional boards.

There are still traffic signs and markings that are not maintained and the condition of the signs and markings is damaged. Repairs to the sign leaves and repainting are needed.

The number of traffic signs installed is 110 units, the need for traffic signs on the road section Merdeka is 158 units.

4.2. Suggestions

To meet the needs of traffic signs on the road section Merdeka of Lhokseumawe City, it is necessary to make/procure traffic signs according to needs, while the condition of the signs that are clearly visible with damaged conditions needs to be repaired and cleaned of objects that cover the traffic signs. Road markings on the road section Merdeka must also be repaired because in addition to damaged markings, there are also road sections with markings that do not comply with the standards of the Indonesian Ministry of Transportation.

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