

# Implementation of Public Street Lighting Needs on the Sukabumi Southern Ring Road

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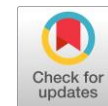
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## ABSTRACT

Ruas Lingkar Selatan is made to facilitate the mobility of people from Bogor to Cianjur and vice versa without having to pass the jammed roads of Sukabumi city. However, the traffic signs, in Ruas Lingkar Selatan of Sukabumi City has not met the elements of comfort, safety, smoothness, and road safety. In addition, the traffic signs, which is located in Ruas Lingkar Selatan of Sukabumi City, is not complete and does not meet the standards. The purpose of this study was to determine the need for traffic signs, criteria needed on the road ruas lingkar selatan. The regulation used to solve this problem is SNI 7391 2008 concerning specifications for street lighting in urban areas.

Availability of sufficient lighting is one of the supporting aspects of safety in driving on the highway. Apart from lighting the vehicle itself, the availability of street lighting or commonly known as public street lighting is very important and must be considered properly.

Ideally the lights installed are high pressure sodium gas (SON) 250 watts, continuous and partial lamp placement systems, the distance between the traffic signs, poles ruas lingkar selatan is 39 meters with a lighting quality of 10 LUX, the lamp poles used are double light poles which is placed in the median of the road, PJU uses solar panels, and in meeting road service standards to be ideal, 317 traffic signs needed.



## KEYWORDS

Implementation  
Public Street Lighting  
Ruas Lingkar Selatan



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## 1. Introduction

Implementation is an action or implementation of a plan that is prepared carefully and in detail [1] [2] [3] [4]. Implementation is usually done after the planning is considered perfect. According to Nurdin Usman, implementation is down to activity, act, action, or the existence of a mechanism for a system, implementation is not just an activity, but a planned activity and to achieve the objectives of the activity [5] [6].

As a developing Regency/City, Sukabumi continues to improve its road construction specifically to support the economic stability of the community. With road construction that continues to increase, it must also be supported with adequate road support facilities, for example with the Public Street Lighting facility [7] [8] [9].

Regulation of the Minister of Transportation of the Republic of Indonesia No. 27 of 2018 concerning Street Lighting Equipment that is to optimize road equipment facilities in the form of street lighting equipment [10] [11]. In order to realize safety, security, order, and smooth traffic as well as convenience for road users in traffic, it is necessary to stipulate a Regulation of the Minister of Transportation regarding street lighting equipment [12]. Street Lighting Equipment is a street lighting lamp that serves to provide lighting in the traffic space [13].

The South Ring Road of Sukabumi City has a road length of 12.4 Km. This route is a regional route connecting Sukabumi City with surrounding cities such as Bogor City, Cianjur City, Bandung City. The South Ring Line is divided into 3 segments. This division is determined based on the division of the physical development of the southern ring line and there are several criteria in the division of this segment. The division of the route is Segment 1 Cibolang Intersection - Port 2 with a length of 6.9 Km. Segment 2 Port Intersection 2 - Baros with a length of 2.4 Km. Then Segment 3 Intersection of Baros - Cibereum with a length of 3.1 Km.

It is hoped that the related agency services will be able to follow up on the problem of public road lighting on the southern ring road so that accidents do not occur.

## 2. Method

This research is a field research, namely data obtained from the field directly from the source (Sugiyono, 2017: 14). The research approach used in this study is a qualitative approach, which is about the situation in the field that is researched, observed, and based on the observations made, as well as understanding (and explaining) how people understand the situation [14] [15].

## 3. Results and Discussion

### 3.1. Public Street Lighting Standard

Luminance (L) is a measure to determine the level of brightness of an object [16] [17] [18]. Luminance that is too large will dazzle the eye, such as an incandescent lamp without an armature. Luminance (L) of a light source or a surface that reflects light is the intensity of the light divided by the apparent surface area, or in the following equation [19] [20] [21]:

$$L = \frac{I}{A_s} \tag{1}$$

Where:

L = luminance in cd/cm<sup>2</sup>

I = Light Intensity in cd . units

A<sub>s</sub> = apparent surface area in cm<sup>2</sup>

If the luminance is very small, the unit cd/m<sup>2</sup> can also be used, where 1 cd/cm<sup>2</sup> is equal to 10,000 cd/m<sup>2</sup>. Here are practical examples of luminance in cd/cm<sup>2</sup> [1]:

According to Hermawan, light efficacy can be calculated based on the following equation:

Sun, seen from Earth	= 150,000 cd/cm <sup>2</sup>
Moon, seen from Earth	= 0.25 cd/cm <sup>2</sup>
Light cloudy skies	= 0.50 cd/cm <sup>2</sup>
200 W incandescent lamp wire, without armature	= 1000 cd/cm <sup>2</sup>
TL lamp	= 0.4 cd/cm <sup>2</sup>
Sodium lamp	= 19 cd/cm <sup>2</sup>
White color table base, with illumination 250 lux	= 0.05 cd/cm <sup>2</sup>

### 3.2. Light Efficacy

According to Hermawan, light efficacy can be calculated based on the following equation [20] [22]:

$$K = \frac{\phi}{P} \tag{2}$$

Where:

$K$  = light efficacy in lumens /Watts (lm/Watts)

$P$  = electric power in watts (W)

### 3.3.Light Efficiency

Meanwhile, the light efficiency can be calculated based on the following equation [20] [22]:

$$\eta = \phi / \phi_{maks} \tag{3}$$

In the street lighting system, the luminaire usability factor is used which is determined from the ratio between the width of the road and the height of the luminaire. To calculate the usability coefficient, the width of the road is divided into two parts, namely the front of the luminaire (street side) and the back of the luminaire (house side). From the ratio of the width of the road and the height of the luminaire, the size of the CU can be determined. Furthermore, the distance and height of the road luminaire can be calculated by the following equation [20]:

$$\text{Jarak} = \frac{\phi L x CU}{Em x Lebar Jalan} \tag{4}$$

Road class

The road facilities that we have used so far are distinguished according to several road class criteria. The following are the road class criteria [21] [23] [24]:

#### 1. Primary Arterial Road

It is a road that accommodates local and regional activities, the traffic is very heavy on this road, so it needs optimal road management. The lux for this type and class of road is a lamp with 50 lux, according to SNI 2000.

#### 2. Secondary Artery Road

An artery that accommodates local and regional activities as a supporter of the primary arterial road. Where traffic conditions on this route are congested, so it requires the same type of light as the primary artery. The lux for this road according to SNI 2000 is 50 lux.

#### 3. Primary Collector

It is a collecting path from the surrounding neighborhood roads that will lead to the primary arterial road and secondary arterial road. Lux for the type of lighting for this road class, according to SNI 2000 is 30 lux.

#### 4. Secondary Collector

It is a collecting lane from the surrounding environmental roads that will end up on the primary collector roads, primary and secondary arterial roads. Lux of the type of this road class, according to SNI 2000 is 30 lux.

#### 5. Environmental Road

It is a path in a residential, rural or village area. This road line requires lighting, which according to SNI 2000 is 15 lux.

### 3.4.Street lighting layout

The arrangement of street lighting is arranged as shown in Table 1 and illustrated in Appendix A. In areas or conditions where the median is very wide (> 10 meters) or on roads where the number of lanes is very large (> 4 lanes each direction) needs to be considered with the placement of street lighting combinations of the methods mentioned above and under these conditions, the selection of the placement of street lighting lamps is planned individually for each direction of traffic.

**Table 1.** Layout of street lighting

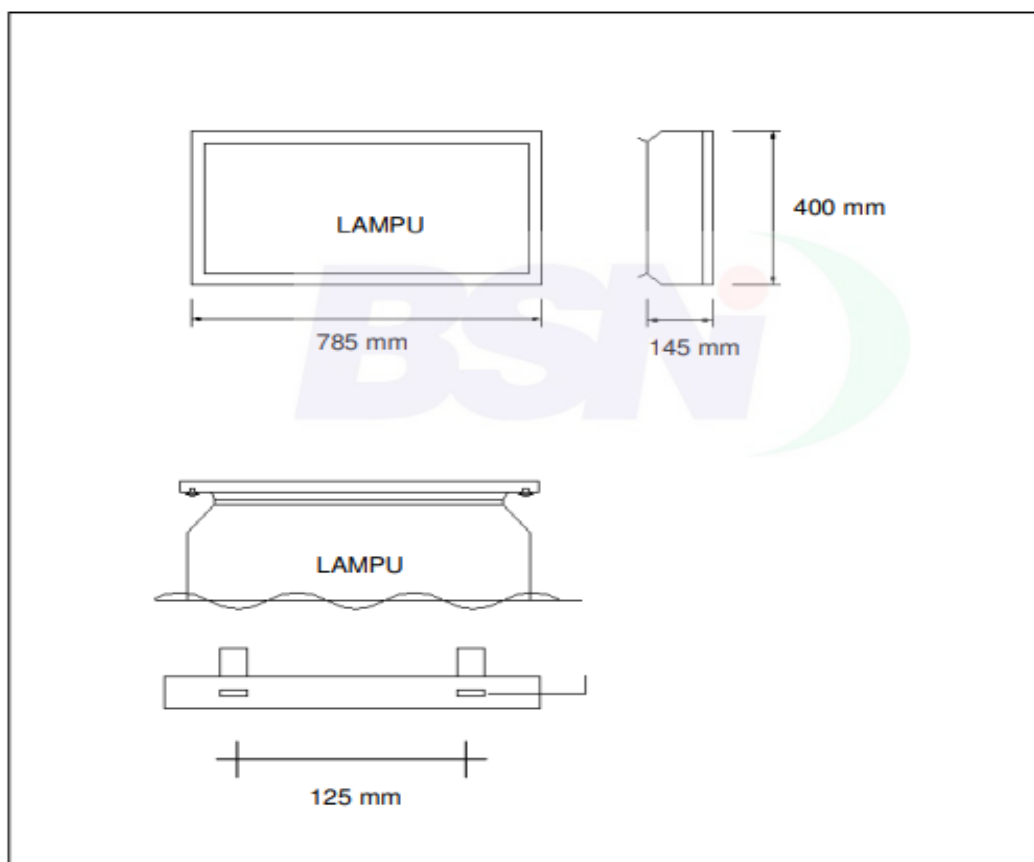
The Place	Layout or Arrangement of Street Lighting
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One Way Street	<ul style="list-style-type: none"> <li>- on the left or right of the road</li> <li>- on the left or right of the criss-cross road</li> <li>- on the left or right of the road opposite</li> <li>- in the middle/separator of the road</li> </ul>
Two Way Street	<ul style="list-style-type: none"> <li>- in the middle / median of the road</li> <li>- a combination of on the left and right facing the middle / median of the road</li> <li>- catenation ( in the middle of the road with the system suspended )</li> </ul>
Intersection	<ul style="list-style-type: none"> <li>- can be used by using tower lights with multiple lights, generally placed on islands, in road medians, outside intersection areas</li> </ul>

### 3.5. Installation of Lighting Housing

#### 3.5.1 Poleless Installation

Installation of a lighthouse without a pole is a lamp placed on the wall or ceiling of a construction, such as under bridge construction, under flyover construction or on tunnel walls or ceilings, etc. Figure 1 show the The Shape and Construction of the Lamp without the Pole.



**Fig. 1.** The Shape and Construction of the Lamp without the Pole

### 3.5.2 Installation with pole

Light pole with single arm.

These light poles are generally placed on the left or right side of the road. A typical shape and structure of a lamppost with a single arm is illustrated in Figure 2 [24] [25].



**Fig. 2.** Typical Single Arm Light Pole

Light pole with double arms

This light pole is specifically placed in the middle / median of the road, with a note that the condition of the road to be illuminated is still able to be served by one pole. A typical shape and structure of a lamppost with double arms is illustrated in Figure 3 [24] [25].



**Fig. 3.** Typical Double Arm Light Pole

#### Armless upright light pole

These light poles are mainly needed to support tower lights, which are generally placed at intersections or large areas such as interchanges, parking lots, etc. This type of lamppost is very high, so the lamp replacement/repair system is carried out below by lowering and raising the lamp using a suspension cable where is shown on figure 4 and table 2 provides street lighting standard based on CIE 114 [24].

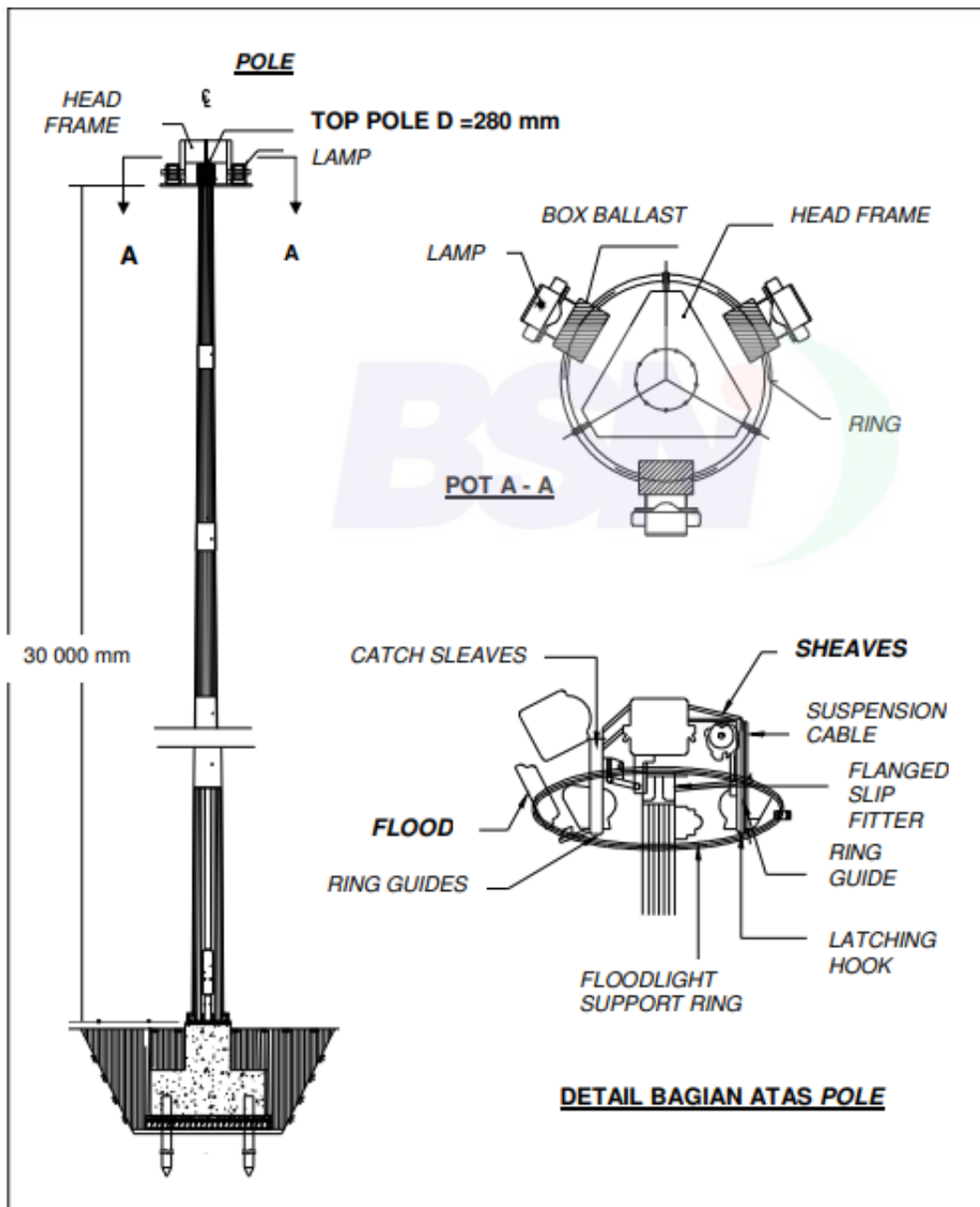


Fig. 4. Typical Armless Stand Lamp

**Table 2.** Street Lighting Standard based on CIE 114

Road Specification	Road Condition	Classification
High speed, 1 way and has 1 road divider,	Road density and complexity	
	High	M1
Freeway	Medium	M2
Main road	Low	M3
High-speed, 2-way without separator; 1-way	Traffic separation and mixing control	
Main road	Bad	M1
	Good	M2
Important distribution channels	Traffic separation and mixing control	
Connecting road	Bad	M2
	Good	M3
Sightseeing / local neighborhood	Traffic separation and mixing control	
	Bad	M4
	Good	M5

#### 4. Conclusion

Based on the discussion and analysis, the need for public road lighting in the southern ring segment is carried out to improve the quality and quantity of public road lighting assets so that they are in accordance with the standard. Planning based on the type of street lighting recommended for use in the southern ring segment is the type of high pressure sodium gas lamp with 250 watts. Continuous and partial lamp placement systems, the distance between public road lighting poles in the southern ring segment is 39 meters with lighting quality of 10 LUX, the lampposts used are double lampposts placed in the median of the road, the public road lighting poles use solar panels, and in meeting road service standards to be ideal, 317 public road lighting are needed.

Because in the field the lampposts used are single-arm lampposts which are placed on the shoulder side of the south ring road which do not maximize lighting and there is still a lack of placement points for Public Street Lighting.

#### 5. Suggestion

Based on the conclusion above, public road lighting needs must be implemented in 2021 according to the criteria and specifications required. So that the southern ring road can become an ideal primary collector road in serving road users.



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