CHAPTER II

LITERATURE REVIEW

2.1. Road Safety Inspection

Road safety inspection is a systematic inspection of a road or road segment to identify hazards, errors, and shortcomings that can cause accidents. The hazards or errors and shortcomings referred to are the potential causes of traffic accidents caused by a decrease (deficiency) of the physical condition of the road and or its complement, errors in the application of the complementary buildings, and a decrease in the condition of the road and surrounding environment.

The main background of the implementation of road safety inspections is to realize road safety which is one of the important parts in the implementation of road transportation by following UU RI No. 22 of 2009 concerning road traffic and transportation. Besides, inspections of road conditions and their traps and the surrounding environment greatly affect the safety of road users, who are expected to have a significant contribution to the occurrence of accidents. Another major reason is to avoid the cost of road repairs due to relatively large accidents.

2.2. Road

Road is a land transportation infrastructure that covers all parts of the land area, including complementary buildings and equipment intended for traffic, which are on the surface of the land, above the surface of the land, below the surface of

the land and/or water, and above the water surface, except railroad, lorry, and cable road. (Government Regulation of the Republic of Indonesia no 34,2016).

Roads are land routes on the surface of the earth made by humans with the shape, size, and type of construction so that they can be used to channel traffic of people, animals and vehicles that transport goods from one place to another easily and quickly (Aglesby, 1999).

Roads are generally divided into sections including traffic lanes, shoulders, sidewalks, medians, side channels, curves, and edge guards.

2.2.1. Traffic Lane

The entire pavement road lane intended for vehicle traffic usually marked from the paved or concreted part of the road on a rigid pavement (Syuradharma, 1999).

The width of a traffic lane (traveled way = carriageway) is a road pavement channel used for vehicle traffic which consists of several lanes, namely traffic lanes specifically intended to be passed by vehicles in one direction. In the traffic lane on a straight road made sloping, this is intended primarily for the needs of road drainage where water that falls on the road surface will quickly flow into the drainage channels. In addition, the use of the transverse slope of the traffic lane is for the need for a balance of centrifugal force that works primarily on bends.

Traffic lane boundaries can be in the form of medians, shoulders, sidewalks, island roads, and separators.

Traffic lanes can consist of several lanes of other types:

a. 1 lane-2 lanes-2 way (2/2 ND)

b. 1 lane-2 lane-l direction (2/1 ND)

c. 2 lines-4 1 lane-2 directions (4/2 D)

d. 2 lanes-n 2-way lane (n / 2 D)

Note: ND = not divided. D = divided

2.2.2. Roadside

The shoulder of the road is the side of the road that is used as a place for vehicles that stop damaged or used by emergency vehicles such as ambulances, fire engines, police who are heading to a place that requires emergency assistance when the road is experiencing high levels of traffic jams. The shoulder of the road functions as:

1. The vehicle's temporary stop.

2. Avoiding yourself from times of emergency to prevent accidents.

3. Providing support for road pavement construction from the side so it is not easily eroded.

4. Space helper when carrying out repair work or road maintenance (Bina Marga, 1997).

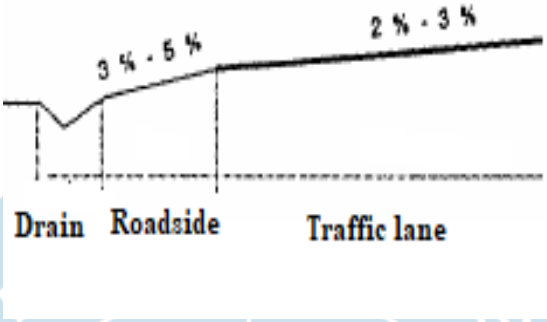


Figure 2.1 Roadside Details

2.2.3. Sidewalk

Sidewalks are pedestrian paths that are generally parallel to the road and are higher than the pavement surface to ensure the safety of the pedestrians concerned. According to the decision of the Director-General of Highways No.76 / KPTS / Db / 1999 dated December 20, 1999, the definition of sidewalks is a part of the road that is specifically provided for pedestrians located in the benefit area of the road, which is given a surface layer with a higher elevation than pavement surface, and generally parallel to the vehicle traffic lane.

Whether sidewalks are needed or not can be identified by the volume of pedestrians walking on the road, the level of accidents between vehicles and pedestrians and complaints/requests from the public.

Pedestrian facilities in the form of sidewalks are placed at:

1. Urban areas in general with a high population density

2. Roads that have fixed public transport routes

3. Areas that have high continuous activity, such as streets in markets and urban centers

4. Locations that have high needs/requests with short periods, such as bus and train stations, schools, hospitals, sports fields

5. Locations that have a high demand for certain days, for example, sports fields/venues, mosques.

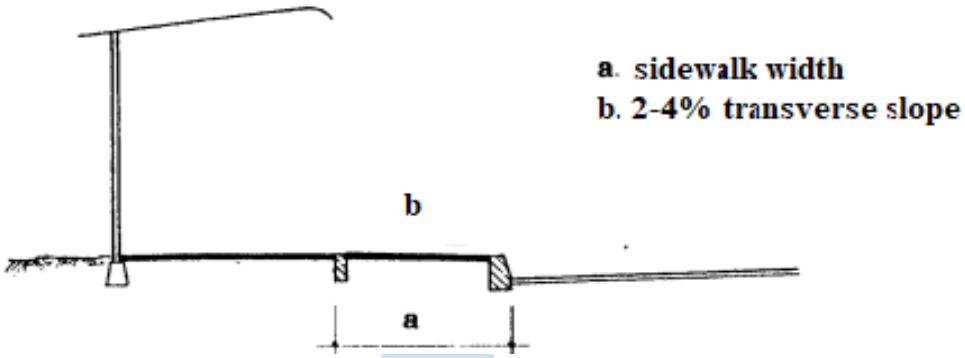


Figure 2.2 Sidewalk Details

2.2.4. The Median

Median is a part of a road-building that physically separates two lanes of traffic in the opposite direction (Department of Settlement and Regional Infrastructure, 2004)

The function of the median is to:

1. Separating the two opposite directions of traffic flow

2. Crossing room for deaf crossing the road

3. Placement of road facilities

4. Temporary work infrastructure

5. Greening

6. Emergency stop (if large enough)

7. Lane reserves (if large enough)

8. Reduce glare from vehicle headlights from the opposite direction.

The median can be divided into:

1. The median is demeaned, consisting of an edge path and a demarcation separating building.

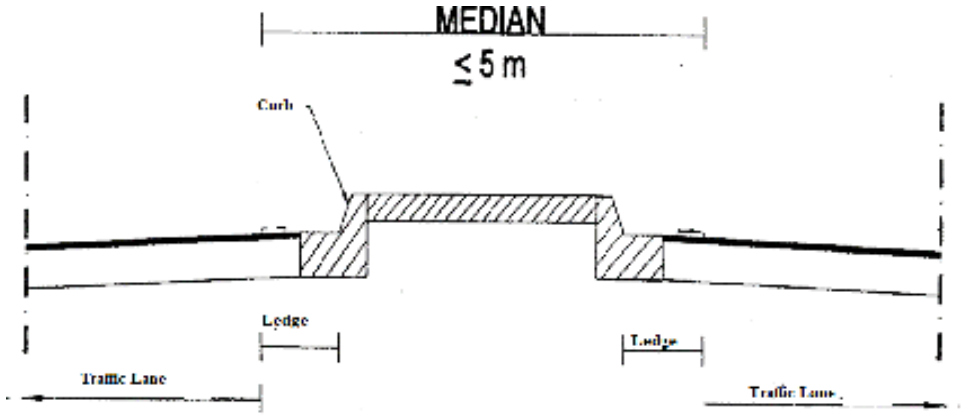
2. Median is elevated, consisting of ledge lane and elevated lane separator building.

The minimum median width consists of a 0.25-0.50 meter wide ledge and a lane separator building, specified as shown in the table below.

Table 2.1 Minimum Median Width

Median Shape	Minimum Width
The median is elevated	2,0
The median is lowered	7,0

Source: Building Construction Guidelines, Department of Settlement and Regional Infrastructure, 2004



Figures 2.3 Median Details

2.2.5. Side Channel

The side channel functions to drain water from the pavement surface or even from outside the section of the road to make the road construction always dry and not submerged in water.

Generally the shape of the trapezoid side channel, or rectangular. For urban areas, where the area of land acquisition is already very limited, the side channel can be made rectangular from concrete construction and placed under the sidewalk. Whereas in deepening areas where freeing of the road is not a problem, the side channel is generally made in the form of a trapezoid. The walls of the channel can be by using a pair of river stones, or native soil. The width of the channel base is adjusted to the amount of discharge that is expected to flow in the channel, a minimum of 30 cm.

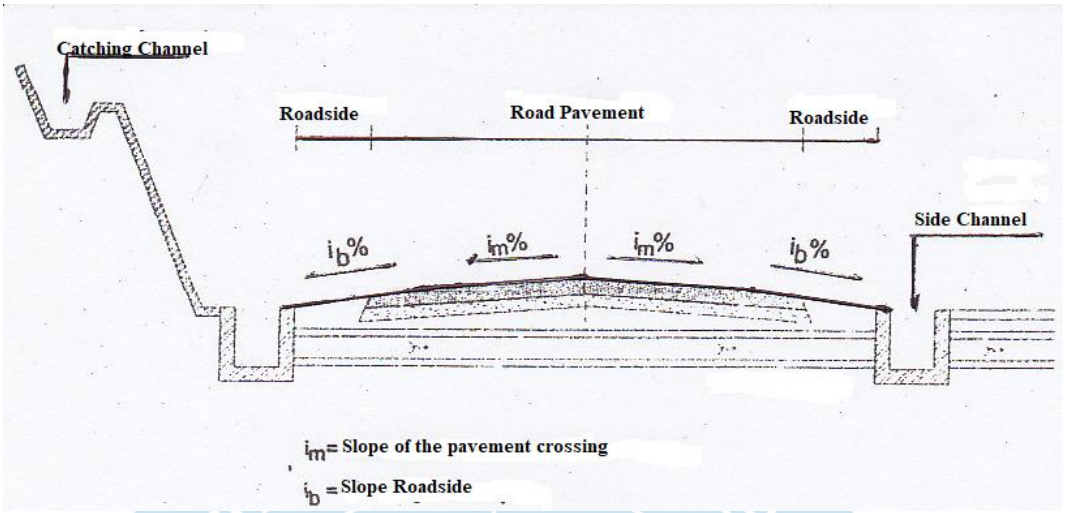


Figure 2.4 Side Channel Details

2.2.6. Curb

What is meant by a curb is the protrusion or elevation of the edge of the pavement or the shoulder of the road, which is mainly intended for drainage purposes, preventing the firmness of the pavement edge.

In general, the curb is used on roads in urban areas, while for the roads between cities the curb is only used if the road is planned for high-speed traffic or when crossing villages.

Based on the function of the curb, the curb can be distinguished into:

1. Mountable Curb (mountable curb), is a curb that is planned to be able

vehicle climbed, usually found in a parking lot on the side of the road/traffic lane.

2. A barrier curb (barrier curb), is a curb that is planned to obstruct or prevent vehicles from leaving the traffic line, especially in the median, sidewalks on roads without security fences.

3. Gutter curb, a curb planned to form a road pavement drainage system. This curb is recommended on roads that require better pavement drainage systems. On the straight road placed on the outer edge of the pavement, while the bend is placed on the inner edge.

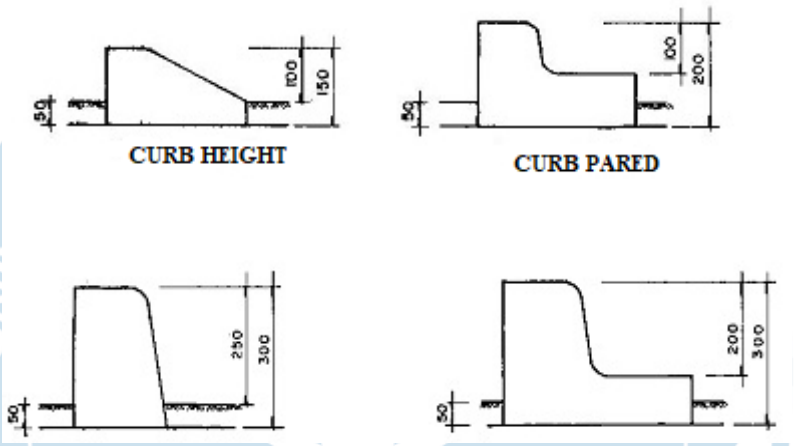


Figure 2.5 Curb Details

2.2.7. Guard Rail

Guard rail aims to provide rigidity at the edge of the body of the road. If an accident occurs, it can prevent the vehicle from leaving the body of the road. Generally, edge guarding is used along a road that runs along a cliff, on a dirt heap with sharp turns, on the edges of a road with heaps greater than 2.5 meters and high-speed roads. Edge protection is distinguished on:

a. Safety edge of galvanized iron (guardrail)

The metal edge guards are used to resist impact from the vehicle and return the vehicle inward until the vehicle continues to move at a smaller speed along the safety fence. The presence of a safety fence is expected that the vehicle does not stop suddenly or roll outside the body of the road.

b. Concrete safety edge (parapet)

planned 80-10 km / hour.

c. Safeguard edges from embankments

Edge guard from the ground is recommended for planned speeds of km 80 km / h.

d. Safety edge of river stone

This type of edge protection is related to beauty (aesthetics) and is recommended for a planned speed of 60 km / h.

e. Safety edge of a block of wood

This type of edge guard is used for the planned speed of 40 km / h and at

the parking area.

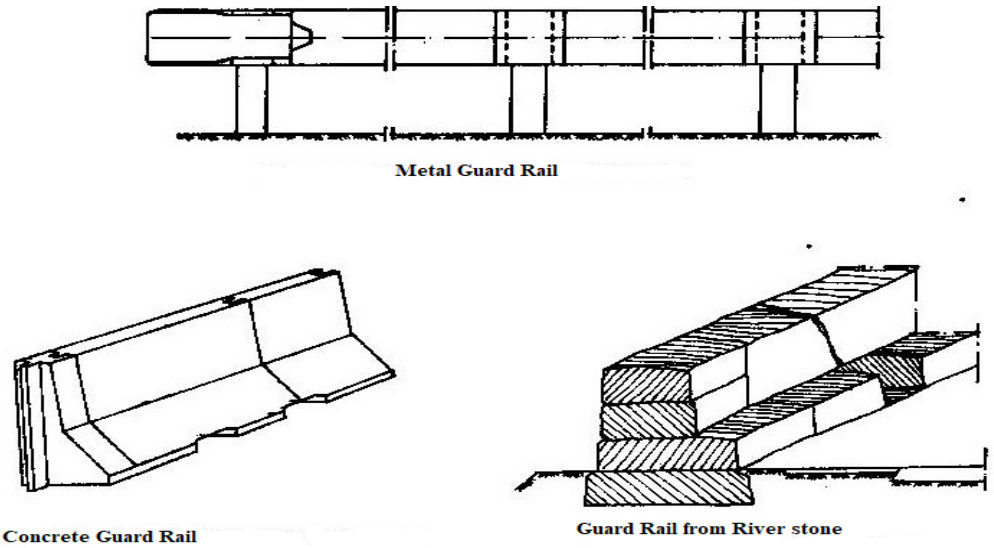


Figure 2.6 Guard rail Details

2.2.8. Sign

Traffic signs are part of road equipment containing symbols, letters, numbers, sentences and or a combination of which are used to give warnings, restrictions, orders, and instructions for road users (Transportation Minister Regulation number 13 of 2014). Signs consist of aluminum leaf signs, signposts made of metal rods and additional boards mounted under leaf signs that provide further explanation of a sign.

Minister of Transportation number 13 of 2014 Article 3 concerning Traffic Signs states that traffic signs consist of 4 types, namely:

a. Warning sign

Warning sign as it is used to give warning of possible danger on the road or a dangerous place on the road or a place on the road and inform the nature of the hazard. Warning signs have a yellow base with a black symbol or writing.

Figure 2.7 Warning Road Sign

b. Ban sign

Prohibited signs as used to declare acts that are prohibited from being used by road users. Prohibited signs have a white base with red or black symbols or writing.

Figure 2.8 Ban Sign

c. Command sign

Command signs as used to declare commands that must be carried out by road users. Command signs have a white base with a red or black symbol or writing.

Figure 2.9 Command Sign

d. Signposts

Signposts are used to guide road users when traveling or to provide other information to road users. Signs have a basic green color with white symbols or writing. While the signposts to indicate boundaries, road situations, public facilities and signs in the form of words using the basic color of blue with a white symbol or writing. Specifically for tourist signage, the base is brown with a white symbol or writing.

Figure 2.10 Signposts

2.2.9. Markers

Based on the Regulation of the Minister of Transportation of the Republic of Indonesia Number 34 Year 2014 Regarding Road Markings, road markings are signs that are on the surface of the road or on the road surface which include equipment or signs that form longitudinal lines, transverse lines, oblique lines and other symbols that serve to directing the flow of traffic and restricting areas of interest. Installation of markers on roads has an important function in providing guidance and information to road users. By type, markers consist of several types (Regulation of the Minister of Transportation of the Republic of Indonesia Number 34 of 2014), namely:

a. Longitudinal markers

Longitudinal markings are road markings that are parallel to the axis of the road. There are three types of longitudinal markers namely, full longitudinal line markers, dotted longitudinal line markers and longitudinal line markings full and dashed combinations.

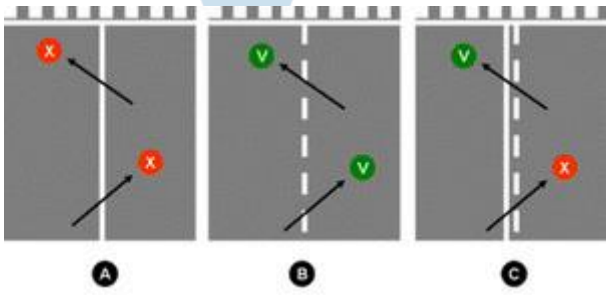


Figure 2.11 Types of Longitudinal markers

b. Transverse markers

Transverse markers are road markings that are perpendicular to the axis of the road. This marker is used to remind motorists to stop or reduce speed. This marker also serves to strengthen the traffic and traffic light. There are 2 types of transverse markers namely, intact transverse markers and dashed transverse markers.

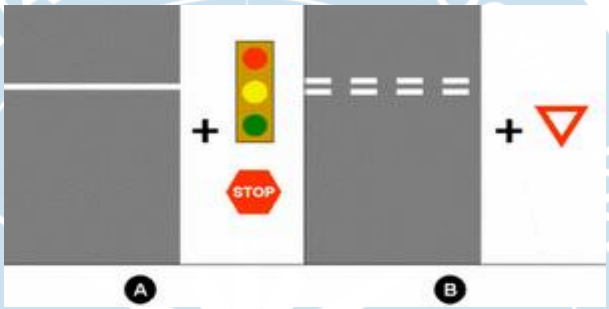


Figure 2.12 Types of Transverse markers

c. Oblique markers

Oblique markings are road markings that form solid lines to express an area of road surface that is not a vehicle traffic lane.

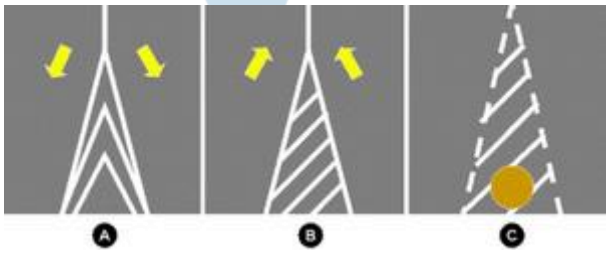


Figure 2.13 Types of oblique markers

d. Symbol markers

Symbols are road markings in the form of arrows, Figures, triangles or writings that are used to repeat the purpose of traffic signs or to notify road users that cannot be stated with traffic signs.

Figure 2.14 Type of symbol markers

e. Yellow square markers

Yellow square markings are yellow rectangular road markings that function to forbid vehicles to stop in an area.

Figure 2.15 Type of yellow square markers

f. Lane markings

Lane is a part of the road used for vehicle traffic

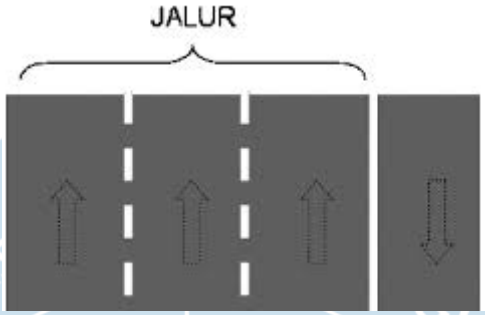


Figure 2.16 Lane markings

g. Lane

Lane is a section of the road that extends with or without road markings, which are wide enough to pass a motorized vehicle, other than motorbikes.

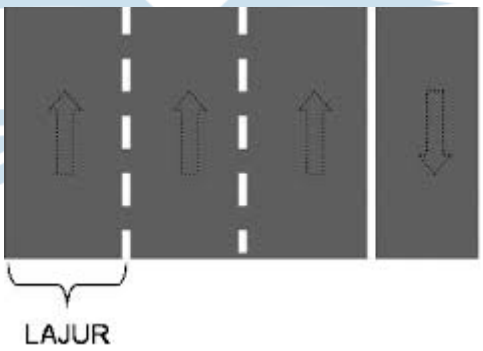


Figure 2.17 Lane

h. Traffic island

A traffic island is a part of a road that cannot be passed by vehicles, it can be in the form of road markings or elevated road sections.

Figure 2.18 Types of traffic island

2.3. Road Space

Republic of Indonesia Government Regulation No 34 of 2006 Concerning Roads, the existence of roads in space contains sections of road space which include:

a. The space for the benefits includes the road body, the roadside channel, and the safety threshold as well as the height of the free space at least 5 cm.

b. Space owned by the road or Rumija includes certain spaces outside the space owned by the road whose use is under the supervision of the road organizer.

2.4. Road Classification

Based on the Government Regulation of the Republic of Indonesia Number 34 of 2006 concerning Roads it is divided into 3 road classifications, namely:

classification according to road function, classification according to road status, classification according to road class.

2.4.1. Classification according to road functions

a. Arterial Road

Arterial roads are public roads that function to serve major transportation with the characteristics of long-distance travel, high average speed and the number of access roads is efficiently limited.

b. Road Collector

The collector road is a public road that serves the function of collecting or dividing transportation with the characteristics of short-distance travel, low average speed and the unlimited number of access roads.

c. Local Road

Local roads are public roads that serve the function of local transportation with the characteristics of short-distance travel, low average speed and the unlimited number of entry roads.

d. Road Environment

Environmental roads are public roads that function to serve environmental transportation with the characteristics of short-distance travel and low average speeds.

2.4.2. Classification According to Road Status

a. National Road

National roads are arterial and collector roads in the primary road network system that connects provincial capitals and national strategic roads and toll roads.

b. Provincial road

Provincial roads are collector roads in the primary road network system that connects provincial capitals with district/city capitals or between district/city capitals and provincial strategic roads.

c. District Road

District roads are local roads in the primary road network system that do not include national or provincial roads that connect the district capital with the sub-district capital, between sub-district capitals, district capitals with local activity centers, between local activity centers and public roads in the system secondary road network within the district area and district strategic roads.

d. City Road

City roads are public roads in the secondary road network system within the city.

e. Village Road

The village road is a public road that connects the area and or between settlements within the village and environmental roads.

2.4.3. Classification by Road Class

a. Freeway

The freeway includes full control of the driveway, no level intersections, completed by road space fences, equipped with a median, at least 2 lanes in each direction and lane widths of at least 3.5 meters.

b. Highway

The highway is a public road for continuous traffic with limited access control and is completed with a median of at least 2 lanes in each direction and a width of at least 3, 5 meters

c. Medium Road

Medium road is a public road with moderate distance traffic with unlimited entry control, at least 2 lanes for 2 directions with a width of at least 7 meters.

d. Small road

A small road is a public road to serve local traffic, at least 2 lanes for 2 directions with a track width of at least 5.5 meters.

2.5. Road Lighting Facilities

Based on the Indonesian National Standard Number 7391 of 2008 concerning Specifications of Road Lighting in Urban Areas, it is explained that part of the road complementary buildings that can be placed on the left or right of the road and/or in the middle of the median used to illuminate the road or the environment around the road required including crossroads, overpasses, bridges, underground roads that consist of light sources, optical elements and support structures and lamp post foundations. Street lighting functions include:

a. produce a contrast between the object and the road surface

b. as a road user navigation aid.

c. improve the safety and comfort of road users at night.

d. support environmental safety.

e. provide the beauty of the road environment.

The placement of street lighting must be planned in such a way to provide even lighting, safety and security for road users. The recommended lighting system for street lighting and the layout of street lighting are shown in table 2.2 and table 2.3

Table 2.2 Placement of Street Lighting Lamps

Types of Roads / Bridges	**Street Lighting Lamp Placement System**
Arterial Road	Continuous and partial system
Collector Road	Continuous and partial system
Local Road	Continuous and partial system
Intersection	Continuous system
Bridge	Continuous system
Tunnel	Graded continuous system at the end of the tunnel

(*Source: Indonesian National Standard Number 7391 of 2008*)