

## **CHAPTER III**

### **BASIC THEORY**

#### **3.1 Sidewalk**

According to Direktur Jenderal Bina Marga No.76 / KPTS / Db / 1999, 20 Desember 1999, 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. The sidewalk should be placed on the inside side of the drainage channel or above a closed drainage channel.

The main function of the sidewalk is to provide optimal service to pedestrians both in terms of safety and comfort. Sidewalks also function to increase the smoothness of traffic (vehicles), because they are not disturbed or affected by pedestrian traffic. Especially in urban areas, the space below the sidewalk can be used as space to get utilities and other road complements (Limpong, 2015).

#### **3.2 Sidewalk Dimension**

In the Regulation of Kementrian Pekerjaan Umum No. 03 / PRT / M / 2014, the design of sidewalks infrastructure dimensions must pay attention to standards minimum design of sidewalks infrastructure dimensions. The minimum sidewalk width that needed based on land use can found in table 3.1:

**Table 3.1 Sidewalks Infrastructure Dimensions According to Standards**

Land Use	Minimum Width (m)	Recommended Width (m)
House	1.6	2.75
Office	2	3
Industry	2	3
School	2	3
Terminal	2	3
Department Store	2	4
Bridge / Tunnel	1	1

Source: Regulation of Kementrian Pekerjaan Umum Sidewalks width formula:

$$W = \frac{P}{35} + n$$

P = Pedestrian volume (people/minute/metre)

W = Width of sidewalks

n = Additional width (metre)

**Table 3.2 Additional Width Standard**

Location	n (m)
Market area roads	1,5
Shopping area roads	1,0
Another roads	0,5

### 3.3 Free space of Sidewalk

According to Peraturan Menteri Pekerjaan Umum No.03/PRT/M/ 2014, planning and designing sidewalk paths must pay attention to free space. The free space of the sidewalk has the following criteria:

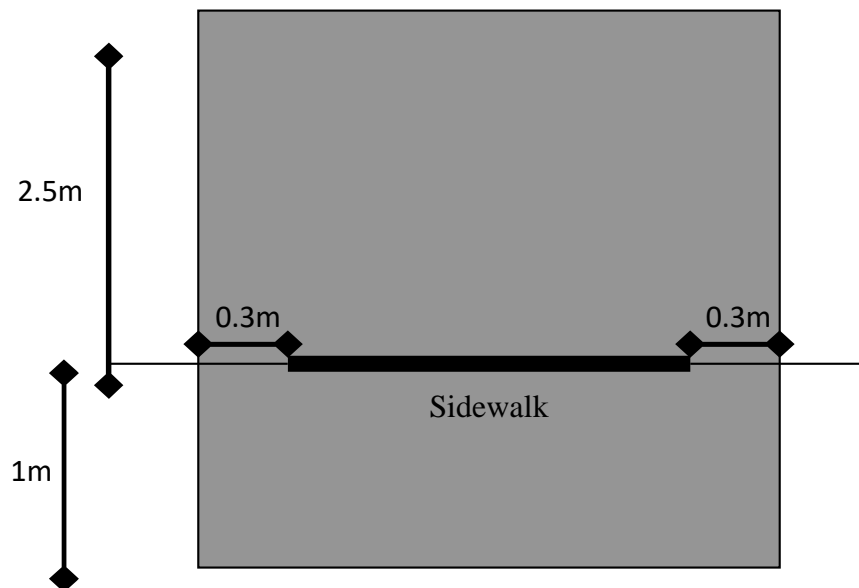
- 1) gives flexibility to pedestrians

- 2) has high accessibility
- 3) guarantee security and safety
- 4) has a free view of the surrounding activities and the overall road corridor and
- 5) accommodate the social needs of walkers.

The specifications of the pedestrian path free space are as follows:

- 1) has a height of at least 2.5 meters
- 2) has a depth of at least 1 meter
- 3) has a side width of at least 0.3 meters.

The illustration for the free space of the sidewalk can be seen in Figure 3.1 below:



Source: *Dinas pekerjaan umum, 2014*

**Figure: 3.1 Free space of sidewalk**

### 3.4 Level of Service

To obtain the average current level can be calculated by use the following formula:

$$v = \frac{V_p}{15W_e}$$

$v$  = average current level (ped/min/m)

$V_p$  = pedestrian peak volume (ped/15min)

$W_e$  = effective width sidewalk (m)

The level of sidewalk service can be obtained after the current level is known on the average with the criteria for sidewalk service levels grouped into 6 criteria. These criteria can be seen in the table below:

**Table 3.3 Sidewalk Service Level Standards**

Service Level	Sidewalk path (m <sup>2</sup> /people)	Average speed (meter/min)	Sidewalk Volume (people/meter/min)	Ratio of Capacity Volume
A	≥ 12	≥ 78	≤ 6.7	≤ 0.08
B	≥ 3.6	≥ 75	≤ 23	≤ 0.28
C	≥ 2.2	≥ 72	≤ 33	≤ 0.40
D	≥ 1.4	≥ 68	≤ 50	≤ 0.60
E	≥ 0.5	≥ 45	≤ 83	≤ 1.00
F	< 0.5	< 45	variable	1.00

Source: Regulation of Kementrian Pekerjaan Umum

According to Menteri Pekerjaan Umum No: 03 / PRT / M / 2014, the level of pedestrian services is divided into 6 standards, including:

1. Standard A

Pedestrians can walk freely, including being able to determine the direction of walking freely, with a relatively fast speed without causing interference between pedestrians. Pedestrian track area ≥ 12 m<sup>2</sup> per person with pedestrian flow <16 people per minute per meter.



**Figure 3.2 Level of service of sidewalk standard A**

2. Standard B

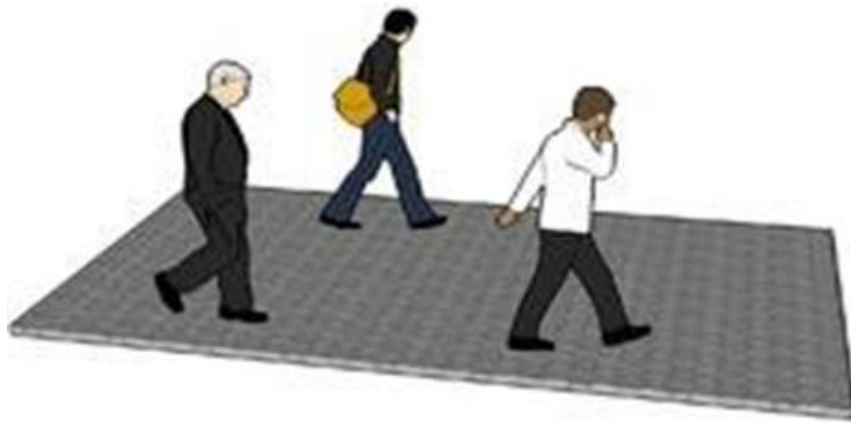
Pedestrians can still walk comfortably and fast without disturbing other pedestrians, but the presence of pedestrians the other foot has already begun to affect the pedestrian flow. Large pedestrian path  $\geq 3,6$  m<sup>2</sup> per person with pedestrian flow  $> 16-23$  people per minute per meter.



**Figure 3.3 Level of service of sidewalk standard B**

### 3. Standard C

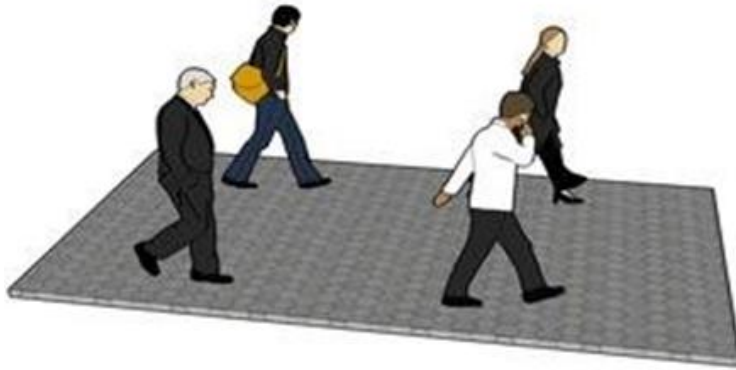
Pedestrians can move in the same direction as normal, although in the opposite direction there will be small intersections, and relatively slowly due to limited space between pedestrians. The area of pedestrian paths  $\geq 2.2\text{--}3.5 \text{ m}^2$  / person with pedestrian currents  $> 23\text{--}33$  people per minute per meter.



**Figure 3.4 Level of service of sidewalk standard C**

### 4. Standard D

Pedestrians can walk with normal currents, but must change positions frequently and change speeds because opposing pedestrian currents have the potential to cause conflict. This standard still produces a comfortable threshold current for pedestrians but the potential for intersection and interaction between pedestrians. The area of pedestrian paths  $\geq 1.2\text{--}2.1 \text{ m}^2$  / person with pedestrian currents  $> 33\text{--}49$  people per minute per meter.



**Figure 3.5 Level of service of sidewalk standard D**

5. Standard E

pedestrians can walk at the same speed, but the movement will be relatively slow and irregular when many pedestrians turn around or stop. The E standard starts to be uncomfortable to pass but is still the lower threshold of pedestrian space planning capacity. The area of pedestrian paths  $\geq 0,5-1.3$  m<sup>2</sup> / person with pedestrian currents  $> 49-75$  people per minute per meter.



**Figure 3.6 Level of service of sidewalk standard E**

6. Standard F

pedestrians are walking at very slow and limited current speeds because of frequent conflicts with unidirectional or opposite pedestrians. Standard F is not comfortable and is not in accordance with the capacity of pedestrian space. The area of pedestrian paths  $<0.5 \text{ m}^2$  / person with diverse pedestrian currents.



**Figure 3.7 Level of service of sidewalk standard F**

**3.5. Sidewalk Placement**

A road section is deemed necessary to be equipped with a sidewalk if along the road there are land uses that have the potential to cause pedestrians. The land uses include housing, schools, shopping centers, trade centers, office centers, entertainment centers, social activity centers, industrial areas, bus terminals, universities that have wide space and others. In general, sidewalks can be planned on roads where there are pedestrian volumes greater than 300 people per 12 hours



(6.00-18.00) and traffic volumes greater than 1000 vehicles per 12 hours (6.00-18.00). The sidewalk should be placed on the outside of the shoulder of the road or the outside of the road (if a parking lane is available). The sidewalk should be made parallel to the road, but the sidewalk may not be parallel to the road if topographical conditions or local conditions are not possible. Sidewalk should be placed on the inside side of an open drainage channel or on top of a drainage channel that has been covered with concrete slabs that meet the requirements. Sidewalks at bus stops must be placed side by side / parallel to the bus lane. Sidewalks can be placed in front of or behind a bus stop. (Pratama, 2014)

### **3.6. Pedestrian Volume Prediction Formula**

The number of visitors along with Jalan Raja Ali Haji, Sei Jodoh for the next 20 years is assumed to increase along with the population growth rate.

Base year volume  $(1+i)^{20}$