

Pedestrian Facility Needs Analysis at the Faculty of Engineering Campus, Sultan Ageng Tirtayasa University

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ABSTRACT

This research discusses pedestrian facilities at the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University located in Cilegon City, there are no adequate pedestrian facilities so it is necessary to analyze pedestrian facilities which aim to determine the type of pedestrian facilities used at the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University and create a pedestrian facility design at the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University. Analyzing the needs of this pedestrian facility uses guidelines from the Ministry of PUPR Regarding Technical Planning of Pedestrian Facilities in 2018 and to design pedestrian facilities using sketchup software. The result of this study is that the pedestrian facilities produced in the form of a pelican cross based on the formula PV^2 produces PV^2 on average with $P = 79$ people / hour, $V = 8461$ (vehicles / hour) then produce PV^2 is (6×10^9) and the effective width of the sidewalk inside the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University is 1.5 meters, these results are adjusted to the 2018 Ministry of PUPR guidelines.



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1. INTRODUCTION

Pedestrians are people moving in one space on foot. The function of the pedestrian path is for the safety of pedestrians when moving from one place to another. The movement of pedestrians includes movement - movement along the road, cutting the road and intersection[1]. In addition to serving the needs of its users, the pedestrian path also serves as a place for socializing between individuals and as a means of open space. Campus is one of the public facilities that requires open space as access to achievement and circulation paths both inside and outside the environment. Users of pedestrian paths in the campus area are of course the academic community consisting of students, teaching staff, namely lecturers and education personnel or employees. The circulation of road users that takes place in the campus area must be accommodated properly, so it requires a public space that can be used as a forum for socializing areas. The high volume of pedestrian flow both to the campus area and from the campus area to outside the campus has a significant impact on the needs of pedestrian facilities[2].

The purpose of this study is to determine the type of pedestrian facilities used at the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University, Making Pedestrian facility design at the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University. And the benefits of this research are Knowing pedestrian facilities in the form of crossing facilities and sidewalks at the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University, Minimizing accidents that occur, especially lecturers, students and workers at the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University, Providing comfort and safety for pedestrians at the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University, This research is expected to be useful for readers and become a reference for similar research.

The results of previous studies show that the volume of vehicle traffic and road crossings in the PV^2 formula produces PV^2 07.00 - 08.00 with $P = 365$ people / hour, $V = 5344$ vehicles / hour, then produces $PV^2 = 1.0426 \times 10^{10}$ and the results generate a crossing bridge facility[3]. Then obtained a proposal for the Jenderal Sudirman road section with a planned sidewalk width of 2 m on each side and crossing facilities in the form of Pelican Crossing. For the Ahmad Yani 1 road section, the planned sidewalk width per side is 2 m and the Ahmad Yani 2 road section, the planned sidewalk width per side is 1.9 m with crossing facilities in the form of Pelican Crossing. On the Youth road section, the planned sidewalk width on each side is 1.9 m and the crossing facility is a Pelican Crossing[4]. Pedestrian facilities are also obtained in the form of proposals for solving pedestrian facility problems, namely sidewalk planning and crossing facilities in the form of pelican crossings, comparison of the level of service of existing and proposed pedestrian facilities, the level of walkability index and the level of accessibility, as well as the design of pedestrian facilities in accordance with calculations and applicable regulations[5].

2. METHODS

2.1 General

The research focused on analyzing the needs of pedestrian facilities on the campus of the Faculty of Engineering, Sultan Ageng Tirtayasa University. At the research location at JL Jenderal Sudirman in front of the Faculty of Engineering campus of Sultan Ageng Tirtayasa University is one of the roads with heavy traffic in the city of Cilegon for road users and students crossing the road. At the beginning of the research at the research location there were no crossing facilities. Many vehicles pass through the road at a fairly high speed during peak hours, causing concern for road users or crossers. To avoid these concerns, it is analyzed what crossing facilities are good for use at this location [6].

2.2 Flowchart of Research

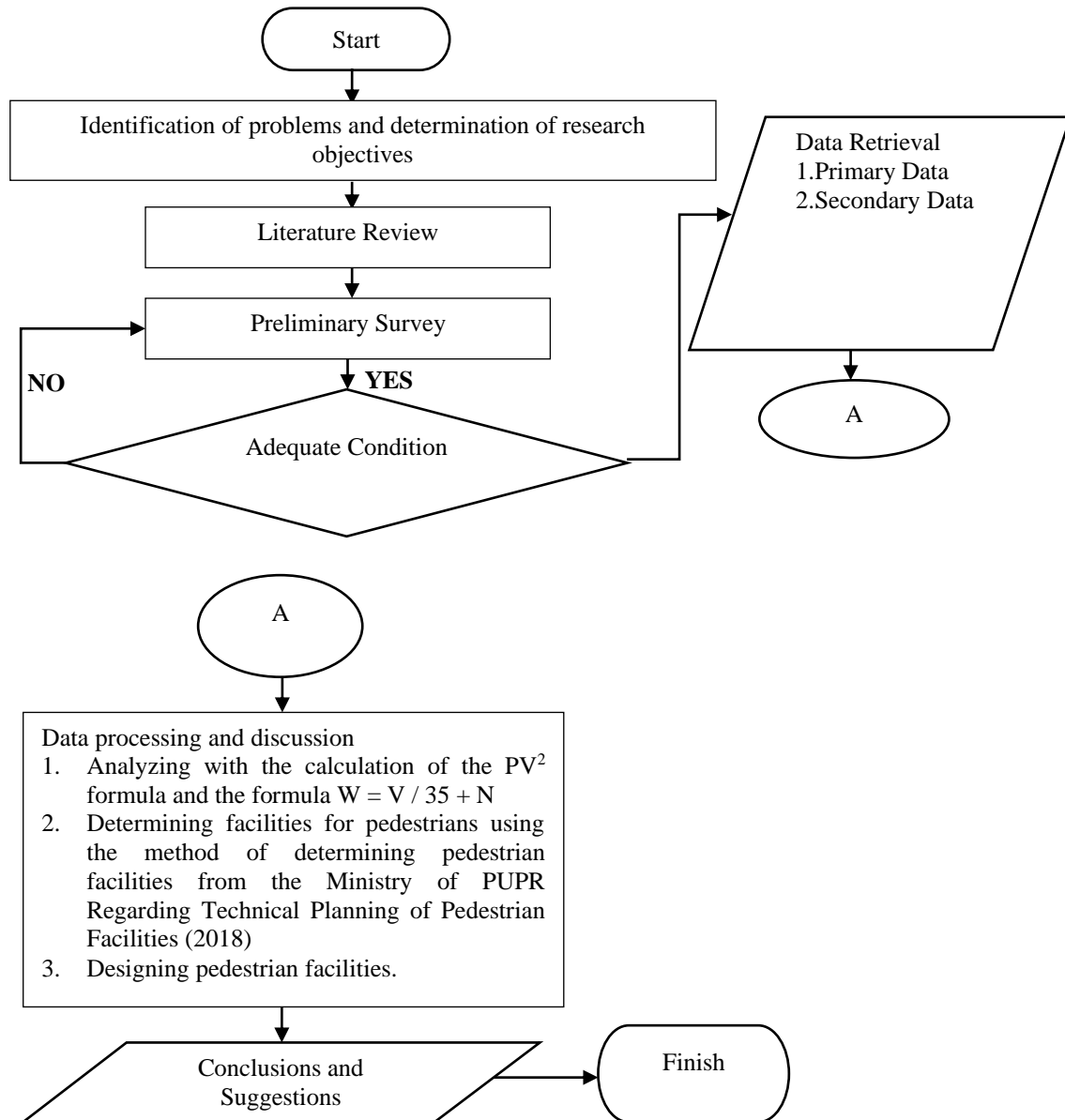


Figure 1. Flowchart of Research

3. RESULTS AND DISCUSSION

3.1 Road Geometrics at the Research Location

The research location at Jl. Jenderal Sudirman is precisely in front of the Faculty of Engineering campus of Sultan Ageng Tirtayasa University, where there are no crossing facilities available. The following geometric data from the research location are:

- a. Width of Cilegon - Merak road section : 7 m
- b. Median width : 2,45 m

c. Width of Merak – Cilegon road section : 7 m.



Figure 2. Road Condition in front of the Faculty of Engineering campus of Sultan Ageng Tirtayasa University

3.2 Analysis of Average Vehicle Speed in Front of the Faculty of Engineering Campus, Sultan Ageng Tirtayasa University

Table 1. Analysis of Average Vehicle Speed Calculation

Times	Speed (km/h)						Average speed per time
	Merak - Cilegon			Cilegon - Merak			
	Motorcycle	Car	Truck/Bus	Motorcycle	Car	Truck/Bus	
06.00-07.00	51,488	42,099	37,367	55,895	45,747	40,336	45,489
07.00-08.00	49,213	40,818	37,856	53,479	44,503	40,552	44,403
08.00-09.00	47,320	44,216	38,357	51,259	42,836	41,487	44,246
09.00-10.00	46,260	44,474	37,446	49,213	41,587	41,961	43,490
10.00-11.00	47,245	40,265	40,170	54,834	40,336	42,574	44,237
11.00-12.00	46,955	46,838	38,440	52,505	44,216	38,357	44,552
12.00-13.00	47,310	48,114	36,848	56,076	42,809	34,882	44,340
13.00-14.00	47,670	43,241	35,380	49,638	41,487	39,398	42,802
14.00-15.00	48,035	44,331	35,819	53,811	40,241	39,940	43,696
15.00-16.00	45,475	45,475	35,668	51,565	39,067	40,496	42,958
16.00-17.00	44,852	44,852	34,844	49,495	42,702	41,067	42,969
17.00-18.00	42,073	42,073	33,524	55,183	41,386	41,655	42,649
Average speed (km/h)							43,819

Based on Table 1. it can be seen that the highest vehicle speed occurred at 12:00 - 13:00 WIB from the direction of Merak - Cilegon, which was 56.076 km / hour and the average vehicle speed was 43.819 km / hour. Vehicle speed survey time is taken every 1 hour 1 time. The results of vehicle speeds that have been analyzed are adjusted to the PV² method with the required crossing facilities[1], [3]–[7]

3.3 Analysis of Determination of Types of Crossing Facilities in Front of the Faculty of Engineering Campus, Sultan Ageng Tirtayasa University

Crossing facilities are divided into level crossing facilities and non-level crossing facilities. Level crossing facilities are crossing facilities with roads for pedestrians. Meanwhile, non-level crossing facilities are for pedestrians above the road (bridge) or below (tunnel). The function of crossing facilities is to ensure that existing pedestrian paths are not interrupted and to make it easier to change to different routes. (Ministry of Public Works and Public Housing, 2018).

Table 2. Analysis of the Calculation of the Determination of Crossing Facilities in Front of the Faculty of Engineering Campus, Sultan Ageng Tirtayasa University

Times	P	V	PV^2
06.00 - 07.00	13	6536	569532517
07.00 - 08.00	79	8461	5632074060
08.00 - 09.00	32	3811	459998289,6
09.00 - 10.00	78	3260	832665586,5
10.00 - 11.00	96	3260	1023792133
11.00 - 12.00	103	3395	1186947463
12.00 - 13.00	224	2864	1834624939
13.00 - 14.00	131	3887	1984625338
14.00 - 15.00	77	3969	1207929879
15.00 - 16.00	92	3847	1366478764
16.00 - 17.00	87	6515	3693112455
17.00 - 18.00	58	6891	2738352471

From the results of the analysis of the calculation of the average volume of road crossers and vehicle volumes in Table 2. the maximum PV^2 results occurred at 07.00 - 08.00 WIB with the PV^2 results being 5632074060 (6×10^9). Based on the results of the volume of road crossers and the volume of vehicle flow adjusted to the method of the Ministry of Public Works and Public Housing Guidelines 2018 (On Technical Planning of Pedestrian Facilities) in Table 3 where the recommended crossing facilities are Pelican Cross with waiting stalls[1], [3]–[15].

Table 3. Selection of Crossing Facilities Based on PV^2

P	V	PV^2	Preliminary Recommendation
50 - 1100	300 – 500	$>10^8$	Zebra Cross atau Pedestrian Platform
50 - 1100	400 - 750	$>2 \times 10^8$	Zebra Cross with waiting stalls
50 - 1100	>500	$>10^8$	Pelican
>1100	>300	$>10^8$	Pelican
50 - 1100	>750	$>2 \times 10^8$	Pelican with waiting stalls
>1100	>400	$>2 \times 10^8$	Pelican with waiting stalls

It can be concluded from the results of the calculation analysis for the recommended crossing facility in front of the Sultan Ageng Tirtayasa University Faculty of Engineering Campus, namely the Pelican Cross with waiting stalls. The following are the criteria for Pelican Cross crossing facilities, namely [9], [10], [13]:

- a. Installed on the road section, at least 300 meters from the intersection, or
- b. On roads with an average operating speed of vehicle traffic > 40 km/h.

3.4 Analysis of Pedestrian Facilities Within the Faculty of Engineering Campus, Sultan Ageng Tirtayasa University

Table 4. Analysis of Minimum Pavement Width Calculation

Times	Pedestrians (Person/Hour)	Pedestrian (Person/Minute)
06.00 - 07.00	34	1
07.00 - 08.00	344	6
08.00 - 09.00	57	1
09.00 - 10.00	155	3
10.00 - 11.00	160	3
11.00 - 12.00	254	4
12.00 - 13.00	331	6
13.00 - 14.00	158	3
14.00 - 15.00	131	2
15.00 - 16.00	297	5
16.00 - 17.00	302	5
17.00 - 18.00	198	3
Total		40
Average		3
Value N		0,5
W (meter)		1

From the analysis of the calculation of the minimum sidewalk width in Table 4. the minimum width result is 1 meter. The following results are adjusted to the method from the 2018 Ministry of Public Works and Public Housing Guidelines (Regarding Technical Planning of Pedestrian Facilities) the effective width of the sidewalk for the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University is 1.5 meters [2], [4], [5], [9], [10], [13].

3.5 Recommendations for the Design of Pedestrian Facilities at the Faculty of Engineering Campus, Sultan Ageng Tirtayasa University

Based on the results of the analysis, it has been determined that the Pedestrian facilities used at the Faculty of Engineering Campus at Sultan Ageng Tirtayasa University are in the form of a Pelican Cross in front of the Faculty of Engineering Campus at Sultan Ageng Tirtayasa University and a sidewalk measuring 1.5 meters. [10], [13].



Figure 3. Design of Pelican Cross in Merak - Cilegon Direction

Pelican cross design with control lights equipped with waiting stalls. This waiting stall is created if there is no time to continue crossing due to running out of time provided by the control lights. The control lights available at the Pelican Cross function to give pedestrians time to cross, and the vehicle control lights are like traffic lights at intersections; namely, if the light is green, it indicates that the vehicle must stop, and the green light indicates that the vehicle must continue its journey. [10]



Figure 4. Design of Pelican Cross in Cilegon – Merak Direction

The same is true for the control lights for road crossings namely the green light indicates that the crosser must cross within the time provided; however, the crosser must press the button first before crossing, and the red light indicates that the crosser must stop his footsteps and wait at the waiting stall provided to arrive. Waiting for the next green light.

Based on the green transportation concept, pedestrian facilities pay close attention to availability for those with special needs. Special requirements for the design of ramps for people with disabilities are that the slope level does not exceed 8%; ramps must have handrails for at least one side (recommended for both sides); Handrails must be made with a height of 0.8 meters measured from the ground and their length must exceed the last step; and the ramp area must have sufficient lighting.



Figure 5. Design of Sidewalk Inside FT Campus. Untirta

Pedestrians with limited vision will rely on their ability to hear and feel when walking. Environmental cues, including traffic sounds, ramps, messages, and sounds, are signals to pedestrians and are a source of warning that can be detected. Pedestrians with special needs (blind and visually impaired) require particular information on the surface of the pedestrian lane. This information is called guidelines.[9]



Figure 6. Design of Sidewalk Inside FT Campus. Untirta

This sidewalk design is equipped with a pointing tile that functions as a guide for road users with special needs and at each end is given a slope to make it easier to cross for road users who use wheelchairs. Sidewalk design is made based on the 2018 Ministry of Public Works and Public Housing guidelines (About Technical Planning of Pedestrian Facilities).[10], [13].

4. CONCLUSION

The conclusions obtained after the authors conducted research on analyzing the needs of pedestrian facilities on the engineering faculty campus of Sultan Ageng Tirtayasa University are as follows:

- a. From the analysis of the calculation of the average volume of road crossers, it can be concluded that the volume of road crossers in front of the Sultan Ageng Tirtayasa University Faculty of Engineering Campus amounted to 1070 people and had a peak at 12.00 - 13.00 WIB totaling 224 people, because at that hour many students wanted to cross for lunch and wanted to go home because they had finished the lecture.
- b. From the analysis of the calculation of the average vehicle volume, it can be concluded that the total volume of vehicles in front of the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University amounted to 56,697 vehicles and had a peak at 07.00 - 08.00 WIB amounting to 8,461 vehicles / hour, because at that hour many students want to carry out lectures and employees who want to go to work.
- c. From the analysis of the calculation of the average pedestrian volume, it can be concluded that the total volume of pedestrians in the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University amounted to 2,241 people and had a peak at 07.00 - 08.00 WIB totaling 344 people, because at that hour many students wanted to enter the class to start lectures.
- d. From the analysis of the average speed calculation, it can be concluded that the average speed of vehicles from the direction of Merak - Cilegon and Cilegon - Merak is 43.819 km / h and the highest speed occurs at 12.00 - 13.00 WIB which is 56.076 km / h occurring in motorcycle vehicles.
- e. From the analysis of the calculation of the determination of crossing facilities at the Faculty of Engineering Campus, Sultan Ageng Tirtayasa University, the maximum PV^2 results were obtained at 07.00 - 08.00 WIB with the PV^2 results being 5632074060 (6×10^9). Based on the PV^2 results, it can be concluded that the recommended person crossing facility is Pelican Cross with waiting stalls.
- f. From the analysis of the calculation of the minimum sidewalk width, the minimum width of the sidewalk is 1 meter, based on these results adjusted to the PUPR Ministry Guidelines on Technical Planning of Pedestrian Facilities in 2018 it can be concluded that the effective width of the sidewalk in the Faculty of Engineering Campus of Sultan Ageng Tirtayasa University is 1.5 meters.

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