Analysis of Parking Lot Needs at Cibinong Regional General Hospital

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ABSTRACT

Cibinong Regional General Hospital is one of the centers of activity that is widely visited by people from the Cibinong area and from outside Cibinong for treatment or for one reason or another. Cibinong Regional General Hospital is also inseparable from parking problems that can interfere with the level of comfort in the service process provided by the hospital. The increasing number of patients certainly has an impact on increasing vehicle ownership which causes an increase in parking needs. In solving these problems, this study aims to determine the characteristics of parking, capacity and parking space needs that occur at this time. Based on the results of survey data conducted on the Cibinong Regional Hospital parking lot for 7 (seven) days on Monday, December 11, 2023 to Sunday, December 17, 2023, the parking capacity available for motorbikes is 851.145m2 with a capacity of 304 SRP while the parking area provided for passenger cars is 3628.55m2 with a capacity of 86 SRP. The data obtained from the maximum parking volume per day for motorcycles occurred on Sunday amounting to 481 vehicles while for passenger cars it occurred on Sunday amounting to 175 vehicles, with the maximum accumulation for motorcycles on Tuesday amounting to 318 vehicles, while the maximum parking accumulation for cars on Saturday amounting to 92 vehicles, with a time span of parking duration for motorcycles obtained, namely a maximum duration of 9 hours 22 minutes, an average duration of 3 hours 40 minutes, a minimum duration of 6 minutes while the parking duration for passenger cars obtained, namely a maximum duration of 8 hours 5 minutes, an average duration of 3 hours 11 minutes, a minimum duration of 14 minutes. With the turnover parking for motorcycles obtained, namely a maximum of 158.22% while for passenger cars obtained a maximum of 203.49%, and the parking index for motorcycles obtained a maximum of 104.61% while for passenger cars obtained a maximum of 106.98%. This shows that the parking performance of motorcycles and cars is quite high by looking at the parking index exceeding 100%. Thus, the parking capacity for motorcycles and passenger cars available is not sufficient to accommodate motorcycles and passenger cars in the Cibinong Regional Public Hospital parking lot.

Keywords: SRP; parking duration; passenger cars; motorcycle.

INTRODUCTION

The problem that usually occurs in big cities, tourist areas, public service places or a center of community activities is the need for parking space. Along with the increasing growth of motorized vehicles, both in the form of motorbikes, cars, buses and other vehicles, the need for parking space is very much needed. Parking problems can affect vehicle movement, where vehicles passing through places that have high activity will be hampered by vehicles parked on the roadside. Therefore, the problem of the availability of parking space must be in accordance with the needs of each particular area. One that requires a high parking area is a public facility where what is meant here is the Cibinong Regional General Hospital. The Cibinong Regional General Hospital is one of the centers of activity that is widely visited by people from the Cibinong area and from outside Cibinong for treatment or for one reason or another. The Cibinong Regional General Hospital is also inseparable from parking problems that can interfere with the level of comfort in the service process provided by the hospital. The increasing number of patients certainly has an impact on increasing

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vehicle ownership which causes an increase in parking needs. In improving government performance in the health sector, the Cibinong Regional General Hospital can carry out infrastructure development at the hospital. In line with the increasing need for health services, the demand for supporting facilities for these services is also increasing. One of the facilities that should be available is a parking lot. The available parking lot must be able to accommodate vehicles of visitors or hospital employees. The presence of hospital visitors who want to seek treatment or visit their families can cause a new problem that is very important if it is not accompanied by adequate parking facilities. Based on the description above, a technical study of the parking lot needs analysis study at the Cibinong Regional General Hospital is needed. This study uses an institutional analysis study, in order to provide full benefits for all users and it is hoped that a balanced parking lot needs plan can be prepared to support reducing the problem of vehicle congestion in the Cibinong Regional General Hospital parking lot. Based on the formulation of the problem above, the objectives of this study are: 1) to analyze the availability of parking capacity at the Cibinong Regional General Hospital, 2) to determine the characteristics of parking (accumulation, duration of each vehicle, parking space turnover rate and parking index) of vehicles in the Cibinong Regional General.

Parking on campus is a critical aspect of university infrastructure, directly influencing mobility, accessibility, and overall campus experience. With the increasing number of students, staff, and visitors commuting by private vehicles, effective parking management becomes essential. Campus parking typically includes designated areas for different user groups such as students, faculty, and guests, often regulated through permits, time restrictions, and specific zones. These systems aim to ensure fair access while minimizing congestion and environmental impact (Syaiful S, et.al, 2025; Syaiful S, et.al, 2025).

Strategically located parking lots and structures are essential to reduce walking distances and encourage orderly traffic flow. However, limited land availability and the desire to maintain green, pedestrian-friendly spaces pose challenges in balancing capacity with aesthetics and environmental goals (Syaiful S et.al, 2025). Many universities are moving toward sustainable practices by limiting on-campus parking and promoting alternative transportation options such as biking, walking, ride-sharing, and public transit. To support this, some campuses incorporate park-and-ride systems, where vehicles are parked in remote lots connected to the core campus by shuttle services (Syaiful S et.al, 2023; Pratama FA et.al, 2023).

Technological integration has also transformed campus parking. Modern systems include automated entry and exit, digital permit management, and real-time space availability monitoring through mobile apps. These innovations help reduce search time for parking, lower emissions, and improve user experience. Enforcement mechanisms, such as fines or towing for violations, are crucial to ensure compliance with parking policies (Syaiful S & Suherman S, 2024).

Definition of Parking

According to the guidelines for planning and operating parking facilities, the Directorate General of Land Transportation (1998) parking is a state of a vehicle that is not moving temporarily. Included in the definition of parking is every vehicle that stops at certain places whether stated with signs or not, and not solely for the purpose of picking up or dropping off people or goods. PP No. 43 of 1993 explains the definition of parking as a state where a vehicle does not move for a certain period of time or is not temporary.

Types of Parking

Types of parking based on land ownership status

Parking based on land ownership status, including on-street parking and off-street parking. On-street parking is the use of parking facilities on the road as a parking facility with the use of the roadside as a parking space. Off-street parking is the use of parking facilities outside the road or parking location is a land use that is specifically provided as a parking space and the existence of an entrance and/or exit service door as a place to collect or hand over parking cards, so that the number of vehicles and the length of time the vehicle is in the parking lot can be known with certainty. Based on the Technical Guidelines for the Provision of Parking Facilities (Directorate General of Land Transportation, 1996), to design a parking lot, several important criteria must be considered, namely:

land use plan, safety and smooth traffic, environmental sustainability, convenience for users, availability of land use and the location of the main access road and the area served.

Types of parking based on land location

Parking based on land status, including public parking, special parking, emergency parking, parking in buildings, and parking areas. Public parking is the use of parking areas on land controlled and managed by the Regional Government. Special parking is parking with land use managed by a third party. Emergency parking is parking in public places with the use of land owned by the regional government or private institutions that is impromptu or incidental. A parking building is a building used as a parking area with management controlled by the regional government or a third party with permission from the regional government. A parking area is a building or parking lot complete with the necessary parking facilities and its management is controlled by the regional government.

Types of parking based on vehicle type

Based on the type of vehicle in the use of the parking area (Abubakar, 1998), parking can be divided into (a) parking for non-motorized two-wheeled vehicles (bicycles), (b) parking for motorized two-wheeled vehicles (motorcycles), (c) parking for four-wheeled vehicles (passenger cars), and (d) parking for four-wheeled or more vehicles (non-passenger cars).

Parking patterns for four-wheeled vehicles

Vehicle parking is divided into three patterns, namely (i) parking patterns on the roadside (on street parking), (ii) parking patterns outside the roadside (off street parking), and (iii) island parking patterns.

Parking patterns on the roadside (on street parking)

Based on how vehicles are parked (parking angle) on the roadside, based on the Decree of the Minister of Transportation KM No. 4/1994, parking patterns on the roadside are classified into (a) parking patterns with a zero-degree angle or parallel to the road axis and (b) parking patterns with angle variations (thirty, forty-five, sixty, and ninety degrees).

Parking patterns for four-wheeled motor vehicles with angle variations

Parking patterns for four-wheeled motor vehicles with angle variations of 30o, 45o, 60o, and 90o.

Parking patterns with angle formation of 300

Schematic diagram of the parking pattern for four-wheeled motor vehicles with an angle formation of 30o, as shown in Figure 1 below.

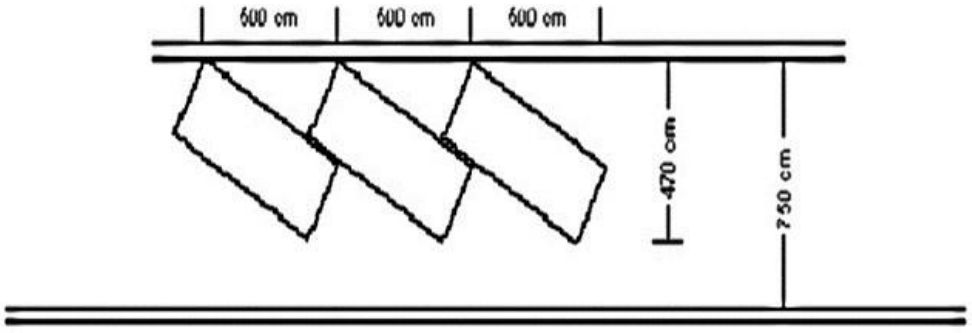

Figure 1. Parking pattern of four-wheeled vehicles with an angle of 30^{o} (Source: Technical Guidelines for the Provision of Parking Facilities of the Directorate General of Land Transportation, 1996)

Parking pattern with a 45^{o} angle

Schematic diagram of the parking pattern of four-wheeled motor vehicles with a 45^{o} angle.

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Parking pattern with a 60º angle

Schematic diagram of the parking pattern of four-wheeled motor vehicles with a 60º angle, as shown in Figure 2 below.

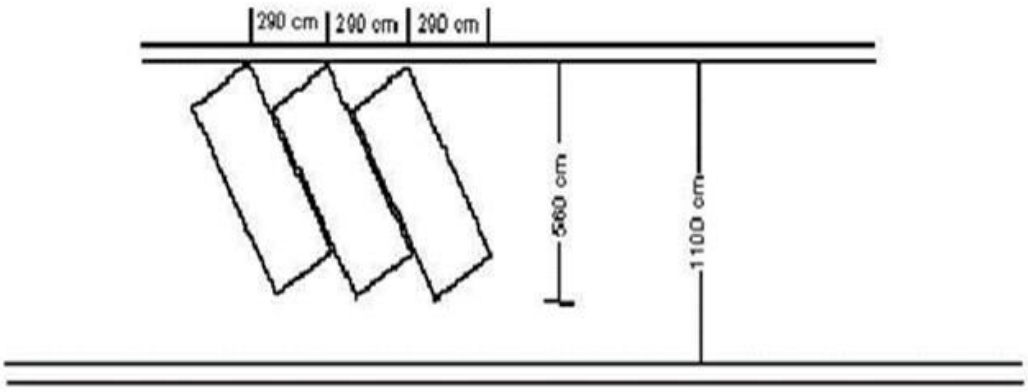

Figure 2. Parking pattern for four-wheeled vehicles with a 60º angle (Source: Technical Guidelines for the Provision of Parking Facilities, Directorate General of Land Transportation, 1996)

Parking pattern with a 90º angle

Schematic diagram of the parking pattern for four-wheeled motor vehicles with a 90º angle, as shown in Figure 3 below.

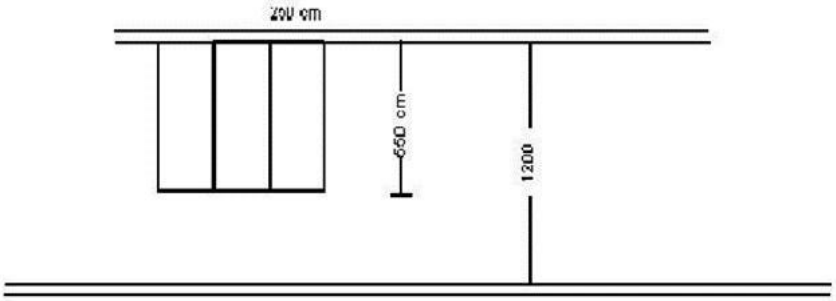

Figure 3. Parking pattern of four-wheeled vehicles with a 90º angle (Source: Technical Guidelines for Parking Facilities, Directorate General of Land Transportation, 1996)

Off-street parking pattern

Based on the Technical Guidelines for Parking Facilities (Directorate General of Land Transportation, 1996), off-street parking patterns are divided into one side and two sides.

Single-sided vehicle parking pattern

The one-sided four-wheeled vehicle parking pattern is distinguished by the formation of a 90º angle and other than a 90º angle.

Formation of a 90º angle

The one-sided parking pattern with a 90º angle is capable of accommodating more, when compared to the parallel parking pattern, but the ease and comfort of the driver to maneuver in or out of the parking space becomes a little more complicated, when compared to the parking pattern with an angle smaller than 90º. Schematic diagram of the one-sided vehicle parking pattern with a 90o angle.

Formation of 30º, 45º, and 60º angles

One-sided parking patterns with the formation of these angles with greater capacity, when compared to parallel parking patterns, the ease and comfort of drivers to maneuver in or out of the parking space is greater, when compared to parking patterns with the formation of 90º angles. Schematic diagram of one-sided vehicle parking patterns with the formation of 30o, 45º, and 60º angles, as shown in Figure 4 below.

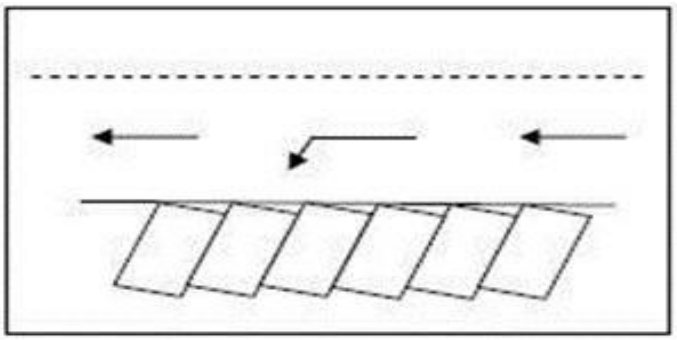

Figure 4. Single-sided vehicle parking pattern with angles of 30º, 45º, and 60º. (Source: Technical Guidelines for the Provision of Parking Facilities, Directorate General of Land Transportation, 1996)

Double-sided vehicle parking pattern

Single-sided four-wheeled vehicle parking pattern, is distinguished by the formation of a 90o angle and other than a 90o angle.
Formation of a 90o angle

The direction of vehicle traffic can be one-way or two-way. Schematic diagram of a two-sided four-wheeled vehicle parking pattern with the formation of a 90o angle, as shown in Figure 5 below.

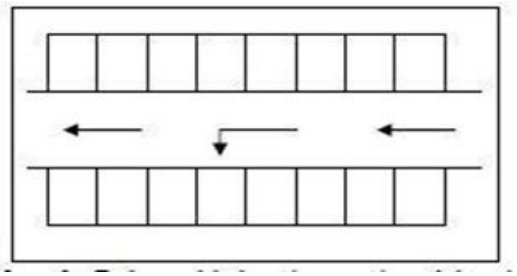

Figure 5. Parking pattern of four-wheeled vehicles on two sides with a 90o angle (Source: Technical Guidelines for the Provision of Parking Facilities, Directorate General of Land Transportation, 1996)

Formation of 30º, 45º, and 60º angles

Schematic diagram of the parking pattern of four-wheeled vehicles on two sides with the formation of 30º, 45º, and 60º angles, as shown in Figure 6 below.

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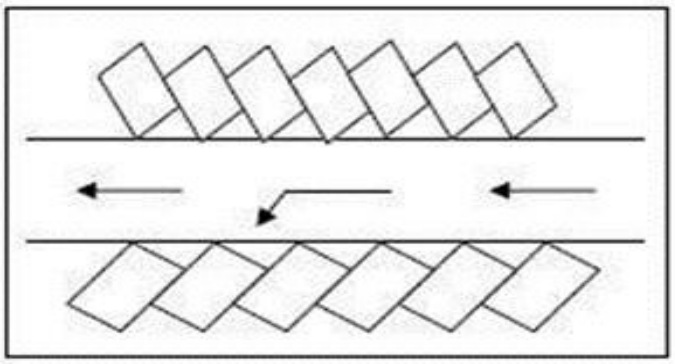

Figure 6. Parking pattern for four-wheeled vehicles on two sides at angles of 30º, 45º, and 60º (Source: Technical Guidelines for the Provision of Parking Facilities, Directorate General of Land Transportation, 1996)

Island parking pattern

The island parking pattern is used when there is sufficient space. This pattern is distinguished into parking patterns with the formation of angles of 90º and 45º.

Formation of angle 90º

Schematic diagram of the island parking pattern for four-wheeled vehicles with the formation of an angle of 90º, as shown in Figure 7 below.

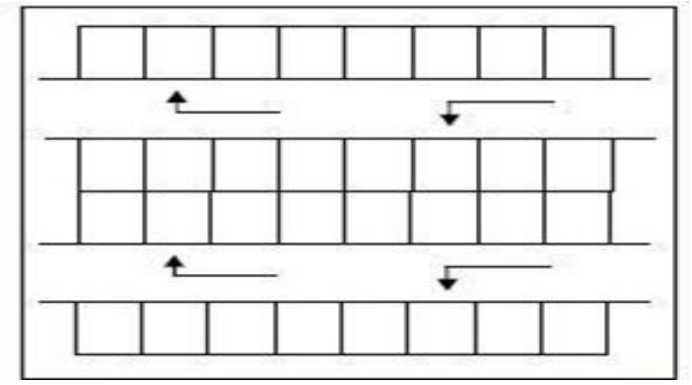

Figure 7. Parking pattern of four-wheeled island vehicles with a 90º angle (Source: Technical Guidelines for the Provision of Parking Facilities, Directorate General of Land Transportation, 1996)

Formation of the 45º angle

The formation of the 45º angle is similar to the shape of a fishbone which is divided into type-A, type-B, and type-C. Schematic diagram of the parking pattern of island vehicles for four-wheeled vehicles with the formation of a 45º angle fishbone type-A, as shown in Figure 8 below.

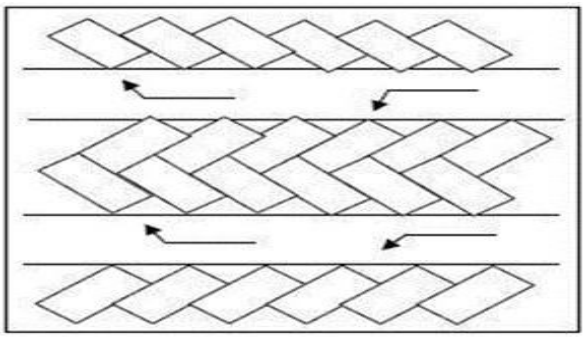

Figure 8. Island vehicle parking pattern with a 45º angle fishbone type-A (Source: Technical Guidelines for the Provision of Parking Facilities, Directorate General of Land Transportation, 1996)

Schematic diagram of the island vehicle parking pattern for four-wheeled vehicles with a 45º angle fishbone type-B formation, as shown in Figure 9 below.

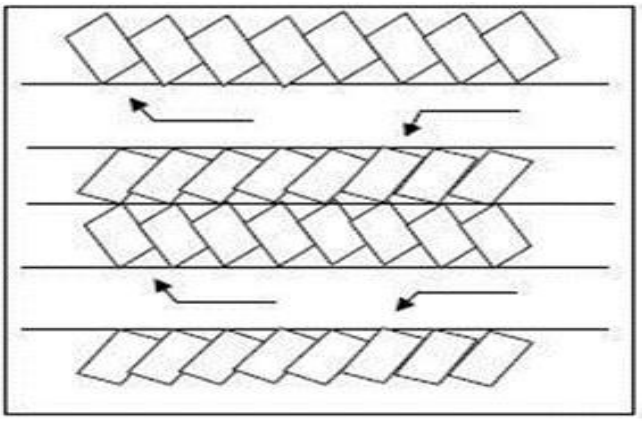

Figure 9. Island vehicle parking pattern with a 45º angle fishbone shape type-B (Source: Technical Guidelines for the Provision of Parking Facilities, Directorate General of Land Transportation, 1996)

Schematic diagram of the island vehicle parking pattern for four-wheeled vehicles with a 45º angle fishbone shape type-C, as shown in Figure 10.

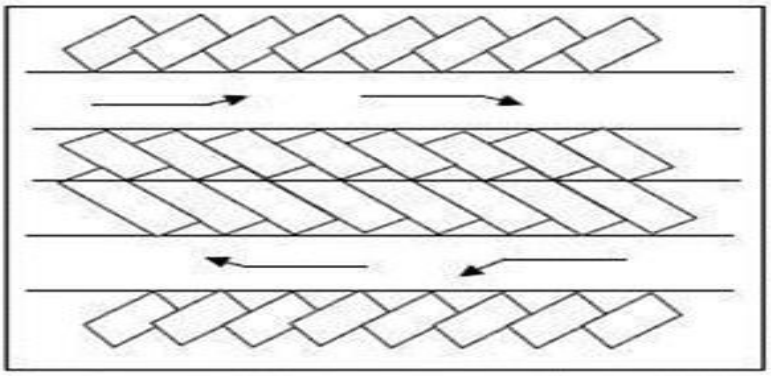

Figure 10. Parking pattern of 45º angled island vehicles in the form of a C-type fishbone (Source: Technical Guidelines for the Provision of Parking Facilities, Directorate General of Land Transportation, 1996)

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Types of parking needs

Parking needs are based on the type of use, including permanent and temporary (incidental) parking activities. Permanent parking activities are used for trade centers, government and private office centers, retail and supermarket centers, markets, schools, recreation areas, hotels and lodgings, and hospitals; while temporary parking activities are used for cinemas, performance venues, sports venues, and places of worship. Use, SRP, and parking space needs.

Size of parking space needs at activity centers

The results of a study by the Directorate General of Land Transportation, the need for parking space at activity centers, is based on the number of beds (units) and SRP. Parking Space Units at hospitals, as shown in Table 1 below.

Table 1. Parking Space Units at Hospitals

Number of Beds 50 (units)	75	100	150	200	300	400	500	1000
Requirement (SRP)=97	100	104	111	118	132	146	160	230

Based on parking space size

According to Tamin (2008), parking space size can be done using several methods based on vehicle ownership, building floor area, and the largest difference between vehicle arrivals and departures. The method based on vehicle ownership is the relationship between the area of the parking lot and the number of vehicles recorded in the city center. As the population increases, the need for parking space will increase because vehicle ownership increases. The method based on building floor area is the need for parking space is closely related to the number of activities expressed in the size of the floor area of the building where the activity is carried out (for example: shopping, shops, and others). The method based on the largest difference between vehicle arrivals and departures is the need for parking. The maximum accumulation method can also be used from an observation interval.

Parking accumulation is the number of vehicles parked in a place during a certain period. The number of vehicles parked in a place is not the same as other places from time to time.

This maximum parking accumulation analysis can be done by calculating vehicles moving in and out of the survey location continuously. This method requires data on the number of vehicles in the initial calculation facility and checking the number of vehicles remaining at the end of the calculation, so that the accuracy of the calculation can be explained. Maximum parking accumulation analysis, including parking accumulation, parking volume, parking capacity, parking index, parking duration, and parking turnover rate. Based on the calculation results of these parameters, parking characteristics can be identified.

Determination of parking space units (SRP) for cars is shown in Figure 11 below.

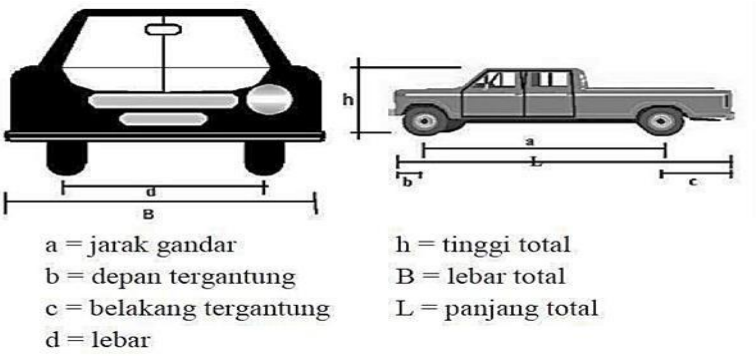

Figure 11. Schematic diagram of passenger vehicle parking space units

Classification of parking facility users based on characteristics, as shown in Table 2.

Table 2. Classification of parking facility users based on characteristics

Door Opening Type	Users and/or Designation of Parking Facilities	Group
Front/back door Open initial stage 55 cm	Employees/office workers, guests/visitors to office, trade, government, university activity centers	I
Front/back door fully open 75 cm.	Visitors to sports venues, entertainment/recreation centers, hotels, retail/supermarket trade centers, hospitals, cinemas	II
The front door is fully open and added to wheelchair movement	Disabled people	III

(Source: Technical Guidelines for the Provision of Parking Facilities, Directorate General of Land Transportation, 1996)

Based on points 1 and 2, the determination of parking space units (SRP) is divided into three types of vehicles and based on point 3, the determination of SRP for passenger cars is classified into three groups. Determination of SRP based on the group and type of vehicle, as shown in Table 3 below.

Table 3. Determination of SRP based on the group and type of vehicle

No.	Type of Vehicle	Parking Space Unit (m^2)
1	a) Passenger cars for Class I	2,30 x 5,00
	b) Passenger cars for Class II	2,50 x 5,00
	c) Passenger cars for Class III	3,00 x 5,00
2	Buses/trucks	3,40 x 12,50

Two-Wheeled Parking Space Unit

Based on the Technical Guidelines for the Provision of Parking Facilities (Directorate General of Land Transportation, 1996), that the Parking Space Unit (SRP) is the effective area for parking one vehicle (passenger car, truck, and motorcycle) including free space and door opening width. Determination of SRP is based on several things: (i) standard vehicle dimensions for passenger cars, (ii) free space for parking vehicles, and (iii) width of vehicle door openings.

Determination of the parking space unit (SRP) for motorcycles is shown in

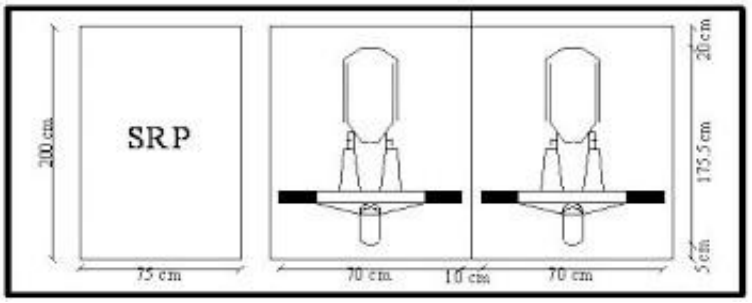

Figure 12. Parking space unit (SRP) for motorcycles (Source: Technical Guidelines for Parking Facilities Provision of the Directorate General of Land Transportation, 1996)

Parking Characteristics

In a parking activity, information will be obtained regarding some or all of the parking characteristics, and the characteristics that we can see include: Parking volume, parking accumulation, parking duration, parking turnover rate, parking index, average parking, parking capacity.

Parking Volume.
Parking Volume = Ei + X ..... (1)
Description:
Ei = Entry (vehicles entering the location)

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X = Vehicles already parked during the survey period
If there are already vehicles parked at the survey location before the observation, the number of existing vehicles is added to the total accumulation as in:

Parking Accumulation.

The parking accumulation value can be calculated using the formula:
Accumulation = Ei – Ex..... (2)
If there are already vehicles parked at the survey location before the research is conducted, then the number of vehicles is added to the accumulation that has been made, using the following equation formula 2.3:
Accumulation = Ei – Ex + X..... (3)

Description:

Ei = Entry (vehicles entering the location) Ex = Exit (vehicles leaving the location)
X = Number of vehicles that have been parked before observation
Description:
Nx = Number of vehicles in time interval X
X = Number of Intervals
I = Length of time for each interval (hours)
Nt = Total number of vehicles during the survey time

Motorized Vehicles

In the definition of motorized vehicles according to Law Number 22 of 2009 concerning Traffic and Road Transportation, article 1 paragraph (8) "motorized vehicles are any vehicles driven by mechanical equipment in the form of engines other than vehicles that run on rails". Motorized vehicles can also be interpreted as a vehicle that moves/drives with the help of a tool in the form of an engine that has a certain dimension size that can be driven and becomes a means of transportation used by drivers, both two-wheeled and four-wheeled drivers.

Riders

Riders are also called drivers. Drivers are people who drive motorized vehicles.

Definition of Motorcyclists and Regulatory Requirements

A motorcycle is a two-wheeled motorized vehicle with or without houses and with or without sidecars or a three-wheeled motorized vehicle without houses.

A motorcyclist is a person who drives a motorized vehicle on the road who already has a Driving License (SIM). This is as regulated in article 1 number 22 of the 2009 law concerning Traffic and Road Transportation (LLAJ) that a driver is a person who drives a motorized vehicle on the road who already has a Driving License. For two-wheeled drivers themselves, they are required to have a Class C SIM.

Definition of Car Drivers and Regulatory Requirements

A car is a four-wheeled motorized vehicle that is driven by engine power with gasoline or diesel fuel that has a certain shape. Similar to motorcyclists, car drivers are people who drive motorized vehicles on the road who already have a Driving License (SIM). This is as regulated in article 1 number 22 of the 2009 Law on Traffic and Road Transportation (LLAJ) that a driver is a person who drives a motorized vehicle on the road who already has a Driving License.

A Driving License (SIM) is a mandatory requirement for every motorized vehicle driver on the highway. Driving licenses for car drivers are classified into A, B1, and B2 depending on the weight of the vehicle used. While for public and goods transportation car driving licenses consist of general SIM A, general SIM B1, and general SIM B2.

RESEARCH METHODOLOGY

The location of the research was conducted at Cibinong Hospital, Cibinong District, Bogor Regency, West Java. The research was conducted within 3 months, starting from November 1, 2023 to January 1, 2024. The implementation time of this research was carried out in 1 week or within 7

days, namely Monday to Sunday at 07:00 to 17:00 WIB, the following is the research location shown in Figure 13 below.

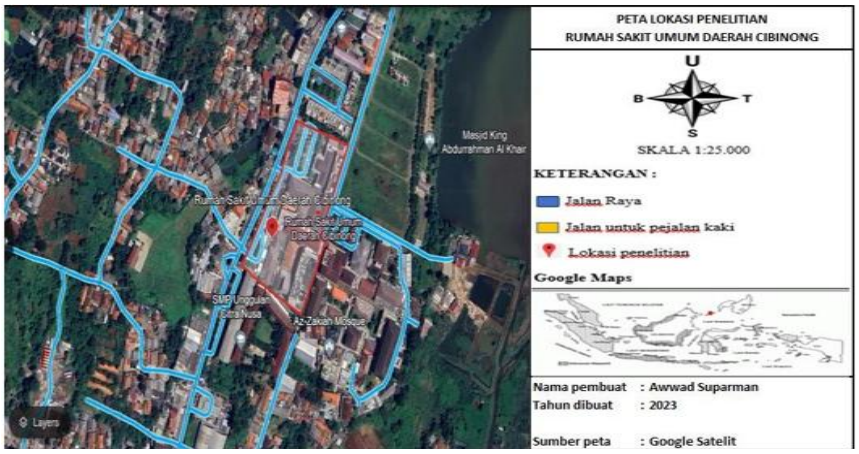
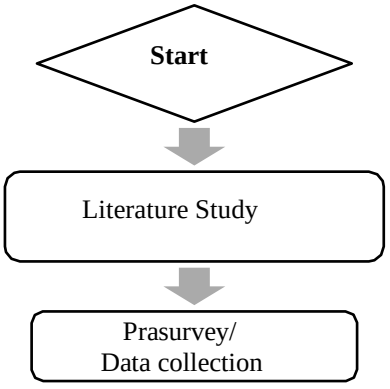


Figure 13. Research location (Source Google Satellite)

The following is a description of the existing conditions of the parking lot
Cibinong Regional General Hospital:
a. Motorcycle
1. No.1 capacity is 53 SRP
2. No.2 capacity is 49 SRP
3. No.3 capacity is 98 SRP
4. No.4 capacity is 92 SRP
5. No.5 capacity is 12 SRP
The motorbike parking area at Cibinong Hospital is 851,145m2 with a capacity of 304 SRP and uses a two-sided parking pattern forming a 90o pattern.
b. Car
1. Capacity No.1 is 32SRP
2. Capacity No.2 is 6 SRP
3. Capacity No.3 is 8 SRP
4. Capacity No.4 is 28 SRP
5. Capacity No.5 is 12 SRP The area of the car parking area at Cibinong Regional Public Hospital is 3628.55m^2 with a capacity of 86 SRP and uses a two-sided parking pattern forming a 45^o and 90^o pattern.

Research Methods

In collecting data, the author uses several methods for each parameter that will be reviewed in the study This. The following are the stages or methods that the author will carry out.
The following is a research flow diagram shown in Figure 14 below.



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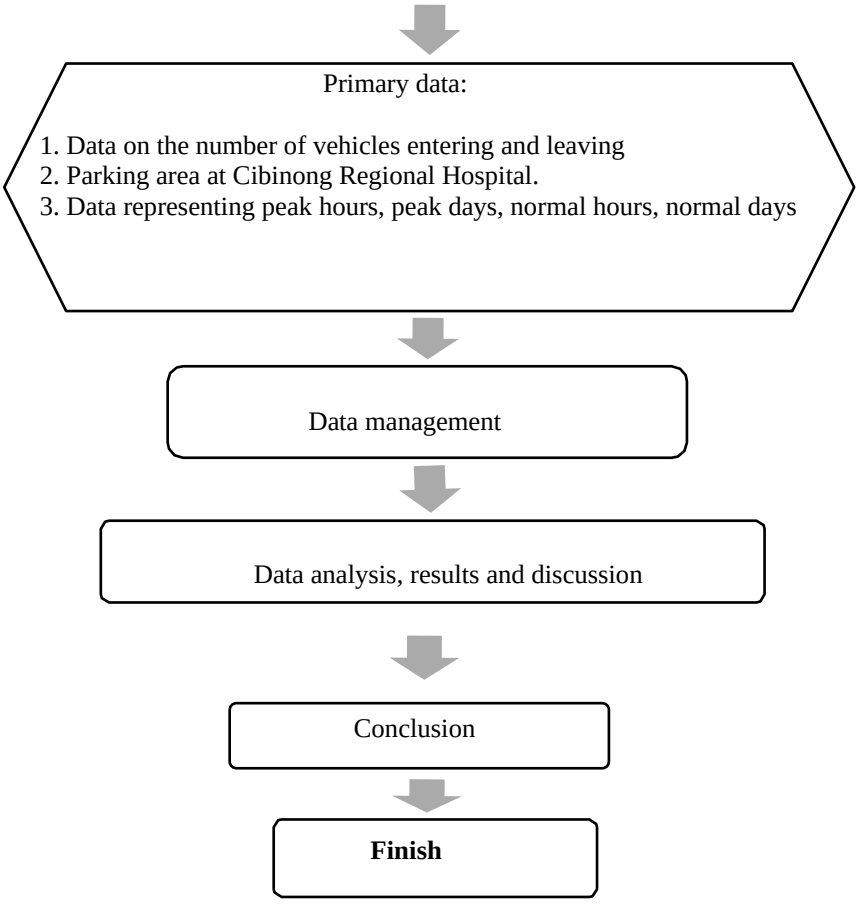

Figure 14. Research flowchart

RESULTS AND DISCUSSION

Calculation of Parking Characteristics

In a parking activity, information will be obtained regarding some or all of the parking characteristics, and the characteristics that we can see include: Parking volume, parking accumulation, parking duration, parking turnover, parking index, average parking, parking capacity.

Parking area plan data

a. Based on observations that have been made at the Cibinong Regional Hospital Building, the parking needs at the Cibinong Regional Hospital are not able to accommodate vehicles that will park. The number of parking spaces for motorbikes is 304 SRP while for cars it is 86 SRP, so many motorbike and car users prefer to park close together without considering the distance and are not organized in the parking area. The existing parking conditions at the Cibinong Regional Hospital in Figure 15 and Figure 16 below.

Figure 15. Existing condition of motorbike parking at Cibinong Regional Hospital

Figure 16. Existing conditions of Cibinong Regional Hospital passenger car parking

Research data.

The research conducted at Cibinong Regional Hospital began on December 1, 2023 to December 30, 2023, while the collection of vehicle volume data was carried out for 7 days, namely Monday, December 11, 2023 to Sunday, December 17, 2023.

Research variables

In order to meet the need for parking space, there are several variables that can affect the need for parking space, including:

Number of vehicles

Based on the results of the study and the calculation of vehicle accumulation, it was found that the average number of motorcycles parked the highest on Tuesday at 12:30 - 12:45, amounting to 318 vehicles, while the average number of cars parked the highest on Saturday at 13:30 - 13:45, amounting to 92 vehicles. (Maximum value of vehicle entry per day, looking for the largest)

Parking area

The parking area at Cibinong Regional Hospital is 851.145m2 for motorized vehicles while 3628.55m2 for cars

Vehicle recording when entering and exiting
Parking volume

Parking volume is the number of vehicles parked at the study location during a certain period of time, in this case the calculation is grouped every 15 minutes. By knowing the volume of parking

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vehicles from a parking facility, the amount of parking space needed can be determined to accommodate the volume of parking vehicles that occur. The greater the parking volume at the study location during 10 hours of observation as shown in Figure 17 below:

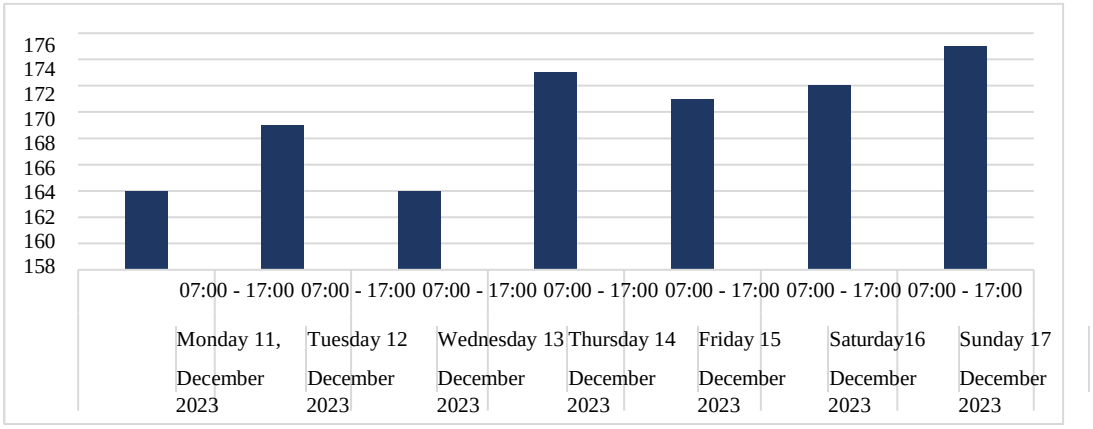

Figure 17. Vehicle parking volume

Based on Figure 17, the maximum volume of motorcycle parking occurred on Saturday, December 16, 2023 with 481 vehicles and for cars it occurred on Sunday, December 17, 2023 with 175 vehicles.

b. Peak vehicle entry hours

The peak vehicle entry hours are the period of time when drivers enter the parking area. In this case, the peak vehicle entry hours are grouped based on the largest number in a daily period. The highest peak motorcycle entry hour period occurred on Monday, December 11, 2023 with 29 vehicles, while the highest peak car entry hour occurred on Sunday, December 19, 2023 with 12 vehicles.

c. Peak vehicle exit hours

The peak vehicle exit hours are the period of time when drivers exit the parking area. In this case, the peak vehicle exit hours are grouped based on the largest number in a daily period. The peak period of motorcycle exits was highest on Monday, December 11, 2023 with 35 vehicles, while the peak of car exits was highest on Monday, December 11, 2023, Tuesday, December 12, 2023 and Sunday, December 17, 2023 with 12 vehicles.

Matching vehicle entry and exit data

a. Parking accumulation

Parking accumulation is the number of vehicles parked in a place at a certain time and can be divided according to the category of type and purpose of travel. Peak parking time and the number of parked vehicles can be obtained from the results of parking accumulation. Data obtained for 7 days recorded the number of vehicles entering and exiting and then grouped into 15-minute time intervals, so that the percentage of distribution of vehicles entering and exiting and the parking accumulation figure were obtained. Based on the table of parking accumulation and the number of motorcycle and car entry and exits at Cibinong Hospital.

1. The maximum number of motorcycles and cars entering and exiting on Monday, December 11, 2023. The maximum number of motorcycles entering the parking lot was 29 vehicles (6.067%) at 07:00–07:15, while the maximum number of cars entering the parking lot was 10 vehicles (6.098%) at 07:00–07:15. The maximum number of motorcycles leaving the parking lot was 35 vehicles (7.322%) at 16:45–17:00, while the maximum number of cars leaving the parking lot was 12 vehicles (7.317%) at 16:45–17:00. The maximum accumulation of motorcycle parking with a total of 310 vehicles was at 12:30–12:45, while the maximum accumulation of car parking with a total of 88 vehicles was at 12:45–13:00.
2. The maximum number of motorcycles and cars entering and exiting on Tuesday, December 12, 2023. The maximum number of motorcycles entering the parking lot was 27 vehicles (5.782%) at 07:00–07:15, while the maximum number of cars entering the parking lot was 9 vehicles (5.325%) at 07:00–07:15. The maximum number of motorcycles leaving the parking lot was 33 vehicles (7.066%) at 16:45–17:00, while the maximum number of cars leaving the parking lot was 12 vehicles (7.101%) at 16:45–17:00. The maximum accumulation of motorcycle parking with a total of 318 vehicles was at 12:30–12:45, while the maximum accumulation of car parking with a total of 81 vehicles was at 12:30–12:45.
3. The maximum number of motorcycles and cars entering and leaving on Wednesday, December 13, 2023. The maximum number of motorcycles entering the parking lot was 24 vehicles (5.299%) at 07:15–07:30, while the maximum number of cars entering the parking lot was 10 vehicles (6.098%) at 07:00–07:15. The maximum number of motorcycles leaving the parking lot was 29 vehicles (6.318%) at 16:45–17:00, while the maximum number of cars leaving the parking lot was 11 vehicles (6.707%) at 16:30–16:45. The maximum accumulation of motorcycle parking with a total of 307 vehicles was at 12:45–13:00, while the maximum accumulation of car parking with a total of 88 vehicles was at 11:00–11:15.
4. The maximum number of motorcycles and cars entering and exiting on Thursday, December 14, 2023. The maximum number of motorcycles entering the parking lot was 25 vehicles (5.319%) at 12:00 – 12:15, while the maximum number of cars entering the parking lot was 8 vehicles (4.264%) at 11:30 – 11:45. The maximum number of motorcycles leaving the parking lot was 33 vehicles (7.021%) at 16:30 – 16:45, while the maximum number of cars leaving the parking lot was 11 vehicles (6.358%) at 16:30 – 16:45. The maximum accumulation of motorcycle parking with a total of 291 vehicles was at 12:30 – 12:45, while the maximum accumulation of car parking with a total of 88 vehicles was at 12:45 – 13:00.
5. The maximum number of motorcycles and cars entering and exiting on Friday, December 15, 2023. The maximum number of motorcycles entering the parking lot was 22 vehicles (4.889%) at 12:00–12:15, while the maximum number of cars entering the parking lot was 8 vehicles (4.678%) at 11:30–11:45. The maximum number of motorcycles leaving the parking lot was 29 vehicles (6.444%) at 15:45–16:00, while the maximum number of cars leaving the parking lot was 11 vehicles (6.433%) at 16:30–16:45. The maximum accumulation of motorcycle parking with a total of 301 vehicles was at 12:30–12:45, while the maximum accumulation of car parking with a total of 86 vehicles was at 12:30–12:45.
6. The maximum number of motorcycles and cars entering and leaving on Saturday, December 16, 2023. The maximum number of motorcycles entering the parking lot was 26 vehicles (5.567%) occurring at 17:00 – 07:15 while the maximum number of cars entering the parking lot was 9 vehicles (5.233%) occurring at 07:00 – 07:15. The maximum number of motorcycles leaving the parking lot was 33 vehicles (7.066%) occurring at 16:45 – 17:00 while the maximum number of cars leaving the parking lot was 11 vehicles (6.395%) occurring at 16:30 – 16:45. The maximum accumulation of motorcycle parking with a total of 303 vehicles was at 12:45 – 13:00 while the maximum accumulation of car parking with a total of 92 vehicles was at 12:45 – 13:00.
7. The maximum number of motorcycles and cars entering and exiting on Sunday, December 17, 2023. The maximum number of motorcycles entering the parking lot was 27 vehicles (5.613%) at 07:00–07:15, while the maximum number of cars entering the parking lot was 12 vehicles (6.857%) at 09:00–09:15. The maximum number of motorcycles leaving the parking lot was 31 vehicles (6.445%) at 16:45–17:00, while the maximum number of cars leaving the parking

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lot was 12 vehicles (6.857%) at 16:15–16:30. The maximum accumulation of motorcycle parking with a total of 297 vehicles was at 12:30–12:45, while the maximum accumulation of car parking with a total of 91 vehicles was at 13:00–13:15.

Parking duration

Parking duration is the time span of a vehicle parked in a place (in hours). Based on the results of the study above, it was obtained that the average parking duration with a time interval of 15 minutes, the maximum duration of motorcycles was the largest on Wednesday, December 13, 2023 at 09:22 hours while the largest car vehicle occurred on Tuesday, December 12, 2023 at 08:55 hours. For the average maximum duration of motorcycle vehicles, it occurred on Tuesday, December 12, 2023 at 03:40 hours while the average maximum for car vehicles occurred on Sunday, December 17, 2023 at 03:15 hours, and for the minimum duration of motorcycle vehicles, it occurred on Friday, December 15, 2023 at 0:06 hours while the minimum duration of car vehicles occurred on Monday, December 11, 2023, Wednesday, December 13, 2023, Thursday, December 14, 2023 and Friday, December 15, 2023 at 0:14 hours

Parking Turnover

Parking Turnover is the level of parking space usage and is obtained by dividing the parking volume by the number of parking spaces for a certain period, the motorcycle parking turnover rate with the highest value is (158.22%), for the average value is (153.76%) and for the minimum value is (148.03%) this shows that parking performance motorcycle vehicles are quite high exceeding 100% while the highest parking turnover rate for cars is (203.49%), the average value is (197.34%) and the minimum value is (190.70%) this shows that the performance of car parking is quite high exceeding 100%.

Parking index

Parking performance can also be seen based on the parking index figures. The parking index value for motorcycles and cars at Cibinong Regional Hospital which is based on the maximum parking accumulation obtained the motorcycle parking index that occurs at the maximum value is (104.61%), the average value is (99.95%) and the minimum value is (95.57%) based on the maximum accumulation of the parking index value obtained stated that the demand for parking space is greater than the parking capacity because it has an index value of more than 100% while the parking index for cars that occurs at the maximum value is (106.98%), the average value is (101.99%) and the minimum value is (94.19%) based on the maximum accumulation. From the parking index value obtained, it is stated that the demand for parking space is greater than the parking capacity because it has an index value of more than 100%.

Parking Space Needs Analysis

1. Parking space needs
   From the results of the calculation of car parking, it shows that the largest parking space requirement for motorbikes at Cibinong Hospital occurs on Sunday, December 17, 2023, amounting to 328 SRP, while the largest parking space requirement for cars at Cibinong Hospital occurs on Sunday, December 17, 2023, amounting to 92 SRP.
2. Parking space capacity requirement standards
   Based on the data analysis that has been carried out, the available parking capacity and parking space requirements can be determined by analyzing the number of vehicles parked against the number of parking spaces available, if the parking space requirement is greater than the available parking capacity, then the number of parking spaces available is insufficient. If the parking space requirement is smaller than the available parking capacity, then the number of parking spaces available is still able to accommodate vehicles that will park in the parking area. The largest parking space requirement is determined as the parking space requirement value that must be met by Cibinong Hospital.

If the parking space requirement is determined based on the results of research in the field, then the parking space requirement value taken is when the maximum accumulation occurs. The following is a comparison of parking space requirements to parking space capacity, the need for motorcycle parking space capacity shows on Monday, December 11, 2023 with a parking space requirement of 326 SRP, the parking capacity available at the research location is 304 SRP, so the difference

between parking space requirements and parking capacity is -22 SRP while car vehicles show on Monday, December 11, 2023 with a parking space requirement of 86 SRP, the parking capacity available at the research location is 86 SRP, so the difference between parking space requirements and parking capacity is 0 SRP. 1. Based on the need for parking space capacity for motorcycles, it shows that on Tuesday, December 12, 2023, the parking space requirement is 318 SRP, the parking capacity available at the research location is 304 SRP, so the difference between the need for parking space and the parking capacity is -14 SRP, while for cars, it shows that on Tuesday, December 12, 2023, the parking space requirement is 89 SRP, the parking capacity available at the research location is 86 SRP, so the difference between the need for parking space and the parking capacity is -3 SRP.

Based on the need for parking space capacity for motorbikes, it shows that on Wednesday, December 13, 2023, the parking space requirement is 313 SRP, the parking capacity available at the research location is 304 SRP, so the difference between the need for parking space and the parking capacity is -9 SRP, while for cars, it shows that on Wednesday, December 13, 2023, the parking space requirement is 86 SRP, the parking capacity available at the research location is 86 SRP, so the difference between the need for parking space and the parking capacity is 0 SRP. 2. Based on the need for parking space capacity for motorbikes, it shows that on Thursday, December 14, 2023, with a parking space requirement of 320 SRP, the parking capacity available at the research location is 304 SRP, so the difference between the need for parking space and the parking capacity is -16 SRP, while for cars, it shows that on Thursday, December 14, 2023, with a parking space requirement of 91 SRP, the parking capacity available at the research location is 86 SRP, so the difference between the need for parking space and the parking capacity is 0 SRP. 3. Based on the need for parking space capacity for motorbikes, it shows that on Friday, December 15, 2023, with a parking space requirement of 307 SRP, the parking capacity available at the research location is 304 SRP, so the difference between the need for parking space and the parking capacity is -3 SRP, while for cars, it shows that on Friday, December 15, 2023, with a parking space requirement of 90 SRP, the parking capacity available at the research location is 86 SRP, so the difference between the need for parking space and the parking capacity is -4SRP. 4. Based on the need for parking space capacity for motorbikes, it shows that on Saturday, December 16, 2023, the parking space requirement is 318SRP, the parking capacity available at the research location is 304SRP, so the difference between the need for parking space and the parking capacity is -14 SRP, while for cars, it shows that on Saturday, December 16, 2023, the parking space requirement is 94SRP, the parking capacity available at the research location is 91SRP, so the difference between the need for parking space and the parking capacity is -5SRP. 5. Based on the need for parking space capacity for motorcycles, it shows that on Sunday, December 17, 2023, the parking space requirement is 328SRP, the parking capacity available at the research location is 304SRP, so the difference between the parking space requirement and the parking capacity is -24SRP, while for cars, it shows that on Sunday, December 17, 2023, the parking space requirement is 92SRP, the parking capacity available at the research location is 86SRP, so the difference between the parking space requirement and the parking capacity is -6SRP.

CONCLUSION

Based on the results of survey data conducted on the Cibinong Hospital parking lot for 7 (seven) days on Monday, December 11, 2023 to Sunday, December 17, 2023, with a parking capacity provided for motorcycles of 851.145m^2 with a capacity of 304SRP, while the parking space provided for passenger cars is 3628.55m^2 with a capacity of 86SRP. Based on the data obtained from the maximum parking volume of Cibinong Regional Hospital per day, the largest for motorcycles occurred on Sunday at 481vehicles, while for passenger cars it occurred on Sunday at 175vehicles, with the largest maximum accumulation for motorcycles on Tuesday at 318vehicles, while the largest maximum parking accumulation for cars on Saturday at 92 vehicles, with a time span of parking duration for motorcycles obtained, namely a maximum duration of 9 hours 22 minutes, an average duration of 3hours 40minutes, a minimum duration of 6 minutes while the parking duration for passenger cars obtained, namely a maximum duration of 8 hours 5 minutes, an average duration of 3 hours 11minutes, a minimum duration of 14minutes. With the turnover parking for motorcycles obtained, namely a maximum of 158.22% while for passenger cars obtained, namely a maximum of 203.49%, and the parking index for motorcycles obtained, namely a maximum of 104.61% while for passenger cars obtained, namely a maximum of 106.98%. This

shows that the parking performance of motorcycles and cars is quite high by looking at the parking index exceeding 100%. Thus, the parking capacity for motorbikes and passenger cars available is not sufficient to accommodate motorbikes and passenger cars in the Cibinong Regional Hospital parking lot.

REFERENCES

Anggraini, D., & Syaiful, S. (2020). ANALISIS KONSEP PARKIR PADA PLAZA EKALOKASARI BOGOR. ASTONJADRO, 2(2), 9–18. https://doi.org/10.32832/astonjadro.v2i2.794

Hermawan, E. (2018). Kajian Ketersedian Lahan Parkir Sepeda Motor Di Gww (Studi Kasus: Kampus Ipb Dramaga). *ASTONJADRO*, *7*(2), 62-69.

Setyawan, M. A., & Agusdini, T. M. C. (2021, February). Evaluasi Kebutuhan Ruang Parkir Pada Rumah Sakit Umum Daerah Ibnu Sina Kabupaten Gresik. In *Prosiding Seminar Teknologi Perencanaan, Perancangan, Lingkungan dan Infrastruktur* (pp. 13-20).

Iman, F. (2018). *Evaluasi Kebutuhan Ruang Parkir di Kampus ITS Manyar Surabaya, Jawa Timur* (Doctoral dissertation, Institut Teknologi Sepuluh Nopember).

Zaenal T, R. F. (2019). *Analisa Karakteristik Dan Kebutuhan Ruang Parkir (Studi Kasus: New Makassar Mall)* (Doctoral dissertation, Universitas Hasanuddin).

Syaiful, S. (2021). KAJIAN TENTANG AKTIVITAS PARKIR PADA JALAN DUA JALUR DENGAN PEMBATAS HUBUNGANNYA DENGAN KARAKTERISTIK JALAN (Studi Kasus Jalan Margonda Raya Kota Depok). ASTONJADRO, 1(2),29–43. https://doi.org/10.32832/astonjadro.v1i2.788

Kurniawan, S., & Sriharyani, L. (2020). *ANALISIS KAPASITAS RUANG PARKIR KENDARAAN KAMPUS 1 UNIVERSITAS MUHAMMADIYAH METRO*. http://u.lipi.go.id/1320332466

Mansuetus Gare, Ireneus Kota, & Andreas Luis. (2023). Analisis Kapasitas Ruang Parkir Sepeda Motor PadaPelabuhan Ipi Ende. *Analisis Kapasitas Ruang Parkir Sepeda Motor PadaPelabuhan Ipi Ende*.

Arianto, W. (2021). *ANALISIS KEBUTUHAN RUANG PARKIR (STUDI KASUS PADA AREA PARKIR ICT UNIVERSITAS TEKNOKRAT INDONESIA)* (Vol. 02, Issue 02). http://jim.teknokrat.ac.id/index.php/tekniksipilJurnalTeknikSipil

DJPD. (1996). *PEDOMAN TEKNIS PENYELENGGARAAN FASILITAS PARKIR*.

S Syaiful, R Rulhendri, D Megawati, MR Rojudin, AK Wardhani. (2025). PARKING MODEL IN IPB UNIVERSITY CAMPUS ENVIRONMENT. ARPN Journal of Engineering and Applied Sciences 20 (5), 270-280.

S Syaiful, MN Prayudyanto, R Rulhendri, AP Lestari, AK Wardhani. (2025). An Urban Modeling Analysis of the Transport Network in the City of Bogor to Observe the Best Choice of a Transport Model. International Journal of Transport Development and Integration 9 (1), 143-150.

S Syaiful, D Maulani, D Megawati, R Gibran, AK Wardhani. (2025). ENGINEERING MODEL ON TRAFFIC VOLUME AT BOCIMI TOLL GATE. Journal of Applied Engineering Science 23 (1), 99-111.

Syaiful, S., Zein, A. M., Rulhendri, R., & Aminda, R. S. (2023). Parking Analysis on Bogor Agricultural University Campus. ASTONJADRO, 12(3), 919–933. https://doi.org/10.32832/astonjadro.v12i3.14994

Pratama, F. A., Syaiful, S., & Aminda, R. S. (2023). Paid Parking Performance at Depok Lama Station. ASTONJADRO, 12(3), 934–952. https://doi.org/10.32832/astonjadro.v12i3.15002

Syaiful, S., & Suherman, S. (2024). Performance Evaluation of Paid Parking at Cilebut Station. ASTONJADRO, 13(1), 12–22. https://doi.org/10.32832/astonjadro.v13i1.11184