



<https://e-journal.trisakti.ac.id/index.php/livas/index>

## THE DESIGN OF THE PARKING LOT LAYOUT OF HKBP MULTI-PURPOSE BUILDING IN TANGERANG CITY

Muhammad Zulyadaen<sup>1\*</sup>, Edison Hatoguan Manurung<sup>2</sup>

<sup>1,2</sup>Department of Civil Engineering, Faculty of Engineering, Mpu Tantular University, Indonesia

\*Corresponding author: [Muhammadzulyadaen832@gmail.com](mailto:Muhammadzulyadaen832@gmail.com)

### ABSTRACT

HKBP Church has an important parking lot to facilitate the parking needs of the congregants who want to worship at the church. The parking lot is located around the HKBP Tangerang City Multipurpose Building, which is still functional, but the parking capacity could not accommodate the number of vehicles needed.

#### Aims:

The objective of this article is to review the parking layout design of the HKBP Tangerang City Multipurpose Building in order to optimize the number of parking vehicles.

#### Methodology and results:

The 90° parking pattern for 40-motorcycles and the lack of sufficient parking spaces clearly interfere the available area for other facilities, making parking a very important issue.

#### Conclusion, significance and impact study:

The study employed the observation method, which was carried out by several field surveyors. The results were considered as 'primary data', while secondary data were obtained from various references and previous studies. This paper demonstrates that effective parking lot management requires an optimal parking pattern and flow. Through simulation, it was determined that a 45° angle parking pattern can accommodate 200 motorcycles, while a 90° angle pattern can accommodate 100 cars.

### MANUSCRIPT HISTORY

Received  
June 24, 2024  
Revised  
Mar 05, 2025  
Accepted  
Mar 06, 2025

### KEYWORDS

- Parking Lot,
- Layout,
- Design,

## 1. INTRODUCTION

Parking is a temporary situation in which a vehicle is left by its driver [1]. It is generally permissible to park on the side of the road, but parking in the middle of the highway [2] is legally prohibited. The definition of parking encompasses any vehicle that is stationary at a specific location, irrespective of whether a traffic sign designates the location. This includes both the loading and unloading of goods or people. Parking is a significant component of the transportation network system; consequently, its regulation influences network performance [3].

The configuration of the building layout is paramount, with the arrangement of parking spaces for two-wheeled and four-wheeled vehicles exerting a significant influence [4]. It is anticipated that they will be connected following the function and purpose of the building infrastructure, thus ensuring a safe, smooth, and efficient means of transportation devoid of technical, environmental, and architectural barriers. The HKBP Tangerang Kota Church is a place of Christian worship located in the middle of a residential neighborhood (see Figure 1.1). Its address is Gg. Melati II No.16, RT.001/RW.002, Tanah Tinggi, Cipondoh sub-district, Tangerang City, Banten 15148 [6]. The edifice is situated between residential properties (see Figure 1.1). The yellow boxes denote the location of the multifunctional building and the church. The primary church edifice, which is frequently utilized for various activities, is in the orange box on the right.



Figure 1. Location of HKBP Tangerang City Multipurpose Building (Google Earth, 2024).

The relationship between residential density and population, on the one hand, and the number of church congregations, on the other, is an essential consideration in optimizing parking capacity. A strategic approach to parking arrangement patterns in the affected area is essential when a deficiency in parking capacity is identified. Currently, the HKBP Tangerang City

Multipurpose Building has two parking lots; one is to the left of the Church, and the other is in the field. The field lot can accommodate 68 cars and 93 motorcycles, while the lot to the left of the Church can accommodate 40 motorcycles. The resource person has stated that the current condition of the parking area is suboptimal and that improvements are required to ensure full utilization of the parking area, thereby preventing vehicles from parking on the road. In light of these observations, a study on the Parking Planning of HKBP Tangerang City Multipurpose Building is recommended.

Preceding studies have demonstrated that the layout of facilities is paramount to enhancing operational success and efficiency. Facility layouts are devised using the Activity Relationship Chart (ARC) and the Total Closeness Rating (TCR). ARC analysis facilitates identifying relationships between facilities, such as parking lots. The TCR analysis determines the priorities of the facility while developing the proposed layout [7]. The author employed the AutoCAD 2021 application in this study to calculate and plan the proposed layout drawings. It is hoped that this proposed layout will assist the church management in re-arranging the parking area so that the capacity of the HKBP Tangerang City Church parking area is optimized.

## 2. RESEARCH METHOD

The research method is the sequence of steps that must be determined before resolving problems [8]. The objective is to facilitate the execution of the research and to streamline the analysis of prevailing issues [9]. The following are the research methods that guided this study.

### a. Preliminary study

The preliminary study comprised a field review and consultation with relevant parties regarding the issues encountered and the subsequent development phase requirements.

This preliminary research was conducted through two methods: field and literature studies.

### b. Problem's identification

At this stage, the researcher identifies the problems of regularity/irregularity of parking patterns, land availability, parking capacity, patterns, types of vehicles, and time of use of parking areas.

### c. Data collection

Direct field observation is one way to collect primary data. Primary data is from direct observation at the study site, where some people are involved as surveyors to help observe and record the necessary data [10]. Primary data in this study are the number of vehicles,

types of cars, and the length of time vehicles park. The data collection method uses pen and pencil equipment, roll meters, and pipe meters. Survey personnel consisted of several people placed at three observation points. The survey was conducted three days from 08.00 to 15.00 West Indonesia Time.

d. Analysis

The type, number, and time of parking vehicles determine the parking area and capacity on the existing site. Time management is a consideration in deciding how much capacity can be accommodated in one day, and parking layout patterns affect how efficient parking lots are to get the optimal number of parking vehicles.

### 3. RESULTS AND DISCUSSION

Direct observation and interviews with relevant parties, such as parking attendants, were used to identify the current parking system. The results are as follows:

- a. The area of the church side parking lot is approximately 540 m<sup>2</sup>, and the building area of HKBP Tangerang City Multipurpose Building is 11080 m<sup>2</sup>.
- b. There are two entrances and exits for motorcycles and cars.
- c. In addition to the four-wheeled vehicles parked on the field, there is a unique motorcycle parking lot.
- d. Strict guarding of parking spaces aims to avoid the loss of motorcycles and cars.
- e. Unused parking spaces were found due to the irregular placement of vehicles when parking.
- f. Lack of information about the occupancy of parking spaces causes some motorists to park their vehicles out of place when conditions are full.



Figure 2. Parking pattern at the HKBP Multipurpose Building in Tangerang City  
(Zulyadaen, 2024)

There are currently two parking lots at HKBP Tangerang City Multipurpose Building, namely, next to the church and in the field. All parking lots use 90° and 45° angle patterns. The capacity of the parking lot next to the church is 40 motorcycles. As mentioned above, the parking lots in these two locations are inefficiently used. The researcher tried to collect data and information to process them and reorganize the parking lot so that the congregation can use it as optimally as possible when they worship there.



Figure 3. The existing layout of the parking lot of the HKBP multipurpose building in Tangerang City.  
(Zulyadaen, 2024)

Above is a picture of the parking lot layout of the multipurpose building and its current size, where the main obstacle is that the parking lot in the field can only accommodate 68 cars and 93 motorcycles. The parking lot to the left of the church can accommodate 70 motorcycles. Every day, it feels inadequate. So, there are four models for parking motorcycles: 30°, 45°, 60°, and 90°. After measuring four times, the motorcycles should have a width of 72 cm, a length of 185 cm per motorcycle, and a distance of 35 cm between each number. With the above plan, the researcher tried to rearrange the layout so that the inadequate parking lot could accommodate the motorcycles and cars parked by calculating the four existing parking patterns and determining which one was more effective.

### Maximum Capacity of Parking Area

The calculation of the maximum capacity of the car park site is based on two factors: the land area allocated for vehicle parking and the number of parking spaces. [11].

a. The formula used to calculate the capacity of 90° angled parking spaces [12]: 
$$N = \frac{L}{1,07}$$

b. The formula for calculating the capacity of 30° angled parking spaces [13]: 
$$N = \frac{L-1,25}{2}$$

c. The formula for calculating the capacity of 45° angled parking spaces [14]: 
$$N = \frac{L-1,77}{1,4}$$

d. The formula for calculating the capacity of 60° angled parking spaces [15]: 
$$N = \frac{L-1,78}{1,2}$$



Figure 4. Parking pattern with 45° angle.  
( Zulyadaen, 2024)

$$N = \frac{L-1,77}{1,4} = \frac{1140-1,77}{1,4} = 813$$

The number of 813 motorbike vehicles is still divided by 4.05, where the number is calculated by dividing the total number of all alleys by the free space,

$$\frac{17,45}{4,3} = 4,05 \quad \text{then} \quad \frac{810}{4,05} = 200 \text{ motorbike vehicles.}$$

### Parking Time

Parking time is defined as the amount of time one vehicle spends in a parking area. [16]. The calculation of vehicle parking time considers vehicles entering and exiting on worship days and weekdays during the survey period [17].

Table 1. Average data of vehicles parked in the HKBP Multipurpose Building in Tangerang City.

Day	Number of parked vehicles
1	340
2	250
3	300
4	250
5	300
$\Sigma = 5$	1700
Average	340

The data processing results show that parking arrangements must be made to reduce the amount of unused land. This can be seen from the flow of parking and its patterns [18]. After calculating with two existing patterns, the result is that the parking lot area next to the church has an area of approximately 540 m<sup>2</sup> and 11080 m<sup>2</sup> building area of HKBP Tangerang City Multipurpose Building, then the result is:

1. 45° parking pattern can accommodate up to 200 motorcycle vehicles.
2. 90° parking pattern for 100 four-wheelers, and
3. 90° parking pattern for 40 motorcycles only.

### Criteria for Determining the Parking Layout

There are several criteria for determining the layout of a car park [19]:

- a. Car parks should be located on a level surface. A cut-and-fill system should be considered if the original land surface is sloping. The purpose of providing a level surface in the car park is to ensure the safety of the vehicles so that they can be parked safely and do not roll.
- b. If the distance between the car park and the place of worship is large enough, it is necessary to have clear and direct access to the car park. In terms of its use, the car park is divided into :
  - Parking of four-wheeled vehicles, cars, and sedans, a maximum of 100 vehicles.
  - Parking two-wheeled vehicles, bicycles, and motorcycles, a maximum of 150 to 200 vehicles.
- c. From the point of view of their design, the criteria and principles for car parks should be broadly in line with the following factors.

- Time of use and utilization of parking spaces.
- The number of vehicles required to determine the size of the parking lot.
- Size and type of vehicle to be accommodated.
- Availability of parking support facilities.

### Selected Concept Drawings

Based on consideration of lessons learned from other cases [20], the following criteria were developed for the layout of the existing parking lot layout :

- a. The parking layout for cars and motorcycles is separated

Factors influencing parking layout differences between cars and motorcycles are vehicle size, safety, and accessibility. In this case, the size of the car is more significant than that of the motorcycle. Therefore, car parking areas require more space for maneuvering and safe parking. In addition, the motorcycle parking is closer to the guard post, making it easier to monitor and more compact to be placed in a smaller space.

- b. Car parking pattern with a 90° angle

In general, the vehicle position is 90°. In terms of space effectiveness, the 90° angle is most favorable. This parking pattern has more capacity when compared to parallel parking patterns, but for the ease and comfort of drivers, maneuvering in and out of parking spaces is more complex than parking patterns with angles smaller than 90°. This parking pattern with an angle of 90° has a capacity of 4 (four) wheeled vehicles, as many as 100.

The 45° angle parking pattern has been shown to offer several advantages over other parking patterns, including a greater capacity for vehicles and easier maneuvering. Compared to the parallel parking pattern, the 45° angle parking pattern has been demonstrated to have a larger capacity and can accommodate more motorcycles in the same area. Furthermore, drivers have been shown to find it easier to maneuver in and out of parking spaces with a 45° angle, enhancing both comfort and convenience for users. The author's proposal for a motorcycle parking pattern with a 45° angle is intended to optimize capacity and comfort, with the capacity to accommodate up to 200 two-wheeled vehicles. In the HKBP Tangerang City Multipurpose Building field, the existing parking pattern previously accommodated 68 cars and 93 motorbikes. In contrast, the parking lot to the left of the church can accommodate 40 motorbikes. The current

capacity of the lot to the left of the church is 100 vehicles for four-wheeled vehicles and 200 for two-wheeled vehicles, with an additional 40 motorbikes.

The proposal and selection of the concept for planning the parking lot's layout of the HKBP Tangerang City Multipurpose Building constitute the initial phase in resolving the problem of uncomfortable parking areas and the underutilization of parking lots.

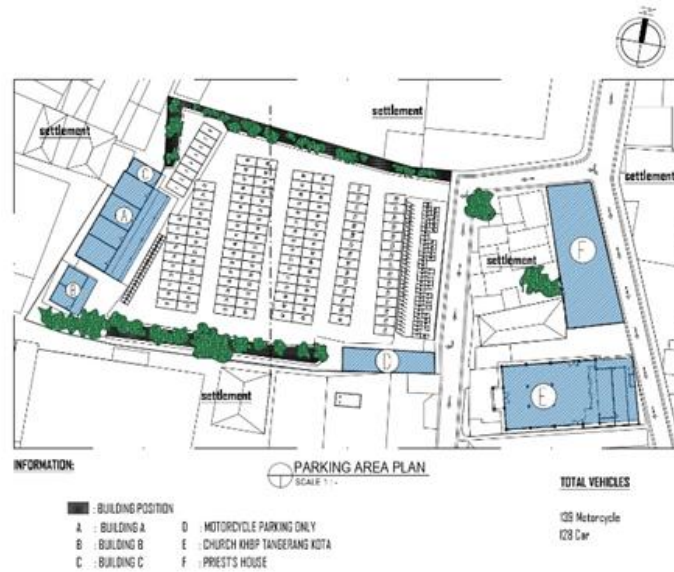


Figure 5. Site Plan (Zulyadaen, 2024)

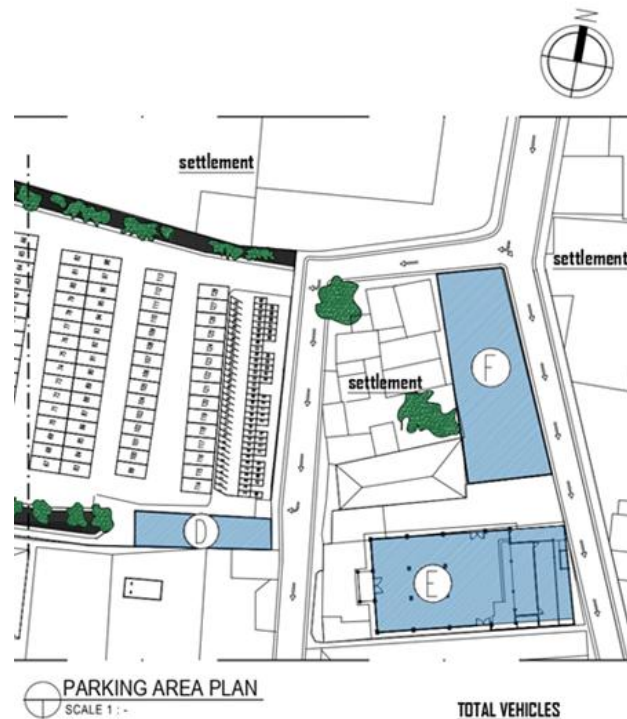


Figure 6. Layout on intersection B (Zulyadaen, 2024)

#### 4. CONCLUSION

The parking issue is of significant concern, as the scarcity of parking spaces can impede the available space for other facilities. A practical parking layout, characterized by a well-designed pattern and efficient flow, can optimize space utilization. A 45° angle parking configuration can accommodate 200 motorbikes, while a 90° angle pattern can accommodate 100 cars. Furthermore, a 90° parking layout can accommodate 40 motorbikes.

#### 5. REFERENCES

- [1] B. Bertarina Dan W. Arianto, "Analisis Kebutuhan Ruang Parkir (Studi Kasus: Area Parkir Ict Universitas Teknokrat Indonesia)," *J. Tek. Sipil*, 2021.
- [2] R. Siska, "Motif Aktor Perparkiran Di Kawasan Pantai Gandorah Kota Pariaman." Universitas PGRI Sumatera Barat, 2022.
- [3] B. J. Haiiri, "Sistem Monitoring Tempat Parkir Kendaraan Bermotor Berbasis Mikrokontroler Di Hotel Golden Flower." Universitas Komputer Indonesia, 2019.
- [4] I. K. S. Giri, C. P. Wirasutama, I. W. G. D. Yoga, Dan I. B. G. Mahardika, "Perencanaan Desain Parkir Pada Kawasan Objek Wisata Pantai Kedungu Tabanan," *J. Ilm. Kurva Tek.*, 2023.
- [5] F. H. Jaya, "Perencanaan Tata Letak (Layout) Dan Penataan Ruang Parkir Kendaraan Pada Kampus Usbrj Lampung," *Tapak Teknol. Apl. Konstr. J. Program Studi Tek. Sipil*, 2019.

- [6] A. Fajarudin, "Upaya Pemerintah Kota Tangerang Dalam Menjaga Dan Memelihara Kerukunan Antar Umat Beragama." Fakultas Syariah Dan Hukum Universitas Islam Negeri Syarif Hidayatullah Jakarta, 2018.
- [7] A. S. Norita, S. A. Syahputri, R. A. L. Hafshoh, S. Yulianti, K. A. Husyairi, Dan T. N. Ainun, "Perancangan Ulang Tata Letak Grosir Fernando Di Sukabumi Menggunakan Metode Activity Relationship Chart: Arc Dan Total Closeness Rating: Tcr," *Matriks J. Sos. Dan Sains*, 2024.
- [8] M. S. Priadana Dan D. Sunarsi, *Metode Penelitian Kuantitatif*. Pascal Books, 2021.
- [9] A. E. Wibowo, *Metodologi Penelitian Pegangan Untuk Menulis Karya Ilmiah*. Penerbit Insania, 2021.
- [10] N. Haryati, "Perencanaan Parkir Pelabuhan Bobong Kecamatan Taliabu Barat Kabupaten Pulau Taliabu," *J. Media Inov. Tek. Sipil Unidayan*, 2021.
- [11] H. Djoni, R. Mangontan, Dan M. D. M. Palinggi, "Analisis Ketersediaan Dan Kebutuhan Lahan Parkir Pada Rs. Bhayangkara Makassar," *Paulus Civ. Eng. J.*, 2023.
- [12] F. A. Azizi, A. L. Nurdin, M. Yunus, A. Khamid, Dan Y. Feriska, "Analisis Kapasitas Ruang Parkir Mobil Di Kawasan Jalan Pancasila Kota Tegal," *Era Sains J. Penelit. Sains Keteknikan Dan Inform.*, 2023.
- [13] B. Tripoli Dan R. Djamaluddin, "Analisis Karakteristik Parkir Kendaraan Bermotor," *J. Tek. Sipil Dan Teknol. Konstr.*, 2019.
- [14] I. Hadijah Dan L. Sriharyani, "Pengaruh Parkir Badan Jalan Terhadap Kinerja Ruas Jalan (Studi Kasus Jalan Imam Bonjol Kota Metro)," *Tapak Teknol. Apl. Konstr. J. Program Studi Tek. Sipil*, 2016.
- [15] A. Numberi, P. Bahtiar, Dan J. J. Numberi, "Analisis Karakteristik Parkir Terhadap Kebutuhan Ruang Parkir Di Pasar Central Hamadi Kota Jayapura," *J. Asimetrik J. Ilm. Rekayasa Inov.*, 2021.
- [16] R. Darma, "Analisis Karakteristik Dan Kebutuhan Parkir Di Pasar Tugu Bandar Lampung," 2019.
- [17] M. M. Ode, "Analisis Karakteristik Parkir Kendaraan Pada Jalan Nusantara Kota Makassar Mulai Dari Simpang Tugu Mandiri Sampai Pertigaan Jalan Tentara Pelajar." Universitas Bosowa, 2021.
- [18] U. R. Islami, "Desain Ruang Publik Hertasning Di Makassar".
- [19] L. S. Tatura, "Analisis Penataan Ruang Parkir Pasar Central Kota Gorontalo," *J. Sainstek*, 2013.
- [20] A. P. Hanugrapasca, U. J. Cahyono, Dan K. Sunoko, "Penerapan Konsep Era New Normal Pada Pusat Konvensi Dan Ekshibisi," *Senthong*, 2022.