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# Design of a Rental Office Using a Smart Building Approach in South Jakarta

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A R T I C L E I N F O

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A B S T R A C T

In the future, the city of Jakarta will change its status to become a special area of Jakarta (DKJ) and play a role as a global city. The design of rental offices in South Jakarta with a smart building approach aims to answer the challenges of economic growth, limited land, and the need for efficient workspace in a global city. Jakarta, which has been transformed into a Special Region of Jakarta (DKJ), encourages the development of mixed-use areas, combining office, residential, and commercial functions. Smart buildings offer energy efficiency, convenience, and sustainability with the integration of automation technology. This design is focused on optimizing facilities and utilities to support productivity, efficiency, and energy conservation, making buildings more adaptive to the current and future needs of the city of Jakarta that continues to grow.

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## INTRODUCTION

A rental office is an office facility that is grouped in one building in response to rapid economic growth, especially in big cities (industrial development, building/construction, trade, banking, and others) Korompu, (2020). In the future, the city of Jakarta will change its status to become a special area of Jakarta (DKJ) and play a role as a global city. In the concept of a global city, the city of Jakarta implements mixed-use development where the area builds by specifically integrating offices and shopping centers and other office functions. Therefore, an office close to residences and shopping centers is needed (President of the Republic of Indonesia, 2022).

In addition, the design of this rental office aims to meet the standards (mixed-use development) in Jakarta so that the potential users of rental offices in Jakarta will increase their use for business needs. This condition further strengthens Jakarta's position as a strategic economic center, so that the demand for business space, including rental offices, continues to increase along with the growth of the number of companies operating in this city, especially southern Jakarta which is growing rapidly, with good access to various commercial and industrial centers (Martinez & Masron, 2020). Smart buildings are design themes that focus on technology and expertise in overcoming problems in buildings (Lintas et al., 2024).

In the principles of smart building, there are several points that can be applied to the design of this rental office, which are as follows (Transformation & Authority, 2023):

1. Automatic.
2. Multifunctional.
3. Adaptability.
4. Interactivity.
5. Efficiency.
6. Inclusivity.
7. Green Buildings.

The concept of smart building technology, which is applied as an approach in planning and designing an office, can be realized in the form of an environmentally friendly building with a modern residential style supported by today's technological sophistication, while still increasing the efficiency and comfort of the building.

The following is statistical data on the number of private workers in Jakarta:

| Status Pekerjaan Utama. | Jumlah Pekerja menurut Status Pekerjaan di Provinsi DKI Jakarta (Jiwa) | | |
|---|---|---|---|
| | 2021 | 2022 | 2023 |
| Berusaha sendiri | 1.111.762 | 1.183.102 | 1.162.880 |
| Berusaha dibantu buruh tidak tetap/buruh tidak dibayar | 254.028 | 195.349 | 248.452 |
| Berusaha dibantu buruh tetap/buruh dibayar | 151.594 | 154.147 | 186.108 |
| Buruh/Karyawan/Pegawai | 2.773.112 | 2.923.158 | 3.048.533 |
| Pekerja bebas di pertanian | 764 | 2.488 | 1.549 |
| Pekerja bebas di nonpertanian | 191.270 | 174.406 | 140.264 |
| Pekerja keluarga/tidak dibayar | 254.885 | 242.452 | 284.951 |
| Jumlah | 4.737.415 | 4.875.102 | 5.072.737 |

**Figure 1. Statistical Data on the Number of Private Workers in Jakarta**
*Source: BPS (2024)*

This condition further strengthens Jakarta's position as a strategic economic center, so that the demand for business space, including rental offices, continues to increase along with the growing number of companies operating in this city, especially southern Jakarta which is growing rapidly, with good access to various commercial and industrial centers (Martinez & Masron, 2020).

In addition, the growth of rental offices in major cities in Indonesia is increasing due to high and limited land prices. Rental offices with smart building technology can offer advantages such as energy efficiency, convenience, and productivity.

South Jakarta, as a strategic business area, is very suitable for the application of this technology. Smart building technology can make buildings more environmentally friendly, energy-efficient, and increase comfort for users (2019; Sukmatama & D., 2024).

## LITERATURE REVIEW

The design of this rental office building focuses on the application of the concept of smart building that is environmentally friendly and sustainable, in order to present a sophisticated building based on technology. The building design supports the integration of automation systems and digital technology to improve operational efficiency. In addition, this project aims to create a rental office in South Jakarta that implements the Building Energy Management System (BEMS), so that it can increase comfort, meet functional needs, and provide an adaptive and technology-based creative workspace.

## METHODOLOGY

The qualitative method used in my thesis research is to understand and explain the rental office and the needs of the rental office with the application of the samrt building concept. This approach is exploratory and analytical, where statistics are taken from various sources, such as literature studies, industry reports, case studies and with various architectural references. Using this method, the study describes the existing conditions that are able to analyze large-scale designed designs.

This research was carried out through several stages:

1. Problem Identification
   Analyze problems in the design of a rental office with the scale of the scope of the site.
2. Determining Limits and Presumptions
   Determine the scope limit of the site and the elements to be analyzed and determine the design aspects based on the concept of smart building.
3. Studi Literature
   Examine several references from journals, books, planning standards, and case studies in technology-based rental office design.
4. Location Survey
   Conducting direct observation of the design site location to document the condition of the site, spatial layout, and the existing environment of the design site.
5. Comparative Study
   Conducting case study analysis on buildings or rental offices that apply the concept of Smart Building both domestically and abroad.
6. Analysis
7. Processing and analyzing existing survey results data in literature studies and comparative study analysis in the planning and design of Rental Offices with the Smart Building Approach.
   Basic Concepts of Planning and Design. Applying the concept of a rental office with the application of smart building to the following elements:
   a. Energy Efficiency and Sustainability.
   b. Occupant Comfort and Productivity.
   c. Security and Surveillance.

## RESULTS RESEARCH AND DISCUSSION

The design of this rental office focuses on the application of *smart building* technology in South Jakarta, with the aim of improving energy efficiency, sustainability, and comfort. Automation technology will be used to efficiently manage lighting, temperature, and security systems, thereby reducing energy consumption and minimizing environmental impact.

In addition, this design will also discuss how *smart buildings* can increase productivity by creating a comfortable environment for users. Considering the challenges and opportunities in the application of this technology in South Jakarta, this design will analyze the existing problems and find the right solutions.

The design of the Rental Office in Pondok Indah, South Jakarta, with a *Smart Building approach*, was chosen because of its strategic location in the middle of a dense and growing commercial, residential, and shopping center area. In the selection of the location of the design site located in the Pondok Indah area, South Jakarta, there are several aspects that support the selection of the site, including:

***Location Processing***

In determining the location of the design site located in the Pondok Indah area, South Jakarta, there are a number of supporting factors that are the basis for choosing the location. These factors can be described as follows.

a. Accessibility and Transportation
   The Pondok Indah area has a high level of accessibility through the main road network such as Jalan Pondok Indah Raya and Jalan TB Simatupang, as well as its proximity to the Jakarta Outer Ring Road (JORR). This condition allows the location of the site to be easily accessible from various regions in Jakarta, thus supporting the mobility and comfort of rental office users.
b. Commercial Areas and Supporting Infrastructure
   Pondok Indah is known as one of the growing commercial and business districts, characterized by the existence of office buildings, shopping centers such as Pondok Indah Mall, and various other commercial facilities. This environment provides added value for rental offices because it is located in an area that supports economic and business activities.
c. Environmental Safety and Comfort
   The Pondok Indah area has an image as a relatively safe, orderly, and comfortable environment, with a good level of security from various aspects. This condition greatly supports the creation of a conducive and protected working environment for building users.
d. Digital Infrastructure and Technology Support
   As a premium area in South Jakarta, Pondok Indah is supported by adequate digital infrastructure, including a high-speed internet network and a reliable telecommunication system. This is an important factor in supporting the implementation of smart building concepts, such as building automation systems, energy management, and security based on digital technology.
e. Property Value and Investment Potential
   As an exclusive area with a rapid development rate, Pondok Indah has a high property value and is in demand by large companies, professionals, and expatriates. This condition increases the demand for quality office space, especially those that carry the concept of smart buildings.
f. Growth and Development of the Area
   Pondok Indah is an area that continues to grow, characterized by the emergence of various new development and property development projects. The development of infrastructure and the surrounding area further strengthens the attractiveness of this location for companies in need of modern and future-oriented office space.

Based on these various considerations, the Pondok Indah area can be considered a very strategic location and ideal for designing rental offices with a smart building approach. This location offers easy access, adequate infrastructure availability, a safe and comfortable environment, and promising investment prospects for the development of modern and efficient office buildings.

***Site Location***

The following is a picture of the location of the site that will be used as a place to plan the design of a rental office in the Pondok Indah area.

a. Site

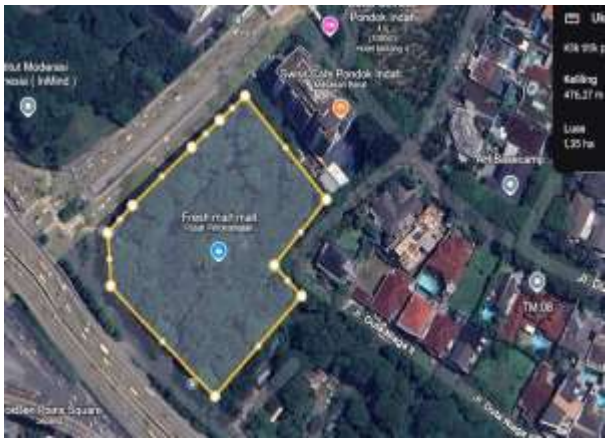


**Figure 2. Site**

*Source : Google Earth*

2. Site Data

**Table 1. Site Data**

| | |
|---|---|
| Area | 13.500 m2 |
| Location | Jl. Metro Pondok Indah, RT.6/RW.14, Pondok Pinang, Kebayoran Lama District, South Jakarta City, Special Capital Region of Jakarta 12310 |
| Boundaries | North: Swiss-bel Hotel Pondok IndahSelatan : Poins SquareWest : BCA KCU Pondok IndahEast : Suzuki Pondok Indah Dealer |

*Source : Google Earth*

3. Detailed Spatial Plan

**Table 2. Detailed Spatial Plan**

| | |
|---|---|
| KDB | 55 % |
| KLB | 6.84 |
| GSB | 6 M |
| KDH | 20 % |
| KTB | 60 % |

*Source : Jakarta Satu*

4. Land Provision Data

**Figure 3. Land Provision Data**
*Source : Jakarta Satu*

5. Building Regulations (KDB, KLB, GSB, KDH, KTB)

**Table 3. Building Regulations**

| **Space Utilization Regulations** | **Calculation** | **Usable Space** |
|---|---|---|
| Building Policy Efficiency (KDB) 55% | Land area X KDB 13,500 X 55 % | 7.425 M2 |
| Building Floor Efficiency (KLB) 5.61 | Luas lahan X KLB 13.500 X 5.61 | 75.735 M2 |
| Green Base Efficiency (KDH) 20% | Land Area X KLB 13,500 X 5.61 | 2.700 M2 |
| Joint Site Satisfaction (KTB) 60% | Land area X KTB 13,500 X 60 % | 8.100 M2 |
| Building Height (KB) | KDB : KLB | 25 Floors |
| Building Matching Line (GSB) | | 6 M |

*Source : google Earth*

6. Boundaries – Site Boundaries

**Table 4. Boundaries – Site Boundaries**

| | |
|---|---|
| North | Swiss-bell Hotel Pondok Indah |
| East | Dealer Suzuki Pondok Indah |
| South n | Poins Square |
| West | BCA KCU Pondok Indah |

*Source : google earth*

7. Environmental Conditions Around the Site

**Figure 4. Environmental Conditions Around the Site**

*Source : Personal Documents, 2025*

8. Access to the Environment Around the Site
9. Circulation Around the Site
10. Transportation System

Typology can be interpreted as the classification of characteristics or traits of the physical form of a city on a smaller scale. Theoretically, this typology describes the different types of open and closed spaces that are based on basic geometric shapes such as squares, circles, and triangles, including variations of these shapes (Abdul Fiqih, 2022). In planning the typology of office buildings, it should be noted that the concentration of work activities in one building can have a certain impact on the surrounding environment. The development of office typology has historically been divided into four main phases. In the 18th to 19th centuries in Europe, the Industrial Revolution encouraged the rapid growth of the banking, insurance, telecommunications, and transportation sectors, resulting in an increase in the need for office space as administrative workers increased.

Entering the 19th century, office design began to emphasize aspects of comfort and work collaboration. After World War II, management patterns and work systems became more organized. Since 1970 until now, office typology has developed with the concept of open space, coworking space, and the application of smart technology. Offices are identified and examined using typological techniques, which are based on architectural classifications that take into account form and function. According to vertical zoning, offices often have private spaces on the top floors and public spaces on the first floor. However, as time goes by, the millennial era begins to change the idea of fixed vertical zones, leading to a more adaptive integration of horizontal and vertical spaces (Lestari, 2019).

The main goal of implementing a smart building management system is to optimize the efficiency of building management. This effort is achieved through energy savings, especially the use of electricity, the use of computer-based systems to minimize human error, and the improvement of the comfort and safety of buildings. In addition, the concept of smart building functions as a supporting means for residents, owners, operators, and building managers in maximizing the use of space while reducing negative impacts on the surrounding environment (Nurdiansyah et al., 2016).


**Figure 5. Objectives of Smart Building Systems**

*Source : Author Data Processing*

A Smart Building can be understood as a building that is designed in a structured and systematic manner with the support of information systems and service control mechanisms to ensure comfort while meeting the needs of its users. The building utilizes special software that acts as a control center, supported by hardware in the form of electronic components that are installed and integrated directly into the main elements of the building. Through this integration, smart buildings are able to manage various systems, such as telecommunications, security, and automation, so that the facilities provided can function optimally and be responsive to occupant activities.

From an architectural perspective, designing buildings that are intelligent, efficient, and integrated with mechanical and electrical (ME) systems is a challenge as well as an opportunity in the future. Architects are required to be able to combine aspects of design, technology, and sustainability in one system that supports each other. The application of the smart building concept ultimately provides immediate benefits to users, especially through energy savings and improved environmental quality in the space. In addition, smart building technology contributes to optimizing energy and water use, reducing carbon dioxide ($CO_2$) emissions, and improving overall building operational efficiency, thereby supporting the principles of sustainable development (Lizar, 2021).

Furthermore, a smart building can be interpreted as a building equipped with an automatic control system, so that owners and users can feel economic benefits as well as improve service quality and management effectiveness. To realize this, a smart building needs to meet three main criteria as stated by Teich et al. (2010), namely:


**Figure 6. Smart Building Requirements**

*Source : Author Data Processing*

1. Buildings need to be equipped with modern automation systems to monitor various facilities needed, such as air conditioning systems, ventilation, lighting, and fire safety. Thus, the environment in the building can be maintained to remain comfortable and safe for its users.
2. The building needs to be equipped with an efficient network infrastructure between each floor, so that the data flow can run smoothly.
3. Infrastructure which includes building systems, telephone data and IP TV, CCTV, GPON and BAS technology.
4. Manage services that include managed LAN/WAN, managed security, and managed building infrastructure.
5. Integrated System yang meliputi payment system, digital signage, dan parking system.
6. The building must provide adequate telecommunication facilities.

There are several elements involved in the application of smart building technology ideas in a structure, such as (Putra, 2020):

a. Cooling, Heating, and Ventilation (HVAC) Systems

   This system is designed to create comfortable and healthy space conditions for the building's occupants. HVAC must be able to adapt to various conditions, such as time differences, weather changes, and space functions, to maintain air quality in buildings. In emergency situations such as fires, this system also plays a role in smoke control.

   The main components of HVAC include boilers as air heaters, refrigeration units or air conditioners that work through heat exchange processes, as well as liquid or gaseous media to lower the air temperature. In addition, the air handling unit (AHU) functions to distribute hot and cold air to all areas of the building.

b. Lighting Control System

   To improve user comfort as well as energy efficiency, the building is equipped with lighting sensors that are able to detect the intensity and color of light in the room. This sensor, which is usually mounted on a wall or ceiling, will automatically adjust the lighting according to the needs of each room.

d. Access Control System
   This system aims to ensure the safety and comfort of residents from the risk of disasters and crimes. Building access, such as doors, windows, and sliding barriers, is controlled automatically through digital sensors. The use of this system helps to increase user productivity, reduce energy consumption, and minimize labor requirements.
e. Data Network
   Data networks serve as hardware infrastructure for distributing, processing, and storing information related to a building's response to the environment and its users' activities. This system is also used to record and store audio and video data from various activities in the building.
f. Fire Protection System
   Fire extinguishing systems work by detecting an increase in temperature, smoke, or flame. The goal is to provide early warning to residents so that they can immediately evacuate safely.
g. Audiovisual System
   To support comfort in spaces such as meeting rooms or educational facilities, audiovisual systems are equipped with acoustic control devices, such as electronic sound dampers, that effectively reduce echoes and sound reflections.
h. Sustainability and Energy
   In terms of sustainability and energy efficiency, smart buildings have similarities with green buildings. Both are designed to reduce energy consumption and provide benefits for the environment while improving the quality of life of its residents.

***Implementation of the Theme***

The application of the Smart Building concept in the design of rental offices in South Jakarta is an architectural strategy oriented towards the efficiency of energy resource utilization. This concept emphasizes the integration of smart technology into building systems to support the creation of a comfortable, safe, and productive work environment for its users. Smart Building is understood as a design approach that unites elements of technology, architectural design, construction processes, and building management systems in a single interconnected unit. Through the application of modern technology, the quality of space in buildings can be improved, both in terms of thermal comfort, lighting, and security.

In addition, the intelligent system implemented is able to optimize the operational performance of the building, so that energy consumption can be reduced and the need for operational personnel can be minimized. Thus, the Smart Building concept not only provides economic benefits for managers and tenants, but also contributes to environmental sustainability. The completeness of the data and the relevance of the literature are important foundations in supporting this concept-based design.

***Requirements for Designing a Rental Office***

Law of the Republic of Indonesia Number 28 of 2002 concerning Buildings stipulates a number of provisions related to rental office buildings. These provisions can be described as follows:

1. Building administrative requirements
   Each building must meet administrative requirements which include:
   a. Clarity of the status of land rights and/or building use permits by land rights holders.
   b. Certainty of the ownership status of the building.
   c. The ownership of a building permit is in accordance with the provisions of the applicable laws and regulations.
2. Building ownership
   The building or part of it can be owned by individuals or legal entities in accordance with the applicable legal provisions.
3. Building recording
   The local government has an obligation to implement a building registration system to ensure the smooth process of construction, utilization, and supervision.
4. Further setup
   The provisions regarding licensing, ownership, and building registration systems as referred to in the previous point are further regulated in government regulations.

In addition, the law also regulates requirements related to building planning, which include the following aspects.

1. Building standards
   Regulations regarding building function, land use intensity, architectural aspects, and environmental impact control are part of the building planning requirements as stated in Article 7 paragraph (3).
2. Building layout and environmental plan
   The local government is authorized to further regulate the planning standards for the layout of buildings and the surrounding environment in accordance with applicable regulations.
3. Technical provisions for the preparation of the plan
   Government regulations regulate in more detail the procedures for preparing environmental planning and building layout plans as referred to in the previous point.

The following are the results of the application of the concept in this design:

1. Situation and Conditions


**Figure 7. Situation and Conditions**

*Source : Personal Analysis, 2025*

**Potential** : The site location has an area of 13,500 m2 with a 6-meter building boundary line facing Jalan Madya Pondok Indah and Jalan R.A. Kartini. It is located in a strategic downtown area, close to a wide range of public facilities.

**Constraints** : The site is on the edge of a busy highway, which increases the risk of congestion, especially during rush hour.

**Solution:** To overcome this problem, several steps can be taken, such as the implementation of strict rules on vehicular traffic and the construction of a skywalk that connects important facilities to the site area, to facilitate access and reduce congestion around the site.

2. Circulation and Accessibility


**Figure 8. Circulation and Accessibility**

*Source : Personal Analysis, 2025*

**Potential** : The site location is located in a strategic city center and has good access to public transportation, such as MRT, Transjakarta Bus, and private vehicles. Access to the site can be done through Jalan Madya Pondok Indah and exit to Jalan R.A. Kartini.

**Constraint** : Pedestrians around the site do not meet the set standards. In addition, the existing pedestrian paths are very narrow to provide convenient access to the site. The presence of busy main roads is also an obstacle, because there is no pedestrian bridge.

**Solution** : To improve pedestrian accessibility, a workable solution is to widen the pedestrian around the site to fit the specified size. In addition, the construction of the skywalk can also help pedestrians cross busy highways more safely and easily, connecting the site with surrounding public facilities.

3. Utility Networks


**Figure 9. Utility Networks**

*Source : Personal Analysis, 2025*

**Potential:** Around the site there are various utility networks, such as clean water networks, dirty water, electricity, and a number of other supporting networks that are the main resources for the site.

**Obstacles:** One of the problems that exist is the existence of a network of dirty water that flows through sewers in front of the site, such as culverts, which are prone to clogging or causing flooding during heavy rains.

**Solution:** To overcome this problem, it is necessary to widen the culverts or sewers around the site and carry out regular cleaning to prevent blockages and reduce the risk of flooding in the area around the site.

4. Climatology


**Gambar 10. Climatology**

*Source : Personal Analysis, 2025*

**Potential:** Based on sunlight analysis, the site receives more sunlight from the east at sunrise and from the west at sunset.

**Constraints:** This intense exposure to sunlight can affect the comfort of the building, as excessive direct exposure to sunlight may interfere with occupant comfort.

**Solution:** As a solution in design, the use of screen protectors can be applied to reduce the entry of sunlight into the room, so as to improve the comfort of its occupants.

5. Noise and Greening


**Figure 10. Noise and Greening**
*Source : Personal Analysis, 2025*

**Potential** : The site is located right on the edge of the intersection that connects Jalan Madya Pondok Indah, Jalan R.A. Kartini, and Jalan Raya Jakarta - Bogor.

**Constraint** : The location of the site near the intersection causes a high level of noise, mainly due to the presence of traffic lights that regulate the flow of vehicles. When a red or green light is issued, many vehicles stop and the sound of horns is often heard, interfering with the user's comfort.

**Solution** : To overcome the noise problem, some steps that can be taken include planting trees around the site to absorb sound. In addition, zoning and spatial arrangement also need to be considered, by placing a more private area in a part away from the source of noise.

6. View Environment


**Figure 11. View Environment**
*Source : Personal Analysis, 2025*

**Potential** : The site is located in an urban area close to residential areas, highways, and also the Jakarta Outer Ring Road toll road.

**Constraints** : The scenery around the site generally leads to other buildings, which can make the view from the hotel less attractive, especially for hotels that rely on the scenery as the main attraction in commercial activities.

**Solution** : To overcome this, it is necessary to build taller buildings around it. By increasing the height of the building, the view presented to hotel visitors will be more interesting, because the taller the building, the wider and more beautiful the scenery that can be enjoyed.

The following are the basic concepts of planning:

1. Basic Building Shape
   The basic shape of the building is taken from a rectangle which has different functions, including: yellow functions as a management and supporting area, while red functions as a rental office building on one store. This building has one form of mass composition. The philosophy of building forms is related to balance/stability and harmony, this balance has the same four sides that create the impression of stability and it is easy to determine the point of an orderly and measurable column.

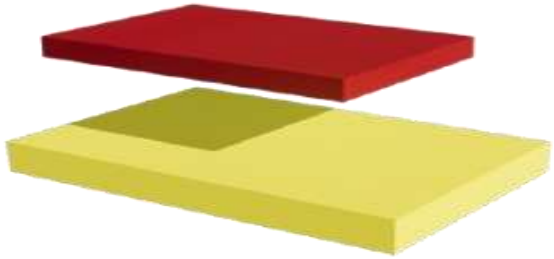


**Figure 12. Basic Shape of the Building**
*Source : Personal Analysis, 2025*

2. Mass Composition
   This form of mass composition is a merger between two different forms of building mass to be integrated with their respective functions on one floor. Thus the drawing of the shape of the building below:

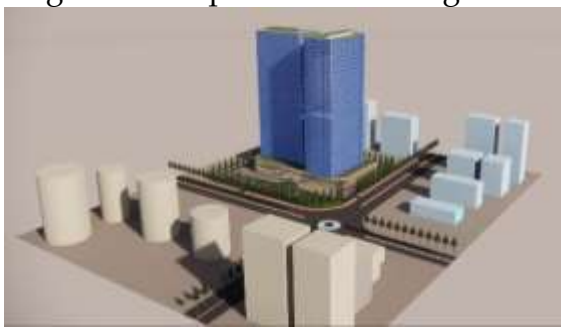


**Figure 13. Mass Composition**
*Source : Personal Analysis, 2025*

3. Zoning and Spatial Properties

**Table 5. Zoning and Spatial Properties**

| Space groups | Nature of Space |
|---|---|
| Managers | Private |
| Supporting | Semi Audience |
| Main Facilities | Private |
| Service | Private |
| Parking | Audience |

*Source : Personal Analysis, 2025*

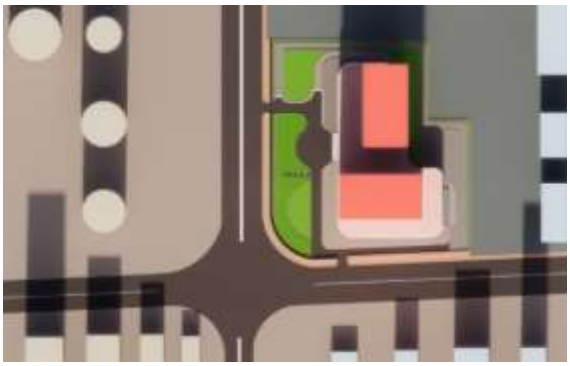
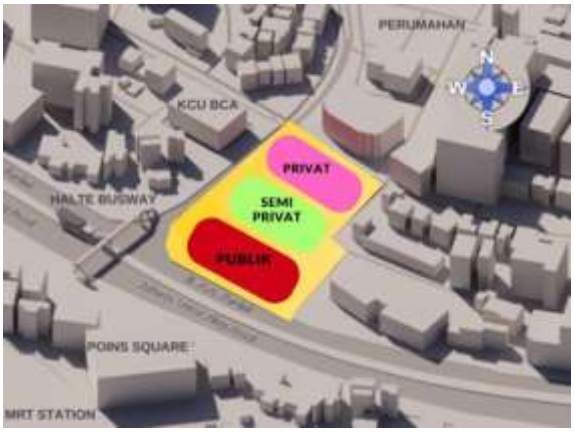


**Figure 14. Achievements and circulation**
*Source : Personal Analysis, 2025*




**Gambar 15. Zoning**
*Source : Personal Analysis*

The following is the zoning of the results of the design analysis of the rental office, which has been processed so that it is easy to understand which spaces are for public, private, and semi-private.

## CONCLUSIONS AND RECOMMENDATIONS

Designing a rental office in South Jakarta with a smart building approach can be a solution to answer the challenges of economic growth, limited land, and the need for efficient workspace in Jakarta. With the integration of automation technology and efficient design, these buildings can serve as an example for sustainable and adaptive urban development.

## ADVANCED RESEARCH

Still conducting further research to direct the author on the limitations of the article Designing Rental Offices with a Smart Building Approach in South Jakarta

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