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DESIGN OF RENTAL OFFICE BUILDINGS WITH BIOPHILIC ARCHITECTURE CONCEPT IN JAKARTA

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ABSTRACT
In the modern era, rapidly developing and sophisticated technology has made human activities easier, but also influences behavioral patterns that distance humans from nature. It is important to strengthen the relationship between humans and nature through Biophilic Architecture, especially in office buildings. Office buildings, with limited green open space and poor air circulation quality, are relevant for the application of this concept. Spending 90% of daily time indoors has an impact on human psychological health. This study examines the design of office buildings with a Biophilic Architecture approach to support employee health and comfort. Expected benefits include increased productivity, creativity, and physical and mental well-being of employees. This design is also expected to be an example for other office buildings and maintain environmental balance through sustainability and energy savings. The focus of the study includes elements that influence human behavior such as natural lighting, vegetation, and sensory elements that affect mood and concentration levels. This study aims to design an office building in West Jakarta with a Biophilic approach that is maximal, supports health, and is comfortable for occupants.
Keywords: Biophilic Architecture, Comfort, Health, Building, Rental Office.

DESAIN BANGUNAN KANTOR SEWA DENGAN KONSEP ARSITEKTUR BIOPHILIC DI JAKARTA

ABSTRAK
Di era modern, perkembangan teknologi yang pesat dan canggih telah memudahkan aktivitas manusia, namun juga mempengaruhi pola perilaku yang menjauhkan manusia dari alam. Penting untuk memperkuat kembali hubungan manusia dengan alam melalui Arsitektur Biophilic, terutama pada gedung perkantoran. Gedung perkantoran, yang memiliki ruang terbuka hijau terbatas dan kualitas sirkulasi udara yang buruk, relevan untuk penerapan konsep ini. Menghabiskan 90% waktu sehari di dalam ruangan berdampak pada kesehatan psikologis manusia. Penelitian ini mengkaji desain gedung perkantoran dengan pendekatan Arsitektur Biophilic untuk mendukung kesehatan dan kenyamanan karyawan. Manfaat yang diharapkan meliputi peningkatan produktivitas, kreativitas, serta kesehatan fisik dan mental karyawan. Desain ini juga diharapkan menjadi contoh bagi gedung perkantoran lain dan menjaga keseimbangan lingkungan melalui keberlanjutan dan penghematan energi. Fokus penelitian mencakup elemen yang mempengaruhi perilaku manusia seperti pencahayaan alami, vegetasi,

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dan elemen sensorik yang memengaruhi suasana hati dan tingkat konsentrasi. Penelitian ini bertujuan untuk merancang gedung kantor di Jakarta Barat dengan pendekatan biophilic yang maksimal, mendukung kesehatan, dan nyaman bagi penghuninya.
Kata kunci: arsitektur biophilic, kenyamanan, kesehatan, gedung, sewa kantor.

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INTRODUCTION

In this modern era, technology is developing very rapidly and increasingly sophisticated and provides convenience for humans in their activities, but apart from the existing benefits, technology is also able to change behavior patterns where humans slowly move away from natural problems or live with nature. It is a special concern how humans can re-strengthen their relationship with nature, especially through Biophilic Architecture in office buildings. Office buildings are one of the buildings that are quite relevant to apply the concept of Biophilic Architecture. In some conditions, the office environment has limited green open space such as a low number of vegetation and trees, so it often causes the quality of air circulation in the office environment to be poor and limited. Therefore, office buildings with this Biophilic Concept can be a solution to overcome these problems.

Modern life forces humans to spend almost 90% of their daily time indoors due to technological advances that support effective and efficient activities, such as work, study, and healthcare. This reduces psychological comfort due to a reduced direct connection with nature. The architectural design of office buildings with the Biophilic Architecture concept approach is a very relevant topic to be researched. Physical and mental health is something that requires more attention, especially to office occupants, namely employees or employees. This design can provide significant benefits by stimulating employee productivity, increased creativity and innovation due to a comfortable and healthy environment. In addition, this design is expected to be an example and inspiration for the design of other office buildings in the surrounding environment. This design aims to create an office building that can not only provide benefits to users and the surrounding community, but can also maintain balance and harmony with the environment in the form of sustainability and energy saving. Even more than that, this design not only focuses on sustainability but seeks to combine a healthy lifestyle with a sustainable environment as the main goal.

RESEARCH METHODS

1. Data Collection Methods

The data used and analyzed in this design are secondary data. Secondary data is data that is not collected directly by researchers, but obtained from other sources such as literature or indirect sources. The way this data is collected is by collecting information from various references. Here are some types of data to look for:

1. Condition of the area or area
2. Land area or site
3. Boundaries with surrounding buildings
4. Information about climate, soil shape, wind direction, solar movement, and other related matters
5. Plants or vegetation present in the area

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6. Water or drainage system
7. Transportation system

2. Design Conception Method

In this section, the design concept is as explained below.

1) Site Concept
   a) Accessibility
      It discusses how the area can be reached and connected to key infrastructure such as highways, public transportation, and other facilities.
   b) Achievement and Circulation Analysis
      This section is about designing how people move within the area, from the entrance, to the walkway, to the parking lot and exit.
   c) Site Analysis
      In the process of this analysis, the aim is to find out about the physical and topographic characteristics of the site, such as soil contour, sun orientation, vegetation, and other environmental factors.
   d) Analysis of Existing Site Conditions
      The section focuses on conducting research on the existing condition of the site, including existing infrastructure, existing buildings, and social and economic factors that affect the site.
2) Building Concept
   As for the concept of this building, it is explained as follows:
   a) Spatial Program Analysis
      In this process, the need for space and functions needed in the building is identified, based on the purpose of use of the building.
   b) Building Mass Composition Analysis
      This analysis is an evaluation of the shape and size of the building, including the height, proportion, and mass distribution.
   c) Building View and Orientation Analysis
      In this case, it is the process of analyzing the scenery or view that can be seen from the building, as well as the orientation of the building to the sun and wind.
   d) Building Appearance/ Architecture Analysis
      This includes related to the exterior design planning of the building, including the selection of materials, colors, textures, and other architectural elements.

3. Pre-Design Method

The pre-design concept consists of:

1) Design Alternatives 1
   - Site Alternatives 1
     Alternative site 1 is the activity of making an existing site area design and used in designing buildings.
   - Building Concept 1
     Building concept 1 is an activity of making building designs used in the design of existing sites.
2) Design Alternatives 2

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- Site Alternatives 2
  Alternative site 2 is the activity of making site designs with a different approach. In this alternative, there are two main gates located at the front and side of the site, to facilitate better accessibility.
- Building Concept 2
  Building Alternative 2 is the activity of making building designs with a Biophilic architectural approach. In this alternative, the building is designed with many natural elements such as green walls and a water pool inside the main space.
- Selected Alternatives
  The selected alternative design has been analyzed based on various criteria, including the efficiency of the site concept and the optimization of the building's mass shape.

Based on the analysis of the alternative selection of sites and buildings above which is intended as the design of the Rental Office Building as a form of consideration in choosing the location and form of the building, it hereby uses the assessment standards in the table below:

Table 1 Site Assessment Criteria
Source: personal documentation

Category	Conditions	Site 1	Site 2
Accessibility	a) Ease of access b) Doesn't cause queues		
Shadow of the Sun	a) One-way b) Not in the same direction c) Diagonal		
Circulation	a) One-way b) Two-Way c) Cross Circulation d) Dead end		
Noise	a) Noisy b) Quite Noisy c) Noiseless		
Orientation and View	a) Against the Road b) An outward view c) An inside look		

4. Design Development Methods

The design development stage is the process of choosing which design to use, as well as analyzing the advantages and disadvantages of each design choice. After deciding on the best design for the location and building, the next step is to create a more detailed design. First of all, an analysis is carried out regarding the selected site and building, including a study of the shape of the soil, natural conditions, and space needs. Creating

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a design concept includes initial drawings, determining the shape and arrangement of the building, and incorporating open areas and garden elements. The principle of sustainability is applied by using energy-saving strategies, environmentally friendly materials, and efficient water management systems.

RESULTS AND DISCUSSION

1. Research Data

a. Secondary Data

The following is for the data of local regulations that will be a mess in the design of the Traditional Market with the concept

1. Location Data
   Location : Jl. Letjen S. Parman No. 61 RT.01/RW.04, Slipi
   Broad : 9200 m2
   District : Palmerah
   City : West Jakarta
   Orientation :South
2. Location Privileges
   a. Close to main road access, toll road from 2 directions
   b. Close to commercial areas as well as residential areas
   c. Being in an office area with crowded activity conditions
3. Regulation
   a. Building Base Coefficient (KDB) : 40%
   b. Building Area Coefficient (KLB) : 2-4
   c. Green Area Coefficient (KDH) : 30%
   d. Open Area and circulation : 20%
   e. Facilities / Miscellaneous : 10%

2. Pre-Design

a. Design Alternatives 1

1. Site Concept
   The alternative site design 1 that will be chosen in this pre-design is as follows:

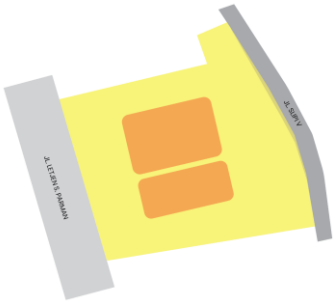

Figure 1 Selected Alternatives
Source: personal documentation

The selection of the tread layout as shown in the image above prioritizes efficiency in the circulation flow within the tread and overall accessibility, both for pedestrians, cyclists, and motor vehicle users, starting from entering the tread area, entering the building area to returning to the treadmill, thus providing convenience and comfort in carrying out various activities.

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2. Building Concept

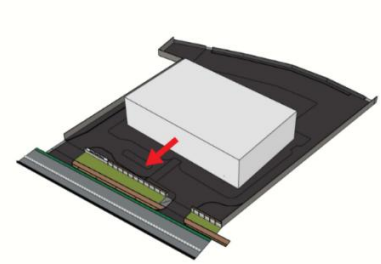

Figure 2 Building Concept 1
Source: personal documentation

b. Design Alternatives 2

1. Site Concept
   The alternative site design 2 that will be chosen in this pre-design is as follows:

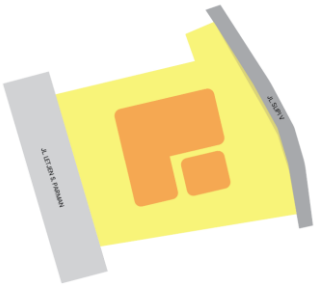

Figure 3 Alternative Site 2
Source: personal documentation

2. Building Concept

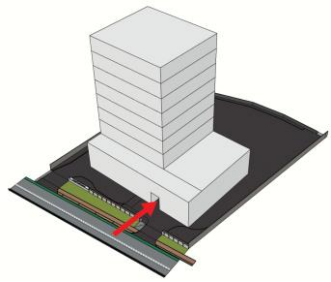

Figure 4 Building Concept 2
Source: personal documentation

c. Selected Design Alternatives

The selected alternative design has been considered from various aspects of assessment, namely a more effective site concept and a building concept that maximizes the form of building period composition.

Category	Conditions	Site 1	Site 2

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Accessibility	d) Ease of access e) Doesn't cause queues	9 7	6 5
Shadow of the Sun	c) One-way d) Not in the same direction f) Diagonal	 7	 5
Circulation	e) One-way f) Two-Way g) Cross Circulation h) Dead end	8	 6
Noise	d) Noisy e) Quite Noisy f) Noiseless	 8	 6
Orientation and View	d) Against the Road e) An outward view f) An inside look	6 7 8	7 6 7

3. Design Development

The following is the design development from the selected design alternatives:

a. Site Concept

Figure 5 Accessibility
Source: personal documentation

b. Facade Concept

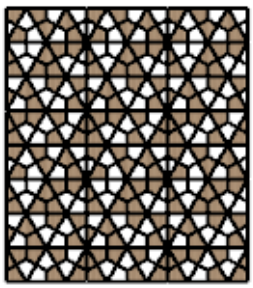

Figure 6 Secondary Skin

In addition to using glass walls on all sides to maximize incoming light, buildings also use an additional layer called a secondary skin. The goal is to reduce the power of light so that people inside remain comfortable during activities and are not disturbed by direct sunlight that is too strong. Nonetheless, the room still gets enough light to meet its lighting needs.

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c. Investment Analysis

1. Project Description

Location :Jakarta
Land : 9,200 m^2
Building Size :

- Basement Floor 1 & 2) : 60 m x 50 m (2 floors)
- Ground Floor and 1st Floor (Commercial): 60 m x 50 m (2 floors)
- 2nd-13th Floor (Office) : 37 m x 40 m (11 floors)

Total Building Area: 22,280 m^2
Building Function :

- 4-wheeled vehicle parking
- Commercial (Cafe, Restaurant, R. Conference, General Meeting): 6,000 m^2
- Office for rent (office): 16,280 m^2

2. Estimated Construction Costs

NO	COMPONENT	AREA (m2)	COST / m2 (Rp.)	SUB TOTAL (Rp.)
1	Bearings	6.000	7.000.000	42.000.000.000
2	Commercial Flooring	6.000	12.000.000	72.000.000.000
3	Office Flooring	16.820	10.000.000	162.800.000.000
TOTAL				**276.800.000.000**
4	Landscape & Parking Area	9.200	3.000.000	27.600.000.000
5	6 unit elevator		2,500,000,000/unit	15.000.000.000
6	HVAC System (10% Construction)			27.680.000.000
7	Electrical & Plumbing (8%)			22.144.000.000
8	Design & Planning (3%)			8.304.000.000
9	Permits & Administration (2%)			5.536.000.000
10	Project Supervision (3%)			8.304.000.000
11	Contingency (10%)			22.144.000.000
TOTAL CONSTRUCTION				**413.512.000.000**

3. Estimated Rental Cost

Based on the latest report from Colliers Indonesia, office rental prices in Jakarta in the fourth quarter of 2024 show a positive trend. For class A (premium) office buildings, the rental price ranges from Rp. 400,000 to Rp. 600,000 per square meter per month. Meanwhile, for class B (medium) buildings, the rental price is in the range of Rp. 250,000 to Rp. 400,000 per square meter per month. It should be noted that rental prices may vary depending on location, amenities, and current market conditions.

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In addition, a report from Jones Lang LaSalle Incorporated (JLL) Indonesia stated that the rental price of class A buildings, especially those with premium status, increased by 0.7% in the third quarter of 2024. Nevertheless, the office occupancy rate in the Jakarta CBD area remains stable at 70%.

The average market price in Jakarta for office buildings based on building class, namely:

a. Class A (Premium) Building:
   - Office floor: Rp. 400,000 – Rp. 600,000/m^2 per month
   - Commercial floor (restaurant/café): Rp. 600,000 – Rp. 1,000,000 /m^2 per month
b. Class B (Intermediate) Building:
   - Office floor: Rp. 250,000 – Rp. 400,000/m^2 per month
   - Commercial flooring: Rp. 400,000 – Rp. 600,000/m^2 per month
c. Class C Building (Economy):
   - Office floor: Rp. 150,000 – Rp. 250,000/m^2 per month
   - Commercial flooring: Rp. 250,000 – Rp. 400,000/m^2 per month

4. Investment Value Analysis

The following is an investment calculation assuming construction and the value of the rental price for class A or premium buildings according to the reference market price of the average office building in Jakarta.

a. Rental Income
   - Average office rent: Rp. 400,000/m^2/month.
   - Office floor revenue (16,280 m^2): IDR 78,144 billion/year.
b. Commercial Revenue
   - Estimated commercial floor rent: Rp. 600,000/m^2/month.
   - Commercial floor revenue (6,000 m^2): IDR 43.2 billion/year.

The total income from rent per year is Rp. 121,344,000,000

c. Estimated ROI (Return of Investment)

According to Brigham & Ehrhardt (2021), Return on Investment (ROI) is calculated by the following formula:

$$\frac{\text{Pendapatan Tahunan}}{\text{Total Biaya Konstruksi}} \times 100\%$$

$$\frac{121.344.000.000}{413.512.000.000} \times 100\% = 29{,}3\%$$

d. Payback Period

Meanwhile, according to Ross, Westerfield, & Jaffe (2019), the Payback Period is calculated by:

$$\text{Payback Periode} = \frac{\text{Total Biaya Investasi}}{\text{Pendapatan Tahunan}} \times 100\%$$

$$\text{Payback Periode} = \frac{413.512.000.000}{121.344.000.000} = 3{,}4 \text{ Tahun}$$

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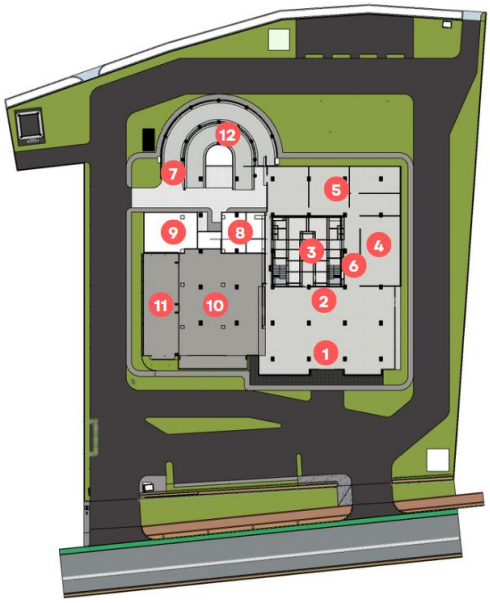
5. Conclusion of Investment Analysis
   - Total Estimated Construction Investment Cost: Rp. 413.512 billion.
   - Annual Revenue: Rp. 121.344 billion.
   - Payback Period: 3.4 years.
   - Annual ROI: 29.3%.

This project has attractive potential with a relatively fast payback period and a fairly high ROI. For commercial property investments such as premium offices, an annual ROI of 8-12% is considered healthy and realistic according to Jones Lang LaSalle Incorporated (JLL) in a stable property market. Further feasibility studies need to be conducted to consider external factors such as market trends, competition, and occupancy rates.

d. Design Results

1. Site Plan
   The following is the layout of the site plan for the design of Rental Office Buildings with the development of Biophilic Architecture in Jakarta:



Information:

1. Waiting space / Lobby Area
2. Reception
3. Core of the building
4. R. Conference
5. R. Manager
6. Corridor
7. Access to Besmen
8. Storage
9. Kitchen
10. Cafe & Restaurant
11. Outdoor Dining Area

2. Plans
   - Basement Floor Plan 1 & 2

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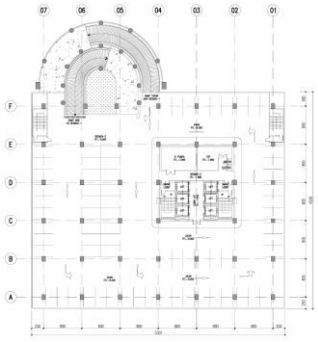
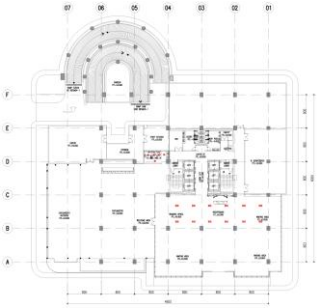
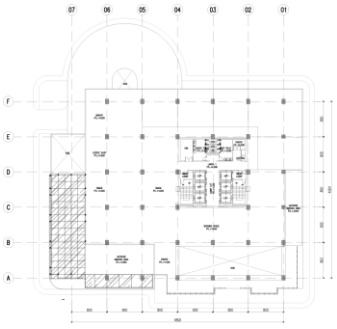


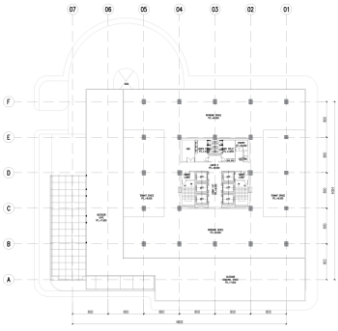
- Ground Floor Plan



- 1st Floor Plan



- 2nd Floor Plan



- 3rd & 4th Floor Plan

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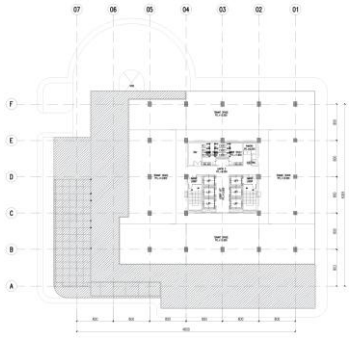
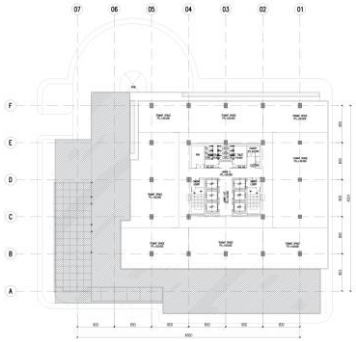
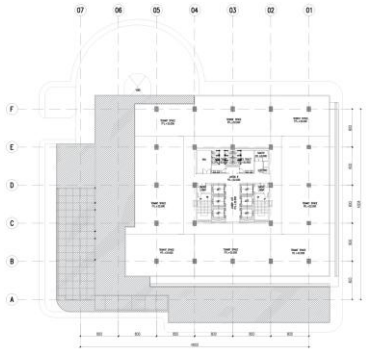


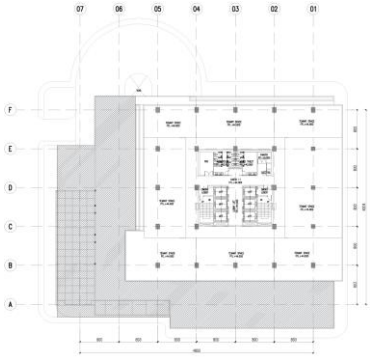
- 5-7 Floor Plan



- 8-10 Floor Plan



- 11th-13th Floor Plan



3. Appearances
   - Front View

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- Rear View

- Right View

- Left View

4. Piece
   - Piece 1

   - Piece 2

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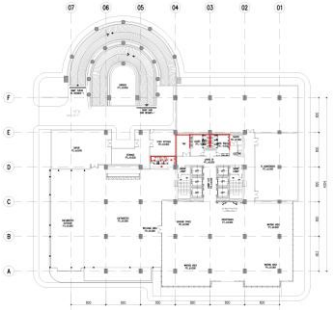
5. 3D Perspective
   - Perspective 1

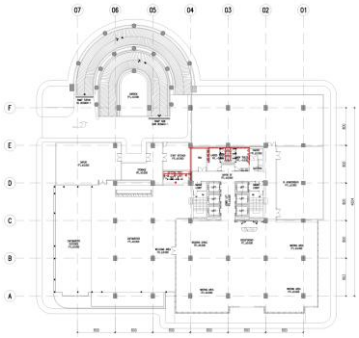
   - Perspective 2

e. Utility Concept

1) Clean Water Plan



2) Dirty Water Plans



3) Hydrant Plan

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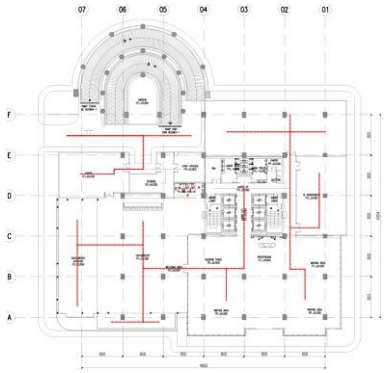

CONCLUSION

Based on the research that has been conducted, some conclusions that can be drawn are as follows:

1. The application of the concept of Biophilic Architecture in Office Buildings that highlight biophilic aspects can improve the quality of life of residents through natural lighting, vegetation, and sensory elements. The biophilic approach to office building design provides economic benefits by increasing tenant attractiveness while supporting environmental sustainability.
2. Providing Comfort in Rental Office Space. Designs that pay attention to site zoning, accessibility, and noise management succeed in creating a comfortable, healthy, and productive work environment.

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