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The Retention Pond Role in Shaping Thermal Comfort and the Effect of Ventilation at Universitas Katolik Musi Charitas, Palembang, Indonesia

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ABSTRACT

A retention pond is a body of water that holds water, primarily rainwater. In Palembang, there are 46 retention ponds located throughout various areas. One is located between Ida Bayumi University (IBA) and Musi Charitas Catholic University, approximately 10 meters from the Aloysius Building. This pond is a factor that influences comfort due to the moisture content in the air carried by the wind into the Aloysius Building through windows overlooking the pond. This study aims to determine the influence of the IBA retention pond on thermal comfort through natural ventilation (windows), which function as air inlets and outlets within the Aloysius Building. The method used was a descriptive quantitative approach, utilising Computational Fluid Dynamics (CFD) and CBE thermal comfort simulations, as well as simulation modelling using AutoCAD and CadAlyzer. Data collection utilised a thermometer for humidity and temperature measurements, as well as an anemometer for wind speed measurements. The analysis showed wind speeds ranging from 0 to 2.5 meters per second, with turbulence observed in several rooms. The comfort standard based on ASHRAE-55 shows that the room is warm with an average RH of 67.6% and a temperature of 28.9°C. To achieve optimal comfort, the corridor space requires large ventilation so that maximum air flow can reach the spaces on the left and right of the building, especially on the second and third floors. Therefore, there is a relationship between thermal comfort and water vapour in the air passing through the windows from the retention pond location to the Aloysius building.

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1. INTRODUCTION

Indonesia is a country that has a humid tropical climate. It is called so because the equator crosses its geographical location. The characteristics of a humid tropical climate are high air temperatures and relatively high air humidity. The average temperature is 26°C–27°C; during the day, it can reach 34°C. The relative humidity ranges from 70% to 90% [1]. Based on the processing of climate data at the South Sumatra Climatology Station, the average air temperature in February 2024 was 27.0°C. The lowest average temperature occurred on February 25, 2024, at 25.0°C, while the highest average temperature was recorded on February 22, 2024, at 24.9°C [2].

One of the contributing factors to the rise in temperature and humidity is the increase in water vapour in the air, as well as the reflection of sunlight on water surfaces. Palembang is nicknamed the "Water City" because it is situated on the Musi River and has most extensive wetlands in the region, which serve as water catchment areas for the Musi River. Every five years, Palembang experiences flooding caused by the overflow of the Musi River, which is exacerbated by high rainfall, resulting in severe flooding. One alternative to address this issue is the construction of retention ponds—reservoirs designed to store rainwater temporarily [3].

Retention ponds, also known as reservoirs, store rainwater for specified period to mitigate peak flooding in water bodies or rivers [4]. These retention ponds are designed to temporarily store rainwater, thereby reducing the severity of flood peaks in rivers or other water bodies [5]. Retention ponds significantly contribute to local climate change. From night until morning, they help cool the surrounding environment. However, during the daytime, they can increase humidity due to the evaporation of water caused by sunlight heating the pond's surface, which gradually contributes to rising air temperatures.

One such retention pond located near a residential area in Palembang is the Ida Bayumi (IBA) retention pond. It is named after its location in front of the Ida Bayumi University campus in Palembang. This pond is also adjacent to the Aloysius Building, which houses the Faculty of Teacher Training and Education at Musi Charitas Catholic University (UKMC). Naturally, this has a considerable impact on indoor thermal comfort through natural ventilation, as air carried by the wind passes over the surface of the retention pond.

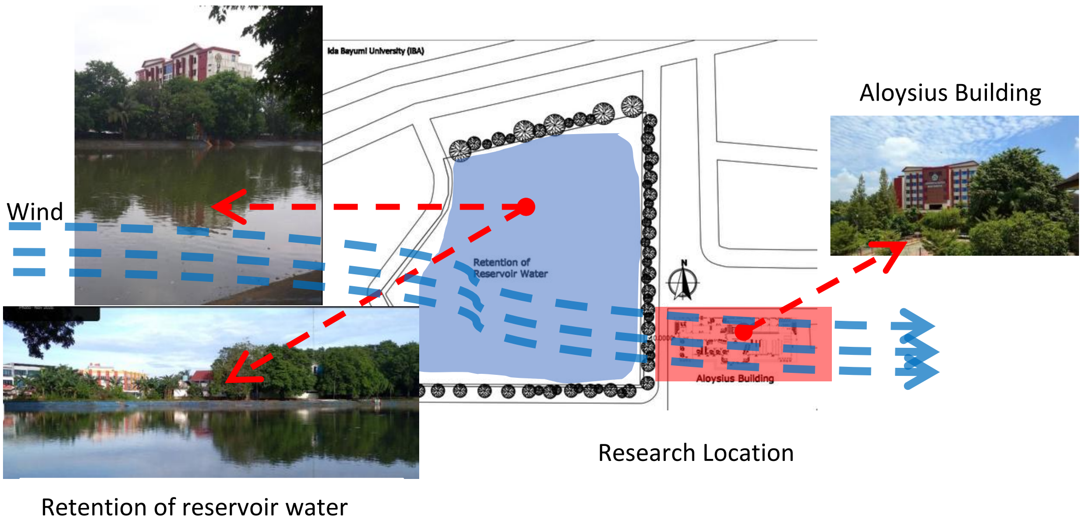


Figure 1. Location Map of Water Reservoirs and Aloysius UKMC Building
Source: [6]

The research was conducted using a quantitative-descriptive approach, supported by CFD (Computational Fluid Dynamics) computer simulations as a tool to evaluate the performance of window openings and to compare potential solutions. A HOBO Lite meter was used as a field instrument to measure and validate temperature and humidity levels. Interviews were conducted under existing conditions with space users—specifically, representatives of students and lecturers—to enhance the quantitative analysis and assess the level of thermal comfort within the room. To further clarify thermal comfort conditions, the CBE Thermal Comfort Tool was utilised.

1.1. Natural Ventilation

Natural ventilation is the process of air exchange that occurs naturally, without the use of mechanical equipment such as air conditioners (AC). Maintaining healthy and comfortable indoor air conditions is essential. Specific requirements must be met for adequate natural ventilation: the availability of clean outdoor air (free from odours, dust, and other pollutants), outdoor temperatures not exceeding 28°C, minimal obstruction from surrounding buildings that could block airflow, and a quiet environment free from excessive noise [7].

Natural ventilation can create a cool indoor atmosphere by generating airflow through openings [8]. This process occurs when air exchange takes place within a building through openings, such as windows or vents. Natural ventilation refers to ventilation that provides healthy and comfortable conditions without relying on additional energy [9]. Several factors influence the effectiveness of natural ventilation, including the building's location, the arrangement of openings, building orientation, and the presence of vegetation [10].

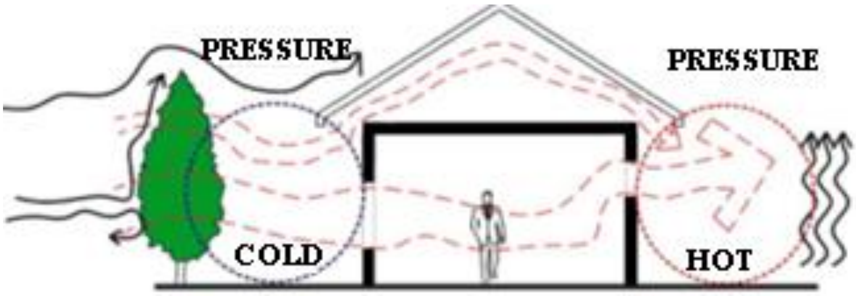


Figure 2. Natural ventilation in a building
Source: [3]

1.2. Cross Ventilation

Cross ventilation is the movement of air through a space connected by openings, characterised by positive and negative air pressure, which is influenced by external conditions [4]. Natural ventilation is essential for maintaining healthy air exchange within indoor spaces. Air exchange can be achieved through a cross-ventilation system, which involves placing openings that allow fresh air to enter the room and hot air to exit. These openings are positioned facing the incoming wind and opposite to the outgoing airflow [10].

Natural ventilation allows for passive airflow into the building, thereby creating a comfortable indoor environment [11]. It is an essential requirement for both buildings and their occupants. The use of natural ventilation and an effective ventilation system has a significant impact on indoor thermal comfort, promoting a healthier space by ensuring proper air movement within the room [8]. The following factors are related to natural ventilation [9]:

a. Lighting: The need for adequate lighting in a room is enhanced by natural light, which is facilitated by openings such as windows or vents.
b. Humidity: The amount of water vapour contained in the indoor air.
c. Opening size: The presence of openings allows air exchange and natural light to enter a space.

Based on the building mass layout, buildings designed with a checkerboard pattern promote more even airflow distribution [4].

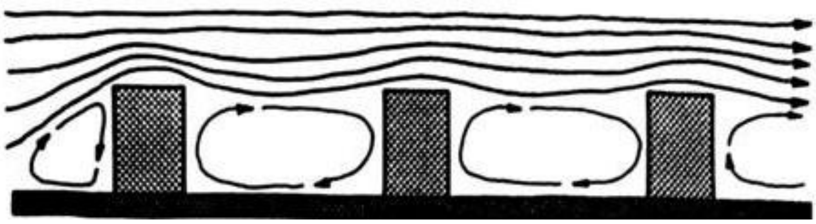


Figure 3. Natural ventilation in a building with a parallel pattern
Source: [4]

The parallel building mass pattern creates an unusual airflow jump pattern with pockets of turbulence [4]. Wind flows from one location to another, experiencing friction influenced by differences in humidity and pressure at each site. The wind follows its path until it encounters obstacles such as people, trees, shrubs, and buildings, after which it flows back along its original route [12].

The calm areas formed by the five main building shapes below reveal interesting facts about air movement in relation to building size as a barrier to wind flow. Vortices create deep, calm zones that are directly released as air moves through the structure's shape, with the level of structural obstruction determining the potential impact on internal airflow [4].

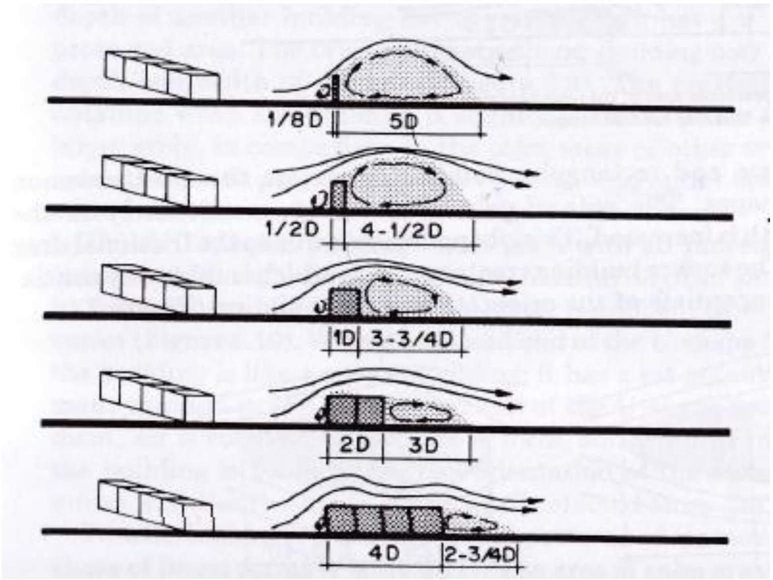


Figure 4. Thin masses, such as walls, provide a greater protected area from air movement than thicker masses of the same height and width
Source: [4]

1.3. Inlet and Outlet

Window design is influenced by factors such as location, placement, dimensions, and the type or model of the window chosen. Cross ventilation is more effective when vertical placement is also considered. Windows that function as inlets (air intakes) should be positioned at human height, between 60 cm and 150 cm (to accommodate both sitting and standing activities), allowing air to flow around occupants to provide the desired comfort. Meanwhile, windows that function as outlets (air exhausts) should be placed higher to facilitate the easy removal of warm air from the room [5].

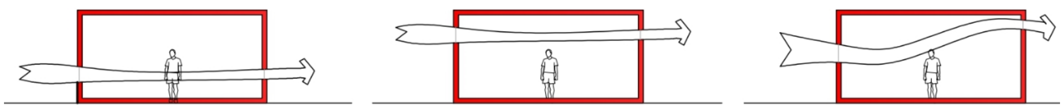


figure 5. Inlet and outlet positions in buildings
Source: [13]

The configuration and orientation of a building influence the pattern and speed of airflow before it reaches the building. Studies on buildings with varying configurations, orientations, heights, overhangs, roof shapes, and other architectural forms—examined without the influence of external environmental factors—can reveal numerous techniques available for controlling air movement.

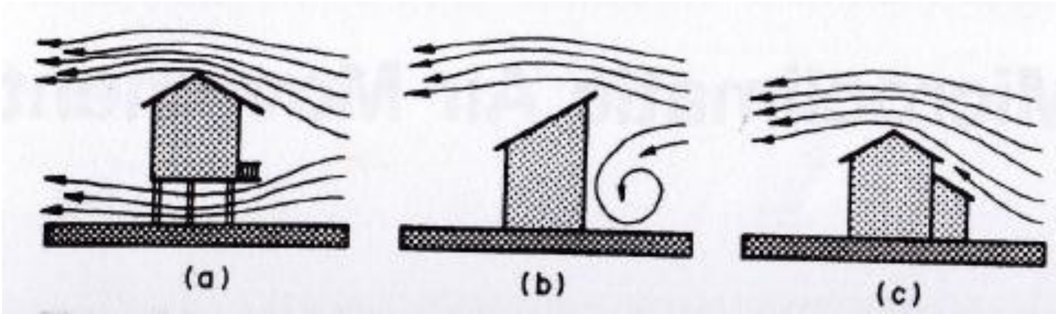


Figure 6. Wind flow pattern based on the shape of the house
Source: [4]

1.4. Window Shape

The type of window used as an air inlet determines the volume and distribution of airflow within a room. Windows should ideally direct the wind flow to remain horizontal or guide it upward. Double-hung, single-hung, and horizontal sliding windows do not direct air upward; instead, they allow airflow along a horizontal path. Therefore, these types should be positioned at a height where airflow is most needed. Casement, folding, and pivot windows can deflect airflow to the right or left, but not upward or downward. As such, these types should also be placed at a height that aligns with the area where airflow is required [5].

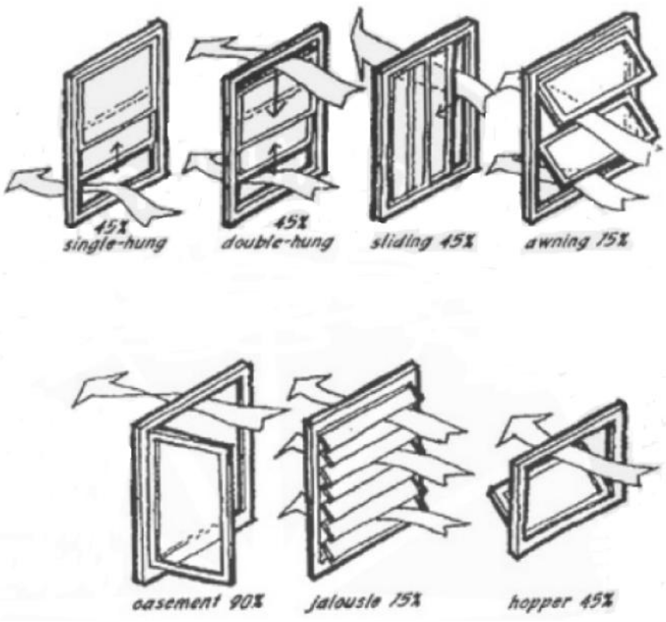


Figure 7. Different window designs and their ventilation capabilities
Source: [13]

1.5. Thermal Comfort

Thermal comfort refers to a condition state of satisfaction with the thermal environment and is typically assessed subjectively [14]. It refers to the temperature conditions perceived by humans and is influenced by the surrounding environment and objects [15]. Thermal comfort is affected by several factors, including air temperature, humidity, wind speed, and air movement [16].

According to the thermal comfort criteria established by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers), comfort is influenced by indoor air temperature, indoor humidity, and air velocity. The acceptable thermal comfort range includes an effective temperature between 23°C and 27°C, an air velocity of 0.5–1.5 m/s, and a relative humidity of 50–60% [5].

Thermal comfort can be measured using a unit called effective temperature (ET). Effective temperature (Table 1) is defined as an environmental index that combines air temperature and humidity into a single index. This means that at a given effective temperature, a person's thermal response is the same, even if the air temperature and humidity differ—provided that air velocity remains constant (SNI 03-6572-2001) [17].

Table 1. Effective Temperature

DBT (°C)	Met	Clo	RH (%)	Maximum Wind (m/s)	Minimum Wind (m/s)
21	1	0.9	40	0.1	-
21	1	0.9	60	0.1	-
21	1	0.9	80	0.1	-
24	1	0.9	40	0.1	0.1
24	1	0.9	60	0.1	0.1
24	1	0.9	80	0.1	0.1
27	1	0.5	30	0.95	0.6
27	1	0.5	50	1.35	0.6
27	1	0.5	75	2.05	0.6

Source: [17]

1.6. Climate Study

The area of Palembang City is approximately 400.61 km² or 40,061 hectares. Geographically, Palembang City is located between 2°52' and 3°5' South Latitude and 104°37' and 104°52' East Longitude, with an average elevation of 8 meters above sea level. The topography of Palembang City is lowland with an average elevation of 4 to 12 meters above sea level. The city consists of 48% non-flooded plains, 15% seasonally flooded land, and 35% land that remains flooded throughout the year [8]. Based on its location, the selected building site experiences a humid tropical climate with high rainfall.

1.7. CFD Simulation

This study is limited to wind simulation, considering the turbulence effects that occur within the space. Wind speeds categorised as safe and comfortable range from 0.5 to 1.5 m/s, while the data used for the inlet velocity is 3 m/s (field data). The inlet openings are then configured optimally to approach the limit of the field data values. Due to the wide range of variations, the simulation is conducted using a three-dimensional model.

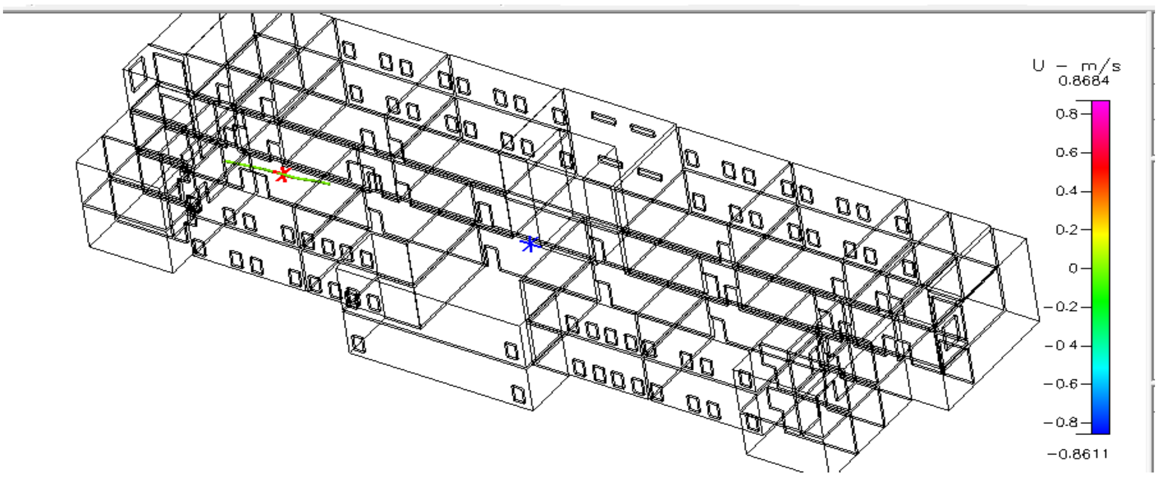
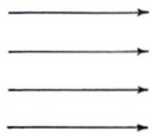
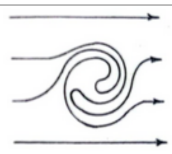


Figure 8. 3D Simulation Model
Source: [18]

Air movement refers to the movement of wind caused by differences in temperature or pressure. Wind speed impacts heat loss [19]. Wind speed and wind flow patterns are closely related in atmospheric dynamics. Four factors, namely influence wind or air flow patterns:

Table 2. Airflow Classification Based on Air Movement Characteristics. Source: [20]

No	Airflow Pattern	Characterised	Scheme
1	Laminar	parallel layers of air movement	
2	Turbulent	random and difficult to predict	
3	Separated	the flow continues parallel, but the wind speed decreases	
4	Eddy (rotational flow)	occurs when the wind reaches the surface layer of a building, causing air to accumulate and create positive pressure, then the wind/air is deflected to the sides of the building.	

2. RESEARCH METHOD

A quantitative descriptive method was employed in this study. During the research process, Computational Fluid Dynamics (CFD) simulations were used to determine the wind flow direction around the Aloysius building, and a HOBO meter was utilised to measure temperature and humidity. CFD is a branch of engineering science that applies numerical methods and computational algorithms to analyse and solve problems involving fluid flow. Currently, CFD simulation is one of the most commonly used research techniques for developing natural ventilation designs, as it is more cost-effective and allows for easy control of the boundary conditions of the study object [21]. CFD is a technique that utilises computers to collect data on how fluids flow under specific conditions and can also be used to predict fluid flow within a given system under certain conditions [22]. The CFD method involves computer simulations to calculate and predict fluid flow [23]. Therefore, this study utilised various CFD software programs, including CFD CADALYZER, CFD ACE, CFD VIEW, and Residual.

This research was conducted in the following stages:

a) Data Collection Stage: Observations were conducted at locations around the Ida Bayumi Retention Pond (IBA) and the Aloysius Building of Musi Charitas Catholic University (UKMC), measuring temperature and humidity, wind speed, and window openings.
b) Model Creation Stage: Drawing a 3D simulation model using AutoCAD, using window and door measurements as wind flow openings.
c) Simulation Model Import Stage: The 3D simulation model from AutoCAD was imported into CADalyzer in DXF format for mesh size processing, ensuring proper simulation performance by determining inlets and outlets.
d) Simulation Stage: Simulation using Computational Fluid Dynamics (CFD) ACE, incorporating data obtained from observations.

e) Analysis Stage: The analysis was conducted using a descriptive quantitative approach, based on the simulation results in CFD View, for a more in-depth analysis, and thermal comfort was assessed using CBE Thermal Comfort.
f) Conclusions

2.1 Primary Data and Secondary Data

Field data collection was conducted on the west side of the Aloysius Building at Musi Charitas Catholic University to provide a realistic picture of the thermal condition problem. Data were collected over three days, from 8:00 AM to 1:00 PM (Western Indonesian Time), because during this time the sun is hot, allowing water vapour to be blown by the wind. All collected data were compared to identify the worst-case scenario that best represents the related problem. The observed phenomenon revealed that the wind coming from the west side of the Aloysius Building was blocked by trees around the IBA reservoir. As a result, the wind speed was more concentrated on the second and third floors, while a 2-meter-high wall partially blocked the wind on the first floor. From the data obtained, the average wind speed was 3 m/s, and the average temperature data ranged from 28 °C to 33 °C. The location of the data collection is indicated in blue in the image below.

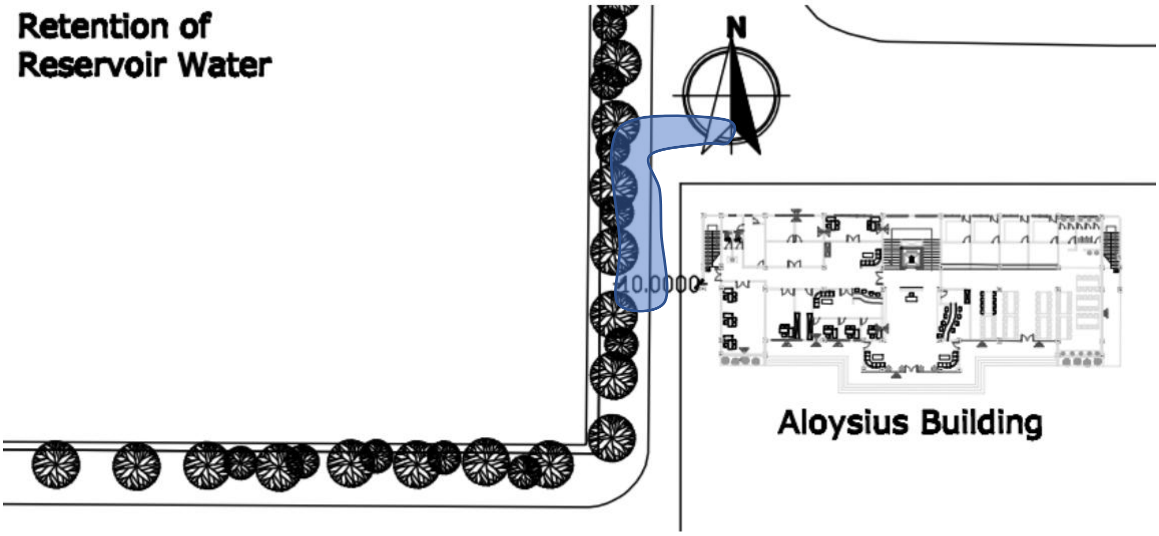


Figure 9. Data collection location on the Ground Floor Plan of the Aloysius Building, Musi Charitas Catholic University (UKMC)
Source: [24]

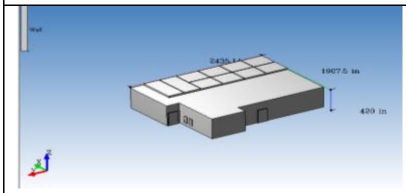
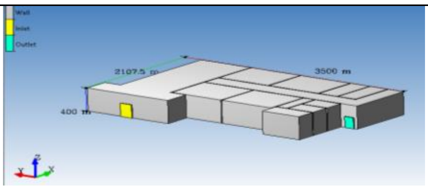
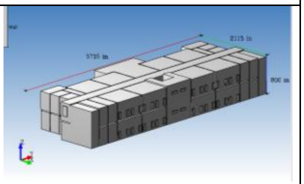
3. RESULTS AND DISCUSSION

The Aloysius UKMC Building is a new building, constructed in 2013. It is unique because it is located adjacent to a retention pond in the centre of Palembang. This condition naturally has several effects on the building, including air humidity and thermal comfort, due to water vapour carried by the wind to the Aloysius Building. Therefore, this study conducted a wind flow simulation using CFD software. The wind speed obtained from field measurements, which reached 3 m/s, was used as the simulation inlet data. The simulation results revealed the presence of turbulence within the space, with some spaces experiencing no wind speed (0 m/s).

3.1. Simulation

The simulation was conducted on only three floors out of the seven floors in the Aloysius building, as the building has three floors designated as office spaces and classrooms. The simulation process began by creating the simulation model using AutoCAD, followed by CFD-CADalyzer to define the mesh according to the wind flow direction within the room. The smaller the mesh size, the smoother the wind flow will be. The simulation was then exported to CFD-ACE, and the results were viewed in CFD-View, while also considering the residual results from the simulation graph. The simulation scenario assumed that the wind flow perpendicular to the building originates from the retention pond (west) and moves towards the Aloysius building. The simulation was divided into three objects, which were:

Table 3. Building Zones Selected for CFD Simulation

The cafeteria/ food corner	**The administration/ student services unit**	**The typical second and third floors**
		

Source: Author, 2025

In this simulation, 200 iterations were used with an iteration frequency of 25. To get maximum results, this can be shown by the residual graph produced when the simulation is complete.

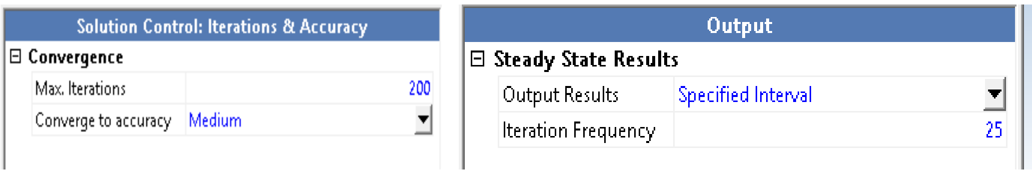


Figure 10. Iteration of ACE CFD simulation
Source: [26]

The setup of mesh properties is achieved by setting the maximum value to 0.03, the minimum value to 0.01, and the curvature reference value to 0.03, thereby obtaining a mesh suitable for running the simulation.

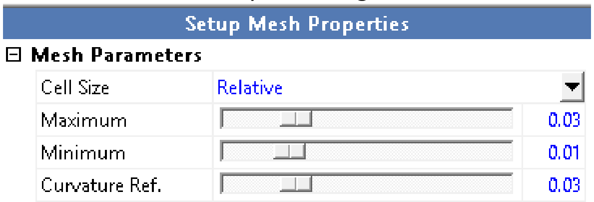


Figure 11. Setup mesh properties
Source: [26]

The results of mesh generation for the research objects in the lobby room and the administrative room are shown below.

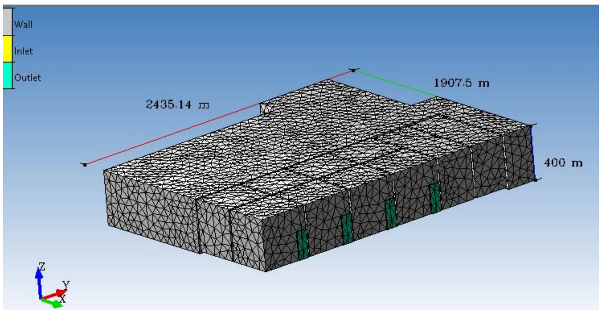


Figure 12. Result of the research object mesh generation
Source: [26]

3.2. Inlets

In CADAlyzer, the inlet (yellow colour) is determined as a source of wind flow in the building, in determining the inlet (Figure 10), the wind speed obtained in the field has been entered, with a value of 3 m/s. The inlet is determined based on the direction of the wind coming from the southwest, while the outlet is in the southeast direction.

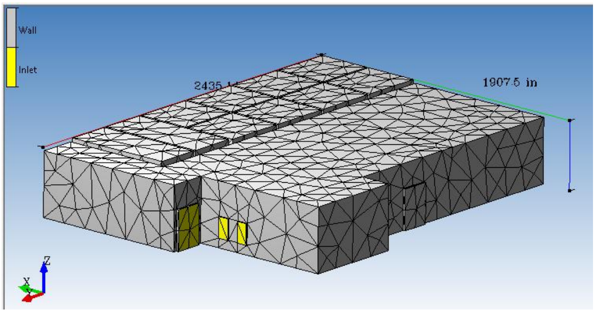


Figure 13. Determining the Inlet
Source: [27]

3.3. Outlets

Specifying an outlet in the simulation serves to direct the wind flow out of the building; in this case, the door is used as an outlet (Figure 11). Outlets can be doors, windows, and bouvenlights (BVs). In CFD-CADALYZER, they are shown in green colour.

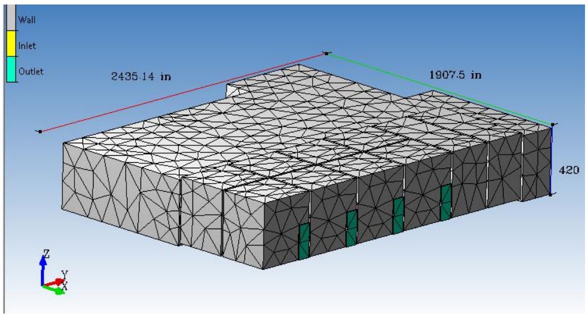


Figure 14. Determining the Outlet
Source: [27]

3.4. Simulation Results

The simulation results are clarified by displaying the results with CFD view in the horizontal cut direction, namely, in the direction of the wind flow.

a. The cafeteria/food corner

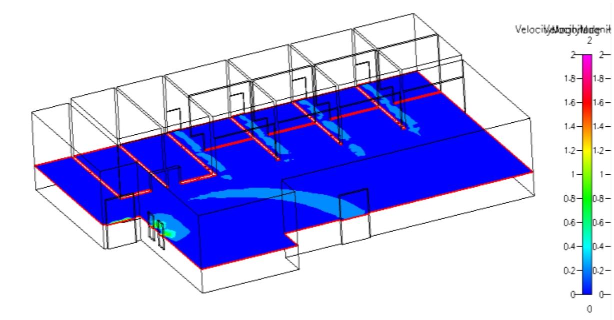


Figure 15. Air flow in the canteen room
Source: [24]

The object of this canteen is the location of the inlet in the door and window in the west direction, while the outlet is the front door of the canteen (south direction) and the canteen kitchen door (north direction). The results obtained show that the wind flows more from the window (west direction) towards the front door (South direction) and a small portion towards the kitchen door (north direction), with a height of 1.7 meters and a speed of 0.3 m/s.

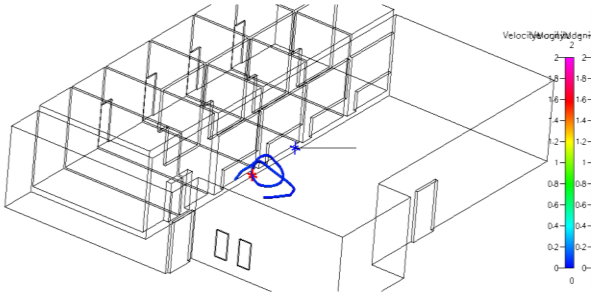


Figure 16. Turbulence of air flow in the canteen space
Source: [24]

When viewed using a CFD display of the air flow in the cafeteria area, turbulence was observed at a speed of approximately 0.15 m/s. This is due to the presence of several openings serving as outlets towards the rear of the building, which divert the air flow within the room.

b. Lobby and administration

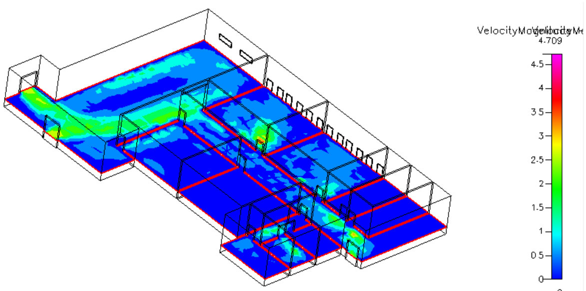


Figure 17. Air flow in the lobby and office space
Source: [25]

The inlet on this object is in the southwest direction, which is the most exposed to the wind. From the simulation, the wind flow pattern spreads to each room in the lobby and to other rooms, with speeds ranging from 1 to 2.6 m/s (shown in blue to yellow).

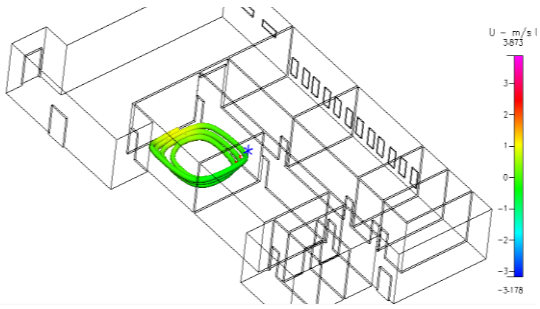


Figure 18. Turbulence of air flow in the office space
Source: [25]

There is a turbulence effect in some spaces, such as: the office of Admissions, Public Relations, and Cooperation (KAHK), where the velocity ranges from 0 to 0.5 m/s. This is the effect of the wind direction through the lobby.

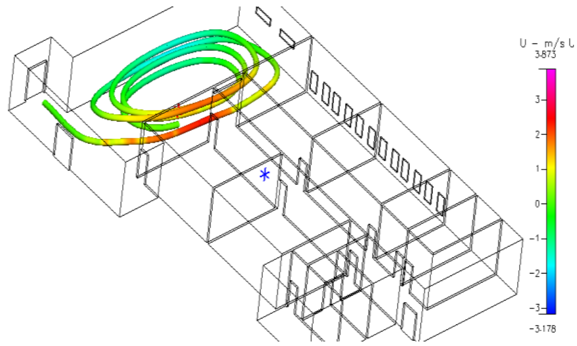


Figure 29. Turbulence of air flow in the lobby space
Source: [25]

The wind direction at the side lobby door (west direction) produces turbulence effects ranging from 0 to 1 m/s. This is due to the wind flow turning towards the north and back again towards the west and south. And this effect also causes turbulent impacts to occur in the KAHK room.

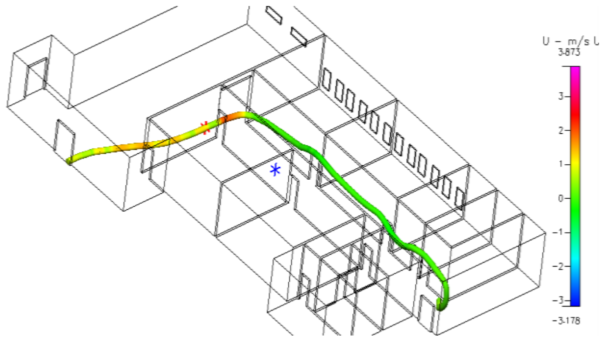


Figure 20. Air flow in the corridor space
Source: [25]

The wind flow at the front door of the lobby (south direction) was measured at a speed of 0 to 1.2 m/s, which directly led to the side door (east direction through the corridor).

c. 2nd floor

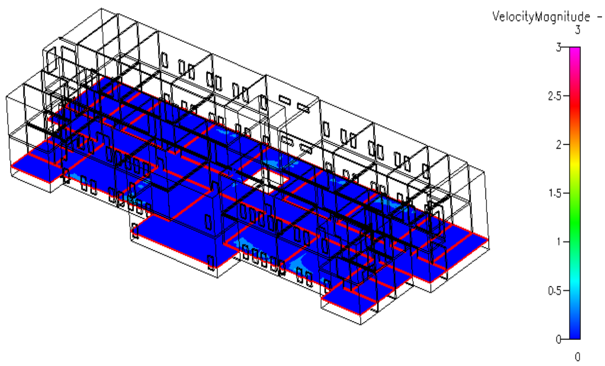


Figure 21. Air flow on the 2nd floor
Source: [25]

The simulation results on the second-floor show that the wind flow is only around the outlet window (north and south direction), which is around 0.5 m/sec; most of the second floor has no wind flow. This is because the inlet on the second floor does not exist. After all, the windows in the direction of the corridor are made dead windows.

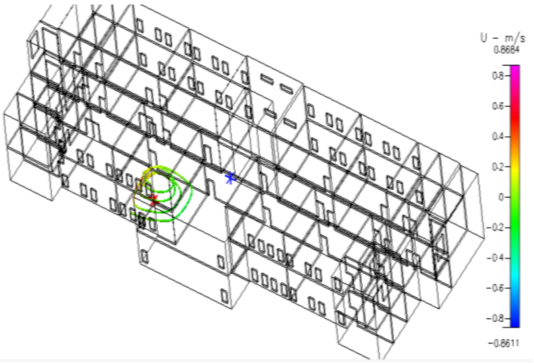


Figure 22. Turbulence of air flow on the 2nd floor
Source: [25]

In some chambers, turbulence effects occur at speeds ranging from 0 to 0.5 m/s. This can be observed in chambers adjacent to larger chambers that serve as outlets, causing the flow to pull outward and resulting in turbulence.

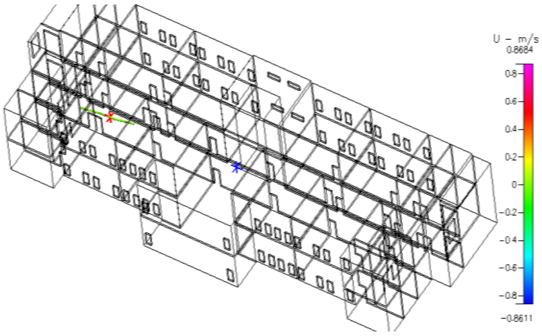


Figure 23. Air flow in the corridor
Source: [25]

On the simulation on the second floor, there is almost no wind flow; this is because the second floor has no wind flow inlet. Wind flow is found only in the window area in front (south direction).

d. 3rd floor

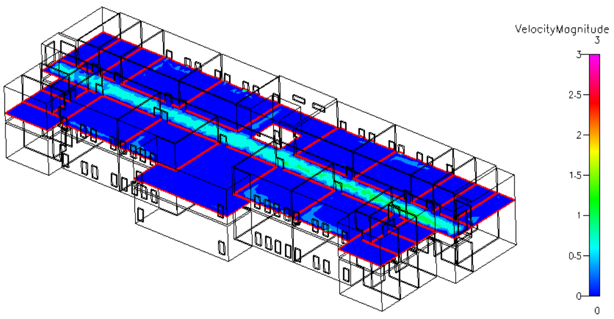


Figure 24. Air flow in the corridor on the 3rd floor
Source: [25]

On the 3rd floor inlet in the direction of the corridor with a height of about 14 meters from the ground floor. Shows that the wind flow is 0.5 to 1.3 m/s and a minimal wind flow in the classroom near the window that functions as an outlet.

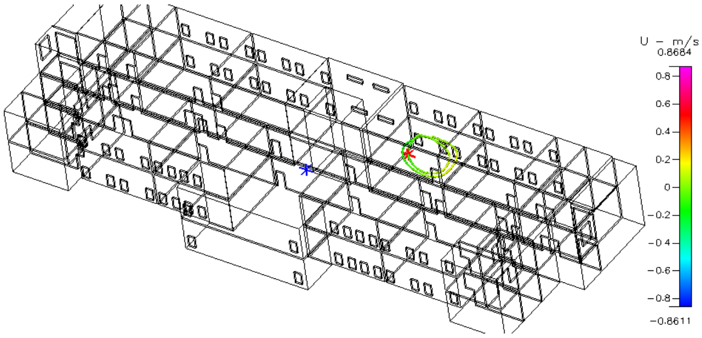


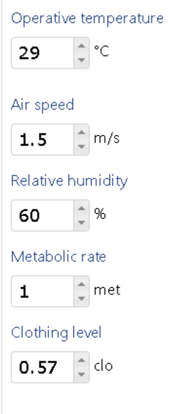
Figure 25. Turbulence of air flow in the classroom
Source: [25]

In several rooms on the 3rd floor, the turbulence effect occurs, especially in classrooms with wind speeds ranging from 0 to 0.5 m/s.

3.4. Humidity and temperature of Aloysius Building

Temperature and humidity measurements were conducted using an Onset HOBO meter. The use of this device involved setting a predetermined time interval for data collection. Data were collected during the morning and afternoon, as the Earth's temperature is still low in the morning. When the sun rises, it affects both temperature and humidity. The Aloysius building experiences fluctuations in temperature and humidity due to the wind direction originating from the retention pond. Temperature and humidity data were gathered from 08:00 to 13:00. The data showed that the recorded minimum and maximum temperatures were 28.7°C and 30.4°C, respectively. Similarly, the recorded minimum and maximum humidity levels were 59.9% and 69.1%. The average temperature was 28.9°C, with an average humidity level of 67.6%. The simulation using CBE Thermal Comfort employed a constant wind speed of 1.5 m/s, a metabolic rate of 1, and a clothing level of 0.57 clo, with an emphasis on PMV (Predicted Mean Vote), PPD (Predicted Percentage of Dissatisfied), and SET (Standard Effective Temperature).

Table 4. Simulation Results

<table>
<tr><th>Input Data</th><th>Simulation Results</th><th>Description</th></tr>
<tr>
<td>


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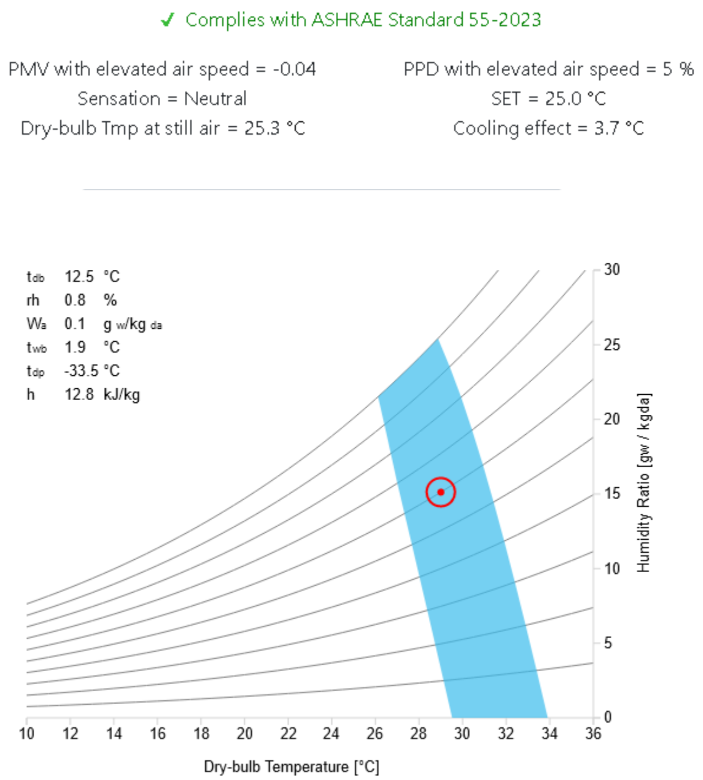
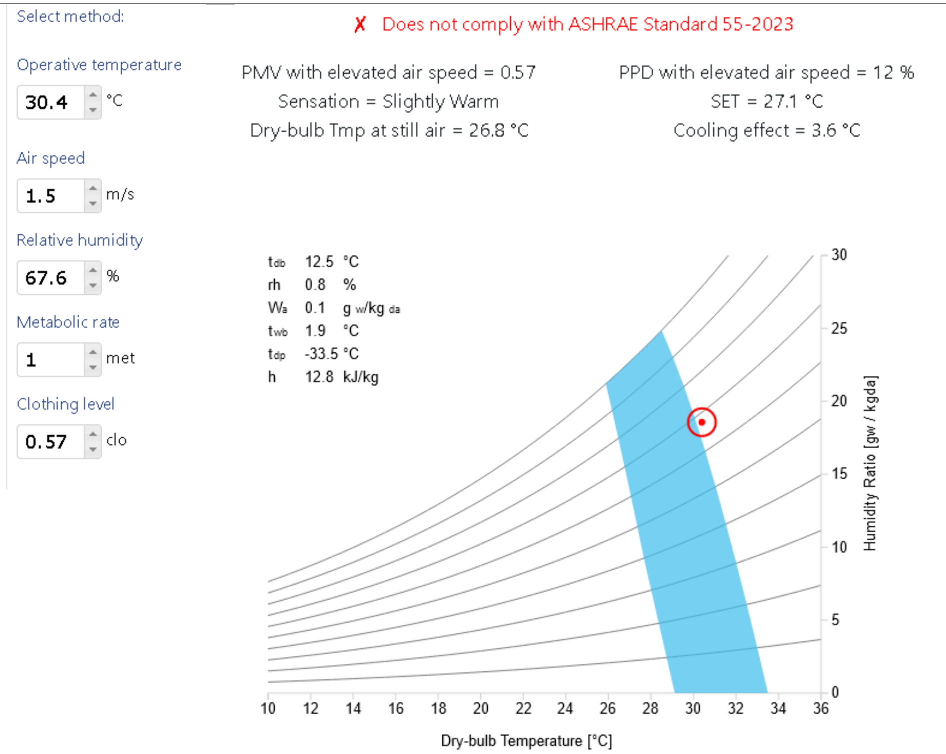
<td>


</td>
<td>

1. **PMV with elevated air speed = -0.04**
A value of -0.04 is very close to zero, which means the thermal sensation is neutral or comfortable.
2. **PPD with elevated air speed = 5%**
PPD (Predicted Percentage of Dissatisfied) estimates the percentage of people who are dissatisfied with the thermal condition, even when the majority are comfortable. A value of 5% is the lowest possible in the PMV/PPD model, indicating that 95% of people feel comfortable.
3. **Sensation = Neutral**
This is a direct interpretation of the PMV value. Since PMV = -0.04, the thermal sensation experienced is neutral—not too hot or cold.
4. **SET = 25.0°C**
SET (Standard Effective Temperature) is an equivalent temperature that combines the effects of air temperature, humidity, air velocity, and radiation. A value of 25.0 °C indicates that the body perceives an equivalent temperature of 25°C, which falls within the comfort range.
5. **Dry-bulb Temp at still air = 25.3°C**
This is the actual air temperature measured without any air movement (still air). "Dry-bulb" means the temperature measured without considering humidity.
6. **Cooling effect = 3.7°C**
This illustrates the cooling effect caused by air movement. With the presence of wind or a fan, the body feels as if the temperature has dropped by 3.7°C, even though the actual temperature is 25.3°C. This means air flow makes the body feel cooler.

Conclusion
The thermal environment indicated here is very comfortable. Although the air temperature is 25.3°C, due to air movement, the body feels like it is at 21.6°C (25.3 - 3.7), and the result remains within the comfort zone (PMV ≈ 0, PPD = 5%).
</td>
</tr>
</table>



1. **PMV with elevated air speed = 0.57**
   A PMV value of 0.57 indicates that most individuals will feel slightly warm.
2. **PPD with elevated air speed = 12%**
   A PPD value of 12% means that approximately 12 out of 100 people may still feel thermally uncomfortable (either too hot or too cold). However, most individuals will perceive the environment as comfortable.
3. **Sensation = Slightly Warm**
   Given that PMV = 0.57, the corresponding thermal sensation is classified as "slightly warm."
4. **SET = 27.1°C**
   The Standard Effective Temperature (SET) of 27.1 °C represents the perceived temperature by the human body when the combined effects of air temperature, humidity, air velocity, and radiation are considered.
5. **Dry-bulb Temp at still air = 26.8°C**
   A dry-bulb temperature of 26.8 °C suggests that the room is warm, though not excessively so.
6. **Cooling effect = 3.6°C**
   This value indicates that although the actual air temperature is 26.8°C, the presence of air movement (e.g., wind or fans) results in a perceived cooling effect of 3.6 °C. Thus, the subjective thermal experience corresponds to approximately 23.2 °C.

Conclusion:

The thermal environment in this condition has an actual air temperature of approximately 26.8 °C. However, due to the enhanced air movement, the human body perceives the temperature as around 23.2 °C. Most individuals feel slightly warm but still within the acceptable comfort range, with only about 12% of people experiencing thermal discomfort.

4. CONCLUSION

This study's scope is limited to floors 1 through 3 of the Aloysius Building, as only three of the seven floors are functional. The floor plan has a distinctive shape, featuring a central corridor that serves as a horizontal circulation space. In contrast, the central lobby serves as a vertical circulation space and natural ventilation. This research was conducted in several stages: data collection, creation of the simulation model, model import, simulation, and analysis of the simulation results. Simulation results obtained using Computational Fluid Dynamics (CFD) software indicate that wind speeds within the Aloysius Building range from 0 to 2.5 m/s.

On the first floor, in the administration area, wind flow patterns are more evenly distributed throughout the building, with speeds ranging from 1 to 2.5 m/s and turbulence of around 0.5 m/s. In the cafeteria area, wind speeds are approximately 0.5 m/s, with turbulence reaching 1.5 m/s. On the second floor, there is no wind flow within the building due to the lack of ventilation openings. On the third floor, the wind speed was recorded at 0.5 m/s, with turbulence also at 0.5 m/s. When analysed in relation to comfort standards using ASHRAE-55 CBE Thermal Comfort, the results showed a value of +1, indicating a tendency towards warmth. This is due to the water vapour content in the air carried by the wind towards the research object during the day, due to the close distance between the building and the retention pond.

In conclusion, a connection exists between the location of the retention pond and the thermal comfort of the, as well as the ventilation effect within the building. Enhanced air movement effectively offsets higher air temperatures by lowering the perceived temperature (physiological cooling) by approximately 3.6°C to 3.7°C. While 25.3°C provides ideal neutral comfort, increasing the temperature to 26.8°C remains within the acceptable comfort range, despite a slight increase in dissatisfaction from 5% to 12%.

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