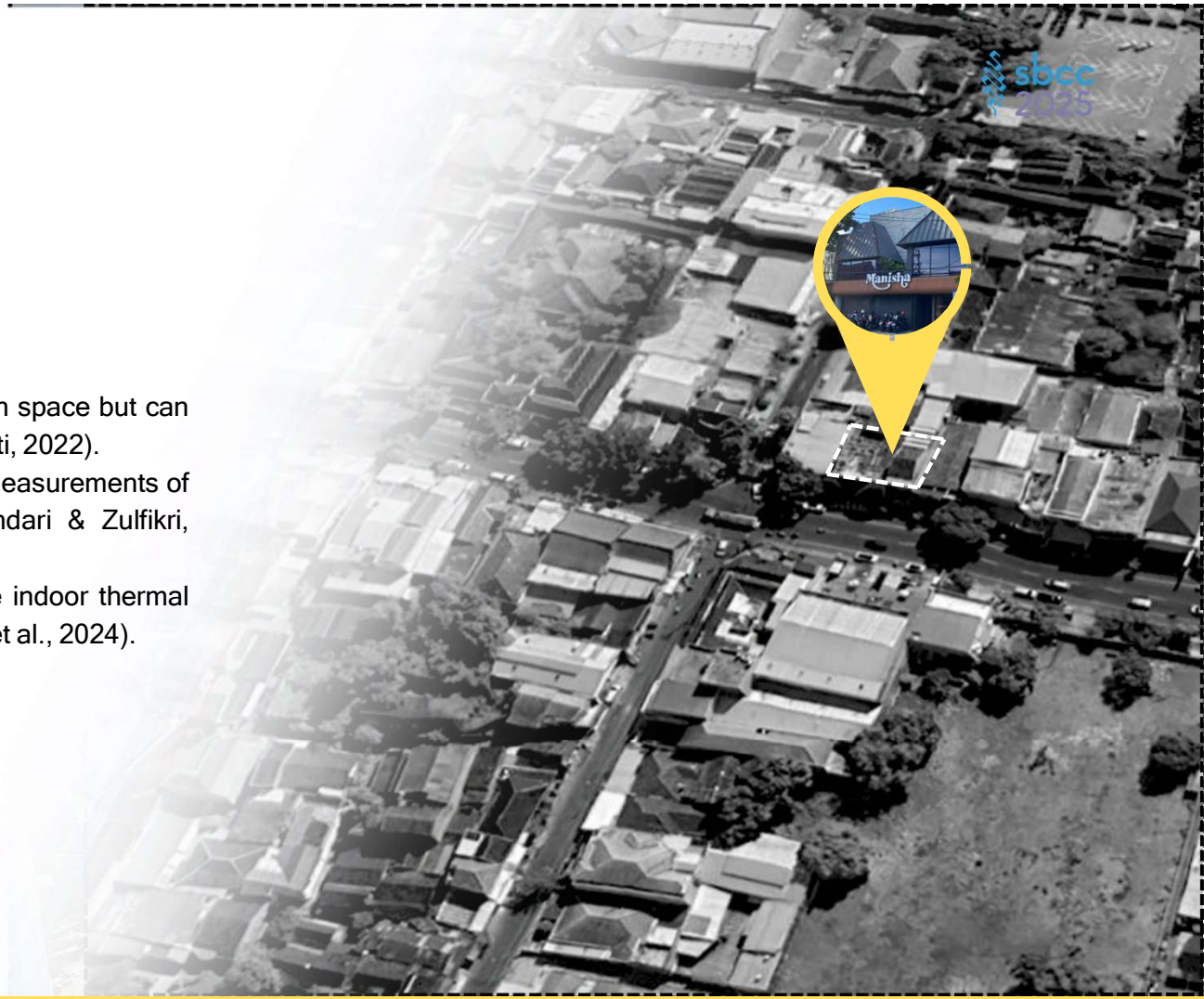
SEBELAS MARET UNIVERSITY

sbcc 2025

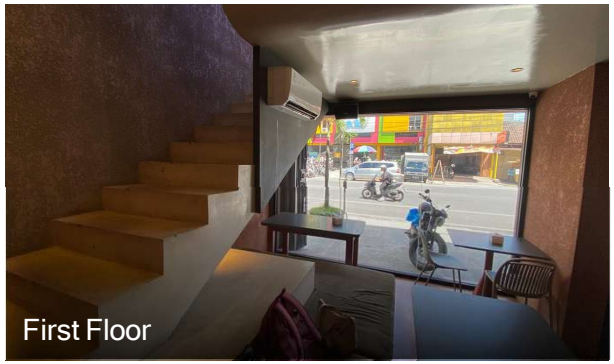
The Assessment of Mechanical Air Conditioning System Performance in A Cafe with Large Windows and Skylight

Introduction

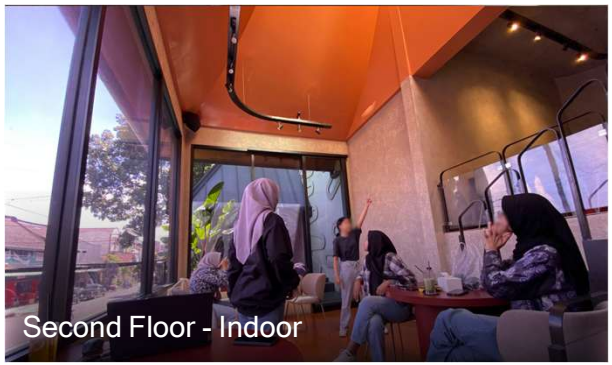
- Skylights and large windows create a bright, open space but can increase heat during high sunlight (Deqita & Sudarti, 2022).
- Study evaluates mechanical ventilation through measurements of temperature, humidity, and wind speed (Wulandari & Zulfikri, 2024).
- Building orientation and skylight design influence indoor thermal conditions (Duncan & Khamdevi, 2023; Khatimah et al., 2024).
- Thermal Comfort Standards (BSN, 2001):
  - Temperature: 22.8–27.1°C
  - Relative humidity: 40–60%
  - Airflow velocity: 0.15–0.25 m/s



Building Condition


First Floor


First Floor


Second Floor - Indoor


Second Floor - Smoking Room


Skylight

Method

- Measurements taken using an Environment Meter
- Parameters:
  - air temperature (°C)
  - relative humidity (%)
  - wind speed (m/s)
- Measurement schedule:
  - April 27, 2025 at 08:00, 12:00, 16:00, 20:00
- Space divided into 3 m² grids → 31 measurement points placed at each grid center
- Device held at head height in seated position to represent visitor comfort
- Additional outdoor measurements for comparison
- Results analyzed using thermal comfort standards (SNI 03-6572-2001)

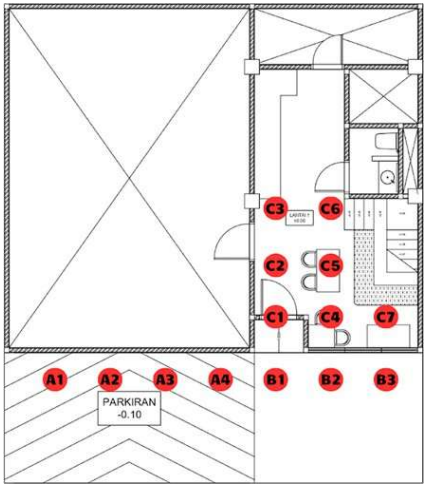
Result and Discussion

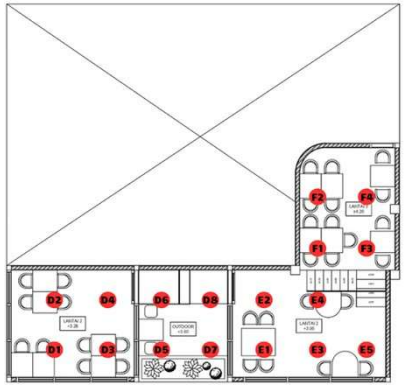
1. Morning

- Most temperature points fall within the ideal range →room feels cool and comfortable
- Only 1 point meets airflow standards →poor air circulation
- All RH values exceed the ideal limit →room feels damp and stuffy

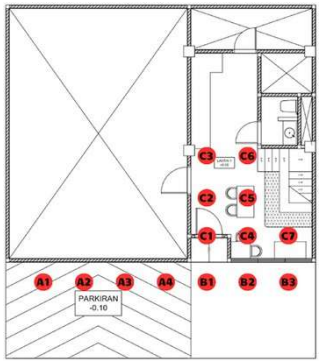
2. Afternoon

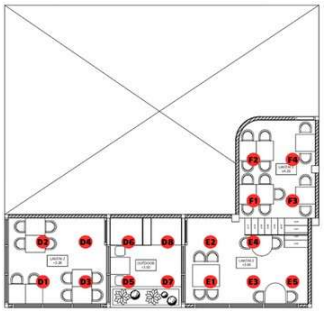
- Zones D & E show higher temperatures due to direct sunlight & skylights
- Point C meets the standard because its windows are shaded
- Area F is cooler than D & E since it is not exposed to direct sunlight
- Only 2 points meet wind-speed standards →limited air circulation
- >50% of points meet humidity standards, but Zone E meets none





Result and Discussion





3. Evening

- All temperature points exceed ideal standards →likely due to low sun angle allowing direct sunlight
- Only 2 points meet wind-speed standards →room feels hotter
- About 40% of points meet humidity standards
- Points D & E meet the standard due to proximity to doors/windows/exhaust fan
- Point F has no nearby ventilation →poor humidity
- Point C has a ventilation door, but low opening frequency → does not meet humidity standards

4. Night

- Temperature within a comfortable range
- Very low wind speed prevents air circulation →worsens humidity
- All RH measurements fall below ideal standards →room feels damp, stuffy, and less cool
- Likely caused by inadequate ventilation and poor air movement

References

Badan Standardisasi Nasional. (2001). SNI 03-6572-2001 Tata cara perancangan sistem ventilasi dan pengkondisian udara pada bangunan gedung.

Deqita, A. D., & Sudarti. (2022). Analisis intensitas radiasi matahari dan peningkatan suhu lingkungan. *Jurnal Pendidikan Fisika Dan Sains (JPFS),* 5(2), 76-82. https://doi.org/10.52188/jpfs.v5i2.237

Duncan, C., & Khamdevi, M. (2023). Analisis kenyamanan termal tropis pada bangunan coffee shop Tanatap Ampera. *Aksen : Journal of Design and Creative Industry*, 8(1), 13-26. https://doi.org/10.37715/aksen.v8i1.4071

Khatimah, H., Irzaidi, & Zahriah. (2024). Evaluasi kenyamanan termal perpustakaan wilayah Provinsi Aceh. *Jurnal Ilmiah Mahasiswa Arsitektur Dan Perencanaan*, 8(3), 63-85.

Wulandari, R., & Zulfikri. (2024). Analisa penghawaan dan pencahayaan terhadap kenyamanan termal pada Rindang Cafe Palembang. *TekstuReka*, 2(2).

Thank You