THE DIFFERENT AIR TEMPERATURE IN THE SHADOWED AND UNSHADOWED CONDITION
Case Study: Ci-Walk, Old Town, Semarang.

Akbar Rahman [1)]

Abstract

An experimental study has been the simulation of shadowing pattern of buildings line attributed to the comfort of pedestrian ways with the case study on ci-walk, old town Semarang. Since the pavement been made, there were only few pedestrian make use of it. These circumstances rises an indication that this pedestrian ways was not comfortable enough for the pedestrian due directly into sun radiation. It was believed that any barrier causing the sun radiation to indirectly hit the body would give some comfort for the pedestrian. This direct sun's radiation barrier would cause some shadow patterns, where on the open space this pattern could be produced from surrounding buildings line. The result was, The unshadowed and shadowed air temperature give significant differences to the effective temperature value achieved. The most uncomfortable effective temperature was one that not shadowed by the building on ci-walk pedestrian ways, old town on Semarang.

Keyword: shadowing, comfort, pedestrian.

INTRODUCTION

Based on its geography, Indonesia located on 6° parallel north to 11° southern latitude, where this circumstances make Indonesia to have classified as the humid tropical climate character, with the high intensity of the sun radiation, relatively high temperature of air, high air humidity and rainfall, and relatively cloudy sky (Lippsmeier, 1994). This condition would exist the whole year, which effect the micro environment. According to Satwiko, 2004, in order to control the rate of environmental temperature increment it is necessary to pay attention to; the duration of sun radiation, the intensity of sun radiation, and the angle of sun radiation.

One of the elements of urban design are pedestrian ways. This track is a sub system linkage of the street network in a city, and he circulation track used by the people in order to make their movement (Speiregen, 1965). This track is also important as the element of design, in order to connect the activitis on it's location. Any activity in pedestrian ways affected by the increment of environment temperature, thus the connectivity between the buildings and pedestrian ways become the key of architecture solution in urban design (Sucher, 1995). This track would play the role to create the comfortable environment.

The pedestrian ways in the open space of the city marked by the building line on the side of the circulation line, and at the end of circulation there's a pole as the magnet that became the public path (Rubenstain, 1978). As the public track, this pedestrian ways must have the principle of urban design, like, visual interest, clarity and convenience, or the amenity of comfort (Shirvani, 1985). This principle of comfort is the main thing that needs to be considered in order to support any emergence activity, both qualitatively and quantitatively. This comfort mostly focused on the quality of the city environment equipped by the street furniture, protection from the weather and dazzling (Shirvani, 1985). Weather and dazzling or the intensity of sun radiation, effect the thermal comfort of the pedestrian. This pedestrian ways as the open space is important to the environmental temperature decrement on the day.

[1)] Dosen Tetap Jurusan Arsitektur Universitas Lambung Mangkurat

The shadowing is one of the part that support the environmental temperature decrement in the open space, by taking advantages of the buildings and trees shadowing pattern on the pedestrian ways, thus the pedestrian would make comfortable to walk or do some activity on the day.
The pedestrian ways at Ci-walk, Old town as the open space is highly need to create comfortable environmental temperature on the day. The excessive sun radiation would effect the surface and the air temperature on that pedestrian ways.

RESEARCH METHOD

Research Location

In Semarang there are pedestrian ways, around Tawang Polder well known as the Ci-Walk area of Semarang City. This Ci-walk start from Merak street, the area of old town on the south of Tawang Polder, to the cross street of Cendrawasih (fig.1). This ci-walk is 400 meters hight and categorized as unroofed pedestrian ways plaza. This condition cause direct sunlight to the surface cover of pedestrian ways and influence the thermal comfort especially on the day.

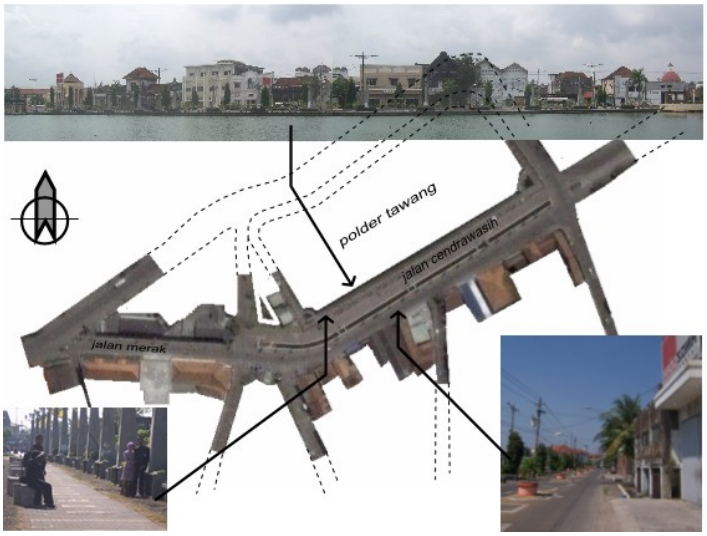

Fig. 1: Ci-walk of the pedestrian ways on Semarang, old town

RESULTS

Humid Tropical Climate and Thermal Comfort.

The geographical location of Semarang city 6° 5' – 7° 10' southern latitude and 110° 35' longitude east, make it categorized as the region with character of humid tropical climate. The factors of humid tropical climate affecting the human comfort according Satwiko, 2004 was the intensity of sun radiation, air movement, air temperature and relative humidity. The combination from those factors will produce the comfort value. Based on the data issued by he Badan Meteorologi dan Geofisika (fig. 2), the temperature of Semarang city, shows some indication exceeding the area of comfort zone especially on the open space.

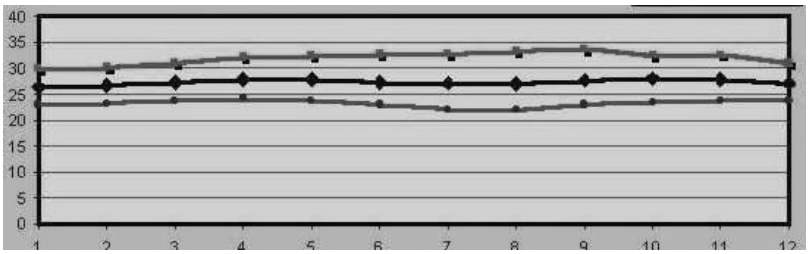

Fig. 2: Temperature of Semarang city

This comfort zone according to Jacques on Lippsmeier, 1994 could not be represented by single number, where the limitation for the equator condition was by using effective temperature value, while he effective temperature value between 19° C – 26° C. while based on Mom research on Lippsmeier 1994, it was concluded the interval of effective temperature thermal comfort on Jakarta between 20° C – 26° C, then Mom's research was the closest to the geographical condition of Semarang City, make it to be the based on this research.

The different air temperature in the shadowed and unshadowed condition

Based on the measurement result on the field (fig. 3), the air humidity was rapidly decrease from 07.000 am - 09.00 am from 75% on 07.12 am to 62% on 08.55 am or the average humidity decrement speed was 7% per hour. Then slowly decrease until the lowest point on 01.52 pm with the humidity on 44 or the average decrement of air humidity was 4% per hour. After reaching the lowest point, the air humidity was starting to slowly rise until 04.53 pm to 57%. On 04.53 pm the air humidity had not yet return to the level on the morning around 7%.

The temperature of dry air unshadowed by the building from 07.00 am - 09.00 am rise rapidly from 25,6° C on 07.23 am becomes 32,1° C on 08.47 am. The average speed of temperature increment from 07.00 am - 09.00 am was 3,3° C per hour. Then from 09.00 am - 01.00 pm starting to slowly rise into 35° C n 01.01 pm with the average speed of temperature increment 0,8° C per hour. From 01.00 pm - 05.00 pm then slowly decrease into 30,7° C on 05.07 pm with the average temperature decrement speed 1,2° C per hour. This effective temperature unshadowed by the building on 07.00 am – 09.00 am rise quickly from 22° C on 07.23 am into 26,8° C on 08.47 am, with the average temperature increment 2,4° C per hour. Then from 09.00 am - 01.00 pm starting to slowly rise into 27,3° C 01.01 pm with the average temperature increment speed 0,23° C per hour. From 01.00 am - 05.00 pm the temperature starting to decrease into 25,° C on 05.05 pm with the average temperature decrement speed 0,67° C per hour. The average effective temperature of unshadowed area by the building starting from 08.30 am - 04.28 pm exceeding the comfort zone or, uncomfortable.

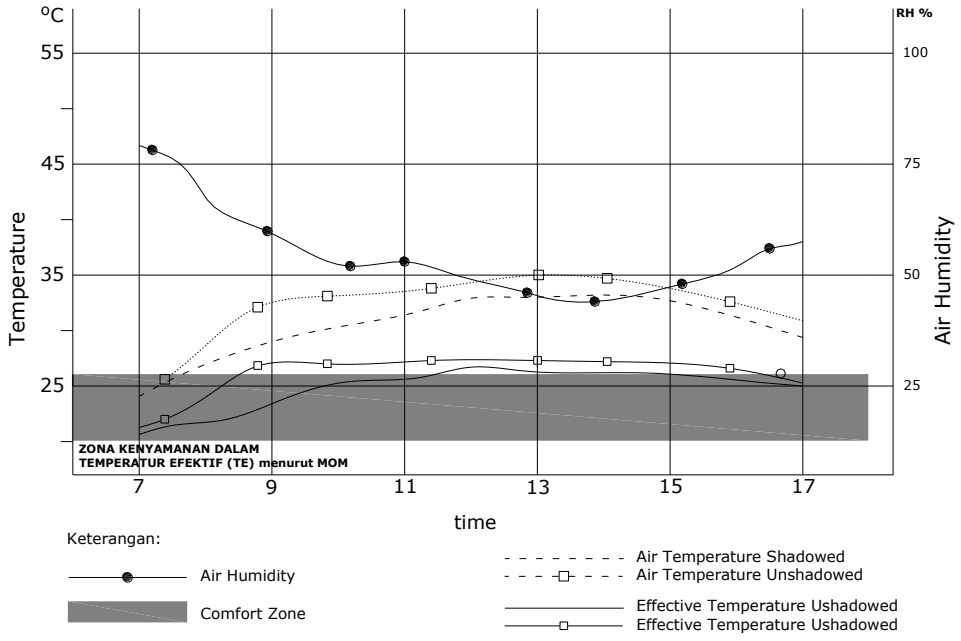

Fig. 3: Different air temperature in the shadowed and unshad-

The shadowed dry air temperature from 07.00 am - 01.00 pm rise from the 25,2° C on 07.23 am into 33° C on 12.44 pm. the average temperature increment speed from 07.00 am - 01.00 pm 1,2° C per hour. From 01.00 pm - 04.30 pm keep falling into 30,6° C on 04.25 pm with the average temperature decrement speed 0,55° C per hour. This effective temperature shadowed by the building on 07.00 am - 01.00 pm rise quickly from 21,4° C on 07.27 am into 26,4° C on 12.44 pm, with the average temperature increment 0,7° C per hour. On 01.00 pm - 04.30 pm the temperature keep falling to 25,3° C on 04.25 pm with the average decreament speed 0,3° C per hour. The effective temperature shadowed by the buildings from 11.25-15.10 was exceed the comfort zone or, uncomfortable.

CONCLUSION

The unshadowed and shadowed air temperature give significant differences to the effective temperature value achieved. The most uncomfortable effective temperature was one that not shadowed by the building. Based on the how long the effective temperature outside the comfort zone then respectively the unshadowed and shadowed area have the uncomfortable duration all day, 7 hours 58 minute and 3 hour 45 minutes. So, the effective temperature on shadowed zone was more comfortable than the unshadowed zone.

REFERENCES

Egan, M. D, 1975. ***Concepts in Thermal Comfort***. New Jersey.

Hough, M, 1989. ***City Form and Natural Process***. Routledge. London and New York.

Kukreja c.p. 1978. ***Tropical Architecture***, McGraw-hill Publishing company limited, New Delhi

Lippsmeier, G. 1994. ***Alih bahasa oleh Ir. Syahmir Nasution, Bangunan Tropis***, Penerbit Erlangga. Jakarta.

Rubenstain, H, M, 1978. ***Central City Malls***. A. Wiley Inter science Publication, New York.

Satwiko, P. 2004. ***Fisika Bangunan Jilid 1***. Erlangga. Jakarta

Shirvani, H, 1985. ***Design Process***. Van Nostrand Reinhold Company. New York.

Speiregen, Pl, D. 1965. ***Urban Design: The Architecture Of Town and Cities***. New York: Mc. Graw Hill Book Company.

Sucher, D, 1995. ***City Comforts***. Press, Seattle, 1995.