

<b>Thesis Title</b>	The Effects of Solar Radiation on Windows and Sun Protection Equipment for the Conservation of Energy Case Study : Townhouse Design in Bangkok Metropolis
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### ABSTRACT

Thailand expanded in electrical energy than before and come from building of townhouse, the accommodation constructed on many units of land which each unit has windows so to design window to be effective in using, in ventilation, light and hot protection and save energy, it necessary to it to study the way of design in this following step.

- Study temperature in Bangkok by taking atmosphere from department of meteorological during comfort time and more than by comparing with standard ECI, it is declared that scope of temperature in Bangkok mostly in April-June at 9.00-20.00 during July-September at 9.00-19.00, during October-January at 10.30-17.00 and February-March at 10.00-18.00 at average temperature more than 27.7 degree C (ECI) value of vomfort temperature should be about 25.6 degree C, the status of highest condition in each day will be at 14.00 P.M.

- Study thermal transfer of materials surrounded building and calculating U-Value of materials and clear glass which consisted of window and door have high heat transfer to 5.88 W/m.<sup>2</sup> °C than thermal transfer of brick wall about 1.7 times over, wall of brick has U-Value 3.31 W/m.<sup>2</sup> °C and roof C-pac at the ceiling gypsum has U-Value at 2.24 W/m.<sup>2</sup> °C. The trend in reducing thermal transfer value into the building by choosing materials that have low thermal transfer value.

- Study solar radiator effected to open way and take solar ray information in Bangkok to analyse ray amount from the sun in each direction and find out amount of heat from ray, the ray is part that make heat in the building which ray will transfer thermal by open way convenient and faster than roof and wall. The solar ray will gain higher thermal than sky ray, and the light into

building should be used by open way to receive ray from the sky because sky ray will have more light and less thermal than solar ray.

- Study design of shading equipment with open way by taking solar ray information and direction of sun effected to Bangkok area to consider with temperature to find time for shading and type of equipment to the open way. To shade should be shaded equipment outside the building such as roof that has shaded eaves to design wall, balcony, architect to open way etc.

- Study wind direction and ventilation of open way and study theory of open way and ventilation and take the information in Bangkok wind direction to study. To design should be open for body blowing pass will take the thermal away from user fo building which the sweat will be out of the body, the open way should be at body level, direction to receice wind at South west, South, the velocity of wind should not more than 1.02 metre/second because user will feel windy to attack working and activities, to design cross ventilation should be opened for wind and in and out so the ventilation is better than single sided ventilation.

- Study townhouse sample by studying K.C. project Ramintra townhouse which checking OTTV of the building and check effective of shading of open way and shaded equipment, check cooling load generating, in sample townhouse has OTTV high to  $51 \text{ W/m}^2$  which is over than standard of  $45 \text{ W/m}^2$ . Cooling load of sample building is about  $490 \text{ Btu/h/m}^2$ , from checking sample townhouse, to design townhouse building should start with direction for receiving thermal from the sun at least and receive wind and construct environment out of the building, materials that has heat resistance, open way that can receive wind and good ventilation, to shade with open wind, wall and stack ventilation system into it, after calculating value of thermal transfer, the building to offer has thermal value to  $37 \text{ W/m}^2$  cooling load reduced to  $295 \text{ Btu/h/m}^2$ , which cooling load value reduced to 40%

This case the effect from choosing materials for wall combination that has low U-Value, brick wall has U-Value  $1.02 \text{ W/m}^2 \text{ } ^\circ\text{C}$  whlich the wall is brick that has U-Value  $3.31 \text{ W/m}^2 \text{ } ^\circ\text{C}$ , the roof and wall of sample building is C-pac,gypsum boad which has U-Value equal to  $2.24 \text{ W/m}^2 \text{ } ^\circ\text{C}$  townhouse building should be used former materials but increased thermal insulator and increase open space under the roof which reduce U-Value to  $0.56 \text{ W/m}^2 \text{ } ^\circ\text{C}$ , the equipment of shading has cooefficient about 0.80, most open space has sun ray which high to  $171 \text{ W/m}^2$ , the open space of townhouse building designed as the roof, balcony and wall which the windows received shade, the cooefficient (SC) is about 0.54, thermal value is  $125 \text{ W/m}^2$  (at south direction)

Solar ray effects to frame of building that has thermal in the building more, to choose materials, roof should use insulators which the heat from the sun pass rapidly and convenient than the wall and roof, the trend of reducing ventilation is to design in shading and choose qualified less ventilation open space.