

<b>Thesis Title</b>	Exterior Wall of Condominium Design to Minimize Heat Gain Case Study : Condominium in Bangkapi Area, Bangkok
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### **Abstract**

The increasing needs for accommodation, closely following the nation's social and economics growth, the urge to maximize the use of limited land available, together with the traffic problem are the three main factors driving the rapid growth of high-rise building--the so called "Condominium"--in Bangkok. The building's physical constraints cause a higher than normal temperature inside because the walls can hardly prevent the heat radiated from outside. Natural ventilation system to compensate for the heat build-up inside the building is not a viable solution either. Hence, air conditioning is an inevitable. Still, uncontrolled heat gain certainly means inefficient energy consumption.

Proper exterior design can help reduce the internal heat gain, save energy and improve the living condition. A condominium building in the Bangkapi area were used as a basis for the design. All apartments within this condominium are studio type which costs between 1,200,000 - 1,500,000 baht per unit. The design sequence is as follows:

1. Designing the exterior wall to minimize heat gain based on 2 criteria: Architectural function and physical and environmental constraints. A minimum wall width of 5.00 m. is recommended. Furthermore, when the considering building structure, 6.00 m wide wall is the most appropriate design. Belows are the concluding remarks for such a design:

1.1 An appropriate orientation of the building i.e., conform with the environment, would greatly help the design to improve the heat gain reduction especially in Bangkok area.

1.2 Eggcrate-type shading devices, installed in the southern living quarter, should significantly reduce heat gain since they prevent direct sun light exposure during the day. The devices also act as a rain shade. Vertical shades around units are light weight concrete whereas those in between are aluminum louvre which can be adjusted from inside. Horizontal shades are concrete structures.

1.3 To minimize heat gain through the wall, the exterior wall is divided into 2 parts:

1.3.1 The solid walls should comprise light weight concrete coated by smooth cement. White gypsum board should be installed in the interior side of the wall. Such a design will reduce heat gain and has added other benefits.

1.3.2 The opening parts, e.g. windows, doors, should be sliding glass doors with aluminum frames. The glass used here should be heat absorbing type especially when installed indoor.

2. Testing the design during different times of the day to measure the effectiveness of shading devices thus the effectiveness of heat gain reduction. The tests were done by observing the shadow of the design model under the sunlight. The test results indicated that shade devices could effectively block sun light throughout the year. Another analysis of the light weight concrete also suggested that this material could significantly prevent the heat transferring through the wall. The wind visualizer test of the model was performed and the result confirmed that the orientation hence the natural air ventilation of the design can reduce heat gain as hypothesized.

Therefore, proper exterior wall design for the condominium building to minimize heat gain can be done effectively by taking the actual physical and environmental factors into consideration. This design can greatly improve the living condition thus enhance the value of architectural functions to better serve human's needs.