

Thesis Title	Optimization of Building Wall Thickness and Materials
Thesis Credits	6
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Degree of Study	Master of Science
Department	Energy Technology
Academic Year	1999

### Abstract

The aim of this thesis was to optimize the wall thickness made from various types of building material for a residential house in Thailand. A two-story house with four bedrooms and 226 m<sup>2</sup> of floor area was used as a case study. The study was conducted into three parts.

At first, the thermal conductivity of construction material and selected insulation were measured, and the overall thermal transfer value (OTTV) of the house was then estimated based on these information.

Second, the appropriate orientation of the house made from conventional construction material was investigated to minimize OTTV of the walls. It was found that the minimum OTTV of 62.87 W/m<sup>2</sup> was obtained when two walls of minimum area of window to wall ratio were in the direction of southeast and southwest.

Third, The conventional wall was installed with 3 types of insulation materials namely : gypsum board, fiberglass and foam. The optimum thickness of insulator was determined based on the minimum total cost, which consist of electricity expenditure for air conditioning system and the material cost. The results showed that the optimal thickness of gypsum board when allowed to have an air-gap width 20 mm., fiber glass, foam and foam with the 9 mm. gypsum board were 9 mm., 100 mm., 60 mm., and 60 mm., respectively. The OTTV of insulated walls were reduced to 54.95 W/m<sup>2</sup> for gypsum board when allowed to have an air-gap width 20 mm., 41.98 W/m<sup>2</sup> for fiber glass, 43.73 W/m<sup>2</sup> for foam and 43.37 W/m<sup>2</sup> for foam with the 9 mm. gypsum board.

Keywords : Overall Thermal Transfer Value (OTTV) / Energy Conservation in Buildings /  
Housing Estate / Building materials / Orientation