

CHAPTER V

APPLICATION

This chapter provides information and comparative results of the experiments on conventional materials with and without application thermal insulation from the selected of this study.

5.1 Thermal Resistance Performance of Conventional Wall Systems with Selected Broken-Down Packaging EPS Foam

5.1.1 Purpose

This experiment was performed to investigate thermal resistant performance of EPS particles Size 0.1-15 mm when applied to systems of composite walls with conventional materials such as wood, clay bricks, concrete block bricks, etc. as exterior panels while the interior panels were gypsum board for fire protection.

5.1.2 Specimens

In this experiment, lightweight concrete block was selected as a reference specimen. The specimens in these experiments were categorized into two groups, which are:

- 1). Lightweight wall panels systems: These systems were composed of exterior wall panels, which were wood, artificial wood, and viva board while using gypsum boards as interior panels. The ten-centimeter-wide space between the exterior and interior panels was air-gap and EPS particles Size 0.1-15. Figure 5.1 shows conventional lightweight wall systems which were applied as test specimens inside the hot box.



Figure 5.1 Lightweight wall systems installed in the hot box

2) *Masonry wall panels systems*: The exterior wall panels were clay-bricks and concrete-bricks plastered wall, and the interior panels were gypsum boards. Ten centimeters wide space between walls panels were air-gap and inserted the selected insulation.

Figure 5.2 shows conventional masonry plastered wall systems applied as test specimens inside the hot box.



Figure 5.2 Masonry wall systems installed in the hot box

5.1.3 Experimental Procedure

The procedure of this experiment is similar to experiments performed in Section 4.2 – 4.4 except the testing temperature was resemble the air temperature during summer season in Thailand.

5.1.4 Results

Lightweight Wall Panels Systems:

Three conventional lightweight wall materials were chosen to test as exterior walls in the hot box where the inside panels were gypsum board. Graph in Figure 5.3 presents air temperatures of the heating cell, which resemble day and night air temperature in summer season, and temperatures in metering cells separated from the heating cell by the specimens previously described.

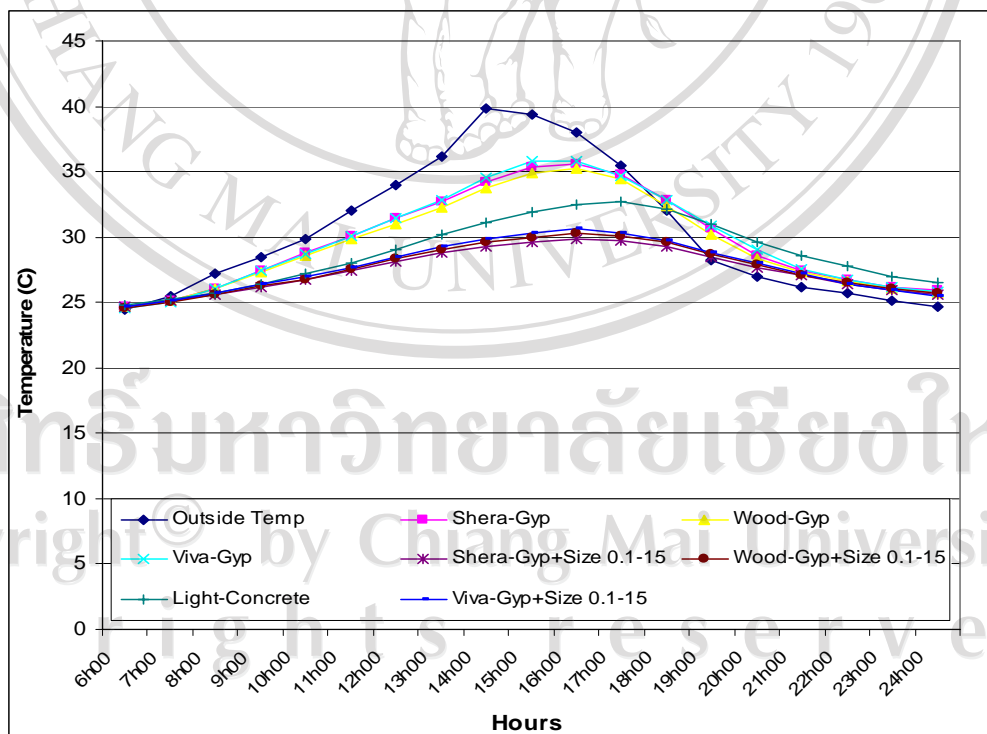


Figure 5.3 Temperatures in the heating cell (outside temperature) and in the metering cells separated by lightweight wall systems

Figure 5.3 shows that all the wall systems with EPS particles can resist heat from the heating cell better than the systems without EPS. And it can resist the heat even better than the lightweight concrete blocks. It can also keep the temperature in the metering cells more steady all day.

Masonry Wall Systems

Two conventional masonry wall materials such as clay brick and cement brick were chosen to test as exterior walls in the hot box test apparatus where the inside panels were gypsum board. Figure 5.4 presents the result of the experiment.

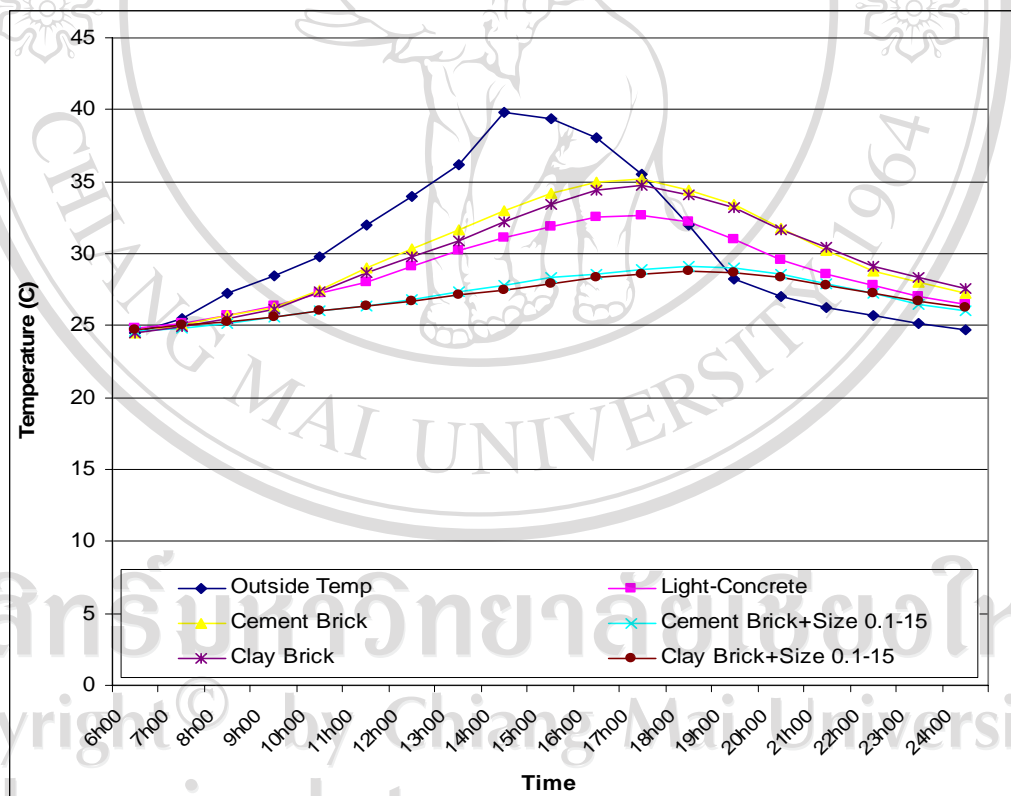


Figure 5.4 Temperatures in the heating cell (outside temperature) and in the metering cells separated by masonry wall systems

Similarly to the previous figure, Figure 5.4 shows that the wall systems with EPS particles can perform much better in resisting the heat transferred from outside to inside the metering chambers. The simulation shows walls with EPS particles can keep indoor temperature below 29°C while walls without EPS particles let the indoor temperatures rise up to 35 °C when the outdoor temperature rises up to 40 °C.

5.2 Conclusion

Figures 5.3 and 5.4 showed a significant improvement of thermal resistance of conventional systems. Therefore, insulation from EPS packaging foam can be used to improve thermal property of conventional wall panels. However, the above results show indoor heat gain from heating cell to metering cells of 0.6 m depth. In refer to Fourier's method of heat transfer; temperatures in metering cells must be increased higher than application with actual dimension of room, which depths are mostly larger then 3 m. Thus, people may obtain lower indoor air temperatures in case they apply the selected insulation with their exterior walls.