Semenyih Green Bungalow Technical Visit Report

ENVIRONMENTAL ENGINEERING TECHNICAL DIVISION

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THE Environmental Engineering Technical Division had organised a field visit to Semenyih Green Bungalow on 12 June 2010. A total of 40 participants took part in the visit.

Upon arrival, we were warmly greeted by Ms. Lee Su May whose family owns the property. At first, the author observed little difference between this and other bungalows. A typical bungalow would normally have a long driveway, a fish pond and a large frontal porch gate. This green bungalow is no exception. An indepth explanation was given by Ms. Lee, followed by a question and answer session by the ever curious and skeptical participants. Some of the questions were technical in nature.

Figure 1: Isometric view of the green bungalow

A BRIEF OVERVIEW OF THE GREEN BUNGALOW

A cooler home is what most people would look for in their homes. Installing fans and air-conditioning is a norm in most houses. Having a cooler home that has an indoor air temperature 6°C to 9°C lower than the outdoor ambient temperature is a bonus. A lower temperature leads to a cooler ambience, thus creating a more comfortable environment.

The green bungalow aims to do exactly that. Smart and Cool HOMES Building Technology managed to manipulate the laws of thermodynamics with a few tricks in heat transfer and strictly without active cooling such as air-conditioning. Due to the large number of participants, we were divided into three groups and each group had a chance to explore the outside of the bungalow while another group tours the inside of the house.

Figure 2: Tyres used as wall and tyre arrangements

EXTERIOR OF THE BUNGALOW

While outside, my group was introduced to tyres as a form of heat sink. Discarded old tyres pose an environmental nightmare due to its extremely slow or zero bio-degradability. Using these old tyres and arranging them in wire baskets of six by two matrixes, three baskets of tyres were stacked on top of each other, creating a foundation as well as heat sink. The bungalow utilises approximately 2000 to 2500 discarded tyres. A few civil engineers did interrogate the necessary structural strength of such a design, but it seems they were nodding in approval when

Figure 3: Explanation and Q&A by Ms. Lee on our tour

we viewed a cut-out-section at an open field. From a heat sink point of view, the layers of tyres absorb the heat and ground it before heat enters the bungalow. Rubber also retains heat well.

What this means in reality is, the bungalow porch, driveway and surrounding feels lukewarm to the touch, but is much cooler than a regular mortar-cement floor. Walking barefoot in the hot afternoon sun was actually possible without feeling stinging hot burns on the skin. By the way, we were given instructions to come wearing sandals for this specific test. My regret is in not having a laser thermometer to report the exact temperature and thus had to rely on our body feedback.

INTERIOR OF THE BUNGALOW

Inside the bungalow, a different technology is at work. Generally, heat from the outside penetrates into the bungalow from all directions (walls, windows and openings, roof, *etc*). Internally, heat is generated via human activity, machinery, as well as the absorption of heat by dense materials. "Eureka! Material, another important factor in heat transfer, exposes the secret of this bungalow," I thought to myself. The contractor who built the bungalow informed us that the walls were made with autoclaved aerated concrete (AEC), not regular red bricks. AEC like foam has tiny "air-bubbles" that slows down the transmission of heat through the walls. This also acts as a heat shield, thus providing insulation from incoming heat into the building. As AEC is larger in size than regular red bricks, it allowed the contractor to build the walls in a shorter time.

Between floors, another material called corrugated concrete (CorCon) was used. As its name indicates, it has corrugation and ribbed beams across the span of the slab. Although it is a thinner slab, it maintains its strength.

Figure 4: Interior of the bungalow, take note of the corrugated CorCon material

Figure 5: Solar powered distribution board and electrical DB panel to power utilities inside the bungalow

Figure 6: Solar meter: Amount sold to TNB and amount used by the bungalow

Figure 7: Participants at the visit group photo

The CorCon slab absorbs heat and transfers it through the walls to the ground with the heat-sink system. CorCon offers a larger surface area compared to a conventional flat slab, thus it can dissipate internal heat more effectively and efficiently.

THE ROOF

As heat rises to the top of the house, it often gets trapped. We know a higher ceiling cools better than a lower ceiling. The use of ConCor absorbs heat via its larger surface area and dissipates to the walls and tyres inside the ground (heat sink).

External heat from the sun is combated with 'venturi-action' roof. Its job is to prevent sun heat radiating onto the roof. Small air gaps in between the roof tiles and roof trusses provide breathing space at the ridges. Using insulation to prevent heat from transferring back to the ceiling, heat only rises to the peak of the roof. The difference in air pressure and having these air gaps give off a venturi-action that diverts heat out at the roof peak, and replace this with cooler air from the bottom of the roof.

SOLAR POWER

The house is equipped with solar cells to generate electric power. These cells are strategically located at an angle to the roof structure. However, the harnessed energy is used not for air-conditioning, it is for powering the electrical utilities inside the house; from heating water to powering the television, etc.

Potentially, with an incentive called Feed-in-Tariff (FiT), the energy can be sold to TNB by 2011. The National Green Technology Policy introduced in July 2009 stated that the FiT mechanism will take off under the 10th Malaysia Plan which begins in 2011.

IN SUMMARY

Our tour finished with some refreshments and drinks. Under the porch, we were cool, much like standing under a tree, the blazing heat would be best harvested using solar power cells without heating the house. Not a bad idea for future homes and buildings to adopt such design benefits. This author believes it meets an ironic saying, "to use technology to save our planet from ourselves". ■

NOTE: All photo's are courtesy of Ir. Tang Boon Heng.