

**List of publications of ELITH Thailand**

<b>Abstract code</b>	<b>Name of conference/Journal</b>	<b>Place</b>	<b>Date</b>	<b>Title</b>	<b>Corresponding Author</b>	<b>Authors</b>	<b>Presenter</b>
D-019	International conference on "Sustainable Energy and Environment Science, Technology and Innovation for ASEAN Green Growth (SEE2014)"	Bangkok , Thailand	19-21 November 2014	A Review of Housing Features of Medium and Low Income Earners in Thailand	Surapong Chirarattananon	Preecha Tummu, Surapong Chirarattananon, Pattana Rakwamsuk, Pipat Chaiwiwatworakul, Surawut Chuangchote	Preecha Tummu
D-020	International conference on "Sustainable Energy and Environment Science, Technology and Innovation for ASEAN Green Growth (SEE2014)"	Bangkok , Thailand	19-21 November 2014	Reducing Energy Consumption Cost and Greenhouse Gas Emission for Tropical Low-income Housing: Thailand Contribution	Surapong Chirarattananon	Surawut Chuangchote, Pipat Chaiwiwatworakul, Siriluk Chiarakorn, Pattana Rakkwamsuk, Surapong Chirarattananon	Surawut Chuangchote

D-021	International conference on "Sustainable Energy and Environment Science, Technology and Innovation for ASEAN Green Growth (SEE2014)"	Bangkok , Thailand	19-21 November 2014	Energy Consumption and GHG Emission of Thailand's Residential Sector	Surapong Chirarattananon	Surapong Chirarattananon, Pipat Chaiwiwatworakul, Pattana Rakkwamsuk	Pipat Chaiwiwatworakul
D-026	International conference on "Sustainable Energy and Environment Science, Technology and Innovation for ASEAN Green Growth (SEE2014)"	Bangkok , Thailand	19-21 November 2014	Greenhouse Gas Emission from Low Income House Construction: Case study in Baan Eua-Arthorn Project in Thailand	Siriluk Chiarakorn	Hathairat Loyprakhon, Siriluk Chiarakorn, Pattana Rakkwamsuk	Hathairat Loyprakhon
D-028	International conference on "Sustainable Energy and Environment Science, Technology and Innovation for ASEAN Green Growth (SEE2014)"	Bangkok , Thailand	19-21 November 2014	Evaluation of Greenhouse Gas Emission from Residential Buildings in Thailand	Siriluk Chiarakorn	Siriluk Chiarakorn, Pattana Rakkwamsuk, Kamonthip Aransiri, Nalinee Aneksaen, Ranida Parnthong	Siriluk Chiarakorn

D-029	International conference on "Sustainable Energy and Environment Science, Technology and Innovation for ASEAN Green Growth (SEE2014)"	Bangkok , Thailand	19-21 November 2014	An Enhancement of the Daylighting from Side-Window Using Two-section Venetian Blind	Pipat Chaiwiwatworakul	Vichuda Mettanant, Pipat Chaiwiwatworakul, Pattana Rakkwamsuk	Vichuda Mettanant
D-010	International conference on "Sustainable Energy and Environment Science, Technology and Innovation for ASEAN Green Growth (SEE2014)"	Bangkok , Thailand	19-21 November 2014	Ray Tracing Method for Simulating Daylight Transmission through Tubular Light Pipes with Anidolic Concentrator	Surapong Chirarattananon	Thanyalak Taengchum, Surapong Chirarattananon	Thanyalak Taengchum
C-007	International conference on "Sustainable Energy and Environment Science, Technology and Innovation for ASEAN Green Growth (SEE2014)"	Bangkok , Thailand	19-21 November 2014	A study of transmission and illumination of light through rectangular light pipes with bends	Wannakanit Supachart	Wannakanit Supachart, Thanyalak Taengchum, Surapong Chirarattananon, Pattana Rakwamsuk, Pipat Chaiwiwatworakul	Thanyalak Taengchum

D-019

**A survey of housing features and thermal comfort of medium and low income earners in Thailand**

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**Abstract:**

House design is influenced by the climate and the culture of people at a location. Thailand is located in tropical climate with low wind velocity and ambient air is humid. Climate of each region is different due to their location. This paper aims to study typical house design of low and medium income in rural area of each region of Thailand including interviewing and measuring parameters required for thermal comfort assessment. Each houses type features are showed and analyzed comparing with living style, climate and tradition of people in each region. Thermal environment and comfort are also recorded and calculated for each region. Results indicate that typical houses features of low and middle income earners of each region are different up to their life style, climate and traditional. Neutral temperature of each region is also different. People in the southern feel comfort under higher operative temperature than other regions. And neutral temperature of Thai people is different from PMV assessment scale.

**Keywords:** Low income housing; residential house design; Tropical housing design

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D-020

**Reducing energy consumption cost and greenhouse gas emission for tropical low-income housing: Thailand contribution**

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**Abstract:**

Recently, there is insufficient effort and insufficient body of studies into the issues of low-energy housing for low-income and medium income earners. Even fewer studies have touched on the issue of thermal comfort for low-income housing. Modern housing design does not adequately attempt to utilize daylight fully nor to provide sufficient but energy-efficient electric lighting during night time. This project is carrying out to study on reducing energy consumption cost and greenhouse gas emission for tropical low-income housing in Thailand. Recent progress is on the survey process in low-income housing to collect the data of electric appliances, building configurations and energy uses in household, and establish the baseline for each household type in low-income housing in Thailand.

**Keywords:** Low income; housing; energy efficiency; greenhouse gas emission

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D-021

### **Energy consumption and GHG emission of Thailand's residential sector**

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#### **Abstract:**

In this study, historical energy data from various sources were compiled to evaluate the energy consumption in residential sector in Thailand. The energy consumption was characterized for houses located within and outside municipality and for different activities in the houses: lighting, cooking, entertainment, amenity and other. Under the business-as-usual (BAU) scenario, the electrical energy consumption in the sector will increase from 48,611 GWh in 2010 (base year) to 100,475 GWh in 2030 and the greenhouse gas (GHG) emission will increase from 13,368 to 30,330 kTon carbon CO<sub>2</sub>. However, under the energy efficient scenario, it was found that the GHG emission can be limited at 15,353 kTon carbon CO<sub>2</sub> in 2030. The GHG emission reduction from power generation also plays an important role in the emission mitigation from the residential sector.

**Keywords:** Residential sector; Greenhouse gas emission; Urbanization, Household energy consumption

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D-026

## **Greenhouse gas emissions from low income house construction: case study in Baan Eua-Arthorn project in Thailand**

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### **Abstract:**

This study aims to evaluate greenhouse gas (GHG) emission in the unit of kgCO<sub>2</sub>e/m<sup>2</sup> from construction materials of low income houses under the Baan Eua-Arthorn Project. The activity data of constructing materials were extracted from house plans and Bill of Quantities (BOQ) of 4 low income houses such as detached house (61.97 m<sup>2</sup>), twin house (109.67 m<sup>2</sup>), townhouse (552.20 m<sup>2</sup>), and condominium (2,121.15 m<sup>2</sup>). The greenhouse gas emissions in the unit of kgCO<sub>2</sub> e/m<sup>2</sup> were calculated in the scope of cradle to gate following the Thai national guideline for carbon footprint of product and Thai national life cycle inventory database (TGO, 2011). Results show that the highest greenhouse gas emission from constructing materials belongs to condominium (179.06 kgCO<sub>2</sub> e/m<sup>2</sup>), followed by townhouse (118.73 kgCO<sub>2</sub>e/m<sup>2</sup>), twin house (107.53 kgCO<sub>2</sub>e/m<sup>2</sup>), and detached house (93.21 kgCO<sub>2</sub>e/m<sup>2</sup>), respectively. The largest greenhouse gas emission was emitted from condominium due to more concrete and cement used than other houses. Concrete, cement and steel were found to be significant emission hot spot which is consistent with the study of Aneksaen (2011). Thus, in order to reduce the greenhouse gas emission from construction materials, the conventional building envelopes should be replaced by low carbon embedded materials, like lightweight concrete. It is found that the greenhouse gas emissions (kgCO<sub>2</sub> e/m<sup>2</sup>) decrease to 28% for condominium, followed by 10.4% for townhouse, 6.4% for twin house, and 4.2% for detached house. The results of this study can be used as a guideline to reduce carbon footprint of residential buildings in the government housing project in the future.

**Keywords:** Greenhouse gas emission; Low income houses; Construction process; Baan Eua-Arthorn

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D-028

## Evaluation of greenhouse gas emission from residential buildings in Thailand

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### Abstract:

Apart from energy sector, greenhouse gas (GHG) emission from the construction industry has become more significant especially indirect GHGs from carbon embedded in construction materials. This paper presents the evaluation of GHGs from construction materials in different residential buildings such as detached houses with different styles (contemporary, modern and Thai modern houses) and low-rise and high-rise condominiums in Bangkok. The concept of carbon footprint was applied in this study to evaluate how much GHG emitted from construction process. The activity data were extracted from floor plans and Bill of Quantities (BOQ) of 42 houses and 12 condominiums. The GHG emissions in the unit of kgCO<sub>2</sub> e/m<sup>2</sup> were calculated in the scope of cradle to gate, following Thai national guideline for carbon footprint of product and Thai national life cycle inventory database (TGO, 2011). The high-rise condominium built from precast concrete emitted the highest GHGs (326.77 ± 22.01 kgCO<sub>2</sub>e/m<sup>2</sup>). While the Thai-modern house built from half wood-half concrete emitted the lowest GHGs (2.47 ± 36.37 kgCO<sub>2</sub>e/m<sup>2</sup>) due to the large carbon offset from wooden construction materials.

**Keywords:** Greenhouse gas emission; Residential building; Construction process

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D-029

## **An enhancement of the daylighting from side-window using two-section venetian blind**

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### **Abstract:**

In the tropics, daylighting from a side window requires shading to intercept direct sunlight from entering the window whilst allowing penetration of daylight from sky. Daylighting from a double-pane glazed window with enclosed horizontal slats has long been investigated under different climates and locations. In this paper, a double-pane window with the slats that were separated into two sections (lower and upper sections) was investigated for its daylight application in tropical climate. A series of full-scale experiments and simulations were conducted under real tropical skies and by which the slats in each section were tilted to different angles. Through the yearly simulations, performance of the two-section slat window was evaluated in terms of "useful daylight illuminance" (UDI), average interior daylight illuminance (ADI), and reduced light power density (LPD) of a dimmable lighting system. The results show that the two-section slat window can enhance the daylight use in the building by increasing more useful daylight illuminance, and providing better uniformity of the interior daylight distribution than the single-section slat window.

**Keywords:** Vertical slats; Daylighting; Illuminance; Useful daylight illuminance; Tropical climate

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D-010

## **Ray tracing method for simulating daylight transmission through tubular light pipes with anidolic concentrator**

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### **Abstract:**

Light pipes can bring both daylight from the sun and daylight from the sky into deep interior spaces of a building. However, light pipes are still considered costly. Adding an anidolic concentrator at the entry port of a light pipe will increase daylight capture and may reduce the overall cost per unit of delivered daylight flux, especially for long pipes or pipes with bends. This paper presents results of modeling, and simulation of transmission of beam daylight through tubular light pipes. Analytic method is used for tracing light rays from the sun and sources in the sky zones through the anidolic concentrator to the straight sections of a pipe through to the exit port. The vertical curvature surface of the anidolic concentrator is modelled as a parabolic section. The algorithms are coded in a MATLAB program. The results show that the concentration ratio of a concentrator is a function of its acceptance angle and the reflectance of its surface. The method can be used for analysis and design of such system.

**Keywords:** daylighting; light pipe; anidolic concentrator; sky luminance; sunlight.

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C-007

**A study of transmission and illumination of light through rectangular light pipes with bends**

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**Abstract:**

Light pipes can bring daylight from the sky into deep interior spaces of a building. A pipe is often connected with a bend so as to orient the entry port in the direction that optimizes light reception and transmission. Another bend is connected before the exit port to optimize delivery of light into a room. This paper presents results of modeling, experiments, and simulation of transmission of beam and diffuse daylight through rectangular light pipes. Analytic method is used for tracing light rays from the source into the bend through to the straight section and through to the bend and then the exit port into the room, or forward raytracing method. The curve surface of the bend is modeled as a pie bend section. The interior surface of each section is specular but may have different reflectances. The algorithms of calculation are coded in MATLAB scripts and functions. The interior surfaces of the rectangular light pipe and bends are lined with a film of reflectance of 99%. A set of experiments was conducted indoor using an LED lamp as a point source. Results of calculation using the method match closely with those from experiments.

**Keywords:** Daylighting; light pipe; bended pipes; sky luminance; sunlight

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