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Abstract

The research is a study and an analysis of the design for comfortable living in public building which is an ordinary hall, or *vihara* in Chiang Mai and *sim* in Luang Prabang. The primary data indicated the similarity in location and topography, weather, climate, historical and social background. The field data collection on the architectural and technical design concerning comfort, such as thermal and lighting comfort, could be used for comparing factors affecting the buildings chosen for this study. It is found that the conventional design and the passive design using local intelligence can bring about the adaptation and design for the better comfort in the buildings and application of knowledge for the development of modern architectural design in Chiang Mai and Luang Prabang. The local intelligence for building design was categorized as site selection, building orientation, building designs, shading devices and opening designs, building envelopes and materials, comfort designs, daylighting designs, user behaviors and other considerations. The results of this research are able to confirm that local intelligence could be applied to modern architectural design aimed at a combination with active design for much more efficiency in energy conservation at present.

บทคัดย่อ

งานวิจัยนี้ทำการศึกษาและวิเคราะห์การออกแบบเพื่อความสบายในการอยู่อาศัย โดยการเก็บข้อมูลอาคารสาธารณะประเภทวิหารในเชียงใหม่ หรือสิมในเมืองหลวงพระบาง ซึ่งมีข้อมูลเบื้องต้นคล้ายคลึงกันในด้านพิกัดที่ตั้งอาคาร ภูมิประเทศเพื่อการตั้งถิ่นฐาน ลักษณะลมฟ้าอากาศ ภูมิอากาศ ความเป็นมาทางประวัติศาสตร์และสังคม การเก็บข้อมูลภาคสนามของอาคารด้านการออกแบบสถาปัตยกรรม และด้านเทคนิคที่เกี่ยวกับเงื่อนไขของสภาวะน่าสบายในด้านความรู้สึกร้อนหนาวและแสงสว่างที่พอเหมาะ สามารถนำมาเปรียบเทียบกับปัจจัยที่มีผลต่องานสถาปัตยกรรม โดยวิธีการออกแบบที่ปฏิบัติถ่ายทอดสืบเนื่องกันมา และวิธีการออกแบบที่ใช้วิทยาการในการแก้ไขและป้องกันปัญหา เป็นภูมิปัญญาพื้นถิ่นทางสถาปัตยกรรมเพื่อปรับวิธีการออกแบบอาคารให้เหมาะกับสภาวะสบายเพื่อใช้งานอาคาร และสามารถนำไปสู่การประยุกต์ใช้องค์ความรู้เพื่อการพัฒนาการออกแบบ

ทางสถาปัตยกรรมสมัยใหม่ในพื้นที่ศึกษา โดยพบว่าภูมิปัญญาพื้นถิ่นในการออกแบบอาคาร 9 ประการ ได้แก่ การเลือกที่ตั้ง การวางทิศทางของอาคาร การออกแบบและประโยชน์ใช้สอยของอาคาร การออกแบบอุปกรณ์บังแดดและช่องเปิดอาคาร มวลสารอาคารและวัสดุกรอบอาคาร การออกแบบสภาวะน่าสบายในอาคาร การใช้แสงสว่างจากธรรมชาติในอาคาร การปรับตัวของผู้ใช้อาคาร และปัจจัยอื่น ๆ ภูมิปัญญาพื้นถิ่นเหล่านี้ สามารถนำมาประยุกต์เป็นแนวทางการออกแบบสถาปัตยกรรมสมัยใหม่ร่วมกับวิธีการออกแบบสถาปัตยกรรมแบบใช้วิทยาการใหม่ เพื่อการใช้พลังงานอย่างมีประสิทธิภาพในปัจจุบัน

Keywords (คำสำคัญ)

Local Intelligence (ภูมิปัญญา)
Vernacular Architecture (สถาปัตยกรรมพื้นถิ่น)
Thermal Comfort (สภาวะน่าสบาย)
Vihara or *Sim* (วิหารและสิม)

1. Introduction

At present, the energy sources are an important factor for living while the energy is limited. Using too much energy causes many problems including environmental problems which can be seen through global warming resulting from the Green House Effect. At the same time, the effect of energy on the economy is that a large sum of money has been used in the production of energy. As a result, energy saving is the issue that is important in the country's policy. Luckily, the local wisdom in designing for comfortable living has been reflected in vernacular architecture for a long time that buildings can reduce the usage of energy and, moreover, is compatible with the environment. This kind of wisdom is very valuable and has been practiced, collected and transferred since the past. However, the studies of the intelligence in vernacular architecture under the topic of thermal comfort are still limited and the result of the studies has not been fully adapted.

Thailand and Laos have clear intelligence in vernacular architecture. The two countries are both in the tropical climate. They also share cultural background as it has been said that there is the brotherhood between Thailand and Laos. Chiang Mai and Luang Prabang are the historical location of the two neighboring ancient kingdoms of Lanna and Lan Xang respectively. The architecture of the two areas is similar but the culture, politics, beliefs, and migration have affected the development of the design for comfortable living in different ways.

The objectives of this study are to construct the knowledge and innovations in terms of adaptation for comfortable living and designs of the *vihara* or *sim* in the tropical climate in order to save energy and analyze the local intelligence in the building design for *vihara* or *sim* in Chiang Mai and Luang Prabang. The results of the research will be applied to modern architecture. In addition, this can also establish a network of academic cooperation between architectural institutes of Thailand and Laos.

The study areas used in the research are Chiang Mai and Luang Prabang. Chiang Mai is in the upper north of Thailand on the bank of the Ping River at latitude 18°N and longitude 99°E. The city is 310 meters above sea level. The overall climate around the mountain ranges is quite cool and there is much more rain than in the plains. The rainy season of Chiang Mai is from June to October. The largest amounts of rain occur during August and September and the coolest time of the year is from November to February. The lowest temperature is in December or January and the highest temperature starts from March to May; the hottest day is usually in April. For Luang Prabang, it is in the north of Lao PDR on the bank of the Mae Kong River at the area where the Khan River joins it. It is at latitude 19°N and longitude 102°E. The city is 301 meters above sea level. The rainy season starts from May to October with the cool-dry season from November to February. The dry season is between March and April.

2. Methodology

1. Study and survey data related to the buildings, locations, directions and relationship with the surroundings, including characteristics, architecture, size and scale as well as function both inside and outside the buildings along with the architectural components by drawing the plan and the elevation features. The samplings for the study are as follows:

- 1 *vihara* at Wat Prasat, Muang District, Chiang Mai;
- 1 *vihara* at Wat Pa Daeng, Muang District, Chiang Mai;

- 1 *vihara* (*vihara* lai kham) at Wat Phrasingha, Muang District, Chiang Mai;
- 1 *sim* at Wat Pakkhan in the conservation zone of Luang Prabang;
- 1 *sim* at Wat Chiang Thong in the conservation zone of Luang Prabang; and
- 1 *sim* at Wat Sop in the conservation zone of Luang Prabang.

2. Gather information about the buildings, their function and designs for comfortable living at present by using various methods of survey: a Global Positioning System compass, camera, video camera, questionnaire, interviews and observation in order to perform the analysis of the following:

- location of the building's mean altitude or average height above sea level;
- surroundings: trees, shade, building complex, adjacent buildings, relationship to the surroundings;
- designs and construction of the respective buildings, directions of the building location, the degree of roof slope;
- design of ventilation system and sun shading devices;
- user behavior, beliefs, traditions and customs about each building; and
- building mass, building envelopes, roof, wall and floor.

3. Collect data on the technique and condition of the comfort in two aspects: thermal comfort and lighting comfort. Monitor each building twice a day during the day in summer using a thermometer and hygrometer, air velocity and our flow meter, data logger, automatic data-collecting device of 8-12 channels for collecting data of each building. The data will be used as primary data for an analysis as follows:

- temperature: inside and outside the building;
- relative humidity: inside and outside the building;
- pressure and wind direction: inside and outside the building;
- mean radiant temperature; and
- weather condition such as cloud cover, precipitation, visibility, etc. during the data collection period.

4. Compare changes and factors affecting the respective indigenous architecture under the study.

5. Analyze data and summarize it as description, illustration, photos and tables.

3. Results

3.1 Data Analysis

The orientation of the two chosen places is related to the course of the sun. Even though Chiang Mai and Luang Prabang are in nearly the same altitude, with similar weather and climate, there are differences in architectural aspects. That is, public buildings like *vihara* or *sim,* of 135-215 sq.m., have different architectural styles due to physical environment, location, materials, the users' behaviors. The locals made use to provide comfort to the users in three ways:

1. conventional design which makes use of local intelligence;
2. passive design which makes use of all kinds of techniques and skills to improve and modify the architecture to provide comfort, and this can also be considered as local wisdom; and
3. active design which is the use of technology to solve the problems and architectural modification for better comfort, but it is not from local wisdom, for instance heat reduction by using electric fans and increasing electric lights in the buildings.

The analysis of *vihara* or *sim* is considered a kind of public buildings that serve as a center for religious activities among the people of Chiang

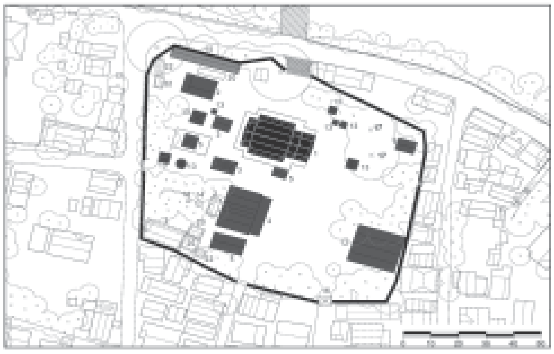

Figure 1. Site plan of *sim* at Wat Chiang Thong, Luang Prabang.

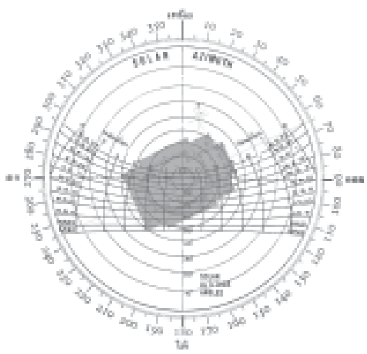

Figure 2. Location of *sim* at Wat Chiang Thong, Luang Prabang, latitude 19° 53' 86'' N., longitude 102° 08' 58'' E., altitude at 301 meters, angled in a northen direction, 65°.

Figure 3. *Sim* at Wat Chiang Thong, Luang Prabang.

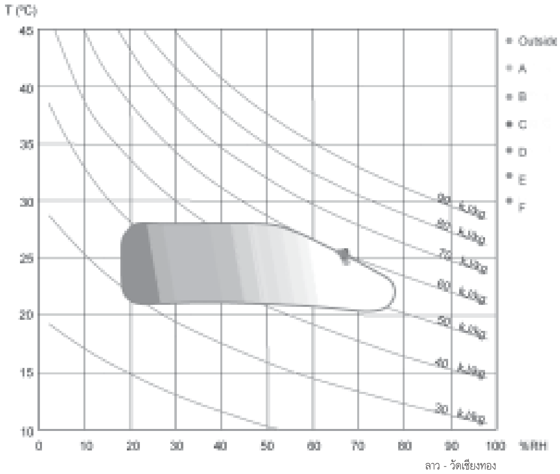

Figure 4. Recorded data on bioclimatic of *sim* at Wat Chiang Thong, Luang Prabang.

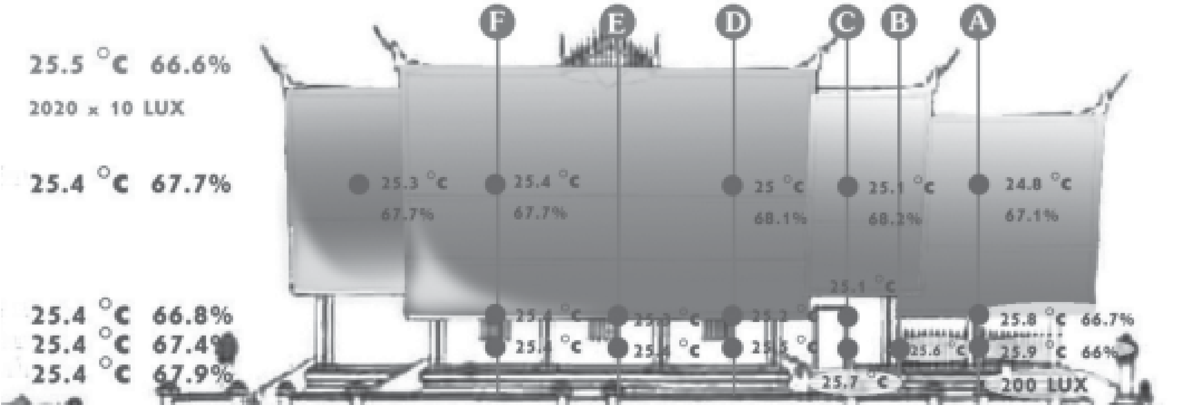

Figure 5. Recorded climatic data of *sim* at Wat Chiang Thong, Luang Prabang.

Figure 6. Villagers' style of dress in *sim.*

Figure 7. The thick wall of *sim* with the side doors, opposite to each other, and levels of tied roof.

Mai and Luang Prabang. Their architectural design has long been influenced by Buddhism through the artisans' faith and beliefs, resulting in grand public buildings that are elaborately beautiful with the development of talents and skills. They can be divided in terms of architectural modification for comfort and appropriate functions as follows:

1. Site Selection

- The site selection for a public building usually follows the Buddhism convention that it should be at the center for public circulation. The main building and other minor buildings have specific positions. A temple generally has other composite structures included in its premise.

2. Building Orientation

- The building orientation is related to the northern direction. The building faces the east which houses the principle Buddha image whose face is turned eastward at 50°-95° (on the east side of Chiang Mai and Luang Prabang, the sun chart is at 19°N = 65°-115°). The front part of the building, which is used the most, can get the sunlight and warmth in the morning whereas the rear part, which is used the least, is exposed to the sun in the afternoon. Thus, the wall on this part is made solid with no windows.
- The relationship to other buildings is that a large open space is between the main circulation path and the front part of the building. This also allows good ventilation in the front, improving the ventilation of the building.
- The building location is related to the surroundings. Big trees are mostly planted on the south and the south-east sides. They provide shade and reduce the outside temperature.
- The ground is usually covered with level of sand or tile and swept daily and kept clear of leaves or weeds. It is used for outdoor activities.

3. Buildings Designs and Functions

- Religious buildings have to conform to a rigid and conventional space planning. That is, they have to be rectangular in shape and face the east. They have only one storey of 42-173 sq.m. raised above the ground approximately 1.00-1.75 m. to prevent moisture from the ground. The floor is made of concrete paved with tiles, carpet, or other materials. The height from the floor to the ceiling is around 3.50-6.70 m., depending on the proportion of the structure. Thus, it is rather airy with good ventilation. It is used mostly in the daytime, especially in the morning. It comprises 1) the space for the Buddhist devotees to sit in the front and the middle part of the hall, 2) the seating for the monks in the middle and the back part of the hall. The platform of this part is raised 0.20–0.50 m. higher than the floor. 3) A pedestal upon which the Buddha images are placed is at the back close to the wall.

- The scale and shape of *vihara* or *sim* is rectangular around 1:3 in an east–west direction which creates a thermal impact. The gable roof is placed in an east–west direction as well. This allows the building to be less exposed to the hot sun during the day.
- The roof of *vihara* or *sim* is constructed in three tiers with angles of 55°, 35°, and 24° con-secutively which is good for rain drainage. How-ever, the lower tier may face some problems of drainage if it does not get enough pressure from the rain on the upper roof.

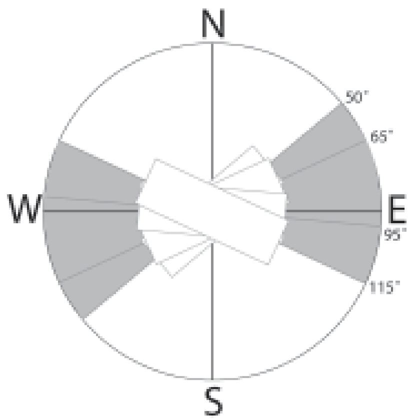

Figure 8. Relation of the building to the north.

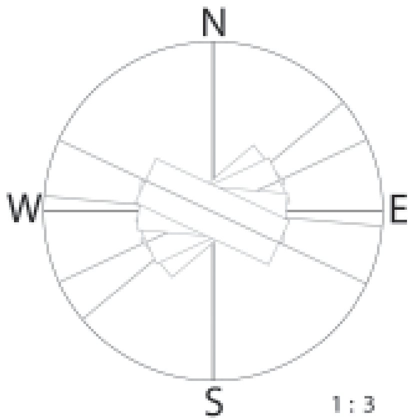

Figure 9. 1:3 shape of *vihara* or *sim.*

The angle of the upper gable, 55°

The angle of the middle roof, 35°

The angle of the lower roof, 24°

Figure 10. Different shapes of the roof at different angles and levels (*Sim* at Wat Chiang Thong).

4. Shading Devices and Opening Designs

• The eaves of the projecting roof are not less than 0.80 m. in order to block the sun in a horizontal line while the lower part of the wall around the building can get the light.

• Cross ventilation can be achieved by constructing the openings along the sides of the building which can be used in many ways: 1) outward casement windows help control the wind direction to flow inside at the level of the users' bodies; 2) inward casement windows can also direct the wind to flow inside at the level of the users' bodies; 3) ventilation with rows of decorative wooden bars (or "*Look Ma Huat*" in Thai) allows the air to flow at the level of the users' bodies; and 4) there are also the openings along the sides of the wall at higher levels to let the hot air float up. Therefore, the openings along the sides of the wall are mainly intended to regulate the moisture inside the building.

• Stack ventilation is considered. Buildings with this arrangement usually have solid walls with no openings to allow cross ventilation. However, it allows hot air to flow higher than usual making the temperatures vary due to the height of the building. The hot air flows through the space between the roof frame and the baked-clay tiles,

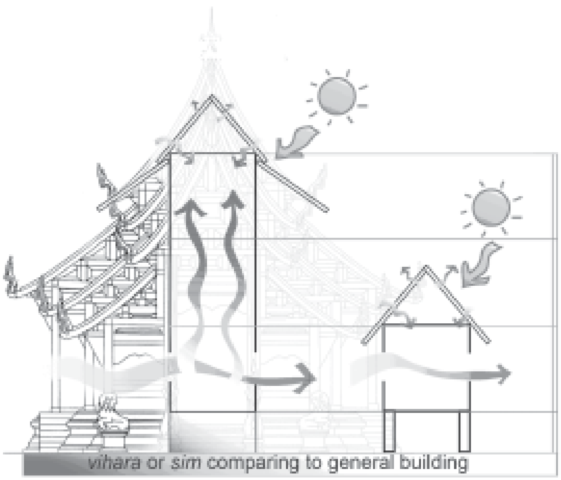

Figure 11. Stack ventilation of *vihara* or *sim* comparing to general building.

which are small, causing space around the areas where they are placed to overlap one another.

5. Building Mass and Building Envelopes

• Most of the roof materials are locally made such as baked-clay tiles (glazed and unglazed), which have medium mass and weight, and moderate heat accumulation. Therefore, it is able to prevent heat loss very well and it also allows small space to induce air to circulate throughout the building.

• There are two kinds of wall frame materials. 1) Wood and timber usually have medium mass, moderate weight, moderate heat accumulation and heat absorption and are able to prevent heat loss very well. The wooden boards are nailed with another piece on top to seal the seam. 2) Masonry materials, brickwork with local cementitious products i.e. binder and plaster, this material has a lot of mass and weight. It can accumulate and at the same time absorb heat. Moreover, it can also prevent heat loss. On the other hand, it can keep comfortably cool inside the building.

• The floor is constructed from locally-made materials. The thick concrete floor is 1.00-1.50 m. above the ground. The base is packed tightly with sand and pieces of brick, thus this can contain moisture. The surface is polished. These materials contain high mass and heavy weight. Heat accumulation is high and so is heat absorption. They can keep moisture inside, making it cool and comfortable.

• The ceiling frame is used with buildings that get heat radiation from the roof and it is also used to interior decoration. Natural materials such as wood that has a low mass and light weight with low heat accumulation and low heat absorption are used.

6. Comfort Factors

• The buildings have different temperatures and relative humidity inside and outside. The wind direction and speed can be directed into different parts of the interior.

7. Natural Light

- The interior design of the buildings allows very little light in the area that has been used often, making it difficult to allow activities that require visual capability. Thus, the outside part around the front entrance where there is a lot of light and which is covered by the roof is used for such activities.

8. Users

- The users belong to the same ethnic group but may be different in their tribes, races, nationalities, and ages. They usually wear light cloth but polite when coming to *vihara* and *sim.*

- The seating arrangement inside the buildings provides comfort and convenience for people of different ages and genders.

9. Other Factors Concerning Comfort

- The beauty of the buildings is added by aesthetic decoration with plants and flowers, this also makes it cool and refreshing around the building and reduce light reflection from the ground.

- The humidity in the buildings is reduced by making small opening, and this can also increase the light.

- The heat in the buildings is reduced by components specially designing the western part of the building (Figure 12) which is exposed to the sunlight and heat the most by 1) making it a massive building (especially the *stupa* and *chedi*) with high mass materials. Thick wall of high mass and weight is used so that the cold accumulation in the night-time is high. The heat absorption is also high but it is able to prevent heat loss as it can keep the temperature low inside. Therefore, the wall on this side remains cool and dry, making the whole building cool (Figure 13). 2) The solid western wall, focusing on its width and height, is covered with thick stucco and bricks of high mass and heavy weight. Cold accumulation during the nighttime is high and so is the heat absorption. Its ability to prevent heat loss is also effective (Figure 14). 3) The construction is massive as the pedestal and the Buddha images are huge (Figure 15, 16). 4) The solid materials of the raised floor, which helps reduce heat, have high mass. Other buildings components are placed closely to one another to block the sunlight on the west side. The cold accumulation at night is high and so is its heat absorption and ability to prevent heat loss (Figure 17). 5) All the four walls are solid of high-mass materials with openings for humidity reduction and ventilation (Figure 18).

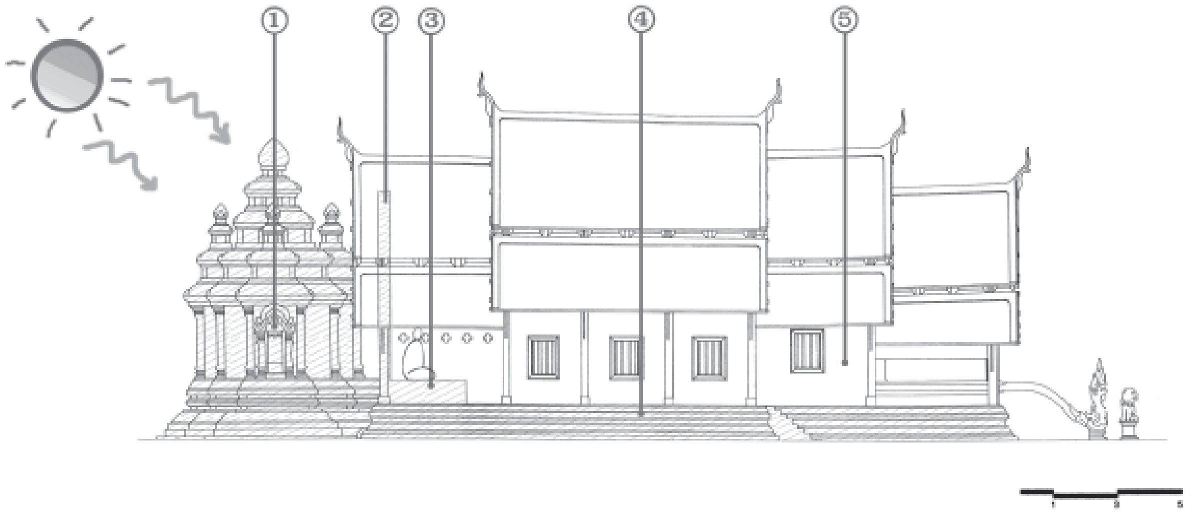

Figure 12. Components of *vihara* or *sim* with specially designing the western part of the building.

Figure 13. Massive building, stupa and *chedi*, in the western part (*vihara* lai kham).

Figure 14. Side voids to allow ventilation and daylighting on side wall (*vihara* lai kham).

Figure 15. Massive pedestal and the Buddha images (*vihara* lai kham).

Figure 16. Massive pedestal and the Buddha images (*vihara* at Wat Prasat).

Figure 17. The raised floor, for reducing heat, from high-mass materials (*vihara* at Wat Prasat).

Figure 18. Opening without panel for humidity reduction and ventilation (*sim* at Wat Sop).

4. Discussion

The knowledge derived from local wisdom concerning architectural adaptation for comfortable living in *vihara* or *sim* in Chiang Mai and Luang Prabang leads to the application to the modern architectural design which is the main objective of this research. The development and application of local wisdom to conserve energy inside the building which can be applied to the modern architecture in Chiang Mai and Luang Prabang is, however, limited by social, economic and political changes including technology and materials in modern times. Medium-size buildings in the city are such as public buildings, and also commercial and office buildings which use modern materials of high mass and strong structure, to serve the function of the buildings during the daytime. Nevertheless, the local wisdom in designing the building can be concluded and able to be applied as follows:

4.1 Site Selection

This involves the surroundings of the buildings. Large or medium-size building in the city, it should be situated on a flat area with enough open space at the front and it should be close to the main thoroughfare. Providing some big trees to give shade to buildings is good since the city can be crowded and full of pollution like noise, air, and heat which makes the city hotter than the suburbs. Moreover, the wind velocity in the urban area is usually low, about one-third of the normal wind velocity. Thus, much more open space can reduce the crowded atmosphere. Planting many more trees and providing many more parks can also help. The ideas about community improvement can be used by location the buildings in the proper wind direction to get the most benefit from the sunlight, breezes and shade as well as the prevailing winds. Trees and some other building structures nearby can be used to disperse and control the direction of the wind.

4.2 Building Orientation

For medium and large buildings in the city, they should be placed in relation to the core transportation route. The gable roof should line up in an east-west direction at 50□-115□ so that the roof will be less exposed to the sun in the afternoon. The building should also be related to the other so that the wind can flow through each of them. Wind and air ventilation will reduce the heat that can affect each building. Relation to the surroundings should be considered also. Big trees on the west, southwest and south can provide nice shade and reduce the temperature inside. Thus, trees are important for buildings. The plan should include planting a variety of trees. Architectural landscaping always makes use of trees to reduce heat and light reflection and provide shade to the buildings. There are three aspects to consider about tree selection: size, height and spacing as when trees grow up, they do not get in one another's ways. Thus, good planning will prevent the surroundings from becoming too packed. Trees give the shade to the ground, improve the surface soil, and provide moisture, making the air cool while reducing smoke, dust, and noise. Therefore, the building orientation and the relationship to other buildings in the premises, the environment, the landscaping can give the most benefit from the natural surroundings to the buildings.

4.3 Building Designs

Large and medium-size buildings in the city are designed to let the wind circulate around to reduce the heat. Also, raising the floor 1.00-1.75 m. above the ground can prevent moisture from the ground and increase ventilation inside the buildings. The areas used the most during the daytime should be the east and north sides which are the least exposed to the sun and heat. The buildings are designed to be open. They are mainly rectangular of 1:3 in an east-west direction affecting the thermal impact allowing rapid heat reduction in summer.

They have a gable roof in an east–west direction with slope of 34°–55° to ensure good rain drainage and to reduce the surface which will be exposed to the sun. The air pocket area under the roof also reduces the heat.

The building heights are making the hot air float up, causing the convection effect. This makes house of 2.50 m. ceiling height less comfortable than the medium–size buildings in the city that are 3.50 m. ceiling height, and less comfortable than public buildings that are 9.00 m. ceiling height. This is because heat accumulating in a small house cannot transfer to the outside and the heat accumulating under the roof also brings much more heat to the house. For this reason, it is preferable to make the room as tall as possible to enlarge the volume of the air that accumulates the heat. It is also necessary to have some kinds of air ventilation devices to let the hot air float up and go out.

The design to make the ventilation opening under the roof able to release the hot air is an efficient way to reduce the heat. The gable roof is good when making holes or latticework to allow the heat to escape from the space under the roof. Sometimes they make small holes to let the breeze come in then go out through the larger holes, causing an air pocket which sometimes reduces the temperature better than a solid wooden board. The area under the roof should not be used for other purposes.

4.4 Shading Devices and Opening Designs

Generally the building has an eave projecting out not less than 1.20 m. with an additional panel. The device effectively blocks the sunlight horizontally. Other kinds of shading devices should be created in accordance with the sun's path and the solar chart. Other minor architectural components and shading devices should be studied to prevent heat radiation from the roof and the wall into the building. The building should have 1) cross ventilation with a French–style window to control the wind to blow into the building at the same level of the inhabitants' bodies, and 2) an adjustable air vent (such as a louvered window or sliding window) to control the direction of the wind into the building. An air vent on the inner wall of about 0.40 m. wide at the same height of the inhabitants' bodies will let the hot air float up. Medium and large–size buildings in the city should make use of stack ventilation by increasing the height of the room, but need to be appropriately designed.

4.5 Building Envelopes and Materials

It is necessary to study and focus on the quality of the construction materials, color and type first. This will solve problems related to the heat from the sun to the building by means of 1) conduction through the wall, 2) convection, and 3) radiation, either by short wave or long wave through the structure frame, wall, and floor. Modern kinds of materials that have low mass, accumulate less heat, and have low heat conduction should be used. The materials, for wall and ceilings in particular, should be able to prevent high degree of heat or heat radiation by convection from the roof. The modern building materials can prevent heat transmission either by conduction or convection, which affects the average temperature around the area. Thus, these factors should be considered for material selection.

Medium and large–size buildings in the city in the old days mostly used high–mass materials for high heat accumulation and heat conduction. Nowadays, modern kinds of materials with high mass, heavy weight, high heat accumulation, and heat convection that can prevent an extreme heat are used. Thus, material selection must be related to the designs of the building functions. For example, high mass material (reinforced concrete) is used for an elevator core, a stairway, a sheer wall, and a pipe liner on the west side. The rooms on the south side, which are used less such as storage rooms and bathrooms, can use other kinds of modern materials for various purposes. A vent or a hole to allow natural light to come in is made in the north side and on the east wall.

4.6 Comfort Designs

The data shows that the local intelligence can create the comfort zone in the building by making use of the moisture and the coolness from the ground. However, it also shows that in the study area, the temperature and relative humidity of the weather outside the building cannot be controlled all day long because the enthalpy, or the energy accumulation in the air, comprising sensible heat and latent heat, cannot be controlled by means of passive design, with the local intelligence, but by active design, or modern technology. Therefore, it is necessary to adopt and adjust modern technology to reduce the temperature and moisture at certain periods of the day.

4.7 Daylighting Designs

The problem of passive design for using natural light in the building such as skylights and other types of devices to control the level of light has been solved by using new kinds of materials and colors. Nowadays, the building can be used for general purposes without using additional electric lights. Thus, additional lights are used only when it is necessary.

4.8 User Behaviors

The users of buildings in Chiang Mai and Luang Prabang, consisting of people of different ethnic groups, races, nationalities, and ages, can adapt themselves by wearing light and comfortable clothes according to the seasons and avoiding wearing western-style clothes in the summer. Moreover, they can pursue a simple lifestyle and adjust their activities so that they can reduce the use of energy in the buildings.

4.9 Other Considerations

The indigenous people can increase the degree of coolness to their bodies by using water jars for drinking, washing their feet or for water storage. Having a well on the premises can also help. Thus, there are various sources to create natural coolness to reduce the body temperature to feel fresh and avoid thirst and dehydration. Another means of pleasant feeling is to plant trees, flowers or vegetable gardens around the areas by their local landscaping skill. Some people also install umbrellas, awnings, and curtains which can be temporarily used or adjusted due to the sun's position or the seasons. These are local wisdom or intelligence that can be adapted and modified for functions as well as aesthetic purposes.

5. Conclusion

The local intelligence and vernacular architecture for comfort in *vihara* in Chiang Mai or *sim* in Luang Prabang can lead to the development for architectural design in the two cities. This research is based on the awareness of the importance of the local wisdom which proves that it is necessary to review the gist of knowledge in all nine aspects of architectural design previously mentioned. It was found that the vernacular architecture derived from local intelligence which makes use of the relationship of the knowledge and the surrounding to create appropriate thermal comfort can be applied to modern architectural design in order to conserve energy in buildings. The designs used are a combination of conventional design, passive design and active design which are appropriate for the social, economic and political changes.

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