THE SPATIAL STRUCTURE OF COOKING AND SLEEPING AREAS IN CONTEMPORARY THAI HOUSES

The aim of this study is to clarify the spatial structure of contemporary Thai houses. It focuses on the arrangement of cooking and sleeping areas, which have been functional areas since the traditional time. Firstly, the characteristics of traditional houses are described. Secondly, the spatial arrangement of contemporary houses is examined. Finally, the compositional aspects between the traditional and contemporary houses are compared and referred in terms of social and environmental factors. The findings show that the cooking space in contemporary houses are designed as enclosed kitchens and as connecting areas of additional functions. In addition, sleeping areas in the contemporary houses are generally designed as tightly enclosed spaces for each unit and the bed heading situated away from west which is similar with the interdiction in traditional houses.

Keywords: Cooking area, Sleeping area, Spatial structure, Thai, Contemporary house

1. Introduction
1.1. Background and purpose
Over the decades, the design of contemporary Thai houses reflects Thais’ life styles and can be divided into 2 main designs. Firstly, the houses constitute a modern adaption from many traditional Thai elements such as stilt house, gable roof and terracing more than half floor as semi outdoor space. Secondly, the houses are influenced by international styles. Simple cubical shape seems to be highly popular in this type of Thai houses. Architects generally play an important role in dwelling design with these different approaches.

This research aims to clarify characteristics of the spatial structure of traditional and contemporary Thai houses by the analyzing of cooking and sleeping areas, which are fundamental functions for Thais’ life. The analysis stated from the above design background situation and develops to a hypothesis which is, even if physical characteristics in contemporary houses seem different, the spatial structures might have similarities because of their contexts which are the culture and the environment.

1.2 Methodology
A study focus on spatial structure of single family detached houses type. The traditional and contemporary houses were collected for analytical process by followings.

1. The analyses of the traditional houses’ characteristics are presented in terms of timeline, regional characteristics and common features.

2. The arrangement of function is implemented to describe cooking and sleeping areas which are functional areas in Thai contemporary houses since the traditional time. We clarified all data by the parameter of average size, ratio, sequences, main surface and sleeping direction.

3. The composition aspects of spatial arrangement between traditional and contemporary were compared in this section. The relationship between traditional and contemporary houses was also investigated and how spatial design affected socially and environmentally.

1.3 Relevancy
The studies revealed houses spatial structure in Asian countries. For the spatial structure of traditional houses, the characteristics of living space in wooden houses, the characteristic of floor plan in traditional high ridge-houses and the spatial characteristics of traditional houses in functional basic activities, which are living,
receiving guest, cooking, dining and sleeping were studied. These studies suggested spatial structure that is relevant to traditional house interior space study.

For the spatial structure of contemporary houses, the characteristic of space in 3 stories detached houses, the spatial organization in contemporary multiple dwelling units and the arrangement of interior elements in contemporary houses have been investigated. The findings showed the relevancy of spatial structure in contemporary houses.

A wide range of literature reviews investigated factors which effect on contemporary Thai houses. Tanaka et al., explained that the core housing space which is defined by residents as extension of activities and also analyzed multipurpose spaces in Thai houses. Wongphyat and Chiranthanunt et al., reviewed the space arrangement and the evolution in Thai dwellings from different dwellers as Thai-Islamic and Kaloeng ethnic tribes. Tommit et al., evaluated self-built metamorphosis which also represented the basic space arrangement in low-income houses.

Cooking and sleeping areas are fundamental features of houses, yet there has never been a thorough study on their arrangement. This study will investigate their arrangement by analysing from architectural design resources.

2. Spatial characteristic of the traditional houses

Data have been gathered from 2 main books which are ‘The Thai house: History and Evolution’ and ‘Architecture of Thailand: A Guide to Tradition and Contemporary Forms’. An interpretation of traditional houses was shown as the following.

2.1 Timeline of Thai houses

During the first period of the Chakri dynasty monarchy (King Rama I-III), the populations had moved from the old city Ayutthaya, which has been destroyed from the war to settle in Bangkok. The spatial structure of traditional houses consists of a continuous flow of space, no interior walls or ceiling. Therefore, maximum air circulation could be maintained and ventilated through the roof as shown in Fig.1.

Afterwards, there was the turning point of the Rattanakosin era in the preceding boom of Western civilization during the period of King Rama IV (1851-1868). Spatial organization began to build houses as a complete structure unit of two levels. The specific functions defined by interior walls. Many Thai architects returned home after study abroad in the period of King Rama VII. This was the first period to integrate western concepts with Thai culture.

Consequently, domestic architecture became more rational and compact with minimal spatial requirements. This change was seen clearly in the latest period of King Rama IX after the first Thai National Development Plan in 1961. Currently, architects integrate Thai culture and modern equipment with new ideas for residential design.

2.2 Regional characteristics

Although there are 4 main regions, the main obvious evolution of Thai houses were running on the central region. The definition of traditional house in this research is principally defined based on this area.

Traditional houses in a central region have varied categories, the one which represents authentic traditional style from early Chakri dynasty monarchy (King Rama I-III) era is “Tub Khwan Palace” as shown in Fig.1. The house is an example of an existing traditional Thai house with full features without influences from other countries neither adaptations from modern life. Even Tub Khwan Palace is the house of a wealthy family, initially required functions and features quite similar as single family detached houses which are illustrated in Fig.2.

![Fig.2 Spatial structure of traditional houses](image-url)

**Fig.1 Timeline of Thai houses in Chakri dynasty monarchy or Rattanakosin era (period of King Rama I-IX, 1782-2015)**

- **1782**
  - King Rama I
  - Important historical events: Chinese immigrants came to advocate country’s economy in trading sector.

- **1851**
  - King Rama IV
  - Starting point of Westernization.

- **1868**
  - King Rama V
  - New era of Western civilization. Royal princes educated from Europe.

- **1910**
  - King Rama VI-VII
  - Extra room, etc.

- **1934**
  - King Rama VIII
  - Extra room, etc.

- **1946**
  - King Rama IX
  - Extra room, etc.

- **2015**
  - King Rama X
  - Extra room, etc.

- **2015**
  - King Rama X
  - Extra room, etc.
2.3 Common features

In terms of spatial configuration, the archetype of traditional single family detached house has two most important enclosed areas\(^6\), which are cooking and sleeping areas as shown in Fig. 3.

Cooking areas are contained on two spans post for functions of kitchen and dining having 3.00 – 4.50 meter wide (avg.3.75m.) and 5.00 – 7.50 meter long (avg.6.25m.). The average area is 23.43 sq.m. The position of the cooking areas are located in the north part of the houses.

Sleeping areas are comprised on 3 spans post for connection, hall and bedding, have 3.00 – 4.50 meter wide (avg.3.75m.) and 7.50 – 9.00 meter long (avg.8.25m.). The average area is 30.93 sq.m. There are beliefs that sleeping areas should not be located in the west direction and the bed head should situated away from west direction.

3. Arrangement of functions in contemporary houses

3.1 Classification analysis of case studies

The classification process was made by investigating the similarities in space arrangement of cooking and sleeping areas.

Case studies of contemporary houses collected from the small and medium houses book\(^9\) no. 1-3\(^{2,20,20} \) which contain compilation of 92 contemporary Thai houses during 2000 to 2015. Case studies are chosen on a major group of similarities conditions as following.

1) A study focus on the houses which are designed and completed during 2000 - 2015.
2) Daily houses which are located in high-density residential areas of the central region including Bangkok and the vicinity areas. The case studies’ locations\(^a\) are illustrated in Fig.4.
3) A detached style houses which is the highly popular and suitable for single family.
4) A 2-storey house which is the majority of houses type in Thailand.
5) A house with an overall area was less than 800 sq.m., which is the extensive size for single family detached houses.

Twenty-nine case studies\(^b\) are selected based on informations in drawings and photos. The case studies can be classified into 2 main groups of cooking and sleeping functions. The ideas and the definitions of each unit are represented in Fig.5.

Cooking areas consist of 2 main areas which are the basic function of kitchen and additional functions such as pantry, dining and living. The cooking space, in some case studies used open function of kitchen and additional functions such as pantry, dining and living. The cooking space, in some case studies used open space or terrace to connect two functions.

Sleeping areas\(^b\), consist of 2 main areas which are bedding unit and additional functions as walk-in closet, closet and W.C.

3.2 Classification analysis of cooking areas

Regarding the main idea of cooking and sleeping area in contemporary houses as represented in Fig.5, we grouped the case studies using their similarities of the units which shown in Table 1 as the following descriptions.

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**Table 1 Case studies classified by main functions**

<table>
<thead>
<tr>
<th>Cooking area</th>
<th>Sleeping area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooking area</td>
<td>Sleeping area</td>
</tr>
<tr>
<td>C1</td>
<td>C1</td>
</tr>
<tr>
<td>C2</td>
<td>C2</td>
</tr>
<tr>
<td>C3</td>
<td>C3</td>
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<tr>
<td>C4</td>
<td>C4</td>
</tr>
</tbody>
</table>

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**References**

1. Starting point of Westernization. Siamese (Thai) Architects.
2. Cases studies of contemporary houses collected from the small and medium houses book\(^9\) no. 1-3\(^{2,20,20} \).
3. Even Chaichongrak et al., literature provides information of traditional houses in early Chakri dynasty monarchy era into 4 main regions and shifted to 6 regions from 1977 to present.
4. Focus group of this study in traditional and contemporary houses are located on the same area as central region.
Cooking area comprises with a fundamental function, which is the kitchen, and additional functions, which are pantry, dining, living. Furthermore, there are connecting spaces around all areas. The cooking area can be categorized into 4 groups: C1 – C4 based on function that separated by partitions or walls. The cooking areas configuration are explained in Table 2.

Group C1, detached units means that each one was separated by wall or partition which were connected between space by doors. There are four detached functions which are kitchen, pantry, dining, and living area. The average area of living space was 45.53 sq.m, which is the highest proportion compared with other detached functions.

Group C2, the kitchen unit separated from connecting areas. The majority of cooking areas of case studies in our research (19 out of 29 cases) are categorized into this group. The spatial arrangement in group C2 can also be separated into three groups (C2.1, C2.2, C2.3). The group C2.1 which is kitchen unit was separated from connected areas between pantry dining and living area is on highest demand type. The ratio of continuous area between pantry dining and living space of the group C2.1 was 80% of the whole area. It will be the highest proportion of this group.

Group C3, connected area without basic function of kitchen. The pantry, dining and living areas are connected continuously.

Group C4, pilotis space (opened space) which are connected with either transparent partition or wall, those functions are located in stilt areas under the second floor. Only two cases (out of 29) are categorized into this group. Therefore, this group may not be the main character in contemporary houses.

These findings suggest that users prefer to provide enclosed space for dwelling functions.

Table 2 Space configuration of cooking area

<table>
<thead>
<tr>
<th>Group</th>
<th>Functions Arrangement</th>
<th>Details</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Detached units.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2.1</td>
<td>Kitchen unit separated from connecting area between pantry and dining and living space.</td>
<td>Avg size(Sq.m): 28.28</td>
<td>1st floor plan of case study no. 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ratio (%): 35</td>
<td>1st floor plan of case study no. 13</td>
</tr>
<tr>
<td>C2.2</td>
<td>Kitchen unit separated from connecting area between pantry and dining space.</td>
<td>Avg size(Sq.m): 28.28</td>
<td>1st floor plan of case study no. 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ratio (%): 35</td>
<td>The kitchen unit often be the basic function of cooking area.</td>
</tr>
<tr>
<td>C2.3</td>
<td>Kitchen unit separated from connecting area between dining and living space.</td>
<td>Avg size(Sq.m): 28.28</td>
<td>1st floor plan of case study no. 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ratio (%): 35</td>
<td>The kitchen unit often be the basic function of cooking area.</td>
</tr>
<tr>
<td>C3</td>
<td>Connected area between pantry and dining space.</td>
<td>Avg size(Sq.m): 28.28</td>
<td>1st floor plan of case study no. 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ratio (%): 35</td>
<td>The kitchen unit often be the basic function of cooking area.</td>
</tr>
<tr>
<td>C4</td>
<td>Pilotis space and compound space of pilotis and enclosed area.</td>
<td>Avg size(Sq.m): 28.28</td>
<td>1st floor plan of case study no. 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ratio (%): 35</td>
<td>The kitchen unit often be the basic function of cooking area.</td>
</tr>
</tbody>
</table>

*Main Surface means that its space orientation is touching exterior surface.
3.3 Classification analysis of sleeping areas

The process to categories sleeping areas are categorized and showed in the Fig.5. The sleeping areas include basic unit which is bedding and additional functions which are closet, walk-in closet and W.C. The sleeping area configuration was categorized and analysed as illustrated in Table 3.

Group S1, detached units of bedding, walk-in closet and W.C., each one was separated by wall. This group is the most common of the contemporary houses in our case studies (22 out of 29). The bedding area was the most important proportion which took 51% of the overall sleeping area.

Group S2, connected area between bedding, closet and detached unit of W.C. The connected space between bedding and closet as 75% and 25% of W.C.

Group S3, connected area between bedding and closet area without the W.C. This group was rarely found in the master bedroom of contemporary houses. An average area of S3 was 17.12 sq.m. which consist of bedding and such a furniture like closet.

4. Comparison of spatial arrangement between traditional and contemporary houses

The contemporary houses generally are larger than the traditional houses. The cooking area in contemporary houses was 82.24 sq.m. but in traditional houses the area was only 23.44 sq.m. The contemporary houses sleeping area was 45.91 sq.m. and 30.93 sq.m. in traditional houses, this shows the larger area. More details of 2 house types are described as the following.

4.1 Arrangement of functions in cooking area

The cooking area in the contemporary houses generally has larger size than traditional houses because the dining area is

Table 3 Space configuration of sleeping area

<table>
<thead>
<tr>
<th>Group</th>
<th>Details</th>
<th>Functions Arrangement</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Detached units.</td>
<td>Connected space between bedding, closet and detached unit of W.C.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avg size (Sq.m)</td>
<td>Ratio (%)</td>
<td>Sequence</td>
</tr>
<tr>
<td></td>
<td>23.56</td>
<td>51.32</td>
<td>-</td>
</tr>
<tr>
<td>S2</td>
<td>Connected space between bedding, closet and detached unit of W.C.</td>
<td>Connected space between bedding, closet and detached unit of W.C.</td>
<td></td>
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<tr>
<td></td>
<td>Case 10, 14, 15, 19.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avg size (Sq.m)</td>
<td>Ratio (%)</td>
<td>Sequence</td>
</tr>
<tr>
<td></td>
<td>33.70</td>
<td>74.86</td>
<td>-</td>
</tr>
<tr>
<td>S3</td>
<td>Connected space between bedding and closet.</td>
<td>Connected space between bedding and closet.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Case 12, 23.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avg size (Sq.m)</td>
<td>Ratio (%)</td>
<td>Sequence</td>
</tr>
<tr>
<td></td>
<td>17.12</td>
<td>100</td>
<td>-</td>
</tr>
</tbody>
</table>

*Main Surface means that its space orientation is touching exterior surface.

Cooking Area | Spatial Structure | Sleeping Area
--- | --- | ---
**Less enclosed (more open)**
- Connected area with blur span boundary
  - social environment
  - natural environment
  - Dealing between activities and open spaces
  - increased family and out of door relationships
  - natural factors such as lighting and ventilation

**Less enclosed (more open)**
- Connected area with clear wall and the blur of furniture boundary
  - social environment
  - natural environment
  - Dealing with activities and the combination with connected and detached space
  - increased family relationships
  - natural factors such as lighting and ventilation

Contemporary house
- First floor
  - walk-in closet
- Second floor
  - Closet
  - Dining/Living

Tightly enclosed (detached)
- Detached units with clear wall boundary
  - social environment
  - natural environment
  - Dealing with activities, orientation and prescribe
  - decreased family relationships
  - controlled natural factors such as lighting and ventilation

Fig 6 The comparison and transformation of spatial structure in Thai house
transformed to connect the space of the pantry, the dining and the living as shown in Fig. 4, in which contemporary cooking area is 82.24 sq.m. and traditional cooking area is 23.44 sq.m.

The proportion of cooking area in the traditional houses comprises of two spans, which are spans for kitchen (50%) and span for dining (50%). On the other hand, the contemporary house had connected area of additional functions of pantry, dining and a living by approximately four times bigger than the traditional houses (66.15 sq.m. and 17.72 sq.m.), the ratio of that area was only 20% for kitchen and 80% for additional functions.

4.2 Arrangement of functions in Sleeping area

An average size of sleeping area in the traditional houses were 30.94 sq.m. which were smaller than in the contemporary houses (45.91 sq.m.). A possible explanation for this might be that they include different functions into the sleeping areas. Moreover, the 93.10% of the contemporary Thai house (27 from 29) in our case studies have private W.C. inside sleeping areas.

In term of living habits, the traditional houses will not head the bed into the west direction because the west is thought to be inauspicious as the direction of deaths and evil spirits. In addition, bed heading of contemporary houses situated away from west which is similar with the taboo in contemporary houses as well.

4.3 Transformation of spatial structure in Thai houses

In order to understand the essential characteristics of Thai houses, this research compared the differences between the traditional and contemporary houses.

For the traditional houses, theirs main position of functions are located on the second floor over the stilt area. The main concept of spatial structure in traditional houses is less enclosed (more open). The traditional houses generally consist of continuous space while contemporary houses basically use interior wall as a space separator. The core idea of the less enclosed concept is that the space tries to encourage more activities outside not only for domestic relationship but also outdoor relationships. Moreover, the traditional characteristics were designed to handle natural environments such as lighting and ventilation.

The main spatial structure of traditional houses characteristics showed that the function of cooking and sleeping areas were affected by the range of span. For example, cooking area was designed within two post span for function of kitchen and dining.

For the contemporary houses, its functions is seperated to first floor for cooking area and second floor for sleeping area. The main concept of spatial structure of the two focused groups have different directions. The cooking area is designed in the less enclosed (more open) same as in the traditional cooking area. The sleeping area is designed in more tightly enclosed (detached) for each function.

The main spatial structure of contemporary houses were based on enclosed space as show in Fig. 6. The enclosed can encourage more private space for family members but not to the neighbourhood neither with the environment interaction.

In addition, the sleeping areas were designed as detached units, in Fig. 7 which showed that the contemporary houses require more tightly enclosed space for each functions.

5. Conclusion

This research investigated spatial structure of cooking and sleeping areas in contemporary Thai houses. The findings of these study provide disciplines and explanations of the conceptual design of domestic architecture by Thai architects under their local context. These informations are important to inform design guidelines in the field of Thai domestic architecture which is not only for architects but also inhabitants.

Three main findings are demonstrated as follows.
1) Traditional Thai houses were designed with notable characteristics which provide less enclosed areas (more open areas). A specific enclosed areas encourage users to do outdoor activities which seem to encourage the relationship between people to people and people to environment. Proportions of enclosed indoor areas (cooking and sleeping) compared with open outdoor spaces (verandas and terraces) are 40% to 60% of the overall area. According to this proportion, dwellers could have more social activities at on outdoor spaces which is on obviously aim of architectural response their habit and climate.

Moreover, the spatial structure reflected cultural values such as taboos about death and orientation.
2) The spatial structure of contemporary houses generally are enclosed areas. In case of cooking areas, the continuous space
allocated additional functions in cooking areas was the highest proportion of the whole area (80%). Otherwise, the sleeping areas were commonly designed as detached units. However, the bedroom units in the contemporary houses are smaller than in the traditional houses because the contemporary houses need more tightly enclosed spaces for air conditioning and specific functions such as walk-in closet and W.C.

3.) There are varieties of spatial structure of contemporary houses. The mostly designed related on activities and orientation but in the term of the boundaries which are used for separate spaces are slightly different from traditional house.

However, we have not applied the whole approach to identify the typology of contemporary houses. Moreover, future research which will investigate concepts of design for other features such as open space of terrace or roof form of Thai houses are needed. Lastly, it would be interesting to assess airy space areas which are the characteristic of tropical architecture.

Note
i) Single family detached house is the focusing house type in this study. The house was defined in traditional literature as Nuclear family single house which mean ‘house for a husband, a wife and unmarried children’. More detail of this house type is illustrated in Fig.3.
ii) Consult reference 6): the house(Tub Kwan palace)was built in King Rama VI period. The design concept came from the authentic characteristic in King Rama I-III period.
iii) The book is highly outstanding in Thai architectural profession and society. The selection and publication process were supported by professional architects, architectural company and the Association of Siamese Architects under Royal Patronage (ASA) which is the honorable architects community in Thailand.
iv) Case studies came from central part of Thailand which are Bangkok and Vicinity area(Samut Prakan, Samut Sakhon, Nakhon Pathom, Nonthaburi and Pathum Thani.)
v) Information of 29 case studies.

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19) Tiptus,P.: Rathathanakosin Houses in the Period of King Rama I-X, 1782 - 1851, CU print, 2002
和文要約

本研究は、タイの現代住宅を対象に、調理と就寝の領域からみた空間構成の特徴を明らかにすることを目的としている。その成果は、タイの建築家による当地の文化的な背景との応答の中で、住宅デザインのコンセプトに関する適用や発展を含むものであり、また、建築家やデザイナーだけでなく居住者に対して、タイ国内の建築における設計指針を示すものである。

研究の方法：はじめに、伝統的な住宅に関して、歴史的な経験や地域性を観察し、特に一家族のための住居を共通する特徴という観点から分析される。次に、現代の住宅の調理および就寝の領域における機能の配置の特性が、全体的な利用目的、比率、配列、主要な壁面およびベッドの位置に関する分析を通して詳細される。最後に、伝統的な住宅と現代の住宅の空間構成の比較検討を通じて、空間デザインと社会や環境との影響関係が考察される。

結論：
1) タイの伝統的な住宅には、囲まれ方がより少ない（領域がより開放的）という明確な特徴がある。このような領域は、居住者の屋外での活動を促進し、人と人、人と環境の関係を推進する。さらに、その空間構成は方位やタブーを含む人々の生活文化からの影響を受けている。
2) 現代の住宅の空間構成は、囲まれた領域の配置に特徴がある。調理の領域では、囲まれた領域としてのキッチャンが、付加的な機能を持つひじょうりの空間に隣接するという配置が最も多くみられる。中でも該当数が多いのは、バントリー、ダイニング、リビングの組合せと隣接する形式であり、これら付加的機能の大きさは調理の領域全体の80%と、最も大きな割合を占めている。一方、就寝の領域では、各機能が独立して配置される形式が一般的である。現代の住宅は、伝統的な住宅と比較して寝寢の単位が小さい。これは空調のため、あるいはウォークインクローゼットや水まわりといった特定の機能のために、囲まれた空間がより必要となっているからである。
3) 伝統的な住宅の設計コンセプトはアイデンティティであったが、現代の住宅には、調理の領域における開放性、就寝の領域における閉鎖性（独立性）という多様な空間構成がみられる。しかし、現代の住宅は、概ね伝統的な知恵に基づいて設計されていることが確認された。

これらの結果は、タイの現代の住宅における調理と就寝の領域が、伝統的な知恵に基づいたコンセプトによって設計されていることの証たるものである。また、本研究では、調理と就寝という主要な生活機能に着目し、現代住宅の空間構成における類型を検討したが、地元の地域性に根ざした住宅設計の特徴を考察する上では、他の領域（テラス、ガレージ、リビングルーム等）の検討も可能であり、今後の研究により明らかにしていく予定である。その成果は、熱帯地域の建築の特徴である、屋外環境に対して開放的な空間の特性を理解する上で有用な知見を与えるものと考える。