

Building Technique for Designing and Constructing Traditional Community Houses of Katu Ethnic Minorities in Central Vietnam

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ABSTRACT: The traditional community house named “*Guol*” is a unique architecture of *Katu* ethnic minorities living in mountainous areas of central Vietnam. The reconstruction project of the *Katu* community house exemplifies that vernacular architecture is constructed using matured and conserved local resources such as natural, human, and intellectual resources. As an intellectual resource, body-based units of measurement are an important part of building knowledge and techniques. This research is consequential for disclosing the intangible local resources of the classification and application of units to understand the nature of vernacular architecture. Research in three communes revealed that the *Katu* people use 17 types of basic body-based units of measurement for design and construction. Building forms with timber structures are developed by combinations of arm-based units, and the sizes of the main building materials are determined by combinations of hand-based units.

1. Introduction

1.1. Vernacular architecture and local resource

Katu ethnic minorities inhabit the mountainous areas of the Thua Thien-Hue Province and the Quang Nam Province in Vietnam, whose population was approximately 59,000 in 2009 (Trần, 2009). The *Katu* people had been living to originally locate a community house in the center of the village, surrounded by family houses in mountains. However, the traditional village layout is changing in the modern context, and also traditional community houses are disappearing in that regard.

The *Katu* traditional community house, locally named “*Guol*,” was reconstructed by mostly original methods through a JICA project¹ in the Hong Ha Commune, Thua Thien-Hue Province. The villagers completed their first traditional community house since the end of the Vietnam War in 1975, as they had to alter their living conditions because of post-war relocation and had no opportunity for construction.

The records of the construction processes and measurements of the house were previously published, explaining the large amount of indigenous knowledge in village elders (Kobayashi, 2008). The entire process, from material collection in the forest to on-

¹ GSGES, Kyoto University and CARD, Hue University of Agriculture and Forestry cooperated with the rural development from Oct. 2006 to Sept. 2009, funded by the Japan International Cooperation Agency (JICA). Participatory construction of the traditional community house in the mountainous village was one of main activities in the project. The house was completed in Sept. 2007

site construction, demonstrates that vernacular architecture is constructed using three local resources that were matured and conserved in the locality: natural resources (building materials); human resources (community cooperation); and intellectual resources (knowledge and technique).

The traditional community house in the Hong Ha Commune appeared to be spiritually important for the villagers. Because they still utilize it in the modern context, these three resources should be maintained. However, in recent years, the limitation of forest resource, changes in life style and housing style, and other related issues render this preservation difficult.

1.2. Role of human body for design and construction

It was determined that village elders use body-based units of measurement for design and construction, which plays a crucial role in indigenous knowledge², by the research in three *Katu* communes (Figure 1) of Hong Ha Commune (HHC), Thuong Quang Commune (TQC), and Thuong Lo Commune (TLC) (Kobayashi, 2010, 2012). The body-based units can be regarded as one form of the intellectual resources. They are vital in designing a building form, sharing the measurement information for cooperative construction, and obtaining suitable-sized trees in the forest. The knowledge is transferred from generation to generation not only through the experiences of construction but also often in daily life. For example, villagers can understand the scale of a rice field using footsteps; they use the circular length of a head to determine the height of a rice mortar, and they compare foot lengths with animal footprints on the ground. The conventional lifestyle forms the basis for learning most of the body-based units, and this knowledge is quickly disappearing because of changes in their life, such as modernization. Regarding this context, this research is meaningful in revealing the intangible local resource of the classification and application of units to understand the nature of vernacular architecture.

² Interviews with village elders and a measuring survey of the houses were conducted. The field surveys were conducted in the Hong Ha commune (HHC) in July 2008 and August 2009, and in the Thuong Quang Commune (TQC) as well as the Thuong Lo Commune (TLC) in September 2008 and March & August 2011.

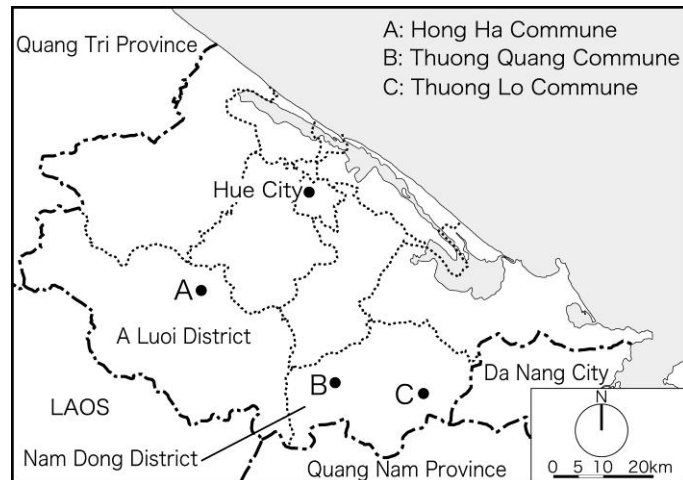


Figure 1: Location of researched communes

2. Features of Katu community houses

2.1. Architectural form

- **Floor plan:** the community houses in TQC and TLC have a typical floor plan with a pillar arrangement and a tortoise-shaped floor, whereas the community house in HHC is composed of a rectangular floor plan and is three spans longer (Figure 2). In TQC and TLC, there are six pillars in the center part as well as in the circular parts because the number six is considered to be good luck for the *Katu* people (Nguyễn, 2003). The interviewed villagers in three communes explained that the number of pillar spans is flexible depending on the required space, and hence, the pillar arrangement in HHC is also rooted in tradition.

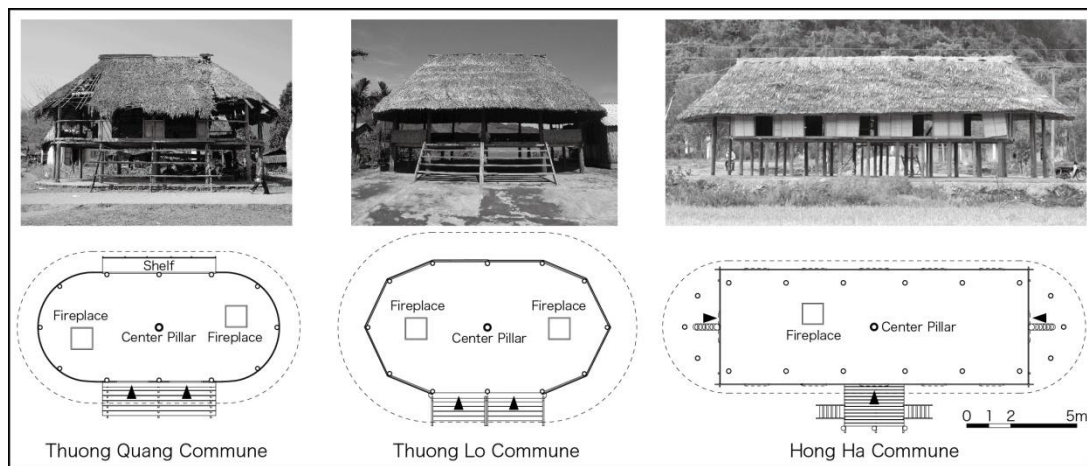


Figure 2: Researched commune houses (photos by the author)

- **House dimensions:** the floor height is generally low, at approximately 1.0–1.5 m; this is done traditionally because enemy attacks have occurred from under the floor in the past. The height of the topmost part roof is 6.0–8.0 m (Lê, 2002). The community house in TLC conforms to the conventional floor height, whereas the floor levels in TQC and HHC

are 2.0 m in height to facilitate modern functions such as motorbike parking. As for the roof height, all three community houses are approximately 7.0 m, and the slope of the roof is nearly 45°.

- **Architectural elements:** some researchers hypothesize that the appearance of the community house symbolizes a buffalo, which is a sacred animal for the *Katu* people (Lê, 2002, Nguyễn, 2001). A center pillar is one of characteristic elements in *Katu* community houses. As determined from the interviews in TQC and TLC, the center pillar represents a village leader or fatherliness, and the villagers perform rituals in a circle around it. Moreover, buffalo horns symbolize a leader, which is often displayed on the pillar, as in TLC. Wooden bird sculptures are displayed on the center pillar and buffalo horns are displayed on some main pillars in TQC.

2.2. Construction techniques

Figure 3 shows the construction process and the joint details of the community house in TQC. The numbers 1 to 26 in the figure indicate the construction order according to the interview. The construction process is reasonable in terms of the joint system and workability. Traditional construction tools, machetes and axes, are hand-operated, and consequently the finished shape is a round timber and simple joint parts. The community house in TQC mostly follows the conventional methods, but partially applies a developed technique for square-sectioned timber and hole joints.

3. Building design using human bodies

3.1. Body-based units of measurement

The human body building design is memorized as indigenous knowledge and is transferred from generation to generation. Villagers decide on a form and arrange the components and the size of materials based on the human body. They use their body directly for measurements or a wooden stick that replicates body parts as a temporary ruler. The standard module is usually based on the body of a construction leader. According to the interview in HHC, a villager with a healthy body and an average height provides good luck for construction.

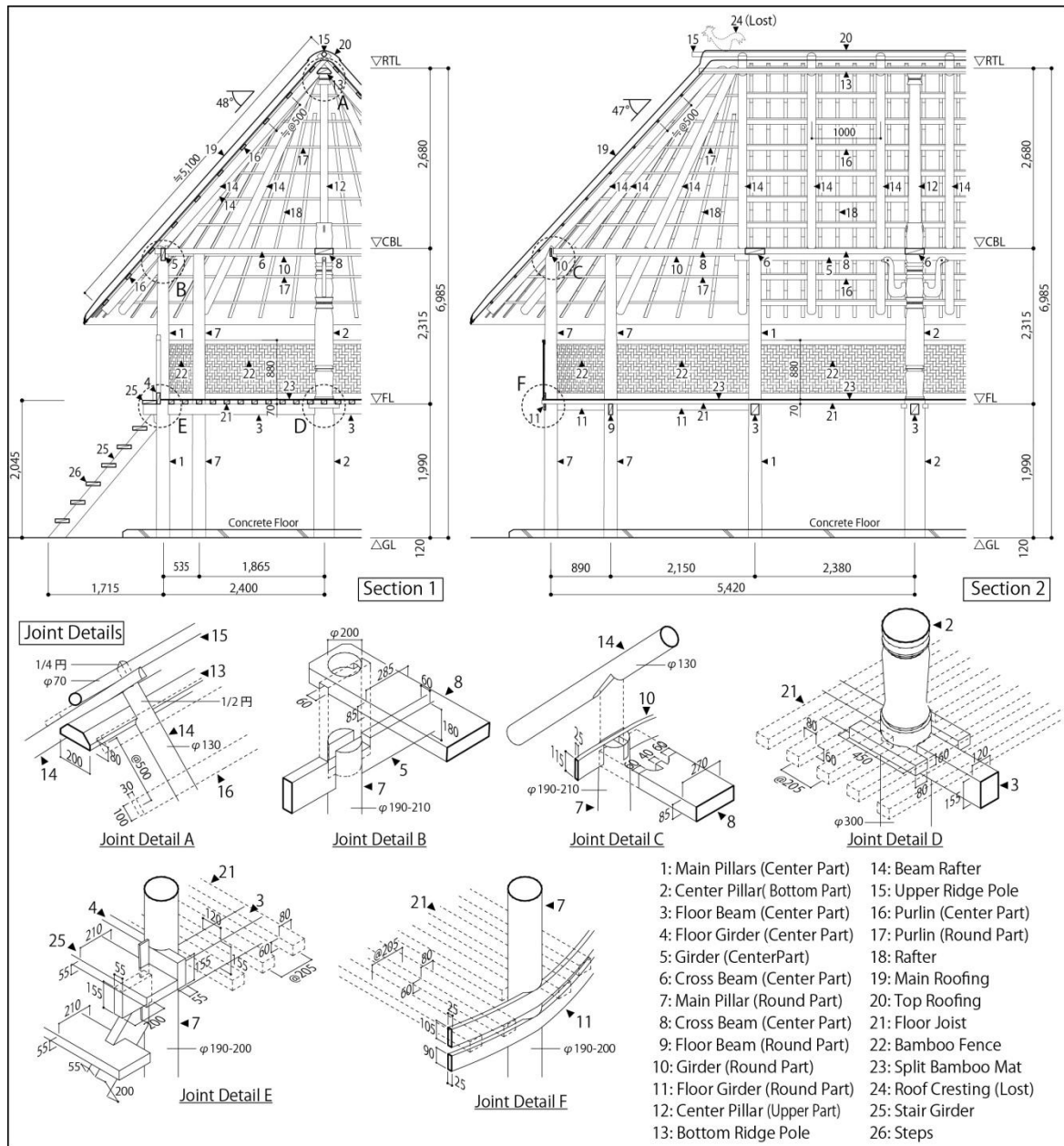


Figure 3: Construction process and joint details of the community house in the Thuong Quang commune

Table 1 and Figure 4 show the classification of the body-based units of measurement with the name and the measured length of each unit, expressing A-1 to A-7 for arm-based units and H-1 to H-10 for hand-based units. The various units can cover lengths from 2.5 cm to 160 cm. The body height of construction leaders in the three communes, which is the standard module for units, is approximately 150 cm. This is the average height of the *Katu* people.

The three communes utilize the same 17 types of units, although some names are different because of strong local tongue (Gray colored boxes in Table 1 are the same name). The Ngoc Tu Commune, the residence of the *Sedang* ethnic minorities who reside in Kom

Tum and Quang Nam south of the *Katu* area, employs mostly the same types of units, but without H-8 and H-9.

Table 1. Body-based units of measurement in three *Katu* communes and one *Sedang* commune

| Ethnic | | | <i>Katu</i> | | | <i>Sedang</i> |
|---------------------------------|----|------|-----------------------------|----------------------------|---------------------------------|-----------------------------|
| Commune | | | Thuong Quang | Tuong Lo Commune | Hong Ha Commune | Ngoc Tu Commune |
| Body height | | | 153 cm | 150 cm | 152 cm | – |
| Body-based Units of Measurement | 1 | A-1 | <i>Achiêng</i> (161 cm) | <i>Achiêng</i> (150 cm) | <i>Achiêng</i> (156 cm) | <i>Plei</i> (160 cm) |
| | 2 | A-2 | <i>Ka chi</i> (121 cm) | <i>Ka chi</i> (115 cm) | <i>Kieng</i> (120 cm) | <i>Môi pa cha</i> (123 cm) |
| | 3 | A-3 | <i>Chang achắc</i> (102 cm) | <i>Chang achắc</i> (93 cm) | <i>Zang achắc</i> (94 cm) | <i>Ta đê plei</i> (100 cm) |
| | 4 | A-4 | <i>Ta hong lom</i> (80 cm) | <i>Ta hong lom</i> (73 cm) | <i>Achorlom</i> (78 cm) | <i>Môi pa cho</i> (84 cm) |
| | 5 | A-5 | <i>Sállóoc</i> (62 cm) | <i>Sállóoc</i> (62 cm) | <i>Sállóoc</i> (61 cm) | <i>Môi xoh</i> (67 cm) |
| | 6 | A-6 | <i>Ka pang</i> (41 cm) | <i>Ka pang</i> (43 cm) | <i>Cắt</i> (41 cm) | <i>Môi ke</i> (42 cm) |
| | 7 | A-7 | <i>Clăngghan</i> (25 cm) | <i>Clăngghan</i> (24 cm) | <i>Clăngghan</i> (26 cm) | <i>Môi kờ pang</i> (24 cm) |
| | 8 | H-1 | <i>Châtdă</i> (19 cm) | <i>Châtdă</i> (20 cm) | <i>Châtdă</i> (17 cm) | <i>Hơ ta</i> (19 cm) |
| | 9 | H-2 | <i>Chà bô</i> (16 cm) | <i>Chà bô</i> (17 cm) | <i>Chápbe</i> (15 cm) | <i>Hơ tà tiô</i> (16 cm) |
| | 10 | H-3 | <i>Chà păng</i> (15 cm) | <i>Châlpôl</i> (15 cm) | <i>Muy châlpôl</i> (13 cm) | <i>Môi hợp aa</i> (15 cm) |
| | 11 | H-4 | <i>Muipa</i> (10 cm) | <i>Muipa</i> (10 cm) | <i>Muipa</i> (10 cm) | <i>Kờ pea</i> (10 cm) |
| | 12 | H-5 | <i>Chà puông</i> (7.5 cm) | <i>Cha puôn</i> (8 cm) | <i>Cârrapoah</i> (7.5 cm) | <i>Tờ pun</i> (7.5 cm) |
| | 13 | H-6 | <i>Ka pe</i> (5.5 cm) | <i>Cha pe</i> (6 cm) | <i>Cârrape</i> (5.5 cm) | <i>Tờ pei</i> (6 cm) |
| | 14 | H-7 | <i>Ka pơ</i> (4 cm) | <i>Cha pơ</i> (4 cm) | <i>Cârrabar</i> (4 cm) | <i>Tờ pea</i> (4 cm) |
| | 15 | H-8 | <i>Kà Léc</i> (6 cm) | <i>Ka pon tay</i> (6 cm) | <i>Kà Léc</i> (5 cm) | – |
| | 16 | H-9 | <i>Kà tien</i> (3.5 cm) | <i>A Tắt Tay</i> (3.5 cm) | <i>Tắt</i> (3.5 cm) | – |
| | 17 | H-10 | <i>Tay kam</i> (2.5 cm) | <i>Kang Tây</i> (2.5 cm) | <i>Tâm mắt âng kằm</i> (2.5 cm) | <i>Môi tờ tuôm</i> (2.5 cm) |

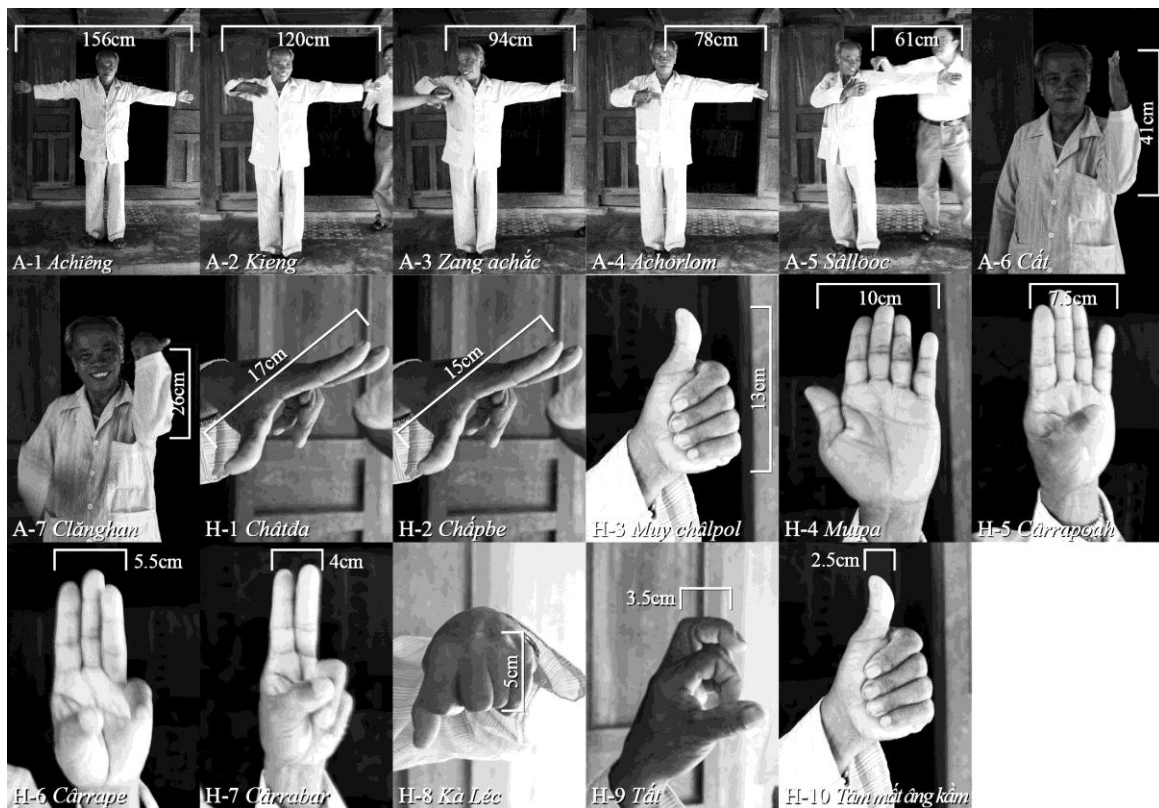


Figure 4: Demonstration of body-based units in Hong Ha commune (photos by the author)

3.2. Scaling relation and conversion of units

A-1, A-6, and H-1 in Table 1 are well known as the standard units of “span,” “cubit,” and “fathom.” TQC and TLC use the scaling relations $A-1 = 4 \times H-1$ and $A-6 = 8 \times H-1$, whereas each unit is independent with no relations in HHC.

TQC communicated more information regarding the body-based units. First, another unit convention exists that uses a base of the upright body (U-1 to U-12). This system measures the height from the foot to certain body parts, such as the following: U-1 (*Cakon*, Knee, 40 cm), U-2 (*Ca ven*, Hip, 80 cm), U-3 (*Ca pun*, Navel, 90 cm), U-4 (*Be ren*, Upper stomach, 110 cm), U-5 (*Ca do*, Arm pit, 120 cm), U-6 (*Tha*, Chin, 130 cm), U-7 (*Bop*, Mouth, 133 cm), U-8 (*Mo*, Tip of nose, 135 cm), U-9 (*Te bai*, Cheek, 137 cm), U-10 (*Mat*, Eye, 140 cm), U-11 (*Mang*, Forehead, 145 cm), and U-12 (*Pung a ko*, Top of head, 150 cm). Each unit is addressed by the name of the body part. The application for this system is, for example, to determine the height of a fence using U-3 (*Ca pun*, Navel) in Figure 5a.

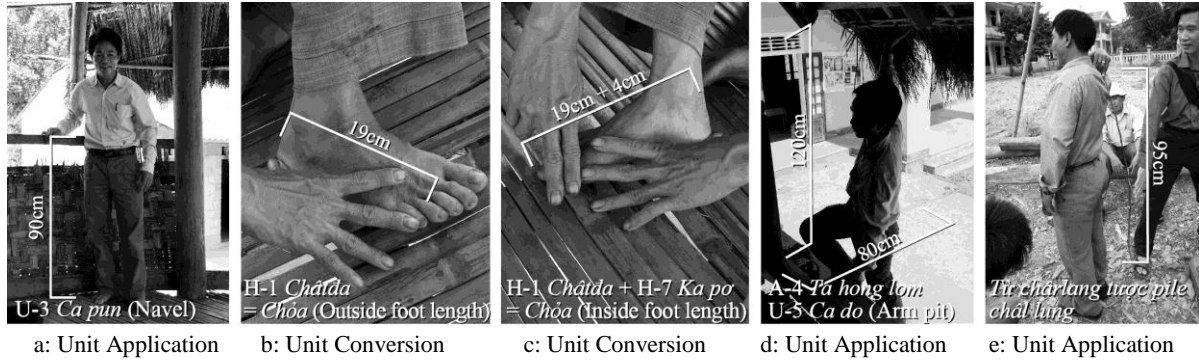


Figure 5: Examples of unit application and unit conversion (photos by the author)

Table 2: Pillar spans in center part of three communes

| | TQC | TLC | HHC |
|----------------------|---------------|------------------|---------------|
| Girder Direction | (A-1) + (A-2) | (A-1) + (A-4) | (A-1) + (A-2) |
| (Planned length) | 2,820 mm | 2,230 mm | 2,760 mm |
| (Measured length) | 2,380 mm | 2,500 mm | 2,600 mm |
| Cross Beam Direction | (A-1) + (A-5) | (A-1) \times 2 | (A-1) + (A-2) |
| (Planned length) | 2,230 mm | 2,910 mm | 2,760 mm |
| (Measured length) | 2,400 mm | 3,000 mm | 2,600 mm |

Table 3. Height planning in Thuong Quang Commune

| Height | Units (Planning length, Measured length) |
|-------------------------|---|
| Ground – Cross Beam | (A-1) \times 2 + (A-4) (4,020 mm, 4,305 mm) |
| Ground – Floor | (A-1) + (A-6) (2,020 mm, 1,990 mm) |
| Floor – Cross Beam | (A-1) + (A-6) (2,020 mm, 2,315 mm) |
| Ground – Roof Top | (A-1) \times 4 (6,440 mm, 6,985 mm) |
| Roof Top – Tip of Eaves | (A-1) \times 3 + (A-5) (5,450 mm, 5,100 mm) |

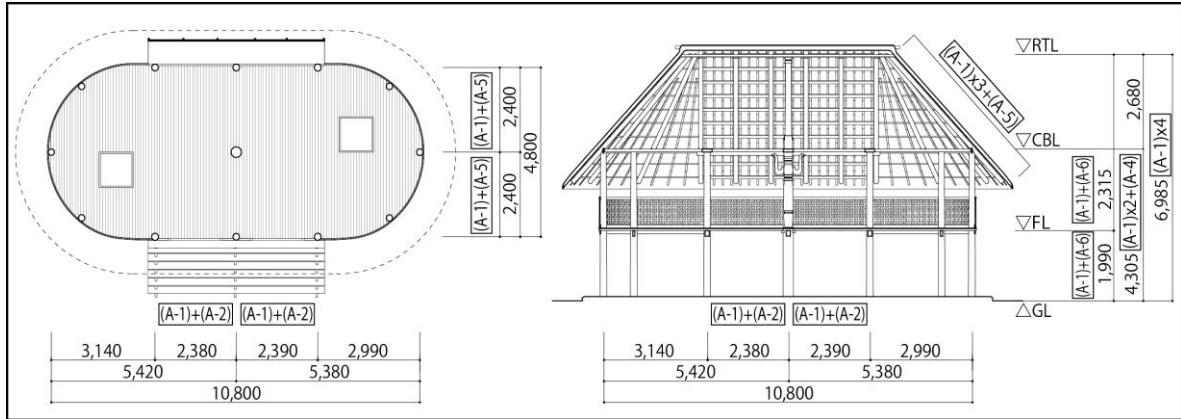


Figure 6: Application of units in floor plan and cross-sectional plan in Thuong Quang Commune

Second, there are conversions to foot-based units, as follows: A-4 (*Ta hong lom*, 80 cm) = One step (*Târcá*); H-1 (*Châtđá*, 19 cm) = Outside foot length (*Chỏa*, 19 cm) in Figure 5b; and H-1 (*Châtđá*, 19 cm) + H-7 (*Ka pơ*, 4 cm) = Inside foot length (*Chỏa*, 23 cm) in Figure 5c.

3.3. Unit application for building form

- **Floor planning:** floor planning establishes the pillar spans in the center part shown in Table 2 and Figure 6. Next, the circular part on both sides is lined with a semicircle shape in TQC and TLC, whereas the floor plan in HHC is a rectangular shape. The pillar spans were measured between 2,400–3,000 mm, which are slightly different from the planned length, but are within the acceptable range for vernacular architecture with respect to inaccurate construction. According to the research in the three communes, the planned spans first use A-1 as a basic unit, and add another arm-based unit between A-1 and A-5, depending on the conditions.

- **Height planning:** the research in TQC shows the process of height planning in Table 3 and Figure 6. First, the height from the ground to the cross beam is planned because it is equal to the length of the main pillars. The main pillars in TQC stand on the ground with the support of a concrete floor, although, traditionally, stilt pillars are inserted underground. For reference, the underground depth for the pillars is 1.5 m by the measurement survey in HHC and 1.0 m (A-3) in TLC. Second, the height of the floor is planned to be 2.0 m to facilitate parking of motorbikes under the floor. Next, the height from the ground to the top is planned to be the same as the length of the center pillar, four times the length of A-1. The same planned length is also observed in TLC. Finally, the length from the rooftop to the tip of the eaves is equal to the length of the roof beams. The length of the eaves is adjusted by A-4 from the main pillar and is U-5 from the floor in TQC (Figure 5d). A unique unit was observed in HHC for the same purpose, naming *Từ*

chârlang tước pile châ lung (95 cm), which means “from (*Từ*) shoulder (*chârlang*) to (*tước*) calf of leg (*pile châ lung*)” (Figure 5e).

3.4. Unit application for building materials

The application of units in determining material sizes is shown by the example in TQC. Main structural materials shaped in round timber in figure 3 - center pillar, main pillar, and roof beam - are found to apply for the units. The size of a center pillar (measured size: 30 cm in diameter) is planned to be six times the length of H-1 (planned size: $19 \times 6 = 114$ cm in circular length, which is 36 cm in diameter). The size of the main pillars (measured size: 18–20 cm in diameter) is four times the length of H-1 (planned size: $19 \times 4 = 76$ cm in circular length, which is 24 cm in diameter). The size of the roof beams (measured size: 13 cm in diameter) is planned to be twice the length of H-1 added to H-4 ($19 \text{ cm} \times 2 + 10 \text{ cm} = 48$ cm in circular length, which is 15 cm in diameter). The other structural materials are also measured by the hand-based units. The same planning for the center and main pillars was witnessed in HHC. The circular length is a more reasonable measurement because it is easier to place a hand on the surface of a standing tree in the forest. The measured size is slightly smaller than the designed size because trees are debarked and reshaped to be structural timbers.

4. Conclusion

From the field research in three communes, it was found that the *Katu* ethnic minorities own the same 17 types of body-based units of measurement with which they design and construct their traditional community houses. The villagers in TQC were interviewed to demonstrate the other units with the upright body and the foot as well as examples of scaling relations and the conversion of units. However, the main applications for design and construction are the arm- and hand-based units, including both independent and combined use. For the building form built with timber structures, the design is developed using the combination of A-1 as the basic unit with other arm-based units. For the main building materials, the size is decided by the combination of H-1 with the other hand-based units.

It is found in Nam Dong District that some community houses had been reconstructed following the traditional form but using modern materials such as concrete structure and corrugated iron sheets. These may intend to care about the traditional building and conserve local culture, however, cannot create opportunities to transfer and share the traditional knowledge and techniques of the body-based units of measurement. Focusing on such intangible intellectual resources is quite valuable for the conservation of vernacular architecture.

5. Suggestions for further studies

Katu people currently distribute in Thua Thien Hue and Quang Nam Provinces. Up till now, the authors have studied the *Katu* in Thua Thien Hue Province focusing on A Luoi and Nam Dong districts. For comprehensive study of *Katu* people in Vietnam, the research of *Katu* people in Quang Nam Province should be adopted in the future.

Original methods for construction of community houses of *Katu* have been replaced by new and modern methods in many villages of *Katu* people in Nam Dong district. This conducts a disappearance of one of cultural characteristics of the *Katu*. The construction of traditional community house by original methods is a feasible way to preserve that cultural aspect. In 2007, a construction of traditional community house by original methods was completed under the support of JICA and that project is evaluated successfully. This way can be enhanced in other areas of the *Katu* such as Nam Dong District and Quang Nam Province.

The related policies conserving traditional houses should be more developed for implementation. Therefore, policies' research is one of feasible further researches.

Table 1 shows that the *Sedang* ethnic group also has its own body-based units of measurement for constructing traditional community houses. This means that among those ethnic minorities in the middle region and highlands of Vietnam, there has a relation about methods for constructing their community houses. More research about body-based units of measurement of ethnic minorities in the middle region and highlands of Vietnam (*Sedang* and *Banar*) should be suggested for finding the relation among them.

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