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Dissertation

The Anatomy of Traditional Dwellings:
Comparative Study between Malay and Dayak Indigenous Architecture in West Kalimantan

Ausgeführt zum Zweck der Erlangung des akademischen Grades eines Doktors der technischen Wissenschaften

Unter der Leitung von

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Abstract

Traditional Indonesian houses of the past were often constructed with a cognitive understanding, being erected either directly on land or on a stage above the ground. A unique construction and space order are found in the traditional stage dwellings of both the Malay and Dayak in West Kalimantan. Environmental factors, religious concepts and community culture clearly influence the physical, architectural form of these dwellings.

Dwellings are designed to meet the needs of the prospective dwellers. The human body is often used in the application of form of traditional architecture, especially when building a dwelling. According to Hendrix (2003: 221), various methods have been realized from the experience of studying the human body that can be included in architectural applications by accurately incorporating them into house designs.

This dissertation research aims to find the connection between the use of human body in the traditional architecture of the Malay and Dayak dwellings in West Kalimantan by reviewing their respective architectural anatomies. Based on both primary data collected from multiple field surveys and secondary data, this research analysis was carried out using selected cases of two (2) indigenous traditional architectures found at various locations throughout West Kalimantan: the Malay dwellings and the Dayak dwellings. The three types of traditional Malay stage dwellings taken as research objects included the *Potong Limas* (*Limas* shape), the *Potong Kawat* (*Kawat* shape), and the *Potong Godang* (*Godang* shape) while several examples of one type of traditional Dayak stage dwelling (longhouse or *rumah panjang*) whose construction was found to be unique to the Taman sub-ethnic group of the Dayak in West Kalimantan were used as comparison research objects. Analysis of the Malay and Dayak dwellings was conducted by dividing and classifying the objects into the lower, middle, and upper parts of the respective buildings.

By analyzing the use of the human body anatomy in the construction of the traditional architecture of both the Malay and Dayak dwellings in West Kalimantan, it was found that the anatomy of dwellings functioned like vital organs in order to facilitate the comfort and activities of the occupants as well as to maintain a harmonious holistic balance with both the physical enviroment/public world without and the spiritual/private world within. Although these dwellings occupied the same general enviroment, the Malay and Dayak contrasting inherent belief systems acted as benchmarks to distinguish the understanding of house elements in these two types of architecture. The positive orders which are obeyed by the Malay are the Quran and Al-

Hadith as the guidelines in running their lives, while for the Dayak, the positive rules that control their lives include customary law, customs, and traditional beliefs. Both these belief systems prioritized the sanctity of the spiritual over the physical while maintaining clear boundaries between the private and the public.

Keywords : *traditional dwelling, the anatomy of dwelling, Malays, Dayaks*

Zusammenfassung

Im Allgemeinen entsprachen die Wohnbautypen Indonesiens in der Vergangenheit dem traditionellen Verständnis der indigenen Bevölkerung. Entsprechend regionaler Traditionen des Bauens wurden Wohnbauten entweder ebenerdig oder auf Substruktionen über dem Boden errichtet. Die in dieser Arbeit behandelten traditionellen Wohnhäuser der Malay und Dayak in West-Kalimantan weisen einzigartige Charakteristika sowohl in ihrer Konstruktion wie auch in ihrer Raumkonzeption auf und bringen darin religiöse Vorstellungen, Bräuche und soziale Konventionen zum Ausdruck. Die traditionelle Baukultur der Malay und Dayak entwickelte sich im Zusammenhang mit Faktoren von Umweltbedingungen und Einflüssen benachbarter Kulturen, wobei im Besonderen auch mythologische Vorstellungen bestimmter Epochen der Vergangenheit eine wichtige Rolle spielten.

In Bezug auf den Grundgedanken der Funktionalität muss bei der Planung des Wohnhauses den Bedürfnissen der zukünftigen Bewohner volle Aufmerksamkeit gewidmet werden. Der Bau des menschlichen Körpers wird hier oft für die gestalterische Konzeption traditioneller Architektur – vor allem des Wohnbaus – herangezogen; in der traditionellen Gesellschaft wird der menschliche Körper als Schöpfung Gottes betrachtet, die beispielhaft in die Architektur des täglichen Lebens zu implementieren wäre. Nach Hendrix (2003:221) wurde der menschliche Körperbau in verschiedenster Weise studiert, um ihn in die architektonische Planung zu integrieren, und widerspiegelt sich explizit im Aufbau traditioneller Wohnhäuser.

Das Forschungsziel der Dissertation ist eine Untersuchung der Umsetzung der Anatomie des menschlichen Körpers in der traditionellen Architektur der Malay und Dayak in West-Kalimantan. Diese Untersuchung stützt sich sowohl auf Primärquellen, welche während mehrerer Feldforschungen vor Ort erhoben worden sind, wie auch auf Sekundärquellen. Während die untersuchten Bautypen der traditionellen Malay-Häuser Potong Limas, Potong Kawat und Potong Godang umfassen, betreffen die Untersuchungsobjekte der Dayak-Häuser (rumah panjang) die tamanische Subethnie in West-Kalimantan, deren Langhäuser (betang) als Vergleich herangezogen werden. Methodologisch wurden in der Untersuchung die Bauteile der Malay- und Dayak-Wohnhäuser analysiert und klassifiziert nach der traditionellen Dreiteilung südostasiatischer Architektur: Unterbau, Mittelteil und Dachzone.

Durch die Analyse von Zusammenhängen der Anatomie des menschlichen Körpers mit der traditionellen Architektur von Wohnhäusern der Malay und Dayak in West-Kalimantan konnten enge Beziehungen

zwischen den vitalen Organen des Hauses und den Bewohnern und ihren Tätigkeiten festgestellt werden, durch welche eine harmonische holistische Balance mit der physischen Umwelt wie auch der spirituellen Welt hergestellt und erhalten werden soll. Obwohl die Wohnbauten der Malay und Dayak den gleichen Umweltbedingungen ausgesetzt sind, bewirkt ein unterschiedlicher kultureller Hintergrund andersgeartete Bauformen. Den Schlüssel zum Verständnis der Elemente der Haustypen von Malay und Dayak bilden hier die inhärente Glaubensvorstellungen: Bei den Malay sind es die Vorschriften des Korans und der Hadithen als Richtlinien ihres Lebensablaufs, bei den Dayak die traditionellen Sitten, Gesetze und Glaubensvorstellungen.

Keywords: *traditioneller Wohnbau, Anatomie des Hauses, Malay, Dayak*

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Zairin Zain
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CHAPTER I
INTRODUCTION

1.1 Research Background

Human beings need a house as a place for living, growing up, and carrying out the activities of their ordinary lives. A house functions as a shelter for the occupants from the direct physical influence of the environmental changes, such as climate or weather. A house also provides segregated roles for human beings between the outside world and the inside world, and to protects their privacy from the observations of others.

As a place for human shelter and living, homes have continued to evolve from time to time. In the past, primitive people occupied caves as a dwelling and took cover from predators and extreme weather. After having experiences in the development of dwellings, by the influences of their own culture and the increasing of knowledge, humans began to control nature and start thinking about building house. During the next development era, houses then continued to evolve from simple building structures with simple posts or beams and a roof (regardless of the rooms division) into buildings with the construction and arrangement of the space as complex as today. The changes were made to follow the environmental conditions where humans erected their residences. Natural and environmental conditions were the main factor that caused people to choose to make adjustments to their residences.

The need for a house as a residence arises when humans become able to organize themselves, and to control their environmental conditions. In the subsequent era, houses are not just a place to dwell, but also part of the social status of a man in his community. In Indonesia’s traditional societies, and also many other

places in the world, home ownership is often the way to measure the level of a man's responsibility toward his family. A man who did not own a house was always assumed to lack responsibility toward his wife and children. Therefore, people are always pushing themselves to own a house, although in a very simple one. A house was built to fulfill the physical and spiritual needs of occupants. Through the order and function of space and facilities, can be traced values and ways of thinking as norms of a family, which appears different in each family.

A house has an important role in the life journey of a human being in the world. The house was built to meet the physical and spiritual needs of the occupants. This means that the home functions physically to preserve their lives from environmental threats such as climate and weather or wild animals, while the home addresses their spiritual needs by facilitating interaction between occupants at home or interaction with people outside of the house. Spiritual needs here also means that the house is a shelter to reach family happiness.

The house is also part of the physical culture, which in the traditional context, is a form of expression and closely linked with the personality of the community. In the cultural evolution, a house as an artefact of human attainment is expressed in façades, and the arrangement of the space order that is embodied in a residential house is strongly influenced by internal or external factors of a community at that time. Regional differences and cultural backgrounds will also cause differences in the forming of the architectural expression among different areas.

Lefas (2009: 19) mentions that the building, in this case the house, was established by observing nature or the environmental conditions and then embodying these conditions in an artefact. But this great concern is not an obstacle to realizing comfort in dwellings; humans will continue to make adjustments to

obtain their desired comfort level. The attention to nature will make us feel closer and show more respect to natural forces in constructing new buildings as a residence. We will increasingly realize that to build a place for living, it is sufficient for humans to learn from the nature. Having a place for living also makes humans able to face the natural hazards and the environmental changes. Therefore, housing is defined as the realization of human artifacts after interacting with nature and paying deep attention to the environmental conditions.

The human need for a dwelling would continue to evolve following the development of knowledge and the interactions that were taking place with the environmental conditions and the societies. A house was needed to provide the feeling of security and also to fulfill the functions of comfort, privacy, and identity. People then started to divide their homes into different rooms to facilitate the different activities, creating special details such as ornaments to show their identity within communities and create cultural rules as restrictions on the activities of each room formed. To anticipate of the local conditions, people also made adjustments on the physical form to the shape in each their residential units, by forming floor elevations, giving wide openings in walls, and so forth.

The housing adjustments people made can be seen in their application in the traditional houses. According to the adjustments as mentioned in the previous passages above, the traditional society also usually linked the parts of the houses and the formed spaces or the rooms for cultural growth in their community. They linked to the local culture, which contained special orders in the rooms' functions. All the home parts or facilities have valuable hereditary norms that held by the community, and applied in the physical appearance of the house. In the understanding of the traditional community, through the physical appearance of the

dwelling, which is reflected in the sequence of the rooms' function, the facilities and the parts of the house also reflected the values that were held by a family as principles and norms prevailing in their community.

Noble (2007: 1-3) cited the word "traditional" as referring both to the procedures and objects that have become accepted as the norm in society, and elements that are passed from generation to generation, usually orally, or sometimes in the form of documents that have the knowledge transmitted orally and codified in the form of instructions, and procedures. The concept of "traditional dwelling" is usually used to describe a simple structure, but often a complex concept. In traditional communities that have a good interrelationship and interaction among others, the concept of home as a structure is less important than the concept of the house as a mixture of the activities within the complexity. The home is the idea of making a given patch of land formed into enclosed spaces, and given walls to protect personal activities. This idea is realized through the artefacts that are always being considered and becoming one with nature. Every part of the house is formed precisely by taking into account the local conditions.

Generally, the original types of Indonesian houses in the past could be constructed with a cognitive understanding of most traditional people. This applies both to constructions built on land and floating upward on water. In most Indonesian traditional points of view, the dwellings construction could be erected directly on land or on a stage above the ground. The same is true for the evolution of wood used as materials to build a house, the use of brick, and so forth; it is very interesting to trace the beginning of its use as a material for houses in Indonesia, but its evolution is very difficult to track more accurately. According to Sumintardja (1978: 10), houses are definitely erected in line with the raising of the human thought level in efforts to reach salvation. These efforts are based on experiences in avoiding the difficulties and dangers of the environmental

conditions (nature, wild animals and other humans). In other words, when human beings are more intelligent, the spirit or the efforts to make dwellings become better, stronger and more beautiful will grow as well. The human ability to control the environment is the main factor, and enables them to create new innovations in realizing better occupancy requirements.

The traditional Malay dwelling and the traditional Dayak dwelling in West Kalimantan as shelters for their occupants, also have a unique construction and space order. The influences of the religious concepts, their beliefs, and the community culture, are expressed in the physical, architectural form of their dwellings. This makes the vernacular product of indigenous ethnic groups in West Kalimantan a work of architecture rich with meanings, which needs to be explored deeply and studied further.

Basically, Malay architecture was very simple and minimalist in the past. Like other traditional architecture, it was originally intended to accommodate the space needs of their family members and was built with a simple construction in the past, because of the very simple equipment they had and lack of ability and knowledge about construction. The Malay architectural evolutions in subsequent periods followed the social and cultural developments. Malay lands at that time were also highly vulnerable to natural disasters, and European colonialism also played a role in influencing the Malays architectural forms. The important fact in Malay dwelling architecture is that it was strongly influenced by their religion, which they professed firmly. They performed all of the Islamic religious order (*Syariah* Islam), were very obedient, and had many roles and symbols within the different norms to show that they were Moslems.

The development of the Malays' house architecture involved their surrounding natural environment. This process took place dynamically until they found a comfortable occupied dwelling. Perhaps this process

lasted for decades or even hundreds of years. If we see the appearance of the traditional dwelling's facades recently, the roof at the top greatly dominates the house body at the center and an open stage foundation also gives a stiff impression to the Malay dwellings. The juxtaposition of the roof with different sizes and orientations also creates an interesting visual form to the Malays dwellings. Jee Yuan (1987: 20) mentions the direct dependence of the house materials on the natural resources, and as part of their efforts to achieve an intimate knowledge of the ecological balance, the Malays dwelling impressions were efficiently designed to meet the local climate requirements by forming a variety of openings, and using local materials that produced low thermal capacity.

The architecture of the Dayak longhouse also has its own uniqueness. A Dayak longhouse is a dwelling with many apartments, and often found to be more than a hundred meters long. Dayak longhouses basically have elongated floor plans, and when erected follow the direction of river flow. Established as a stage construction with a wood pile foundation, it has a floor elevation of more than one meter above the ground level. In the past, longhouses used *kayu ulin* (ironwood) for the roof covers and all the main structures. Inside the longhouse, one would find dozens of apartments occupied by a single family in each room (*bilik*). Although the size of this house is spacious and large enough, occupants or guests should enter the house passing through only one entrance. The entrance access is placed on both sides of a longhouse, or sometimes there is only one installed through floors from the ground, connected by a ladder made of logs. Jennifer Alexander in Fox (1993:30) wrote that the longhouses are the archetypical form of Borneo domicile, although this form of dwelling is also found in other parts of the world, and longhouses are built on piles and

comprise a row of individual domestic units accommodated under one roof. The longhouse has two characteristics: the stage house and elongated floor plans.

Peter Just placed emphasis on folk architecture in Indonesia, noting that

> "*Traditionally, each with a number of Indonesian ethnic groups have distinctive architectural standards for every home built by a member of the group, which is the active expression of the ethnic identity groups. Design houses often into a deep symbolic resonance for the occupants*". (Noble, 2007: 7).

The architecture of the traditional Malay dwellings and the Dayak dwellings in West Kalimantan as part of the Indonesian national cultural element is unique in the configuration of structure, function, style, physical form, and the process of construction. To form it as artefacts, it will always emphasize this distinctiveness as a result of the original works, reflections of the local traditional culture, and provide its own characteristics in the architectural forms. Noble (2007: 13) wrote that traditional architecture as a result of the human work and creations, feels and wills as the elements of culture, which cannot be separated from the interaction or understanding between the physical properties of the environment and the skills or the ability of the community to form a common cognition. The traditional architecture is a product of their environment determined by climate and vegetation, and each region developed variants in response to the environmental conditions and the availability of materials.

The architecture of traditional Malay dwellings and Dayak dwellings in West Kalimantan did not develop independently from the environmental factors and influences. The traditional architecture of both dwellings grew and evolved by following the development of Indonesia as a nation and was supported by the people (Malays and Dayaks) in their community. The beliefs and religion within a certain period in the past

also had a dominant role in influencing traditional dwellin architecture of Malays and Dayaks in West Kalimantan.

The Malay architecture is strongly influenced by Islam, embraced by all Malays until today, while Dayak architecture was influenced by the local culture and their belief in the forces of nature, which controls their lives. Also, in the architecture of Malay dwellings and Dayak dwellings we can find Hindu cultural influences that had existed before Islam spread as a religion and culture in Indonesia, especially in West Kalimantan. The physical evidence of Hindu cultural influences in the architectural artefacts of both of the indigenous ethnic groups on the island of Borneo, can be traced and seen in the ornaments of the dwelling decorations.

The dissemination of Islam in Indonesia is very important to the Malay cultural history and the city growth in West Kalimantan. In general, there are two processes in the spread of Islam in Indonesia. First, the indigenous inhabitants have contact with the Islam spreader and then embrace the religion of Islam. Second, foreigners from Asia such as Chinese, Arabs, Indians and others who have embraced Islam, chose to stay permanently in the territory of Indonesia because of a mixed marriage, and then they follow the local lifestyle in such a way that they become new ethnic groups in the new community (Winstedt 1927 [1918]: 9-11 in Soda, 2001: 209-210). Veth (1854) and Muller (1992) in Hasanudin et. Al (2000) wrote that Islam spreads from the points mentioned above, so, they conclude that the authority of Arab generations as leaders, *Syarif*, or *Syech* is the major factor in building new principles and influencing the community environment in which the religion of Islam is spread. The kingdoms of Palembang, Banjarmasin, Cirebon, Siak and Pontianak also

became significant contributors to the spread of Islam in West Kalimantan (Wilkinson in Soda, 2001: 223-224).

There is an interaction between the different cultures in the community, both the local culture and the culture brought by the settlers, which influences the way of thinking about the socio-cultural points and beliefs then practiced by people as new value systems in the community. These influences gradually affected the Malay people, who owned culture from the past and made adjustments to their socio-cultural perspectives and beliefs. The combination of local and settler's culture transformed into new ways of thinking and were practiced as new value systems in Malay communities. The ease of interaction between old and new cultures is caused by several factors such as similarity in beliefs, similarities as Eastern cultures, mixed marriages, and so forth.

Mudiyono states that the culture can survive if people in a community always conduct the application of their tradition; the tendency of change will appear either naturally or by human manipulation. A change will occur when the new values in society serve to replace the inappropriate values. The emergence of new values usually results in conflict with old values and causes problems (Florus et.al, 1994: 212).

Hasanuddin et. Al. (2000) also explained that the embodied process of Malay as one of indigenous ethnic groups in West Kalimantan began with the introduction of Islam as religion and culture through to the settlements in upstream areas of the major rivers such as the Kapuas, Landak, and Sambas. Dayaks who embraced Islam as a religion practiced and taught it to others as a way of life just as ethnic Malays did. The process for non-Malay inhabitants of West Kalimantan, who converted to Islam is known as the process of becoming Malay (see details in Wadley, 2000: 85). Hasanudin et.al. (2000) explained that the Malay ethnic

group is identical to the Moslems culture, while Dayak culture embraced animist beliefs or Christian faith in the present. Dayaks who had converted to Islam became known as the young Dayaks and would leave their original personal identity as Dayak and be transformed into ethnic Malays (see details in Thomson, 2000: 31; Alqadrie, 1990: 101; Milner, 2008: 84-85). Therefore, for the Dayak, young Dayaks were Dayaks who had embraced Islam. Moreover, the process of economic interaction with the settlers (Sumatra, Sulawesi, the Malay Peninsula), who assimilated with the local ethnic groups and then settled, accelerated the development of the Malays as the one of the indigenous ethnic groups in West Kalimantan.

1.2 The Dwelling and the Human Body

A house was built as a place of shelter for the occupants' activities. Often it is mentioned that a house is the palace for the occupants. A well- known Malay or Indonesia proverb states: my dwelling is a palace for me. The Palace, for the occupants in this Malay proverb, is a place that gives comfort to them to do all their activities. In the term "facilitated the activities," the dwelling must be designed with full attention to the needs of the prospective dwellers. The idea is that homes are designed to suit the needs of the occupants and is applied in architectural design, both modern and traditional. In the modern architectural design, we recognize the existence of the data compiled by the architect Ernst Neufert as a standard scale, which is a reference for the architect to be applied its design. This scale provides a reference scale of space and supporting facilities for private and public buildings. But the question arises next, how is comfort realized for the occupants in the traditional architecture and its application?

In the past, the traditional community did not have a common reference for how to build dwellings as the basic standard. Because of the limitations during this period in conducting communication among other

communities, to build a dwelling, they generally took advantage of the local conditions and used the knowledge from experiences over time. They were not familiar with international units that we use today. They always upheld and followed the rules and guidelines from their elders, which were obtained from generation to generation and applied most often in orally and less often in written form.

The logic of the human body is often used in the application of form on the traditional architecture, especially in building a dwelling. The human body, in the understanding of traditional society, is the creation of god and provides the best examples to be learned that would be implemented in their everyday lives. The human body greatly affects the design approach in the traditional architecture. These influences can be found in the conceptualization in forming space, and also in their perception about a room's meaning. Many experiences in which forming is done by means of various physical objects are important among traditional people. The human body as an autonomous object and its perceived presence as a subject in its physical form influenced the expression of the physical form of the traditional architecture. According to Hendrix (2003: 221), various methods have been realized from the experience of studying the human body that can be included in the architectural applications, and they are accurately reflected into design of the houses.

Traditional people also have a common understanding about the structural perception of the dwellings as being like a human body structure. The building structure, according to them, can be analogous to the human body, which could be divided into three parts: the lower structure (foundation, known as the legs), the middle structure (rooms in the house, known as body) and the upper structure (the roof, known as head). Similar to the human body, the traditional people also understand that the whole part of the building is a physical unit and the parts support one another. Hendrix (2003: 228) in giving an explanation about the

human body says that parts of the body such as skeleton bones suggest the existence of the whole body as fragmented and dissolved into the environment in a heterogeneous structure. This is in line with the traditional understanding about the occupancy-- that the building consists of separate parts that also have their respective functions, but each is an integral part of a dwelling.

1.3 Research Objectives

Research focusing on the human body as a basis of measurement, was implemented on the rooms' dimensions in the traditional houses often found in Indonesia. A master research in 2002, completed by Made Suastika, explored the use of the human body as measurement in ancient Wantilan, Gianyar, Bali. This study are explored in depth the space dimensioning in ancient Wantilan based on units of measure from the human body such as fingers, footsteps, arm spans, and the human ergonomics. He concluded that ancient the Wantilan in Gianyar used the anthropometric roles to form the space in all parts of the building.

These patterns are also found in traditional Malay dwellings and traditional Dayak dwellings in West Kalimantan. In the preliminary survey, author found physical evidence that these two traditional dwellings also used the human body as the measurements to form their architecture. As an interesting phenomenon in the preliminary survey to the traditional architecture of Malay and Dayak dwellings, the author found a wider understanding by people of Malay or Dayak heritage in use of the human body units or human body anatomy in their dwellings. If compared to the results of the research findings of Made Suastika, for which the locus was in Gianyar Bali, author found different information from the interviews. They mentioned that their understanding is not limited to the physical appearance, such as for a measurement for forming space, but more toward the deeper purposes for the concepts concerning why human anatomy was related to the

everyday things of their lives. They used their understanding of the human body by giving deep meaning to the non physical form of architecture that was created in dwellings. People of Malay and Dayak heritage in West Kalimantan make the physical and non physical appearance of their occupancies by the influence of cultural experiences and make these as close as possible to their understanding of the body itself. In addition, the acculturation in the past of the indigenous peoples from inside and new settlers from outside West Kalimantan, who owned different cultures, for example the acculturation of religions (beliefs) to the local culture, raises a uniqueness that became an integral part of the architectural traditional dwellings. That there are a variety of functions, forms, and meanings as the result of acculturation of indigenous peoples in constructing the traditional dwellings of West Kalimantan is interesting to study further.

The dissertation research aims:

1. to find the use of human body anatomy in the traditional architecture of Malay dwellings and the Dayak dwellings in West Kalimantan, with a review of the building anatomy;
2. to trace and to make a comparative study of the building anatomy of the traditional Malay dwellings and traditional Dayak dwellings in West Kalimantan by typology analysis.
3. to explore and to explain the elements and characteristics in relation to the function and meaning of both to the traditional Malay dwellings and the traditional Dayak dwellings in West Kalimantan.
4. to explore the architectural forms influenced by the local culture and the religion (belief) and their impact on the building anatomy of the traditional Malay dwellings and the traditional Dayak dwellings in West Kalimantan.

1.4 Research Methodology

Methodology refers to the approaches researchers usually have used in looking for solutions to the problems in the research. Methodology is also defined as the activities to generate descriptive data from observed objects' behavior. This research was conducted using a positivistic approach, with data processed qualitatively. This research tries to explore the people cognitively, from their own frame of experience and understanding about their dwellings. The facts, found in field research, as the experience of the depth understanding of the particular settings, were investigated by the common theoretical insights. Qualitative researchers should attempt to delay or set aside their own perspectives on the research objects and not simply accept the facts that observations obtain from the research field before giving deeper meanings as an analysis. Taylor and Bogdan (1998) mentioned positivistic researchers conduct investigations to find the answers to the problems in the research objectives through methods such as questionnaires, inventories and demographics which generate data for conducting analysis in statistics.

According to Taylor and Bogdan (1998: 8), qualitative research conducted within the framework of theoretical research confirms the theory based on the data and not vice versa. Data analysis was conducted based on the theoretical framework to look at the empirical reality on the research fields (to see the settings and people holistically); persons or group are not reduced as variables, but are seen as the overall settings.

This research is based on primary and secondary data collected through several field surveys. This research analysis was carried out using selected cases to two (2) indigenous traditional architectures in West Kalimantan: Malay dwellings and Dayak dwellings. The findings in the field are discussed with relevant

theories, so that at the end of the study will be obtained a description of the traditional house architecture being observed.

1.5 Data collection

Taylor and Bogdan (1998: 27) mentioned that research is an ideal setting in which the observer may gain access and establish direct relationships with informants, so data collected is directly related to the research interests. As primary data, the observation was conducted on the Malay dwellings, established in the city, which was the capital of the Malay kingdom in the past. From each of these cities, the researcher chose three types of dwellings as research objects.

Other observations also were conducted on the Dayak dwellings, which have consist of indigenous longhouses in several villages across West Kalimantan. Traditional Dayak dwellings, well-known as longhouses, were selected as research objects in Kapuas Hulu regency. All research objects chosen as Dayak dwellings are taken from indigenous longhouse of the Tamanic sub ethnic.

The structured interviews were conducted with the occupants, the heirs, the elderly, or the stakeholders to get a holistic understanding of the cases of research. From interviews, the researcher also collected data about building history, age of the building, the changes, the occupants activities, function the space or the rooms, the measurements that were used to form the buildings and so forth. An additional targets as important data, is seeking the meaning of the formed spaces, the structural order and the constructions, and core-peripheral status of the building elements according to the occupants' views. Photos, sketches, measurements and recordings of cases acquired in the research will be drawn with Computer Aided Design (CAD) software creating facade views, sections views, details and 3D object views.

1.6 Field Research Activities

Research was conducted in several places in Indonesia. Literary research was completed in the cities of Yogyakarta and Pontianak, while the main field research activities were carried out in scattered location throughout the province of West Kalimantan. The center for all activities involving the planning and preparation of the research as well as the compilation and processing of data was at the Faculty of Engineering, University of Tanjungpura, Pontianak. Field research started on November 1, 2010 and was completed on January 27, 2011. In conducting the research activities in West Kalimantan, the author worked in phases which were scheduled as follows:

1.6.1. Preparation Phase

1.6.1.a. Preliminary Activities

Research activities started on November 11, 2010 at the University of Tanjungpura in Pontianak, West Kalimantan in separate meetings with the dean of the Engineering Faculty and the chairperson of the Architecture Engineering Department. Discussions were centered around what institutional facilities would be provided to support the researcher during the research activities in West Kalimantan. Full support for this research was received. The field research was supported by the dean who signed a letter of assignment and provided a special room that was used to prepare the research activities and process the resulting data. The chairperson of the Architecture Engineering department assigned 2 undergraduate students to assist in data collection in the field and 2 others to assist in redrawing the research objects by using AutoCAD and the 3D format.

1.6.1.b. Preparation of the Research Field Schedule

Work began immediately, on November 11, 2010, in the room assigned for this purpose by the Civil Engineering Graduate Program at Tanjungpura University. The author began by giving an in-depth briefing as to the goals and targets to be achieved to the students who would assist in the survey and the field data processing. Then a schedule of the research activities starting from that day to at least the next 3 months was jointly arranged.



Figure 1.1 *(left and right) Discussing job descriptions in the room assigned by the Civil Engineering Graduate program at Tanjungpura University*



Figure 1.2 *(left and right) Students working to complete the tasks given, in the room assigned by the Civil Engineering Graduate program at Tanjungpura University*

1.6.1.c. Preparation of the Research Support Tools

To ensure the research can taken place smoothly according to schedule, the author conducted a preparatory to the research's supporting tools, such as the digital camera, the measurements tool, the writing instruments, recorder and other supporting equipmeTo ensure that the research would run smoothly according to schedule, tools needed to support the research were prepared. These included a digital camera, measuring tools, a recorder, writing instruments and other support equipment.

1.6.2. The Data Collection Phase

In conducting the field data collection, the author was assisted by 2 undergraduate students of the Architecture Engineering Department Tanjungpura University. The data collection was in two parts, namely the collection of secondary data in the form of literature which was associated with the research objects and

primary data from surveying the research objects in the field by using measurements, sketches and photographs. Secondary data was obtained from the library of the Engineering Faculty of Tanjungpura University, the library of the Research Center on Historical Values and Antiquities of West Kalimantan, the Central Bureau of Statistics of West Kalimantan, and the library of Dayakology Research Institute in West Kalimantan. Primary data obtained from field surveys were conducted on the 2 types of research objects, namely traditional Malay dwellings and Dayak longhouses, which are located in several selected districts or cities scattered throughout the province of West Kalimantan. The research objects‘ locations were chosen based on the results of discussions, interviews and literature which had been collected prior to the survey. Intensive discussions on the preparation of the schedule of activities started on November 15 and ended on November 20, 2010.

1.6.2.a. Collection of the Secondary Data

Secondary data was compiled from the libraries at Tanjungpura University and the government agencies in West Kalimantan and included research theses, relevant publications, maps, manuscripts and so forth. In addition, interviews with experts on the culture of the local communities associated with the research objects were conducted.

- Collection of related literature

  Literature was collected from the following places:

  - the Library of the Research Center for the Historical Values and Antiquities of West Kalimantan,
  - the library of the Dayakology Research Institute of West Kalimantan,

- the Agency of Central Statistics of West Kalimantan Province (to obtain demographic and geographic data), and
- the Library of the Engineering Faculty of Tanjungpura University.

➢ Interviews with Experts

The interviews were conducted with several people who were assessed for their competence in relation to the research objects. These were conducted in an effort to give a deeper understanding of the architecture and the culture of Malay and Dayak in West Kalimantan. The interviews were conducted with:

- Mr. Sudarto, a Malay historian who is part time worker at the Education Department of West Kalimantan;
- Mr. Muhammad Natsir, a researcher for Malay Culture Studies at the Center for the Historical Values and Antiquities Research of West Kalimantan;
- Mr. Jarnius Alloy, a researcher for Dayak Culture Studies at the Dayakology Research Institute of West Kalimantan and chair of the Alliance of Indigenous Society of the Archipelago (*Aliansi Masyarakat Adat Nusantara*) in West Kalimantan.
- Mr. Willis Maryanto, a researcher for Dayak Culture Studies at the Center for the Historical Values and Antiquities Research of West Kalimantan.

1.6.2.b. Collection of Primary Data

Based on literature and interviews, the survey locations of the traditional Malay dwellings were choosen in places that had played important roles as centers of government of the Malay kingdoms in the past. In addition, the surveys were carried out on three different forms of the traditional dwellings according

to the criteria which is explained in the objectives of the dissertation. The Dayak longhouse locations were selected in places where the Dayak Taman (Tamanic) tribe, a sub-ethnic group of the Dayak Iban, dwell.

All the research objects were still in their original condition and lacked considerable alterations. The research locations were scattered throughout West Kalimantan and included 1(one) city and 8 (eight) towns located in different regencies: Pontianak city, Mempawah (Pontianak Regency), Sambas (Sambas Regency), Tayan and Sanggau (Sanggau Regency), Sekadau (Sekadau Regency), Sintang (Sintang Regency), Putussibau (Kapuas Hulu Regency), Ketapang (Ketapang Regency) and Sukadana (North Kayong Regency).

Activities undertaken were photographing, sketching, measuring and recording. The recorded interviews were conducted with stakeholders in the field surveys to get a holistic understanding of the research objects. To achieve the goals of data collection, this researcher collaborated with undergraduate students of the Engineering Faculty at the University of Tanjungpura to conduct the surveys together.

The distribution of the locations of the research object can be seen in the following map below:

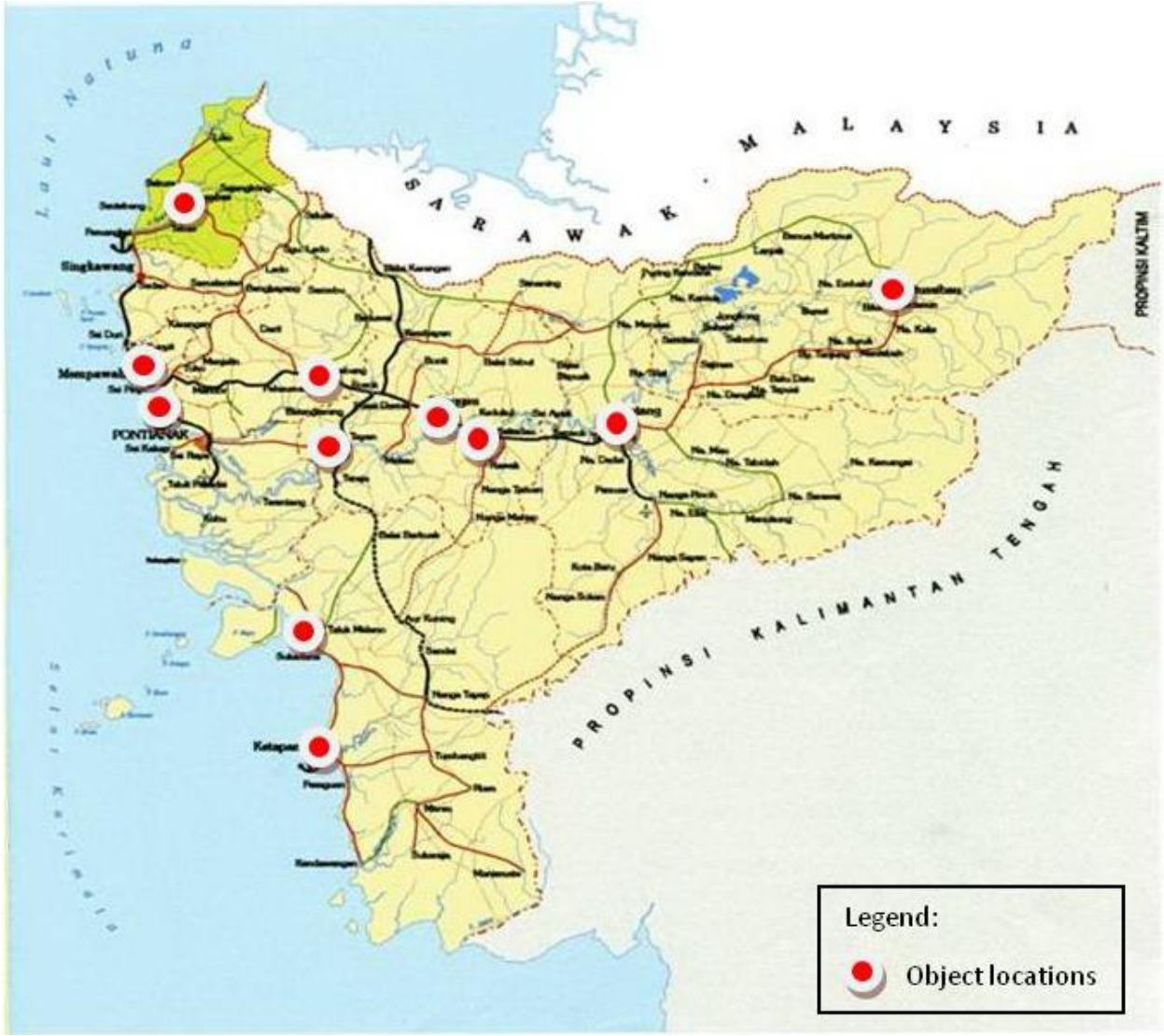


Figure 1.3.
Map of West Kalimantan province and the locations of the research objects

The location of the traditional Malay dwellings which has done with surveys and measurements, are:

1. Pontianak city, survey and measurements performed on 3 cases which was held on November 19 – 21, 2010 and December 28, 2010



Figure 1.4. *(left)*
Research object in
Kampung Tanjung Hilir Pontianak



Figure 1.5. *(right)*
Research object in Kampung Bansir,
Imam Bonjol street Pontianak



Figure 1.6.
Research object in Kampung Kamboja,
Tanjungpura street Pontianak

2. Mempawah town (Pontianak Regency), survey and measurements performed on 3 cases which was held on November 22, 2010





Figure 1.7. *(left)*
Research object in Gusti Moch . Taufik No. 261 Kampung Terusan Mempawah

Figure 1.8. *(right)*
Research object in Gusti Moch . Taufik road No. 242 Kampung Terusan Mempawah



Figure 1.9.
Research object in Teratai street Mempawah

3. Sambas town (Sambas Regency), survey and measurements performed on 3 cases which was held on November 26 - 27, 2010



Figure 1.10. *(left)*
Research object in Kampung Tumok Manggis Sambas



Figure 1.11. *(right)*
Research object in Kampung Lubuk Dagang Sambas



Figure 1.12. *(left)*
Research object in Kampung Lorong 1 Sambas



Figure 1.13. *(right)*
Research object in Kampung Lorong 2 Sambas

4. Ngabang town (Landak Regency), survey and measurements performed on 3 cases which was held on December 6, 2010





Figure 1.14. *(left)*
Research object in Kampung Raja 1 Ngabang

Figure 1.15. *(right)*
Research object in Kampung Raja 2 Ngabang



Figure 1.16.
Research object in Kampung Raja 3 Ngabang

5. Tayan town (Sanggau Regency), survey and measurements performed on 3 cases which was held on December 7, 2010



Figure 1.17. *(left)*
Research object in
Kampung Pedalaman 1 Tayan



Figure 1.18. *(right)*
Research object in
Kampung Pedalaman 2 Tayan



Figure 1.19.
Research object in
Kampung Pedalaman 3 Tayan

6. Sanggau town (Sanggau Regency), survey and measurements performed on 3 cases which was held on December 7-8, 2010





Figure 1.20. *(left)*
Research object in
Kampung Beringin 1 Sanggau

Figure 1.21. *(right)*
Research object in
Kampung Beringin 2 Sanggau





Figure 1.22. *(left)*
Research object in
Kampung Beringin 3 Sanggau

Figure 1.23. *(right)*
Research object in
Kampung Beringin 4 Sanggau

7. Sekadau town (Sekadau Regency), survey and measurements performed on 3 cases which was held on December 8, 2010



Figure 1.24. *(left)*
Research object in Kampung Sungai Ringin 1 Sekadau



Figure 1.25. *(right)*
Research object in Kampung Sungai Ringin 2 Sekadau

8. Sintang town (Sintang Regency), survey and measurements performed on 3 cases which was held on December 9, 2010



Figure 1.26. *(left)*
Research object in Kampung Kapuas Kiri Hilir 1 Sintang



Figure 1.27. *(right)*
Research object in Kampung Kapuas Kiri Hilir 2 Sintang



Figure 1.28.
Research object in Kampung Kapuas Kiri Hilir 3 Sintang

9. Ketapang town (Ketapang Regency), survey and measurements performed on 3 cases which was held on December 12 – 13, 2010





Figure 1.29. *(left)*
Research object in Kampung Muliakarta 1 Ketapang

Figure 1.30. *(right)*
Research object in Kampung Muliakarta 2 Ketapang



Figure 1.31. *(left)*
Research object in
Kampung Muliakarta 3 Ketapang

10. Sukadana town (North Kayong Regency), survey and measurements performed on 3 cases which was held on December 14 – 15, 2010



Figure 1.32. *(left)*
Research object in
Kampung Simpang Tiga 1 Sukadana



Figure 1.33. *(right)*
Research object in
Kampung Simpang Tiga 2 Sukadana



Figure 1.34.
Research object in Kampung Simpang Tiga 3 Sukadana

Meanwhile, the location of the Dayak longhouses which author have done with surveys and measurements were in the four separate locations of Kapuas Hulu regency which was held on December 11, 2010.



Figure 1.35. *(left)*
Research object in Sungai Ulu' Palin village



Figure 1.36. *(right)*
Research object in Bali Gundi village



Figure 1.37. *(left)*
Research object in Melapi Patamuan village



Figure 1.38. *(right)*
Research object in Pabiring village

1.6.3. Data Processing Phase

Photos, sketches, measurements and recordings acquired from the research objects in the field were drawn with the software AutoCAD or 3DMax so that facades, sections, details and objects in 3D could be viewed in detail. Data was processed in the drafting studio facilities owned by the Department of Architecture, Faculty of Engineering, Tanjungpura University.

1.6.3.a. Field Data Sketches and Research Object Descriptions

After completion of the surveys and measurements of the research objects in the field, the next phase was to the process all the data by re-sketching and describing the condition of each research object. The re-sketching process was performed on 35 objects.

1.6.3.b. Drafting of the Research Objects

Based on the re-sketched materials of the research objects and the field survey data, the next phase was to redraw the research objects into 2D and 3D formats. In this, the author was assisted by other two students from the Architectural Engineering Department of the Tanjungpura University

1.6.4. Obstacles during collecting data on field

As can be seen on the figure 1.3 map, locations of the research objects were spread throughout West Kalimantan and either public or private transportation by land or water was used. The distance between the center of research activities at Tanjungpura University in Pontianak the location of the furthest research object which was in Putussibau in the Kapuas Hulu regency is approximately 600 km and took 18 hours to reach over land. The next farthest locations were Ketapang town (Ketapang regency) and Sukadana town (North Kayong regency) which took 8 hours travel time by sea from Pontianak. A variety obstacles beyond that of just distance were met at different research object locations.

Obstacles encountered during the survey included:

1. There was an owner who did not want his dwellings to be an object of research for a variety of reasons (this happened in the town of Mempawah);
2. Some parts of a house had been damaged or destroyed long ago and no heir was found that could explain the original true condition of the house at the time it was first erected (this was found in the town of Sekadau);
3. There were objections from the occupants to allow the researcher to enter their private rooms such as bedrooms or kitchens (as was the case with one of the longhouses in Kapuas Hulu regency);

4. Extreme weather conditions of heavy rain and overflowing rivers were obstacles in measuring the research objects (as happened during field surveys in the towns of both Tayan and Sekadau);
5. The observations, measurements and sketches had not been done thoroughly enough on the research objects due to lack of accurate tools and limited time provided by the home owner. In addition, there was a general feeling of discomfort by researchers while taking measurements and making observations, especially in the private spaces such as bedrooms or kitchens.
6. There was a lack of information obtained from residents about the history and the process of the establishment of the house. This occured because the occupants were the second generation or more in the ownership of the house.
7. There was a lack of supporting data that was needed for this research where little information could be obtained from maps, literature and previous research findings.



Figure 1.39. *(left)*
The overflowing rivers was happen when the field survey in Tayan (condition 1)



Figure 1.40. *(right)*
The overflowing rivers was happen when the field survey in Tayan (condition 2)



Figure 1.41.
The team members was posed in front of the car, the picture was taken on the Sintang road

1.7 Analysing proccess

The next phase was the process of re-sketch and describing the condition of the research objects one by one. The re-sketched process were performed on the 35 objects of research. Based on the re-sketch materials of the research objects and the field survey data, author continued the phase to redrawing the research objects into 2D and 3D formats. Photos, sketches, measurements and recordings of the objects acquired in the research fields were drawn with softwares of AutoCAD or 3DMax created the facade views, the sections views, details and 3D object views.

The research analysis starts by dividing and classifying the objects into the building parts on both of the two research objects: Malay dwellings and Dayak dwellings. The building parts were classified according to the following: lower part, middle part, and upper part. Those classifications were conducted based on research purposes. A typology analysis was done by comparing each element of the dwellings to find the generalization of the architecture of traditional Malay dwellings and traditional Dayak dwellings. According to Salama (2006), typological analysis can be defined as a way to describe the architecture as a part of connected objects in relation to the physical condition, through a descriptive category that is not dependent on "idealistic" style concepts and character concepts. Basically, the analysis permits examination of the typological classification, recognition and the description of different historic-era buildings from the different cultures. Taylor and Bogdan (1998: 144) mentioned that the typology or classification scheme, could be a useful aid in identifying themes and developing concepts and theories. The typology classifies the association of the other people and the objects in their research. By developing a typology, researchers began to construct the conceptual relationships between seemingly different phenomena.

Based on typology conclusions, the next step is the analysis of the meaning of the building elements, by exploring the anatomical characteristics of the building and the analyzing conducted by seeking the use of the human body measurement in the building. Also, the author will explore the physical or non-physical aspects of the cultural influences on the building forms, both for the traditional Malay dwellings and traditional Dayas dwellings. The conclusions for the anatomical characteristics of each traditional dwelling then will be compared to the other to find the answer to the research objectives. Referring to Taylor and Bogdan (1998: 137), by continuously comparing the specific incidents in the data, the researchers refine the

concepts, identify their characteristics, explore their relationship and integrate their data into a coherent theory. At the end of this theses readers would be found a general conclusion as the final findings of research, in order to show the anatomy of traditional dwellings in West Kalimantan.

1.8 Determination Research

Sampling in this study was carried out by having a case study on the population of traditional Malay dwellings and traditional Dayak dwellings in every research location. The type of traditional Malay dwellings which were taken as research objects consisted of *Potong Limas* (Limas shape), *Potong Kawat* (Kawat shape), and *Potong Godang* (Godang shape). Each object of traditional Malay dwellings which was taken as case study represented the type of traditional Malay dwellings in each city across West Kalimantan. The determination of traditional dwellings as samples was done in the field by sorting all objects in the population based on established criteria. The dwellings chosen as the sample should be in the highest place of established criteria, which is based on the built periods, originality of the house typology, and considerable lack of spatial alterations. Selection of object by established criteria aimed to have the original dwelling units, in order to obtain samples which could be analyzed and considered to represent the whole house unit.

All information data from case studies in the field was obtained through primary and secondary informants. Primary informants were people who lived in the location of the object of research and secondary informants were people who did not live in the research location, but knew and understood the cases observed. In this research, data were analyzed with a dynamic and creative process, the entire analysis was conducted to gain a deeper understanding of the objects and to continue to refine the interpretation. Charts, diagrams, or numbers served as a useful auxiliary in exploring patterns in the data. A sketch as interpretation

of data materialized out of different potential relationships, and becomes an important effort if it will help the next researchers come up with a new understanding. To develop and refine the interpretation of data, researchers use coding for all data categories. According to Taylor and Bogdan (1998: 137), the encoding process involves unifying and analyzing all the data link major themes, ideas, concepts, interpretation and propositions. Data codifying occurs in the following steps:

- Develop a story line;
- Create a list of major themes, typologies, concepts and propositions;
- Coding of data;
- Shorting the data into coding categories;
- Comparing the data; and
- Improve analysis

CHAPTER II
LITERATURE REVIEWS

2.1 Estimology

Anatomy

"as a science, is often defined as the study of the structure of an organism and the relationships of its parts. Anatomy is a study to learn about the structure of the human body by cutting it apart. This process, called dissection, is still the principal technique used to isolate and study the structure component or parts of the human body " (Thibodeau and Patton, 2000:1)

Dwelling or Home

"Dwelling does not take place after the completion of a process in which human beings have to deal with a set of existing objects that they use to create a shelter. Dwelling is the result of human beings getting involved with things and the results of human beings viewing the world around them " (Lefas, 2009:19)

"Home is a place which each person requires to sleep, facilities with which to carry out the basics of personal hygiene, a source of water, sources of food, and facilities to prepare the food for eating. But most people live as part of a family and in somewhat less Spartan surroundings. It is meant to be a safe, secure, familiar place, filled with the things of one's life, closed and private at times, open and outgoing at other times, at the option of its occupants " (Allen, 2005:20)

Traditional

"Carver (1981:27) mentioned the word traditional refers both to procedures and material objects that have become accepted as a norm in a society, and whose elements are passed on from generation to generation, usually orally, or more rarely by documents that have codified orally transmitted

knowledge, instructions, and procedures. They often do, but usually slowly enough that their provenance is clearly seen or easily established. Though change is a constant in any society, it is the rate at which a society is forced to absorb the new that determines whether it can retain its integrity " (Noble, 2007:1)

Traditional Dwelling

" Rodger (1974:105). Mentioned the concept of "traditional dwelling," normally employed to describe a simple structure, often can be quite a complex conception. In warm environments where so much of daily life is lived in the open, the concept of a house as a structure is not as important as that of the entire compound, "the idea of a bit of land which is screened for privacy and which contains some enclosed internal space, and some outside space. This whole thing taken together is thought of as the home environment. Each part within is used as seems most appropriate in the circumstances" (Noble, 2007:1-3)

Traditional Building

" Traditional building is the product of talented but largely untrained individuals, who build as they do because such knowledge has been more or less informally passed on from generation to generation. The society enforces rules, often unwritten, by group acceptance. Even so, some individuals do not conform, but their structures never characterize the ethnic group's most definitive buildings " (Noble, 2007:14)

Indigenous Architecture

" Indigenous Architecture or folk architecture is usually employed to describe practices or structures which are the products of persons not professionally trained in building arts, but who produce structures or follow techniques which basically have been accepted by a society as the correct or "best" way " (Noble, 2007:5)

2.2 Constructing the Theory of Traditional Architecture

Talking about the architecture certainly is not out of the human history in which initially tried to compromises with nature and the surrounding environment. In the process, humans began to filled the values into the shapes of the work of architecture. According to Heath (2009: xi), in architecture, regionalism has become an approaches that seeks the understanding of the building by using the contextual forces that surrounds the object to produce them. Critical regionalism is demonstrated through the form of architectural practices that includes the modern architecture which critically to unifier the universal quality which at the same time also responding to the social contexts, cultures, and climates of the region in which it was built.

In Mallgrave (2006: 376), George Muller wrote an essay entitled "German architectural monuments", said that each kind of architectural objects is related its authenticity with the origin country or region where the object comes. The authenticity forms is influenced by the different climates and the different environmental circumstances of the origins. And if transferred to another person or to another country, this architectural masterpiece will try to maintain its character of un related and un harmonised to the current surrounding environments. So, a nation has a certain propriety of architectural styles, which the buildings will:

1. adapt to the climate, construction style, adapted to the material and to the sentiment and behavior of the nation in its times;
2. in its principal forms and in the some parts and ornaments of the whole building in harmony with itself which it does not includes and rejects everything that is outlandish, un appropiate or un suitable.

More details Vitruvius (1914: 15-18), In the book I, said that the architecture depends on:

1. ***Order***, Order occured because the members of a design is considered separately, and symmetrically agreed to the proportion of all parts;
2. ***Arrangement***, arrangement includes to the things that put the object in the right places and the elegance of the effects caused by the adjustments and the appropriateness to the character of architectural work;
3. ***Eurithmy***, Eurithmy is a beauty and fitness in the adjustment of members;
4. ***Symmetry***, Symmetry is a proper alignment between the members of the architectural work itself and the relationship between the different parts of the general schemes, is corresponds to the certain part which selected as standard;
5. ***Propriety***, Propriety is the perception of the style that comes when a work authoritatively constructed to the approved principles. These arised from the perception, of the use, or of the nature; and
6. ***Economy***, Economy shows the good management of materials and lands.

The elements that make up the work of architecture, especially in buildings, such as to the structural elements and the spacing, should continuesly to do the further investigations; like human do to the living beings. There have been many studies is conducted in the past to investigate the building as an architectural work . As mentioned by Leupen, et. al (1997: 27-38), stated that the basic instruments of the sequences of the classical architecture can be found earlier in Asia Minor and Mesopotamia and in the cities of China, everything is built in this way. the basic instruments, are:

a. Grid, grid can be understood as a system of the axial lines and intersect in the same distance, set the center line on the spatial elements.

b. Harmony and proportion, according to Vitruvius, building must meet to the Firmitas (firmness), commoditas (commodities), and venustas (pleasures); architecture according to Vitruvius means the order, hierarchy, accuracy, economy and symmetry. The concept that mentioned the last by Vitruvius is refers to the harmony.
c. The material system, a system of imaginary center line or axis that regulates the position material. System is distinguished in two types of the axis used: axis of symmetry and the axis of the material. All layers of the material elements (columns, architraves) and the used tools to sort them (axis, the proportion of the system) as part of the material system.
d. bay (not discussed by the author);
e. Renaissance (not discussed by the author);
f. Hierarchy, in addition to basic geometric shapes, classic architecture uses a hierarchy to control the ordering of space and matter. On the exterior, symmetry and proportion are used to control the composition of the material. To give the required effect in the altitude composition, some of the elements embodied more dominate than the other in its compositions. In the interior, the material is very important to formed the space composition. Opposition of the material formation in the facade is very prominent, not only in determining the shape of space but also as a bearer of the image and meaning.
g. The space systems, to ordering the material and to sorting the space which comply with a set of rules; system of material and space systems, the composition is formed by these two different systems.

h. Geometry, to construct a design from the basic geometric shapes and then divided into secondary of the smaller basic shapes, which causes centralized composition hierarchy and are usually found in the geometric system.

i. Pictorial systems, pictorial system is related to the elements that determine the image and how they are arranged in a composition.

This is consistent with those also described by Vitruvius (1914: 19-20), that all buildings designed, must be built with reference to:

1) **Durability**, the building durability is ensured when the foundation were implanted into the solid ground and used wisely and freely to the chosen materials;
2) **Convenience**, when building in the perfect arrangement and there is no obstacle in its use and when each class of the building work is suitable and appropriate for the appearance; and
2) **Beauty**, when the appearance of design that is fun and in the good taste and when its members is in the correct proportions accordance with the principles of symmetry.

Vitruvius also says that all the points which author mentioned in previous passage is very relevant to the basic needs of the architectural elements. These elements must be owned by a building and are designed for the occupants in an attempt to compromise with the nature and the environment.

Durability of the building ensured the systems are able to facilitated all the load by its anatomical structures and all their parts are capable of supporting the building loads to give safety to the occupants of building. Schodek (1998: 3) create a simple definition of the structure in relation to the building, the structure is a means to distribute the load, and due to the use and / or the presences of building, into the ground.

Furthermore, it is said that the structure can be defined as a physical entity of the overall properties which can be understood as an organization of the primary elements placed in the place and it dominates the overall character of the interrelation of its parts.

Starting to the point of this overview, according to Glasser, He argued that the structural system provides a framework which includes the unification of all other structural elements and together they succeeded formed the basic frame for the architectural images. In this meaning, the structure is considered as a determining factors in the design process thus provides the basic characters to aesthetic of the buildings (Snyder & Catanese, 1994).

Comfortable for the occupants is a must. To create comfortability, the building must be created with attention to the anatomy of plan and utility to accommodate their activities. The building plan is related to arrangements of the appropiate rooms to accomadate the activities of the occupants. Meanwhile, related to comportability in the building utilities, Chadderton (2004: 2) mentioned some of the basic requirements for human comforts. Visually, the color provided by the natural and artificial lighting produced by the combination of decoration and the windows. The acoustic environment largely due to the success achieved to providing the required temperature with a quiet service equipments, and all are the parts of the thermal control and the transportation arrangements.

Beauty of the building obtained not only from the creation in the anatomically forms and proportionate to its images and aesthetics but also adjusted to the rules of beauty which can be captured by the human senses. Mallgrave (2006: 267), said that beauty is an order and construction of the parts, either to the primary constitution such by the nature, custom, or diversity, but it also fitted to give pleasure and

satisfaction to the soul. David Hume in Mallgrave (2006: 319), with an essay entitled "a treatise of the human nature", said the vast majority of this beauty comes from the idea of comfort and utility. This is reinforced by Uvedale Price, in his essay entitled "essay on the beautiful", states that one of the most important qualities of beauty is smoothness. Perfection of a smoothness is absolute equality and uniformity of the surface.

Meanwhile also in Mallgrave (2006: 340-341), Christian Ludwig Stieglitz, talking about building in his essay entitled "The Archaeology of Greek and Roman architecture", states that a building only can be called beautiful when all its parts constructed and incorporated in the position of normally and regularly, when they contained symmetry, when they related to one another and to the entire sections, and when they both has grandeur and proportion, pleasing to the eye, when they laid out the elements adapted to the character both as the parts or the whole of the building . And furthermore, it also emphasized by Immanuel Kant through his essay entitled "critics values, which is mentioned in the Mallgrave (2006: 396), there are two kinds of beauty: the free beauty (*pulchritudo Vaga*) and the adherent beauty (*pulchritudo adhaerens*). The first is pre-supposition to the concept of what the object should be; the second is pre-suppositions to the concept of perfection of the object which in line to the first mentioned as beauty of the things (self-subsistence), the second as the concept of dependent beauty (conditioned beauty) is a object designed under concept with the particular purpose.

2.3 Constructing the Theory of the Anatomy of Traditional Dwelling

As stated in previous chapter, the objectives of this research are to determine the anatomy of dwellings by performing comparisons between indigenous traditional architecture of Malays and Dayaks in West Kalimantan. To reach that research objective, the following sub-chapter will review the theories that are

designed to get the definition, and the steps to construct a deeper understanding about the anatomy of traditional dwellings.

The term *anatomy* is very often found in biological science or medical science. To explore the anatomy which is associated with the dwellings, firstly, we would have to understand anatomy as a whole. Anatomy studies are used in science to determine the structural order or the parts that make up living things. This science is usually used in defining the body parts of three kindsof living things: plants, animals, and humans. Basically, we can use all three of them to understand anatomy. However, please note that based on appearances, only the anatomy of the human body, which has the structures and the systems, is complex. This complexity holds the advantage of being used as an entry point to anatomical learning. In addition, as the first step to seeking these meanings, understanding the anatomy of these disciplines, especially in medical science, will also be helpful for further understanding the anatomy of the human body, as the structure which will be translated into the meaning of the dwelling.

2.3.1 The Anatomy of Human Body

Thibodeau and Patton (2000:2) mention:

> "The Human body is a unified and structurally in the complex assembly and functionally in the interactive components, each working together to ensure healthy survival. A System is an organization of varying numbers and kinds of organs arranged so that they can together perform the complex functions for the body. An organ is a group of several different kinds of tissue (organization of many similar cells that act together to perform a common function) arranged so that they can together act as a unit to perform a special function".

Explained in depth by Thibodeau and Patton (2000: 58-68), the human body is composed by 11 major organ systems that are listed below:

a) *Integumentary system*, the skin is the largest and the most important organ in the integumentary system, and accounts for about 16 % of total of the human body weight, making it the body's heaviest organ. Its primary function is protection. The skin regulates body temperature by sweating, synthesizes important chemicals, and functions as a sophisticated sense organ*;*

b) *Skeletal system*, this system includes not only the bones but also the related tissues that together provide the body with a rigid framework forsupport and protection. The skeletal system, through the existence of joints between bones, makes possible the movements of body parts. The fourfunctions of the skeletal system: *to support* the body in firmly standing, bones forming the body and supporting the body frame; a*s the protection*, the hard bony "boxes" protect delicate structures enclosed within them; *as the movement*, muscles are anchored firmly to the bones. When the muscles shorten because of contractions, they pull on the bones and thereby move them; *as the storage*, serving as a safety deposit for calcium; and *hemopoiesis*;

c) *Muscular system*, individual skeletal muscles are the organs of the muscular system. Muscles produce movement and maintain the body posture, and generate the heat required for maintaining a constant core body temperature.

d) *Nervous system*, the brain, spinal cord and nerves are the organs of the nervous system. The extensive network of the components of the nervous system makes it possible for this complex system to

perform its primary functions. These include the following : Communication between body functions, Integration of body functions, Control of body functions, and Recognition of sensory stimuli;

e) *Endocrine system*, the endocrine system is composed of specialized glands that secrete chemicals known as hormones directly into the blood. The organs of the endocrine system perform the same functions as the nervous system : communication, integration and control. The endocrine system provides slower but longer-lasting control by hormone secretion;

f) *Cardiovascular (circulatory) system*, the circulatory system consists of the heart and the closed system of the vessels which is made up of arteries, veins and capillaries. The primary function of the circulatory system is transportation. The need for an efficient transportation system in the body is critical. Transportation needs include continous movement of the important substances. The circulatory system also helps regulate body temperature by the disturbing heat throughout the body and can also become involved in the defense of the body or immunity;

g) *Lymphatic system*, the lymphatic system is composed of the lymph nodes, the lymphatic vessels, and the specialized lymphatic organs. The function of the lympathic system includes movement of the fluids and certain large molecules and movement of fat-related nutrients from the digestive tract back to the blood. The lymphatic system is also involved in the functioning of the immune system, which plays a critical role in the defense mechanisms of the body against disease;

h) *Respitory system*, the organs of the respiratory system include the nose, pharynx, larynx, trachea, bronchi and lungs. The organs of the respiratory system perform a number of functions in addition to

permitting movement of air, inhaled irritants, and are also involved in regulating the acid-base balance of the body;

i) *Digestive system*, the organs of the digestive system are often separated into two groups: the primary organs and secondary organs. These work together to ensure proper digestion and absorption of nutrients. The primary organs include the mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum and canal. The secondary organs of digestion include the teeth, salivary glands, tongue, liver, gall bladder, pancreas and appendix;

j) *Urinary system*, the organs of urinary system include the kidneys, ureters, bladder and urethra. Cleaning the blood of the waste products which are continually produced by metabolism of nutrients in the body cells and maintaining the electrolyte, water, and acid-base balance in the body and also involved in the elimination of body wastes; and

k) *Reproductive,* the proper functioning of the reproductive systems is to ensure survival, not of the individual but of the species – human race.

2.3.2 The Anatomy of Building

Generally, author found some literatures in the readings to the architectural theory books which in specially discussed the understanding towards the anatomy of building. Anatomy is described well in the study of biology and arts. Meanwhile, if we seeking the building anatomy in the architectural engineering books, anatomy by the authors, is relates the understanding towards the structure of building. This was described in detail by Wahl (2007) in his book entitled: Building Anatomy, giving Guidance An Illustration Works How the Building Structures. The author also found books which the author tried to classify the

anatomy of the building into 6 anatomical types. Soepardi (1986,1997) in the his book series about building anatomy, described the building as a whole is divided into six types of Anatomy; which is consist of: Anatomy of floorplan, Anatomy of Shape or images, Anatomy of section, Anatomy of Structure, Anatomy Aesthetics, and Anatomy of Utilities. However, in the book series he wrote, He does not explained in detail how he was structuring the anatomy of building as He was mentioned above.

In regards to the need of research, author tried to make the detailed explanation about each type of the building anatomy as mentioned by Soepardi (1986.1997) based on the theory of architecture that is commonly understood, and constructed as the theories of this research, in the following passages.

2.3.2.a. Anatomy of plan

Rooms or spaces appeared after peoples feel the difference of the basic needs to facilitated of each their activities. Unwin (2003: 53-54), identified the place as the architectural elements. A place to do activities may identified in many ways, with the platform, with the lights, or with the numbers of pillars which marking the area as a stipulation of the land. Meanwhile, according to Arnheim (1977: 10, 32), physically, the space defined by the physical extension of the material or areas that adjacent to each other. Space was created and structured by objects that filled them. This means that the mass of buildings and distances between them, and the shape boundaries and axis, set the place of the human occupancy either outside or inside. Arnheim also mentions that space as the organization of the building and the surroundings environment.

Norberg_Schulz (1979: 5), explains that human beings alive when they can orientated into themself and when they identify themselves into the surroundings environment, or in short understanding, when he felt

the environment is more meaningful. Place of residence implied to something more than "the shelter". This implies that the space as a place in which life occurs, in the truest sense of the word. A place is the space that has many different characters. Since ancient times, genius loci or the spirit of a place, people have been recognized a place as a tangible reality that humans must faced and appear to make peace between people with their everyday life. So, a shelter should be protectively.

Regard to the explanation of Norberg_Schulz above, it is necessary for humans to identify the room that suggests the each character of their activities. Unwin (2003: 54-57), identified type of the place or space that generally found in primitive or traditional buildings, namely:

a) fireplace (the hearth). fireplace has traditional meanings in the many cultures, as the heart of the house, or the focus of a community, source of warmness, for cooking, as the reference point of the surroundings life;
b) Bed - a place to sleep, to have sex, or to rest when have the pain. The bedroom is the deepest place, the most personal place, the most protected in the house. The bedroom become a room in the conceptual, and often physically, placed on the edge of a staircases or set aside from the living room, private for the owners, and are often considered less important than the guest room;
c) Altar - a table for the sacrifice or worship. Some things in the architecture, without formed like an altar, a place could be like them. When put something in their room, pour a table with memorablia of the favorite things, could be like an altar;
d) place of work - space for the outdoor activities that were should completed at home immediately.

Development of the human civilization also makes the space is created not only as the shelters of activities, increases become as a thing to showed their personal identity to the community. According Norberg_Schulz (1979: 15), All the place has characters, and characters is the basic mode in which "given" by the world. For some characters, place is the function of time, it changes with the seasons, the day circulation and the weather. The factors mentioned above all is also determined by the different light conditions. Character is determined by the material and the formal rules of the place. Usually the character "family" to the buildings they occupying, will thickened their characteristics into the motifs such as in the particular doors, windows and roof. These motifs may be 'conventional elements', which serves to tranpose characters from one place to another. In in Unwin (2003: 158-160), added that the transition in a room play a role in the relationship between place and context. Often there were sequences, or levels of hierarchy between a static place to another . The core of the house can be said at a fireplace in the meeting room (the family room). The transition also provides a buffer between one place to another, especially between 'the inside' and 'the outside'.

Any way, the character of the room is not only describes the differences of each activities. When people is getting establish, they begin to think about the elements of "great power" that controls their lives and applied in the creating a place which sheltering their activities. Norberg_Schulz (1979: 15), mentions that space as the system of relations, denoted as the preposition.

According to Unwin (2003: 25-35), Although the use of basic elements may be the main way in which the mind, conceptually, is ordered to organize the space into places, but by modified the elements will contributes a lot to feel the differences of the experience when stayed in the place.

The following is modification to the elements that can be done according to Unwin, namely:

a. Light (light is the architectural conditions, but also can be used as an element of architcture. The light can be associated to the activity of place. Light to make the composition of a building seems like the dematerialization);
b. Colors (colors emerged from the material object which is influenced by the color of light falling on them. The color with light, can be instrumentally identifying the places where Colors is played. Colors taken part in introduction to the places. Colors are also used in the encoding);
c. Temperature (play a part in the identification of a place);
d. Ventilation (ventilation involved to the temperature and humidity. Together they can identifying places that may be warm, dry, or still: Cold, damp, and windy, warm, moist; and so on);
e. Sound (can be acted like intencity of the light in identifying the places);
f. smell;
g. Texture (can be achieved by the application of surface, paint or composition);
h. Scale (This refers to the size of something which is relative to itself);
i. Time.

2.3.2.b. Anatomy of shape

In Mallgrave (2006: 413), Karl Friedrich Schinkel in his essay entitled "The principle of art in architecture" denotes all forms of architecture is based on three basic ideas, namely:

1. In the form of construction;
2. In the form that have the traditional or historical interest;

3. In the form that meanings to themselves and they took models from the natural

Reflected to the basic ideas mentioned above, the architecture visualized in various means which is depending on the individual characters and the environment conditions (natural and cultural). However, these forms were identified to the basic shape of an architectural object, has generally understood by human beings from time to time. Unwin (2003: 99-120) said the geometric attached to the identification of shapes that are created; according to Unwin, the type of geometry in architecture as follows:

a. The circles of presence. Architecture using three type of circles: the circle extension which is easily seen, the circle proximity which is easily touched, and the circle which connecting the places. Many architecture from prehistoric times to the present, been concerned with asserting, defining, strengthening, printing or controlling the presence of circle;
b. The line of sight, is thinking of an architecture as the identification of a place, the line of sight established the contacts between places;
c. The line of passage, which is often associated with the line of sight, but it is not congruently. A line of passage to set or to reinforce the lines of sight. Architecture can make a arrangement with aligning the line of passage with the line of sight, but sometimes the line of passage also deviated with the line of sight;
d. Measurement, people set the scale of the work of architecture by compares to their own stature as a man, or with the ways in which their bodies can move. People take the measurements onto their residential architecture works, and using those measurements to make the differenciation of assessment to their work designs;

e. Six-way-plus-center, in deals with the place that has a front (in front), a back (the back) a two sides (left and right), a top (above), and a ground (below). Certainly we feel that in some respects, this is the way we relates to something. This ways to understanding the objects which attributed to many aspects, this also used in its relation to the cosmology factors of the occupants with the belief they held. The work of architecture can be oriented to matters relating to the direction of 'the worldliness" and can also defined to the anthropomorphic forms. In this way, humans can mediate the geometrical structure of the worldliness to their conditions;

f. Social Geometry, the works of architecture is the respond towards the social geometry, ordered them and make the physical realization becomes permanent. Social geometry can be transforming into a rectangle, accommodated in the arrangement of the house structure. Manifestation of the social geometric in placement can be found also on the carpet, forming a circle with a row of chairs and others. A round table can be accommodated as a center in one corner of the semi-circle near the window between the kitchen and the living room.

g. Geometry of making, many in everyday objects have a geometry that comes from the way they are made. Geometry of making is very important in the building construction. The social geometry conditions associated with the size and the layout of rooms. The building as a work of architecture infused with the geometry, although the geometry is not always appropriate and artificially ordered. Geometry of making is said vulnerable to the mathematical calculations, although its seem to be as infinite in the variety ways to organize the structure with a span of the particular space.

h. Ideal geometry, objects that are designed to illustrates a modular harmonious as mentioned by Le Corbusier.

Steadman (2008: 4), explained the characteristics of designed objects such as buildings and the characteristic of the resulting objects in the way of it designed, can be seen both in the individual and cultural level of the people who become the design subject, they lend themselves in the particularly well to descripted and communicated through a biological metaphor. The idea of the "wholeness" coherence, the correlation and the integration, is used to express the setting relationship between the parts of biological organisms and applied for the same qualities in describing a well-designed artifacts.

The building designs is one way to describe the wholeness characteristics of the individual and the culture that developes in where the building was erected. This idea mixed into the wholeness artifacts as well as to shaped the building form. As a work of architectural, this form has the certain properties to determining the patterns and compositions of its constituent elements. As of the certain properties owned by forms in determining the pattern and composition of the Elements, according to Ching (2000: 35), is:

a. The position, is the location of a shape which is relative to the environment or to the visual environment in which the forms are seen;
b. The orientation, is towards the meaning of a form which is relative to the ground plane, the virtual wind directions, the other shapes, or against to someone who saw it.
c. Visual inertia, is the level of concentration and the stability of a shape. The Visual inertia of a shape depends on the geometry and orientation relative to the ground plane, and gravity of the human sight line

The exterior shapes of the building facades is also can be emphasized by showing clearly the natural properties of parts, including the coherence relationship between each other correctly. According Ricardson and Corfiato (1956: 10, 21), the affirmation of the exterior shapes of the building facades will depend on the surface texture, especially with the contrast between the voids and solids. The arrangement and grouping of the windows and doors, which formed patterns on the exterior walls, in creates the rhythms and balance. In addition, color in architecture emerged in the surface modeling, the study of projection, and grouping the best features calculated from the given effects of light and shadow. The decorative carvings and the symbolic meaning in sympathy with the architecture is not only intended to beautify the exterior but also to colored the values. On the other hand, according to Ching (2000: 79), the affirmation or the articulations of form means to the way how the exterior elements working together to formed the shapes and volume. The surfaces appeared as the discrete areas in axterior or even in the different shapes and the overall configuration is clearly and easily accepted by the eyes. Similarly, the affirmed forms to emphasize the connection of the principal forms in order to expressed the individual meaning visually.

Further explanation by Ching (2000) about the affirmed forms, as follow:

- Distinguishing the adjacent surface in giving the different types of materials, colors, textures or patterns;
- Develop a corner as an affirmation of the linear elements and separated from the surface;
- Eliminate the corners which is physically will occured to separate its from the adjacent areas;
- illuminated the shapes by creating contrast in the level of rhythmic acuity along the sides and corners

2.3.2.c. Anatomy of Section

This understanding is needed to explain the section of the building as the stature form and intended to see it in position as the building framework vertically. In the way to understanding the anatomy, the building framework distinguished by taking account to its compositions as the structural system and as the cosmological system.

According to Ricardson and Corfiato (1956: 21), the character in the public buildings, associated with composition of the spiritual qualities delivered outwardly about the meaning and purpose of why the building intends to erected. And furthermore He explained that the balance on its system is implies the elevation to the axis, both known as the absolute symmetry about the center, or as the similarity of reciprocity, and sometimes lead to the identity of detail. Balance without symmetry is also allowed, depending on the structural disposition plan, not less than the exterior perspective and appreciation of the dominant masses.

As the structural system, the building parts would explains the purposed differences between the the height of the each building floor. The height differences gives different characters in the each floor especially to the activities of occupants in inside of the building and also between the spaces in inside and the surrounding environment in outside. According to Unwin (2003: 19-21), in physical meaning, the main elements of the architecture is the condition in which it operates. In the principles, this includes: the lands as the datum which is most closely related to the architecture products; the space above the surface which in the architecture means to makes space in the different activities therein; the gravity, the light and the times.In this condition, the architecture has a high pallet of the conceptual material for the works. The most basic level this palette includes:

- setting the site in land;
- elevating the land, or the platform;
- Lowering the land, or pit;
- marker
- The focal point (this is intended for the altar, or the fire place, even the distant mountain);
- the barrier (can be a wall, stairs, dyke or trench);
- the roof or canopy;
- The supporting posts, or columns;
- the path (place where used to moveI; may be a straight, trace, ramp, stairs, or even a ladder;
- The openings (doors, windows).

Unwin (2003: 77, 81, 150) explained the frames can be a structure and a barier. building can be framed in a structural way, but the architecture can create its in a conceptual framework. The depth of a building often can be seen in every levels of elevation and of course each has owned characters. By design, the characters on each of the structural elevation is also able to explains the purpose of the distinction attended. According to Unwin, The character of the elevational differences can be found in inside the building (floor elevation) or in the differences between the land and the building floor. The character of the building groundfloor which accessed from the ground, it will differ with the separation floor from the ground; the characters of the top floor may also be influenced by the geometry of the roof, or perhaps by the availability of light from the sky.

Furthermore, according to the Ricardson and Corfiato (1956: 21) statement, the composition of elevation is the problem of synthesis of the structural elements; that the composition depends on the proportions and the modulus in the general scale. The references also should be done with the detail contribution to simplified or elaborated and to highlighted of the plastic expressions.

The cosmological system in the building parts vertically described relationship the symbol between space to the other in the each created room. Norberg_Schulz (1979: 15) explains that the man-made places relates with the nature are created in the three basic ways. First, human nature wants to make the more precise structure (visualized the understanding about nature, gained a foothold to express it). Second, people must solve problems of the specific situations. Finally, the third, people must representing his understanding of the nature. All the relationship of the three basic ways implies that humans gather meanings from their experiences and acquired to create useful things for themself. Imago Mundi or microcosm that visualize (make real) the world. Visualizations, complementations and symbolizations are aspects of the general process of the human condition to settle down and alive.

2.3.2.d. Anatomy of structure

The structure is understood as the critical parts of the building which is designed to able to support the received loads. The structural design is intended to the building in order to stand properly and stature, to sheltering the occupant activities in inside, and also provide the security and the comfortability. According to Steadman (2008: 15), the structural functioned to affirmed the shape characteristics through the outer surfaces, they are declared like in the organs of the human body which is seen bulging through the skin. The

structure consists of the members which is supported by various the clearly made functions of building, and also various of the allowed internal spaces.

Therefore, in order to performs the function properly, the structure must have the certain clearly properties both in the materials and the systems. In performing its function to support and to respond any applied load, according to MacDonald (2001: 9-21) structure must containing of four properties: the structure ordered to achieved an equilibrium state, the structure ordered to stable, the structure ordered to have the adequate strength, and structure ordered to have the sufficient stiffness.

Structures is the collection of systems which owned the functions and purposes in it parts and relates to each other. Ching (2008: 2:02), A system can be defined as a collection of the interconnected or the interdependent materials and works together to forms an entity that is more complex and integrated, where the collection is placed to serves the same purpose. A building is a physical entity of a number of systems and subsystems, importance and should be linked, coordinated and integrated to one another, including to the three-dimensional shapes and to the overall of the spatial organization of the building. Affirmed by Schierle (2003: 3-1), the structural system must be designed to: Strength, Stiffness, stability, and synergy. The system basic structure consists of the horizontal structure and the vertical structure (the gravity loads and the lateral loads).

Furthermore Schierle (2003: 3-2) explained that the structure must be designed to meet the three Ss (strength, stiffness, and stability) which mentioned above. These are relates to attention of: the strenght to prevent the fracture occurrence; the compliance to the issues of stiffness to prevent the excessive deformation;

and the stability to prevent the collapse. The thing which no less important is the structural design must also meet the fourth S (i.e. the synergy) to strengthen the architectural design.

In obtaining the desired structures of design, it is necessary to the buildings meet the design requirements to the four basic elements expected by Schierle. According to MacDonald (1997: 5), Terms of the basic elements of the structure (as an element of the assertiveness from the list of architectural terms of 'assertiveness', 'commodity' and 'pleasure') is the ability to achieves balancing in all the possible load conditions, the geometric stability, the strength and the sufficient stiffness. Therefore, to achieve the required Equilibrium, the structural elements must be configured properly, the stability is guaranteed by the provision of the bracing systems, and the adequate strength and stiffness are provided by the specification of structural elements with the size sufficient, so that gives strength to the material's constituent.

Schierle (2003: 3-17) also Adds further, the stability factor is the most complex and in some experiences is more difficult to measures it than to the factors of strength and stiffness, but broadly could defined as the capacity to endures from the occurrence of: the displacement, overturning, falling, Bending.

In practices, according to Ching (2008: 2.03), System of the building structures is designed to supports and to transmit the force of the gravity and lateral loads safely to the ground without exceeding the loads design. For that reason, the building is usually understood in the arrangement of parts as the structural system , and each parts has the specific functions. According to Ching, parts of the building as the structural system is composed of:

- Superstructures, is the vertical extension of building upper the foundation;
- Columns, beams and structures, to support the weight-bearing: i.e. walls, floors and roofs;

- Substructures, is the most under of the structure as the foundation of building.

Additionally, Schierle (2003: 3-9,10, 11-12) also explained that the vertical elements transfering loads from the roof to the foundation, bring the force of gravity and / or the lateral loads; and other parts, the horizontal elements including the floor and the roof frame system , supports the gravitational force from the dead load and the live load, then the force was transferred to the vertical support, such as walls and columns. Although the elements may endure the gravity force or only the lateral loads, most of it designed to withstand both loads. the four basic elements of loadings used individually or in combination to endure the gravity and lateral loads. The walls are usually designed to form the defined space, but also provided assistances to support the load of building.

2.3.2.e. Anatomy of Aesthetics

Aesthetics is the additional values given to the work of architecture. Dwellings as the work of architecture also provided an aesthetic touch to the appearances. Allen (1993: 169), a shelter was set up to shade the occupant activities must be built to the beauty, and to the comfortability of the eyes to enjoying it. Details plays the important roles in its function of giving the Aesthetics impression to the building. This has been confirmed by Fløistad (2007: 3) that the beauty becomes a key idea in aesthetics.

Generally, assessments of the aesthetic beauty of the architectural works is different for every person. People will judge differently to the beauty of the architectural works which he was seen and touched. This is depends on the observer experiences based on the learning and influences of the inherent cultures. According to Fløistad (2007: 7-8), Kant emphasized the difference in the assessment of the beauty of objects, one side is the self-assessments which is often associated to the things that connotes «I love it»; other side is

the intersubjective assessments or a priori assessment without personal interests. However, one of the epistemological moral of Kant's theory of aesthetics which is mentioned above, according to Berger (2009: 81), there is an empirical assimilation to the quality assessment was reasonable, as we see in Locke, but ultimately it is a suspect and problematic. Aesthetics as an assessment to the object is culturally and historically determined from the various aspects. Form or beauty of the various objects can be enjoyed through the trans-cultural, even toward the natural conditions and the natural objects that it seem the differences. the beauty is not a single that can only be enjoyed as to the buildings, but the beauty of buildings can be enjoyed in the conjunction collectively with the surrounding environments.

Diversity of the observer perceptions (which is depending on the experiences and the inherent culture) affect one's explanation about the aesthetics what he seen and feel. Explanation of aesthetic had been developed from the past until present. A description of the classical aesthetics understood metaphysically, according to Townsend (2006: xvii, xxvi, xxvii), mainly associated with the beauty. It seems from how to understand the reality that much deeper and wider than the aesthetics itself. The beauty is seen as the subjective response to the quality which produce emotion for the perceiver. Alexander Gottlieb Baumgarten (1714-1762) introduced the 'aesthetic' as a word to describe the nature of the sensory feelings that include the effects of art, nature and perception in the most usual sense.

Furthermore, Lang (1987: 179, 181), explained the word of aesthetics refers to something that has to do with perceptions. According to him, the aesthetical studies relates to:

1) to Identifying and to understanding the factors that contributes to the perception of objects; or process as a beautiful or a pleasurable experience, which involves the study of the process of perception, cognition and attitude formation;
2) Understanding the nature of the human ability to create and to enjoy the creating displays that perceived aesthetically as pleasing. This involves the study of philosophy of aesthetics and the creativity of process.

Humans have abilities to identify and to understand the quality of the architectural works with variety level of their knowledges and the assessment outputs . Many variables in order to assess the aesthetic quality of the architectural works. In the book edited by Fløistad (2007: 33), Hamashita wrote an essay entitled "extending meanings of aesthetic and the ethical moments", he quoted the statement Chogyu about beauty. Beauty is the facts related to the mental and emotional, irrelevant with the goodness, as a meaning to an end of the supreme goodness. The latter meaning is related to the moral and practical, while the beauty and aesthetics is an object of the appreciation.

According to Townsend (2006: 16-18), the aesthetic quality is usually manifested in the form of beauty, grace, elegance, grandeur, sublimity, and so forth. Aesthetics also is value that can be sensed by the human's senses. The values ascribed to the object or the world that intrinsically well ordered, beautiful, harmonious, or more desirable based on their real nature. Aesthetic Value tipically "about" the pleasant or beautiful objects or the experiences perceived as pleasant.

The aesthetic variables which manifested in various forms, is intended as an effort to provide the uniformity of the given assessment. Eventhough the assessment, of course will varies and its depend on the background provided as the basis of valuation. Generally, the assessment of an artist will be differ with a

constructor in assessing the aesthetics. George Santayana (1896) in Lang (1987: 180-181) mentions about the different of the aesthetic values. According to him, the aesthetic values consist of the formal and symbolic values. The formal aesthetic values should be with: the Perceptions of the system relationshipness on the existing level of pattern (the proportion and the principle of order); determination of an organization that embodied in the slogans such as "form follows function". In this case, the form based on its instrumental function. Because of its use, the building requires the assumptions of certain forms, mechanical perception of the materials, the level of an urgent need as the residence, the light accessibility, and comfortability; The Symbolic aesthetics associated with the associational meaning of the environmental patterns that giving the pleasure for people. the symbolic aesthetics is the interests of the research scientists with the behavioral theory of significance, meaning and feeling.

the given assessment to the architectural works, either as the formal and symbolic values, is actually to provide psychological closeness as a work of the abstract forms as results of the human effort that created to the other people who enjoyed their work. Hegel (1988: 134-141), mentioned the form of the natural beauty is an abstract form that contains the unity and the abstract relationship to itself. But if understood more closely, the beauty ordering the doubled external influences in accordance to the determination and the unity which become the inner strength and shaping the backrest for those who enjoyed the beauty. Therefore, in the abstract form the above purpose are often associated as the regularity and symmetry, conformity with the law and harmony. On the other hand, Townsend (2006: 46), in his understanding of the point of classical philosophy, aesthetics identified with the sequence and the shape reality. In the Classical theory of beauty,

therefore, emphasis on harmony and relationships that show the sequence. Beauty itself is a characteristic of the pure form of reality in itself.

Lang (1987: 188-195) stated that the formal aesthetics in gestaltist approach, it must contained the following aspects:

1) The elements of design

the design elements is gathered together with the texture or lines, plans, volume, environments, the visual appearance of buildings and dimensions of objects.

2) The principles of composition

Psychological organization of the visual composition is the condition of "good" that allows to apply. "Good" in this sense is not the evaluative statement. "Good forms" has the following characteristics: simetry, inclusiveness, unity, harmony, regularity, conciseness, and "maximum simplicity."

3) Order and disorder

Order of the environment is arrangement of the parts which make up the whole in such a way that redundancy, self-contradictions and conflicts can be avoided. According to Arnheim (1977), Order occurs when some of the basic principles determine the composition of components. Disorder (irregularity) of the environment is the relationship to each other of the component is purely gratuitous and not managed by some of the overall principle. The composition is said to disordered when the principles of mutual supports the composition, and it is said not if found no of these principles.

4) The perception of order and the proportional schemata

The concept of proportion related to the concept of order through the concept of rhythm in architecture. the proportional schemata in some cases are based on mathematical theory and some of which are based on the human body (schema modulor Le Corbusier).

5) The Gestalt Theory of Expression

Shape can be analyzed in detail by describing their forms in the definition of the geometry, quantity, size, location and visual forces that determines the meaning and expression in art. As the basis to analyze the expression is the used of associational value between the lines and shapes, can also be through an assessment of quality by communicating the message through the architectural design, such as visual perception of lines and shapes, the specific configurations, and the association learned.

Furthermore, added by Lang (1987: 205-209), that variables of the built environment that also bring meaning to the aesthetics are:

1) The building configuration

Shapes and patterns is load the style of architecture and bring meaning to the design. In particular cultures, certain forms such as circles, or patterns such as simmetry, has owned its associational meaning. The simplicity or complexity of the configuration, relatively associated to a specific era in the past.

2) the spatial configuration

The volumes, elevation of the land boundaries, and the proportion of enclosed space bring meanings. People of the higher status in the most organizations, formal or informal, inhabiting the larger size of the physical arrangement of buildings if compared with those of the lower classes. Delineated space refers to

bounded, constricted, contained, contracted or centripetal; open space suggest to movement, liberty, freedom and spatial penetration.

3) Materials

Materials selected in part as the attributes to the technical construction, but also associated to indicate reliability the income levels of the house owners. the material has an association to the visual character, the sonic, haptic and sometimes to its olfactory properties. Artificiality or naturalness of the materials have different associations for each person who enjoys the building facades.

4) The nature of lighting

Effect of direction, source, color and the configured illumination of the behavioral setting considered as the fundamental variables in providing an atmosphere to the space both indoor and outdoor . Panofsky (1946) mentions "brightness" of the physical world of art will "enlighten" the observers mind by providing illumination for the feelings .....".

5) The colors

Colors and coloring brings meaning for the built environment in various scales. These often carried clearly by the social conventions, which is understood in every level of the inhabitants even though the predecessor conventions may un known. For example: the color is a status symbol is the buildings in many Asian cultures. Often it does not seem to the color itself that carries the meaning but in the way how the color showed deviation with the prevailing norms, or the habituation levels in the population.

6) The non visual Environmental

The voices that reverberate from the surface environment as one of action and conversation in which its cary meaning. This understanding defines the nature of sound in both, the instrumental and symbolic. This also includes the quality of touch, smell and texture on the surface.

2.3.2.f. Anatomy of Utilities

It is very difficult to understand the utility if we do not make boundaries to the object and the location where the works of architecture is placed, especially for the traditional architecture. As is known, the utility is required in every building but the needs are differents for the occupants where it placed and it also depends on the time and culture prevailing at the time and the specific location. As presented Chadderton (2004: 2), except in the tropics, the house might be in good conditions if oriented toward the sun to take advantage of the hot sun, which will be stored in the solid part of the structure and then released into the room to help the loss of the heat gained air out of the building during winter. Buildings in tropical zones require a large overhanging roof and cover over the window avoided the radiation from the sun as much as possible and to shade the rooms. So the building envelopes acts to moderate the extreme climate, and to design the suitable lighting and the ventilation openings, together with heating, cooling and humidity control, stabilizing the internal environment as adjustment in the use of building.

But generally agreed that the utility is required and necessarily as the services for the occupants. Utilities commonly associated as the building service. Service here is intended to the supporting elements is needed for the building occupants to inhabit in performing their daily activities. Hall and Greeno (2005: xi) explains that the building services can not be ignored. The building services are the dynamics in a static

structures, giving the movement, communications, facilities and comforts. This provided as the convenient references for all the construction.

Therefore, according to Marsh (2005: 4), the building service has the following characteristics:

- connecting the parts of other systems and environments;
- a collection of all the technical matters, organized and the combination of sub-systems;
- the material is entirely organized; and
- It aims to showed the diagrams of change in the inputs, synergy of the spare parts and the specified limits.

Furthermore, to assessing the needs of the building service facilities, we must also consider the long-term sustainability of buildings to be used in accordance to the age of the building plan. According to Knight and Jones (2004: 1), a building that has long term of viability and the higher standards, ultimately influencing in the design which are give attentions to such factors as:

- low energy use;
- Low maintenance requirements;
- More flexibility in the use of building;
- the better hygiene of systems; and
- low operating costs.

2.3.3 Building (dwelling) Components

According to Wahl (2007: 3), building structure was ordered (or controlled) by the flow of the physical force through conduits (or routes) formed by resistive materials in order to shelter the three-dimensional space. The design of structures is personally enjoyable, visually and technically significant, and professionally satisfying.

It has also been mentioned by Wahl (2007: 3-4) that components of a building structural system consist of :

1. *The loads;* the physical forces acting on a building;
2. *The superstructure*; the part of the resistive building frame above the ground line;
3. *The lateral support system;* resists the horizontal loads such as wind, earthquakes;
4. *The posts or foundations*; the part of the force resistive frame below the ground line;
5. *Soil and Geology*; the material into which all the ultimate loads must be dissipated.

Furthermore, Wahl (2007: 8-9) said that building structure is designed for goals as follows:

1. *the safety*, is more a appropiate standard that the architecture should provide the positive shelter and protection from harm to its occupants;
2. *the value*, is a comparison of what you get for what you pay; the architecture designed should be appropiate to the occupant needs
3. *the fitness*, the structure should fit the conditions on its specific building site, and the programmatic requirements of its internal circulation and functions;

4. *the compatibility,* the structural system must be sucesfully integrated with the envelope, mechanical and electrical system internally, and the natural system externally;
5. *the flexibility,* the longer the predictable life span of a building, the more unpredictable the future functions and the site context become, and more flexible the structure should be.

2.3.4 Dwelling

All houses are dwellings; but all dwellings are not necessarily houses. The dwelling is to make one's abode: to live in, or to live at, or to live on or about a place. For some, this implies building a permanent structure, but for others just a temporary accommodation. The dwellingas a place is more than the structure, as the soul is more than the body that containing it; for the untold millions of people the bond between themselves and their dwelling-place, transcends the physical limitations oftheir habitation. The dwelling as the activity of living or residing, and the dwelling as the place or the structure which is the focus of the residence — encompasses the cultural manifold and the material aspects of the domestic habitation (Oliver, 1987: 7).

The dwellings are the results of human beings working to create shelter. The evolution of the dwelling development is also the result of human civilizations in creating a comfortable home which is habitable. Some mentionthe dwellings which were built in the past as one of the “traditional architectural design,” but for others it is called “primitive architecture.” Also mentioned by Oliver (1987: 9),

> “the term 'Primitive architecture' is the most invidious, and also imprecise, its implying either a primitive origin to 'architecture' which the buildings represented, or 'primitive' peoples who build them; the 'traditional' architecture is the better term, which is the acknowledges that architecture is built as the inheritance of the past”.

Marcussen (2008: 17) mentions that an evolutionary description of the history of the culture space consisted ofthree stages or levels in an interrelated process. The aspects of cultural history that will be looked at are the visual art, the cosmology, and the architecture. In order to compare the three areas, a model has to be devised which is generally applicable to the study of spatial phenomena and it includes deciding what is meant by development in any given context. Models with this function are also known as "structures'.

Dwellings are sometimes separate from other forms of the buildings that serve purposes related to living, and sometimes they encompass them: as the shelter to protect both animals and family; the shrine in the corner of the room, and in some cultures are even synonymous with the house itself. Dwellings are the focus for the variety of functions, some contained within them, others provided within specialized nearby buildings. The idea of the dwelling persists, expressed in the continuity of form, plan, structure and its uses. (Oliver, 1987: 10).

In Marcussen (2008: 104), Vitruvius says that the parts of the building should be built "proportioned according to the correct principles of the symmetries". In architecture, the general abstract of "symmetries" is translated into the specific proportions of the shaped building materials. Marcussen continued, cited on page 107, "Socrates says that the building makes a considerable use of the measurements and instruments, and the remarkable exactness, thus its achievements makes it more scientific than most sorts of knowledge."

The dwellings were formed as the architectural design not only with the use of proportion as the principle of symmetry, but also with the use of a detailed calculation of the people to create a building to be inhabited. Consciously or not, people use mathematics and science in the design of their dwellings. The geometry principle is embodied in the architectural design as the measurements or instruments. Benton

(2009: 30) cites that Le Corbusier said the geometry is the primary act. It is also the symbol by which we attempt to reach the perfection, the divine. The geometry brings our spirit to the elevated satisfaction of mathematics. Modern art and thought are moving away from the accidental, and geometry brings a mathematical order to them, a general aesthetic attitude which is new in the history of the arts.

The geometry of the human body and its principles are embodied in the design of architecture. The human body parts provide lessons to apply as the principles in the architectural design. Le Corbusier mentions:

> "The organs of the human body provide a lesson in flexibility. So, we can recognize the organs of the house; the number them and fix the continuities as the conveyor belt of the successive operations". The organs representing the functions one sees as the envelope, one feels as the 4 angles (= walls) and the inside are the accidents. in the creation of an organism: we found the same process in the human body with a machine : this skeleton is to carry the body; this muscular is the filling for action; these viscera for circulation and utility; A little automobile construction as a chassis of the body frame ; and a motor with its organs for supply and exhaust". (Benton, 2009: 158-159).

We have insisted that the viscera should be on the inside, classified, tucked away and that only a limpid mass appear on the outside. It is impossible to deny the obvious connection with the Vitruvian formula: *firmitas, utilitas, et venustas* (solidity, utility, beauty). Le Corbusier implies that the morphological idea has evolved, from an opposition between the geometric exterior and the biological interior, towards a unity of the parts and a re-affirmation of the universal truths of the architecture as exemplified by Vitruvius. In addition, the male skeleton symbolizing firmitas - clearly a self-portrait - contrasts in a stereotyped way with the very feminine utilitas. On the other hand, completely unexpected is

the representation of venustas (generally symbolized by the feminine Venus), which takes the form of a muscular athlete's torso, 'to take action'. This demonstration set the tone of the lecture as, on the one hand, very basic and, on the other hand, highly artistic (Benton, 2009: 159)

2.4 Literary Reviews

Research on the traditional houses, especially for traditional dwellings of Malays and Dayaks has been many carried out primarily in anthropological and architectural studies with qualitative analysis. The studies about traditional dwellings of these two indigenous ethnicities in the province of West Kalimantan are usually done separately and with a different focus. The results are published in the various forms of journals and books, and the locus is the object of traditional dwellings in Southeast Asia. For the traditional dwellings of the Malay ethnic group, research was conducted in Peninsular Malaysia and Sumatra, as well as for the traditional dwellings of the Dayak ethnic group, conducted in East Malaysia and Kalimantan.

From the literature investigations, other topics which I examine are also the discussions that vary in focus among a lot of traditional houses in the cities - all over the Southeast Asian countries. On the other side, a special focus of the study on the anatomy of both of the traditional dwellings of indigenous ethnic groups in Southeast Asia has never been done. This research focus is to develop the concepts, the understandings, and all efforts directed to answer the research questions about non-physical and physical factors of the anatomy of the traditional dwellings of these two indigenous ethnic groups (Malay and Dayak) in West Kalimantan. Then, a quantitative analysis is conducted by comparing the results obtained from the previous discussion.

Zairin Zain ("Structural System of Malay Traditional House in Sambas Town West Kalimantan" 2006), who analyzed the structural system to the three types of Traditional Malays Houses with the deepest analyses about the durability and the factors its influences.

Yao-Ru Chen, Syed Iskandar Ariffin and Ming-Hung Wang ("The Typological Rule System of Malay Houses in Peninsula Malaysia" 2008), in this paper analyzed the Evolution of the Malay house from Main House to Compound House, the Variations is Provoked by the construction and the formation of the Local Style in the traditional Malays house

Cho Oo, Sabura Murakawa, Kyosuke Sakaue, Daisaku Nishina, Yasua Koshikawa and Atsushi Yakushijin ("Study on Indigenous Building Material of Traditional Houses in Myanmar" 2003). The authors showed the type of the house structure in Myanmar and the characteristics of the investigated houses based on the fieldworks and questionnaire.

Waricha Wongphyat and Hiroyuki Suzuki ("Spatial Analysis of Traditional Thai Dwellings in the Phrapradaeng District" 2008). This research is a presuming study of the Thai dwellings in the three evolution periods; the "old," the "transitional," and the "old and new" tradition. In order to understand how the Thai dwellings respond to the ever-shifting contexts, the researcher focuses on the reexamination in the broad of the interrelationship between natural and cultural contexts, intimate spatial content and the reintegration between the horizontality and verticality of the ruan thai's lived space.

Totok Roesmanto ("A Study of Traditional House of Northern Central Java - A Case Study of Demak and Jepara" 2002). This research analyzed the typology of the traditional houses in Demak and Jepara based on classification of house type, plan, construction, ornament and aesthetic element, and the building facade.

2.5 The Method of Analysis

In the theory mentioned above, Thibodeau and Patton (2000: 58-68) said the anatomy of the human body consists of 11 systems which cooperate with each other. Meanwhile, Soepardi (1986,1997) described

the building as a whole and divided it into six types of anatomy, which consist of: anatomy of floorplan , anatomy of shape, anatomy of section, anatomy of structure, anatomy aesthetics, and anatomy of utilities.

According to Le Corbusier (Pheasant, 2003 and Benton, 2009), the human body is often used as the reference in everyday life and a house is like a machine for living in. Le Corbusier mentions :

> "The organs of the human body provides a lesson in flexibility. So, we can recognize the organs of the house by studying the human body organs in the way of recognizing the numbers that function and fix the continuities as the conveyor belt of the successive operations".

A harmonious measure of the human scale is universally applicable to architecture. The parts of the human body are often used as the measurements to make up space in the buildings, especially in traditional dwellings, to replace the ordinary measurement (meters or feet) which are unknown by local people because of their limited knowledge in the past.

Actually, the organ systems of the human body, which split into 11 parts, are the way of anatomists to explore further how the human body works, and also to make its functions easy to understand by splitting its systems into groups of functions. This way of thinking can also be used to carry the building "parts" into the anatomical understanding, by knowing their functions, as is done for the human body.

Currently, no theory can describe building anatomy more specifically. In engineering and construction studies, we usually mention a building as a structure divided into three parts; bottom structure, middle structure, and upper structure. In the architecture studies, especially in traditional architecture studies, it is also often mentioned that a building can divided it into three part:; the legs, the body, and the head. The human anatomy is also studied by naming the anatomical based on the position of the head and the legs to describe the relative position of the body parts and their regions.

However, we can also overview the building anatomy by studying it as a whole. When the building is viewed vertically and horizontally, the element positions in the inside or in the outside, and exploring the building, function as the “main” or “supporting.” So, this understanding is helpful to enable the researchers to make a point about the easiest way to analyze the architectural aspect of the building by dividing it also into three parts: the legs, the body and the head. In the case of analyzing the building structure, the researchers also have often used the analogy of a building as the bottom structure, the middle structure, and the upper structure.

So, both the studies of the human body anatomy and the building anatomy have the same purposes: to mention how to learn the anatomy by exploring the functions of the each part, and trying to find the relationships between the parts as systems.

In an effort to understand the human body anatomy, I considered using the universal reference to describe the location of the body parts. The position of human anatomy as a universal reference is in the upright condition, the face facing forward and feet together in parallel, arms hanging at the sides with palms facing out. The location of a body part is always expressed in relation to other body parts in the above position.

According to the reviews mentioned above and regarding to the function of anatomy as systems in the human body, I conducted the comparison of the anatomy system of the human body to the anatomy theory of the building, for which the variables were arranged as follows:

1. The Integumentary system -------- as The Anatomy of Aesthetics

   The Integumentary system is associated with the skin that covers the vital organs of the human body. This system can be analogous to the aesthetic functions in the building, because the skin is like walls which provide cover to the main structures from damages caused by such things as weather and also provide shelter to all activities inside the building. The walls as skin can also function aesthetically in the way they smooth the facades of a building.

2. The Skeletal System ---------- as the Anatomy of Structure and the Anatomy of Section

   The skeletal system is associated with the bones and muscles structured as the framework of the human body. This system makes the stiffness of the human body and keeps the organs of the human body always safe from the outer negative influences. So, in these terms, the skeletal system functions as the supports, the protections, and the movements. The function of this system can be analogous to the anatomy of structure and the anatomy of section in the building. The building's structures, and also its sections, are built to make the stiffness the building and ensure all parts of the structure work and keep the occupants of the dwelling always safe from the outer negative influences. Both the skeleton in human body or the structure in building have functions as the frames to support and protect. All these functions make the human body or the building properly stand upright.

3. The Muscular system ---------- as the anatomy of shape

   The Muscular system (i.e. muscles) correlate to the movement system, guarantees to keep the body upright. Muscles on the skeleton makes motions for the human body according to the brain's directions. The function of this system is analogous to the anatomy of shape, because muscles like

each element of the building structure (i.e. columns or bracings in the wall structures, beams, and floors on the floor structures; roof covers and frames in the roof structures) are shaped as parts of the frame structures of the building, which can guarantee it can be used by the occupants to dwell. If muscles in the muscular system make the human body able to do motions to conduct activities; then in the anatomy of shape, elements of the structure make the structure able to hold all the impact loads of the building. This is a guarantee to conduct daily activities: that muscles in the human body or elements in the dwelling are functioning and 'alive'.

4. Nervous system, Circulatory System, Endocrine System, Lymphastic System and Reproductive System ---------- as the anatomy of floorplan:

   The systems in these groups are working for the specific functions that make the human body able to withstand the impact of outside factors, or to do interactions with the environment. All these systems are analogous to the anatomy of floorplan. Each of the specific functions in the particular system plays an important role in the human body. So does the floorplan; all spaces in buildings have specific functions and their own roles as a system of the building. In the dwelling, it is well known that spaces are designed for the specific functiona of each room. These all will be required by the the occupants to do interactions among other dwelling members or with the people outside. Each space in the dwelling design has a specific function such as kitchen for service room, bedroom for the private space, family room for the semi private space, and living room for the public space, etc.

5. The Respitory system, Digestive System, and Urinary System ------- as Anatomy of Utility

This group of systems works as the guarantor of the supply needs ofthe human body and to ensure that the unneeded subtances, after use by the body, will flow out through the secretion channels. All of these systems are analogous to the anatomy of utility. Utility is the main factor in the building that serves as the support system to the occupants needs for living in the dwelling, for example, the clean and waste water installations, the waste disposal, etc.

Wibowo (2008: 31-51, 143-151), mentioned that the human body is covered by skin and erected by the skeleton frame. Visually, the human body can be divided into:

a) Head; consists of skull, face, and mandible

b) Neck

c) Body; consists of chest, abdomen, backbones and pelvis

d) **the upper part frame of the motion instruments;** consists of the shoulder joints, upper arm, forearm, elbow, wrist, and hands.

e) **the lower part frame of the motion instruments;** consists of the hip joints, upperpart legs, knees, lower part legs, ankles, and feet.

The bones in the human body form the skeleton frame and work as a system in the different functions. Parts of this skeleton work together and systemically form the body frame. Broadly speaking in biological sciences, the human body frame is divided into two parts, the axial skeleton and appendicular skeleton.

The axial skeletal system is the part of human body which serves to support the body to stand upright, and to protect the vital organs inside the body. The axial skeletal system consists of the backbones (vertebrae), skull, chest, and ribs.

The appendicular skeletal system consists of the hips, shoulders, arms, the bones of the arms, legs, and feet. In general, the appendicular skeletal frame has functions as the motion system of the body members and visually, we see it as the hand and the foot. The appendicular skeletal frame is categorized based on its position on the human body frame; the upper part skeleton and the lower part skeleton. The appendicular (upper part) skeleton consists of several bones as follows: collarbone, scapula, arm jetty, lever, hasta and hand (consists of the wrist, palms, and fingers). The appendicular (lower part) skeleton consists of several bones that make up the legs as the motion instrument. The leg consists of the femur, patella, tibia, fibula, and feet.

To facilitate the understanding of the human body and buildings as the system of anatomy that author mentioned above, they are grouped into two parts as follows:

1. Anatomy or anatomical systems which are provided for shaping the human body or the dwelling:
   These groups are intended as a group of anatomy systems of the human body or the building anatomy that provides functions to make up the body or the building, so it can stand upright. This group includes the skeletal system (as the anatomy of structures and the anatomy of sections), and the muscular system (as the anatomy of shapes)
2. The anatomy or anatomical systems which are provided to support the human body:
   In the human body, these are intended as a group of anatomy systems that are provided to make the body motions live, active, and functioning. In the dwelling, these groups mean the building could facilitate all activities of the occupants, who can move inside the dwelling safely, with all sections functioning properly as the dwelling. These groups include the integumentary system (as anatomy of aesthetics), nervous system, circulatory system, the endocrine system, lymphatic system and

reproductive system (as the anatomy of floorplan) and respitory system, digestive system, and urinary system (as the anatomy of utility).

There are many ways that can be done to understand the traditional architecture. Traditional architecture can be understood from the work found in the location of the study and then grouped into the types. From here, the architecture will further facilitates to defined into the analogy, repetition; or to conducts further discoveries by certain efforts or the placing. Described by Steadman (2008: 210), the Durand concept of types is based on the distinction between, on the one hand, are simple and geometric shaped, and on the other hand, are complex and more architectural. According to this distinction, the types is means to forming the simple geometric shapes from the elaborated forms, into a form which is more can be derived. Further explained according to the theory of Durand which related to the type and the systematization of knowledge in architecture, is important to give attention to such as the following:

- Elements of the architecture
- Method of composition
    - description of the method of composition;
    - analysis methods which are illustrated;
    - meaning of the method: architecture versus geometry
- Explore the types

To explore the types in architecture, researchers usually processing data of the objects with the activities which starts by sorting the useful data from the un-useful data, sorted it into its specifications and then organize it. This method is known by the typology. According to Hays (2010: 7, 27), typology involves

the power to think in general, to retrieve, sort and arrange them in groups; and to identify the processes, the tendencies, and the quality which the results is just to produce the amount of lifeless things. Typology is one of its systems. The typological analysis of architecture requires strict attention to the form itself and then try to identify the symbolic meaning, which extends from the structure toward externality and alterity into the breeding chain which is associated as a metonymy. Starts from here where the typology of architecture began to trace the contours of desires. For this effort, the typology is conducted to understand the analytical of pre-analytic architectural objects and also in the process of determination of the possibility that we want to know about the architectural conditions.

Traditional architecture is also a type of architecture that developed in the community. the forms is created as an architectural masterpiece that can be developed as an actual example in the practice of the modern architectural design. According to Hays (2010: 29), a type of the architectural designs is said as a kind of mediator imposed into codes between the sub-layers of the commonly used categories and the conventional categories; but acted as the actual examples of the design practice, others also mentioning it as the mediator through the operation of an architectural form that exists as an entity of the structured materials.

Its can not be denied that in its manifestations, the traditional architecture also influenced with the human architectural desires in realizing of his/her desire to get the conformity to the work of architecture that he/she created. Hays (2010: 19, 37), explaining that the metonymy of desire related to architecture are: analogy, repetition, the discoveries by certain efforts and the placing. Analogy of thinking is the activities to sort the objects into a series of conflicts that structured and then proposes of each set as the opposition analogically related to other parts, as far as their differences resamble to each other. Analogy, repetition, the

discoveries by certain efforts or placing is also the natural process which is carried out by the works of the traditional architecture in creating objects as the material entity. The influences of the Natural conditions makes the architectural process in creating objects continues to evolve in line with the faced challenges.

Architecture developed from the processes which is explored by performing the understanding of analogy. By this analogy, people try to do gradually processes in adjusting to the environment to achieve the conformity in comfort. Analogy processes are generally conducted to the architectural objects that have been designed from previous architects. According to Steadman (2008: 5, 8), by analogy which is placed in an organized form, it is possible to proceed to the critical task of sorting out the objects, whether its useful and enlightening of the previous errors to understanding the objects. The analogy has two different kinds of interpretation, which deals with the visual appearance or composition, and others is associated with the functional. Even so, both are interrelated.

Analogies are mentioned above as the efforts to provide holistic views about the human body, and then the results are based on overviews about the dwelling anatomy. The human body is recognized visually, in one part as the shape of a body (head, neck, body, hands and legs) which can stand upright by the skeletal supports; and on the other part as the frame on which to place the supporting instruments, or the organs which make the body shape and do motions as human activities. So in this case, if we transform this term into an analogy of the dwelling, we can also divide the dwelling anatomy into two parts: one part as a group of anatomy to shape the dwelling and make it erected upright properly, and the other part as a group of the dwelling anatomy which facilitates all activities of occupants to dwell. Furthermore, these two groups are

used as a basis on which to recognize the dwelling as anatomy. As the result of the analysis, we will find the holistic meaning of the anatomy of traditional dwellings in West Kalimantan.

This research will be conducted around a discussion of the architecture of traditional dwellings, which is taken from the sample of several cases in each of two traditional architecture types in West Kalimantan. The study is begun with the in-depth descriptions of the traditional dwellings of Malays and Dayaks, and continues toward an analysis of the six variables chosen: the Anatomy of Floorplan, Anatomy of Shapes, Anatomy of Sections, Anatomy of Structures, Anatomy of Aesthetics, and Anatomy of Utilities..

The analysis of the building anatomy for all samples of the cases of the traditional dwellings of Malays and Dayaks will attain results for the anatomy of each dwelling. These results are based for the following comparison of the building anatomy of the Malays and Dayaks. At the end of this section, the first conclusions will be provided as the research findings on the anatomy of the traditional dwellings in West Kalimantan.

The next step was conducted as the comparative study of system anatomy as described by Thibodeau and Patton (2000). The comparative study was obtained in order to find the correlation between the anatomy of traditional dwellings and the anatomy of the human body. In these steps, the analysis will be conducted based on theoriginal, previous conclusion. The findings on the anatomy of traditional dwellings will be reviewed as a system like the human body. From this analysis attained the research findings as the second conclusion of this study. This will be an effort to prove the Le Corbusier statement in Pheasant (2003) and Benton (2009) that the human body is also used as the references for the establishing traditional dwellings in West Kalimantan.

Things that are important to note here: Anatomy building can also be understood as providing comfort for the occupants. Pheasant (2003: 7) wrote that people often use expressions which are designed to the human scales, generally found in the classical styles of architecture. The implication is that the particular building (also a dwelling) is aesthetically well-proportioned and conveys a certain sense of precision and harmony. The precision and harmony for the occupants is intended as measures that are used in the forming of space, which is based on measurement to the human body parts and also designed to adjust the physical character of its occupants. In the embodiment of the traditional dwellings in Indonesia, as noted in previous chapters, the human body parts as reference of the measurement to forming the room dimensions in their dwellings are also used, especially in West Kalimantan. The stretch of hand, steps, width of the hand and width of the foot are the most commonly used, and usually refer to the head of the family.

In the architectural studies, especially in the building design process, we know the implementation of designs that are based on *anthropometric* and *ergonomic*. According to Pheasant (2003: 6-7), the definition of anthropometric is the human science that deals with the human measurements; particularly with measurements of the body size, shape, strength and work capacity. Meanwhile Pheasant (2003: 5) interpreted the ergonomic as the principle of the user-centred design that should be based upon the physical and the mental characteristics of humans, as its use and may be applied to almost any planned or purposeful human activity. So, ergonomics also means the study of the human beings in their living or working environment. On the same page, Pheasant (2003) emphasized that the ergonomics should match

the users, at least on the five important criterias; functional efficiency, ease of use, comfort, health and safety, and quality of working life.

In ergonomics and anthropometrics, a constraint is an observable, probably measurable and characteristic of the human beings, which has consequences for the design of a particular artefact. Pheasant (2003: 22-23) proposed four cardinal constraints in anthropometrics: clearance, reach, posture and strength. Clearance means the environments must provide adequate access and the circulation space or determine the minimum acceptable dimension in the objects. Reach is the ability to grasp and operate controls, or determine the maximum acceptable dimension in the objects. Posture is the determination by relationship between the body and theenvironment. Strength is the sufficient level of the determined force that is acceptable to a weak or limited user.

At the end of this research, I also conducted analysis on the use of the parts of human body as measurements based on physical characteristics of the occupants as anatomical adjustments in the formationof space in the traditional Malay dwellings and traditional Dayak dwellings in West Kalimantan. This analysis aims to find a concept of anthropometrics and ergonomics in the dwellings in both indegenous ethnics of West Kalimantan. Anthropometric and ergonomic analysis will reveal the physical and non physical aspects of the human body anatomy which have been implemented in the design concept of traditional dwellings in the past.

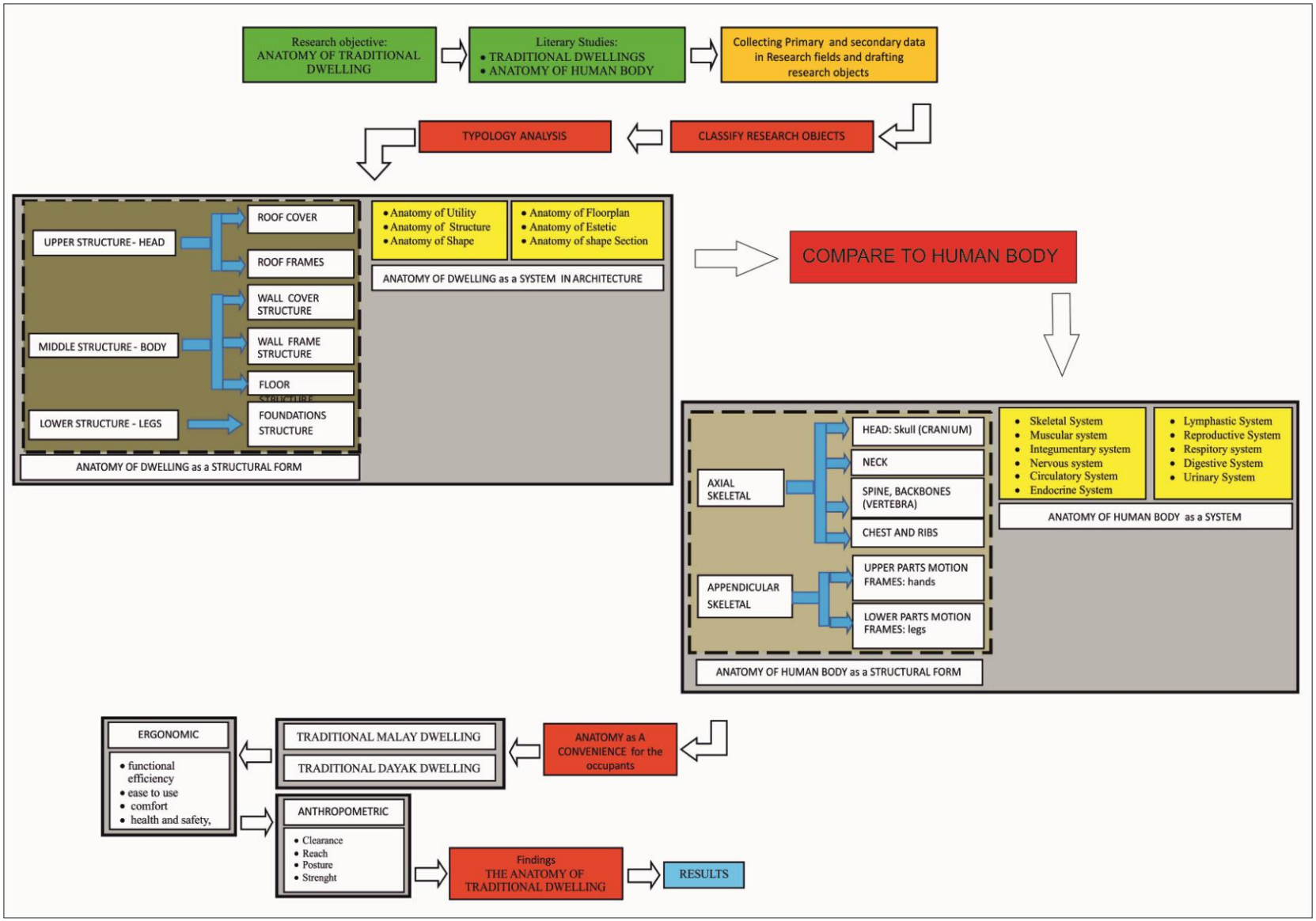


Figure 2.1: *Model of the research flow*

CHAPTER III
RESEARCH DATA

3.1 The Geographical and the Historical Background of West Kalimantan

West Kalimantan (in the Indonesian language: Kalimantan Barat or abbreviated to Kalbar) is a province in the Republic of Indonesia. West Kalimantan is one of four Indonesian provinces on the island of Kalimantan, also known as Borneo. Its capital city, Pontianak, is located right on the equator, so it is usually called the "equator city". According to BPS-statistics of West Kalimantan (2010, 69-104), West Kalimantan's population, according to the census conducted in 2000, was 3,750,795 inhabitants. It is estimated that as of 2009 this province has 4,319,142 inhabitants. The main ethnic groups of West Kalimantan include the Dayak, Malay, and Chinese, who together make about 90% of the total population. The rest are the Javanese, Bugis, Madurese, and other ethnic groups. The borders of West Kalimantan are roughly surrounded by mountain ranges and the watershed of the Kapuas River, which drains most of the inland areas of the province.

Geographical conditions of West Kalimantan are fully described in the BPS-statistics of West Kalimantan (2010: 3-26). Kalimantan Barat is located in west part of Kalimantan island (Borneo) and is positioned between the latitudes and longitudes as follows 2008' NL - 302' SL and 10830' WL - 114010' WL. West Kalimantan is practically split in half by the equator (latitude 00) which runs through Pontianak city. Due to its position, it can be said that West Kalimantan is a tropical area with particularly high air temperatures and humidity.

The area of West Kalimantan is about 146.807 km^2, and is mostly low altitude. The land area of West Kalimantan makes up about 7.53 percent of the Indonesia's total land area and is 1.13 times the size of Java Island. West Kalimantan measures from north to south at about 600 kilometres and from east to west a little over 850 kilometres at its widest point.

West Kalimantan is mostly low coastal and river plains with hilly areas found particularly around the head of the Kapuas river which flows from the east to west. Due to the great number of small and big rivers it can be said that West Kalimantan is "thousand rivers country". Most rivers are safe to travel on even by large watercraft. Rivers until recently have been the primary access to the remote hinterland. Even today, many indigenous communities that have limited road access still use the rivers as primary thoroughfares to trade with other communities as well as larger townships.

Lontaan (1975: 74-243) gives a full description of the history of the prosperous Malay kingdoms in West Kalimantan. Many of these kingdoms existed for several hundred years with a few retaining power right up until very recently. These kingdoms included those of Tanjungpura, Matan and Sukadana which existed and were in power the surrounding area from the XIV up to the XVIII centuries. Other kingdoms found throughout West Kaliantan include: the Kingdom of Mempawah (XIV up to XIX centuries), the kingdom of Sambas (XVII up to XVIII centuries), the kingdom of Sanggau (XIV until the XIX centuries), the kingdom of Tayan (XVII until the mid-XIX century), the kingdom of Sanggau (XVIII up to XIX century), the kingdom of Sekadau (XIV to XIX centuries), the kingdom of Sintang (XIV to XIX centuries), the kingdom of Kubu which existed from the mid-XVII

Kabupaten/Kota *Regency/City*	Luas *Area* (Km^2)	Persentase terhadap Luas Propinsi *Percentage to total Area of Province* (%)
(1)	(2)	(3)
Kab. Sambas	6 394,70	4,36
Kab. Bengkayang	5 397,30	3,68
Kab. Landak	9 909,10	6,75
Kab. Pontianak	1 276,90	0,87
Kab. Sanggau	12 857,70	8,76
Kab. Ketapang	31 240,74	21,28
Kab. Sintang	21 635,00	14,74
Kab. Kapuas Hulu	29 842,00	20,33
Kab. Sekadau	5 444,30	3,71
Kab. Melawi	10 644,00	7,25
Kab. Kayong Utara	4 568,26	3,11
Kab. Kubu Raya	6 985,20	4,75
Kota Pontianak	107,80	0,07
Kota Singkawang	504,00	0,34
Kalimantan Barat	146 807,00	100,00

Tabel 3.1.
Name of Regencies/cities in West Kalimantan Province and the percentage to total area

until XIX centuries and the kingdom of Pontianak that existed from XVII until the mid-XIX centuries. According to BPS-Statictics of West Kalimantan (2010: xi-xiii), the area was later acknowledged as the autonomous territory of West Kalimantan as it changed while under Dutch and then Japanese colonialism. It wasn't until 1956 (well after Indonesia's war of independence) that West Kalimantan became an autonomous region consisting of 6 self-governing regencies under provincial administration. After the reformation movement (1999 until now), West Kalimantan consists of 2 mayorial urban districts and 10 autonomous regencies. In other words, West Kalimantan is divided into two urban cities (controlled by city governments) which are Pontianak and Singkawang and 10 rural regencies (controlled by regency governments) which are Sambas, Bengkayang, Pontianak, Ketapang, Landak, Sanggau, Sekadau, Sintang, Melawi, Kapuas Hulu, and include the newest regencies: North Kayong and Kubu Raya.

3.2 Surroundings of Traditional Malays Architecture

Traditional Malay dwellings are basically built with the construction on a stage and formed by wood as the main material. They basically look like a floating building above the ground, which is supported by a posts and beams structure with wooden or bamboo walls and thatched roofs or shingles. In general, the traditional Malay house uses hardwood materials for the main structure such as ulin wood, belian wood, or meranti. Many windows and dense walls provide good ventilation, and attractive ornaments, and these ornaments complement the look of the facade of the traditional Malay house. Malay people are generally open to outside people or culture; the reflection of their openness is in the formation of a large open space with minimal partitions in the house interior. Also as an approach to the house, Malays began to see solids and voids in the house, doors, windows and wall panels, solid columns; and various openings in the house.

And if we look closely, we can find carvings and ornaments - in various panels found in home. Jee Yuan (1987:20) said that at a long distance view of the object, the traditional Malay house introduces to the observer the elegance of the building itself, as a beautiful mass, and if we observe more closely, the intricate carvings and the beautiful ornaments give emphasis to the existence of Malay works and show the riches of Malay cultures.

3.2.1 Types of the traditional Malays House

The forms of traditional Malay houses can be identified in various styles, roof styles and the number of columns. Jee Yuan (1987:20) affirmed that traditional Malay houses can be classified mainly by their roof styles. This concerns the first sight of observers to the buildings. If we search in site, the roof styles are the easiest way to recognize a traditional Malay house. In line with this statement, the basic form of the traditional Malay house in West Kalimantan is also identified in three types: *Potong Limas* (Limas shape), *Potong Kawat* (Kawat shape) and *Potong Godang* (Godang shape).

In addition to defining by the style of the house roof, Jee Yuan (1987:26) or Embi and Said (2008: 24) also wrote that a traditional Malay house is also classified by the number of columns which form in main house. A six-column house called the house six poles. This is also called the house of bujang which means an unmarried's house. This term refers to the small houses that consist only of a core house (mother's house), without a separate house for the kitchen, toilets or other washing facilities. The *rumah bujang* with a verandah *(serambi)* is called *rumah bujang berserambi*. There are nine columns in this house. *Rumah tiang dua belas* is a 12-column house which is also called *rumah besar* (big house). This is a much larger house consisting of the *ibu rumah* with the *serambi samanaik.*

3.2.2 Design and Layout

According to Jee Yuan (1987: 34), traditional Malay house basically can be divided into the front and the rear which are centered on the main house (house of spirit) and the child's house (kitchen). This was also affirmed from the observation made by Zain (2003) about the traditional Melayu house in West Kalimantan, which states that the traditional Malay dwelling consists of two parts: the main house and the support houses. These two parts are usually connected by a corridor (*pelataran*).

At the front before entering the traditional Malays house, we will find an open space. This open platform for Malay people used to call the *pelataran*. Steps lead to an un-partitioned porch called *anjung*. The terrace acts as a good transition platform between the public and the private domain. However, in the more basic traditional houses, the *anjung* or porch sometimes is not found. The spacious house terraces are usually surrounded by a carvings fence, but there are also particular objects that are uncovered, or even without a fence. Next is the opening to the entrance that leads directly into the inside (Jee Yuan, 1987: 34; Zain, 2003: 86-125).

Anjung or the front hall also acts as an important focal point for the entrance. The foreign visitors and guests who meet with the occupants will be served here. This is also a favorite place for the occupants to relax, chat, and watch the activities that happen in front of the house. These activities are usually done by the occupants of the house in the afternoon before sunset. The wooden chairs with round tables are placed on the porch; or sometimes a bench built in along one of the sides of this terrace.

From the verandah, an entrance leads to the middle porch (*serambi tengah*). According to Zain (2003: 86-125), *serambi tengah* is a wide area inside the house located in the center of the house, while according to

Jee Yuan (1987: 34) is called the hanging *serambi*, a long narrow area situated beside the house and separated from the *rumah ibu* or main house. According to Jee Yuan, floor elevation of the *serambi gantung* is about seven inches lower than the floor elevation of the mother house. Both Zain and Je Yuan mentioned, the *serambi tengah* or *serambi gantung* has the main function as a place where most guests or visitors were entertained, often referred to as the living room.

Next is the room for the main activities of the occupants in the house. Jee Yuan (1983: 4), explained this room is the largest area in the house where most activities are conducted. According to Zain (2003: 86-125), the next room is *serambi belakang*. Zain explains that the main part of *serambi belakang* consists of two parts separated by the partition of space; they are the family room and bedroom, while according to Jee Yuan, this place is a vast space with no partitions. This is the largest area in the house where most of the activities are performed. Whether by Zain or Jee Yuan, activities such as sleeping, sewing, praying, ironing, learning, and even traditional ceremony (feasting) held during weddings and other festivals, all occur here. The interesting thing mentioned in the writings of Zain is the existence of partitions that can be removed or added as needed by the homeowner.

As mentioned previously, traditional Malay dwellings consists of two masses of buildings, they are the mother house (*rumah induk* or the main house) and the support house (*rumah anak*) which are connected by a transition space (*selang*). According to Jee Yuan (1987: 36), the transition space is a covered by paths to use as an open area to connect the kitchen and the mother's house. However, from the observation of Zain (2003), a transition space was also found in similar functions without a cover as *pelataran*. A side door to the kitchen is also situated here. In addition to the circulation space, a transition space is often used by women as a space

to chat and socialize. Connected by the transition space (*selang*) is a very effective transition area for the main house and the support house that leaves an open space between two parts that allow to good ventilation and lighting for the home. Jee Yuan also mentioned, common activities in *selang* such as praying, sleeping and resting are done here. He clarified the *selang* function by explaining that it also acts as a fire break tube between the two parts of the house.

A wide space under the Roof in main house is remarkably left open. Sometimes a small part of the roof space is made into the attic. Jee Yuan (1987:36) mentioned this room called *loteng* in Malacca and Negri Sembilan. In some older homes, attics are used as a rest area for a young woman at home. Nowadays, the attic is rarely used as a bed, but instead used for tools storage. In the observation conducted by Zain (2003), this room section is also found in traditional Malays houses in West Kalimantan. The people there call it *parak*, also with no partition and the room function is the same as those described by Jee Yuan in his theses.

The support house or *rumah anak* (kitchen) is always located on behind of the main house, with the lowest floor elevation, and also has a lower roof height than the main house. According to Zain (2003), in the past, *rumah anak* consisted of two main parts without partitions. The first part is the common room to prepare food before cooking, and also a room for eating. The second part is a fire bench (*tungku api*), a standing wood fire box for cooking with firewood storage. *Rumah anak* has one door connected to *gerata'* (wooden steps) and door in the other side connected to an open platform (*pelataran*). The walls of *rumah anak* use wood material which is installed and super-imposed. A small wall section over the top of the wall was left open as air circulation. The women often take their time here to chat with neighbors who visit.

Another important part is an open platform located near the kitchen as the mediator of women's activities. This is an open platform that is used for washing clothes, vegetables and cooking utensils. This open platform is called *pelataran*. The lifted floor from the platform frames is usually made from small nibong logs which are installed split to each other and placed with a one-log gap to allow water to drain. Pelataran are usually located near rivers or canal (*parit*) as a main source of water for the kitchen activities (Jee Yuan, 1987: 39; Zain, 2003).

3.2.3 Proportion and Scale

Proportion is harmonious composition formed in a building as the architects wish. Proportion is the relationship of building elements to each other and their relation to the building as a whole. The level, where there is a scheme, will illustrate the true scales of mass proportion, as the goal of these efforts is the balance of aesthetic unity in the building. Scale is an agreed reference as a means to describe or create architectural objects according to the desired proportions. Scale is often used to give a complete drawing of the original object on paper, scaled in mathematical computation, and the drawing results in a picture of the object in different scales. The scale usefully gives the overall picture of the objects, which shows the proper relationship between the elements and how they are interrelated.

The commonly used construction methods in their community, and also the repetition of their original architectural forms in every erected house in traditional dwellings, makes Malays create their own scale and hierarchy of spaces for the traditional Malay house (Sim, 2010: 18). These are the "obeyed orders" of traditional Malay dwellings and they form their physical makeup as an important addition to the various parts of the house in the first erected dwellings. The main house (*rumah induk*), which is the important core of

traditional Malay dwellings has a higher hierarchical level than the support house (*rumah anak*). This fact can be seen in the main house, with the dominating form in the larger mass of the support house, and also can be found in the higher floor elevation, the details of ornaments, and the number of openings which show us that the main house has a higher hierarchical level than the support house (*rumah anak*). According to Zain (2003: 88) the dominance as the reinforcing of solidity and grandeur of the main house relative to the support house is an integral part of the traditional Malay dwellings. In addition, further discussed by Zain, traditional Malay dwellings typically have a symmetrical house facade on both the main house and the support house. Because the shapes are symmetrical and balanced, traditional Malay dwellings look captivate and very stable.

According to Jee Yuan (1987: 45), linear measurements used by the Malays are based on the dimensions of the human body: the forearm length (*Hasta*), the length of outstretched palm of hand (*jengkal*), and the length of two outstretched arms (*depak*), as the measurement for establishing or forming rooms in the traditional Malay dwellings. These are all the facts that show the Malays use of the human body anatomy as a measure for forming their houses. In Malay culture, the linear measurements are based on the body dimensions of family heads from traditional Malay dwellings erected. The use of human body dimensions was applied to the dimensions of space, openings, floor elevation, etc.

3.2.4 The Malays Architecture in West Kalimantan

According to Zain (2003), in the architecture of Malay dwellings in West Kalimantan, Malay people have known that the traditional dwellings are based on the level of the hierarchy. They divided traditional Malay dwellings into 3 main types; Limas shape (*potong limas*), Kawat shape (*potong kawat*) and Godang shape (*potong godang*). Generally, traditional Malay dwellings had one large, massive building and a small

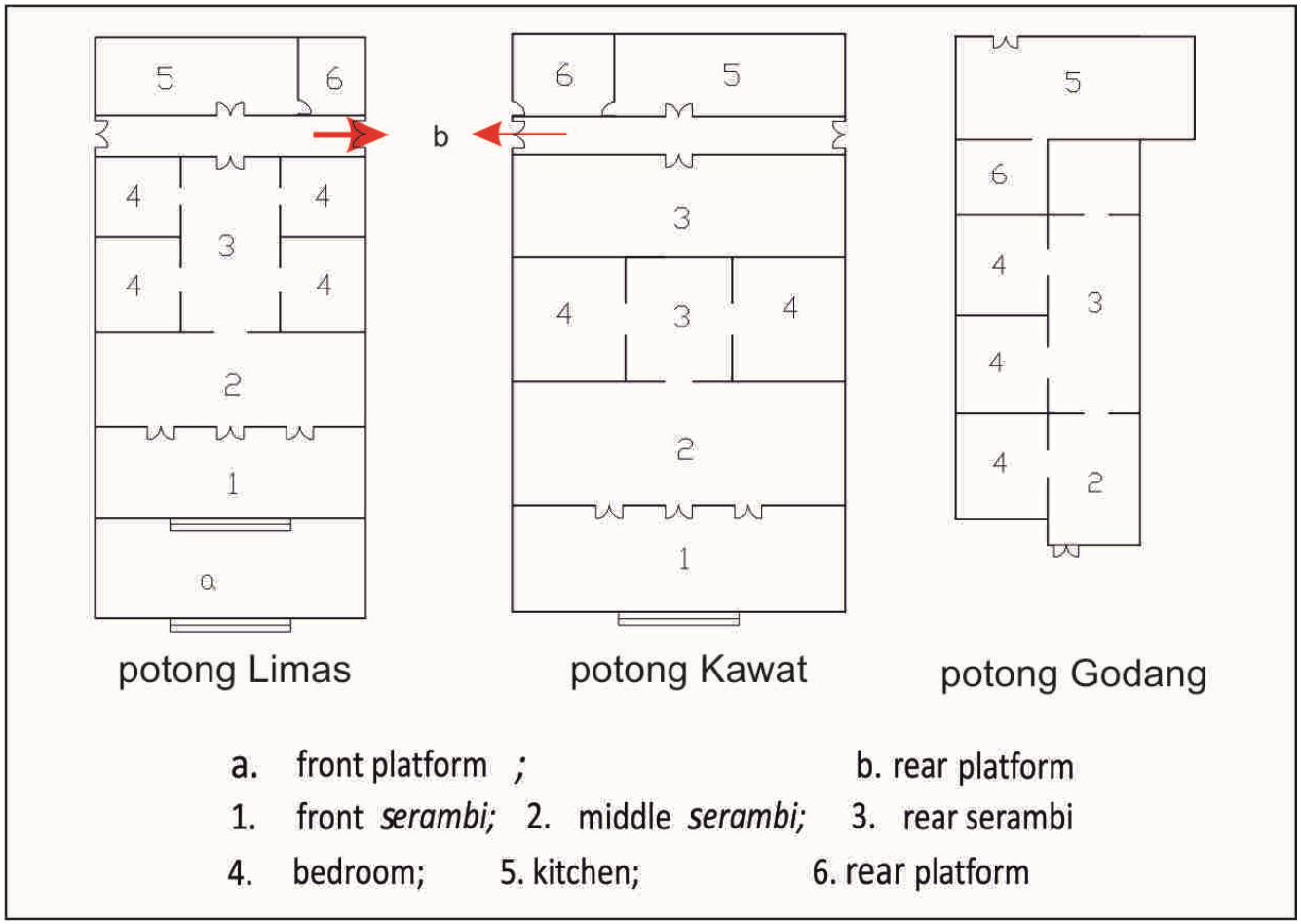
building in the back or side. The large massive building was the main point of view for the observer and basically of a rectangular shape that extended to the rear (the similar condition is found in Malaysia traditional house, see in Yao-Ru, 2008: 251).

Based on the survey, Zain (2003) mentioned the traditional Malay dwellings layout consists of two parts: the main house and the support house. In the main house, we can find verandah (the front *serambi* or *serambi depan*), guest room (the middle *serambi* or *serambi tengah*) and living room (the backward *serambi* or *serambi belakang*); in the support house is the kitchen; and also one other additional element, platform (*pelataran*). Pelataran is the element which is always found both in the main house or the support house. The functional explanation of each room is as follows:

- the verandah (the front *serambi* or *serambi depan*) situated at the front of the building, has functions as the guest reception room before entering the house. This section is the main entrance to the dwelling with a single characteristic: by the single ladder direct to the veranda floor.
- the guest room (the middle *serambi* or *serambi tengah*), situated in the center between outside and inside part. This room functions as a guest room, typically formed with a spacious, elongated room. This room is usually used as a formal parlor and the banquet space for men when conducting traditional ceremonies such as newborn ceremony (*aqiqah*), the ceremony of the expression of gratitude to God (*selamatan*), marriage ceremony (*akad nikah*), and so forth.
- the living room (the rear *serambi* atau *serambi belakang*), is a private space for family members which consists of bedrooms and a communal room (family room).

- kitchen, is a small mass building situated at the back which usually is connected by wooden ladder (*gerata'*) from the courtyard. This room functions as the place for the family's food preparations.
- the platform (*pelataran*) which is an open platform and usually situated in the front of the main house (the front *pelataran*), in the middle between the main house and the support house (the middle *pelataran*) and in the back of the support house (the rear *pelataran*). The front *pelataran* is usually used as a place for drying crops such as paddy, corn, fishes, etc; the middle *pelataran* or *selang* is used as a connector for linking two parts of the house; and the rear *pelataran* is used as a place for washing clothes or vegetables, a place for the cooking utensils, bathing place for girls/women, and also the place to put rainwater reservoir.
- the attic (*loteng* or *parak*) located at the top of the main house, between the ceiling and roof, is a place for everyday activities of girls or women, especially to rest after cooking. In this room, they usually do weaving or knitting.

Figure 3.1.
The basic floorplan of three types of the Traditional Malay Dwellings in West Kalimantan



3.3 Surroundings of Dayaks Traditional Architecture

Sather in Fox (1993: 66) mentions that the longhouse (*rumah panjang*) is a manifestation of basic principles. The Dayak community as a community lives in one building. Longhouses are built along rivers

and streams with the long axis ideally oriented parallel to the main river course. As a result, both ends of a longhouse are usually distinguished as' upstream *ulu* and downstream *ili* ends. Structurally, each house consists of a series of family apartments arranged side by side.

3.3.1 The Divisions in the Longhouse

A longhouse is a building consisting of a row of compartments (*bilik*), each of which is inhabited by many family groups. The definition refers both to the longhouse with a number of compartments, and the family groups that occupy it. The quotation by Sather in Fox: 1993: 66) said that each apartment in the longhouse is usually inhabited by families of three generations - grandfather, a son or daughter with her spouse, and their children - with a membership acquired by birth, marriage, establishment, or adoption. The front of the *bilik* is a spacious gallery that extends throughout the house and this is a large room without partitions. Dayak people call this large room without partitions "*ruai*". This section is a public place guarded collectively by the occupants, and usually used for communal activities, while the *bilik* is belongs to individuals and is maintained by a group of families inhabiting it. The *bilik* and the *ruai* are separated by an elongated wall that bisects the longhouse structure into two equal parts. Sather in Fox (1993: 66) explains that the existence of this wall provides a demarcation zone between the *ruai* and the *bilik* as the public area and the domestic area. The *biliks* represent the domestic area of each occupant in family's apartment, symbolizing the individual family's existence as a separate group. Whereas, a large room with no partitions on the other side is a public space, symbolizes the existence of the longhouse as a community of Dayak people, with the membership of many individual groups who inhabit the house.

On entering the long house, we first find a spacious area similar to a verandah without a roof and walls. In most of the longhouses in Kalimantan would be found a spacious verandah. Dayak people usually called this "*tanju*" (see figure 3.2). As in the pelataran of traditional Malay dwelling, this space also functions as a drying place for paddy, fishes, etc. The next room is a spacious gallery partitioned by the small logs fitted in the distances called *ruai*. The *ruai* consists of several sections for room division which vary in each sub-tribe of the Dayak community in Kalimantan. According to Sather in Fox (1993: 79-82), in the Dayak Iban longhouse, *ruai* contains 'upper zone' (*zone atas*) and the lower zone (*zone baroh*), each zone demarked with separators by the pillar series (see figure 3.2). The uppermost section of the galleryis called the "*panggau*" (or *pantar*) and is usually formed by a raised platform further emphasizing its elevation. This refers to the general considerations that are understood by Dayak people in realizing the space in the longhouse, the *bilik* conceptually is 'lower' than the ruai, while the upper gallery is the 'highest zone' and the central *tempuan* is 'the lowest'. The zones in the ruai are bilaterally oriented, the inner mid-zone being 'lower' and the opposed outer zones being 'upper'. The division of the space with a floor elevation and the boundary's pillars in the *ruai* conformed to the different activities in the longhouse. The identical spatial division is also applied to the bilik. So the arrangement of the upper and the lower zone cross cuts the upstream and downstream divisions of the longhouse.

The total length of the longhouse or the number of apartment inside a longhouse is not always fixed and equal from one to another. According Pebriano (2006: 41-45), this depends on the increase in the family members in the longhouse who are married. The new married couple will build a new apartment (*bilik*) at the upstream or downstream of the longhouse. Also emphasized by Pebriano, in building a new apartment, Dayak

people deeply attached to traditional values follow the pattern of the previous apartment and do not create new forms in their new apartment.

Each longhouse usually has a bilik owned by a communal leader. This community leader is called "*pun*," which means 'the source'. The *pun bilik* is usually built first and becomes the pattern for of making new *bilik* in a longhouse. The construction of the new *bilik* is directed to the left or right side of the *pun bilik*, too. According to Sather in Fox (1993: 70), the *pun bilik* represents the family's living ancestor, the linking chief between generations, its present and past, and the source through whom all family rights devolve.

In addition to defining the *pun* as source, and using it as the name of the communal leader in the *bilik*, *tiang pemun* is used as the name of the main post in each compartment (*bilik*). Each compartment has a *pemun* post its own source in the longhouse, placed in the right corner of the *bilik* front wall (see figure 3.2). *Pemun* is literally interpreted as the central pillar (source) or pile foundation. Among the columns or pillars, this is the first to be erected during construction of a new compartment; this pemun post also serves as a reference in extending the number of other new compartments in the future. According to Sather in Fox (1993: 70-71), a *pemun* post acts as a central axis to separate the *bilik* from the non-partitioned gallery or separate the domestic area of individual activities from the public area of communal activities. This *pemun* post is made of wood and attached to the wall. The *tiang pemun* of each of the individual *bilik* is erected in sequential order, moving outward from the central *tiang pemun*, first downriver and then upriver, ending with the final *tiang pemun* at the upriver end of the house.

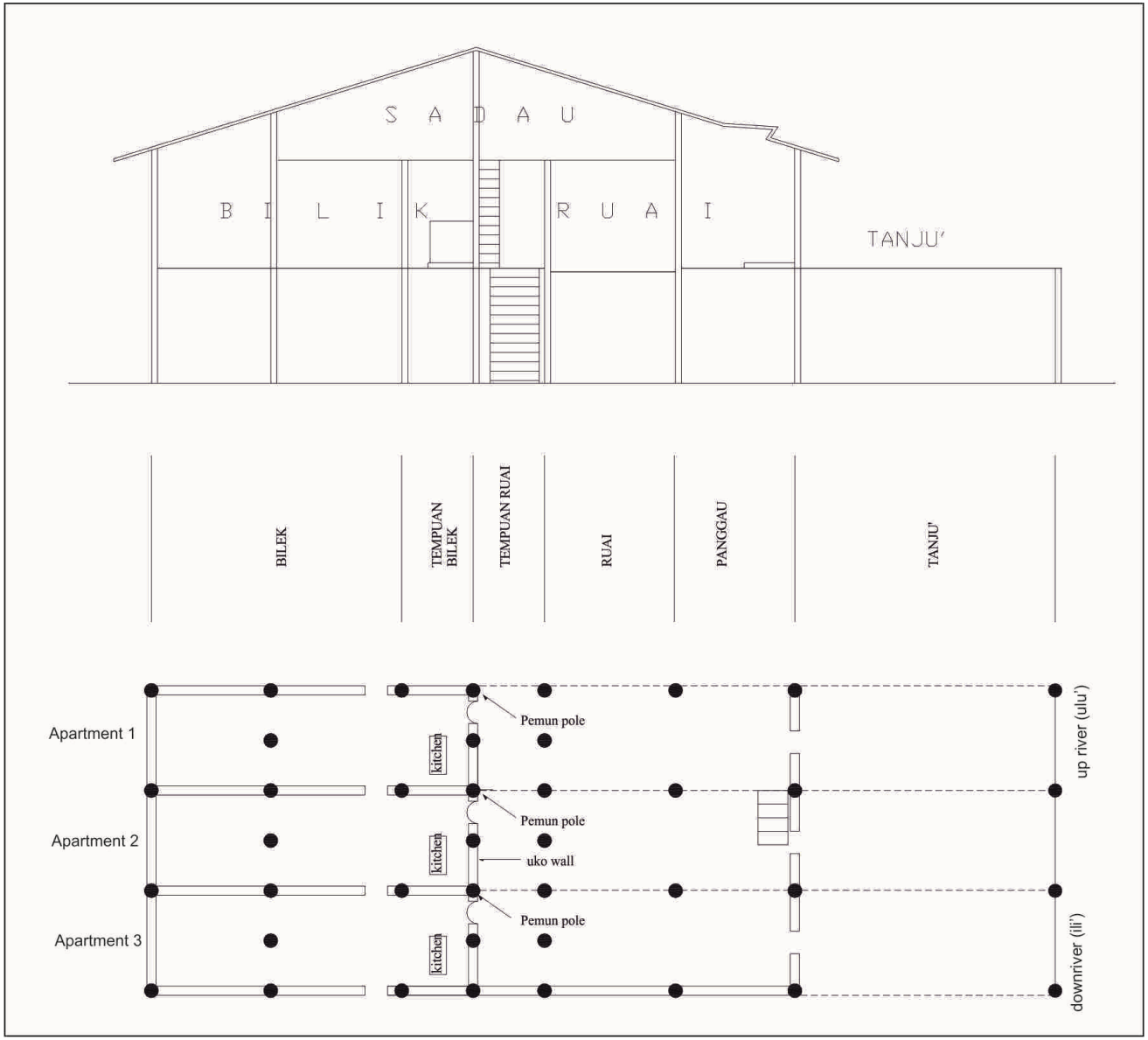


Figure 3.2.
The longhouse section and floorplan

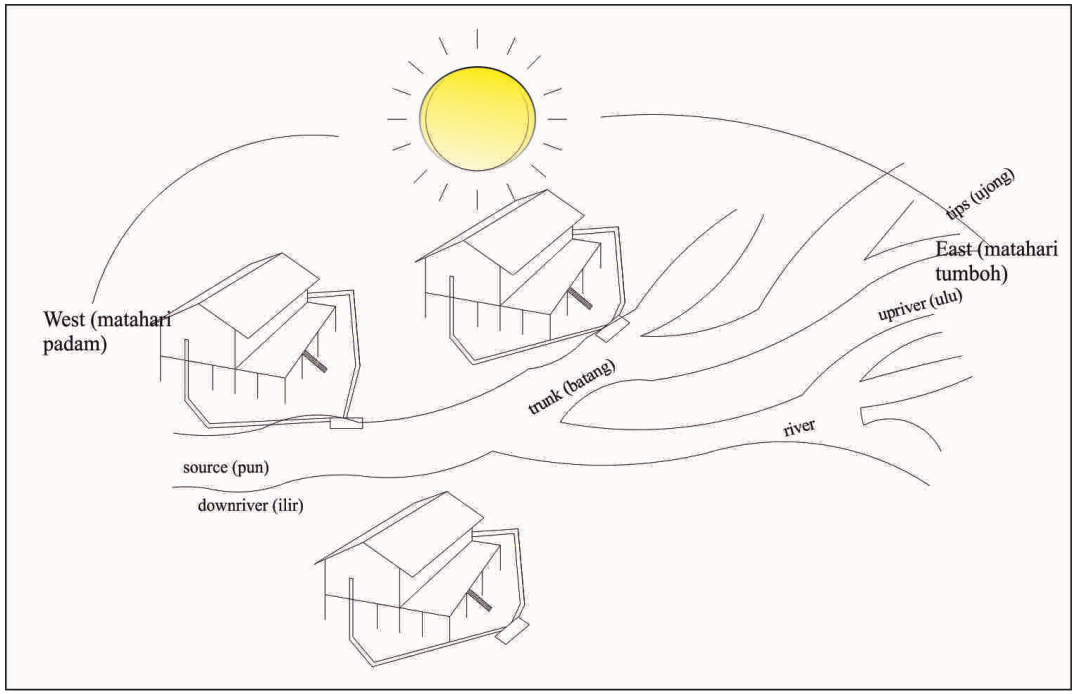
Another important part of the longhouse is the kitchen. The kitchen consists of the fireplace and the shelf of cooking utensils. As the energy for the fireplace, Dayak people usually use firewood. The traditional fireplace used in the past was built behind the front wall of the bilik, in the area which is called the *tempuan bilik* of the family's compartment. On further development of the longhouse, the kitchen was placed in the rear section of the bilik in every compartment.

3.3.2 The longhouse Orientation

Generally, Dayak people are really concerned with the movement of the sun and the river stream when they wish to establish a new longhouse. This phenomenon occurs because they are highly dependent on nature. For the Dayak people, nature is the source of life. Therefore, with any activities carried out, they attempt wherever possible to not conflict with nature.

According to Sather in Fox (1993: 79), "A longhouse, instead, should be mirrored by the sun's movement within the cosmos. That is, the sun should orbit the house; it should ascend to the slope of the roof from the gallery side, reaching its highest point (*rabong* day, 'zenith'), directly over the central ridge-capping (perabong). The east-west movement of the sun over the longhouse, should cross-cut the upriver-downriver internal divisions of the longhouse. The gallery side of the house should thus ideally face the eastward, in the direction of the rising sun. "

Figure 3.3.
The longhouses orientation



3.3.3 Dayak Architecture in West Kalimantan

Like other areas in Kalimantan, the direction of the front facade of the longhouse (*rumah panjang*) of the Dayak people in West Kalimantan, is always oriented to the sunrise (*matari tumbuh*) and the all other support buildings should be erected following the direction of the longhouse orientation. Generally, the longhouse situated on along the edge of the river stream. According to Pebriano (2006: 47), the river is the important factor for the people in the Dayak community, serving as a transportation route between the vvillages and also as one of the food sources in their livelihood.

There are five important section names usually addressed to initialize one of the longhouse sections and its surrounding area, particularly for the Iban sub-ethnic, namely:

1. The front part which is called the tip of the *Ruai* (*Ujung Ruai*) referring to the section situated in front of the Ruai and located on the eastern side of the longhouse;
2. The back part which is called the tip of the *ilik* (*Ujung Bilik*) referring to the section situated at the edge the bilik on backward and located on the western side of the longhouse;
3. The right side of the longhouse is called *Punggung Ulu'*;
4. The left side of the longhouse is called *Punggung Ili'*;
5. The bathing place is at the river's edge (*tepian*). Usually, there are two places where the bathing area was placed; on the upstream of the longhouse which is called *tepian ulu'* and the downstream of the longhouse which is called *tepian ili'*.

The longhouse consists of several apartments called bilik. Like other areas in Kalimantan, the longhouses in West Kalimantan also showed that the number of *bilik* is the number of families' heads who inhabited the dwelling. Each compartment (*bilik*) is usually occupied by one family. Generally, the width of each bilik averages 4 to 5 metres, and the length of each bilik averages 8 m, which excludes the length of the *Ruai* and the *Tanju'*. Occasionally, the extended room for the kitchen will be built toward the back of the longhouse. In the past, the *bilik* was one large room without separator (walls), but currently the occupants make sleeping rooms in the *bilik*.

According to Santoso (2008), when the Dayak wish to erect a new longhouse, there should be four *biliks* with special placement in the longhouse for their traditional leaders, and the family members who have

a special assignment as the communal leaders. The four leaders of the *bilik* are named as: *Pun*, *Nga-pit*, *Nekop*, and *Pemangku Tangga*. *Pun's bilik* is positioned in the center of the longhouse, *bilik Nekop* is located on the right side of the *Pun bilik*, the door openings for which are in the opposite direction of the door openings of the *Pun bilik*. *Bilik Nga-pit* is located on the left side of the *Pun bilik*, but different from bilik *Nekop*, the door openings in *bilik Nga-pit* are in the same direction as the *Pun bilik*.

According to his investigation, he found that each *bilik* of the longhouse, can divided horizontally into two major sections, the communal-side section which is called the *Ruai*, and the domestic-side section (individual group) which is called the *Bilik*. Both the *Ruai* and the *Bilik* are then divided into several sub-sections which have different functions. In addition to these sections, there is one other section which is also important called sadau. The sadau is a section located at the top of the longhouse under the roof.

The further explanation of the sub-sections in the longhouse will presented as follows:

a. The communal-side section (the *Ruai* section)

Ruai is divided into three sub-sections which are called as: the *padong, ruai,* and *teluk*.

- *Padong*

  Padong is usually used as the place for weaving for women or girls, and the place for children to play. In addition, padong also serves as a place to receive guests who do not stay overnight. The family's guests usually will be welcomed in their own *bilik* to be served personally by the occupants. In special events such as traditional ceremonies, the *Padong* is used as the place to conduct ceremonies such as 'funeral rites or gawai (party after the successful harvest).

- *Ruai*

The *Ruai* usually serves as the temporary place for the paddy after harvest, and then to be pounded and put in the storage as the family supplies. In particular, the adults or family heads used it as the place for repairing working utensils such as cleaver, rubber tappers, fishing equipment, and others.

- *Teluk*

  Teluk serves as the circulation path for the occupants to walk to all the bilik of the longhouse. The Teluk also serves as a separate area between *Ruai* and *Bilik*. This occurs by making the floor elevation on the *teluk* lower than *Ruai* and *Bilik*. Usually found in this sub-section, the women or the girls clean the paddy by pounding it.

b. The domestic-side section (The *bilik* section)

Bilik is divided into three sub-sections which are called: *Bilik Baruh*, *Serambik*, and *Peningkak*.

- *Bilik Baruh*

  Bilik Baruh functioned as the place to serve the family guests and served as the space for guests to sleep during the overnight visitation. In the past, the kitchen was also placed in this sub-section. Therefore, the occupants spontaneously offered meals to all their family guests and ate together with the occupants of the *bilik*. However, due to the changes in the Dayak people's current habits, the kitchen was moved to the rear of *bilik*.

- *Serambik*

  Serambik serves as the place to sleep for the occupants in each *bilik* of longhouse. *Serambik* functioned as the place to store individual utensils such as weaving utensils or other special things belonging to the *bilik* members.

- *Peningkak*

  Peningkak currently serves as the place for cooking as well as the dining room. Sometimes, if needed, it serves also as the sleeping place for the occupants when they receive many overnight guests. *Peningkak* usually called as the *Teluk* since the floor is made lower than other areas in the *bilik*, such as the *bilik baruh* or the *serambik*.

c. Sadau

Every Dayak longhouse generally has a loft which serves as the warehouse or a place to store the paddy harvest and the rarely used farming utensils. Dayaks usually call it "*Sadau*.". *Sadau* is divided into three sub-sections, which are named *Sadau Baruh*, *Sadau Ruai*, and *Sadau Emplenguk*. This naming is based on the position of the *sadau* where it shades the room underneath.

3.3.4 Dayak People, Architecture and Adat (Customs and Traditions)

Before conducting an analysis to the architecture of Dayak longhouse, it is necessary to understand the customs (*Adat*) and traditions (*tradisi*) which is prevailing in the Dayak community. In addition to the positive law which is set by the government of the Republic of Indonesia, in West Kalimantan, the Dayak communities also apply the customary law. The position of these laws are both equally are obeyed and carried out by the Dayak community. In addition to customary law, people of Dayak also applies the customs and traditions in some of their lively activities which is related to the belief of Dayaks in the past and it is still performed until today.

According to Thomson (2000: 60-61), the positive orders which is carried out and obeyed by the Dayak community is divided into 3, ie:

1. *Hukum adat* or *adat* law; is the body of rules which are contained the traditions, regulations and norms that roughly corresponds with the orders in the community. This law also applies to the outsiders who break the rules in the Dayak community. Adat law has traditionally provided strong sanctions against divorce, adultery, beating one's wife, theft, etc;
2. *Adat kebiasaan*, or customs. Some adat customs concerning the regulation of social relationship, these rules containing of the daily attitudes in the community and how to interacts with others, for example how Dayak people greets and treats the guests, how marriages are arranged and performed;
3. *Adat kepercayaan*, religous beliefs, customs, rituals and ceremonies. These rules are designed as the guidelines of Dayak people with regards to conduct the prayer actions towards the respected force in the mysterious invisible realm that govern and regulate the human life. Adat of this category is most explicitly as the religious in nature;

According to Alqadrie (1990: 103), the Dyaknese are very religious, and Their religious beliefs are hardly separadable from Their daily lives. Thus, Dyaknese personality, behavior, Attitudes, and actions are all guided and supported strongly by religion and culture. In the past they firmly hold the customary rules in the indigenous traditional behaviours, but due their conversions as the Christian adherents, some of these customary beliefs slightly bit began to be abandoned. This was due the beliefs which is based on the doctrine delivered by missionaries that some of the customary beliefs are considered contrary to the teachings of Christianity (Alqadrie, 1990, Thomson, 2000 and Pebriano, 2006).

Similar like many other local inhabitants in West Kalimantan, Dayak people consistently run and obey the teaching of religion or customary belief. Currently, most of the Dayak people embracing the Roman

Catholic Christians, and few of Dayak people embraced Protestant Christianity and Islam (Alqadrie, 1990 and Thomson, 2000). On the other side, they also have great respect to the customary which is developed in the community. For Dayak people, running the customary will ensure the harmony, prosperity and peacefulness in the community and guarantee the mutual interaction with nature in their surrounding settlements.

Thomson (2000: 38-39), states the Dayak people differentiate between hukum adat (traditional law) and adat kepercayaan (traditional beliefs and religious practices). In the practically daily activities, They do admit and commit to discard or modify those aspects of customary belief of the laws, traditions, ceremonies, rituals and sanctions that conflict with christian faith, but they emphasize the respect to customs and want to preserve adat that does not conflict with the Christian faith and practices.

As author noted in the previous, for the Dayaks, Complying with adat means there will be harmony, prosperity and peacefulness for the community life in their neighborhood. Complying with adat means they do not disturb the balance of natural force that certainly to avoidance the outrage of nature and catastrophe for their neighborhood. The balance of life, for Dayaks, is should also provided by the actions to keeps in touch with the past. The life of today is the continuation of the life in past. Therefore they will always maintain the relations with ancestors who are currently live as the ancestral spirit. Ancestral spirits will also contribute to their life as protector of the community environment and their hometown of the disruptions or damages. The living Dayaks people should always honor their ancestors by provide the inscription to ancestral spirit. In their beliefs, if these breached will lead to misfortune and catastrophe, not only for the person but also will impinge to their community. For indigenous Peoples, the adat beliefs (traditional beliefs and religious practices) is the guidance for people of Dayak to interact in their community.

According to Thomson (2000: 58), states:

"*adat as manipulation raised some implications regarding the nature of morality. The rightness or wrongness of an action is determined by whether the action achieves the desired result. Proscribed actions are to be avoided because they might bring calamity or ill fortune to the individual or the community. A proscribed action might not be morally wrong if one is able to "pay the adat" to smooth over the potential disruption in the overall harmony before the individual or community suffer the consequences from the angered of ancestral or other spirits*".

Furthermore Thomson (2000: 58-59) mentioned the important of adat is the conducting of the required ceremonies and rituals to satisfy the spirits or natural forces are likely to be cooperate with humans. Adat also maintaining the appropriate barriers between the living Dayak peoples and the forces of unseen realms. These adat rituals is conducted in order to maintaining relations of the harmonious interaction with spirits, but at the same time, people of Dayak need the distance to protect them from annoyance of the bad spirits.

Longhouse as the product of architecture with the inherent adat and traditions, existed before they embraced the new religion. Manifestation of cosmology in the detail of its architectural concept is closely related to understanding of the Dayak people towards the great force concept that affect to their lives in the world.

CHAPTER IV
DISCUSSIONS

As mentioned in the previous chapters, the research data was collected from 2 types of architecture of traditional houses found in West Kalimantan: the traditional dwellings of the Malay and the longhouses of the Dayak. The total amount of traditional Malay dwellings used in the research were 31 houses observed at 10 locations throughout the province of West Kalimantan, while only 4 Dayak longhouses were observed at different locations in the Kapuas Hulu regency in West Kalimantan.

4.1 Overview of the traditional dwelling in West Kalimantan

. The traditional dwellings in West Kalimantan were observed from four aspects i.e. type of the construction, quality of the buildings structure, the number of storeys and the building shape style.

Overall, the construction type of all the traditional dwellings is the stage house where the floor is raised from the ground. The buildings‘ ages ranged from 70 up to 200 years old. Structure quality ranged from good to poor condition. The traditional dwellings are also grouped into houses having only one floor or storey and those having two-storeys, while the house masses also fall into two groups: those with two masses and those having one mass which consist of many compartments (hereafter refered to as *biliks*).

The architecture of traditional dwellings in West Kalimantan are generally dominated by two major ethnic groups; the Dayak and the Malay. However, there are also other ethnic groups like the Chinese, Buginese, Madurese and Javanese who are also long term residents scattered throughout West Kalimantan. In accordance with *The Digital Atlas of Indonesian History* by Robert Cribb (Sirtjo Koolhof in Kuhnt-

Saptodewo et.al., 2010: 44), major buginese settlement areas dating back to the 17th – 18th centuries can be found along the coast of West Kalimantan and are even currently inhabited in the areas of Sambas, Mempawah, Pontianak, Sukadana and Ketapang.

In general, the traditional dwellings of the Malay consist of two masses which are inhabited by one family, while the traditional dwellings of the Dayak consist of a single mass dwelling which has many of compartments (*bilik*) and are inhabited by a number of nuclear families.

Generally, traditional dwellings in West Kalimantan use wood as the main construction material and are erected in locations along the main rivers of Kalimantan, i.e. the Kapuas river and smaller rivers, such as the Subah, Pawan, Melawi rivers among others. In fact, most of the traditional dwellings in West Kalimantan are oriented towards a river, especially among the traditional dwellings of the Dayak. However, in some cases, the traditional dwellings of the Malay and the Dayak, were found to be oriented toward a road and yet still located not very far away from a river. Generally, the dwellings were still in good condition and inhabited. Only in some cases were the dwellings uninhabited or in poor condition due to lack finacial means of the owners to pay for the cost of repair.

4.2 Classification and codification of the research objects

In conducting an analysis of the research, the dwellings were classified and codified based on the culture inherent to the work of the architecture as presented in table 4.1, and their locations as presented in table 4.2.

Table 4.1.
Classification of the research objects based on the cultures inherent

No.	Research objects	code	Number of locations (towns)
1.	Malay traditional dwellings	A	10
2.	Dayak longhouses	B	1

Table 4.2.
Classification of the research objects based on the locations

No.	Research objects	Locations (town)	code	Number of objects in each locations (houses)
1.	Malay traditional dwellings		A	
		Pontianak	A.1	3
		Mempawah	A.2	3
		Sambas	A.3	4
		Ngabang	A.4	3
		Tayan	A.5	3
		Sanggau	A.6	4
		Sekadau	A.7	2
		Sintang	A.8	3
		Ketapang	A.9	3
		Sukadana	A.10	3
2.	Dayak Longhouses		B	
		Putussibau	B.1	4
	Total	**11**		**35**

Based on literature and interviews, the traditional Malay dwellings chosen for this research were in towns that played important roles as centers of government of the Malay kingdom in the past while the Dayak longhouse locations were selected in places occupied by the sub-ethnic group called the *Dayak Taman* (hereafter refer to as the Tamanic) which is part of the greater ethnic group called the *Dayak Iban* (Ibanic).

The samples of Malay traditional dwellings in this research were selected to illustrate the differences in house shapes at each location. The number of samples taken at each location, generally, consisted of between 2 to 4 houses in order to represent each of the three types of Malay traditional dwellings which are as follows:

1. Type 1: *Potong Limas* (*Limas* shape)
2. Type 2: *Potong Kawat* (*Kawat* shape)
3. Type 3: *Potong Godang* (*Godang* shape)

Codification and distribution of the dwellings based on the Malay traditional dwelling shapes are presented in table 4.3.

Table 4.3.
Distribution of the research objects based on the house's shapes

No.	Research objects	Code			
		culture inherent	Type		
			Type 1	Type 2	Type 3
1.	Malay Traditional dwellings	A			
	Pontianak	A.1	A.1.1	A.1.2	A.1.3
	Mempawah	A.2	A.2.1	A.2.2	A.2.3
	Sambas	A.3	A.3.1	A.3.2; A.3.4	A.3.3
	Ngabang	A.4	A.4.1	A.4.2	A.4.3
	Tayan	A.5	A.5.1	A.5.2	A.5.3
	Sanggau	A.6	A.6.1	A.6.2	A.6.3; A.6.4
	Sekadau	A.7	A.7.1	A.7.2	
	Sintang	A.8	A.8.1	A.8.2	A.8.3
	Ketapang	A.9	A.9.1	A.9.2	A.9.3
	Sukadana	A.10	A.10.1	A.10.2	A.10.3
2.	Dayak Longhouses	B			
	Putussibau	B.1			
	Sungai Ulu' Palin Village	B.1		B.1.1	
	Bali Gundi Village	B.1		B.1.2	
	Melapi Patamuan Village	B.1		B.1.3	
	Pabiring Village	B.1		B.1.4	

4.3 Discussion on the research objects

A separate analysis of each type of architecture was conducted so that an in-depth discussion could be carried out on the architecture of:

a. Malay traditional dwellings

b. Dayak longhouses

The in-depth analysis on the architectural aspects of the Malay traditional dwellings is conducted in order to get a clear perception of the anatomy of these types of dwellings, while the analysis of the

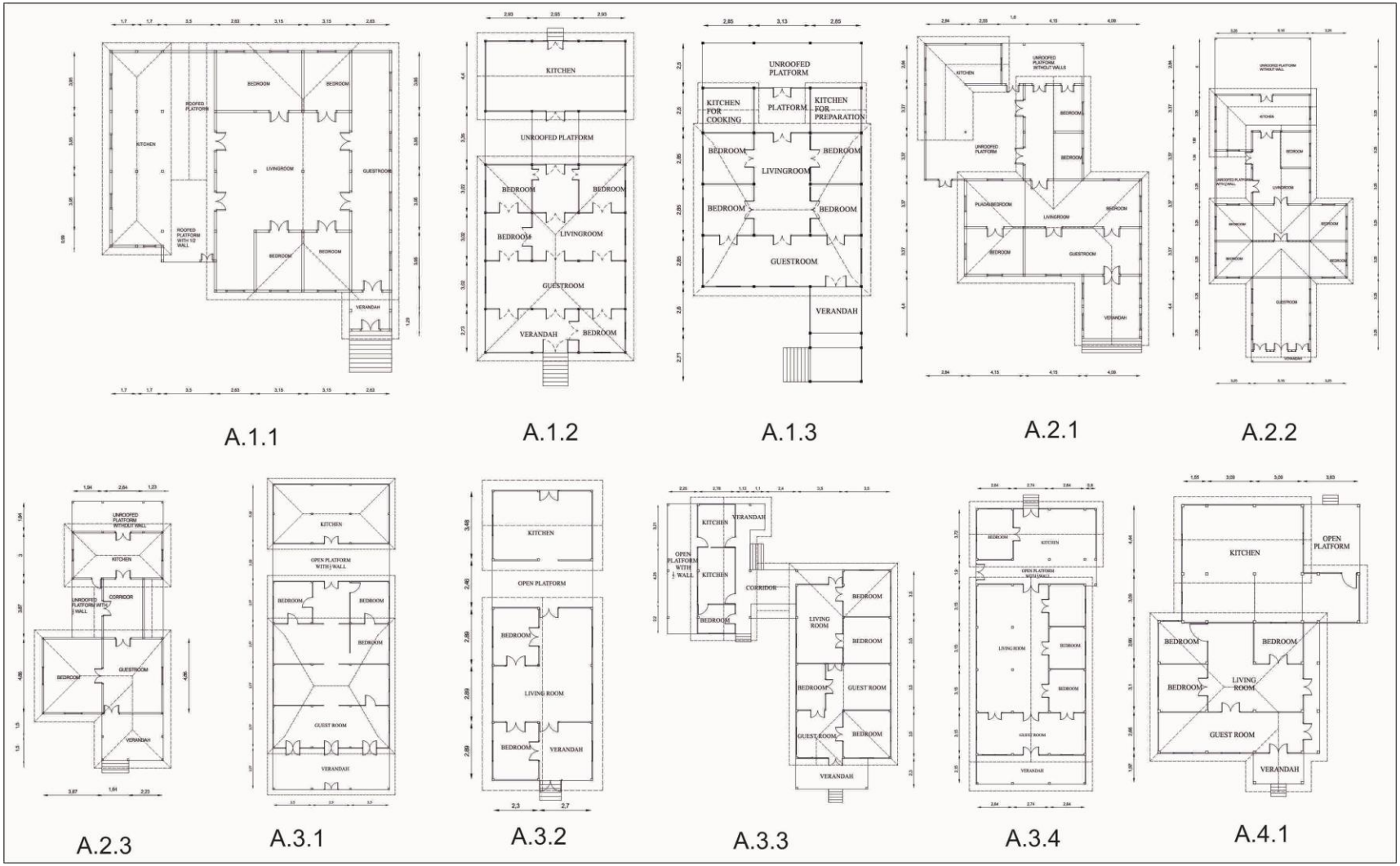
architectural aspects of the Dayak longhouses were carried out as a comparative study of the results found in the Malay traditional dwellings discussion.

4.3.1 The architecture of traditional Malay dwellings

Speaking on the Malays, Djamour (1959: 7) noted that "ideally they liked to live in a wooden house built on stilts, with a verandah, a front room for receiving guests, one or two bedrooms and a kitchen" (Milner, 2008: 7), while Muhamad Rasdi et. al. (2005) mentioned that a traditional Malay house normally consisst of two basic units; *rumah induk* (main house) and *rumah dapur* (kitchen house). In addition, Irene Doubrawa and Ferenc Gábor Zámolyi (Kuhnt-Saptodewo et. al., 2010; Feest, 2007: 122), states that the space-defining architectonical elements of the Malay house are the core house including the annexes (verandah) on different floor heights, the connection gangways (corridor) and the kitchen house (support house). Zain (2011: 120-121) mentioned that Malay traditional dwellings of West Kalimantan generally consist of two parts, the main house (*rumah induk*) and support house (*rumah anak*). The main houses referred to in this research are the main building, which consists of the spaces, i.e. front *Serambi* (verandah), middle *serambi* (guestroom), rear *serambi* (livingroom) and bedroom, while *rumah anak* is defined in this research as the support building and consists of kitchen, platform (*pelataran*) and corridor (if any). The plan of the cases is presented in the figure 4.1.

Figure 4.1.

Floorplans of the research object of the traditional Malay dwellings



vertical

horizontal

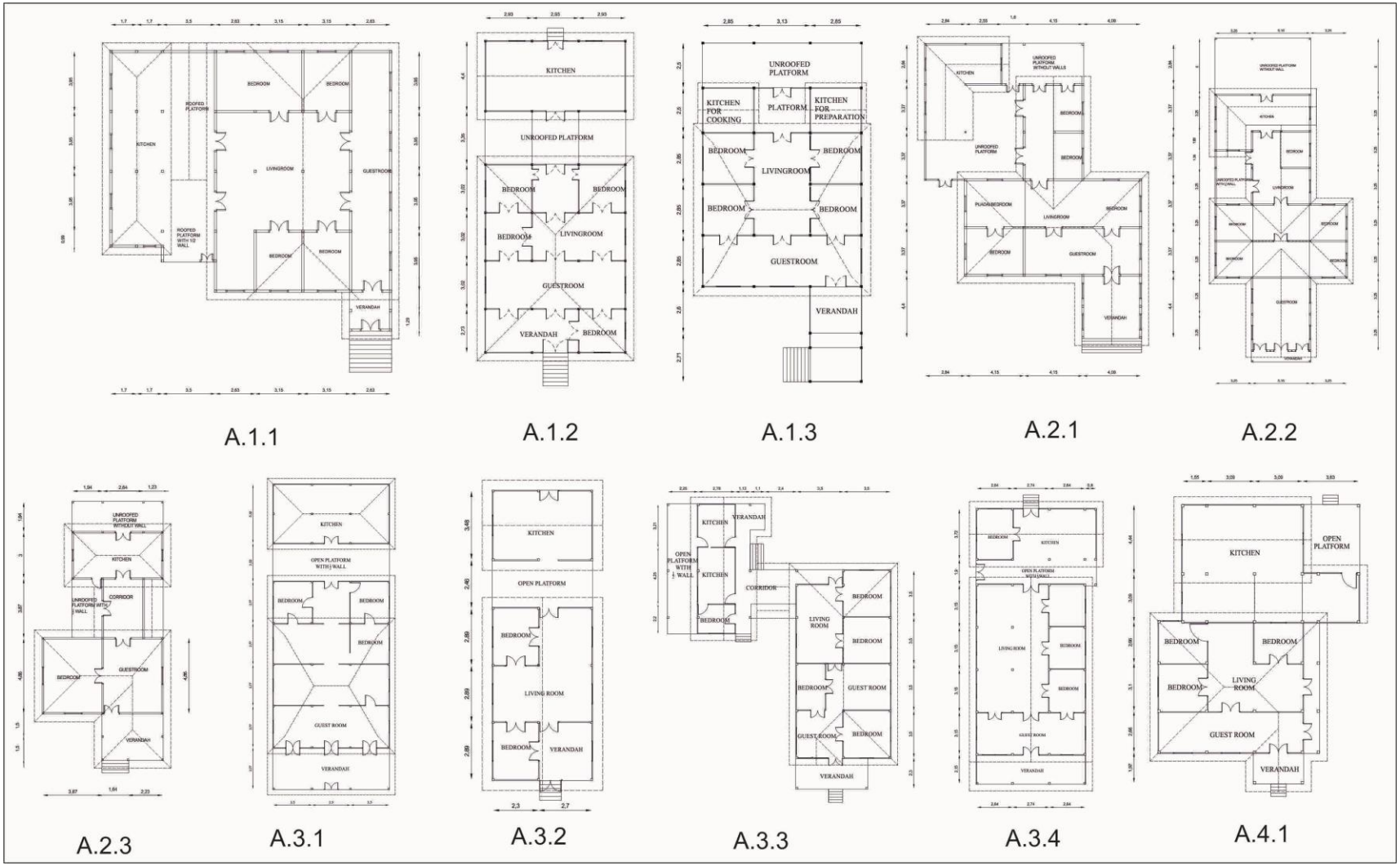
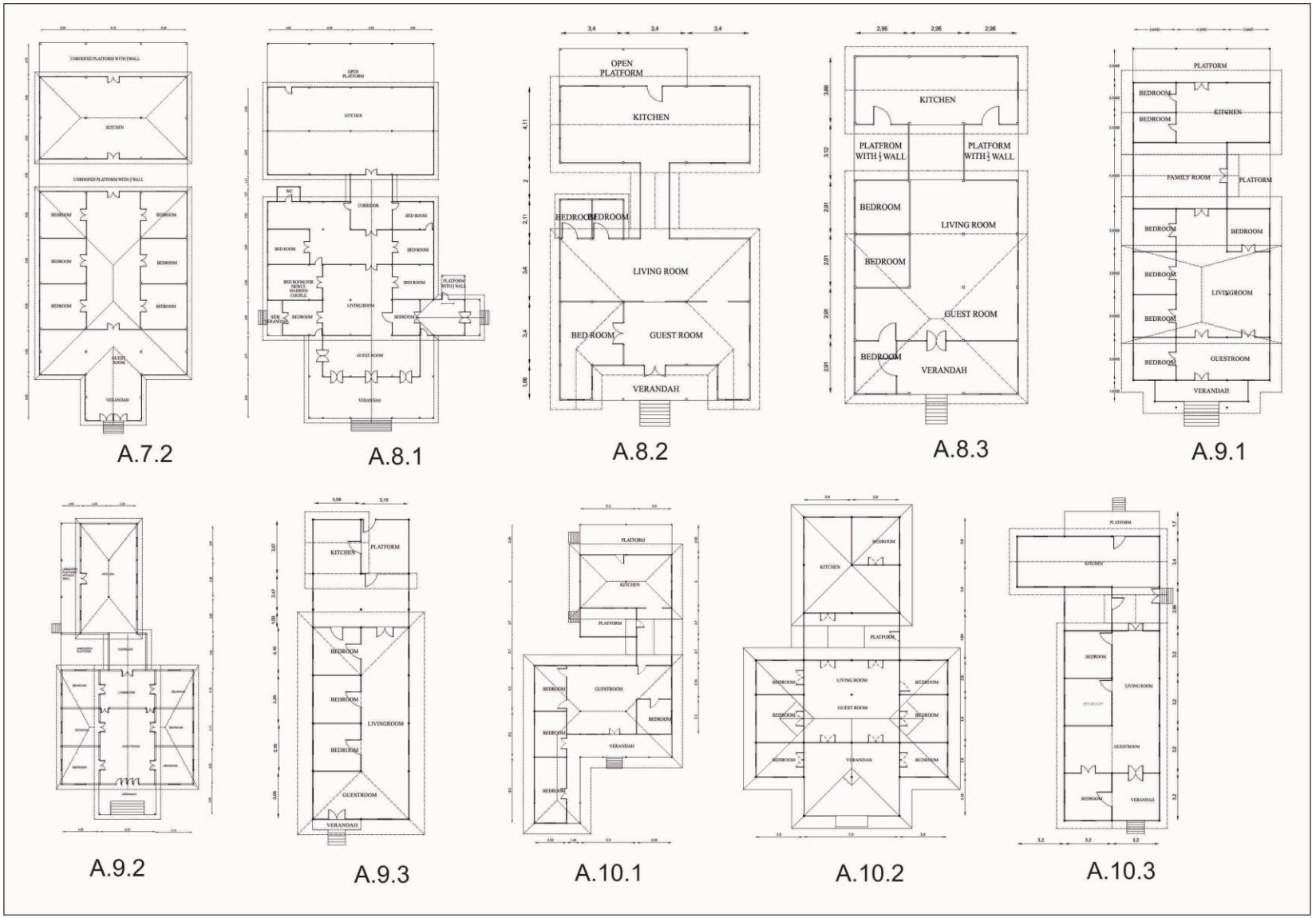


Figure 4.1a.
Floorplans of the research objects of the traditional Malay dwellings (continued)

vertical
horizontal

Figure 4.1b.
Floorplans of the research objects of the traditional Malay dwellings (continued)



vertical
horizontal

According to figure 4.1., in the vertical axis, the main house plans are grouped as 3 parts:

- Floor plans with 2 grids are found in 7 houses, i.e. A.2.3.; A.3.2.; A.3.3.; A.4.2.; A.7.2.; A.9.2.; and A.10.2.;
- Floor plans with 3 grids are found in 20 houses, i.e. A.1.1.; A.1.2.; A.1.3.; A.2.1.; A.2.2.; A.3.1.; A.3.4.; A.4.1.; A.4.3.; A.5.1.; A.5.3.; A.6.1.; A.6.2.; A.6.3.; A.6.4.; A.7.1.; A.8.2.; A.8.3., A.9.3.; and A.10.3.;
- Floor plans with 4 grids are found in 4 houses, i.e. A.5.2.; A.8.1.; A.9.1.; and A.10.1.

Meanwhile, in horizontal axis or parallel to the roof covers, the support houses are grouped as 2 parts:

1. Floor plans with 1 grid are found in 16 houses, i.e. A.1.2.; A.1.3.; A.3.2.; A.3.3.; A.3.4.; A.4.1.; A.4.3.; A.5.1.; A.5.2.; A.6.1.; A.6.4.; A.7.2.; A.8.2.; A.8.3.; A.9.3.; and A.10.2.;
2. Floor plans with 2 grids are found in 15 houses, i.e. A.1.1.; A.1.3.; A.2.1.; A.2.2.; A.3.1.; A.4.2.; A.5.3.; A.6.2.; A.6.3.; A.7.1.; A.8.1.; A.9.1.; A.9.2.; A.10.1.; and A.10.3.

4.3.1.a Anatomy of Plan

In conducting the analysis for understanding the plans of the anatomy of the Malay traditional dwellings, the author identified each space and found the support elements of each space. *Plan* is defined as a collection of spaces linked to each other. In the architectural theory, spaces in the floor plans have specific functions with their own definitions. Therefore, parallel to the analysis, the author also defined the function of each space.

SPACE GRIDS

Tabel 4.4.
The main house grids

No.	Objects code	Main House grids					
		Horizontal		Vertical			
		Length per grid (m)	Number of grids	Length per grid (m)	Number of grids	Length of Verandah (m)	Number of grids
1.	A.1.1	2.63; 3.15	4	3.95	4	2.45	1
2.	A.1.2	2.93	3	3.02	3	2.73	1
3.	A.1.3	2.85; 3.13	3	2.85	3	2.59	1
4.	A.2.1	4.15	3	3.37	4	2.20	2
5	A.2.2	3.25; 5.16	3	3.25	4	3.25	2
6	A.2.3	3.87	2	4.81	1	1.50	2
7	A.3.1	3.50	3	3.77	4	3.77	1
8	A.3.2	2.30; 2.70	2	2.89	2	2.89	1
9	A.3.3	3.50	2	3.50	4	2.30	1
10	A.3.4	2.64; 2.74	3	3.15	4	2.15	1
11	A.4.1	3.09	3	2.66; 3.09;	3	1.97	1
12	A.4.2	3.97	2	3.97	2	3.97	1
13	A.4.3	3.53	3	3.53	3	3.53	1
14	A.5.1	3.36	3	3.36	3	2.03	1
15	A.5.2	3.63	4	3.50; 4.81	4	2.10	1
16	A.5.3	3.10	3	3.67	3	1.96	1
17	A.6.1	3.91	4	3.43	5	1.04; 1.77; 3.29	3
18	A.6.2	4.03; 5.91	3	4.06	2	3.91	1
19	A.6.3	3.04; 3.38	3	3.04; 3.25;	4	2.15; 4.12	2
20	A.6.4	3.38	3	2.92	3	1.90	1
21	A.7.1	6.15; 5.08	3	5.08	4	2.54	2
22	A.7.2	4.98	2	3.15	2	(3.15-1.25)	1
23	A.8.1	4.64; 5.18	5	1.67; 3.08; 3.95; 4.71	6	4.64	1
24	A.8.2	3.40	3	2.11; 3.40	2	1.86	1
25	A.8.3	2.96	3	2.91	3	2.91	1
26	A.9.1	3.88	3	3.65	4	1.82	1
27	A.9.2	4.12; 6.05	3	4.12	3	3.25	1
28	A.9.3	3.16	2	3.16	4	0.70	1
29	A.10.1	3.90	3	2.80; 2.90	3	3.15	3
30	A.10.2	3.20	2	3.20	3	3.20	1
31	A.10.3	4.30	3	1.90; 4.30	3	(4.30-2,15)	1

According to Natsir (with interview on December 2010), the traditional measurement was used in the calculation of the arrangement of space in the traditional Malay house. The size estimation if converted to the metric units is shown as follows:

- 1 *depak* = 170-180 centimeters;
- 4 *hasta* = 1 *depak;* So, 1 *hasta* (*se-badan*) = 170/4 = 42,5 centimeters; if 1 *depak* = 180 centimeters, then 1 *hasta* = 45 centimeters
- 1 *hasta* = 2 *kilan;* So, 1 *kilan* = 42,5/2 = 21,25 centimeters; or 45/2 = 22,5 centimeters; and
- 1 *kepal* or *se-genggam* = 10 -12 centimeters;

It is also known of other measures, i.e. *se-lutut* or as knee height (+ / - 40 centimeters), *se-pinggang* or as waist height (+ / - 80 centimeters), *se-dada* or as chest height (+ / - 120 centimeters) and *setaput kepala* or as the head height (+ / - 170 centimeters).

If the measure of the smallest grid that is found in the main house of the horizontal direction (see figure 4.1.) on one of the cases is 2.3 meters (230 centimeters), the following steps are conducted to obtain a traditional unit:

- The first step, the figures were reduced by a *se-depak*, so then it obtained = 230 -170 = 60 centimeters;
- The second step, the results in the first step were reduced by *se-hasta* = 60 - 42.5 = 17.5 centimeters;
- The third step, the result of the second step is close to the estimation unit of *se-kilan*;
- So the the approximate unit of the grid is 1 *depak* 1 *hasta* 1 *kilan*.

It is important to note from these calculations that the figures above are an estimation because the measure of traditional units in the past were based on the measurement unit of the anatomy of the family

heads, whose sizes were certainly diverse. But the ideal outcome of the grid for 1 *depak* 1 *hasta* 1 *kilan* is 170 + 42.5 + 21.25 = 233.75 centimeters (this estimation is close to the results of field measurements).

From the results of field measurements, the size of each grid of space in the main house, both horizontally and vertically, shows a wide variety of size of the grid. The largest grid size that found was 4.98 meters. If converted into traditional units, then we obtained the results following:

- The first step, converted to *se-depak*: 498 – (2 x 170) = 158 centimeters;
- The second step, converted to *se-hasta*: 158 - (3 x 42.5) = 30.5 centimeters;
- The third step, converted to *se-kilan*: 30.5 – 21.25 = 9.25 centimeters;
- The fourth step, the result of the third step is close to the unit of 1 *kepal*;
- So the approximate unit of the grid is 2 *depak* 3 *hasta* 1 *kilan* 1 *kepal*.

If compared with the ideal result of grid for the previous calculation of 1 *depak* 1 *hasta* 1 *kilan* the result is (2 x 170) + (3 x 42,5) + 21,25 + 10 = 498.75 centimeters (this estimation is close to the results of field measurements).

Height of elements on the bottom part of main house is found to vary in elevation from 70 centimeters up to 243 centimeters. If converted to the traditional units it ranges from half of *se-depak* (or almost to *se-pinggang*) up to 1 *depak* 3 *kilan*. The height of elements on middle part is also found to vary between the smallest size of 251 centimeters, or almost 1 *depak* 4 *kilan* to the largest of 430 centimeters or 2 *depak* 2 *hasta*, while on the upper part it varies between the smallest unit of 153 centimeters (or less than 1 *depak*) up to 497 centimeters or 2 *depak* 2 *hasta* 3 *kepal*.

The smallest units of grid were found in one of the cases of the support houses in the horizontal direction at 1.7 meters (170 centimeters), so then the size could be converted into a traditional unit of *se-depak*. While the largest unit of grid that was found at 5.08 meters, which could be converted to the traditional unit of 3 *depak*. From the investigation on field research, the support houses were formed on a grid unit of 2 x 3, so the size of the support house has an area of at least 2 x 3 *depak*, up to the maximum of 6 x 9 *depak*.

The height of elements on the bottom part of the support house is found to vary from the smallest elevation of 50 centimeters to 273 centimeters. If we converted to a traditional unit it ranges from the unit of less than half of 1 *depak* up to 1 *depak* 2 *hasta* 1 *kilan*. The elevation on the middle part varies from about the smallest unit of 243 centimeters or equal to 1 *depak* 1 *hasta* 3 *kepal* up to the largest unit of 362 centimeters, or 2 *depak* 1 *kilan*. On the upper parts were variations of about the smallest size of 94 centimeters, or less than 4 *kilan* or 2 *hasta*, up to 497 centimeters or equal to 2 *depak* 3 *hasta* 3 *kepal*.

In addition, there was found also a system of measurement for the width of a door by based on the position of a male adult who is sitting on the floor with legs stretched out. This measure is equivalent to the height of a male waist or about 80 centimeters. By the size of it, an adult male would freely pass through the door without worrying about his shoulders colliding with the door frame.

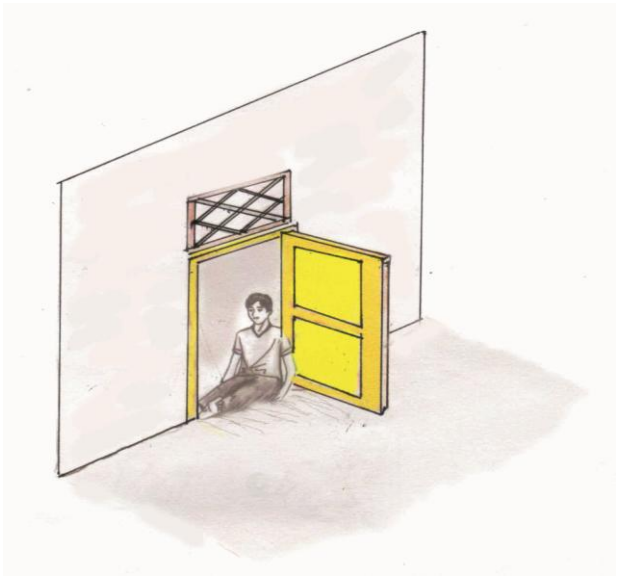


Figure 4.2.
The width of a door by based on the position of a male who is sitting on the floor with legs stretched out

Tabel 4.5.
The support house grids

No.	Object codes	Support House grids							
		Horizontal				Vertical			
		Length per grid of the roofed kitchen (m)	Number of grids	Length of the unfroofed Platform or corridor* (m)	Number of grids	Length per grid of the roofed kitchen (m)	Number of grids	Length of the unfroofed platform or corridor* (m)	Number of grids
1.	A.1.1	1.70	2	3.50	1	3.95	3	1.95; 3.95	4
2.	A.1.2	2.93	3	2.93	3	4.40	1	3.95	1
3.	A.1.3	2.85; 3.13	2	3.13	1	2.50	1	2.50	1
4.	A.2.1	2.84; 2.55	2	1.60; 4.15	2	2.84; 3.37	2	3.37	1
5.	A.2.2	3.25; 2.58	3	3.25; 2.58	3	3.25	2	3.25; 2.50	3
6.	A.2.3	1.94; 2.64; 1.23	3	1.94; 2.64*	1 1	3.00	1	3.87; 2.64*	1 1
7.	A.3.1	3.50	3	3.50	3	2.66	2	3.52	1
8.	A.3.2	2.30; 2.70	2	2.30; 2.70	2	3.48	1	2.46	1
9.	A.3.3	2.80;	1	2.25 3.40; 1.10*	1 2	2.75; 4.25	3	2.75; 4.25	3
10.	A.3.4	2.64; 2.74; 0.80	4	2.64; 2.74; 0.80	4	3.72	1	1.90	1
11.	A.4.1	1.55; 3.09	3	3.09	1	3.09	1	4.14	2
12.	A.4.2	3.97	2	1.97	1	2.80	2	3.06	1
13.	A.4.3	3.53	3	3.53; 3.53*	3 1	5.52	1	4.12; 3.36; 4.12*	2 1
14.	A.5.1	3.36	3	3.36	3	3.27	1	1.91	1
15.	A.5.2	3.63	4	3.63	4	5.06	1	1.94; 2.24	2

Tabel 4.5a.
The support house grids (continued)

No.	Object codes	Support House grids							
		Horizontal				Vertical			
		Length per grid of the roofed kitchen (m)	Number of grids	Length of the unfroofed Platform or corridor* (m)	Number of grids	Length per grid of the roofed kitchen (m)	Number of grids	Length of the unfroofed platform or corridor* (m)	Number of grids
16.	A.5.3	3.10	3	2.90	1	2.22; 4.24	2	1.84; 2.22	2
17.	A.6.1	3.41	1	2.76	1	3.43; 2.28	5	3.43; 2.28; 2.19; 1.53	5
18.	A.6.2	4.03; 5.92	3	- 4.06*	- 1	4.06	2	4.06	1
19.	A.6.3	2.42	2	2.50	1	3.12; 2.94	4	3.25	1
20.	A.6.4	3.38	2	3.38; 3.38*	2 1	3.60	1	2.27 2.27*	1
21.	A.7.1	5.08	3	5.08	3	4.52	2	3.76	1
22.	A.7.2	2.49; 4.98	2	2.49	1	2.43	1	1.64	1
23.	A.8.1	4.64	4	4.64	4	4.88	2	4.88	1
24.	A.8.2	3.40	3	3.40; .1.50*	2 1	3.00	1	2.00; 4.11*	1 1
25.	A.8.3	2.96	3	2.96; 296*	2 1	3.66	1	3.12; 3.12*	1 1
26.	A.9.1	3.88	3	3.88	3	2.55; 5.65	3	5.65; 2.90	2
27.	A.9.2	3.15	2	5.32	1	3.98	3	3.98	1
28.	A.9.3	3.16	1	3.16	2	3.57	1	2.36; 3.57	2
29.	A.10.1	3.90	2	3.90; 3.90*	1 1	3.90; 3.94	2	3.84; 3.84*	1 1
30.	A.10.2	3.20	3	3.20; 3.20*	2 1	3.40	1	2.96; 1.70 2.96*	2 1
31.	A.10.3	4.30	2	4.30; 3.00*	2 1	2.50	2	2.70; 2.85 2.70*	2 2

The smallest units of grids were found in one of the cases of the support house in the horizontal direction at 170 centimeters, so that would be the size, if it converted into a traditional unit, of *se-depak,* while the largest unit of grid was found at 508 centimeters, if converted to the traditional unit of 3 *depak.* From data of field observation, the support houses are formed on a grid unit of 2 x 3. So, the size of the support house has an area at least on the order of 2 *depak* x 3 *depak,* up to the maximum on the unit of 6 *depak* x 9 *depak.*

The height of the elements on the bottom part of the support house is found to vary from the smallest elevation of 50 centimeters to 273 centimeters. If it is converted to a traditional unit, it ranges from the unit of less than half a *depak* up to 1 *depak* 2 *hasta* 1 *kilan*. The elevation on the middle part varies from about the smallest unit of 243 centimeters, or equal to 1 *depak* 1 *hasta* 3 *kepal*, up to the largest unit of 362 centimeters or 2 *depak* 1 *kilan*. Whereas on the upper parts, dimensions varied from about the smallest size of 94 centimeters, or less than 4 *kilan* or 2 *hasta,* up to 497 centimeters or equal to 2 *depak* 3 *hasta* 3 *kepal*.

PLACE: IDENTIFICATIONS AND DEFINITIONS

The main house used wall partitions to separate the functions of the different spaces. The spaces commonly found in the main house (*rumah induk*) are the front *Serambi* (verandah), middle *Serambi* (guest room) rear *Serambi* (living room) and bedroom (in Malaysia, *rumah induk* is called as *rumah ibu*, see in Yao-Ru et.al., 2008: 248). Support houses do not have any wall partitions to separate the function**s** of space, but in the some cases, the author also found a bedroom with the given walls as partitions.

Malay people visualize the honour of distinguished guests who come, with differences in the sitting position to receive the guests of males and females (Mohamad Rasdi et. al., 2005: 33). Differentiation of the receiving place of guests in accordance with the Islamic teachings, as specified in the Qur'an that God

instructed the believing women that they should hold their views, and to draw their veils over their bosoms, not to reveal their adornment and be modest, and not reveal "their jewelry" except the usual look of them (Md. Zohri, 2010: 30). Jewelry is meant here as the whole female body sections except the face, palms and feet soles; Malay people commonly know it as *aurat*.

> "*And tell the believing women to lower their gaze and be modest, and to display of their adornment only that which is apparent, and to draw their veils over their bosoms, and not to reveal their adornment save to their own husbands or fathers or husbands' fathers, or their sons or their husbands' sons, or their brothers or their brothers' sons or sisters' sons, or their women, or their slaves, or male attendants who lack vigour, or children who know naught of women's nakedness. And let them not stamp their feet so as to reveal what they hide of their adornment. And turn unto Allah together, O believers, in order that ye may succeed*". (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 24:31)

> "*As for women past child-bearing, who have no hope of marriage, it is no sin for them if they discard their (outer) clothing in such a way as not to show adornment. But to refrain is better for them. Allah is Hearer, Knower*". (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 24:60)

Front *Serambi* was the place to serve male guests, while rear *Serambi* was the place to serve female guests (Md. Zohri, 2010: 53, 56). Special rooms for females were located in the *parak* (attic), with stairs or ladders as the access to the *parak*, which were placed on the backward side of the living room. *Parak* has no wall partitions as boundaries and usually is found with carpets, mats or mattresses, which are placed on the floor as the marking of the area. Placement of the females on this area was meant to maintain the safety, honour, and dignity of them as family members. To keep observing the girls' behaviors for interactions with the opposite sex is the main thing, as an effort to maintain their purity from inappropriate attitudes. Therefore, in the Malay culture, adult males could not easily meet adult females, because their parents always supervised

the conduct of their daughters. For Malays, the family honour depends on the family behaviour. In accordance with this, Malay people were usually strict to give the Islamic learnings to their children, both in education and the basic behaviors in society.

The building mass of the Malay traditional dwellings is formed with the uniform pattern of floor plans. The main house is marked with a higher floor level if compared with the support house (Gibbs et.al., 1987: 31-32). According to GhaffarianHoseini (2011: 99) the floor levels of a Malay house have different changes in different spaces to denote the boundaries of each functional space, in addition to indicating the priority and value of these spaces. Generally, the difference between the floor elevation of the main house and support house ranges from 10 up to 30 centimeters. This relates to the comfort of footsteps for humans stepping on different floor levels. As a characteristic of the main house, it has a front *serambi* (verandah) and wall partitions that envelope one whole side of the building mass and are found with a lot of windows or door openings. Meanwhile, the support house has a platform (roofed or un-roofed) with narrow space divisions, and some of the wall sides were commonly found with no cover.

The level on the floor of the main house is elevated from the support house or the surrounding environment in the intent to purify according to the Islamic teachings, because the main house is meant as a place to perform the worship of God, including the prayers which are conducted several times daily. By maintaining cleanliness of the main house, as well as the efforts to carry out God's commands, as mentioned below:

> .....*Allah loveth the purifiers*. (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 9: 108)

In their daily conversation, Malay people used the term of "*naik* (up)" as a sign of permission to the guests for entering the house, while to express the coming out of the house they usually used the term of "*turun* (down)". The living room is usually identified as the front section for most Malay people. In addition, there is also found another term, which is the way of Malay people to indentify space between "inside" and "outside". Inside is the clean place, while outside is the non-clean place. So then, *naik* means steps towards the clean area, while *turun* means steps towards the non-clean area.

Generally, the front *Serambi* in the Malay traditional dwellings was divided into two types: with the roof cover and fence, or just with a small canopy and without a fence. The front *Serambi* with small canopy usually was found on the main houses with 2 grids and some of 3 grids, while the front *Serambi* with roof covers was found on the main houses with 3 or 4 grids. The front *Serambi* was constructed with wide room area and it was as part of the main house. The front *Serambi* with a roof was structured and attached to the structure of other rooms.

Middle *Serambi* is identified and expressed as the front room (*ruang depan*), In their daily conversations, Malay people usually asked the male guest(s) to sit on *ruang depan* as their expression of the guest room. This term is used as a means to honour the guests by serving them in the glorious space on the *ruang depan*. The front (*depan*) refers to the term of honour and the clean area in Malay people‘s expression, while the back (*belakang*), usually refers to the kitchen as the dirty and wet area (Gibbs et.al., 1987: 29). Therefore, the relatives and guests who came from afar would be "forced" to sit in the guest room, even though these relatives did not want to sit there, or they might feel more relaxed while sitting on the rear *Serambi*.

The atmosphere on the middle *Serambi* felt more formal than on the rear *Serambi*. The fundamental differences between these two rooms is the providing of chairs in the middle *Serambi* while in the rear *Serambi*, the guests were usually served by sitting down on the carpets or mats which were spread out on the floor as the symbol of formality and honour to guests (Muhamad Rasdi et. al., 2005: 36). Mats are also rolled out in the main house for praying and sleeping at night (Gibbs et.al., 1987: 10). In some cases, the Malay traditional dwellings also included a special room for guests who stayed overnight. These rooms were located on the front and adjacent to the living room.

The space composition in Malay traditional dwellings showed the levels of functionality and based on the space allotment of defined activities (GhaffarianHoseini, 2011: 99). This floor level is intended to distinguish the function of rooms according to their hierarchy. In the hierarchy of the main house, the more we walk from the front into the spaces inside, the more private the defined activities (see figure 4.3; Sim, 2010: 18).

This figure showed the path circulations for male guests to enter the house (with permission only) from the front *Serambi* (public space) toward the support house (semi private space). Placement of the bedroom adjacent to or on both sides of the rear *Serambi* is an effort to "hide" the private space and also to avoid the passing with male guests who are not the *Muhrim* of the daughters or wife (see figure 4.4.). This is also includes placing of the stairs of the *parak* in back of the rear *Serambi* to anticipate if there are male guests who are not *Muhrim* of daughters or wife who want to enter the inside house, so then the father will ask for time for his daughters or wife to go into the bedroom or running up to the *parak* immediately (A(h)mad et. al., 2007: 285).

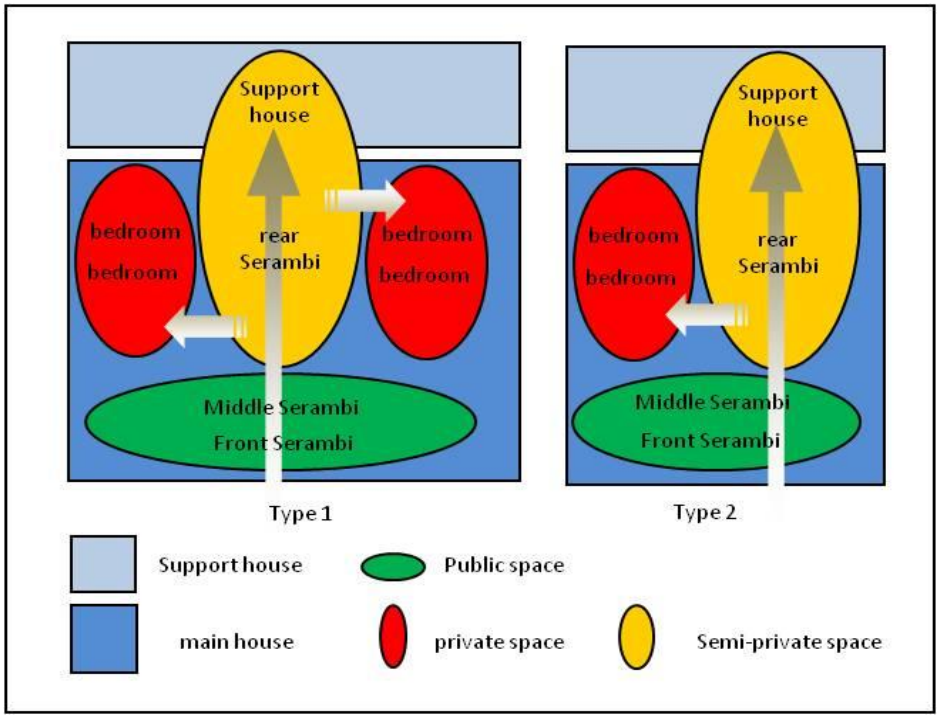


Figure 4.3.

Hierarchy and the composition of space in the Malay traditional dwellings of West Kalimantan

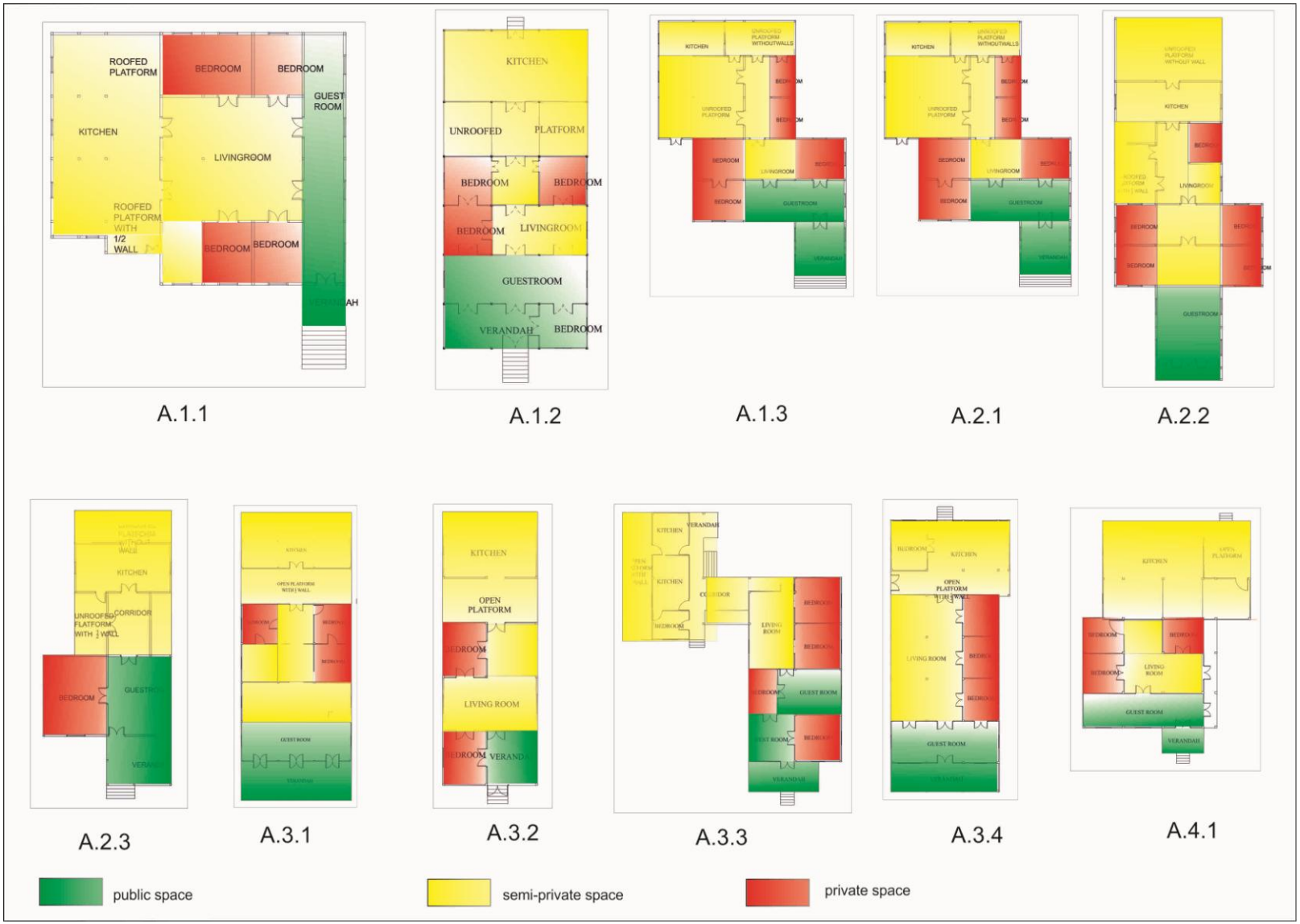


Figure 4.4.
The spatial division of the traditional Malay dwellings of West Kalimantan

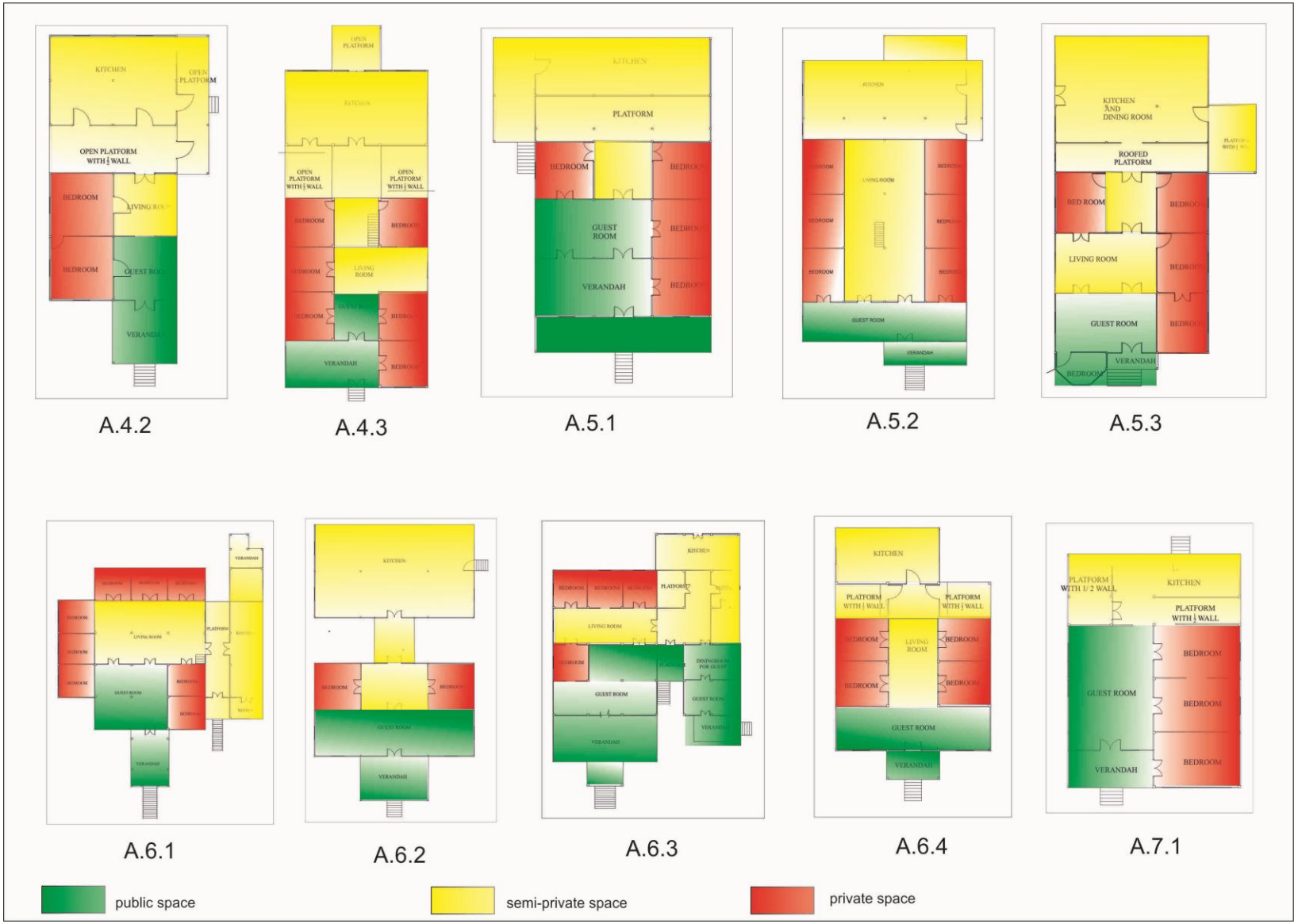
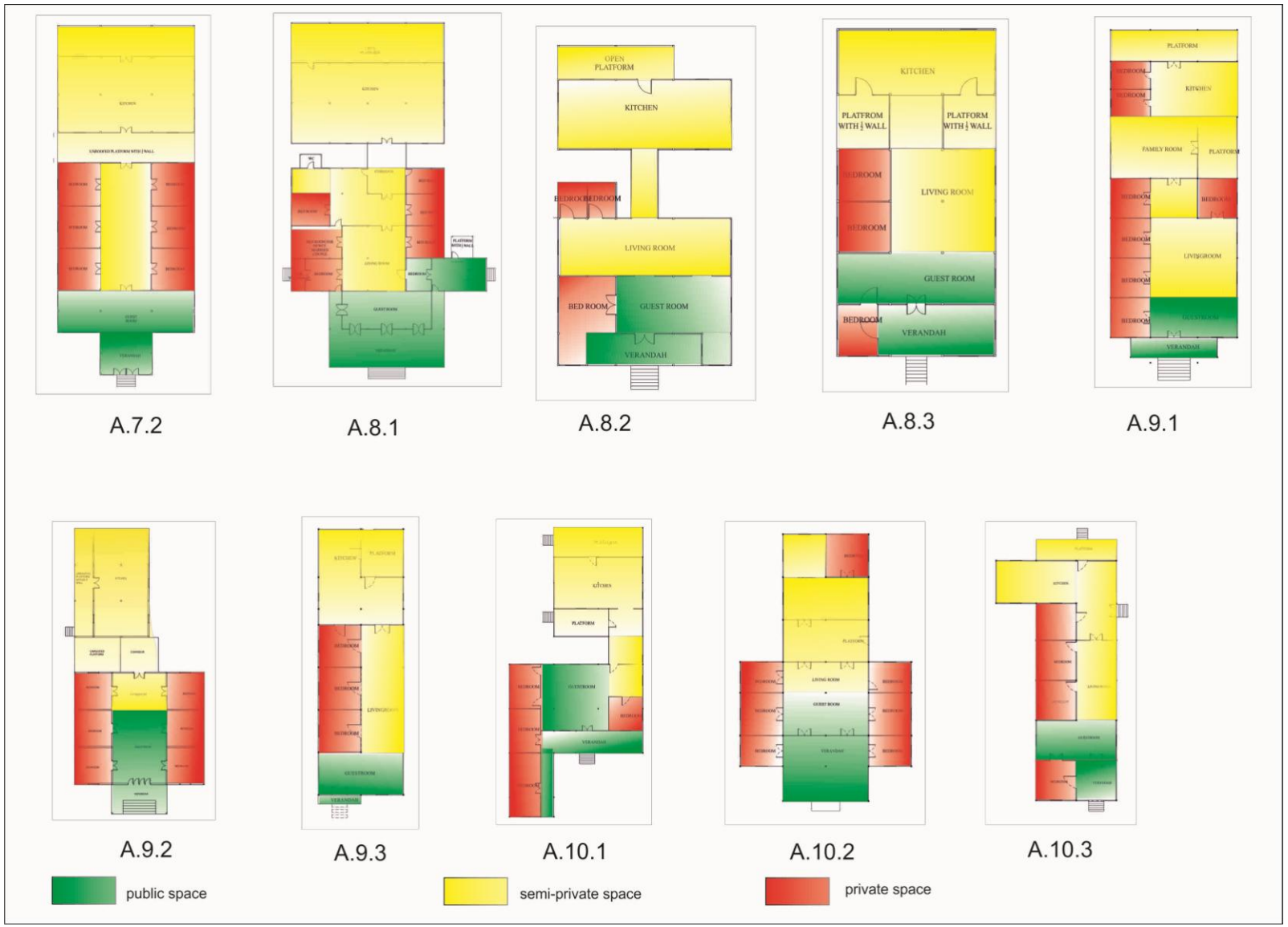


Figure 4.4a.
The spatial division of the traditional Malay dwellings of West Kalimantan (continued)

Figure 4.4b.
The spatial division of the traditional Malay dwellings of West Kalimantan (continued)



Normally, whole rooms in the traditional Malay dwellings have specific names, functions and meanings. The first space found in the front section is *Selang* or usually called the front *Selang*. The front *Selang* serves as the place to put the goods of guests, which cannot brought into the room. The front *Selang* is an open platform that also serves as the drying place of the agricultural crops, fishery or plantations. Malay people usually called it *pelataran depan* (front platform). In the past, the platforms were often found on some traditional dwellings of West Kalimantan. According to Zain (2003), an open platform is found in the Malay traditional dwellings of Sambas town. *Selang* serves as the end point for the guests to use their footwear. Typically, guests who come will put their footwear on the front *Selang* before entering the room, while the guests without footwear will clean their feet on this platform also. Therefore, normally in the past, there is a tank (*tempayan*) on this platform as a water source to clean up the guests' feet. In all cases of this research, the author did not find any platform anymore, even in some cases this space was not created. In case A.3.1., the front *Selang* was found in decay, but the author still found the *gerata'* (the wooden foot steps) as the artifact of front *Selang* before entering the house. Without a front *Selang*, footwear was placed on the ladder of the front *Serambi*. *Selang*, in the Malay expression means *jeda* (the gap). The front *Selang* is the gap between the dirty on the outside and the clean in inside. So then, the dirty things should be cleaned before entering into the house. Cleaning the dirty also refers to the purpose of the guests' visitation. They should clean up their dirty purposes or minds for the owner of the house. By putting the footwear on the front *Selang* or by cleaning the feet before, the guest must also humble himself to the owner of the house, and the water for washing their feet relieves the anger of guests, if they come with any bad purposes, so it can be immediately cooled.



Figure 4.5.
The gerata' (the wooden foot steps) as artifact of front selang before entering the house. I also found the decayed foundation of the front selang (the photo was taken from the front facade of the case A.3.1)

According to Wan Hasim and Nasir (2011: 17), the front *Serambi* (verandah) serves as a place to serve male guests or neighbors, and the elders. Middle *Serambi* as the guest room is the formal place to serve the highly respected guests. Rear *Serambi* is the place to receive female guests. Usually, if women guests came, either relatives or foreign guests, they would be served on the rear *Serambi* by the wife of the owner, while the male guests were served on the front or middle *Serambi* by the family head (Sim, 2010: 21). If a guest comes while the family head is not at home, usually the front door will not be opened and the male guests will not be allowed to enter the house. In Islamic teachings, the wife may not accept guests who are not *muhrim* whenever her husband is not at home (Md. Zohri, 2010: 28). These acts have been culturally accepted as how married Malay women should guard their chastity and their husbands' honour to avoid *fitnah* (the untruth scandals).

> *And if ye find no-one therein, still enter not until supplication hath been given. And if it be said unto you: Go away again, then go away, for it is purer for you. Allah knoweth what ye do*. (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 24:28)

Meanwhile, the rear *Selang* also serves as the place to put items that are not brought into the rear *Serambi*. Usually the female neighbour would enter the main house from the side door of the rear *Selang*, or she used the support house door. The rear *Selang* was also called *pelataran belakang* (the rear platform). This place is an entrance for the female guests that is accessed from the *gerata'*, which is found on the side of the main house, or directly from the side enterance of the platform on the support house (Sim, 2010: 21; Wan Abidin, 1981: 59; A(h)mad et. al., 2007: 280).

The support house consists of a kitchen and platform. The kitchen is used for cooking food and storing the kitchen goods. The kitchen was also the place for serving food to the family members on rare occasions. Because of the placement of the wood floor, which was constructed with gaps, the cooking waste materials could be discharged into the ground directly. The main function of the rear *Selang* in the support house is separating the two shapes (Said and Embi, 2008: 130) with the aim to anticipate fire danger from cooking activities in the kitchen, while another function of the area was



Figure 4.6.
The side door of rear selang of the traditional Malay dwellings West Kalimantan. The door could be found in both sides (photo taken from the left side of the case A.1.1)

washing vegetables or clothes. The rear platform was found in all cases with two purposive functions. The first, separating the area with the fire risk from the area for washing food or clothes (see in Sim, 2010: 21); the second, a combination of both functions in one space.

Bedrooms were mainly for the parents and commonly found also for the girls. Parents‘ bedrooms were usually placed near the main house post, and the Malays called it *tiang seri*. *Tiang seri* is the first erected column when they build a new house (Milner, 2008: 188; Said and Embi, 2008: 133). This column became a central pillar for the surrounding spaces. Boys (Malay people usually called them *anak bujang* or the adult but unmarried boy) do not have their own bedrooms. In the past *anak bujang* were supposed to sleep in the *mushalla* (small mosque) or in the middle *Serambi*. In some cases, there were bedrooms for *anak bujang* in the support house. This aims to separate the adult boys from girls and also enable the boys to act as the guardians of the main house.

The rear *Serambi* or living room is the gathering place for family members. This space is located in the area after the front *Serambi* sections, but usually flanked with the bedrooms. In this space is the area for the mother and girls for doing activities daily. Sometimes this space is also used as the room where food is served to guests. This is also the control room for the activities of the children, so that they cannot step out of the house without being detected by the parents‘ observation.

The separation is conducted to restrict the space in the main house. In all cases there were three types; i.e., masive walls, partitions, and beams above the floor. As the transition and also the separation of space between public and semi-private, the boundaries between these spaces in the main house were marked by a beam above the floor. These beams were placed in the front entrance. In all cases, these marks were found on

the floor of the verandah before entering the front *Serambi,* and also found on the door bottom of the front *Serambi* before entering the middle *Serambi,* or on the door bottom of the middle *Serambi* before entering the rear *Serambi*.

Additionally, in the support house, this condition is also found as the boundary marker between the dry area and the wet area. Generally, all cases give the space restriction of the semi-private and the private, which are marked by the masive walls with doors or the curtained openings. Curtains on doors are used to ease the transition from one space to another (Gibbs et.al., 1987: 9). The interesting method used to define the bedroom was found in case of A.2.1. The room boundaries were marked by a partition of the cabinets and curtains. According to the house's heir, the boundaries had always been marked that way, since the first occupation, because of the influence of the origin of his parents. His parents were from Makassar, and according to him, Buginese usually use curtains to define the boundaries of the bedroom. According to Irene Doubrawa and Ferenc Gábor Zámolyi (Kuhnt-Saptodewo, 2010; Feest, 2007), speaking on spatial organisation and floor plans of Bugis architecture, a private rear area is served for female as a sleeping place and it was featured by a slightly elevated floor or a light wall.

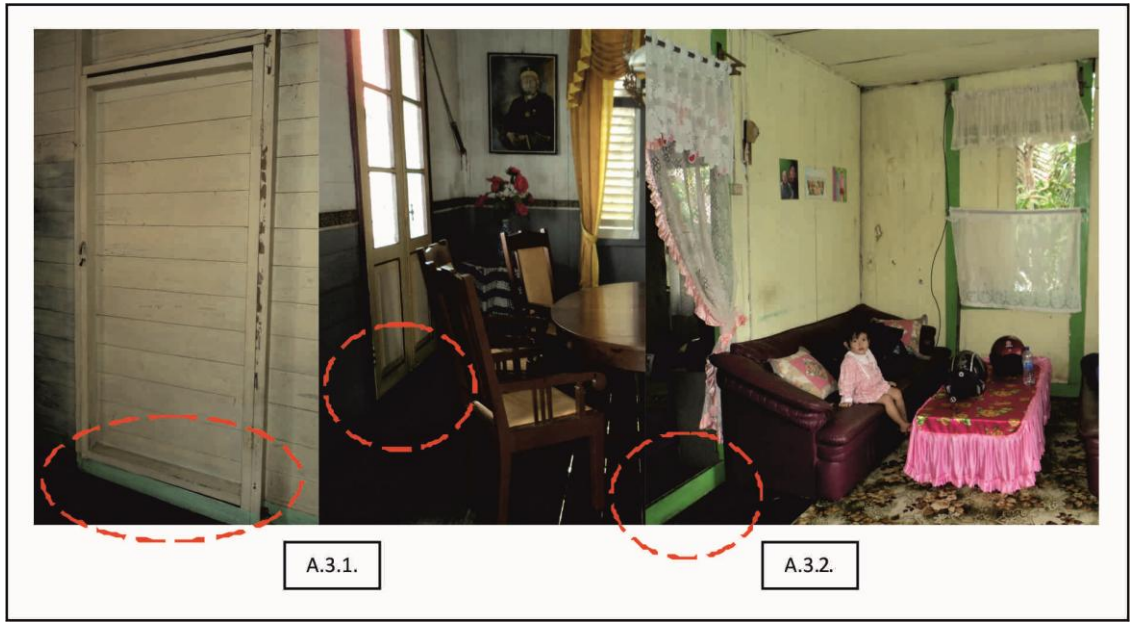


Figure 4.7.
Beams above the floor as the boundaries of spaces found in the traditional Malay Malay dwellings of West Kalimantan (photograps were taken from the inside room of cases of A.3.1. and A.3.2.)



Figure 4.8.
Partition as spaces boundaries found in the traditional Malay dwellings of West Kalimantan (photo was taken from the inside room of case A.2.1.)

In some cases there was found a special room called *puadai*. *Puadai* was the special room for a bridal couple to stand and sit during the ceremony when they got married. In addition, in some cases, there was also found a special room for newly married couples staying in the house. The couple would live in the room after their family members as a newly married couple, or this couple would already have their own home. For Malay people, marriage is the way to implement the Sunnah of Prophet Muhammad. For the Malays, getting married is one of the religious teachings of Islam and Moslems are encouraged to do so. Being understood by Moslems that a man who got married is living *ibadah* to fulfill the teachings of Islam. Therefore, they would give special places for newly married couples as a joy for the bride‘s happiness (Muhamad Rasdi et. al., 2005: 33).

> “*And Allah hath given you wives of your own kind, and hath given you, from your wives, sons and grandsons, and hath made provision of good things for you. Is it then in vanity that they believe and in the grace of Allah that they disbelieve ?*” (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur’an Mushaf Al-Madinah An-Nabawiyah revised, 16:72)

> “*And of His signs is this: He created for you helpmeets from yourselves that ye might find rest in them, and He ordained between you love and mercy. Lo! herein indeed are portents for folk who reflect*.” (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur’an Mushaf Al-Madinah An-Nabawiyah revised, 30:21)

> *"Narrated By 'Abdullah : We were with the Prophet while we were young and had no wealth whatever. So Allah's Apostle said, "O young people! Whoever among you can marry, should marry, because it helps him lower his gaze and guard his modesty."* (Sahih Bukhari, translated from Muhammad Uwaidah, 1998: 398).



Figure 4.9.
Puadai in the traditional Malay dwellings (on clockwise: photo taken from the inside room of case of A.2.1.; A.3.1., A.6.3. and A.5.3)

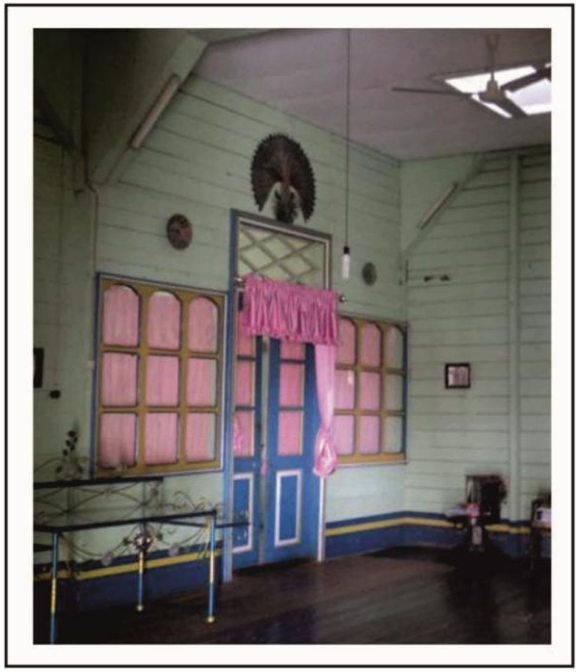


Figure 4.10.
Special room for a newly married's couple with pink curtains on the windows and an ornament on the door top (photo taken from the inside room of case A.9.1.)

At the support houses, the space was not separated with massive walls or partitions to become rooms, but it also had the boundary areas which were formed by the occupants. There are three boundary areas created on the support house. The first area is the place for cooking food, characterized by the fireplace (*tungku*) and the firewood interspace; the second area is the preparing place or the processing food place as well as the areas for eating together; and the third area is the place for washing of the cooking utensils, the processed food or vegetables, or clothes. These three spaces are called as the rear *pelataran* (Embi and Said, 2008: 25). The two spaces mentioned firstly were usually known as the dry area, and the last is the wet area. The fireplace and firewood interspace were usually placed in one corner of the support house. Each area

usually has boundaries to mark the space. A beam on the floor was used for marking the space between dry area and wet area, while carpets or mats were laid down on the floor as a marker of the seating area, such as the area for processing food or eating together. Usually, after the cooking time was finished, they provided the foods on the mats and asked all the family members to eat together. Special methods were found on case A.1.3., as they clearly separated the space of the cooking area and the preparing area, by forming separate rooms with the separate roof structure.

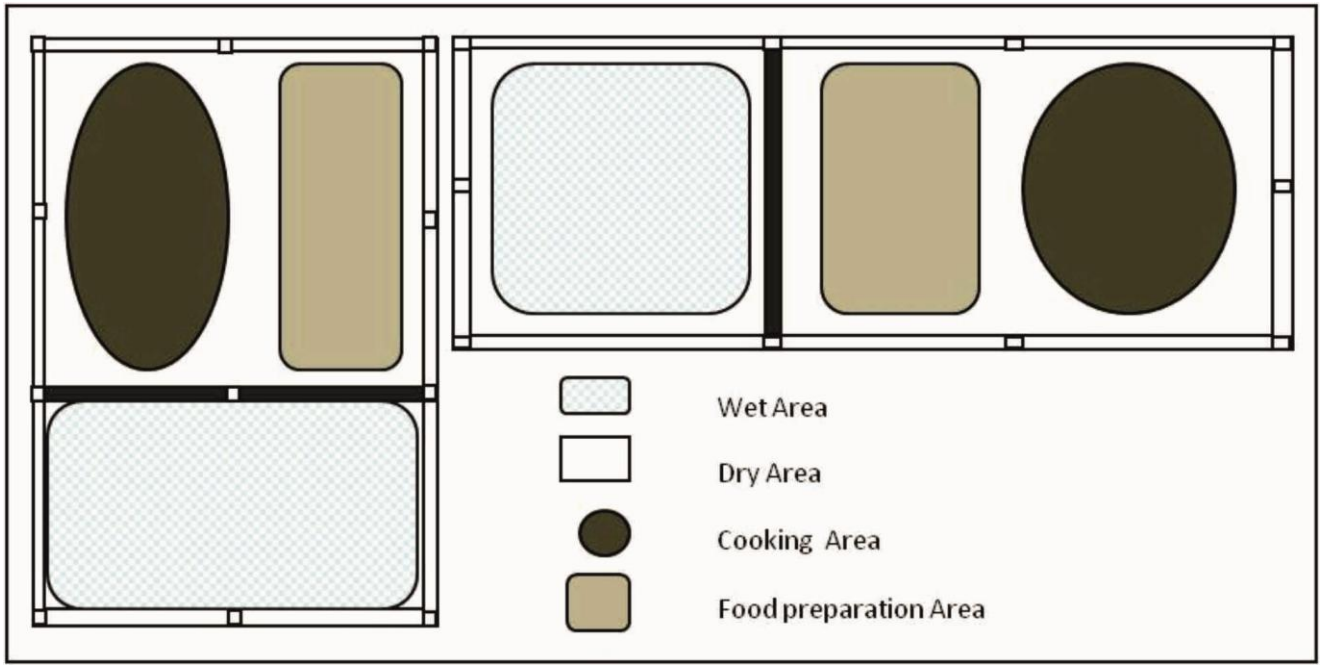


Figure 4.11.
The pattern of the dry and wet areas are found in the support house of the traditional Malay dwellings

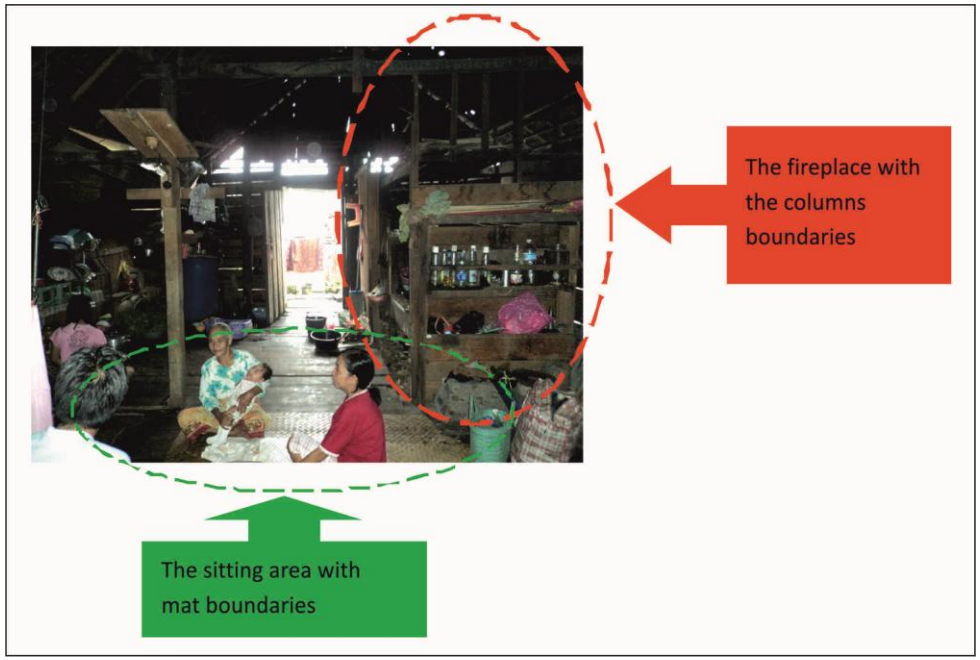


Figure 4.12.
The area boundaries found in the traditional Malay dwelling (photograph was taken in the supporthouse of case A.5.1)

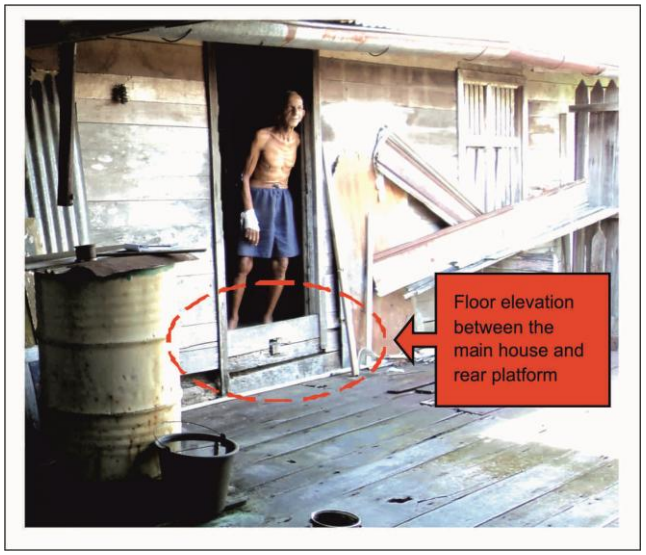
PLACE: THE PHYSICAL ENTITIES

Places identified as the physical entities, in the traditional Malay houses of West Kalimantan were found with the forms of:

a. Platform

In the traditional Malay house, a platform is realized by the floor level, giving differences between the main house and the support house, or between the floor of the house and the outside environment (the house floor elevated from the ground through the stage structure).

Figure 4.13.
The rear platform (rear selang) of the traditional Malay dwelling. (photograph was taken in case of A.1.1.)



b. Light

Light is the primary element on the Malay traditional house and is given by the use of the abundant sunlight, which effectively illuminated all the rooms in the main house and the support house. The distinction between public space and the semi-private or private space can be seen in the light restrictions of each rooms. In the public space (front *Serambi* and middle *Serambi*), is found no restriction of the sunlight entering and illuminating all sides of these rooms during the day. By making many huge doors and window openings, builders caused these two rooms to be bright during the day. In opposite, for semi-private space (rear *Serambi* and kitchen) and private space (bedroom), the restriction of light reduced the brightness in each room. To restrict the light in a room, the small window is provided as a way of entry for sunlight, and in many cases there are curtains to avoid glare in the daytime.



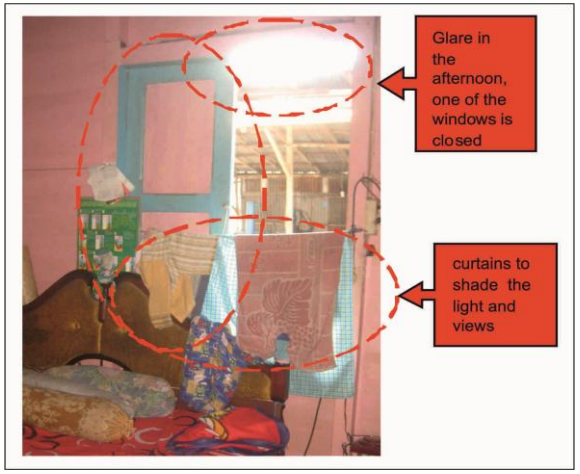


Figure 4.14.
Numbers of openings as a source of incoming sunlight at daytime to lightening the front serambi of Malay traditional house at daytime (photograph was taken in the case of A.6.3.)

Figure 4.15.
The window as a source of incoming sunlight at daytime to lightening the bedroom of Malay traditional house at daytime (photograph was taken in the case of A.1.2.)

- Number of Pillars

The number of pillars is also a physical entity as the element to differentiate the main house and the support house. Generally, the main house has more pillars (columns) than the support house. The main distinctive features of the main house are the long posts stretching from the foundation up to the top of the , and its size is larger than the columns of the support house. Meanwhile, differences are found in the support house; the columns were not constructed as a continuation of the foundation pile.

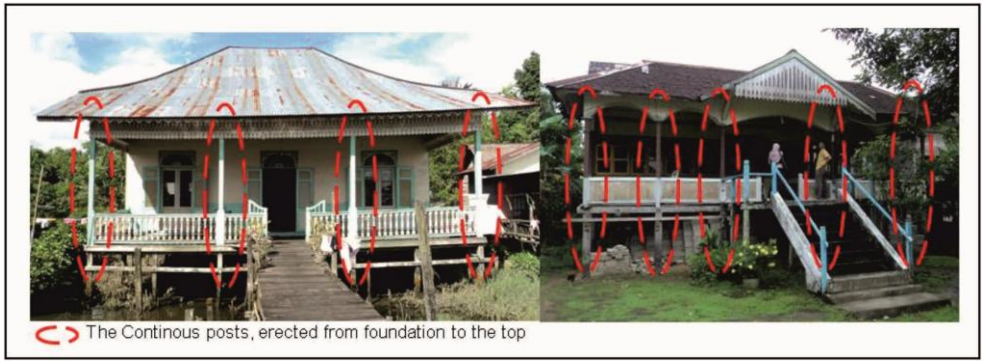


Figure 4.16.
The row of columns that complement the facade of the Malay traditional dwellings (photographs was taken to the case of A.3.1. and A.6.3.)

c. Shape boundaries and axis

d. The shape boundaries act as an envelope for the house. The main differences between the main house and the support house are the shape boundaries. The shape of the main house is a boundary to cover all parts of the house and marked with a number of openings on each side, while on the support house, the shape boundary is found only to cover a few sides of the house and generally found with the small openings on the shapes. The axes, in the main house and the support house, were both formed from a row of pillars (columns). On the main house, a row of the pillars also divided the room and was based on the grid of the structure; while on the support house, as the contrast views, a row of pillars (columns) that firmly gives an axis to divide the space as a basis for the activities.

e. For Malay people, the house is considered as a place for females (women and girls) since the facts showed that they occupied it during the day (Said and Embi, 2008: 127; Gibbs et.al., 1987: 8). According to Milner (2008: 188) the dominant role of women in the house is also conveyed by the way in which the "mother of the house" must hold the central house post (*tiang seri*) when it is erected. In Malaysia, this main house is called as *rumah ibu* or *ibu rumah* and according to Gibbs et.al. (1987:8), *ibu* means mother and *rumah* means house, so then *rumah ibu* means mother house and the house is the domain of the woman. The head of family will go to work in the early of morning and in the afternoon or evening will return home.

f. The following is the identification of place as the shelter of activities for women and girls in the Malay traditional dwellings, i.e.:

a. Fireplace (the hearth)

These activities were conducted in the support house. Fireplace (*tungku*) in the Malay community is a place for cooking and it located in the kitchen. For the Malays, cooking is an activity to which the women and girls are devoted. Therefore, to cover their activities from non *muhrim* observation, the kitchen is located on the back and separated from the main house. This separation is intended to provide flexibility for females to move without being afraid to be observed by non *muhrim*, both male guests or neighbours.

b. Bed

The sleeping room in the Malay traditional dwellings, for the Malays is only for parents or the married couples (Md. Zohri, 2010: 52). The girls usually sleep in the *parak* (Sim, 2010: 23) while boys do not have a special room for sleeping in the house. Other consideration for privacy is the separation of sleeping places for family members to respect the privacy of parents, daughters and sons (Md. Zohri, 2010: 31). Usually, if one of their daughters were married, she would have her own bedroom to live with her husband but on the contrary, if there were boys who were married, they would move in with their wives to stay at the house of the parent in-law, or their own houses.

c. Altar (place for worship)

Altar as the place for worship, as the special entities, is not found as the special space in the traditional Malay dwellings. According to the belief of Malay people, all of the space in the main house is possible as the place for worship (GhaffarianHoseini, 2011: 100). They can perform prayer in every room of the main house because the occupants will keep the cleanliness of the rooms on every section of the main

house (A(h)mad et. al., 2007: 278). But usually, the favorite area to conduct their religious ceremonies together with the family members was on the middle *Serambi* or on the rear *Serambi*. On this room is easily found the prayer rug, the holy book and the prayer materials, in order to make it easier to carry out the prayer if the time has come.

d. Place of work

The place for women or girls to do daily activities is generally found in the two locations, i.e., in the rear *Serambi* and in the kitchen (A(h)mad et. al., 2007: 278). In rear *Serambi* or family room, they were usually doing the common activities such as embroidery or ironing clothing. While in the support house, the common activities are those associated with preparing the food or washing the clothes. In the past, the *parak* was also the favorite place to do activities such as embroidery, but the activity currently is not possible to do due to the decayed condition of the stucture.

In addition, other activities are also identified in the traditional Malay dwellings and formed to cover the occupants' activities, as follows:

e. Place of serving the guests

The verandah or the front *Serambi* is a location to serve the informal guests such as neighbours. But in the middle *Serambi* and the rear *Serambi* is also a place that is often used to serve guests. The honored guests and females are respectively served in each room. Sometimes, neighbors or the relatives are also often served in both rooms.

f. Place of relaxing

Relaxing for the Malay people is intended for the activitites done personally or shared with the family members. The common place to share happiness is in the rear *Serambi*. Here in this location, as part of the relaxation, the parents usually invite all the family members to give advices (*nasehat*) or provide teaching of the religious lessons. In the rear *Serambi*, all family members mingle while enjoying a traditional meal. Verandah is also the favorite place of relaxation, especially in the morning or in the late afternoon. Generally, the traditional Malay house was oriented to the river, so then the verandah is a comfortable place for the occupants to observe the people moving with their respective activities (A(h)mad et. al, 2007: 278).

ELEMENT INDENTIFICATIONS

The identification was conducted to determine the elements that support the activities in each of the rooms. The supporting elements of space in the Malay traditional dwellings of West Kalimantan are identified as follows:

- Light

The lighting of the Malay traditional dwellings is obtained from the sunlight, abundant throughout the year. The lighting is received through the openings of windows and doors. In the main house, the openings are found to be many in the public space, i.e. in the front *Serambi* and middle *Serambi*, while in semi-private and private space, fewer openings are found than in the public space. Openings in the private and semi-private space being fewer than the public space is intended to reduce the intensity of

light coming into the rooms, because it would disrupt the private activities of the occupants therein. The more private the space created, the more barriers are made to diminish the intensity of incoming light, or in other words, the more public the activities in the functioning space, the more sunlight coming in and brightening the room.

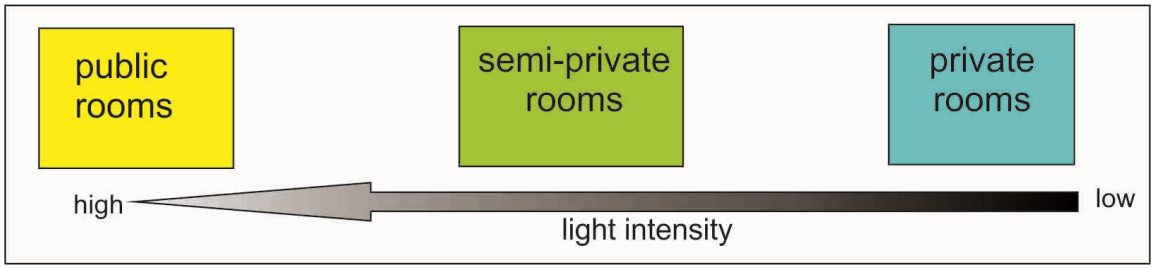


Figure 4.17.
The gradations of the light entry into the group of space in the traditional Malay dwellings of West kalimantan based on the settings of the rooms

- Colors

Generally in the past, colors in the Malay traditional dwellings were only used to color the facade of the royal family members' houses or houses of the relatives of the king. Commonly used colors were yellow and green. Generally, on the cases of this study, colors were not found on the facade of the house. Houses of the ordinary people usually did not have coloring for the facades of the house. The blackish color emerged in the facades because of the age of the timber. Blackish wood color, because of the age, emerged as the impression of the strength and the robustness of buildings.

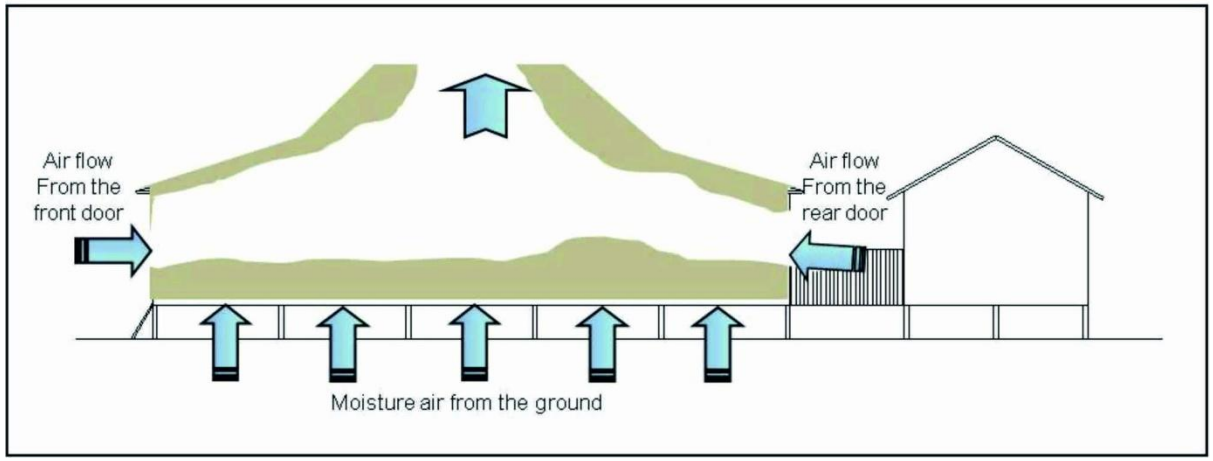
- Temperature

According to the data of BPS-statistics West Kalimantan (2010: 28, 38), the factor representing the common characteristic for a lowland area in the tropics is the air temperatures, which are hot or high. Especially in West Kalimantan, the high temperature is accompanied by the high humidity. Commonly,

the air temperature in Kalimantan is normal, but varies within the range of about 26° C up to 28° C. During 2009, highest of the air temperature reached was 35° C, and the lowest temperature was 22.2° C. The average relative moisture is in the range of 74% up to 91%, and the yearly average of relative moisture is about 83.76% (this percentage is obtained from the processed data of the table on page 38). From the average of air temperature, the highest and the lowest temperature, West Kalimantan is classified as a high-heat area with the stability of humidity and temperature. To anticipate these obstacles, the construction of stage houses is one of the solutions to these environmenal problems (Tahir et.al., 2010: 54). Every aspect of the roofs, walls, and floors of the traditional Malay house is designed with a unique ventilation system that allows for air coming into and out of the house (Md. Zohri, 2010: 44). The stage house made it possible for the cross air circulation to work properly and gave the dynamic rotation of the fresh air to flow into the house. Another thing which is also found in the traditional Malay housees of West Kalimantan is the forming of openings in the all sides of facades. The many openings give the Malay house an air transparency (Gibbs et.al., 1987: 9). Cross ventilation systems applied both vertically and horizontally on the Malay traditional dwellings of West Kalimantan.

The moist air from the ground will flow up through sidelines of the wooden floor boards (Nasir and Wan Hashim, 1996: 9; Wan Hashim and Nasir, 2011: 9). While at the top of the main house, the *parak* will reduce the warm temperature in the afternoon. In general, the Malay traditional dwellings have a door opening in a line crossing the house from the front to back and the wide window openings are placed opposite on both sides of the house. The air movement is obtained from the circulation through the front to the back door and from the opposite openings of windows on both sides (Tahir et. al., 2009: 278).

Figure 4.18.
Sketch of airflow in the main house of the traditional Malay dwellings



- Ventilation

Ventilation was found in all cases of the Malay traditional dwellings of West Kalimantan. These ventilations are found as the holes, with or without carvings or as massive ventilations with glass or wooden frames. In all cases, these ventilations are found in the different functions. In the Malay traditional dwelling, the ventilation type was found in three kinds of functions, i.e. as the entry of light; as the air circulations, or it has a double functions as the entry of light and the air circulations. As the author mentioned in the discussion about the temperature and also mentioned by A(h)mad et. al. (2007: 278), to overcome the circulation of hot air temperature, openings of windows and doors provided great comfort for the occupants. Commonly found in all cases, whenever there is a window or door there is always found the ventilation on top of it.

- Sound

Sound is not an annoying problem for Malay people in West Kalimantan. In the traditional Malay dwellings, there were found no installations for the sound insulation, either to isolate the sound from inside or outside of the house. The principle of openness and togetherness in the community, made the Malays happy to live together in one environment. Malay people like to gather with family or neighbors in every moment of opportunity. Feelings are of being still together were felt when they "still listened" to the sounds from neighbors. Feelings of empathy would be shown when they "did not listen" to the sound of a neighbor's house. Usually they would visit as soon as possible , to find out whether there are family members of neighbors who are ill or traveling out of town. Usually, they will spontaneously offer the assistance needed by neighbors who are facing problems.

- Smell

Like the author found on the analysis for the sound elements, there was a lack of smell isolation installed for avoiding the smell outside of the house. Neighbors would know if the house cooked anything daily, or in other words, the neighbors also would know if the house was not cooking anything on any particular day. The habit of providing the cooked food to the nearest neighbor is still performed until today, because Islamic teaching states that Muslims should not feel full of food while finding their neighbor is still hungry. In the Qur'an it also states that to do good with the neighbors is one of the charities favored by God. It is mentioned in the Hadith and the Qur'an.

> "*.....(Show) kindness unto parents, and unto near kindred, and orphans, and the needy, and unto the neighbour who is of kin (unto you) and the neighbour who is not of kin, and the fellow-traveller and the wayfarer and (the slaves) whom your right hands possess. Lo! Allah loveth not such as are proud*

*and boastful, (*Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised. *4:36)*

"(Saying): We feed you, for the sake of Allah only. We wish for no reward nor thanks from you"; (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 76:9)

"*Whoever believes in Allah and the Last Day, should he whether to say or silent. Whoever believes in Allah and the Last Day, should he respected the neighbors. Whoever believes in Allah and the Last Day, should he honor the guest*" (Sahih Bukhari and Muslim quoted from Al-Bugha dan Mistu (2005: 101)).

- Texture

The smoothness and roughness of textures on the surface of walls or the supporting elements is to distinguish the differences between the main house and the support house. Physically, the smooth texture was found on the material and how to construct the materials. The selective fine material is used in the main house. The fine material is used in all parts of the main building structure, such as columns and beams, walls and the floor boards. Meanwhile, the rough material is found in the support house as wooden boards to cover the walls. Methods of the material instalation are also found to be different between the main house and the support house. In the main house, a wall is mounted flat with the hole and pen system, and they hook each other between the boards. While in the support house, the walls are covered by the wooden boards with wall mounted systems that overlap each other (*susun sirih* system). The texture describes how the Malay community will protect the activity to form the family's personality with the "smooth" attitudes. The smooth also meant that the family must educate the smooth behaviour that is reflected in the main house with the smooth texture.

"*And enjoin upon thy people worship, and be constant therein.....*"(Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 20:132).

"Thy people" is meant here as the family.

- Scale

The use of scale is found in the forming of space in the Malay traditional dwellings in West Kalimantan. The scale used refers to human body anatomy in forming the space grid in the house structure. According to Gibbs et.al. (1987: 32), scales used as a measurement are *depak, kilan,* and *kaki*. *Depak* is the stretched length of both arms with open palms; *kilan* is the stretched length of the open palm of the hand, while the *kaki* is the stretched length of the inside of the feet. The most important of this measurement, all the measurement used is referring to the head of the family. This means that the head of the family is playing the important role to take responsibility in nurturing of the family members.

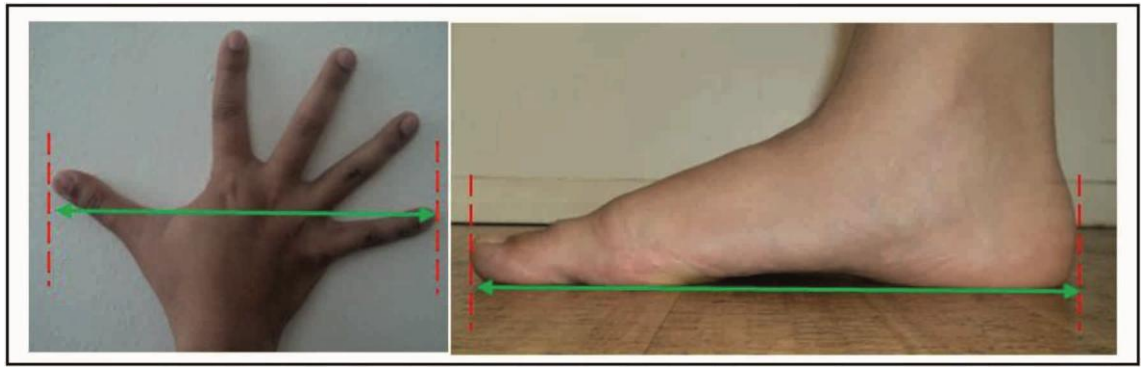


Figure 4.19.
Kilan and kaki measurement in the traditional Malay dwellings of West Kalimantan

- Time

By judging the age of buildings, the Malay traditional dwellings were constructed in the time frame ranging from when kingdom existed in West Kalimantan, from the year of 1800s until the mid 19th century. The houses which were formed in this period have uniform patterns of space, which is composed of two building masses (the main house and the support house), the composition of space consists of typically the same room names (i.e. verandah or front *Serambi*, middle *Serambi*, rear *Serambi*, bedroom, *pelataran* or rear *Selang*, kitchen, and *parak* or attic). If we consider the number of the posts, the Malay traditional dwelling consists of 12 posts and 24 posts with the style of roofs generally consisting of three shapes based on hierarchy, i.e. *Potong Limas*, *Potong Kawat* and *Potong Godang*.

Space compositions with the grid pattern were formed on the Malay traditional dwellings as the architectural works of Malay people in West Kalimantan at a certain period, and this can still be found in the region of West Kalimantan. This is firmly understood from the stuctural observation in the field. The younger houses were found with the simpler grid structures compared to the oldest houses. This also influenced the number of rooms made, and there is also found less room in the youngest houses. This occured because of the difficulties in procuring housing materials, which continue to be expensive from time to time, and fewer occupants who inhabit the structures.

From the interviews with the occupant of case A.3.4., it is known that her house was originally in the *Potong Limas* shape (the highest hierarchy shape) with the appropriate number of rooms. However, in the next period, the house was changed into the current conditions. The basic changes are the substitution of roof shape, from *Potong Limas* changed into *Potong Kaw*at, and also with the decreasing number of

rooms and the grids from 24 posts into 12 posts. According to her, the decreasing number of rooms was also caused by fewer family members who wanted to stay with her parents after getting married.

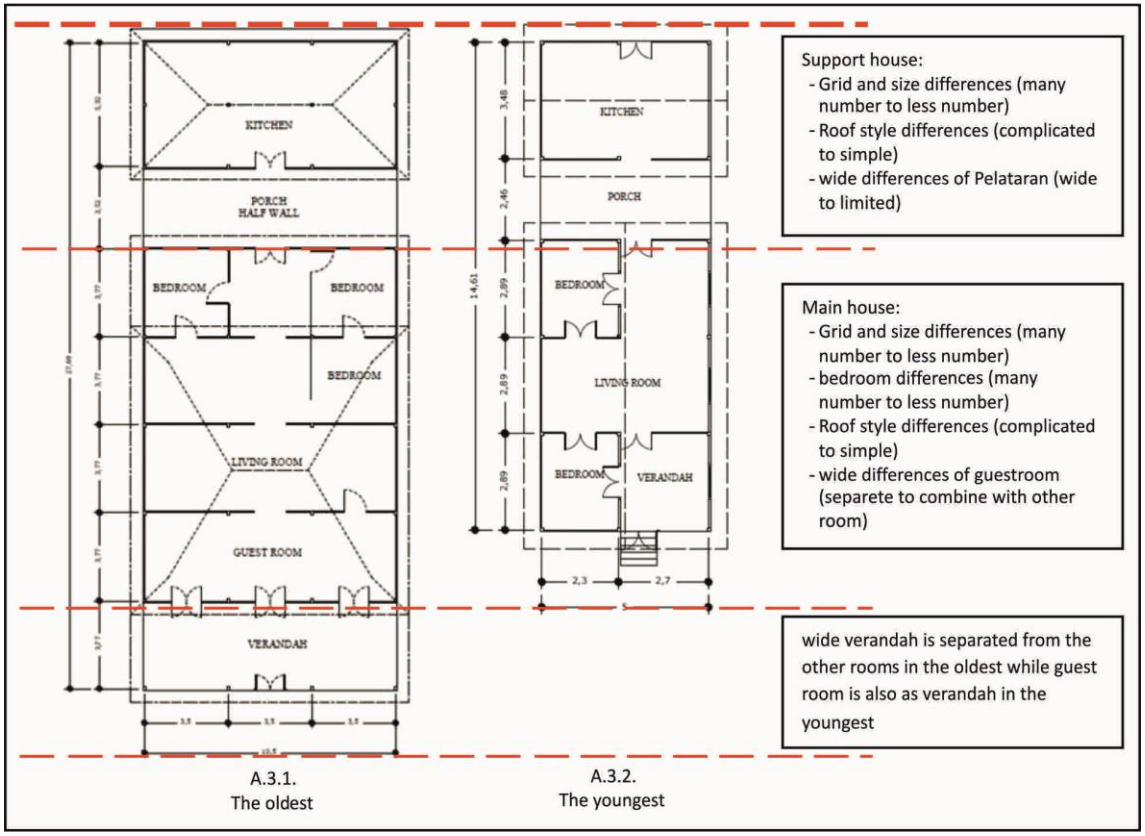


Figure 4.20.
Comparation between floorplans of the oldest and youngest in the traditional Malay dwellings of Sambas

MOVEMENT IN SPACE

Ching (2000: x) asserted the movement in space is experienced from:

- The attainment and entrance

The attainment and entrance of the Malay traditional dwelling is found in two ways, i.e., the entry or exit points on the main house and the support house. The entry or exit points on the main house are located in the front and usually used by the male guests (Md. Zohri, 2010: 53). This entrance is marked by the huge door with a number of window openings. The entrance is reserved for the guests who are usually accepted at the guest room (middle *Serambi*). In particular, for the strangers, they areusually accepted on the front *Serambi* without permission to enter the house (to the middle *Serambi*).

The entry or exit points at the support house are located in the left or right side of the rear *Selang*, and the attainment is accessed from *gerata'* (the wooden foot steps). The door position is usually adjusted with the settlement existing on the circulation path or the water source for cooking food preparations. In some cases, the rear *Selang* is found as the entrance as well as the washing place. This is the entrance for the females' guests and it often happens, the neighbors (especially the females) come through this door.

The females of relatives' families or neighbors, if they visit the house, usually will enter the house from the rear *Selang* door and they are accepted directly into the family room (rear *Serambi*). In particular, the neighbors will directly enter the house into the rear *Serambi* or kitchen after saying *salam* without waiting for the answer from the occupants.

- Configuration of Paths and the Access Point

The space configuration of Malay traditional dwellings is concentrated toward one room. Rear *Serambi* is the central room and path to accessing the other rooms. Rear *Serambi* is the space that binds

the other rooms. Generally, the path configuration of the Malay traditional dwellings is linear with access points from the front door to the kitchen past the rear *Serambi*. Rear *Serambi* as the family room binds and controls the activities of family members in the other rooms as well as the guests who want to enter the house toward the kitchen (Muhamad Rasdi, 2005: 36).

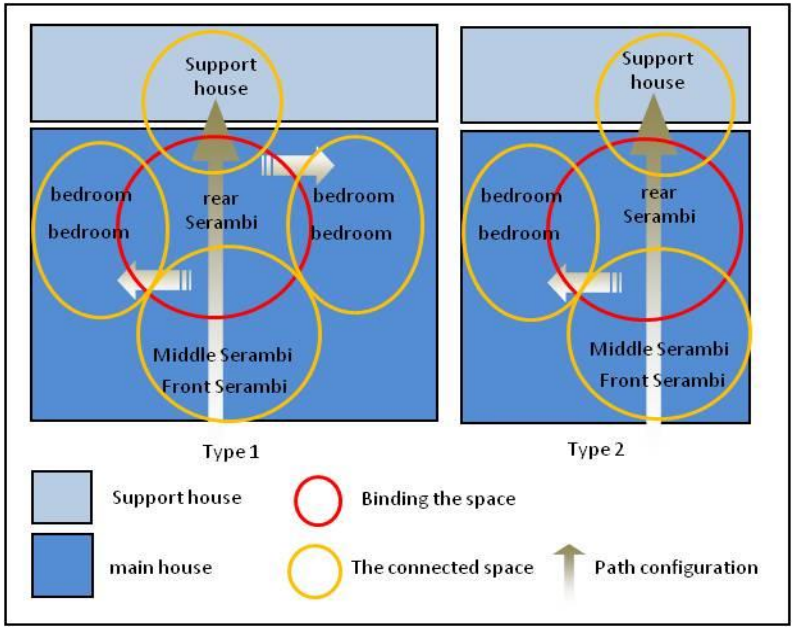


Figure 4.21.
The path configuration and the space connection in the traditional Malay dwellings

- Spaces Sequence

GhaffarianHoseini (2011: 99) explained that the spaces inside the Malay house which are categorized into public, private and semi private spaces are located based on the level of privacy. Hashim and Abdul Rahim (2008: 96) mentioned that privacy in the houses of Malays is needed for the

concealment of inter-family life from strangers, separation between men and women in sitting arrangements during social interaction (but not for those of the same family), separate sleeping areas for male and female family members, for parents and children, and for normal functioning of daily activities. The spaces formed in the Malay traditional dwellings are the sequence of the connectedness. This is found in the relation between the public, semi-private, and private spaces, which are connected to each other. Two sequence series can be captured as follows:

a. the sequence of open series: public - semi-private - semi-private (front *Serambi* - middle *Serambi* - rear *Serambi* - rear *Selang* or kitchen)
b. the sequence of limited series: semi-private - private - semi-private (middle *Serambi* - bedroom or *parak* - kitchen or rear *Selang*)

According to Mohamad Rasdi et. al. (2005: 33), the male guests identified as non family members are non *muhrim* while all of family members are *muhrim*. Accordint to Islamic teachings, the religious interactions is the demand to seclude women from men. First sequence series is the circulation access especially for the guests who are not *muhrim* of women and girls in the house, while the second sequence is the circulation access of the family members, especially for the women and girls. The last sequence aims to protect women or girls' activities from being observed by inappropiate people. Therefore, in the main house, the bedrooms are placed on the left or right of semi-private spaces in this sequence series.

- Light, sight, touch, hearing and smell

The abundance of sunlight in West Kalimantan is a blessing, because at the time when houses were established, the use of the abundance of sunlight was maximized to illuminate the daily activities, due to

the lack of electricity supplied. The adjustment is also needed to control the amount for the Malay traditional dwellings. In the Malay traditional dwellings, control of the received sunlight from the openings is adjusted to the activities of each room. In opposition, the main houses generally have a lot more openings than the support houses. In the main house, the number of the openings is also different between the public, semi-private and private space. Generally, the openings were made in the large volumes, on the other hand this also caused the view extention from outside which cannot be blocked. Therefore, as an adjustment, inside the windows are usually given a row of wooden blinds , partially opened as the second window, or they provide curtains on them.

The smell in the traditional Malay house could be felt immediately by the observer because of the use of wood materials in all parts of the house. Smoothness or roughness is felt when we are touching the material of the house structure. The smoothness is felt at the main house, but the material roughness is felt at the support house. The smoothness is also found in the wall structure of the main house, while in vice versa is found on the support house. Main houses are described as the space to accomodate the clean activities of the occupants, while in the support house is vice versa. Smoothness is described as the smooth feeling of the family head in giving lessons for the family, while the roughness describes the assertiveness of Malay people against the bad attitudes.

The sound or conversations in the house will be easily heard by the guests or even the neighbours, and vice versa. This is behaviour that is generally perceived by the Malay people to "always" want to be with other people. Feeling safe in their community is the main reason for this behaviour. In the past, the surrounding environment of the house was forest with the threats of wild animals.

The openness is the behaviour that is always built by the Malay communities. They will show their willingness to serve guests with open heart, reflected in the poetry (*pantun*) which is commonly known by Malay people, "*jika tidak cukup nyiru kami sediakan, parabola akan kami tadahkan*". It is means if meals (*nyiru*) were not enough to serve the guest, they will encourage their hard efforts (*parabola*) to give the best for the guests. *Nyiru* is the analogy of the ordinary things, while *parabola* is the analogy of the most valuable things. Malay people are so respecting of their guests or neighbors that they will always encourage themselves or family members to prepare food (or at least drink) before the guest or neighbour leaves the house (A(h)mad et. al., 2007: 286).

Openness is reflected in their behaviour as anticipation of the smell generated from activities inside the house, especially for flavor and cuisine of the food processing in the support house. The material behaviour and the construction conditions were such that the food smell could felt by the guests or neighbors from the outside of the support house. Generally, the occupants would invite the guests to eat together when lunchtimes were coming. In particular, once in a while, they would share some of their cooking with the nearest neighbor. The primary function of the side door at the rear *Selang* in the support house is bridging the neighbours relationship between one house and the other house next door. According to Md. Zohri (2010: 48), the women usually used the kitchen space for informal social interactions, particularly during neighbourly visits. This describes the importance of human relationships in Malay societies as the practices of *hablumminannas* concepts.

In detail Ching (2000: x) mentioned that space has the pattern of organization, relationships, and hierarchy. The organization of space in the main house is the grid pattern (organization of structural

spaces within the structure of the 3-dimensional grid). In this term, the spaces have a connectedness (in sequences) to each other from the front to the back of the house. This connectedness is formed by the circulation of the daily access for the occupants, and also to accomodate the needed activities in the future. A lot of ceremonies, both religious and traditional ceremonies, usually should be conducted by the Malay family, i.e. *aqiqah*, *potong rambut*, *akad nikah*, *tahlilan*, *selamatan*, etc. All the spaces (public and semi-private space) are used together to accomodate the invited guests. For the male invited guests used the public space (front *Serambi* and middle *Serambi*), while the female guests used the semi-private space (rear *Serambi* and kitchen). Usually in the ceremony, the male guest will enter the house from the front door while the female guests will enter from the side door of the rear *Selang* (Muhamad Rasdi, 2005: 36; A(h)mad et. al., 2007: 280; Md. Zohri, 2010: 53). This separation is to distinguish the space as the hierarchy pattern. In Malay cognition, according to the religion, the inside is more glorified than the outside. So, the space in the inside is more glorified than the outside. Hierarchy of the inside space is to glorify and respect the females by putting them in "inside" to cover their activities.

4.3.1.b Anatomy of shape

In general, the structure of the Malay traditional dwelling is divided into three parts: the bottom, middle and upper. Heights of each part of the house (see figure 4.22.) are presented in the table 4.6. (main house) and table 4.7. (support house).

According to the table 4.6., the bottom part elevation of the main house is ranging from 0.75 meters to 2.73 meters, measured from the ground. The lowest bottom part elevation is found in the towns of Sambas and Sukadana, while the highest elevation is found in Sanggau town. The middle part elevation of main house

is ranging from 2.51 meters to 3.71 meters, which are measured from the floor surfaces. In the middle part of the main house, the lowest elevation is found in Sambas town, while the highest is found in the towns of Sekadau and Sintang. The upper part elevation of the main house is ranging from 1.79 meters to 5.97 meters, which are measured in vertical axis from the bottom of the roof surfaces to the top. The lowest elevation of the upper part is found in the town of Sambas, while the highest is found in the towns of Tayan and Sanggau.

According to the table 4.7., the bottom part elevation of the support house is ranging from 0.75 meters to 2.73 meters measured from the ground. The lowest elevation of the bottom part is found in the towns of Sambas and Sukadana, while the highest elevation is found in Sanggau town. The middle part elevation of support house is ranging from 1.98 meters to 3.62 meters measured from the floor surface. The lowest elevation of the middle part is found in Sambas town, while the highest is found in most of the objects of all cities observed. The upper part elevation of the main house is ranging from 1.24 meters to 3.43 meters, which are measured in vertical axis from the bottom of the roof surface to the top. The lowest elevation of the upper part is found in the towns of Sukadana and Sekadau, while the highest is found in the towns of Ngabang and Sintang.

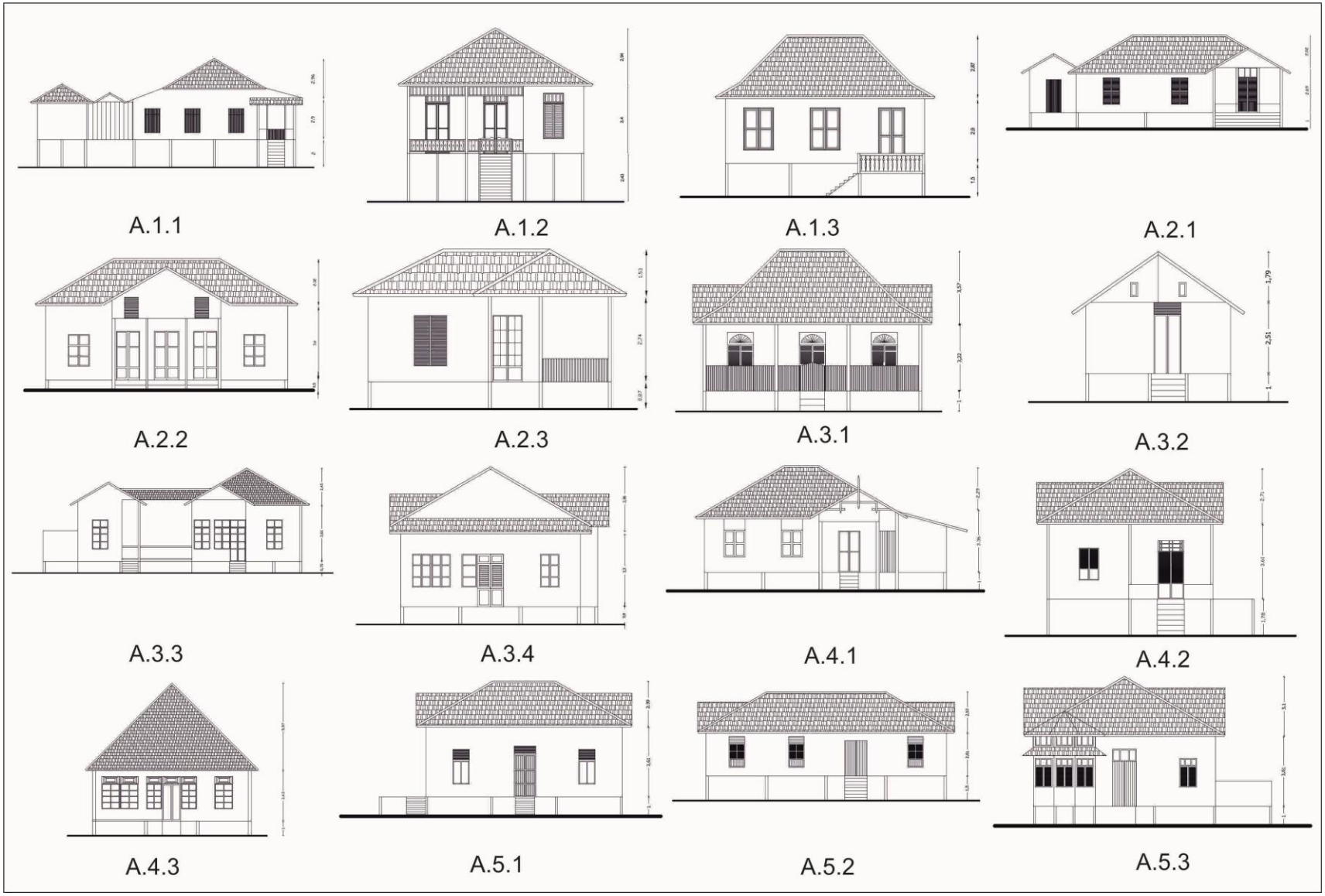
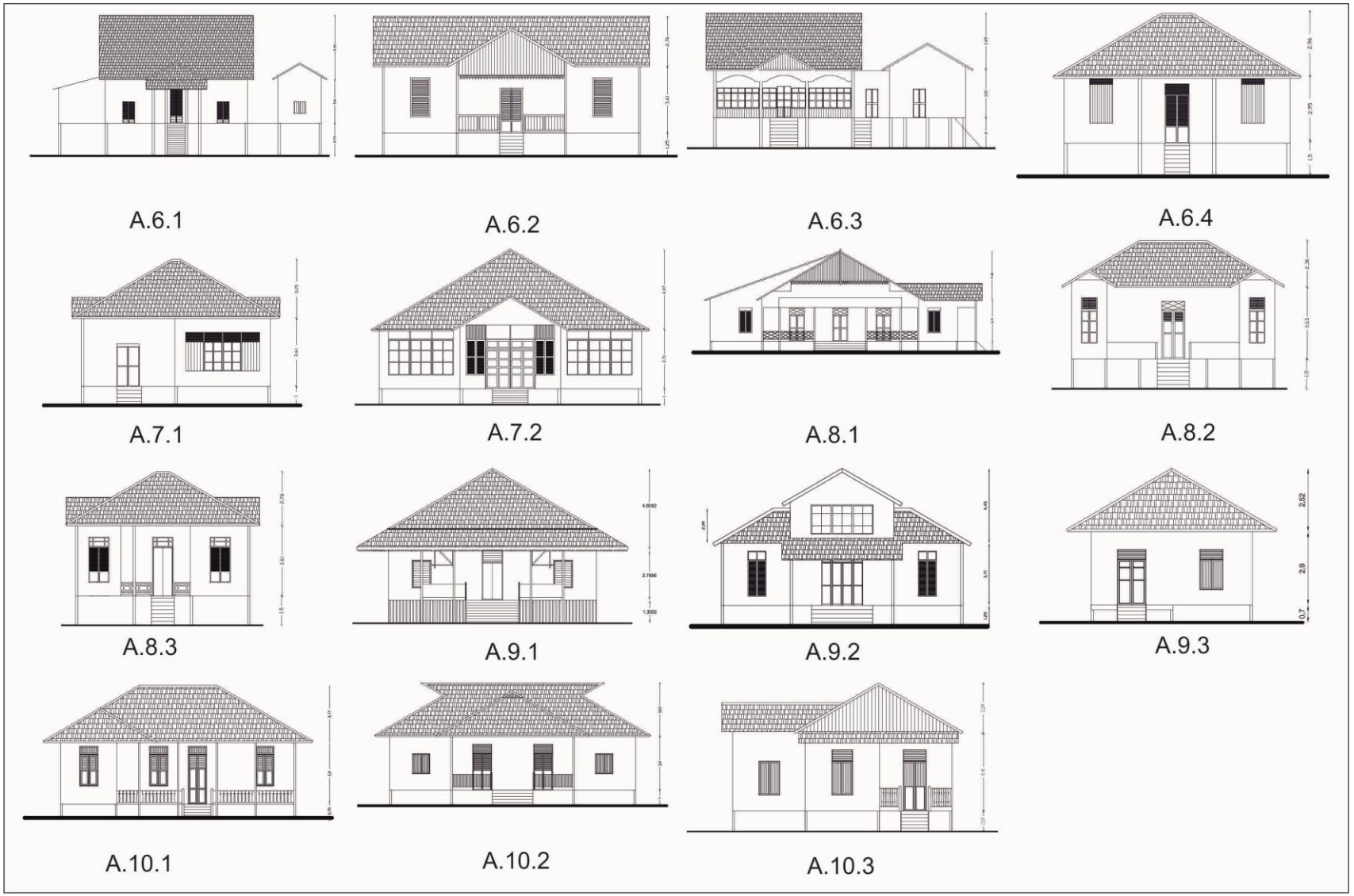


Figure 4.22.
The front Fasade of the traditional Malay dwellings

Figure 4.22a.
The front Fasade of the traditional Malay dwellings (continued)



No.	Objects code	Main House Height			
		Bottom parts	Middle parts	Upper parts	Sum (a) + (b) + (c)
		(a)	(b)	(c)	(d)
1.	A.1.1	2,00	3,01	2,86	7,87
2.	A.1.2	2,43	4,30	2,94	9,67
3.	A.1.3	1,50	2,90	2,87	7,27
4.	A.2.1	1,00	2,69	2,02	5,71
5	A.2.2	0,50	3,60	2,32	6,42
6	A.2.3	0,87	2,74	1,53	5,14
7	A.3.1	1,00	3,22	3,57	7,79
8	A.3.2	1,00	2,51	1,79	5,30
9	A.3.3	0,75	3,61	2,45	6,81
10	A.3.4	0,80	3,30	2,96	7,06
11	A.4.1	1,00	3,36	2,29	6,65
12	A.4.2	1,78	3,61	2,71	8,10
13	A.4.3	1,00	3,43	5,97	10,40
14	A.5.1	1,00	3,61	3,39	8,00
15	A.5.2	1,50	2,61	2,53	6,64
16	A.5.3	1,00	3,61	3,10	7,71
17	A.6.1	2,73	3,61	5,39	11,73
18	A.6.2	1,25	3,61	2,76	7,62
19	A.6.3	2,00	3,21	3,69	8,90
20	A.6.4	1,50	2,95	2,96	7,41
21	A.7.1	1,00	3,61	3,15	7,76
22	A.7.2	1,00	3,71	4,97	9,68
23	A.8.1	1,00	3,71	4,32	9,03
24	A.8.2	1,50	3,63	2,36	7,49
25	A.8.3	1,50	3,61	2,78	7,89
26	A.9.1	1,30	2,79	4,60	8,69
27	A.9.2	1,25	3,71	2,09	7,05
28	A.9.3	0,70	2,90	2,52	6,12
29	A.10.1	0,75	3,40	3,17	7,32
30	A.10.2	1,00	3,40	3,43	7,83
31	A.10.3	0,90	3,41	2,24	6,55
	MEAN	**1,75**	**4,70**	**4,35**	**10,80**

Table 4.6.
The heights of the main house

Table 4.7.
The heights of the support house

No.	Objects code	The Support House's Heights			
		Bottom parts	Middle parts	Upper parts	Sum (a) + (b) + (c)
		(a)	(b)	(c)	(d)
1.	A.1.1	2,00	2,61	1,41	6,02
2.	A.1.2	2,15	3,50	1,57	7,22
3.	A.1.3	1,50	2,80	0,97	5,27
4.	A.2.1	1,00	2,43	1,14	4,57
5	A.2.2	0,50	3,71	0,94	5,15
6	A.2.3	0,87	2,74	1,28	4,89
7	A.3.1	1,000	3,220	1,940	6,16
8	A.3.2	1,000	1,980	2,180	5,16
9	A.3.3	0,750	3,610	1,530	5,89
10	A.3.4	0,750	3,600	1,520	5,87
11	A.4.1	1,000	3,170	1,690	5,86
12	A.4.2	1,780	3,610	2,040	7,43
13	A.4.3	1,000	3,430	3,430	7,86
14	A.5.1	1,000	3,610	1,750	6,36
15	A.5.2	1,500	2,610	1,890	6,00
16	A.5.3	1,000	3,610	2,500	7,11
17	A.6.1	2,730	3,620	1,410	7,76
18	A.6.2	1,250	3,620	2,750	7,62
19	A.6.3	2,000	3,110	1,820	6,93
20	A.6.4	1,500	2,850	1,470	5,82
21	A.7.1	1,000	3,610	1,240	5,85
22	A.7.2	1,000	3,620	3,040	7,66
23	A.8.1	1,000	3,620	3,230	7,85
24	A.8.2	1,500	3,630	1,690	6,82
25	A.8.3	1,500	3,620	1,460	6,58
26	A.9.1	1,300	3,000	2,040	6,34
27	A.9.2	1,250	2,540	2,800	6,59
28	A.9.3	0,700	2,900	1,280	4,88
29	A.10.1	0,750	3,400	2,140	6,29
30	A.10.2	1,000	3,400	2,940	7,34
31	A.10.3	0,900	3,500	1,280	5,68
	TOTAL	**38,180**	**100,280**	**58,370**	**196,830**
	MEAN	**1,735**	**4,558**	**2,653**	**6,349**

Floor elevation kept the house always well above the flood waters during the rainy season (Nasir and Wan Hashim, 1996: 9; Wan Hashim and Nasir, 2011: 9; A(h)mad et. al., 2007: 277; Tahir et.al., 2010: 40). Almost all of the observed towns are located in the upstream basin of the Kapuas river (including Tayan, Sanggau and Sintang). All the traditional dwellings in these areas usually used the stage houses with higher elevation from the ground due to anticipated the floods, a danger in the tidal seasons of the Kapuas river that periodically happens throughout the year. When the river floods, the land may be washed away (Gibbs et.al., 1987: 9). In addition to facing these conditions, the higher elevation is also to anticipate the entry of wild animals into the house like snakes, crocodiles etc.



Figure 4.23.
The flood conditions in the town of Tayan due to the upstream overflow of Kapuas river. According to information received during survey, overflow of the river water will flood the land at least for a week and this was routinely occuring throughout the year. (the photo was taken on December 2010 from the rear side of the case A.5.1)

THE RATIO BETWEEN HOUSE SECTIONS

The comparison of buildings' parts to one another is conducted to find out the ratio between the main house and the support house of Malay traditional dwellings. The ratio is calculated with three methods of comparison, i.e. the upper part by the middle part; the upper part by the bottom part; and the middle part by the bottom part. In addition, the comparison of buildings as a whole was also conducted to find the ratio between the main house and the support house.

In tables 4.6 and 4.8., data show the average sums of the main house elevation of Malay traditional dwellings in West Kalimantan. Bottom part in the average of 1.225 meters from the ground, middle part in the average of 3.397 meters from the floor surface, while the upper part is in the average of 3.272 meters from bottom to the top of the roof surface. The total height average of the main house is 7.894 meters from the ground. The table also shows in the vertical axis that middle parts have a greater elevation than the other two parts. In successive measurements, an average height percentage of the each building's parts, which is compared to the whole form, results in numbers 16%, 44% and 40%. By this phenomenon is understood that the body (middle part) of Malay traditional house of West Kalimantan has a larger ratio than the head (upper part) and the leg (bottom part) with the ratio of 1.6 : 4.4 : 4.0. Meanwhile in general, at the legs (bottom part), the composition of them is only less than one-fifth of the whole building's parts. These appearances make the Malay traditional house so stable on the ground, but this also makes the impression of rigidity to the pillar that is covered with the skin of wooden walls.

No.	Objects code	Main House Height					
		Ratio each parts (x10)			Ratio		
		(a/d)*10	(b/d)*10	(c/d)*10	(c/b)	(c/a)	(b/a)
1.	A.1.1	2,541	3,825	3,634	0,950	1,430	1,505
2.	A.1.2	2,513	4,447	3,040	0,684	1,210	1,770
3.	A.1.3	2,063	3,989	3,948	0,990	1,913	1,933
4.	A.2.1	1,751	4,711	3,538	0,751	2,020	2,690
5	A.2.2	0,779	5,607	3,614	0,644	4,640	7,200
6	A.2.3	1,693	5,331	2,977	0,558	1,759	3,149
7	A.3.1	1,284	4,134	4,583	1,109	3,570	3,220
8	A.3.2	1,887	4,736	3,377	0,713	1,790	2,510
9	A.3.3	1,101	5,301	3,598	0,679	3,267	4,813
10	A.3.4	1,133	4,674	4,193	0,897	3,700	4,125
11	A.4.1	1,504	5,053	3,444	0,682	2,290	3,360
12	A.4.2	2,198	4,457	3,346	0,751	1,522	2,028
13	A.4.3	0,962	3,298	5,740	1,741	5,970	3,430
14	A.5.1	1,250	4,513	4,238	0,939	3,390	3,610
15	A.5.2	2,259	3,931	3,810	0,969	1,687	1,740
16	A.5.3	1,297	4,682	4,021	0,859	3,100	3,610
17	A.6.1	2,327	3,078	4,595	1,493	1,974	1,322
18	A.6.2	1,640	4,738	3,622	0,765	2,208	2,888
19	A.6.3	2,247	3,607	4,146	1,150	1,845	1,605
20	A.6.4	2,024	3,981	3,995	1,003	1,973	1,967
21	A.7.1	1,289	4,652	4,059	0,873	3,150	3,610
22	A.7.2	1,033	3,833	5,134	1,340	4,970	3,710
23	A.8.1	1,107	4,109	4,784	1,164	4,320	3,710
24	A.8.2	2,003	4,846	3,151	0,650	1,573	2,420
25	A.8.3	1,901	4,575	3,523	0,770	1,853	2,407
26	A.9.1	1,496	3,211	5,293	1,649	3,538	2,146
27	A.9.2	1,773	5,262	2,965	0,563	1,672	2,968
28	A.9.3	1,144	4,739	4,118	0,869	3,600	4,143
29	A.10.1	1,025	4,645	4,331	0,932	4,227	4,533
30	A.10.2	1,277	4,342	4,381	1,009	3,430	3,400
31	A.10.3	1,374	5,206	3,420	0,657	2,489	3,789
	MEAN	1,609	4,436	3,955			

Tabel 4.8.
The section ratio of the main house

Tabel 4.9.
The section ration of the support house

No.	Objects code	The Support House's Heights					
		Ratio each parts (x10)			RATIO		
		(a/d)*10	(b/d)*10	(c/d)*10	(c/b)	(c/a)	(b/a)
1.	A.1.1	3,32	4,34	2,34	0,54	0,71	1,31
2.	A.1.2	2,98	4,85	2,17	0,45	0,73	1,63
3.	A.1.3	2,85	5,31	1,84	0,35	0,65	1,87
4.	A.2.1	2,19	5,32	2,49	0,47	1,14	2,43
5	A.2.2	0,97	7,20	1,83	0,25	1,88	7,42
6	A.2.3	1,78	5,60	2,62	0,47	1,47	3,15
7	A.3.1	1,62	5,23	3,15	0,60	1,94	3,22
8	A.3.2	1,94	3,84	4,22	1,10	2,18	1,98
9	A.3.3	1,27	6,13	2,60	0,42	2,04	4,81
10	A.3.4	1,28	6,13	2,59	0,42	2,03	4,80
11	A.4.1	1,71	5,41	2,88	0,53	1,69	3,17
12	A.4.2	2,40	4,86	2,75	0,57	1,15	2,03
13	A.4.3	1,27	4,36	4,36	1,00	3,43	3,43
14	A.5.1	1,57	5,68	2,75	0,48	1,75	3,61
15	A.5.2	2,50	4,35	3,15	0,72	1,26	1,74
16	A.5.3	1,41	5,08	3,52	0,69	2,50	3,61
17	A.6.1	3,52	4,66	1,82	0,39	0,52	1,33
18	A.6.2	1,64	4,75	3,61	0,76	2,20	2,90
19	A.6.3	2,89	4,49	2,63	0,59	0,91	1,56
20	A.6.4	2,58	4,90	2,53	0,52	0,98	1,90
21	A.7.1	1,71	6,17	2,12	0,34	1,24	3,61
22	A.7.2	1,31	4,73	3,97	0,84	3,04	3,62
23	A.8.1	1,27	4,61	4,11	0,89	3,23	3,62
24	A.8.2	2,20	5,32	2,48	0,47	1,13	2,42
25	A.8.3	2,28	5,50	2,22	0,40	0,97	2,41
26	A.9.1	2,05	4,73	3,22	0,68	1,57	2,31
27	A.9.2	1,90	3,85	4,25	1,10	2,24	2,03
28	A.9.3	1,43	5,94	2,62	0,44	1,83	4,14
29	A.10.1	1,19	5,41	3,40	0,63	2,85	4,53
30	A.10.2	1,36	4,63	4,01	0,86	2,94	3,40
31	A.10.3	1,58	6,16	2,25	0,37	1,42	3,89
	MEAN	1,93	5,15	2,92			

In the tables 4.7. and 4.9., data of the Malay traditional support houses of West Kalimantan shows an average sum of the elevation of bottom part is 1.223 meters from the ground, an average sum of the elevation of the middle part is 3.366 meters from the floor surface; while an average sum of the elevation of upper part is 2.043 meters from the lower end up to the tops of roof covers. The highest average of support houses is 6.632 meters from the ground. The table shows, in the vertical axis, that the middle parts also have a greater elevation than the other two parts. In succession, an average height percentage of the each building's parts, which is compared to the whole form, results in numbers of 18%, 51% and 31%. By this can be understood that on the support house of Malay traditional dwellings of West Kalimantan , the body (middle part) also has a larger ratio than the head (upper part) and the leg (bottom part) with the ratio of 1.9 : 5.2 : 2.9; while generally the composition on the leg (bottom part) is still less than one-fifth of the whole buildings; the interesting phenomenon is the finding that there exists a decreasing ratio in the upper part, but it becomes increasing in the middle part.

If the author compares the data on the elevation of main houses and support houses which are presented in table 4.6. and table 4.7, there are no significant differences with the height of the bottom part. The height average percentage of the bottom part of the main house is 16%, while in the support house it is 18%. This occurs because in some locations there were found no differences in elevation from the ground to the house's floor, between the support house and main house. The differences were found on the traditional dwellings in the coastal areas (Pontianak, Mempawah and Sambas) and the traditional dwellings in the inland areas (Ngabang, Tayan, Sanggau, Sekadau, and Sintang). These are the adaptation and adjustment to the natural environmental conditions in each location. In contrast, the author found the significant differences in

the other building's parts; middle part and upper part. There are significant differences in the middle parts in which the percentage is increasing from 43% in the main houses up to 51% in the support house (the difference is at least 9%); while in the upper part, there is a decreasing percentage from 41% in the main house down to 31% in the support house (the difference of at least 10 %). This difference shows the increasing or decreasing ± 10% in each parts. From the field survey, the author found a minor elevation change in the middle part, but there were major changes in the elevation of the upper part of the main house if we compared it to the support house. Therefore, the author concluded the main differences between the main house and the support house lay in the appearance of the significant change in the head size. These are shown by the appearance impression of the Malay traditional facades in West Kalimantan, with more emphasis on the domination of the main house than the support house. This domination emphasizes the importance of the main house as the core activities space to build the family mindset based on Islamic views (Yao-Ru, 2008: 248; A(h)mad et. al., 2007: 280; Said and Embi, 2008: 127).

The analysis for understanding the shape anatomy of the Malay traditional house of West Kalimantan, the author also conducted for three elements; i.e. the basic ideas of form, the setting of forms, and the certain properties of the forms.

BASIC IDEAS OF SHAPES

The basic idea impressing upon the shaping of facades of the Malay traditional dwellings, is related to the cultural influence factors (in this case the religious influences) and the natural conditions (Wan Hasim and Nasir, 2011: 9). Shapes are adjusted to both factors, which are applied in composition and positioning.

- The construction

In the methods for forming its structural construction, the basic shape of the Malay traditional dwelling is used to describe the balance and symmetry. The basic shape commonly used in the building facades is the square (or rectangle) and triangle.

The triangle shapes are used in the roof construction to provide slopes for the structure. Generally, high slopes used for the roof construction are found in all cases. This slope is required to drain the rain water immediately (Wan Abidin, 1981: 27) and then store it in the water tanks. Generally, every Malay traditional dwelling has rainwater tanks in the platform. The water tanks are placed in the platform of the front or rear *selang*. Rainwater is used as a the source of clean water for drinking or cooking. According to data of BPS-statistics of West Kalimantan Province (2010: 42-43), West Kalimantan obtained the daily rainfall in average of more than 16 days every month throughout the year 2009. The average rainfall in the period of January to May ranges between 13 days to 22 days each month. In the period from October to December, the average rainfall is high and reached the maximum level of 26 days / month, while the minimum rainfall average in range of less than 8 up to 11 days per month occurred in the period of June to September. For the data of 2009, the rainfall of West Kalimantan was in average of 259.58 millimeters every month. Highest rainfall occurs from the middle of October to January in averages of 342.6 millimeters to 485 millimeters, while the lowest occurred from the middle of June to September in the range of 115.96 millimeters up to 255.57 millimeters. This data explained that the high-slope of roof construction is used as an adjustment to adapt to the local natural conditions (Tahir, 2010: 49).

On the other side, a high slope on the roof will also provide a large space under the roof (Sim, 2010:20). Space under the roof serves as a partition in the rainy season that can be used as a place of activity or storage the goods, while in the summer season that occurs from June to September each year it serves as the hot air traps.

In addition, a triangle shape on the roof also provides stability to the building roof structure from the danger of damage caused by a tornado which sometimes occurs in several areas of West Kalimantan. According to data of BPS-statistics of West Kalimantan province (2010: 29), generally, the wind speed in West Kalimantan recorded in a particular meteorological station throughout the year 2009 was two knots per hour, but people should be vigilant about the maximum wind speed, recorded at 22 knots per hour.

Another shape is also found in the Malay traditional dwellings as a rectangle. This shape dominates as the walls on the building facades of both masses of the Malay traditional dwellings. In the main house, the rectangular shapes are found with a lot of openings (doors and windows) on each side. According to data released by BPS-statistics of West Kalimantan province (2010: 39), the percentage of the average solar radiation in West Kalimantan for the data of 2009 was 57.33%. Maximum solar radiation occured from the middle of May to September in the range of 64.14% up to 70.71%, while the minimum sunshine ranged from 41.71% to 56.57% from the middle of October to March. The data indicated that in general the sun occurs throughout the year. So, in the wise utilization of the sunlight abundance and the rainwater by the Malay people to form dwelling shapes the sizes of openings made in the rectangular forms on the Malay traditional dwellings facades are adjusted to the functions of spaces (public, semi-private or private), so that sunlight can be controlled as needed. Huge openings are placed

to reach maximum sunlight illumination for the public space, while the converse happens for the openings in the semi-private or private space. Providing windows and doors is a method to control the incoming sunlight. In particular cases have been found placements of twin doors or windows. In addition, the installation of curtains in some openings is also a way to reduce the incoming sunlight into rooms.

The rectangular and triangular shapes were also found on the bottom part of Malay traditional dwellings. The row of foundations forms the rectangular shape and creates the elevation from the ground surface, while the triangular shapes are created by the diagonal joints (bracing) of the foundation. The rectangular and triangular shapes are used as the grid pattern to stabilize the foundation structure.

According to Ching (2000: 38), the triangle, square and circle are the basic shapes of geometry used by the people to simplify the form. The three basic shapes are said to be the "very stable" form. Ching indicates the triangles show the stability, squares indicate something which is pure and rational, while the circle represents something central to the point. Also confirmed by Ching, the rectangle is a variation of the square shape.

In all cases, the triangular and rectangular shapes dominate the facades of buildings. The dominance of these two shapes in the Malay traditional dwellings illustrates the stability and balance principles of Malay people in their daily lives. A triangular shape placed at the top indicates that the Malay people were to maintain stability in the spaces underneath the triangular shape, and the imaginary lines forming an angle toward the top also intended that all activities be forms of the worship of God. Malay people also maintain the balance between left and right, keeping the balance

between the activities for world's life and heaven's life, the balanced relationship between humans and their relationship with God (*hablumminannas* and *hablumminallah*). While the rectangular shape placed on the next layer illustrates that the Malay people will purely and rationally conduct all religious teachings in their daily activities, both interactions with other people and worship to God (*hablumminannas* and *hablumminallah*).

The rectangular shape is is formed with the three-dimentional space in the body of the main house, the central space of all activities of occupants. Therefore, in the body of the house, especially the main house, it is considered as a means to maintain the purity of Islamic teachings. In the understanding of Malay people, all the activities conducted in all parts of the house are worship. So, beneath the triangle shape and at the center of the main house is the place to maintain the purity of their belief in Islam. This principle should be given to the children by continous religious teachings by their parents. In addition, Malay people also develop the principles of openness, rationality and respect to the elders, whichis based on the Islamic teachings strongly learned by their children as parental messages. Children would always be discussing their activities in the evening between the prayer times of Magrib and Isya (between 5.30 – 7.30 PM), which are usually performed in the family room (rear *serambi*).

- The Traditional interest

Traditional interest in the shape of Malay traditional dwellings is found in :

a. *Rumah panggung or the stage house*, the stage house construction commonly found in the traditional houses of Indonesia. In the Malay traditional dwellings of West Kalimantan, this structure was chosen as an adaptation to the natural conditions and the culture inherent in the Islamic religion in the

community life of Malay people. According to Tahir et. al. (2009: 278), the traditional design of raised floors involves issues such as ventilation, lighting, thermal comfort, safety and security as well as social aspects. Elevating the floor from the ground surface is intended to distinguish the dirty place outside from the clean place inside the house.

b. the roof styles, the huge and high-sloped roofs with the general pattern of triangles on the roof shape adapted to the local environment (Sim, 2010: 20). Roof shapes which are commonly found in West Kalimantan are *Potong Limas* (limas shape), *Potong Kawat* (kawat shape) and *Potong Godang* (godang shape).
c. openings, the openings are found as the doors and windows with huge forms and in the large quantities. This condition is an adaptation to the local environmental conditions.
d. Ornaments or carvings, in the particular cases, the ornaments or carvings found in the roof edges, doors, railings or ventilation (Gibbs et.al., 1987: 28; Said, 2002: 49; Said: 2004). Carving is to strengthen the identity and social status of the house owners. According to Harmoko (2008: 91-93), the ornaments found in fences are called the welcoming ornaments. The welcoming ornament symbolizes the dynamism of the house owners, so that people who come to the house with good intentions will be accepted by the owner of the house with a warm welcome. Ornaments also found on the ventilation with the star formation style symbolize that human life is always seen and supervised by God. Stars are the visualization of God placed on the high place, so that people who live in the house should beware to commit sin. Others are the lotus flower ornaments and a half circle, this ornament symbolizes peace from the homeowners.

e. Color, in few cases, is found coloring the walls of traditional houses, but the commonly used color is yellow and green. These two colors are to expose the social status of the house owner (hussin et.al., 2010). Generally, the house is colored only for a large grid dwelling, and in that era occupied by relatives of the royal family or merchants. Yellow is analogous to gold, and gold is the symbol of prosperity for Malay people. Green is analogous to the color of plants, and always growing under the sunlight. According to Harmoko (2008: 90), yellow symbolizes the prosperity of the house owner, while the green symbolizes the religion of Islam and the growth, through which it is believed that the Malay people should grow and move forward and should do anything to reach their dreams.

- The Meaning and the models

The Malay community generally is the religious community; they believe that the life on earth is impermanent. The religious lessons have been adopted since childhood to build their understanding of Islam. Therefore, any activities undertaken are always linked in order to worship the Lord. In Islam, Moslems are not allowed to symbolize anything into any forms. But in particular aspects, they visualized it into symbols, which are influenced from the culture of Hindus and Budhists in the past, and still held until now (Nagata 1974: 94; Abdul Rahman 1999: 2; Milner, 2008: 23). According to Abdul Rani (2005) in recognizing the significant influence of Hinduism in Malay history and culture from the points of view of three Western Researchers: N.J. Krom (1950); Bernard H.M. Vlekke (1959) and J.C. Van Leur (1955), in speaking of the art products, it is mentioned that they agree concerning the Hindu influences in bringing 'the high-class culture' to the people of the Malay-Indonesia archipelago; meanwhile, Islam in the next stage came to introduce principles of Islam. So then, Islam was coming with the purposes of "not

to compete" with the donations of the high-class culture of the Hindu influences that had been owned by the Malay community, but to gives a touch of Islamic principles on the existing cultural products. Similarly, to the form of the products of the architecture that they created are also attached the meanings of Islam. The meaning is contained in the visible facade composition, i.e. solid and void, color, shape and composition. Models on the Malay traditional dwellings were erected to show and explain that the house is a symbol of perfection of life for the Malay people. The house model is a simplification or idealization of Malay people from the concept of worship to God (*hablumminallah*) and the relationships between humans (*hablumminannas*). The shape and house model of the Malay traditional dwellings provided a comprehensive picture of the profile composition of Malay people as Moslems.

THE SETTING OF SHAPES

- Wholeness coherence

Coherence in the Malay traditional dwellings is a manifestation of the building, depicted as the human anatomy (Abdul Rahman, 1999: 3). As also found in other architecture of Indonesia, the Malay traditional dwellings have a composition of parts which are divided into a bottom part (leg), middle part (body) and the upper part (head). Connectedness (the wholeness coherence) among the sections found on the formation of Malay traditional dwellings from the proportion of every part and the elements that shape it. Proportion relates to the symbols and contents that form the shapes. Symbols and content as a whole coherence give the meaning to the shape of Malay traditional dwellings, and to the idealism of the owners as Moslems. So, the Moslem profiles will be directly observed by the guests or the community

when they look at the front facade of a Malay house or are inside the house. Malay people usually put the symbols of Islam on the top of door, calligraphy on the wall of the living room, and the attached ornaments on the elements of the main house, etc.

Wholeness coherence on the shapes also shows that Malay people always keep on hand the valuable principles in their lives, the balances. This is reflected in the equilibrium shape (symmetry) of the facade between the left and right, balances in placement of openings, and the balance in placing the symbol (i.e. ornaments), whether above or below, and it is significant that as Muslims, Malay people always encourage themselves to do good deeds (*amal ma'ruf*) and avoid doing sins (*nahi mungkar*). Propositions of balance are also reflected in the composition forms between the leg, body and head. In proposition form composition, the balance does not mean "give me the portion of the volume" but the balance in providing appropriate portion for a major part in the activity. From the calculation, the result is that the middle part is more dominating in the form of traditional Malay houses. It is understood as the importance of maintaining a balance by providing a large portion to the part that serves as a place to build the Islamic personalities in the house.

Malay traditional houses also distinguish activities between the main house and the support house. Distinguishing the activities is indeed necessary in order to maintain the cleanliness of the main house from the activities that can cause soiling effects on rooms. And physically, it was shown by the mass differences that the main house is bigger than the support house. Although composed of different masses, both are connected by the rear *selang* (Sim, 2010: 21). This illustrates that the Malay people were keeping the family honor and the Islamic teachings as the main sources of lessons. In addition, Malay

people also must be know how to position themselves according to their ages. The children should respect their parents or the elders; younger must respect the older, and a big brother should guide his brothers and sisters; and all the behaviours are connected by brotherhood in the Islamic teachings (Banks, 1974: 56).

- Correlation
  - The linkage (correlation) in the shape of Malay traditional dwellings is meant as the linear connectedness between the two masses. Both of the masses are connected by the rear *selang* and built to support the main purpose of Malay people's needs. So, the support house served the main house. This illustrates that the main house and the houses of children are integrated and mutually support one another.
  - Humans cannot be separate from their natural environment. In most cases, the traditional Malay house also has a physical relationship with the surrounding environment. The linkage is also formed by placing the traditional Malay house oriented to the river or canal (*parit*), which is generally located in front of the house (Milner, 2008: 23). Orientation is found as the basis for forming the shape. The leg and body shapes felt unified with the surrounding environment; the elongated forms shown in the leg and body are parallel with the river or *parit* and intended to follow the direction of river flow. The pattern of horizontal facade stretched over (on leg and body parts) is an effort to blend with the environment and show the linear correlation between Malay people and the natural conditions (Gibbs et.al., 1987: 10). The linkage between the form and nature is also manifested by giving the elevation of the soil surface. The stage house illustrates Malay people will not disrupt the balance of natural

conditions. This elevation is an adaptation to environmental conditions due to climate change impacts. Similarly, the openings are created by an attempt to take advantage of sunlight and air exchange within the rooms.

- Integration

Shape of Malay traditional dwellings is integrated and adopted from the understanding of the local Malay culture and Islamic religion inherent. Integration with local culture and the religion of Islam is manifested in many ways, both in the physical or non-physical forms. Physically, integration can be found in the ornaments, color, shape composition, openings, and symbols, while the non-physical can be felt with the power of the philosophy and meaning attached to every part of the house shape.

PROPERTIES OF SHAPES

- The position

The position found in placing of the elements on shapes, i.e. the doors, windows, or ornaments and frequently used is the position on the center or on the right. The middle position provides a balance and symmetry on a shape that is understood by the Malay community to happen also in their lives in the world. Life should be balanced between the life in the world and the hereafter. The position on the right is a highly recommended choice in the religion of Islam. For Malay people, the right side of the human body anatomy is reserved for good activities and cleanliness; for example, in eating the right hand will be used, but in cleaning the dirt, the left hand will be used. Position on the right direction is always portrayed as a place for a good connotation, while on the left direction is vice versa. As in the Islamic

teachings, Malay people believe they should precede to the right in any activity, for example in getting dressed, they should use the right hand, etc.

- The orientation

In hierarchy orders, orientation of the Malay traditional dwellings is generally to the rivers, canals or streets nearby. This orientation is a form of relationship between Malay people towards nature. Rivers or canals are a source of water for daily domestic use (Gibbs et.al., 1987: 9). Commonly, the rivers or canals are used by Malay people for bathing, washing clothes and other activities.

- Visual inertia

Visually, the center of inertia of Malay traditional dwellings is on the middle part. If observing each part of the basic shapes that dominate the compositions, the centers of the visual inertia of Malay traditional dwellings are all located in the middle. This is why in visual views, the traditional Malay houses look more stable and rigid. (see figure 4.24.)

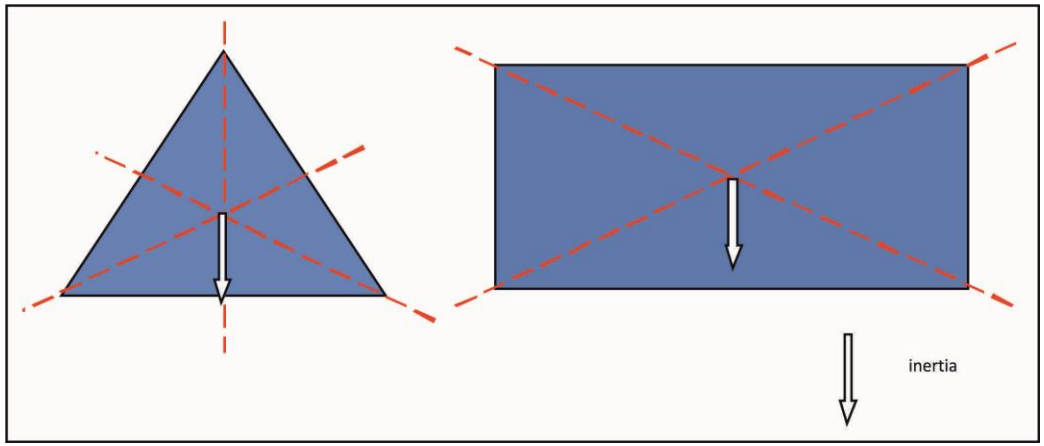


Figure 4.24.
Inertia on the basic shape of traditional Malay dwellings of West Kalimantan

Balance in the facade forms a stability to the structure. All cases have a mass balance of buildings on the axis, both on the main house or on the support house and the balances are the references to forming the framework of the roof structure. The balance of building, both in vertical or horizontal views, will form the structural rigidity to facilitate the formation of space underneath. Facades have a major influence on the appearance of buildings. The influence of the facade in a traditional Malay house is primarily shown on the appearance of the main house.

BASIC INSTRUMENTS

The main house forms the basic instruments on facades in the form of:

- Grid

Shape anatomy of the Malay traditional dwellings, viewed from the front facade of the building (the coordinate axis x) has various grid patterns. The grid pattern found in field surveys on the traditional Malay house could be divided into:

a. Regular grid patterns

The regular grid patterns, defined as the main houses in which each grid unit has the same size. The grid patterns are found in 2 grids, 3 grids and 4 grids. Generally, the main house of Malay traditional dwellings found in survey occur in the grid patterns with 3 grids (14 cases), 2 grids (4 cases) and 4 grids (1 case).

b. Irregular grid patterns

The irregular grid patterns are defined as the main houses, in the which one or more grid units have different sizes, commonly found in the survey for the grid pattern with three or four grids. Three-grid patterns with an irregular pattern were found in two cases, while four-grid patterns with two different patterns were only found in one case.

The grid patterns of three and four are usually owned by the people who have a prominent position in the community at the time, work as traders, or are relatives of the royal family, while the grid patterns of two are mostly owned by ordinary people or working as farmers or fishermen.

COMPOSITION

According to Vitruvius (1914), symmetry is the balance of the building which refers to the ratio between the facade of the building (both volumes) and the components that shape it. The composition of symmetry on the facade of Malay traditional dwellings is formed in the main house. Both symmetries are discussed in the following passages.

- Symmetry of volume

The balance of volume is found in all building facades of the main house. This balance (symmetry) is obtained by the equal division of the left and right if it we made an imaginary y-axis. A balance can be seen on the main roof shapes that also divides the two equally between the left and right. The equal division is intended to share the burden received by the foundation equally. In addition, as the part of house sheltering the activities of occupants, the roof also provides the balance metaphor for the

occupants. Home for the Malay people is a place to stay and also worship, the roof surface with a top located in the middle of the house functions as the principle consideration of the metaphor, which transforms the shape into a philosophy for balancing the worship and daily life activities in the house. The nature of religiousness is to demonstrate "good news " to outsiders to understand the Malay people as Moslems.

"*.....and make your houses oratories, and establish worship. And give good news to the believers*". (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 10:87)

"*And Allah hath given you in your houses an abode.....*" (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 16:80)

- Symmetry of components

Doors and windows are opening components in the house facade. Doors are intended as a human circulation path from outside to inside the buildings or vice versa, while the windows help the occupants to see from the inside out or vice versa, without any access to the human circulation. In addition, this component also functions as air circulation and sunlight for rooms inside the house.

To analyze the patterns of voids in house facades, I made a notation of openings: a for doors and b for windows, which was combined with the grid that made patterns to the main building facade. It can be seen as the following: figure 4.25. and table 4.10.

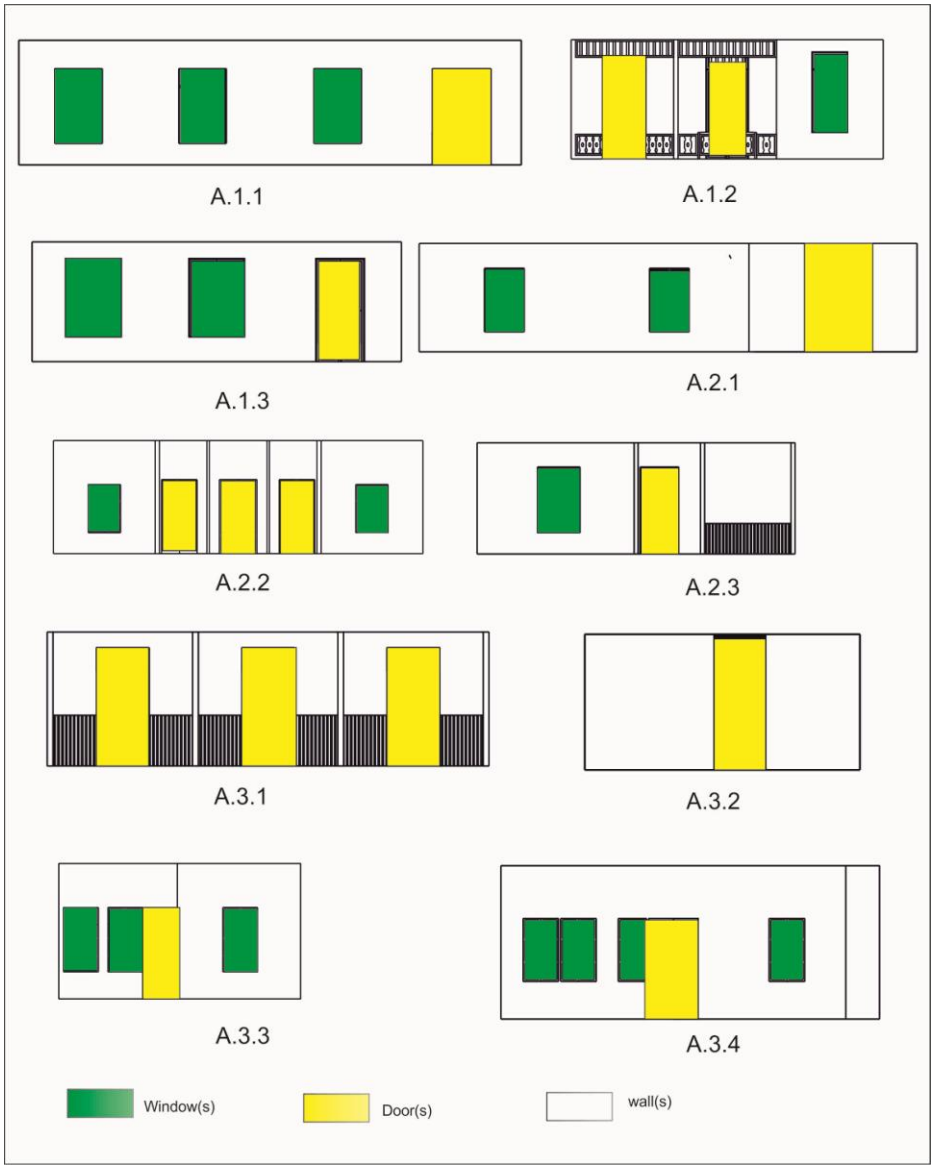
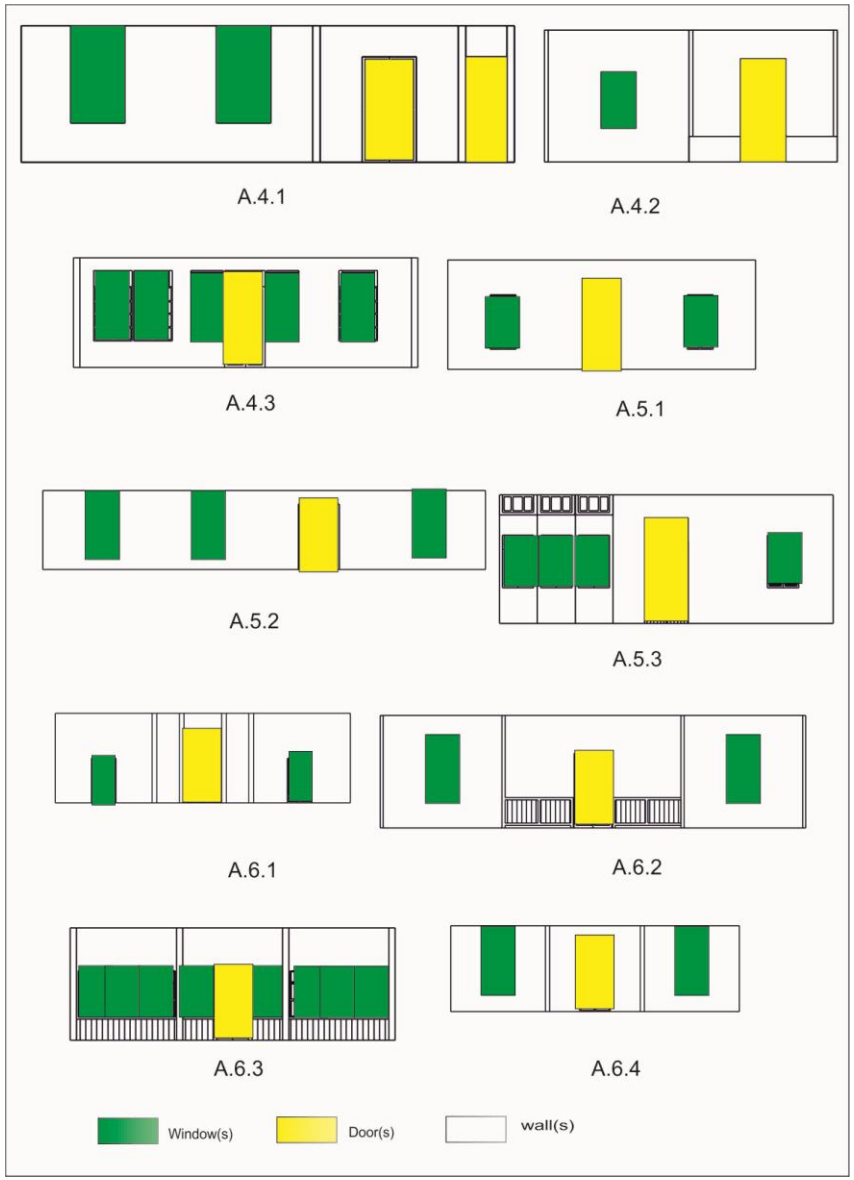


Figure 4.25.
The grammar openings on the traditional Malay dwellings of West Kalimantan

Figure 4.25a.
The grammar openings on the traditional Malay dwellings of West Kalimantan (continued)



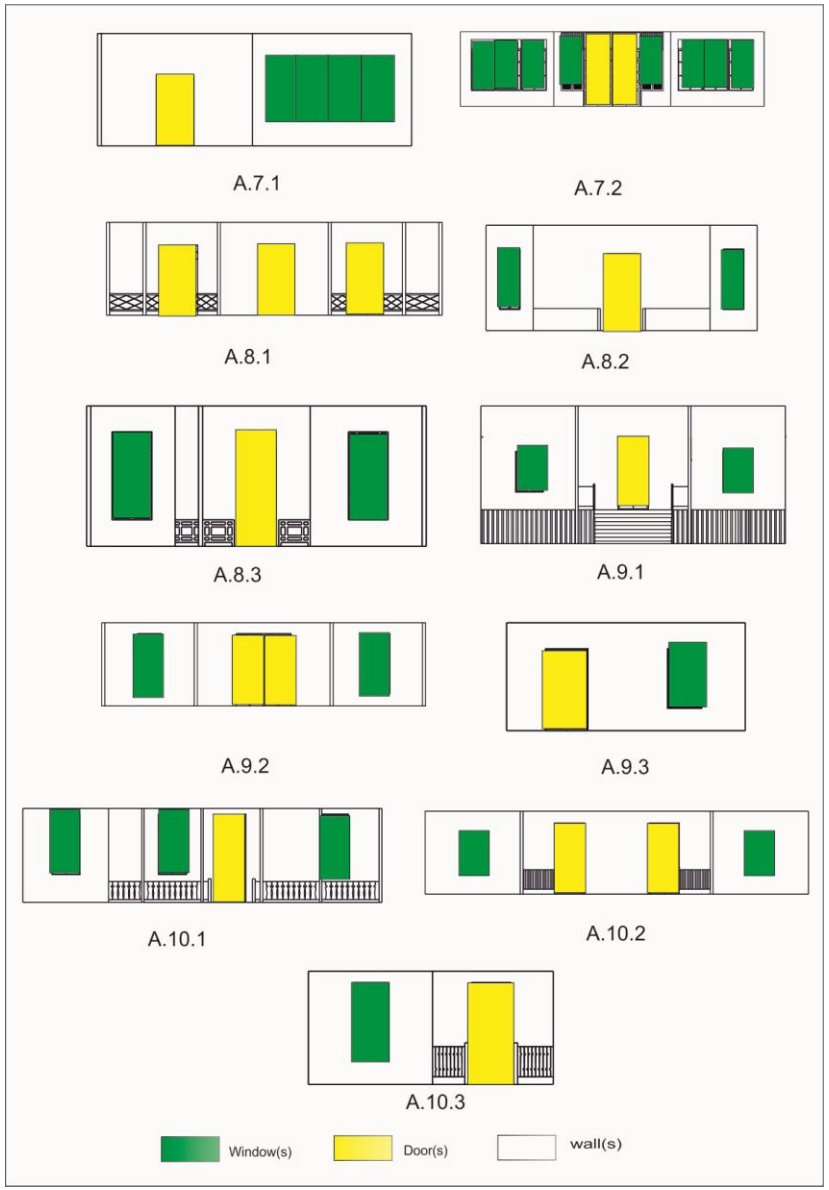


Figure 4.25b.
The grammar openings on the traditional Malay dwellings of West Kalimantan (continued)

Tabel 4.10.
The pattern of void on the facade of the main house

The Pattern of 4 grids	The pattern of 3 Grids	The pattern of 2 Grids
b – b – a – b	a – a – b	b – a
b – b – b – a	a – a – b	- – a
	b – b – a	b b a – b
	b – a a a – b	b – a
	a – a – a	a – b b b b
	b b – b a – b	b – a
	b – b – a a	
	b b – b a b – b	
	b – a – b	
	b b b – a – b	
	b – a – b	
	b – a – b	
	b b b – b a b – b b b	
	b – a – b	
	b b b – b a b – b b b	
	b – a – b	
	b – a – b	
	b – a – b	
	b – b a – b	
	b – a a – b	
	b – a – b	
	b – a – b	
	b – a a – b	

note: a = door ; b = window

Balance the components to build the facade on the traditional Malay dwelling with emphasis on the placement of doors and the window, and position of these two components, placed on the positions of "left " or "right"

Balance, for the components of the building facade on the traditional Malay house, emphasizes the placement of doors and windows, and the position of these two components, placed on the "left " or "right"

The pattern formed for balance in Malay traditional dwllings is also found in the number of elements, doors and windows placed on each grid. There are some patterns that are created, i.e.:

a. Pattern with each of 1 element (1 door or 1 window in each grids)
b. Patterns with each of 2 elements, or the patterns with each of 4 elements in grids (2 up to 4 doors or windows in each grids)
c. Patterns with each of 3 elements in grids (3 doors and/or windows in each grids)

All patterns are found by presenting the number of the formed-facade elements that provides a balance between the doors and windows. These balances are realized by:

a. The patterns placing only one element in each of the created grids, or
b. grouping of the element in one type of particular grid (i.e. four windows in the one grid while the other grids just have one door); or
c. An element flanked by two other, different elements (i.e. a door flanked by 2 windows); or
d. Placing an element in each grid alongside the others

The patterns that shape the main house with two, three, or four grids are the patterns that form balance, by continuing to provide the voids on each created facade area, except in the case of A.3.2. Especially for the case of A.3.2., voids are only in the openings for a door, but at the top are placed two small windows, which serves to release the sunlight into the attic (*parak*) and both windows were placed and balanced in the center of each grid.

When viewed from the pattern, it was found that a majority of cases put the door on the middle or on the right side of the grid. Especially for the case of A.3.1., doors are placed in all the grids, but for daily circulation there is a door in the middle. while in the cases A.3.3. and A.6.4., doors are placed on the left grid position due to the location of the building, which is between the masses of other buildings, while the access road found on the left side circles down to the right side of the house. However, in the case of A.3.3., this house provides an additional two windows on the left of the grid, while the door is placed on the right side of the grid. So it appears that the door keep in the center or right side of the windows in the grid.



Figure 4.26. *(left)*
The middle doorof the front facade as the main path circulation, which is always open during the day and this condition is found on the case A.3.1.

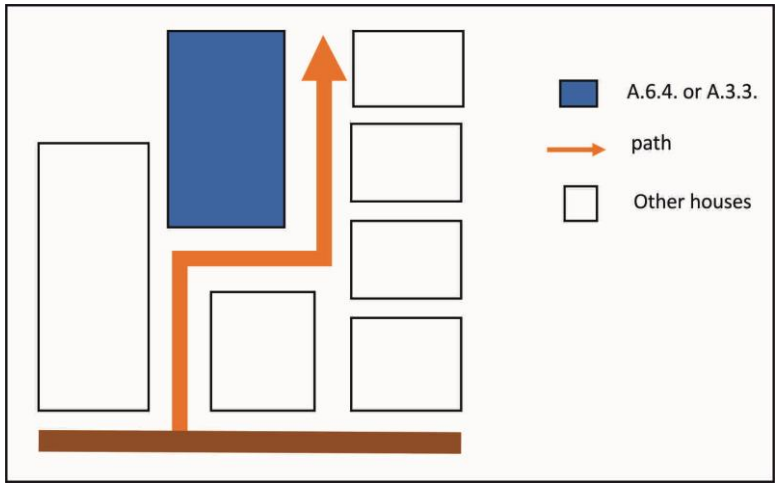


Figure 4.27. *(right)*
The position of case A.3.3. and A.6.4. to the surrounding environment

Placing the access circulation on the right side was also confirmed by the case of A.5.2. This house has 4 grids; if the facade of the building is divided into two parts symmetrically, it keeps placing the door on the center of the grid, or if it is divided into 3 parts, the door is on the right side of the middle grid.

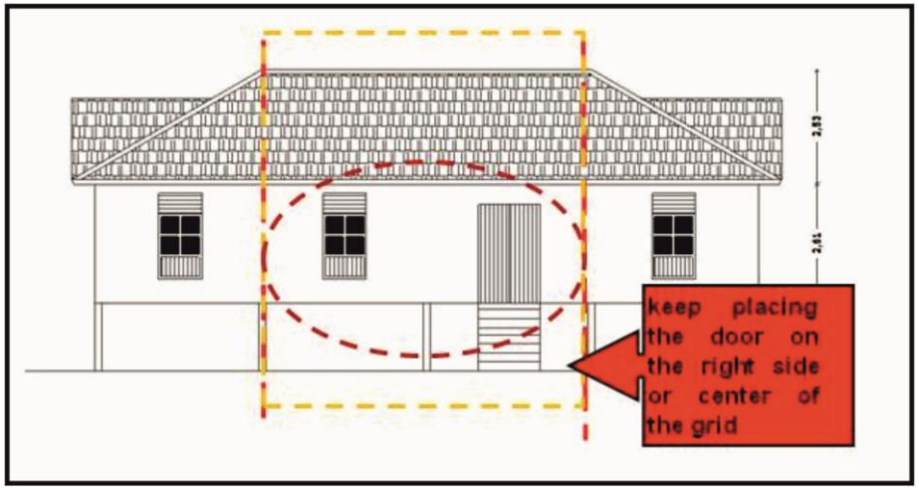


Figure 4.28.
The placement of the circulation path on the right side is found on the case of A.5.2.

Further, if viewed, the patterns placed the doors and windows on the same grid; hence the positions of the doors are always found on the right side or among two windows. To continue placing things on the right side is an act that has always been practiced by Moslems, and it is always taught by their parents as in the Islamic religion. Well known in their understandings, the things positioned on the right are more noble than the left. The right portions are` described as kindness, while the left portions are illustrated as badness or things that are not good.

In the Qur'an, God illustrates the people or groups who are noble by being placing them always on the right side, and the opposite, people or groups who are perverted are always placed on the left side. Orientations and clustering people or groups into left and right portions is embodied in the Qur'an, mentioned as the following:

"*Then (there will be) the Companions of the Right Hand;- What a noble, the Companions of the Right Hand; And the Companions of the Left Hand,- what a misserable, the Companions of the Left Hand*" (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 56: 8-9)

"*Every soul, for what it has earned, will be retained, Except the companions of the right*" (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 74: 38-39)

"*On the day when We shall summon all men with their record, whoso is given his book in his right hand - such will read their book and they will not be wronged a shred*". (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 17: 71)

The use of his right hand and the left by the Prophet Mohammed is also mentioned in Hadith.

"*Narated by Abu Dawud from Aisyah ra., she said: "The right hand of Prophet Muhammad used for purification and eating, while his left hand is used to clean the dirt during defecation or to do all the dirty things*". (Nawawi et.al, 2005: 803)

The influence of positioning (placing the things on the right and left side) is embodied in placing the location of doors, which are always on the right side. Because the guest, for Malay people, is a noble person who should be respected, served, and placed in the honorable place.

"*O ye who believe! Enter not houses other than your own without first announcing your presence and invoking peace upon the folk thereof. That is better for you, that ye may be heedful*". (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 24: 27)

Proportion is the balanced comparison between the dimensions of width, height and depth. In architecture, the proportion is often assumed as a balanced comparison of the bottom parts (leg), the middle part (body) and the upper part (head). Here on table 4.11. the comparison between the width and height of the main house is based on data of the field measurements.

NO.	Objects code	height					width	Ratio	
		(a)	(b)	(c)	(d)	(e)	(f)	(f)/(e)	(f)/(d)
					b + c	a+b+c			
1.	A.1.1	2,00	3,01	2,86	5,87	7,87	11,71	1,49	1,99
2.	A.1.2	2,43	4,30	2,94	7,24	9,67	8,91	0,92	1,23
3.	A.1.3	1,50	2,90	2,87	5,77	7,27	8,92	1,23	1,55
4.	A.2.1	1,00	2,69	2,02	4,71	5,71	12,98	2,27	2,76
5	A.2.2	0,50	3,60	2,32	5,92	6,42	12,66	1,97	2,14
6	A.2.3	0,87	2,74	1,53	4,27	5,14	7,74	1,51	1,81
7	A.3.1	1,00	3,22	3,57	6,79	7,79	10,50	1,35	1,79
8	A.3.2	1,00	2,51	1,79	4,30	5,30	5,00	0,94	1,16
9	A.3.3	0,75	3,61	2,45	6,06	6,81	7,00	1,03	1,16
10	A.3.4	0,80	3,30	2,96	6,26	7,06	8,02	1,14	1,28
11	A.4.1	1,00	3,36	2,29	5,65	6,65	10,27	1,54	1,82
12	A.4.2	1,78	3,61	2,71	6,32	8,10	7,94	0,98	1,26
13	A.4.3	1,00	3,43	5,97	9,40	10,40	10,59	1,02	1,13
14	A.5.1	1,00	3,61	3,39	7,00	8,00	10,08	1,26	1,44
15	A.5.2	1,50	2,61	2,53	5,14	6,64	14,52	2,19	2,82
16	A.5.3	1,00	3,61	3,10	6,71	7,71	9,30	1,21	1,39
17	A.6.1	2,73	3,61	5,39	9,00	11,73	11,73	1,00	1,30
18	A.6.2	1,25	3,61	2,76	6,37	7,62	13,98	1,83	2,19
19	A.6.3	2,00	3,21	3,69	6,90	8,90	9,12	1,02	1,32
20	A.6.4	1,50	2,95	2,96	5,91	7,41	10,14	1,37	1,72
21	A.7.1	1,00	3,61	3,15	6,76	7,76	9,96	1,28	1,47
22	A.7.2	1,00	3,71	4,97	8,68	9,68	16,31	1,68	1,88
23	A.8.1	1,00	3,71	4,32	8,03	9,03	18,56	2,06	2,31
24	A.8.2	1,50	3,63	2,36	5,99	7,49	10,20	1,36	1,70
25	A.8.3	1,50	3,61	2,78	6,39	7,89	8,88	1,13	1,39
26	A.9.1	1,30	2,79	4,60	7,39	8,69	11,62	1,34	1,57
27	A.9.2	1,25	3,71	2,09	5,80	7,05	14,22	2,02	2,45
28	A.9.3	0,70	2,90	2,52	5,42	6,12	6,22	1,02	1,15
29	A.10.1	0,75	3,40	3,17	6,57	7,32	12,93	1,77	1,97
30	A.10.2	1,00	3,40	3,43	6,83	7,83	15,60	1,99	2,28
31	A.10.3	0,90	3,41	2,24	5,65	6,55	6,40	0,98	1,13

Tabel 4.11.
The ratio of width versus height

The comparison of the house is focused on two parts; width compared to the height (from ground to the roof top) (i) and width compared to the height (from the surface of the floor to the roof top) (ii). The comparison (i), shows that all cases have a ratio above one, except for cases of A.3.2., A.4.2., and A.10.3; these three houses have two grids. Two cases (A.5.2 and A.8.1.) have a ratio greater than two, 12 cases have ratios between 1 and 1.5, and five cases have ratios between 1.5 and 2.00. The comparison (ii) shows that the ratios of all cases are above one, and four cases have a ratio greater than two.

Ratios explain that the building width dominates the facade proportion of the Malay traditional dwellings, and even in some cases the ratio is more than two. Homes for Malay people are a means of interacting with humans in the surrounding environment (*hablumminannas*). So, it was reflected that the Malay people encouraged the openness in behaviour toward humans and environment. Facades also help the Malay people to provide the open space in the front parts as the broad acceptance of the incoming neighbors. The behaviour of openness was reflected and supported by giving the number of openings on the facades of houses, which also considesr the surrounding environment. As found by the survey, the traditional Malay houses are generally oriented to the nearest river, so that generally the space also follows the river flows.

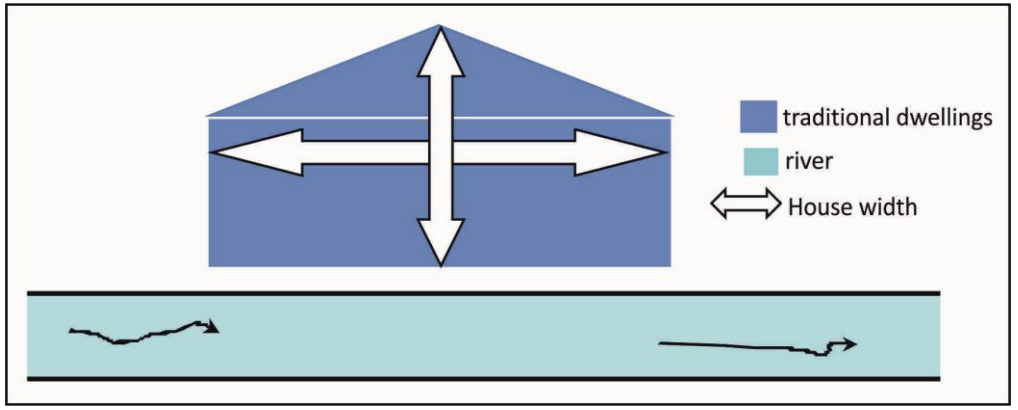


Figure 4.29.

The alongate facades on the main house and its position toward the river, is a symbol of the engagement with nature which is described by the traditional Malay dwellings of West Kalimantan

4.3.1.c Anatomy of Sections

In vertical view, dwelling can split into three main parts: bottom part, middle part and upper part. This point of view is used to analyze the factors influencing each architectural element of the cases examined.

BOTTOM SECTIONS

According to Zain (2003), the architecture of Malay dwelling in West Kalimantan generally consists of two main buildings, namely *rumah induk* (the main house) and *rumah anak* (the supported house, and is builts as a stage building approximately one to three meters from the ground. Raised floors served to reduce the effects of dampness from the land beneath and facilitated ventilation (Nasir and Wan Hashim, 1996: 8). This stage house is also intended to avoid the dangers of wild animals attacking and anticipate natural disasters such floods (Wan Abidin, 1981: 27; A(h)mad et.al, 2007: 277). As well as the Dayak longhouse, Malay traditional dwellings are usually built on the riverside, or erected not far from the river. The traditional Malay house has evolved and adapted to the Malay needs, culture and environment (Tahir et. al., 2009: 278). The elevation of foundations from the ground varies depending on locations, environmental conditions, and needs of the owner. Usually, the dwellings erected on the riverside will have a foundation height larger than the ones that are far away from the river.

Malay people are related to Islam and well-known as Moslems. Malay people embraced Islam as a religion generally held since birth and applied in many ways or forms of their life activities. Malay people always related all their activities as essences of worship to God. By their cognition, the essences of life include the interaction with other people as a social community, served as *ibadah* (religous services). By the objectives mentioned above, Malay people applied Islam as a doctrine also manifested in the methods of

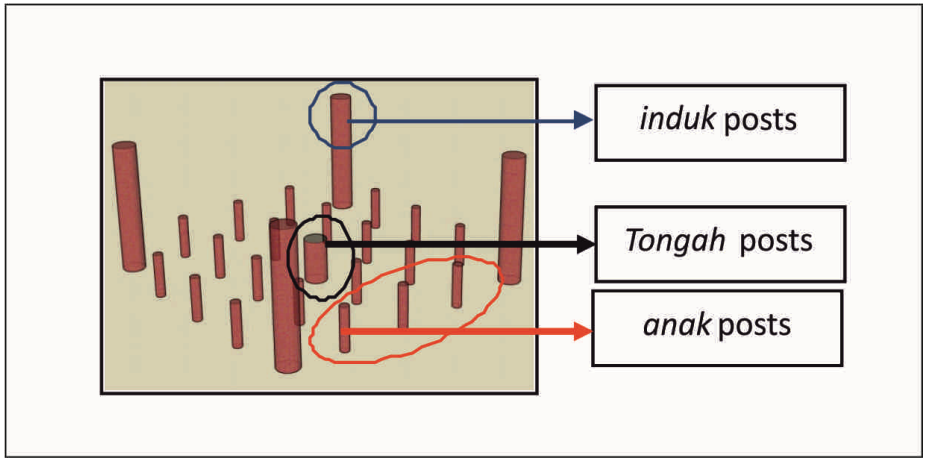
dwelling development. Dwellings are important for Malay People. According to Harmoko (2008: 63), dwellings are mentioned as the family utilities to build and to develop the characters of family members, appropriate to guidance of Holy Qur'an and Hadist. All rooms in a *rumah induk* (main house) are a place of worship (*shalat*/prayer) and should be kept clean from *hadats* (impurities). Islamic religion is the inherent guidance in every action of the Malays, and they always keep the faith of the holy Qur'an and Hadist in all activities. They should keep clothes and rooms in every part of the main house clean from *hadast* (impurities) (Christine, 2007: 100). In hadist, Muhammad SAW said cleanse o.s. of impurities half parts of faith ("*Ath-thahuuru syatrul iimaan...*" - narated by Ahmad, Muslim, and Tirmidzi. Reads the details in Al-Qazwini, 1989: 66-67). According to this, every Moslems should be always cleansing o.s. of impurities, both in their body and the environments.

In Islam, the land is fully considered as the place always dirty and not cleansed of the impurities (*hadast*). Therefore, in building constructions of their dwellings, Malay people raised the floor elevation from the ground and homes became stage building. In Islamic cosmology, mentioned in holy Qur'an, the human is the most perfect being created by God to be a leader on earth (*khalifatul fil 'Ardh*). Malays dwellings being formed by raising the floor elevations from ground is also intended to ennoble human beings from other creatures on earth. This means that there are many other creatures of God's creation of this earth and man as the most perfect being created by God has a reasonable duty control everything. As imperfect beings, who became managers of the creatures on earth, the Malays make it happen through the formation of architecture in the form of raising the floor elevation from the ground. In architecture, raising the elevation of the floor means to distinguish the inside from the outside, and give the impression that it is more noble than the

outside, whereas in Islam, the more glorious is the above position compared to the position below. In efforts to build the family character, in Malays, exaltation for their building is intended 'to break away' from outside influences.

The foundations of main house in Malay traditional dwellings is generally built from five main pillars, in the forms of one main pile (*tiang seri*) at the center and four support piles (*tiang anak*) at each corner. These five of main pillars are erected as continuous beam foundations and also as the columns which support the entire structure of the main house. In Islamic cosmology it is always mentioned that God loves all things formed in odd numbers. This could be linked to, i.e., prayer commandment as five times in a day, and pillars of faith in Islam are also required as five parts. So the placement of five pillars as the foundations of the main house is analogous to pillars of faith in Islam and the command to pray at five times a day that must be done by Malay people. The placement of five main pillars is also assisted by the supporting pillars. These support piles are installed to assist in supporting the floor constructions. This is also mentioned by Harmoko (2008), the foundations of main houses of the Malays for the traditional dwellings in Jongkong are named *tiang tongah* placed on the center, *tiang induk* placed in each corner and *tiang anak* as supported piles placed between *tiang induk*.

Figure 4.30.
The foundations position and the naming of the posts in traditional Jongkong dwellings



The main pillar (*tiang tongah* or *tiang seri*) is the first erected pillar established when the Malays built their houses, and this pillar always acts as a reference point for new traditional dwelling establishment. This pillar also acts as the main orientation of all rooms in the main house and is located on one corner of the head of the family's bedroom (parent). This meant parents were representatives of God on earth provided good teaching to all family members to have good life in the world, and also reach blissfulness in heaven (life after death - the Hereafter).

As part of their culture and religion, Malay people believe, parents also have the important command from God to ensure that children keep their faith in Islam, and will continue and hope that when children grow up with good assistance from parents, in the future they will also send their wishes to God for their parents. Therefore, to give good assistance to their children and other family members, the main pillar (*tiang seri*) was placed in the middle of the main house and acts as part of the parents bedroom in the way to provide

good monitoring and the intention to monitor the daily activities and worship. In this way, pillars act as a source of livelihood for all family members.

Parents will provide the teaching of religious education and social life in daily life. This teaching is a source of livelihood for all family members. Parents will inculcate religious teachings on worship to God (*hambluminannallah*) and religious subjects on how to interact with other people as human beings (*hablumminannas*). The locations of main pillars (*tiang seri*) in parents‘ bedrooms is analogous to parents as the main source of family and also, parents act as role models for all family members. The location of *tiang seri* in the center of the main house means parents act and give all their energy to support all family members to have good life in the world and blissfulness in heaven.

In addition to a main pillar (*tiang seri*), the main house also has four other pillars that surround the main pillar in the four corners of the building. Placement of this fourth pillars is a symbol of covering and protecting the *tiang seri*, and all activities in the house from outside influences. In the religions of Islam, Malay people know five pillars that must be upheld by adherents and are often taught as the pillars of Islam. One of the pillars of Islam is the prayer performed five times a day. In the Hadith the performance of the prayer is a main pillar of religion. Malay people as Moslems must perform prayer. In Islam, prayer for the adult Moslem male is better done at the mosque, but for more mainstream householders, the headman of the family occasionally will conduct prayer in the house to implement the compulsory worship. Congregational prayer activity is usually done in the living room (*serambi belakang*). The living room is placed close to parents‘ bedroom and one corner of the living room is attached to *tiang seri*, which also is a corner of the parents‘ bedroom. The *tiang seri* as the main pillar is chained and *supported* by four pillars. This meant, *tiang*

seri acted as the main pillar to support the living room, which is the main room to perform prayer (*shalat*) for family members. So, one main pillar and four supported pillars are analogous to five pillars of Islam. One of five pillars of Islam usually mentioned as main pillars of Islam is performing prayer (*shalat*). So, *tiang seri* also symbolizes a pillar of Islam, because it is erected as the corner of rooms which have functions as locations to perform prayer (*shalat*). The four other pillars symbolize other pillars of Islam. In Islam, four other pillars of Islam support and complete the main command from God to perform prayer ((*shalat*). We can find four other pillars in Malay houses also sorrounding, supporting and protecting the main pillar (*tiang seri*) from outside influences. These four of pillars symbolize the cover of protection for religious teaching activities for family members from bad outside influences. To signal it as main pillar, *tiang seri* is usually formed with larger dimensions then the other four pillars. This signal is used to provide confirmation that it is the main pillar capable of sustaining house construction, and also gives a safe feeling to all family members to do their activities at home. These also symbolize *tiang seri* as a focal point of the four other pillars. Four pillars act as completing parts of the main pillars. All these pillars working together support the house. This also has the same meaning in five pillars of Islam, acting as unseparated pillars to build the Malay people as good Moslems.

Mentioned in the hadith, prayer (*shalat*) is a pillar of Islamic religion, so that every Moslems (Malays people) must implement it in daily activities. In the Hadith, the virtues of prayer, if performed together (*berjama'ah*) and especially for adults, should done in a mosque. Parents will always maintain and encourage all family members to perform prayer together by ordering them to do it when prayer time is coming. The head of the family is *imam* (leader of prayer) and usually ordered important roles for all family members to do

prelimanary activities before prayer is performed such as reciting holy Qur'an, or *berzikir* (reciting of God's name with a loudspoken voice).

Prayers are usually performed in the living room (*rear serambi*), so the parents will know if one of their children does not pray, because their bedroom is side by side with the living room. Here, *tiang seri* is defined as the main pillar of worship control for all family members. The central position of the *tiang seri* plays an important role of connecting the parents' bedroom as "place for head of family" and rear *serambi* as the center of family worship activities.

Compositions of the bottom part of the building compared, with the body parts or upper part, have a measurement of less than half portions. In the sampled case of the Malay dwellings in the town of Sambas (Zain, 2003), the bottom parts of buildings have height ranges from one meter, 1.5 meters to two meters, while the body has height ranges from 3.5 meters, four meters to 4.5 meters, while the upper parts have height ranges from 3.9 meters, 4.1 metesr to 4.5 meters. What should be noted here is that the bottom part is the lowest elevation part compared with other parts (body part or upper part) in a main house of Malay traditional dwellings, and generally has a height measurement of less than half portions with the other parts. Meanwhile, the size of the upper part has a greater measurement of height than the two other parts. In addition, the Malay architecture is generally known by the hierarchy of three different types; namely, *Potong Limas*, *Potong Kawat* and *Potong Godang*. Among those three shapes of Malay dwellings, the type of *Potong Godang* have the smallest bottom part height measurement compared to the two other types. In the past, the Malay community made a hierarchy status for each type of dwellins. *Potong Limas* was generally used by Malay

kingdom members, *Potong Kawat* was usually used by kingdom servant officers, and while *Potong Godang* was for the ordinary people.

The bottom part lower than the others, like other traditional communities, because the Malay community recognizes the hierarchy of the lowest to the highest. Mentioned in the Qur'an, other living things on earth were created to sustain human life on earth. Human beings are mentioned in holy Qur'an as the more perfect living things than others on earth, created by God and having a level higher than others, such as animals, who also live on the earth at the lowest level. In addition, the importance of elevation from the ground is to distinguish the inside from the outside of the house, and seperate the dirty outside from the clean inside. The elevation of the bottom part that is not greater than the body part or upper part illustrates that life on the earth's surface (bottom part) is only to support life (on body part) and to reach the final destination as eternal life in heaven (upper part). Here, we saw that the upper part has higher elevations than other part as the final distination of human life.

Life in the world for the people is preparation for eternal life in the Hereafter, and this is the most important part for humans. Therefore, the formation of family characters who could worship their Creator with the County by providing a supportive space is considered at all.

From the point of cosmology, traditional houses are a manifestation of the vertical relationship of the worship of Malay people with the Creator (*Hablumminallah*). The highest place in the house is in the top of the roof. These top positions manifested the highest place to reach God in Heaven. So, rooms under this top of roof were also manifested as the most sacred room. Bedrooms and living rooms (*rear serambi*) wereplaced under the top of the roof in the main house. These two rooms were used as the place to develop family

character. In these rooms, all special acitivities were performed such as prayer, reading holy books, etc. According to this fact, bedrooms and living rooms, which were shaded by a top of main house roof, were the most sacred spaces in the main house. This roof construction was rigid with four pillars, without joints from ground to the top and surrounding the *tiang seri*. To show the importance of the bedroom and living room as sacred spaces, floor elevation in this part was formed higher than other parts in Malay traditional dwellings and this highest elevation was placed under the main roof (highest top of the roof).

In Malay culture, based on Islamic doctrine, placing things higher indicates that they are more sacred than the lower, and things considered to be glorious should be placed in the higher place. Islamic religion does not allow the symbols in all forms physically, but the symbols commonly used by Malay communities are due to the influence of Buddhism. According to Firmansyah (2003: 129), vertical axis and lines centered to the one pole were manifestations of heaven in the concept of universe, and floor elevation as *swarga-swarga* (nirvana) concept. Both of these concepts are found in Buddhism. In Islam, we can find hierarchy often mentioned in the holy Quran based on the three levels, Moslems, *mukmin* and *ihsan*. *Ihsan* is the highest level which Malays or most Moslems wish to reach. This hierarchy of three Moslems usually can be found as analogous in physical forms in Malay architecture. For example, Malay people usually defined three parts of house (bottom part, body part and upper part) as manifestations of *muslim*, *mukmin* and *ihsan* in Islamic doctrines.

In the past, *parak* (the attic) is a place devoted to women or girls. In Islam, the status of women and girls is preferred and honourable. Women are placed in special positions in the main house to honor and to provide protection for them from the sight of a man who is not the member of their family (*muhrim*).

According to the level of Moslems mentioned above, *parak* was formed as special room for women and girls, indeed to placed them in the honoedr section of main house. This means as the highest section of the house, *parak* is also the place and plays the roles in Malay culture to honor females in the highest level of position in the family.

Vitruvius (1914) states that in the body there is a harmonious relationship and symmetry among the forearms, hands, feet, palms of the hands, fingers and other small parts, as in the perfect building. Human body parts, such as legs and arms, were used as the units to measure space in the Malay traditional dwellings. These units of measure were a major part in the construction of residential houses in the past, instead of metric measurements. *Depa*', *hasta* and *kilan* were units commonly used as measurements in Malay traditional dwelling construction (Gibbs et.al., 1987: 72-73). These measurements were based on units of body anatomy for the head of the family who would dwell in the structure. This use of anatomical units was an effort to adjust space with the occupants‘ anatomy, in order to provide convinience for them as long as they occupied the house.

According to Harmoko (2008), in the past, Malay people built their houses using units as measurement by the size of the human arms, i.e using the dopa' (1 *dopa'* = 1.70-1.80 cm), Seta (1 *Seta* = 35-45 cm), and kilan (1 *kilan* = 15-25 cm).

BODY SECTION

Generally, the floorplan of the traditional Malay dwelling is divided into 2 sections, the main house and support house which are connected by a corridor. The space in the main house consists of a front *serambi*

(verandah), a middle *serambi* (guest room), a rear *serambi* (living room), a bedroom and a *parak* (attic), while the support house is used as a kitchen.

The main house plays a major role in the daily lives of the Malay (A(h)mad, 2007: 280). Most of the activities performed in the house are centered around serving guests, interacting with family members and practicing Islam. According to the teachings of Islam of which the Malay are devout adherants, the purpose of life on earth is to worship God. As Islam has been integrated into Malay culture, daily worship is divided into 2 kinds of activities; worship performed in a vertical relationship with God *(Hablumminallah)* and worship preformed in a horizontal relationship among humans *(Hablumminannas).* Therefore, the space in the traditional Malay dwelling accomodates these vertical and horizontal relationships. Interactions with neighbors and family members usually take place in the front *serambi*, middle *serambi* or kitchen while the rear *serambi* is used for interactions among family members as well as for worshiping God. The support house, where the kitchen is located, has a side door as an access for visiting female guests and neighbors (Yao-Ru, 2008:248).

Spaces in the main house can divided into three types of space, namely public , semi-private and private. The formal space of the front and middle *serambi* in traditional Malay dwellings is meant as a place to formally serve visitors or foreign guests (usually those who come from other villages) for special affairs (A(h)mad et. al., 2007: 280).The front *serambi* is a space that may be formed with or without wall partitions with a single ladder for access. The most formal visits are usually performed in the middle *serambi.* This room may also be used ocassionally for family members, specially at night, to conduct activities together (i.e. as a prayer area (*shalat berjama'ah* or reciting the holy Qur'an). The front *serambi* is an unpartitioned room,

so there are less restrictions on family members to received guests of a different gender. Islamic doctrine prohibites interaction between different genders who are not *muhrim* (Wan Abidin: 1981: 31). An unmarried daughter is not allowed to receive male visitors in the front *serambi* without receiving approval from her parents and is usually only able to meet the visitor when being chaperoned by her mother or father.

Access to the front *serambi* and the inside of the house is facilitated by a ladder. This ladder must have an odd number of steps - usually 3, 5 or 7 steps. This odd number of steps, for the Malay, is a symbol of their understanding of divinity in Islam where God loves odd numbers. For example, Moslems pray five times with the number of prayer rituals being broken down into 17 units in a day and they can recite the 99 glorious names of God. In the science of architecture, steps are built in odd numbers because humans naturally feel more comfortable when using an odd number of steps before stopping.

Soenarpo et.al, 1986: 55. Odd numbers of the ladders is based on the beliefs of adherents of Islam that an odd number, having a sacred value, refers to the nature of God (*asmaul husna*) and God loves the odd things. According to the custom of the Malays, the composition of ladders is calculated with the sequence which starts from 1 tangga, 2 tangga, 3 tangga, and so on. If the number of ladders is more than three, then the count will go back to the first sequence. The first ladder serves as *tangga* which means that the process of living was begun, the second is the function of *tunggu* which means that anyone who lived in that house would occupy it in the long term, while the third ladder is serves as *tinggal*, which means anyone who dwells in the house will not experience eternal occupation. According to the results of this calculation, then, the people who stay at home will experience things that are unexpected and cause the occupants to leave the house. The favorite ladder number for the Malays is five and it is understood that not only will the occupants

live in long term occupation of the house, but five is also the sacred number which refers to the number of pillars of Islam.

In addition, in the teaching of Islam it is mentioned that whenever people begin to conduct an activity, a Moslem should use the body parts located on the right. This condition is found in the procession of purification rituals (*berwudhu*) in which each pair of parts (hands, ears, feet) are washed by giving priority to the right. Likewise behaviour (*adab*) when entering the mosque, every Moslem must pay attention to the steps of his/her right foot just before the entrance and followed by the left foot, and then use the left foot followed by the right foot when the exiting the mosque. According to that purpose, therefore, the count is an odd number; then, if someone begins the steps on the ladder using the right foot, it will be the first foot on the house floor. Conversely, if someone is stepping out of the house with the left foot first, it will be that the first foot set on the ground is the left foot.

The ladder which is used as the main entrance to the house, defines the transition from the dirty land outside into the clean house inside. Every guest must remove their shoes or sandals in front of the ladder before entering the house (A(h)mad et. al., 2007: 280; Md. Zohri, 2010: 50). In the past, the owner of the house would usually provide a *tempayan* (water tank) in front of the house or an area near a river or stream so that guests could clean their feet before entering.

The front and middle *serambi* are used as public space where all visitors are welcomed. The space is enclosed by massive walls with few openings such as windows and doors. These are usually configured with one or two large windows on the left and/or right side of a large single or double door. In the past, this space was also used by parents to receive guests who asked to marry their daughter or to bring in the candidate to

their daughter. The daughter would be allowed to see the candidate and hear the conversation from the attic (*parak*) since unmarried women are not allowed to join in conversations or to meet any guest of the opposite sex until he is approved by her parents. The *parak* is a space at the top of the main house like an attic which is used by all the women of the house to relax. This room allows people using it to view the middle *serambi* through a grid-like wall. Religious ceremonies and traditional or cultural (*adat*) ceremonies such as *aqiqah, gunting rambut* (the hair cutting ceremony of a newborn baby), *tahlilan* etc. are also held in the public area of the front and middle *serambi*. Only men sit in these rooms at these ceremonies.

The section to the right of the middle *serambi* is also sometimes used by family members for special activities such as congregational prayers which are generally followed by parents teaching their children about Islamic doctrine or for reading the holy Quran (*mengaji*) together. These interactions are usually done at sunset and evening prayer times at around 17:30 to 19:30. The children are usually asked to clean up and get ready before this activity begins.

The rear *serambi* and bedrooms also play important roles as the center of activity in the main house. The modular forms and widths of both the family room and the bedroom are usually similar. According to both Abdul Rahman (1999: 6-7) and Muhamad Rasdi, (2005: 38), the partition walls in this section are movable so that, as time goes on, the space can be adjusted to add or subtract rooms in accordance with the needs of space for the family members. Muhamad Rasdi (2005: 33) explains that the interior of a Malay house is designed according to the demands of privacy and respectability but there is no necd to subdivide it into specialised activity spaces. A typical main house with its 15 pillars could be configured with one bedroom taking a third of the total space in the rear *serambi* while the rest is used as the livingroom. This

could also be reversed by partitioning off three bedrooms in the rear *serambi* with one third of the total space being used as the living room. This floorplan with its uniform width of area allows the head of the family to make minor changes to this section easily. Similar changes can also be made to the middle *serambi*.

The *tiang seri* (a pillar) is placed between the public and semi private spaces to promote equilibrium in order to be a visible reminder of balance that must be maintained in daily lives of the occupants i.e. their interactions with others (*hablumminannas*) and their worship of God (*hablumminallah*). The placement of *tiang seri* in one corner of parents‘ bedroom is considered a source of guidance for all family members. The *tiang seri* symbolizes the central role the head of the family plays in the family members‘ lives as the supervisor to control and guide them in their building of relationships with others and in their worship of God.

Usually the only access to the living room is set as a series of poles without a door leaf. The parents‘ bedroom is placed between the middle *serambi* where the guest room is and the rear *serambi* where the living room is so that all activities in both rooms can be monitored from the parents‘ bedroom.

The function of supervision and the parental guidance for children and family members (wife) is a burden to be borne by the head of the family (father). As mentioned in the holy Qur'an (QS. 4:34), men are the leaders of women and parents are obliged to teach Islam to their children until they reach adulthood (*akil baligh*).

> “*Men are in charge of women, because Allah hath made the one of them to excel the other, and because they spend of their property (for the support of women). So good women are the obedient, guarding in secret that which Allah hath guarded. As for those from whom ye fear rebellion, admonish them and banish them to beds apart, and scourge them. Then if they obey you, seek not a way against them. Lo!*

Allah is ever High, Exalted, Great". (Ministry of Hajj and Endowments the Kingdom of Saudi Arabia: Qur'an Mushaf Al-Madinah An-Nabawiyah revised, 4:34)

In the past, adult sons usually did not sleep in the house. Instead, they would sometimes they would sleep in the small mosque (*surau)* commonly found in their local neighborhood, or they would sometimes sleep in the rear *serambi*. Other bedrooms were generally available for the married daughter and her husband.

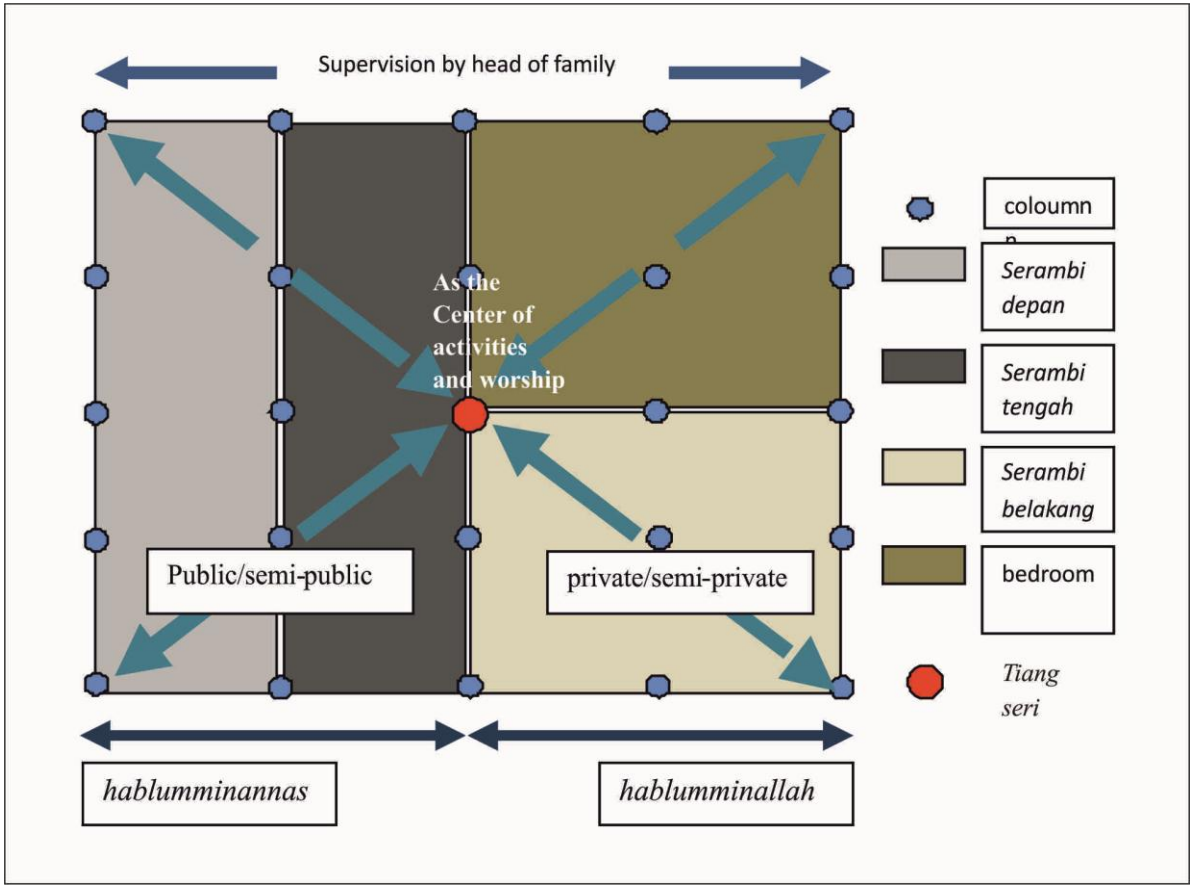


Figure 4.31.

The placement of the tiang seri as head of family to provide supervision on the activities and worship of the family members

In the past, boys who adult (*akil baligh*) usually didnot sleep in the house. Sometimes they sleep in the small mosque or *surau* which easily found in their neighborhood area, and sometimes they also can slept in the rear *serambi*. Meanwhile, other bedroom generally available for married daughter and her husband.

UPPER SECTION

The *parak* (attic) is an open room without partitions encompassing the entire upper part of the main house. In everyday life, in accordance with the teachings of Islam, women are placed in a position of respect which protects them from being seen by strangers of the opposite sex without being properly attired i.e. without wearing a *hijab* (clothes that cover the female body except for the face and hands). For moslem women, the house is the place where women can have freedom from covering themselves from the sight of other non-family members (Md. Zohri, 2010: 30). However, when guests come to visit the *parak* is the most private place in a Malay traditional dwelling where women can remain undisturbed in a position of respect and nobility and where all females can do their activities without wearing a *hijab* or *jilbab* (head cover) because most people, especially men, are not permitted to enter.

In traditional Malay dwellings, the upper part (head) has a greater height ratio compared with the body parts. In traditional societies, the head has a divine function. There is an imaginary vertical axis that divides the residential symmetrical conical section from the section above it. The interior roof support is of a simple post and beam construction which is primarily used on all structures, (see Sim, 2008: 19). In Malay, the beam or king post is called "*tunjuk langit*" (sky pointer) (Abd. Rashid and Dawa 2005). This is because it points vertically to the "sky" from inside the house. As further confirmed by Abd. Rashid and Che Amat (2008), in Malay architectural terminology, *tunjuk langit* often refers to the elements of the internal structural timber of

the roof. Since the sky is a place that is considered to belong to God and a heavenly place, *penunjuk langit* emphasizes the belief that all activities inside the house are forms of worship and will be sent directly to the sky where God lives.

4.3.1.d Anatomy of Structure

The structural design is intended to the building in order to stand properly and stature, to sheltering the occupant activities in inside, and also provide the security and the comfortability. Structures is the collection of systems which owned the functions and purposes in it parts and relates to each other.

STRENGHT

Strength is a crucial element that is realized in the form of design and spatial structuring of a house to ensure the safety of the occupants. In traditional Malay dwellings, sustained strength is primarily attained by the use of a species wood that is known for its high durability namely *belian* timber.

In all cases that were studied, the façades and structures were predominantly constructed from timber. In general, *belian* timber is used for the columns and beams in the construction of the stage structure of traditional Malay dwellings in West Kalimantan. Further support to the main structure is gained by the use of *belian* boards as walls to act as a skin. This combination of timber columns and beams covered by a skin of wooden boards makes the structure of Malay traditional dwellings more robust. As mentioned by Zain (2003: 111), the walls, in addition to functioning as room boundaries, also act as stiffeners of the structure. Wooden boards provide rigidity to the structure by binding the columns and beams both vertically and horizontally.

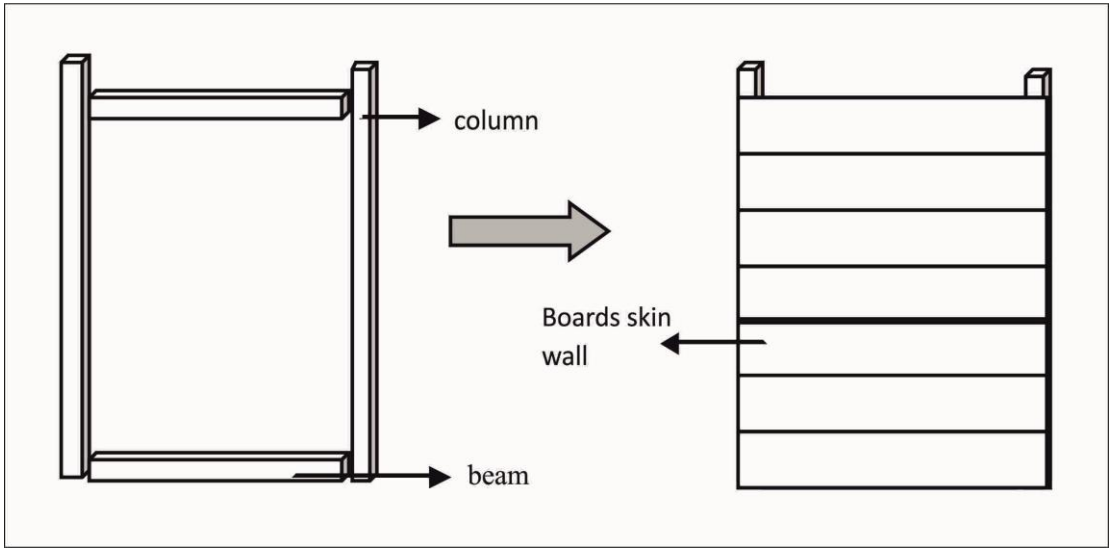


Figure 4.32.
Boards attached to columns act not only as room boundaries but also as stiffeners by binding the column and beams

The essential characteristic of the main structure of the traditional Malay dwellings is the use of timber which extends from the foundation up to the roof structure. Here, the extended timber is used not only for the foundation but also for the columns. This extended timber is placed on an established grid. Usually, the main columns are strengthened by beams which go through the columns to become the basis of the floor and are also found at the top of the structure.

STIFFNESS

In several cases, reinforcement of the house stiffness is found by adding bracings. Bracings are beams which are placed diagonally at the top of the wall structure in each corner of the building of the main house. Bracings serve as stiffeners for the structure so that it is not distorted due to internal loads such as the weight of the roof structure and external forces such as high winds.



Figure 4.33.
Beams to strengthening of the house stiffness with bracings is found in the main house corners of case A. 4.2.

The blackish color of the *belian* timber from being weathered further strengthens the impression of solidity of the building shape. The timber used as construction material can be classified based on the structures, namely the main structure (foundation, posts, etc.) and the support structure (wall, roof, etc). For the main structure first class timber, such as *belian*, was used, while the support structure used second class timber such as *jelutung*, *selimpau*, *rengas* etc. Meanwhile, according to Sim (2010: 19), the hardwood timber usually used for the traditional Malay dwellings are *cengal* (*Neobalanocarpus heimii*), *belian* (*Eusideroxylon zwagerii*), *merbau* (*Intsia palembanica*) or *resak* (*Vatica spp*), while part of the walls use *belian* board. Furthermore, Sim (2010: 20) also mentioned that the secondary structure (such as rafters, floor joists, wall studs, window frames and door frames) and other non-structural members are made of moderately hard timber such as *meranti* (*Shorea spp.*) and *jelutong* (*Dyera costulata*).

The walls of the main house in all cases have a well refined texture on all sides which sheds rain water without seeping into the timber fibers. The wall element is constructed with tight tongue-in-groove connection (*sambungan lidah*) - the traditional wood connections - to protect the facade and the main structure from weathering.

The installation of wooden board for walls of the main house also varies. Wooden boards are installed horizontally on the front and rear walls, while side walls are install vertically. The wooden boards are installed in a tight formation and are assembled adjacent to each other. Generally, the wall layer does not use nails as a binder but the wooden boards are installed in a cavities beam that serves as a rail. The cavities beams are installed on the top and bottom or left and right at each end of a wooden board.

At the support houses, the skin walls are also formed by wooden boards and are usually connected with the *susun sirih* system (the traditional systems of wooden board connection). This system is similar to clapboard siding where wooden boards are installed slightly overlapping each other but the essential characteristic found in these houses is that the walls of the support houses are not completely covered in this manner. Usually the walls installed on the three sides of the support houses meanwhile one other side (which is close to the main house) was not given the walls or commonly found with the half wall. In several cases, the walls is installed only on the outer side of the support houses which also functions as the boundaries. On the side where the fire place (*tungku*) is located, at the top of walls are given pitted for air circulation or a small balk is made of wood with the dimensions of 3 cm x 5 cm referred to as *reng bar* or battens are mounted to create gaps.

As viewed from the outside, the main house's wall contours are generally flat and smooth in appearance due to the *sambung lidah* or tongue-in-groove system of construction used whereas the *susun sirih* or clapboard construction for the support house have jagged contours.

The main and support house's outer layer of walls with their relatively few openings are, according to the Malay, to restrict anyone from outside from viewing the interior while not restricting incoming or outgoing sounds. In this way, Malay communities can maintain the privacy of their females from being seen by anyone who is not *muhrim* (a close relative of the opposite sex). Building elements such as entrances, doors, windows and rooms are arranged to provide total privacy and freedom for the family members (Md. Zohri, 2010: 31). Commonly, doors are always opened during the day. If the house has many doors only the front door of the main house is formally opened whereas other doors including that of the support house is always closed. Windows (particularly on the the living room and bedroom(s)) are always opened during the day, and placed at quite a height from the floor so that when women are seated in the room they cannot be seen directly from outside. There are 3 additional ways that also hinder the direct view of the interior from the outside as follows:

- using curtains,
- making a hitch from a row of wooden beams sprawl; and,
- installing another part in a window which can open it partially..



Figure 4.34.
The pairing of curtains in the window of case A.5.3. and A.10.1.



Figure 4.35.
Pairing of the curtains and the wooden beams sprawl in the window on case A.1.3.

There are two types of skin or wall contours found in traditional Malay dwellings namely those of the interior and the exterior. Ching (2000: 18) mentions that image of a plane has particular characteristics to support the shape i.e. the contours, the surface of color, pattern and texture. The exterior view of the wall contours of the main house is generally flat due to the use of the *sambung lidah* (tongue-in-groove) wood connection system which enables less differences in the surface elevation of the wooden boards, whereas the surface differences found at the wall surface of the support house which uses the *susun sirih* (clapboard) wood connection system causes a jagged contour. However, jagged wall contours of the interior of both the main house and the support house are found because of the structural appeareance of columns and beams which provide a graciousness to the structure.

The pattern created on the wall surface of the main house and support houses usually provide balances between solid and void in each created grid. Voids are created from the windows and doors with their well balanced patterns on the grids as well as the whole of the wall surface along each side.

Generally, the wall surface of the main house is found to be far more smooth textures than that of the support house. This is due to the use of planed timber for columns, beams and boards in the main house, while rough unfinished material is used in the construction of the support house.

STABILITY

Confirmed by Zain (2003), the foundations of the Malay dwellings can be categorized into 2 types:

1. *Foundation with the continuous pads which consists of:*

a. Parallel to the horizontal axis

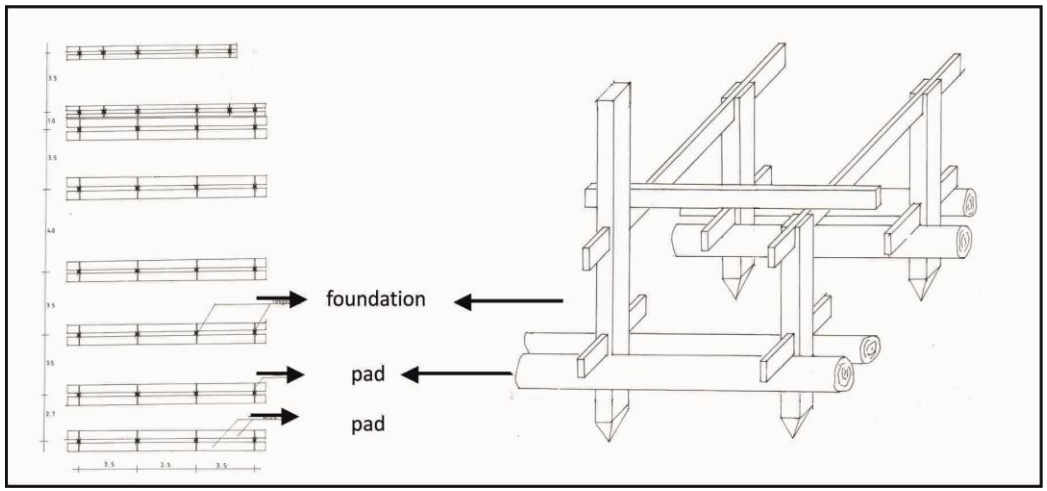


Figure 4.36.
Foundations with continuous pads which parallel to the horizontal axis

b. Parallel to the vertical axis

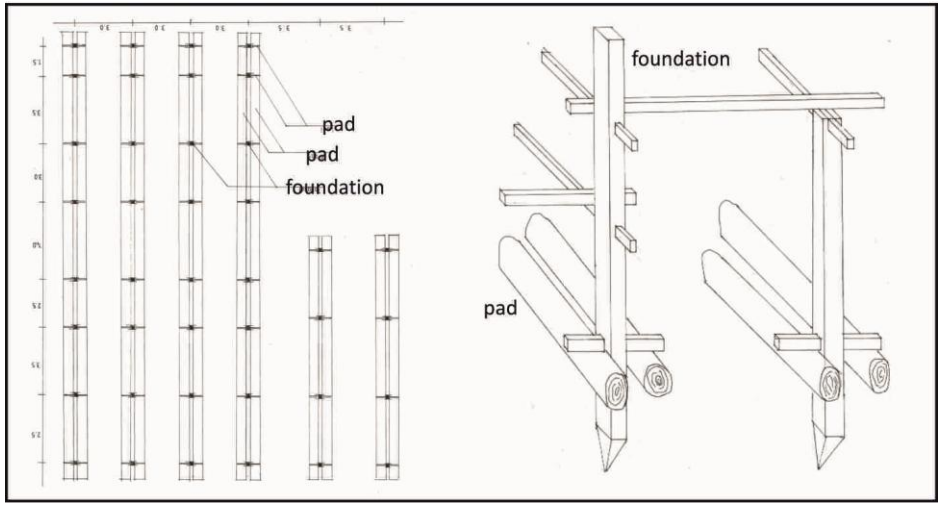


Figure 4.37.
Foundation with continuous pads which parallel to the vertical axis

The foundations with continous pads are usually used for buildings with a huge mass, such as the dwelling types of *Potong Limas* or *Potong Kawat*. In addition, the configuration of space and the grid is basically formed on a more complex pattern, with a large distance between the grid.

2. Foundation with local pads:

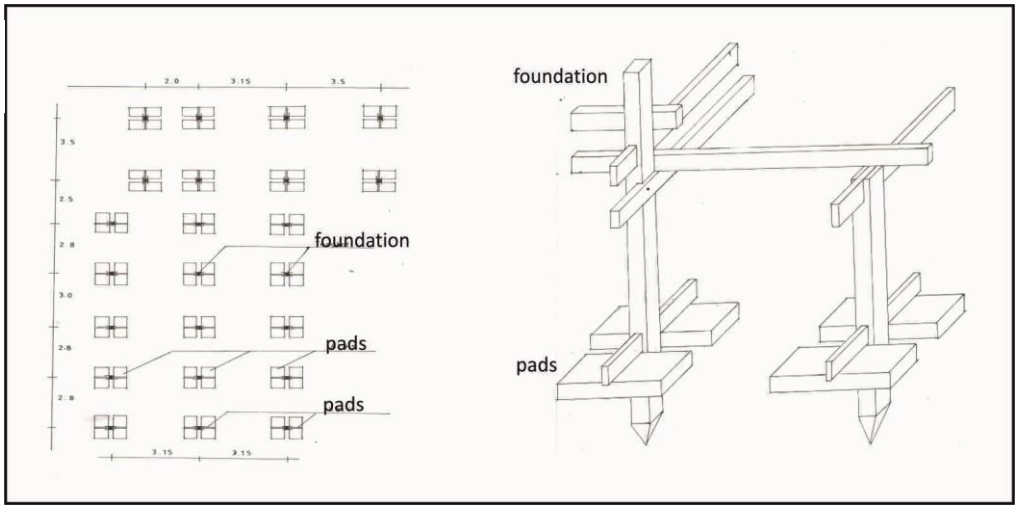


Figure 4.38.
Foundations with local pads

The foundations with local pads are usually used for buildings with a small mass such as for the dwelling types of *Potong Godang*. In addition, the configuration of space and the grid basically is not as complex as that formed on the dwelling type of *Potong Limas* or *Potong Kawat*, and the distance between the grid is also not as great.

Foundations found on the main house with grids of 3 and 4 use continuous pads, whereas foundations found in the main house with 2 grids use local pads. Support house foundations usually use local pads.

Confirmed by Zain (2003), pad direction of the foundation installation was associated with the local natural conditions of the locations. Pads were typically installed to follow the flow direction of the river or canal nearby. This was to reduce the impact of shifting of foundations due to loose pads. In addition, the pad direction was also installed in a crossed-position towards the roof structure construction to provide rigidity in the weight-bearing of the structure.

SYNERGY

Synergy in a building is intended to be the connections interlinked and working between different elements, and they work together to produce the same purpose which is not obtainable by one element only. The value added provided by the performance of building system as a whole and continues contributed independently by the sistem parts. Performance is indicated by a system that supports the building structure in order to stand up straight and holding the load it receives. Basically, the structure of the building system is a set of components that work together with common purpose: and synergy is needed to meet particular of the design needs and shown by the relationship between the parts, how they are interrelated.

Synergies in traditional Malay buildings, indicated by the use of the traditional connection system to connect the posts of the structure to one another. In the traditional Malay dwellings of Sambas, there are several types of timber connections which are used for spesific purposes. The connection types are as follows: a) the connection between boards and the columns and/or the beams for wall's constructions, b) the connection between beams and columns, the connection between door and wall structures, and c) the connection between foundations and the pads.

a) The connections between wooden boards and the columns or beams

There were 2 types of wall construction found in for this kind of connection i.e.:

- *The tight installation of wooden board attached on the beams and columns*

Generally, wooden boards used as walls are assembled in a tight formation to cover all parts of the main house. The composition of wooden boards installed either vertically or horizontally is inserted into and flanked by the beams or columns. The pinchers, if located above the floors gave the impression of floor differences between rooms, for example differences between front *serambi* to middle *serambi*. According to A(h)mad et. al. (2007: 278), The Malays often constructed their dwellings without any use of metal including nails. Instead they used pre-cut holes and grooves to fit the timber building elements into one another. Neither steel nails or wooden nails are found in dwelling construction. Strengthening is provided by the use of tongue-in-groove (*sambungan lidah*) connections which connect the boards firmly to each other.

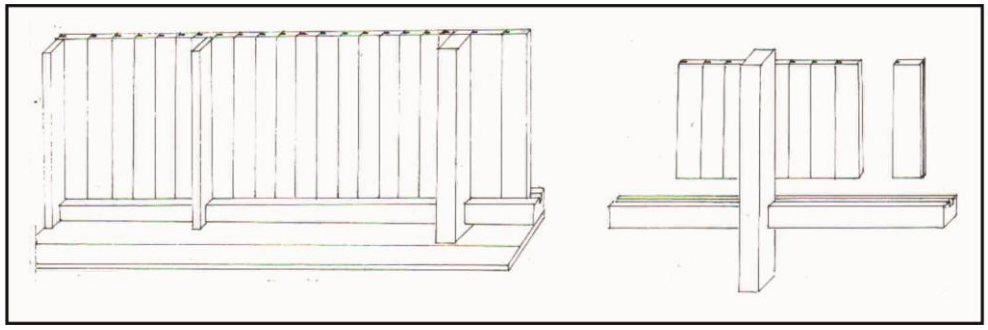


Figure 4.39.
The tight installation of wooden board with a tongue-in groove connection in the traditional Malay dwelling



Figure 4.40.
The pinchers give impression of the floor differences between rooms (the photographs was taken from the inside house of A.3.1.)

- *The super-imposed installation of wooden board attached to the beams and columns*

  Wooden board attached to the columns or beams using a clapboard (*susun sirih*) system and specific use as the wall's construction of the support house. The wooden boards are installed horizontally pressing upon one another and are fastened by steel nails.

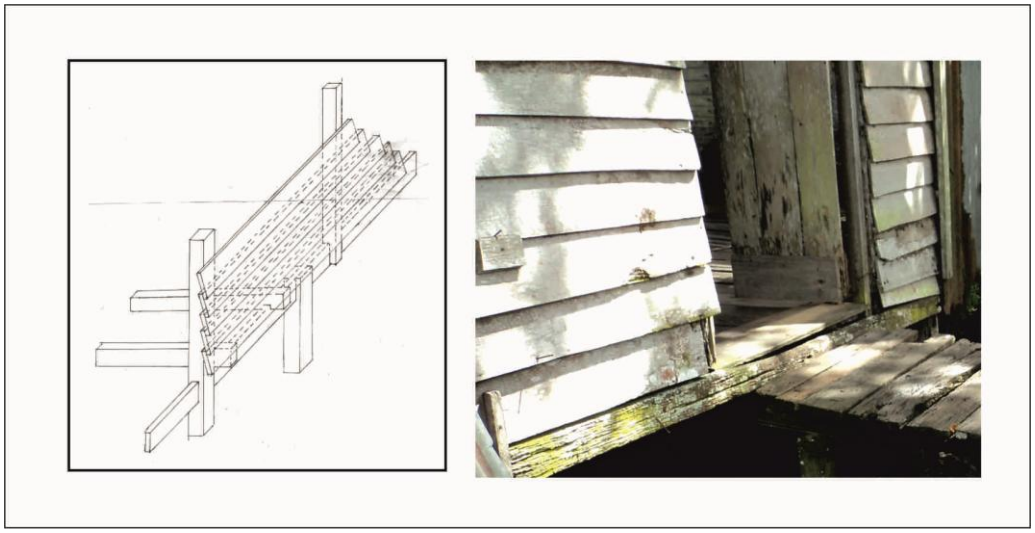


Figure 4.41.
The wooden board attached to the columns or beams with a clapboard system – sistem susun sirih. (photograph was taken from the outside house of A.3.1.)

b) The connections between columns and beams

A variety of connections between the beams and columns are found in the traditional Malay house. Most importantly, wooden nails (*pasak*) were used in this system of wooden connections between beams and columns on the wall structure in order to strengthen the joints (Muhamad Rasdi et.al., 2005: 46). The wooden nail connections are commonly found in the structure parts, such as connections between the bottom structure to the middle structure or between the middle structure to the upper structure. However, there are different treatments of the connections depending on the particular structure, which in this section are usually not given binders. These treatments were found on the beams to the wall structure which were placed through the columns without binders. One other type of connection between beams

and columns commonly used is the connection of hole and pin (*lubang* and *pen*). This connection was found on railings and the frames of doors or windows.

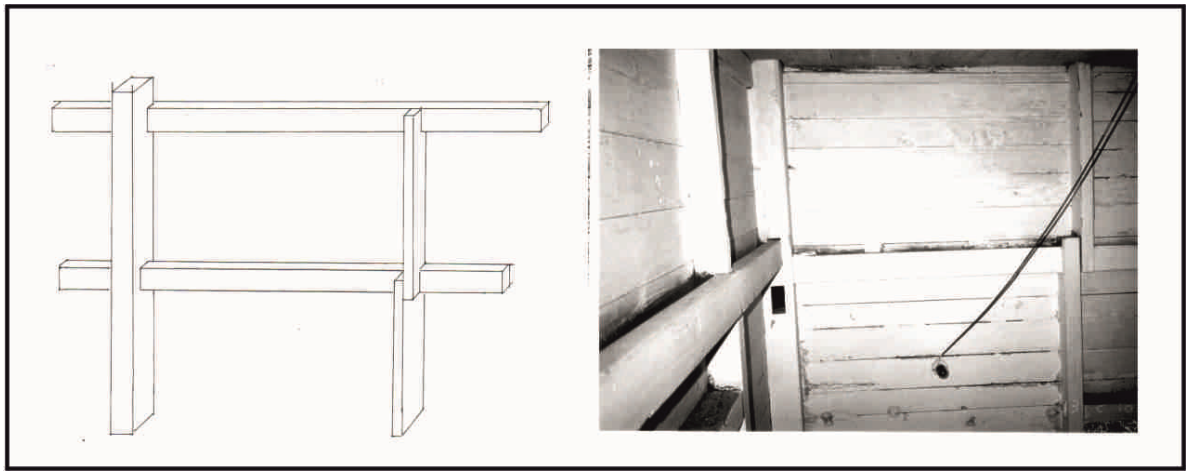


Figure 4.42.
Connection system of the beams and columns on the walls structure of traditional Malay dwellings (photograph was taken from the inside house of A.3.1.)

Floor structure connections also did not use wooden or steel nails. The wooden boards were placed on the support structure and were strengthened by the structural weight which pressed upon it from above. The wooden floor boards were placed in this way so that they would make a noise when tread upon as these boards are not nailed down. By this, it was intended that the occupants would immediately hear if someone else entered the house without permission.

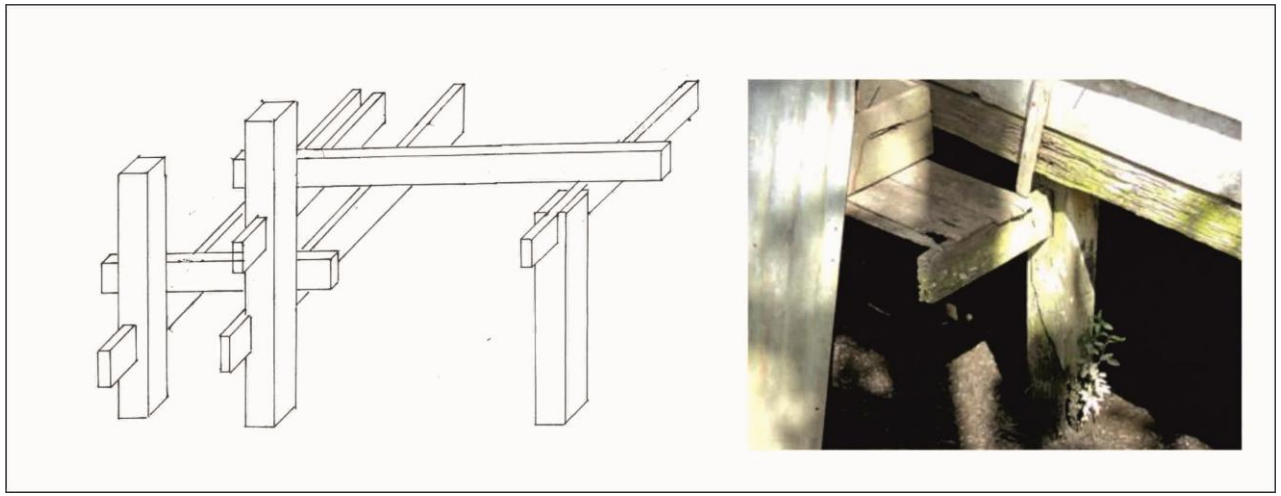


Figure 4.43.
Beams and columns connection on the bottom structure of main house. (photograph was taken from the outside house of A.3.1.)

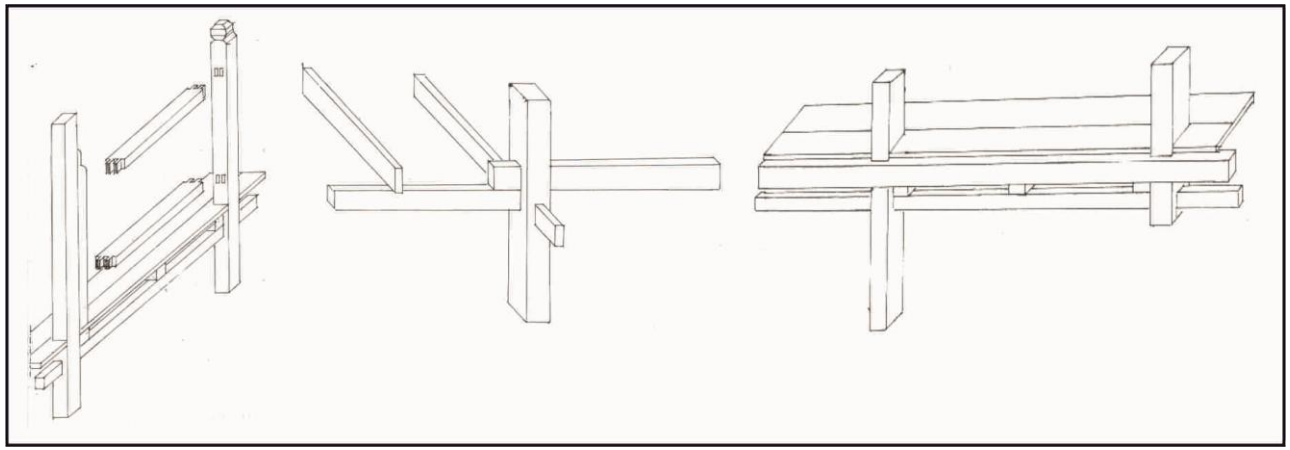


Figure 4.44.
Beams and columns connection on the fence or floor structure of main house

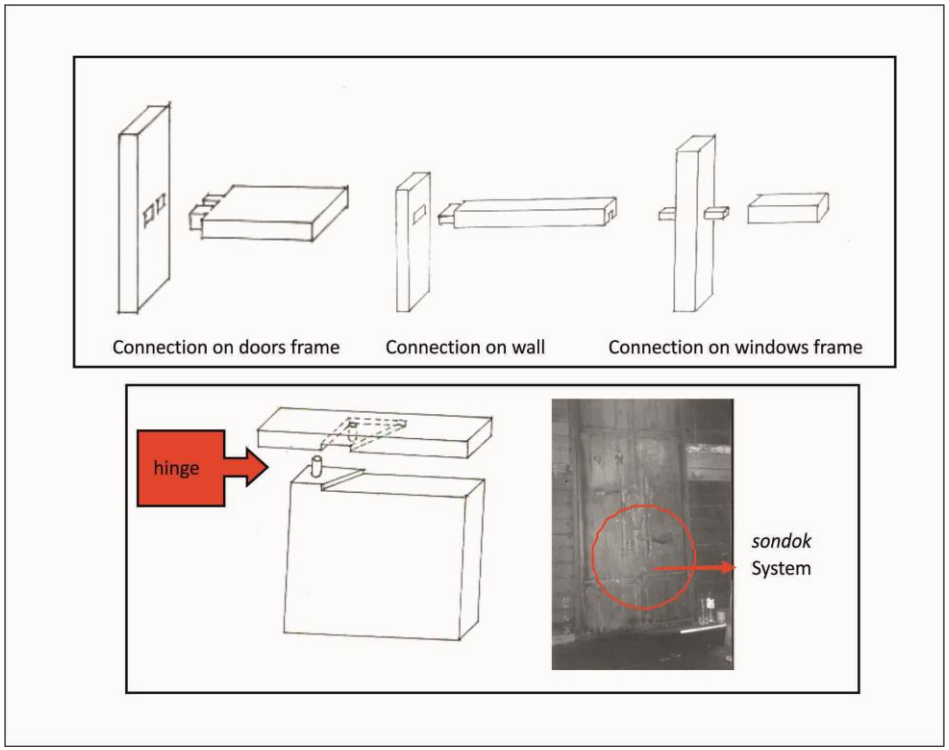


Figure 4.45.
Variations of the system connection type on the traditional Malay dwellings

c) The connections between foundations and pads

The wood connections which rely on the force of gravity were also found in the connections between the foundation with the pads. The horizontal beams at the bottom structure is supported and held by the pads without bindings. In #1, the connections between the foundations and the pads can be seen because they were placed above the ground.`

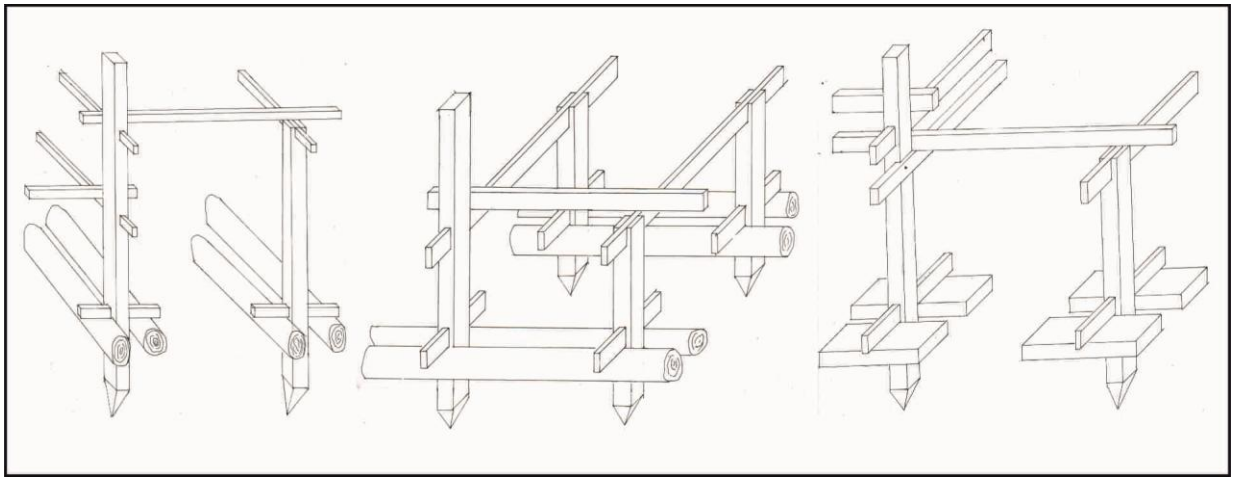


Figure 4.46.
The connections between foundations and pads on the traditional Malay dwellings

EQUILIBRIUM

Equilibrium is defined as a condition in a state of the balance and the mutual influences between the artefacts with the surrounding environment. Equilibrium in the traditional Malay dwellings is achieved in the relationship between buildings as a place to stay with their surrounding environments and as a location which is affected by the buildings. The condition of balance is achieved by the design adjustments made so that the buildings cause the least amount of impact on the surrounding environment. The stage house is used as a place to avoid wild animals but it also makes an effort to not cover the ground surface. The covered ground will preclude water infiltration into the ground and while on the other hand, uncovered ground certainly will not prevent the drainage of water in the soil surface. Natural conditions are vulnerable to the changing conditions the tidal river makes so the traditional Malay dwelling design is created to be in equilibrium with the river as well as the ground conditions.

Traditional dwellings as artifacts which are always competing with the environment, are designed to engender equilibrium conditions to the building design which is adapted to the local environmental conditions. These types of adjustments were found in the architectural elements in all cases especially with the number of openings and the roof slope. Both these elements were designed to create a balance between the needs of the occupants' comfort and adaptation to the natural conditions encountered. The large openings create cross ventilation for air flow for the occupants' comfort as well as to take advantage of the abundance of sunlight to illuminate all rooms (GhaffarianHoseini, 2011: 99-100). The roof slope is beneficial for providing quick drainage rain water into water tanks to supply potable water for daily consumption (Sim, 2010: 20).

4.3.1.e Anatomy of Aesthetics

The aesthetic values of the Malays traditional dwellings is found in its identification of the contents. The content that identified could be found in the overall design of the main house house or the attached ornaments of the house elements. According to Muhamad Rasdi (2005: 51), there is unwritten rule that in the support house, kitchen unit, is always the simplest and undecorated, of all, reflecting its purely ulitarian role. Contents increase the aesthetic value of the Malay traditional dwellings, but also the significance of the placement of elements in the house to provide meaning to the design. The meanings and significances are associated with the Malay culture and Islamic religious principles adopted by the Malay people (Hussin et.al., 2010; Said, 2002).

ELEMENTS OF DESIGN

Use of the basic of design elements such as triangular shape, square and circle dominate all the ornament parts of the Malays traditional dwellings. This basic element forms to show the beauty of the created rhythm, prominent facade image established or strengthening the element. According to Said (2002) for the research on woodcarvings on Malay Peninsular houses found three to four fundamental principles regulating the design of the carving including symmetry and balance, repetition, order and harmony. Meanwhile Zulkifli Hanafi (2000) in Kamaruddin and Said (2008b: 91) mentioned that floral (flower motifs), calligraphy and geometry are the 3 major type of motifs in Malay woodcarvings.

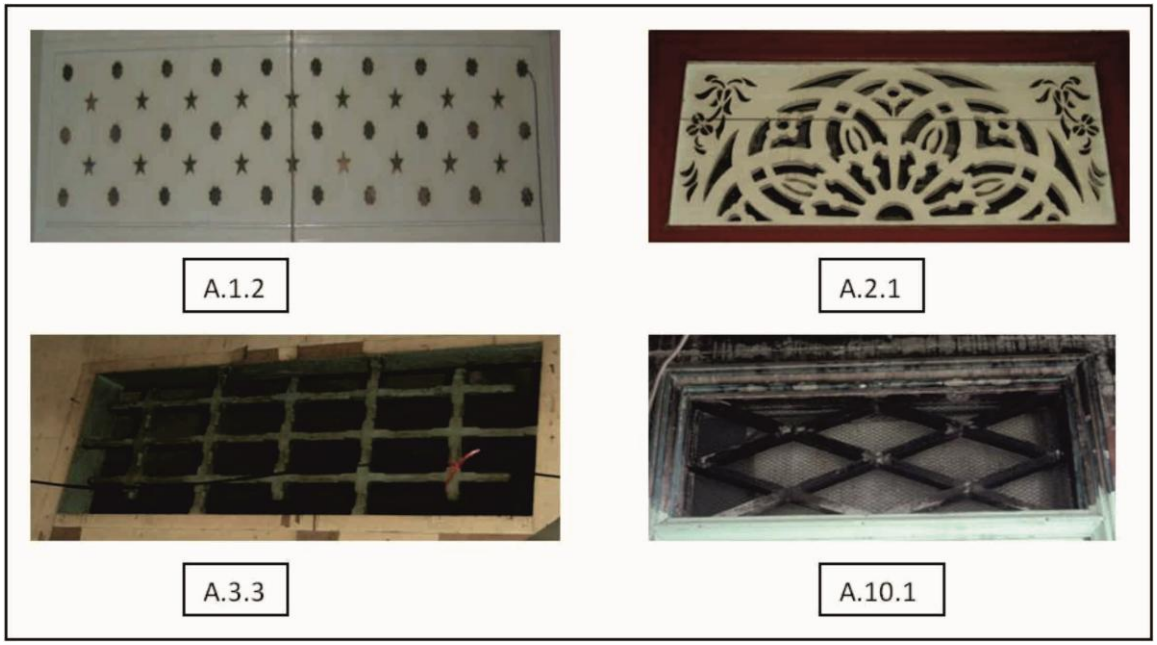


Figure 4.47.
Principle of geometry on ornament at the top of door of The Malay traditional dwelling

THE PRINCIPLE OF ORNAMENTS

Composition principles invoked to reinforce the beauty of the Malays traditional dwellings is found in the form of:

- **Axis**

  An axis is formed by two points in the shape, and can be arranged a regular or irregular position. The axis should be in linear form and terminated on both ends. In traditional architectures, the axis was used as a tool for organizing forms, which are found in the balanced ornament shapes (Kamaruddin and Said (2008b: 92). Axis is found in several types i.e.:

a. semi-circular ornament pattern with the central axis

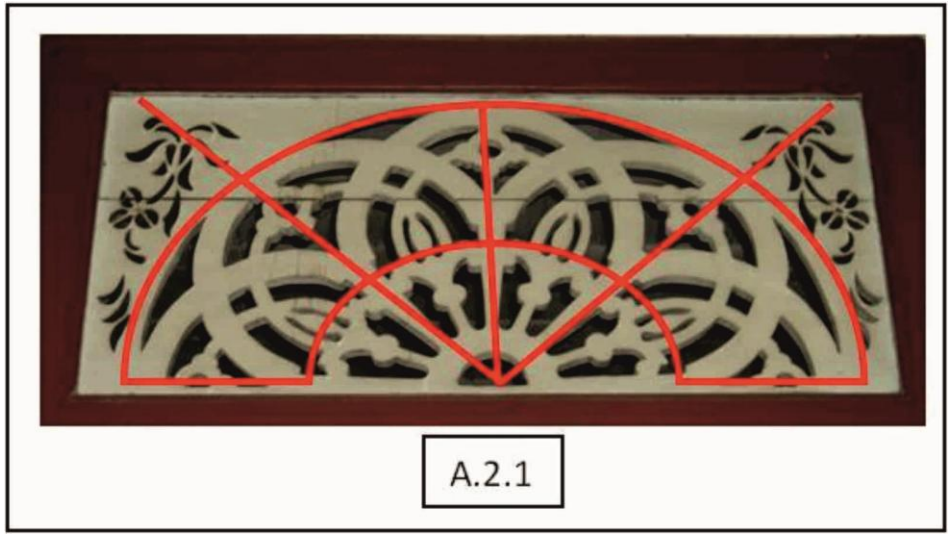


Figure 4.48.
The semi-circular ornament pattern with the central axis (photographs was taken from the ornament of A.3.1.)

According to Kamaruddin and Said (2008a: 111), the semi-circular ornament pattern represents the rendition of the curvilinear and foliated pattern according to the ordering principles and It is a suggestive indication of the concept of growth to reflect the affinity to nature

b. The pattern of square grids ornament with a linear axis

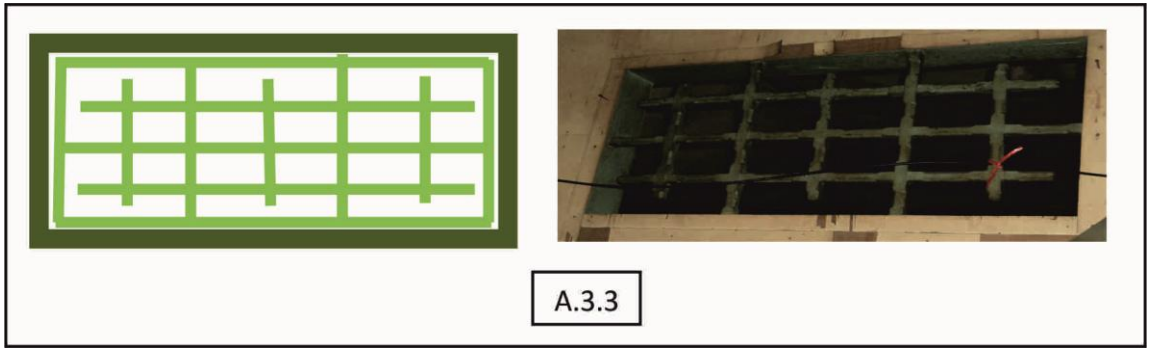


Figure 4.49.
The pattern of square grids ornament with a linear axis (photographs was taken from the ornament of A.3.3.)

c. The pattern of parallelogram grids ornament with a linear axis

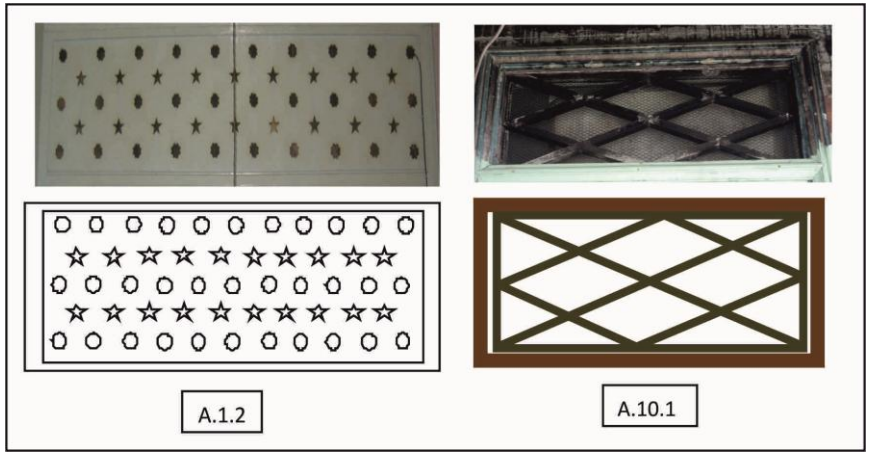


Figure 4.50.
The pattern of parallelogram grids ornament with a linear axis photographs was taken from the ornament of A.1.2. and A.10.1)

According to Kamaruddin and Said (2008a: 111), the pattern of the parallelogram grid on the ornaments gives the impression that this type of floral and geometrical pattern could also suggest a tessellation.

- **Symmetry**

  in the architectural composition of the traditional Malay dwellings, ornaments uses symmetry to organize the harmony and the unity of lines to the created forms (Kamaruddin and Said, 2008b: 92). In general, the ornament forms of Malay traditional dwellings categorized into two types, ie:

  a. Ornaments with the pattern of bilateral symmetry, ie a balanced arrangement of same elements then formed a pattern of ornaments which is balanced of volume and amounts. Such ornaments is presented from the linear axis which is form a uniform grids pattern of parallelograms or squares. Other motives such as circles, stars, shields, square or parallelogram, also often used to form the ornament with the specific grid patterns.

  b. Ornaments with the radial symmetry pattern, this patterns is often found on the ornament with geometric patterns (Othman Mohd. Yatim, 1989 and Abdullah Mohamed, 1990 in Hussin, 2010). These ornaments is presented from the pattern of a half circle with the central axis. Motifs are frequently used is flowers (Said, 2002: 47).

- **Hierarchy**

  Hierarchy on the ornament is refers to the difference in meaning and degrees of emphasis of ornamentation created. Placement of ornaments in rooms with the functional roles and symbolic

meanings is also play an important roles in giving emphasis on rooms of the organization. Hierarchy of certain forms on the ornaments of the traditional Malay dwellings is found in form of:

a. The forms of welcoming guests ornament, which was placed on the front facade. Ornament of this is found on the railings or ladder at the front *serambi*, or the wall coverings bottom part of the front facade, or on the roof end of front facade.

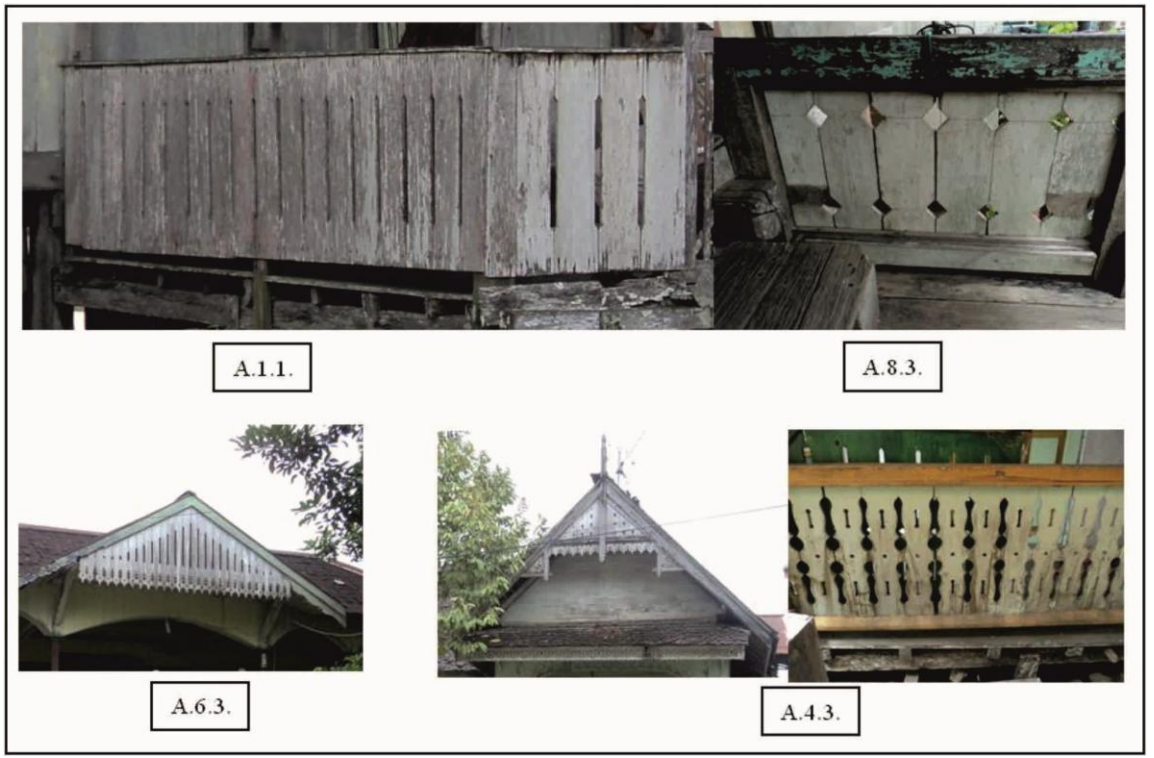


Figure 4.51.
The welcoming-guests ornament on the fence or ladder on the the front serambi, or on the roof end of the front facade



Figure 4.52.
The welcoming-guests ornament on the fence and ladder on the the front serambi, or the wall covers of the bottom part on the front facade of A.2.1

b. The forms of religous or local culture symbols are usually placed in a position above the head and out of reach of human hands. Symbols were created usually for people to reflect on themselves as Moslems, such as the motif of moons and stars (a symbol of Islam which is commonly found on the rooftops of mosques in West Kalimantan); and in several cases, the ornaments are associated with the local culture symbols, which are influenced by the culture in the past and merely involved in new interpretations by the design of new functions and meanings for the exixting pre-Islamic forms and structures (Abd. Rashid and Dawa (2005). Further more also by Abd. Rashid and Dawa (2005), these ornaments also called as *tunjuk langit* or finials which defined as crowning structures on gables and they predominate on gable-ends for architectural, aesthetic and superstitious reasons. Ornament on the roof element as the motif of *tolak bala'* as the symbol of the catastrophe avoidance for occupants of dwelling and a symbol of the existence of a higher being of the spiritual world or the symbol of noble status in the community such as rich people, *penghulu* or representatives of the Sultan (Abd. Rashid

and Dawa, 2005; Abd. Rashid and Che Amat, 2008; Irene Doubrawa and Ferenc Gábor Zámolyi in Feest et. al., 2007).

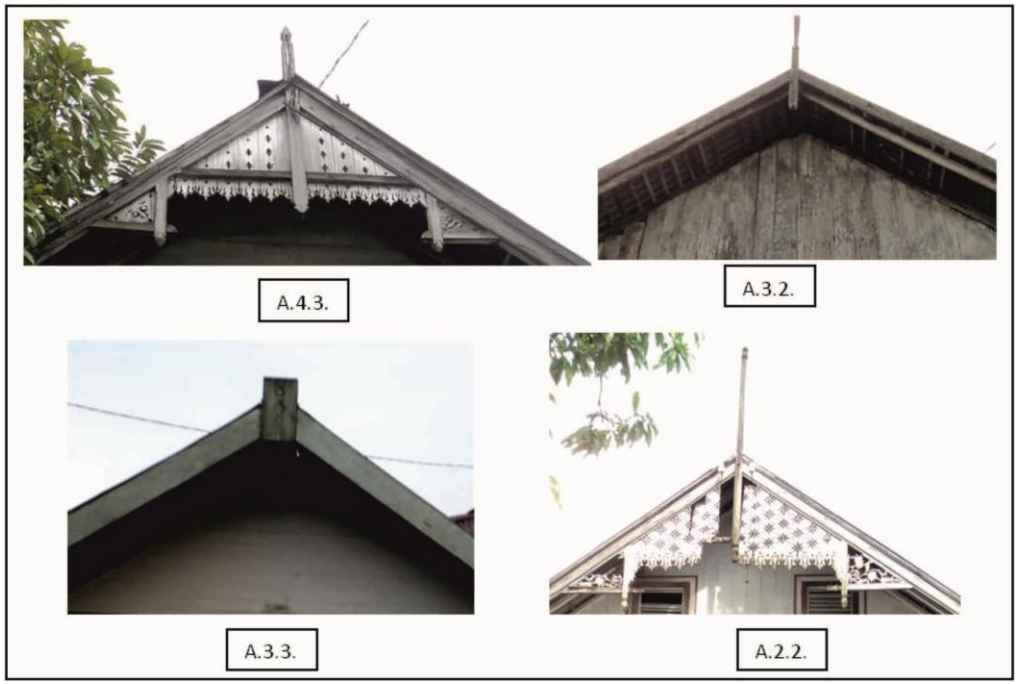


Figure 4.53.
Ornament of tolak bala (the catastrophe avoidance)



Figure 4.54.
The moon-star ornaments, symbols of identity as a Moslems (photograph was taken from the ornament of ventilations of A.1.2.)

- **Perception of order and the proportional schemata**

Perception of order on the ornaments of Malay traditional dwellings is based not only on the symmetry and balance, but also is found in the basic shape of rhythms and repetitions (Kamaruddin and Said, 2008b: 92). Symmetry and balance is found the ornamentation at the vent, while the rhythm and repetition is found on the end roof ornaments and railings. Hussin et.al., (2010) The basic forms found in traditional Malay house ornaments are generally taken from the motifs of flowers, moons, stars, squares and shields. But ther were not found any animal motifs, because the Islamic teaching forbids the Moslems from drawing or installing the ornaments which resemble living creatures such as animals or human beings (Hussin et.al., 2010; Said, 2002: 48; Muhamad Rasdi, 2005: 51).

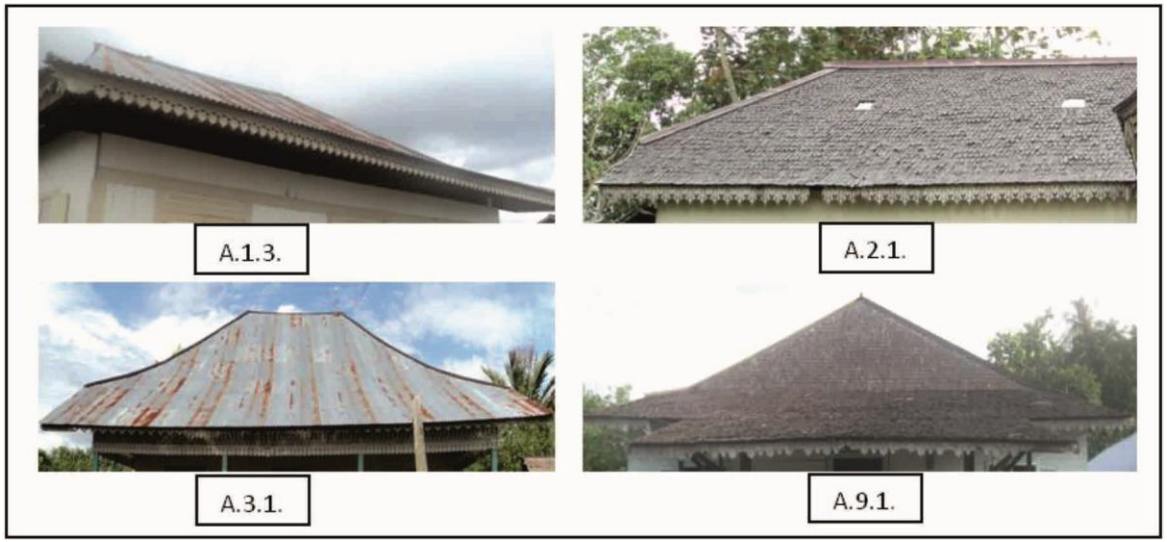


Figure 4.55.
Rhythms and repetitions at the roof end ornaments of the traditional Malay dwellings

- **Expression**

Expression is the image presented to the observer about the aesthetic values. In the traditional Malay dwellings, expression indicated the openness of the occupants. Malay people always carrying out in their activities according to the teaching of the Islamic religion to interacts with others, therefore their provides a lot of openings and colored glass on parts facade to express the the warmth people Malays receive visitors and interact to the anyone. Likewise, to the ornaments is placed on the the element aimed to give the identity of the house owner as the adherents of Islamic religion (Nagata 1974: 96). This expression is manifested as the a star-shaped ornament on the railings or wall, calligraphy etc.

- **Sequence**

Sequence is strengthened by providing ornaments to the particular rooms. Specifically, motif ornaments are placed to provide particular symbolic meaning to the forms adapted to the function of rooms. Zumahiran B and Said (2011: 16) was found the differences in the carving design were influenced by the functions of the two primary spaces allocated as guest reception areas. There is a clear division of the house into various spaces including the male and female guest reception areas. The allocation of the two separate areas designated for men and women in the house is parallel with the Islamic practices. Ornaments also provides the harmony of rooms to one another. Circle-shaped ornaments would provides the impression of softness to the rectangular shape as found in the door frame by provide circle ornament in the ventilation.

4.3.1.f Anatomy of Utilities

Utilities in the traditional Malay dwellings are necessary to provide convenience for the occupants to dwell in comfort while under the constraints of environmental conditions and extreme weather. The design of the traditional Malay dwellings is adjusted in order to enable the occupants to survive against these environmental conditions. According to Chadderton (2004: 3), people's basic needs are to maintain a constant body temperature, regulate metabolism and heat flow from the body to compensate for changes in the environment. Therefore, the building utilities which are required in a tropical zone are:

SUN RADIATION AVOIDANCE

In order to reduce the reflective effects of sun radiation, a traditional Malay house provides a canopy on the sides which receive direct sunlight. In all cases, the houses were given the canopy at the edge of each roof. Generally, the canopy extended from 1.5 meters up to 2 meters. In several cases, the canopy in the front is a structure completely separate from the main roof. In addition, the traditional Malay dwelling has also very distinct types the openings for windows and doors which are based on the function of each room. In the middle *serambi* where the guest room is, windows are installed with glass to maximize incoming natural daylight to illuminate the room as it is a public place to receive male guests, close neighbors, respectable people and elders. However, the opposite is found in the rear *serambi* where the living room and bedroom are located. The living room where female guests are recieved and the bedroom where parents and married couples rest are covered by massive doors and windows which can be adjusted to block incoming solar radiation if needed. A similar case is also found in the attic (*parak*) as well as in the support house where small windows with glass or other openings are made to restrict incoming sunlight. Both these places are

areas of activity and for rest for females. At midday, when most rest, very high intensity sunlight can be reduced through the partial closing of windows and doors of the rear *serambi*.

In the Malay culture of West Kalimantan, the front and middle *serambi* are considered public space that should be always "bright". The brightness provides convenience and joy in formal interactions, but it also illuminates the interior so that activities therein can be viewed from the outside. This brightness in public spaces is intended to avoid temptation (*fitnah*) of the neighbors from the activities performed by guests and occupants in the middle *serambi*. Instead, different types of windows and doors are installed in the private and semi-private areas in an effort to block excessive light as well as to ensure privacy. In particular, the rear *serambi*, bedroom, attic (*parak*) and the support house are spaces which have massive windows and doors installed that can block light for the activities of a private or semi-private nature. Usually curtains are also added to windows to block light.

The intensity of light in rooms is also part of how the Malay maintain the honour of females while maintaining the defined male and female roles (Gibbs et.al., 1987: 7-8). Space for the activities of men are brighter, while the contrary is true of space for women's activities.

MODERATE THE EXTREME CLIMATE

The traditional Malay house has been designed to suit the local climatic requirements using various solar control devices and low thermal capacity materials (Tahir et.al., 2010: 37). Design adjustments to the traditional Malay house is required to adapt to the extreme weather experienced throughout the year in West Kalimantan. The high rainfall in rainy season, the extreme heat in the dry season and the extreme environmental conditions (such as that of tidal flows of the river) are the main factors that are encountered by

communities in areas where traditional houses are erected. Adjustments found in the traditional Malay houses of Sambas that used the proper materials and were properly designed were able to reduce the influences of these environmental conditions. It is all done by controlling the heating, cooling, humidity and the instability of the internal environment.

The use of low thermal materials in all parts of the house makes it possible to control excessive heating of the inside of the house during the day while the suitable design is used to maintain the warmth at the night and during the rainy season (Tahir et. al., 2009: 279). The huge masses of the building along with the large volume of the roof shape with its high-elevation slopes also contributes to temperature control. Humidity and temperature in every room is controlled through the incorporation of many large openings in each room of the house design. If the sunlight is necessary to provide the warmth to the room, the windows will be open during the daytime. The "skin" of the main house made of the wooden boards, whether as the walls or floor, is fitted tightly to avoid the entry of wind into the rooms. The level of humidity inside the house is maintained during dry season due to the stage structure that allows the house floors to absorb moisture from the water vapor which rises from the soil's surface (Wan Abidin, 1981: 27). Floor boards can be constructed with gaps to let the air circulate from beneath the house (Tahir et.al., 2010: 37). In addition, the large volume of each room which incorporates great openings also exerts a significant influence in keeping the rooms cool during the dry season. Air circulation is constantly taking place so that the internal environment can maintain a constant temperature in inside the rooms.

4.3.2. The architecture of Dayak longhouse

As mentioned previously, the Dayak longhouse of each Dayak sub-ethnic group has its own characteristics that are adapted to local environmental conditions. The longhouses of several sub-ethnic Dayak communities usually have an open platform at the front, but in the longhouses of the Tamanic sub-ethnic group do not have these open platforms. Instead, the Tamanic longhouses have one unique feature that is not found in those of other Dayak sub-ethnic groups: the presence of a pavilion (hereafter refered to as *pendopo*). A *pendopo* is a small building situated at the front of the longhouse that functions as the main entrance. The *pendopo* is distinctive with its small building mass and low floor elevation (built at a height of 50 cm above the ground); it has no walls but it has a wooden bench.

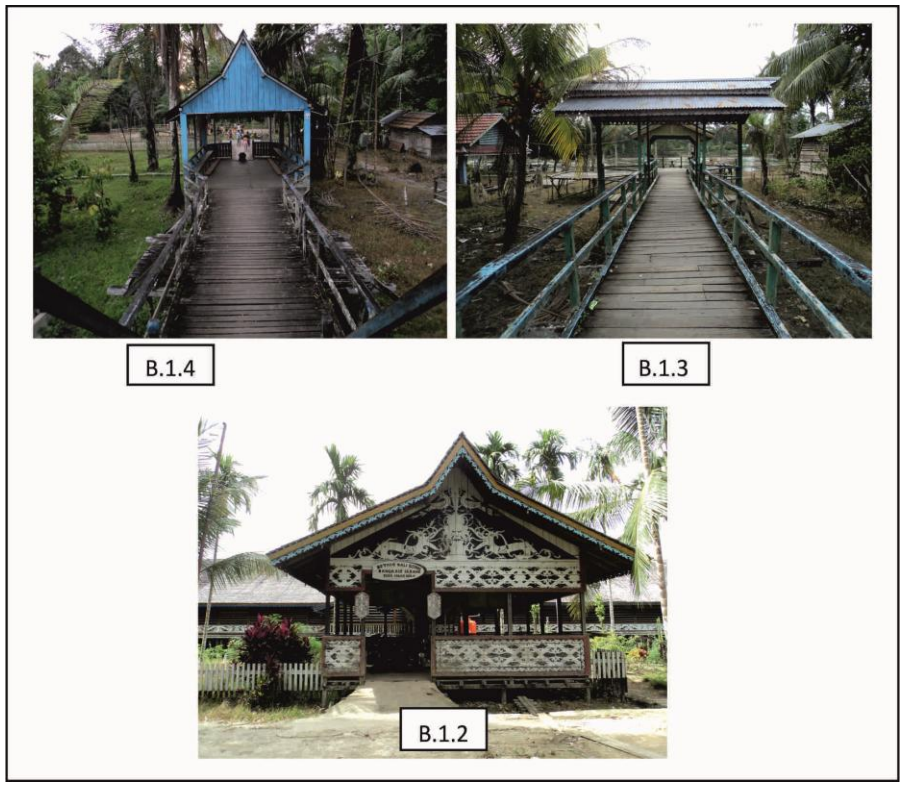


Figure 4.56.
The pendopo of the traditional Dayak longhouse of the Tamanic sub-ethnic

Therefore, the Tamanic longhouse can be identified by its two important parts, namely the pavilion (*pendopo*) and the main house. The *pendopo* with its small mass is used as the main entrance and as a recption

room to welcome guests, while the large mass of the main house is used as the place for the residents to do their daily activities. A complete layout of each longhouse can be found in the appendix **(**see figures on page 35 -42 of the appendix 2).

Two of the four longhouses surveyed and measured were very old buildings. The longhouse in *Ulu' Palin* village was erected almost one hundred years ago, while the longhouse in the *Melapi Patamuan* village has been standing since 1942. The longhouse in the village of *Bali Gundi* was built in 1996, while the longhouse in *Pabiring* village was erected in 1961. According to Lontaan (1975: 368-369) and Alqadrie (1990), and interviews with Sujarni Aloy in November 2010, it is only in the Tamanic communities that a distinct social strata or class system is practiced which determines the dwellings‘ construction and usage. The social strata is described as follows:

- The *Samagat* or *Semangat* (in English this refers to the expression of spirit) is the highest strata of the Tamanic community that resides in the longhouse. People of this strata usually act in leadership postions in the longhouses as they possess the highest social status in the Tamanic community. They have the right to work in the government and to act as the chief / leader of the community;
- The *Pabiring* or the middle class, are the people who actually could not be made into slaves, when slavery was practiced long ago during times of tribal war, by the *Samagat* but the *Pabiring* may be commanded by the *Samagat*. On the other hand, the *Pabiring* can also attain privileges which give them opportunities to actually become *Samagat*. This is possible when a *Pabiring* marries one of the *Samagat* and is able to pay "a customary marriage price". For example, in the past, a bridegroom might offer a slave or a human head from the activity of *ngayau* (war) to the *Samagat* as a requirement

of the marriage so then the status of the bride from *Pabiring* would be changed to *Samagat*. According to Lontaan (1975: 369), the change of *Pabiring* to *Samagat* is also accompanied by a traditional ritualistic ceremony called the *Menangga Puri* which includes the handing over a gong (*tawak-tawak*) along with other ancient objects which could endure for a long time. In this way, the offerings act as evidence for the future descendants that the change of status has occured;

- The *Suang tao'* or middle level, are the people who have been redeemed from working as slaves by the *Samagat*. According Aloy, the *Suang tao'* are generally estimated to make up the majority of the Tamanic community;
- The *Budak* or slaves, are the people who are usually acquired as the spoils of war among tribes in the past. The people of this group are regarded as the most poor, miserable and ignorant. The slaves could never be married to a *Pabiring* or a *Samagat*, but only among their own group or with the *suang tao'*.

According to current field survey results, the locals now refer to the *Suang tao'* as the *Banua*. What is more, the Tamanic do not practice slavery because there are no longer any tribal wars and also Indonesian law does not allow for the practice of slavery. Therefore, the current social strata of the Tamanic are the *Samagat*, the *Pabiring* and the *Banua*.

Of all the longhouses surveyed, three of the four houses were inhabited by all 3 social strata at the villages of *Sungai Ulu 'Palin*, *Bali Gundi* and *Malapi Patamuan* respectively, while the longhouse at *Pabiring* village was inhabited only by the *Pabiring* social strata. For comparisons of the longhouses‘ household compositions according to H. Garinang (62), the *Melapi Patamuan* longhouse which is comprised of 32 *biliks*, 11 *biliks* were inhabited by the *Samagat*, while another 11 *biliks* were inhabited by the *Pabiring* and

the other 10 *biliks* were inhabited by the *Banua*. The *Bali Gund*i longhouse which is comprised of 33 *biliks*, 11 *biliks* were inhabited by the *Samagat*, while another 9 *biliks* were inhabited by the *Pabiring* and the other 12 *biliks* were inhabited by the *Banua*.

The placement of *biliks* for the respective occupants also have special rules which must be followed according to the social strata within the community. Within the longhouse, the *Samagat* occupy the *biliks* the furthest upstream and the *Pabiring* occupy the *biliks* downstream while the *Banua* occupy *biliks* internmingled among the *biliks* of the *Samagats* and the *Pabirings*.

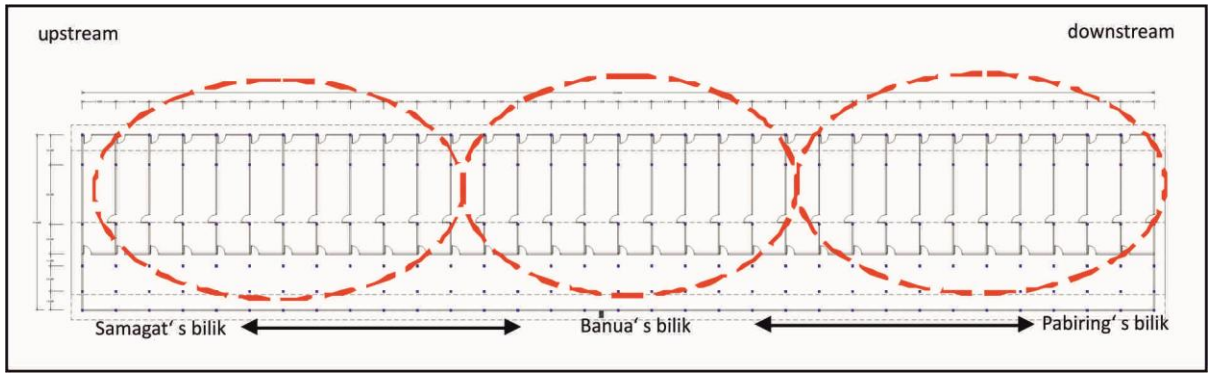


Figure 4.57.
Bilik's placement for Samagat, Banua and Pabiring in the Tamanic sub-ethnic of the traditional Dayak longhouse

The placement of the *biliks* based on social strata is not only meaningful but also has consequences in community life. The occupation of the *biliks* are ordered in such a way so that the *Samagat* effectively lead the community while the *Pabiring* can maintain community safety. As mentioned previously, the *Banua* who make up the majority of the population of the Tamanic communities are not considered to have the ability to defend nor lead themselves so that they must be placed in positions that offer the most protection by being under the authority of the *Samagat* and the guardianship of the *Pabiring*.

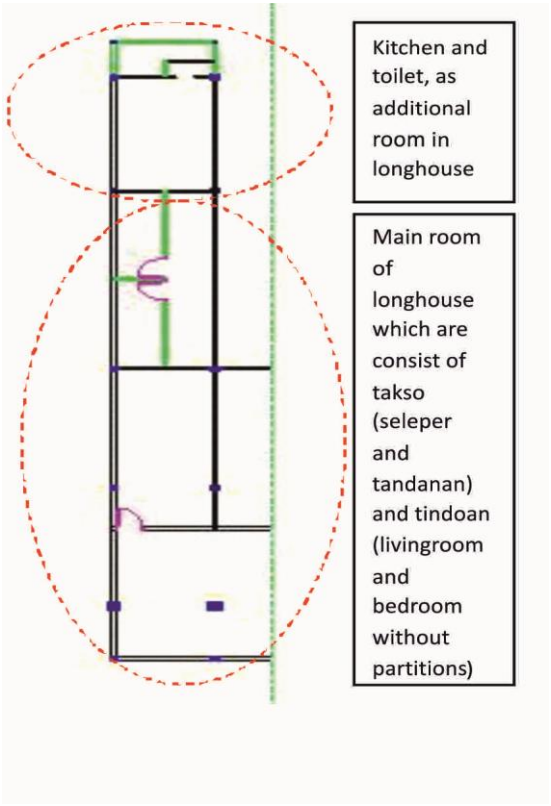


Figure 4.58.
Room division in Tamanic sub-ethnic of traditional Dayak longhouse

In addition, it is the *Samagat* that are responsible for keeping the customs and traditions in order to maintain their positions of authority as well as to ensure that the proper rituals of the community are practiced and also to avoid any misfortunes that may threaten the community. The most influential person of the Tamanic community resides in the *bilik* that is the further most upstream in the longhouse. This *Samagat* holds the position of *Tumenggung* which is someone who is appointed to lead the longhouse and its community. A *Tumenggung*, chosen by the *Samagat* themselves, must have leadership skills as well as extensive knowledge as an expert in *hukum adat* (customary law), *adat kebiasaan* (customary practices) and *adat kepercayaan* (customary beliefs). According to Lontaan (1975: 415) the *Tumenggung* is a leader who has the function as a customary chief, the leader of a village (*dusun*), head of religious beliefs or the head of the community leaders. Furthermore, the *Tumenggung* is a person who is greatly respected and obeyed by the whole of society in both communities that live in longhouses as well as in other houses nearby. The *Tumenggung* also settles disputes that occur in the community.

While the *biliks* at the opposite end or downstream are inhabited by the *Pabiring* who are warriors to lead armed conflicts between tribes, are obliged to maintain the safety of the longhouse from attack.

In the *Bali Gundi* village longhouse, the *biliks* were not built all at once but were modeled according to the financial ability of the prospective occupants. The previous longhouse which had been located alongside the river was decaying due to age so at the beginning of 1996, before the longhouse's first *bilik* was erected, the community conducted a survey ofwho wished to live in the new longhouse. The *biliks* were then arranged according to the social strata of each owner within the community. The ease of access to transportation for residents of the new longhouse was taken into consideration and it was decided to build the longhouse near the provincial main road. On July 31, 1996, construction began by first erecting the *bilik* which was owned by the elder of community of the *Samagat*, and then others continued to build their respective *biliks* according to the land lots which had been prepared according to community consensus. The *bilik* development was finally completed in 2003 and was blessed by a priest on 27 December 2003.

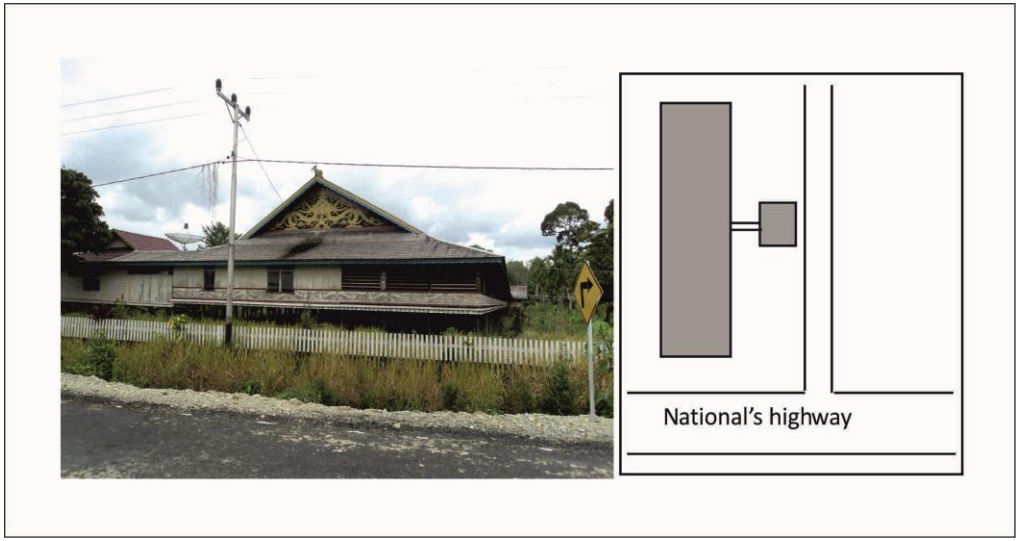


Figure 4.59.
The position of case B.1.2. to the provincial highway

The longhouse in the *Pabiring* village, a single strata village that is inhabitied by only the *Pabiring* and originally built in 1961, changed the orientation of the house facade. According to A.R. Mojasuka (in interviews on December 2010), the elder of the longhouse who has resided there since the beginning of 1981, the longhouse‘s facade was originally oriented towards the river. However in 1989, by the request of the *Bupati* (regent) of Kapuas Hulu Regency, the orientation of the facade was changed towards the road.

Another difference that can be found in Tamanic longhouses is a second floor or upper floor under the roof that can be used as an additional bedroom or for storage of personal items. The existence of this upper floor was found in the longhouses of all four villages i.e. the *Sungai Ulu' Palin,* the *Gundi Balinese,* the *Melapi Patamuan* and the *Pabiring* villages. In the of villages of *Melapi Patamuan* and *Pabiring*, the upper floor can be seen from the front facade, while in the villages of *Sungai Ulu' Palin* and *Bali Gundi*, the upper floor of the longhouses can be seen only from the inside through the *Takso* room. In the villages of *Bali Gundi* and *Pabiring*, the longhouses‘ upper floor is used as additional bedrooms and as a storage room for personal items. According to residents, the top floor on the *Bali Gundi* longhouse can also be used as a guest bedroom for visitors who stay overnight. On the other hand, in the villages of *Sungai Ulu' Palin* and *Melapi Patamuan*, the longhouses‘ upper floor is used only for storage of mats and farm equipment.

Tamanic longhouse development has also changed over time. When *biliks* were first established in the past, the longhouse generally consisted of three rooms: the *takso seleper*, the *takso tandanan* and the *tindoan* (Isbat, 2003: 34). The *tindoan* was one unpartitioned space, later on however, as Dayak social life evolved and the need for space developed, the *tindoan* space was partitioned into living room and bedroom areas. Additions of kitchens and bathrooms have also been more recent incorporations. Additions and partitions into

the spaces were found in longhouses in the three villages of *Sungai Ulu' Palin*, *Melapi Patamuan* and *Pabiring*. The greatest change over time has been the disappearance of the original concept of the longhouse as a single building. The main concept and organization of space in the longhouse at *Bali Gundi* village, is a better-organized arrangement for the establishment of space. This longhouse was constructed in two parts, the main house and the support house. The spaces in the main house are still traditionally maintained in their forms and by their locations, namely the *takso seleper*, the *takso tandanan* and the *tindoan*. However, the organization of the *tindoan* has been modified by the construction of partitioning walls between the living room and bedroom while the kitchen is now located in the back and is separate from the main house. This support house is connected by an open platform.

The width of each *bilik* in two of the longhouses were found to be in a variety of sizes while *bilik* sizes were uniform in two of the longhouses. Two methods of *bilik* measurement were used in construction namely, the tradisional unit of measurement and the metric unit of measurement. In the longhouses in the villages of *Sungai Ulu' Palin* and *Melapi Patamuan*, traditional units of measurement were used and widths of each *bilik* ranged from 2 to 4 depa'. The size of each *bilik* differed from one to another. When converted to metric units, the width of these *biliks* ranged from 1.70 meters to 1.80 meters. The largest *biliks* were owned by the *Tumenggung* and had widths of 4 depa', while other *biliks* ranged in widths of 2 to 3 depa'. The different measurement units were found in the longhouses of the *Bali Gundi* and *Pabiring* villages. The *Bali Gundi* village longhouse was built using metric units and it was found that each *bilik* width was 4 meters, while the uniform of width of 3 depa' for each *bilik* in the Pabiring village longhouse was used. In all cases, the *bilik* for the head of all the *biliks* or for the head of the community was placed at the furthest upstream end of the

longhouse. This first *bilik* that was the first to be erected became the benchmark for the other *biliks* that followed. In the longhouses of the villages of *Sungai Ulu' Palin* and *Melapi Patamuan*, the *Tumenggung's bilik* seemed to dominate the overall appearance of the building, esspecially the *takso* (*takso seleper* and *takso tandanan*). With its position at the upstream end of the longhouse, this *bilik* can have additional space in the front. According to residents, this is allowed because of the *bilik's* position upstream and it also shows the house's tenure of the *Tumenggung* of the community. As stated by Lontaan (1975: 416), the *Tumenggung* must be competent in leading the community to a life of prosperity. He must be authoritative and have expertise and knowledge in indigenous matters such as customs (*adat*) and be experienced in adjudicative matters relating to customary law. He must also be able to represent the village (*dusun*) when attending ceremonies which are held by neighbouring villages.

4.3.2.a Anatomy of Plan

SPACE GRIDS

Generally, housing measurements were based on human anatomy. All the measurements used in construction, including the elevation of the house, are based on the function of each room (eg. bedroom, living room, circulation space, etc.).

According to the findings of the team from the Agency of Planning and Development of Pontianak Regency (2009), the traditional dimensions used to form rooms in the Dayak longhouse are units of the human body sections (see figure 4.60). The measurements most often used are: the *Depa', the Seta, the Jengkal, the Badan and the Lengan*. When these units of measurement are converted into metric, approximate sizes can be obtained.

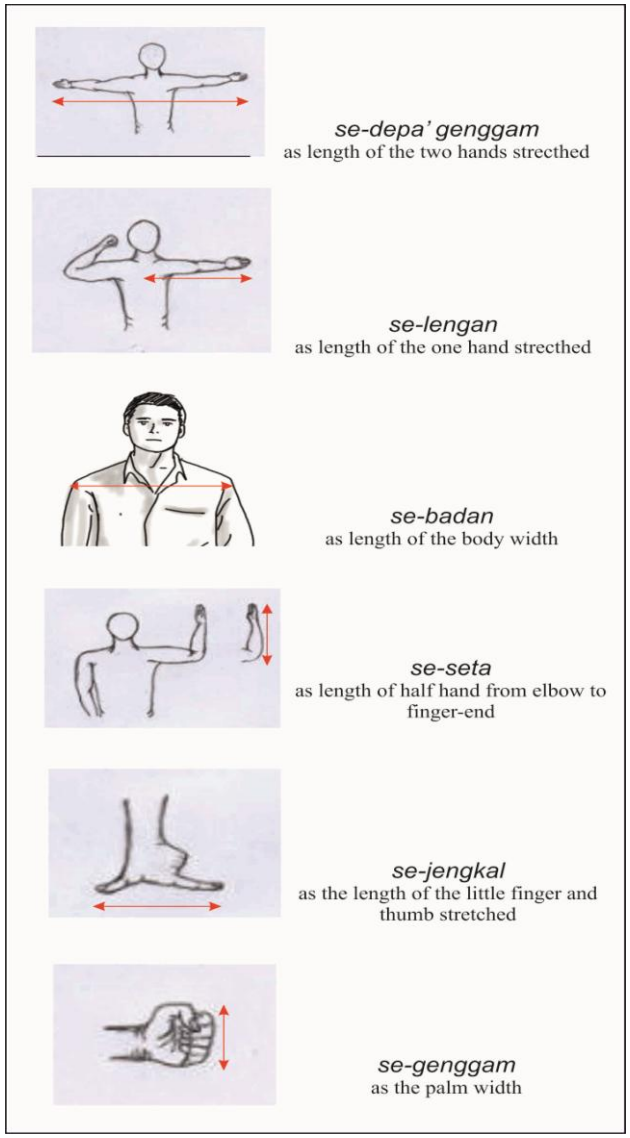


Figure 4.60.
The unit measurements of space in the Dayak Longhouse

Table 4.12.
Room's units and composition in the sub-ethnic Tamanic of traditional Dayak longhouse

No.	Cases	Width of each biliks	Takso Seleper	Takso Tandanan	Tindoan	Additional rooms
		units	units	units	units	
1.	B.1.1.	Varies (2, 3 or 4 depa')	1.5 depa'	2 depa'	4 depa'	Varies width of kitchens, several biliks owned bathroom
2.	B.1.2.	4 meters	2 meter	4 meters + 1 meter teluk	9 meters	Open platform (2 meters) and kitchen (8 meters) separated from the main house
3.	B.1.3.	Varies (2, 3 or 4 depa')	1 depa'	2.5 depa'	7 depa'	Varies width of kitchens
4.	B.1.4.	3 depa'	1.5 depa'	2 depa'	3.5 depa'	Varies width of kitchen

Table 4.13.
The conversion of the measurement units

No.	**measurement units**	
	Traditional units	**International units** (approximate sizes)
1.	Se- Kepal	10-12 cm
2.	Se- Jengkal (2 Kepal)	20 cm
3.	Se-Seta (2 Jengkal)	40 cm
4.	Se-Badan (2. Jengkal)	40 cm
5.	Se-Lengan (3 Jengkal)	60 cm
6.	Se-Depa Genggam (8 Jengkal)	170 cm

Table 4.14.
Conversion within the traditional measurement units

No.	**Measurement units**						
	Kepal	Jengkal	Seta	Sebadan	Lengan	Depa Genggam	Metrics
1.	10	5	3	2½	3	½ + 1 Jengkal	1 metre
2.				1 + 1			1 metre

In addition to the measurements which mentioned above, other traditional measurements also use the relative height from different sections of the human body. These measurements are often used as the basis to determining the height of doors, windows, fences and so on. The measurements most often used are:

1. *Se-lutut* (as the knee height)
2. *Se-pinggang* (as the waist height)
3. *Se-dada* (as the chest height)
4. *Se-bahu* (as the shoulder width)
5. *Se-dagu* (as the chin height)
6. *Se-taput kepala* (as the head height)

These units are convenient for the occupants of the longhouse as they use existing elements for a variety of purposes. For example: to calculate the height of window typically the height of the waist (se-pinggang) is used while the height of the backrest is usually according to knee-height (se-lutut), and so on.

No.	Measurement units		
	The height unit	In traditional unit	Approximately in international units
1.	Se-Lutut	2 Jengkal	40 cm
2.	Se-Pinggang	4 Jengkal	80 cm
3	Se- Dada	5 Jengkal + 1 Kepal Tangan	112 cm
4.	Se-Bahu	6 jengkal + 1 Kepal Tangan	132 cm
5.	Se-Dagu	6 jengkal + 2 Kepal Tangan	144 cm
6.	Taput kepala	7 Jengkal +2 Kepal Tangan	164 -165 cm

Table 4.15.
The height units: traditional versus metric

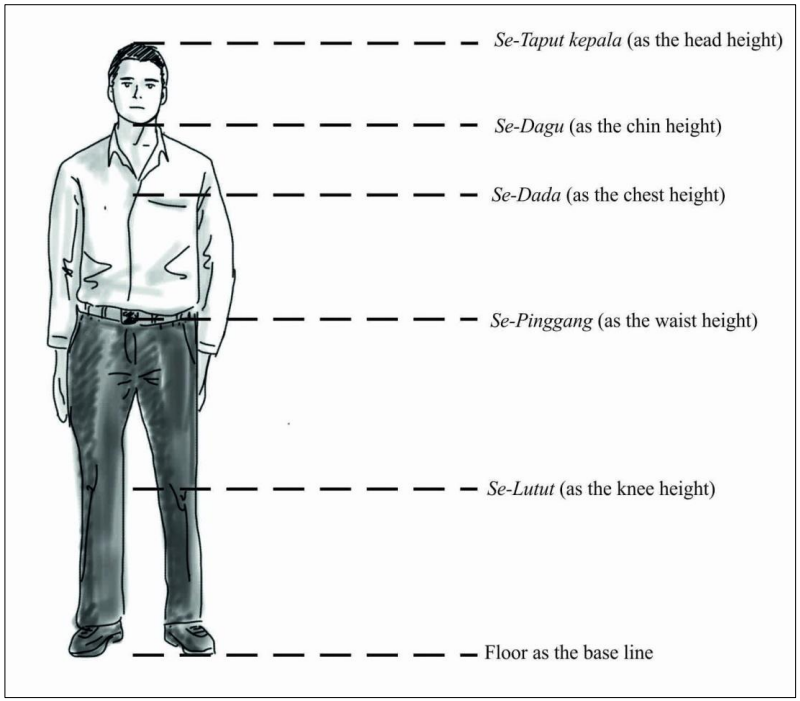


Figure 4.61.
The human body sections as a basis for the relative height of the traditional measurement units of the Dayak longhouse

Commonly, the width of each *bilik* is between 2 depa 'and 3 depa'. A circulatory path required for 2 persons passing through a room together side by side is a distance of 1 kepal respectively between each person to left, right and in between, so then the space is measured as 4 *jengkal and* 3 *kepal* or 5 *jengkal* 1 *kepal*. In areas for rest, the size of space is adjusted to the length of the human body when lying down for sleep. The length of the human body is equal to the length of the human hand when outstretched (i.e. 1 *depa'*) while the width of the human body is measured as 4 *jengkal*.

The units previously mentioned along with the width of space inside the *biliks* can be calculated in table 4.16. as follows:

3.4 metres = 2 depa' genggam = 16 jengkal		4.1 metres = 3 depa' = 24 jengkal	
circulatory = 5 jengkal 1 kepal	Bedroom = 10 jengkal 1 kepal	circulatory = 5 jengkal 1 kepal	bedroom = 18 jengkal 1 kepal
Could passed by 2 people with the distance of 1 kepal to each other	Could occupied by 1 person	Could passed by 2 people with the distance of 1 kepal to each other	Could occupied by 2 persons

Table 4.16.
The width of space inside the biliks in the traditional measurement units

The width of each *bilik's* space is usually adjusted to the requirements of an individual family and is based on the body size of the household head who will occupys the particular *bilik*. The household head calculates *bilik* width according to the number of occupants as well as his social status within the community.

The number of occupants in a single *bilik* may number between 6 to 8 people. In order to serve as an area for sleeping at night, a *bilik* space is usually divided into 2 or 3 rooms. One room may be occupied by up to 5 people. The bedroom is occupied by the parents, while the family room is occupied by the children. Overnight guests will usually sleep in the family room. In addition, for the *bilik* which has more than 1 bedroom, the additional bedroom is usually reserved for other members who also have a family.

The number of occupants in each *bilik* is calculated by the width of the human body plus space for movement during sleep and the space for circulation. As the direction of sleeping bodies generally runs from west to east, so the width requirement of one bedroom of each *bilik* is easily calculated. For 4 occupants in a bedroom, the calculation is as follows: 4 (occupants) x [the width of each body (40 cm) plus the sleeping movement space (40 cm)] + the circulatory space (5 *jengkal* 1 *kepal*). The total requirement of the bedroom width is (4 x (40 + 40) + 110 cm = 430 cm). Then, the width of a bedroom, according to these calculations, is 2 ½ depa. If calculating for 3 persons in a bedroom, the width required is (3 x (40 + 40) + 110 cm = 350 cm) so then the width of bedroom's *bilik* is at least 2 depa'. If calculating for more than 5 persons in each bedroom, the width requirement is (5 x (40 + 40) + 110 cm = 510 cm) which comes to at least 3 depa'.

Table 4.16 uses the conversion table to show the results of the field measurements (in metric units) converted into traditional units.

No.	Room's name	B.1.1.		B.1.3.		B.1.4.	
		metric	Traditional	metric	traditional	metric	traditional
1.	Takso seleper	2.3 m	If converted to the unit of body size (each of 40 cm), then this measurement is equivalent to 6 people who sit side by side	1.9 m	If converted to the unit of body size (each of 40 cm), then this measurement is equivalent to 5 people who sit side by side	2.5 m	If converted to the unit of body size (each of 40 cm), then this measurement is equivalent to 6 people who sit side by side
2.	Takso Tandanan	5.2 m	If converted to the unit of body size (each of 40 cm), then this measurement is equivalent to 13 people who sit side by side	3.74 m	If converted to the unit of body size (each of 40 cm), then this measurement is equivalent to 9 people who sit side by side	3.5 m	If converted to the unit of body size (each of 40 cm), then this measurement is equivalent to 9 people who sit side by side
3.	Tindoan	7.8 m	If converted to the requirement space of longhouse so then this space can be divided into 2 sections: a family room (the requirement units of 340 cm is a fairly space for 8 people seated side by side) and 1 bedroom with the circulatory (the requirement units of 430 cm is a fairly space to sleep)	12 m	If converted to the requirement space of longhouse so then this space can be divided into 2 sections: a family room (the requirement units of 340 cm is a fairly space for 8 people seated side by side) and 2 bedrooms with the circulatory (the requirement units of 430 cm is a fairly space to sleep)	12 m	If converted to the requirement space of longhouse so then this space can be divided into 2 sections: a family room (the requirement units of 340 cm is a fairly space for 8 people seated side by side) and 2 bedrooms with the circulatory (the requirement units of 430 cm is a fairly space to sleep)

Table 4.17.
Conversion of the measurement on the field survey to the traditional units

When assuming that a comfortable size for a bedroom is twice the length of the human body, where the length of the human body is equal to 1 *depa'*, plus space for circulation, the required length for one *bilik* would be as follows:

= 16 *jengkal* + 5 *jengkal* 1 *kepal*

= (16 x 20 cm) + (5 x 20 cm) + 10 cm

= 430 cm.

The sleeping position for the occupants in each room of the longhouse is lengthwise in the *biliks* where the feet are to the sunrise and the head is to the sunset. The sunset is considered to be a kind of "temporary death" of the Dayak in the living world while the sunrise is considered to be a renewal of life where the activities of the Dayaks are performed to contimue their livelihood. This also illustrates the cycle of life of the Dayak which is dependant upon the position of the sun, from its rising in the morning and its setting in the evening. The Dayaks believe that when they wake up in the morning, their faces should be facing toward the sunrise (*Matari tumuh*) so that they are brought back to life; alternatively, since sleep is believed by the Dayaks to be the condition of "temporary death", so the sleepers position themselves to avoid death during sleep.

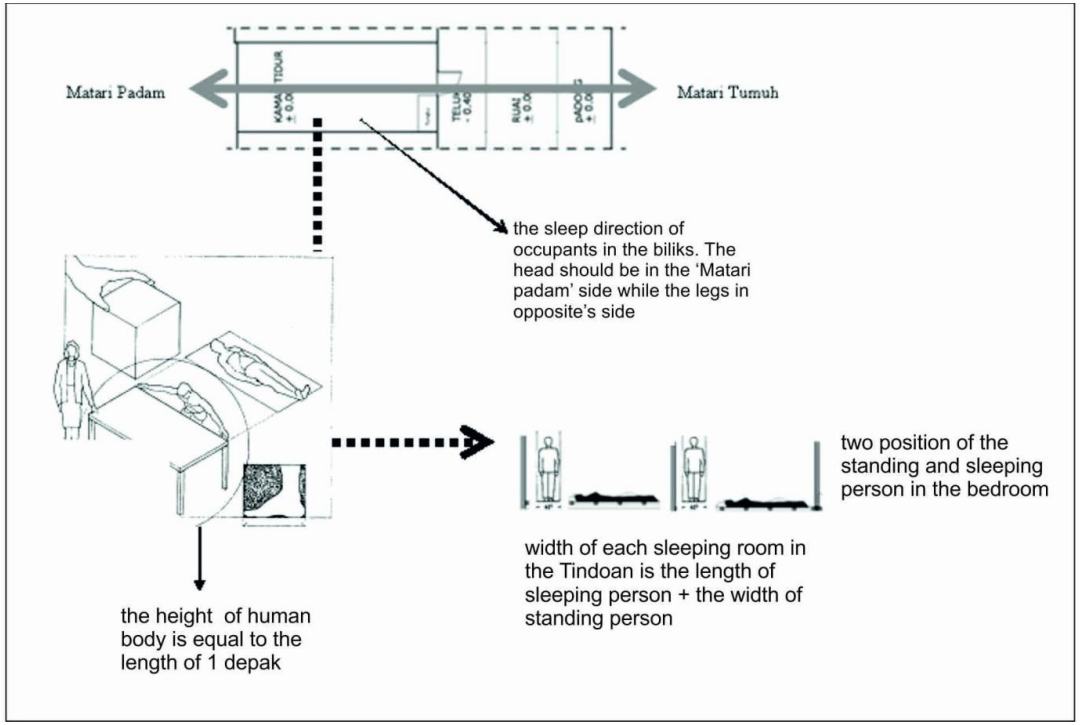


Figure 4.62.
The sleep direction of the occupants in the biliks and the measurement units

PLACE: IDENTIFICATION AND DEFINITIONS

The *pendopo*, or pavillion, is the first building that should be passed by the guests before entering the longhouse. It serves as the main entrance and the screening place for guests. Like many longhouses, the Dayaks have restrictions (*pantangan*) that must be complied with by both the inhabitants and the guests. Violations of the restrictions will be subject to a penalty in the form of paying a fine according to customary

law. Restrictions are posted in the *pendopo* to notify guests whether or not they are allowed enter into the longhouse.

The most common restrictions are for times when one of the longhouse's occupants has died. The inhabitants are not permitted to play any instruments inside the longhouse and guests are also forbidden to enter. For the next 18 days after the restrictions have been posted, every morning and evening, the *Tumenggung* (Chief of the longhouse) hits a *kangkuang* which is an instrument which is made of hard wood with a hole in the middle. During this period, in the cases of B.1.2. and B.1.3., the body of the dead person is placed in the *bale-bale* (a low table which is regularly used as a place for relaxation by the residents of the longhouse). The *bale-bale* is situated in the middle of the longhouse nearest the main exit. While, in the case of B.1.1. and B.1.4., the body of the dead person is laid on the floor on mats in the *Takso Seleper* in front of the *bilik* where the person lived. Although guests are forbidden to enter the longhouse when a death has occurred, there are exeptions. If a guest needs to enter, they must be free of any jewelry, watches or mobile phones.

To get into the longhouse, the guests or occupants must use the ladder or staircase provided. Except in the case of B.1.1. which had 3 entrances accessed by ladders made of carved logs, the other three cases of B.1.2., B.1.3. and B.1.4. only had one entrance with staircase access to a main door made of the wood boards. In the case of B.1.1, when climbing up the ladders of the longhouse the guests should be careful to look down. According to the occupants, this is meant to screen guests. The occupants can easily see the guest’s intentions if the guest is humbly paying attention to climbing the ladder or if he is arrogantly or maliciously looking up at the occupants.

The *Takso Seleper* is used by the occupants of longhouse as a place for relaxing and for receiving and serving guests. This room is usually where a *bale-bale* or a mat is placed in each of the *biliks* as a base for sitting or lying upon. The position of this room is close to the transparent wall that lets the occupants view the outside environment while the people looking from the outside would have their view blocked by the lines of small logs that form the walls. The row of columns which act as the benchmarks of each compartment also become dividers between the *takso seleper* and the *takso tandanan*. The *takso tandanan* is the place used especially to conduct the traditional ceremonies. One characteristic of this room is that it is provided with wooden boards to be used as backrests which are attached to the columns between the *biliks*. In the case of B.1.2., an additional room was found called a *teluk* which is a circulation path for the occupants of the *bilik* in their daily activities or when they performed the traditional ceremonies. Overall, occupants of the longhouse rarely used the *takso tandanan* instead they more regularly used the *takso seleper*.

Although transparent walls have been discussed, further pessages will be about other rooms in the longhouse that use massive walls like those used for the *tindoan* which in past was an unpartitioned space that functioned as a bedroom as well as a family gathering space. However, nowadays the *tindoan* has been partitioned with walls separating the family room from the bedroom.

At the rear of the longhouse is the space for the kitchen which is generally a more recently developed addition to the longhouse. Currently, the size of the kitchen varies being suited to the needs of the occupants of each *bilik*. Some kitchens can be quite large in order to accomodate a toilet. In the past, the kitchen was at the very front of the *tindoan* near the entrance to the room but as Dayak social life has evolved, the kitchen was moved to the rear.

The arrangement and order of spaces in traditional Dayak longhouses show the privacy patterns of the Dayak. Social rules dictate that the deeper the space in the longhouse the more private the space is for the occupants. The *takso seleper* is a public space for receiving guests while the *takso tandanan* is a semi-public space for conducting community activities. Semi-public space is defined as a space which is used only for certain activities of specific purposes and may not be used for general purposes by occupants or guests. In contrast to the traditional Malay house which does not have semi-public spaces, in the Dayak longhouse space of the *takso tandanan* acts as a special room for ceremonies and meetings. This is because the longhouse is "a house" with a lot of households within it which require community space. Nevertheless, occupants of a *bilik* that contains the *takso tandanan* rarely use this space even though there are no obstacles, restrictions or physical barriers to prevent them from doing so.

The *tindoan* is a private space for the occupants of each *bilik*. This space is the place where the family members conduct personal activities. In the past, during daylight, this space was use for activities but at night it was transformed to become the place for sleeping. An important element found in the *tindoan* of every *bilik* is the existence of a wide door which can be opened to connect it to the *tindoan* of the neighboring *biliks*. This wide door would be opened at times when a traditional ceremony is held in the longhouse, so that each *bilik* could be used as the place to prepare dishes together with neighbors. This door is the element that makes the *tindoan* a semi-public space when the longhouse holds traditional ceremonies.

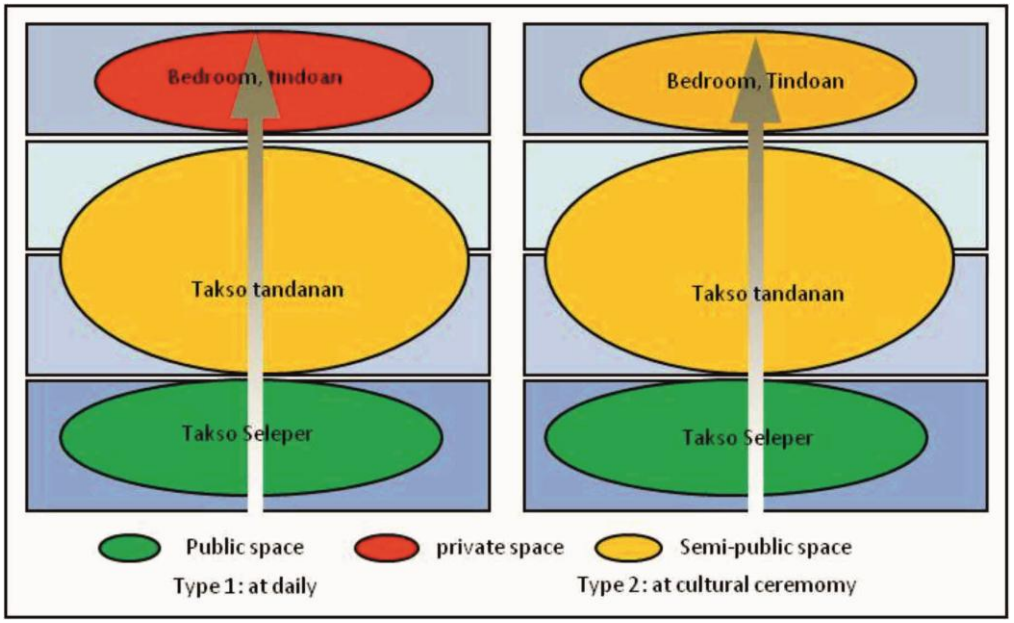


Figure 4.63.
Hierarchy and the space order in the traditional Dayak longhouse of the *Tamanic sub-ethnic*

PLACE: THE PHYSICAL ENTITIES

The physical entities of space in the Dayak longhouses are found in the form of:

1. The *Pendopo,* or pavilion, a place to welcome and screen guests in order to ascertain whether or not the guests should be allowed into the longhouse. Guests will usually be met by some people sitting in this area.
2. The platform serves as the floor in a longhouse. However, as in the case of B.1.2 an open platform can be found connecting the main house to the kitchen. There is a difference in floor elevation between the *Pendopo* and the longhouse. While in inside the longhouse, there is no difference in floor elevation as

other physical entities are used to distinguish the functions of space namely, partitions which divide rooms. Two forms of partition are found: firstly, the outer section of public and semi-public spaces are formed by the presence of rows of pillars and are even in some of cases further defined with the addition of backrests made of wooden boards which are attached to the pillars. Secondly, the private space in inside section is formed by massive walls that envelope the *Tindoan* of each *bilik.*

3. Sunlight is the main natural source of lighting in the longhouse. But the lighting from the sun is obstructed by a row of horizontal logs at the front facades that formed a transparent wall without window openings. It was also found that wall of the front facade was made poorly then covered by a roof. This made the roof sag giving a small opening to the longhouse which further blocks out incoming sunlight.
4. Pillars, or rows of columns, act as width benchmarks for the *biliks* of the respective occupants in the longhouse. In addition, when viewing the longhouse lengthwise, rows of pillars also show the lines between rooms, e.g. the line between the *Takso Seleper* and the *Takso Tandanan*, or the line between the *Takso Tandanan* and the *Tindoan*.
5. Shape boundaries and axis are the final two physical entities. The shape boundaries are found in longhouses in two forms. Firstly, the shape boundaries of transparent walls formed by the installation of wooden logs. This acts as the room separator between the outside environment from the inside of the longhouse of the public space and semi-public space. Secondly, the shape boundaries of massive walls formed by the instalation of tight wooden boards which acts as a room separator for the *Tindoan*, from public and semi-public space to the private space as well as separating the inside of the *Tindoan* from the outside environment. Meanwhile, the axis is the row of pillars and walls of each *bilik* which creates the

spaces in the longhouse. Pillars and walls are dominant elements in inside of longhouse and are used as space separators as well as benchmarks of *bilik* ownership.

Other spaces which also support the activities of occupants are found in the form of:

1. The kitchen which is currently found as rear extensions of each bilik. However, in the case of B.1.2., the kitchen is a separate building structure which is located at the back of each bilik and connected to the main house by an open platform.
2. The bedrooms and family rooms are in the *Tindoan* space which are defined by the creation of non-permanent walls as partitions. The *Tindoan* space today is generally separated into one family room and one or more bedrooms.
3. The place for worship is in the *Takso Tandanan* space. This space is a semi-public space special for the healing ceremonies, meeting place or other traditional ceremonies.
4. The place for work or for relaxing is the *Takso Seleper* and is a favorite place of the longhouse occupants to come together and/or work together with the neighbors of other *biliks*. This space is where occupants can gather together with other occupants of the longhouse as well as to entertain guests. The transparent wall provides a pleasant view as well as light in order to perform work like repairing the farm tools. This space usually has a wooden bench or mats placed on the floor of each *bilik*.

ELEMENT INDENTIFICATION

The supporting elements in the Dayak longhouses are:

- **Light,** like in many other types of traditional houses in Indonesia, is used to show the level of privacy in the inside of Dayak longhouses. The rooms in inside a longhouse divided according to the level of privacy which consists of public space, semi-public space and private space. The shape of the building along with the sequence of rooms also offers different levels of accessibility for the *bilik* occupants, longhouse's occupants and the guests. The public and semi-public spaces are the brightest rooms in the longhouse and accessable to not only the *bilik's* occupants but also to longhouse occupants but accessability is limited to visitors from outside. The private rooms tend to be darker in comparison. In addition there are customs (*adat kebiasaan*) which should obeyed by the longhouse's occupants and visitors alike when accessing the public and semi-public rooms. There are also special customary regulations for the outsiders who are not Dayak are known as restrictions (*pantangan*) when visiting a longhouse.

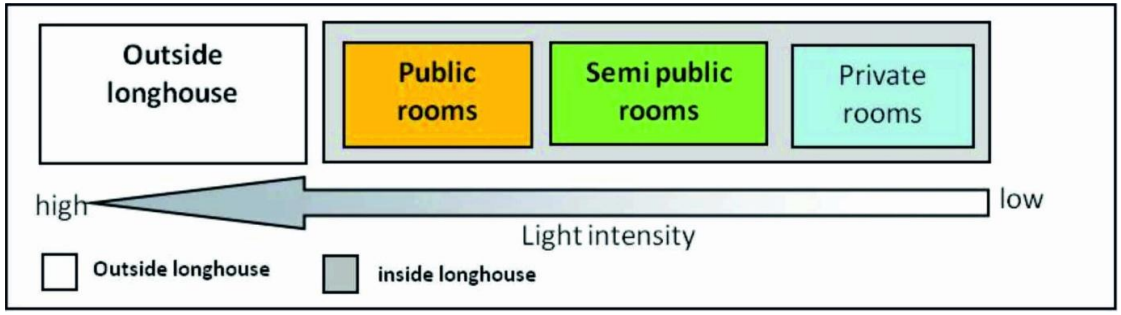


Figure 4.64.
The gradations of the incoming light to the group of space in the Dayak longhouse of West Kalimantan. These group are based on the settings of the rooms

- **Colors** of the entire facades of longhouses are generally absent. Colors are ususally used on the embellishments to the sturcture. The common colors used are yellow, black and white. In the case B.1.2., only black and white are used in decorating the front facade of the *Pendopo*.
- **Temperature** is also a defining element in Dayak longhouses. The warm temperatures are relatively constant all along day throughout the year in West Kalimantan. As a result, the high roof is used to trap hot air while the roof cover is made of timber so that it can absorb heat in order to regulate temperature. Further comfort is acquired in the middle section from the large volume of the rooms as well as from the open area beneath the structure. These three elements of construction ensures comfort by providing cross ventilation and the air circulation to each room in the longhouse.
- **Sound** is not obstructed due to the walls' wooden construction so that sound from other *biliks* as well as from outside can be clearly heard. For the Dayak as well as generally for the indigenous people of West Kalimantan, these sounds support feelings of safety and happiness especially when a person is alone in a *bilik*. According to Helliwell in Fox (1993), women's monologues in a *bilik* always had an audience and were sources of affirmation and of creating ties across compartements. By these monologues a woman could made her feelings known to the longhouse and be a contributing member of a whole rather than a member of an isolated household.

4.3.2.b Anatomy of Shape

THE RATIO BETWEEN HOUSE SECTIONS

In general, the structure of a traditional Dayak longhouse can be divided into three sections, the bottom, the middle and the upper sections (i.e. the legs, body and head). The following discussion is a comparison of these 3 sections of the longhouse. The comparison consists of two parts: the ratio of each section to each other and the ratio of each section to the total building height (see table 4.18).

Table 4.18.
The ratio of Longhouse's height

No.	Objects code	Longhouse's Height					
		RATIO			RATIO		
		(c/d)	(b/d)	(a/d)	(c/b)	(c/a)	(b/a)
1.	B.1.1	5,2	2,0	2,8	1,4	0,5	0,4
2.	B.1.2	1,7	2,4	5,9	2,5	3,5	1,4
3.	B.1.3	3,7	2,2	4,1	1,9	1,1	0,6
4.	B.1.4	2,5	3,0	4,5	1,5	1,8	1,2

Notes: a = the height of leg section; d = the sum of all sections
b = the height of body section; c = the height of head section

The ratio of the bottom part to the total height of the building in each case varies. Although a uniform pattern cannot be found, the elevation for each longhouse depends upon the first *bilik* to be erected so that all *biliks* that follow would be uniformly built. The construction is generally adjusted to the main post elevation of each *bilik*. The main post, called the *Pemun* pole, is the main pillar of each *bilik* and is taken from the forest around the longhouse. According to the occupants of B.1.1., it took a long time to find good logs to bring to the location of the longhouse. The *Pemun* pole is placed as the foundation and rises to the top of the

roof where it must reach the uniform height of the total elevation of the building. Generally, for longhouses that have a base with a high elevation, the other sections, like the upper part, must be adapted and vice versa. However, it should be noted here that there were smaller ratio changes found in the body section of the buildings. In B.1.1., the elevation of the bottom part (i.e. the elevation from the ground surface to the floor) varied from between 7 meters at the upstream end to 13 meters at the downstream end. This was also found in case B.1.2. where new buildings used square wooden *Pemun* posts along with with joints so that a total height of the building could be maintained close to 13 meters. This manner of construction illustrates the fact that the Dayak build dwellings in harmony with the environment that comply with the laws of nature. The longhouse construction was established by harnessing the surrounding natural resources without damaging the environment. This continues to be the rule of thumb for Dayaks in the building of new longhouse even today.

The comparison between the sections of the longhouse also showed a variety of ratio patterns as well. The comparison between the upper part by the middle part shows that the upper part is the most dominant feature of the longhouse. In the cases of B.1.1. and B.1.4., the comparison between the sections of the head to the body are almost equal even though, as in the case B.1.4., the head section is used for bedrooms. The comparison of the body to the legs in the old buildings of B.1.1. and B.1.3. show that the dominant ratio is that of the legs. However, the opposite is found in the ratios of the newer longhouses of B.1.2. and B.1.4. where the body section dominates the legs. It can be concluded that the high elevation found on the legs of the older longhouses are no longer needed by the Dayak at the present time because there are no longer any concerns of the threat of attack from other tribes.

Although the structure of the longhouse is divided into three sections, the bottom, the middle and the upper, there are two types of longhouse: those having one level of floor as found in B.1.1. and B.1.3. and those having two levels of floor as found in B.1.2. and B.1.4. This second floor can be found in the upper section under the roof like an attic. When traditional longhouses were first built long ago, as in the casses of B.1.1. and B.1.3, there was never a floor placed under the roof. It is only in the more recent longhouse development of the last three decades that the Dayak traditional longhouse has floor space under the roof that can be used as a sleeping area.

The Dayak traditional longhouse of Tamanic sub-ethnic group has two types of roof structure: a single level of roof cover and a double level of roof cover. The height of each section of the longhouse can be seen in figure 4.64 and the data of which is presented in table 4.19.

Table 4.19.
The type of roof cover of the traditional Dayak longhouse sub-ethnic Tamanic

NO.	Research Objects	Code	Number of floor(s)	Number the level of roof cover
1.	Sungai Ulu' Palin	B.1.1.	1	1
2.	Bali Gundi	B.1.2.	2	1
3.	Melapi Patamuan	B.1.3.	1	2
4.	Melapi Pabiring	B.1.4.	2	2

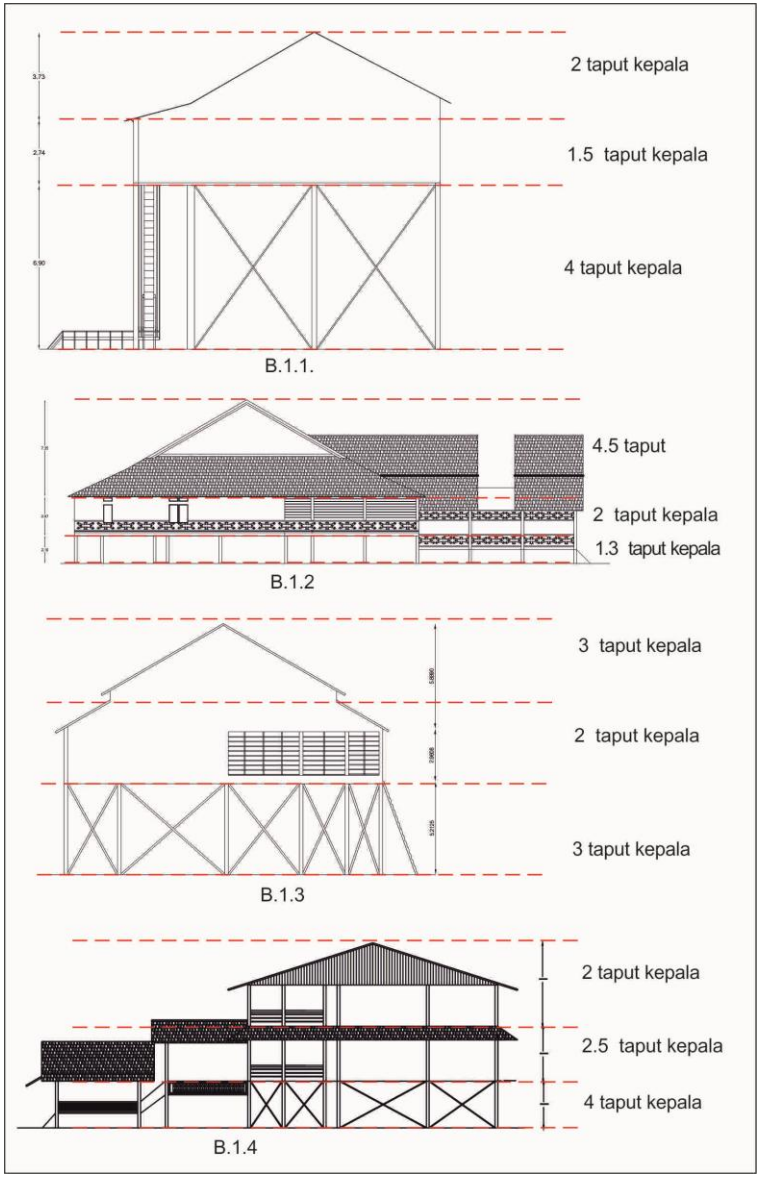
The elevations of the bottom part of the Tamanic traditional longho
uses ranged from 2.10 meters to 6.90 meters; while the heights of the middle part ranged from 2.74 meters to 4.03 meters; and finally, the upper part heights ranged from 3.74 meters to 7.35 meters. The total building height from the ground level ranged from 12.42 up to 14 meters.

No.	Objects code	Longhouse's Height			
		Bottom parts (m)	Middle parts (m)	Upper parts (m)	Sum (m)
		(a)	(b)	(c)	(d= a+b+c)
1.	B.1.1	6,90	2,74	3,74	13,38
2.	B.1.2	2,10	2,97	7,35	12,42
3.	B.1.3	5,09	3,08	5,77	13,94
4.	B.1.4	3,40	4,03	6,07	13,50
	TOTAL	**17,49**	**12,82**	**22,93**	**53,24**
	MEAN	**4,37**	**3,21**	**5,73**	**13,31**

Table 4.20.
The height of each sections of the longhouse

The table 4.19 shows the major differences in heights occurred in the bottom and upper parts, while the middle parts all tended not to have major disparities. The height of all the buildings in this study were generally uniform thus it was found that when the elevation of the bottom part was higher, the height of the upper section is lower as can be seen in B.1.1., and vice versa as can be seen in cases B.1.2. and B.1.4. In the case of B.1.1., the space under the roof is used as a place to store the agricultural tools, mats, heritage items and so forth while in the cases of B.1.2. and B.1.4 the space under the roof is deliberately utilize as a bedroom. On the other hand, for B.1.3 where all three parts were almost equal in elevation, the space under the roof is used only as the place to store agricultural tools, mats, heritage items etc. like that of B.1.1., the oldest longhouse.

Figure 4.65.
The height of each sections of the longhouses in the traditional units



BASIC IDEAS OF FORM

The shape of the facade of the Dayak traditional longhouses is dependent upon both cultural factors which include religious influences and natural conditions that control composition and position.

- Construction

Basic rectangular and triangular shapes that are commonly found in the the traditional houses throughout Indonesia are also used in the Dayak traditional longhouses of the Tamanic sub-ethnic group. The triangular shapes are used to form the upper structure, while the rectangular shapes are used to formed the middle structures. The triangular shape of the upper structure is used to drain rain water as well as to provide space under the roof. Space under the roof can have two functions: (1) as bedrooms as found in B.1.2. and B.1.4., and (2) as storage rooms as found in B.1.1. and B.1.3. Space under the roof at the same time also functions to trap hot air during the day. In cases B.1.2. and B.1.4., bedrooms on the upper floor are used only at night by children as a place to sleep. During the day, the occupants usually use the *Tindoan* space on the ground floor as a place to rest. Sometimes, they gather with other occupants of the longhouse to relax in the *Takso sleeper* as well.

The rectangular shape is found in the middle structure of the Tamanic longhouse form the walls which can be either massive and transparent. The massive walls are installed to cover the *Tindoan* in all four directions of the compass. Only openings, in the form of doors are found in the front and back of the longhouse of the respective *biliks*. In the past, the Dayaks did not install windows in the *Tindoan* but recently modifications to the massive front walls by the installation of small windows in each bilik can be seen. What is more, as can be seen in younger longhouses, further developments have been influencing traditional

architecture in West Kalimantan such as the installation of several large of window openings with transparent material like those found in B.1.2..

Figure 4.66. *(left)*
The transparent windows on one of the bilik of cases B.1.2. (condition 1)



Figure 4.67. *(right)*
The massive windows on one of the bilik of cases B.1.4. (condition 2)



Transparent walls are the second type of wall which is constructed by installing parallel rows of wooden logs horizontally with gaps between each log. This type of wall is found covering the front of the

Takso. The volume of this front wall of the *Takso* is much lower than the volume of the front wall of the *Tindoan*. Therefore, even with a transparent walls, the sunlight did not illuminate the entire *Takso* area well. The impression of this room is that it is rather dimly lit.



Figure 4.68.
The transparent walls which is covering the front wall of Takso room (photographs was taken from outside of cases B.1.3. and B.1.4.)



Figure 4.69.
The transparent walls which is covering the front wall of Takso room (photographs was taken from inside of cases B.1.1. and B.1.2.)

A transparent walls provide an opportunity for the occupants to remain sheltered by the observation from those of the outside but still provide enough light necessary to illuminate their activities in the *Takso*. In addition, in the past, a transparent walls as well serves to provides a sense of security from wild animals or from the attack of enemies from other tribes.

The rectangular and triangular shapes were also found on the bottom part of Tamanic traditional longhouse. The row of foundations form rectangular shapes as they elevate the sturcture from the ground surface, while the triangle shapes are formed by the creation of the diagonal joints which brace the foundation. These rectangular and triangular shapes are used in a grid pattern to stabilize the foundation structure.



Figure 4.70.
The diagonal logs as bracings is found on the Dayak longhouses to strengthen the foundation (photographs was taken on the bottom part of B.1.1 and B.1.2.)

In all cases, the triangular and rectangular shapes that dominate the facades illustrate the principles of stability and balance that are the foundation for the daily lives of the Dayak people. The triangle placed at the top has a spiritual significance in that the Dayak people continue to maintain stability in their social lives

beneath while the lines that form an angle toward the top are intended to show that all activities considered to be forms of respect to their gods. In the past, offerings to the gods were hung on triangular posts and beams under the roof. Nowadays, however, as most Dayak have embraced Christianity, such customs have now been generally abandoned. According to Yusnono et. al. (2004: 39), the loss of indigenous ritual practices is due to the assumption that these were forms of idolatry, friendship with the devil, worship the spirits of darkness and a disturbance to public order and so on. However, for the practice of traditional medicine and healing, some Dayak people is still believe in and implement these practices. Offerings to the gods are conducted during healing ceremonies by hanging a *baleen* or *beliatn* off a triangle under the roof. These offerings are believed to be a medium to communicate with the *Jubata* (Jasmin, 2006: 125).



Figure 4.71.
The remain offerings of the healing ceremonies was found hung in the cross section of the post and beam under the roof (photographs was taken from the inside longhouse of B.1.1.)

According to Yusnono et.al. (2004: 21), a *baleen* or *beliatn* is assigned to repair any damage that may be caused by disease, bad luck or a curse as well as to avoid the possibility of damage caused by spirits. A *baleen* also becomes an intermediary for people to communicate with the spirits (Isbat, 2003: 51; Jasmin, 2006: 48).

The rectangles that form the middle part of the house are considered to be the human domain where family and social activities are conducted. The social activities among the residents of the longhouse are conducted in the Takso, while commuity activities are conducted in either the *Takso Seleper* or *Takso Tandanan*. Children usually frolic in the *Takso Seleper* where wooden benches or mats and cushions are found.



Figure 4.72.
One family is relax in the front of their bilik after returned back from the farm fields (photographs was taken on the inside of longhouse of B.1.1.)



Figure 4.73.
A group of males (left) and childrens (right) were relaxing on wooden bench of the Takso Seleper (photographs was taken on the inside of longhouse of B.1.1.)

- Traditional interest

The traditional interests is found in the Dayak longhouses in the elements as follow:

a. The stage house is an adaptation of the local wisdom of the Dayaks to the local social and environmental conditions. In the past inter-tribal war was common in the hinterland of Kalimantan so longhouses were built on stages at a high elevation from the ground and the transparent wall in the front was used as a form of defense:

b. The numerous compartments, or *biliks*, are adapted to ensure social harmony and safety from the surrounding environment. Each *bilik* is usually inhabited by one or more families who are related to the dwellers of other *biliks* by ties of kinship or by relationships according to social strata or by community relations within the same village. Generally, for the Tamanic Dayak, it was found that social strata played a dominant role. For example in B.1.4., all residents of the *biliks* have kinship ties

to the *Pabiring* level; in the case of B.1.2., all the *bilik* occupants are relatives and occupants of the previous longhouse being inhabitants of the same village with all three social strata - the *Samagat*, *Pabiring* and *Banua* represented. All three social strata were also found in the cases of B.1.1. and B.1.3.;

c. The shape of the gable roof with its high slope is adapted to the local weather conditions;
d. Few openings, is a dominant characteristic of Dayak longhouses. However, air circulation and the room illumination are obtained from presence of the transparent front wall façades which are formed by installing wooden logs horizontally with gaps between them. In this way, inhabitants within can observe from a distance, the people who come to the longhouse and in the past, this wall also acted as a defensive barrier from outside enemy attacks.

THE SETTING OF SHAPES

The Dayak belief system which is highly important in Dayak society is clearly manifested in daily life. The Dayak understand that there are great natural forces that govern their lives (Jasmin, 2006: 50). According to Alqadrie (1990: 103 -104), the Dayak religious system has regulations that govern relations between God and man, man and man, man and the spirit of their ancestors, and man to his nature. In the past, the Dayak symbolic system was a comprehensive concept of cosmology. Lontaan (1975: 449-452) states that the nature of supreme divinity which is much of the basis of the Dayak belief system, is in the form of a "duumvirate" (*dwi-tunggal*) inhabiting the upper world (*dunia atas*) and the lower world (*dunia bawah*) respectively. The ancient concepts of cosmology in Dayak belief is described as follows:

a. The supreme divinity which inhabits the upper world

The upper world is stated in the language of Dayak – Ngaju as "*Tasik Tabenteram Bulau, Laut Babandan Intan* (= the sparkling lake of gold, the sea like a bridge of diamonds). The supreme divinity which inhabits in the upper world has at least four names, i.e.:

- *Bungai* or *Tingang* or *Enggang*, The holy bird name is the nature of divinity associated with the male sex and the upper world in Dayak mythology;
- King of *Tontong Matanandau, Kanarohan Tambing Kabanteran-bulan* means the King over the sun, Prince of the full moon; and
- *Mahatara*, is found in the traditional healer's (*beliatn*) song of offering (*baleen*) which is found in verse as "*ranying mahatara langit"*. *Mahatala* is also expressed in everyday speech as *Hatala, Lahatala* or *Alatala*. External influences of Hinduism and Islam may have been the origin of these terms to describe one god, for example the terms definition of *Mahatara* which may come from the Hindu term of Mahabarata ("God is the great"), while *Lahatala* or *Alatala* may come from the terms of the Islamic God's name, *Allah Ta'ala* which means "Allah (God) is the most high".

b. The supreme divinity which inhabits the lower world

The lower world is referred to as the *Basuhun Bulau, Seramai Rabia* or "the gold river which flows with all wealth". The supreme divinity which inhabits the lower world is symbolized as:

- *Tambon*, kind of a dragon or sacred snake that is the nature of divinity with female sex in the Dayaks mythology.
- *Bawin Jata Balawang Bulau* is translated as "the *Jata* woman with a jewel door". In everyday expression, Dayak people call her *Jata*.

As can be seen, the Dayak have an intricate symbolic belief system which attributes great power to the creator of the world. The two highest Gods in Dayak belief are represented by striking totemic emblems. The *Mahatara* is symbolized by the the holy bird (*tinggang*) and the spear (*tombak*), while Jata is symbolized by the dragon (*tambon*) and the ceremonial knife (*keris*). According to Lontaan (1975: 452), the divine duumvirate illustrates the opposing forces found in worldly daily life which is unified in Dayak social life. These include good and evil, life and death, dark and light and so on. According to the Dayak, *Jata* and *Mahatara* are gods which can inhabit the body of a *beliatn* or traditional healer when conducting a healing ceremony. Therefore, a *beliatn* is often called *Tambon haruei Bungai* or "dragon with the spirit of the holy bird". To the Dayak, this is proof of the unification of the two trusted gods which can manifest themselves in the single human body of the *beliatn*. According to the religious beliefs of the Dayaks, the highest gods are anthropomorphic i.e. *Mahatara* is depicted as a man while *Jat*a is depicted as a woman. In addition, the gods can also be expressed in the form of totemic emblems like spear or *tombak* and ceremonial knife or *keris*, as well as the bird of *Tinggang* and the dragon of *Tambon*.

The Dayaks believe that humans can not directly communicate with the gods, *Mahatara* and *Jata*. Instead, they have to use another god's help to act as an intermediary or *King*. According to Lontaan (1975: 453-454), the *King* mediates in matters of customary law and makes decisions when called upon. The intermediary is consulted on matters pertaining to obtaining livelihood, wealth and prosperity as well as to avoid misfortune, loss, disease or death.

According to Lontaan (1975: 455-458), Dayak people also believe in a *Lord* who represents both good and bad. In addition, they also believe in the spirits of their ancestors who had died. Generally, after a

complete funeral ceremony, the spirit ancestors arrive in *Lewu Liau* (heaven). It is then that they can be called on for help by the living relatives. Spirits have various roles as protectors and guardians of the village, river or family. Small houses built on wooden pillars are often found in the front of longhouses and are considered as places where ancestral spirits dwell. In the past, according to Soenarpo et.al, 1986: 41-42, the spirits of ancestors were regarded as powerful and highly respected persons during their lifetimes.

In addition, the Dayaks also believe in a god who has the power and supreme authority who they called *Jubata* who is omniscient and omnipresent. It is the the gods and ancestral spirits that are intermediaries between man living in the world and Jubata. The gods are also believed to live on the mountains, rivers, forests, and elsewhere. Therefore, the Dayak believe in adverse consequences if someone among them should do something that interferes with the power of any of the gods. To maintain the welfare and security of a village, according to Soenarpo (1986), the Dayaks made a *pantak* as the statue representing their ancestors. This was usually placed at the boundary before entering a village. In addition, each family would conduct a *Gawai* (traditional ceremony for the ancestors) where they would make the *pantak* statue, which was set in front of the longhouse.

A balanced placement of ladders as entrances into a longhouse can be found in theTamanic sub-ethnic group of the Dayak. In all cases, the number of ladders placed as entrances was found to be of 2 types, i.e. single ladder entry or 3 ladder entry. A longhouse with a single ladder entry was always found to be placed in the center of a longhouse, while 3 ladder entries were placed in the center, left and right respectively.



Figure 4.74.
Pantak as the statue of ancestor found in the longhouse front of case of B.1.2. and B.1.3.

Thomson (2000: 54-55) mentions that Dayak beliefs and traditions are fundamentally intended to provide humans with some control over forces of nature. These controls are move and act in very physical ways with material results, yet have invisible motives and means.

An understanding of the divinity concept of Dayak people can viewed of the physical manifestation in the composition of the longhouse. Traditionally, the longhouse is divided into 3 parts, ie the bottom (legs), the middle (body) and the upper (head). In accordance with the religious understanding of the Dayak, the underworld is a place inhabited by evil spirits which dwell at the bottom part of the longhouse, the middle world is inhabited by humans who dwell in the middle part of the longhouse, while the upper world is inhabited by *Mahatara* who dwells in the upper part of the longhouse. The composition of legs of the longhouse are generally more prominent than the other parts i.e. the body and the head. Elevation of the floor

is far from the ground and when a person want to enter the longhouse, he/she must pass through the ladder which is formed, in the original structure, by a wooden log with footholds (*kayu bertakik*). This illustrates that the Dayak people want to dwells as far away as possible from the places which is inhabited by the evil spirits and to avoid and neutralize the intentions of evil spirits (Domenig, 2008: 465). The evil spirits are considered to be the cause of diseases, catastrophes and other difficulties.

If consider the composition of the body and head, then we shall obtain similar results as with the previous comparison. The height of the body section is also smaller than the head in order to provide a prominant place for the spirits and *Mahatara*. This space in the upper part is usually called *Sadau* and is used to store customary goods or rice as well as to hang offerings for the spirits of ancestors.

Finally, it can be concluded that the setting of shapes in the construction of a Dayak longhouse is an outward manifestation of the Dayak belief system.

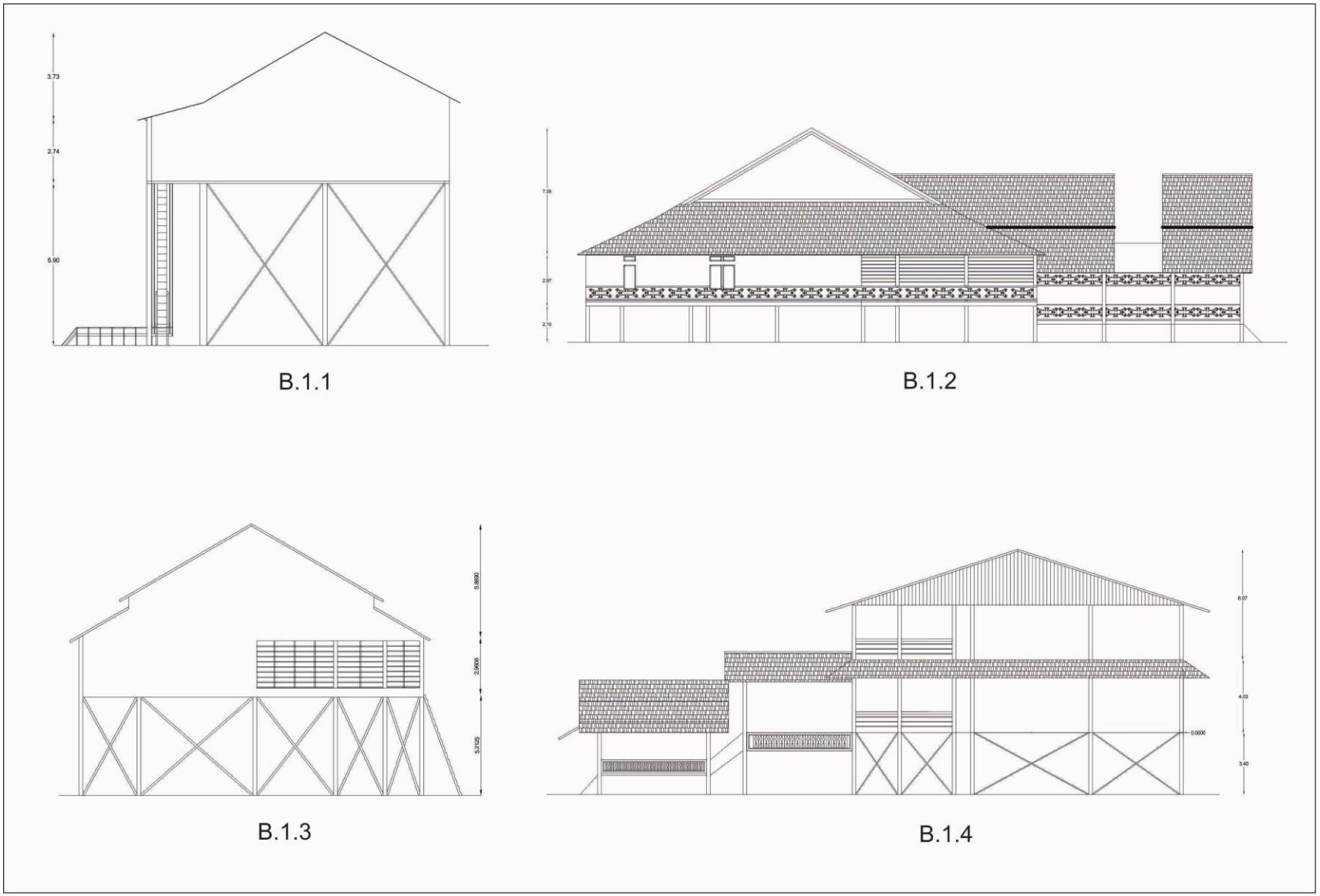


Figure 4.75.
The side view of the traditional Dayak longhouse of the Tamanic sub-ethnic

4.3.2.c Anatomy of Section

BOTTOM SECTION

According to Pebriano (2006) and Santoso (2008), Dayaks in West Kalimantan are classified as one-family cluster of the Klemantan sub-ethnic group with the Ibanic/Iban as the main group. The Klemantan sub-ethnic group can be divided into smaller groups based on place of residence. Each of these smaller groups can be characterized by language or dance style. However, all these groups have the same architectural form in common. Generally, the longhouse of Klemantan sub-ethnic group build their compartments or *biliks* in the same order with only the names of these being changed according to the local language.

Confirmed by Pebriano (2006: 36), the longhouse is a series of private compartments (*bilik* or *lawang*) which are constructed into a single unit. The longhouse is constructed from wood with a distinctive shape which reflects the philosophy and lifestyle of the community. According to Sather in Fox (1993), the longhouse represents a plurality of symbolic orders and the representation of the longhouse that emerges from the ritual conveyed by the existing ethnographer.

In the Dayak community, the stage longhouse with its use of wood pile foundations is logically meaningful in order to deal with threats from outside, such as attacks from wild animals or from enemies from other tribes. This is also stated by Pebriano (2006: 152), where the Dayak Dosan's longhouse is an illustration of how the Dayak anticipate difficulties in their lives, especially when considering security needs and geographical conditions. While Santoso (2008: 67) mentions that the Dayak Desa longhouse is considered to be like a tree which shelters its occupants. The use of this illustration is intended to portray

Dayaks life as part of society in the indigenous community so as to be involved in the social interaction within.

In the past, the longhouse had piles up to eight meters in height from the ground so the foundation stood like trees and was easy to first erect. This extreme height was for security as well as to support the load of an occupied house. Availability of the natural materials in the past and limited knowledge had Dayak communities erect pillars from single intact tree trunks for longhouse foundations.

On the other hand, the longhouse being considered analogous to a tree has significant meaning and symbolic order in Dayak society. The Dayak usually use symbols from nature to name things found in architectural order. This symbolism can be found even in the naming of the elders within longhouse communities. The Dayak Desa longhouse community named their leader *pun*, as confirmed by Santoso (2008: 67), which means tree, while according to Sather in Fox (1993), *pun* means source, basis, origin or cause. The main pile of the first erected foundation was positioned in the longhouse leader's apartment - the *pun bilik*. This is also found in the architecture of Dayak longhouse in the Ulu Paku District in Saribas Malaysia in Sarawak province as mentioned by Sather in Fox (1993). The naming of the posts and beams on longhouses is based on the placement of the tree trunks in the roles of *pun* and *ujong* (base and tip).

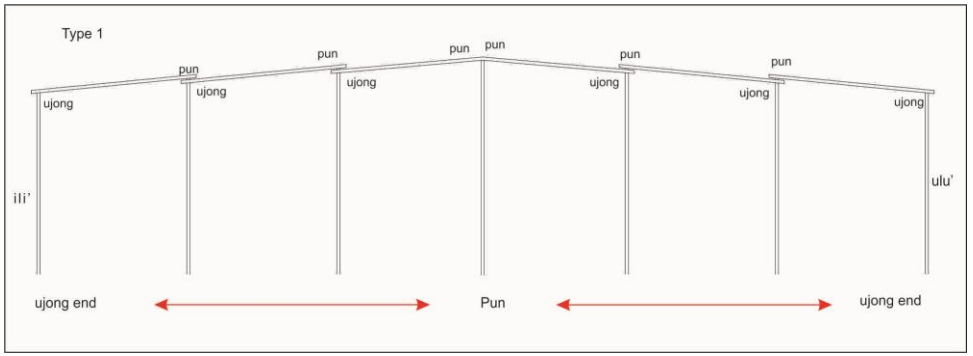
In nature, every tree grows from the root to the bud (*pun*) which over time becomes able to withstand the weight of the branches and leaves. The use of a tree trunk pile base is defined as the ability of living things (adults or the head of a family or the head of a community) to support the occupants of a longhouse. The *pun bilik* is located to be the first erected pile to become main pile of the longhouse. In the Ulu Paku and

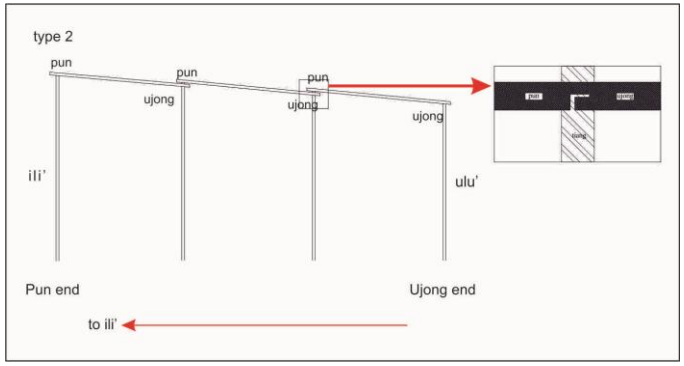
the Dayak Desa communities, this pile is called *tiang pemun* which refers to parents or community elder or group leader who will be able to protect all the occupants of the longhouse.

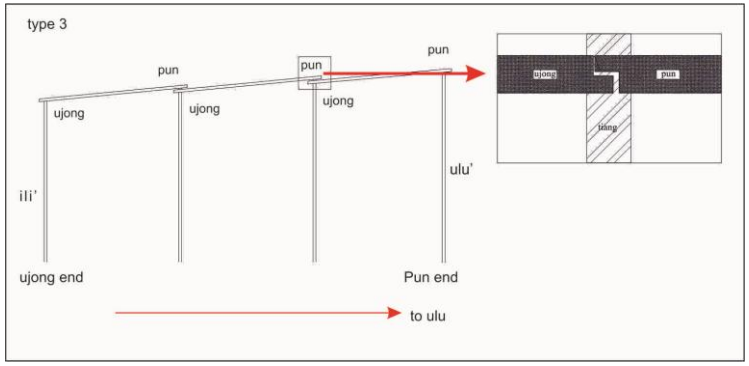
The Dayak community uses the terms of *ujong* and *pun* (tip and base) when referring to wood as building material for homes. This can be found in both the Dayak Desa in Sintang and the Ulu Paku in Saribas District. According to Santoso (2008: 67) and Sather in Fox (1993), the *pun* beam (the base beam) should always lead towards the middle of the longhouse or toward the *pun bilik* while the *ujong* beam (tip) should be always pointed toward the outside of the longhouse. This is similar to that which was presented by Sather in Fox (1993) where the order of beam instalation in the longhouse first construction is divided into three types (See figure 4.75).

This particular way of connecting beams where the *ujong* of a beam must be installed and joined to the *pun* of the other beam, illustrates the Dayak philosophy of continuity from the beginning to the end, interaction between children with their parents, community members with their leader or elder and is the central idea of 'a flow of life' (Domenig, 2008). It also means that the *pun* is a source of continuity and inspiration or even as a source of information for the community within the longhouse.

Figure 4.76.
The 3 types of beam Installation as the longhouse orders of construction







In addition, when viewing the vertical installation of piles as columns or foundations, it must be noted that the *pun* must be positioned into the ground or in the direction toward the ground. This means that the *pun* is the source or the origin or leader of the longhouse community that will provide a livelihood to the all members by striving for the availability of food sources in the surroundings of longhouse and guarantee the continuity of the community life of social relations in the longhouse (Domenig, 2008: 264). Therefore, by positioning the *pun* beams vertically into the earth, the Dayak believe that the earth is the foundation

sustaining the lives of all community members in the longhouse. It also means that the Dayak depend on the earth as their source of livelihood. According to Pebriano (2006: 112), the Dayak consider nature as a protector of lives, as provider and source of their lives needs, and the source of luck.

The floor elevation from the ground in a longhouse is intended to provide security for humans from the evil disruptions of the lower world (*dunia bawah*). Longhouse elevation acts as the "stage of life" for the Dayak community. Traditional societies within the Dayak communities view life from a cosmological standpoint i.e. vertically and horizontally as reflected in their architectural entities. The vertical view encompasses the relationship between man and god, while the horizontally view is associated with relationships between human beings (Alqadrie, 1990). The Dayak have vertically divided the world into three. The first division is the lower world (*dunia bawah*) which is a place for supernatural beings as well as for the spirits of the dead who during their lifetime, often did evil things; the second division is the middle world (*dunia tengah*) which is a place to be inhabited by humankind; and the third division is the upper world (*dunia atas*) which is a place for the gods.

An example of these architectural entities is also mentioned by Santoso (2008: 73), where the vertical arrangement of space in the longhouse of the Dayak Desa consists of three divisions; i.e. the lower divisions on the ground (*ruang baruh*) is the place for spirits of dead people or the realm of supernatural beings (*antu'*); the middle division above the floor (*ruang tengah*) is the place for humankind (*mensia*), and the upper division is the room under the roof (*ruang atas*) as a place for the gods and a symbolic representation of heaven.

Pebriano (2006: 112) states that the Dayak community believes that nature can also contain destructive elements which can be disastrous for humankind and can disturb the order of human life. The Dayak also believe in the existence of evil spirits that dwell in nature; e.g, on the mountains, in the forests, rivers and fields. In an effort to avoid the influence of bad spirits, the floor of a longhouse is erected at the highest possible elevation from the ground so as to have the greatest possible distance between *dunia bawah* and *dunia tengah* or the distance between the bad spirits and humans. This is so that these two worlds do not interfere with each other. This also means that there is a differentiation between the bad things of the evil spirits and the good things of humankind.

Apart from being inhabited by bad spirits, the under world is also a place where good spirits, such as the guardian spirits of the forest, rivers or fields, dwell and maintain the resources that the community depends upon for its livelihood. According to Alqadrie (1990: 107), the good spirit that is the guardian of the nutritional resources is represented by a bird called *tinggang* which lives in the luxurious forest. This spirit that takes the shape of the bird, *tinggang*, parallels the interests of the Dayak community by acting as the forest guardian thereby guaranteeing the continued existence of the community as an ethnic group.

The Dayak believe, there are other natural forces that order human life and influence the longhouse community. By providing distance between the *ruang baruh* i.e. the lower world of evil and the *ruang tengah* i.e. the middle human world of good, the Dayak believe that they can control their lives. The bad things should not be joined together with the living. However, the lower world (*dunia bawah*) provides material which is needed for human life. Dayak life essentially respects the natural world so the *dunia bawah* is not disturbed but rather the Dayak are always grateful to nature that provides them with all their daily needs.

According to the cosmological view of the Dayak, the height of the floor from the ground also means that humans have a higher status than other living things on the earth so that other living things are not allowed to exceed the limit of their own world. According to Santoso (2008: 74) in Dayak daily life, all animals, except dogs, are prohibited from walking inside the longhouse because they should live on the ground. The exception to dogs occurs because they guard the Dayaks living on earth. If suddenly, an animal, such as a chicken, enters into a longhouse then the animal must be killed because it has passed beyond the limits of its world into that which belongs to humans.

Ritual, according to Sather in Fox (1993), which is highly important in traditional society, is 'enacted' *(nunda)* or 'played ' *(main)* upon a stage; that is to say, within a symbolically ordered setting. Since many activities in Dayak society have a ritualistic meaning, the Dayak would feel "guilty" if they gave up the rituals. The longhouse is considered a "huge stage" above the ground which facilitates the daily activities and rituals of the Dayak.

BODY SECTION

The setting in each space formed in the longhouse floor plan describes a particular function held by the indigenous Dayak. In the past, the Dayak believed in spirits or supernatural beings and used to show their respect as the occupants of longhouse by performing a lot of ritualistic ceremonies. The ritualistic ceremonies for the Tamanic sub-ethnic group of the Iban are usually conducted in the *takso tandanan* (other Dayak sub-ethnic groups call this room *Ruai*). When observing how space is ordered before reaching the *bilik*, it can be seen that the *takso tandanan* is placed between the *takso seleper* (other sub-ethnic groups refer to this room as

the *padong*) and the *tindoan* and is located in the center of the longhouse floor plan. In several Dayak longhouses of other sub-ethnic groups, this room can usually be found before entering the *tindoan*. The *takso seleper* is a public space and is often used to receive "foreign guests". With the depth comprehension of the space sequence as mentioned above, the *takso tandanan* then becomes the antechamber to filter guests before they are allowed to enter the *tindoan*. Therefore, the *takso tandanan* is usually used as a place for performing many ritualistic traditional ceremonies. These ceremonies are concrete efforts to banish the bad influences of evil spirits from the *biliks*. There are two kinds of traditional ceremonies in Dayak society for the occupants of the longhouse both of which are performed in the *takso tandanan*. There is a ritual to greet the spirits into the *bilik* as well as a ritual to send supplications to evil spirits or supernatural beings so that the Dayak community in the longhouse is not disrupted.

Ritual ceremonies performed in the "*ruang tengah*" of the longhouse are to protect, to prevent or to make requests of evil spirits or supernatural beings. This is also conducted in order to express gratitude to the natural forces for the food that has been obtained by the community. According to Pebriano (2006: 186), the traditional ritual ceremonies are expressions of the Dayak as a medium by which to offer supplication or to express gratitude to supernatural beings.

According to Santoso (2008: 72), the Dayak interpret the meaning of space of the longhouse not just as the place for living, but also as an embodiment of important things such as the soul, body and heaven. Generally, the body of a longhouse where the community dwells and conducts activities, can be divided into 3 parts; private, semi-public and public. All these spaces are illustrations of the human body which also divided into three sections. The activities conducted in the public space illustrates Dayak social behaviour so

like legs that move thus interaction with other people both inside and outside the community is conducted in this public area where guests are served. The body is a semi-public area being the place to conduct ceremonies. Customs embody the daily life of the Dayak and regulate the behaviour, beliefs and laws of most Dayak communities. While the private area is the "heavenly" place for personal activities of the Dayak to procreate for the continuation of the community.

Pebriano (2006) found the division of space in the longhouse to be in two main parts; the first part was family-owned space (private space), i.e. where each family lived, and the second part was public space, i.e. space that can be used by all members of the longhouse. This is also mentioned by Helliwell in Fox (1996). This basic division between an enclosed 'inner' area (private) and an open 'outer' area (public) is one that occurs in Dayak longhouses throughout Kalimantan. In the concrete visualization of architecture, these two kinds of spaces are opposites in shape and form. The former is formed by massive walls, while the latter is formed by a transparent wall or even no wall.

According to Helliwell in Fox (1996), the spatial separation into divisions is not for those within the longhouse community but between this community and those outside of the longhouse: between 'we' and 'other'. For a Dayak community in a longhouse, public space is defined as space to serve foreign guests who have no familial relationship with the occupants or as a space sometimes devoted to public community activities of all the longhouse members. Guests and occupants of the house will go through the *pendopo* and enter the longhouse using a ladder on the left, middle or right side before arriving at the *takso seleper*.

In other Dayak sub-ethnic groups, there is a room called *tanju'* before the longhouse where guests put their shoes in the front of door (*lawang*). The *tanju'* is formed without walls or partitions and is intended to

represent the openness of longhouse occupants toward visitors or outsiders. This room is usually used as a seating area for foreign guests at public traditional ceremonies or as a drying place for newly harvested rice (*padi*). This section is like a stage where Dayak culture is disclosed to the public or the outside world by showing the openness of Dayak longhouse community to outside influences. This is a transitional space for guests to become aquainted with the life of the Dayak community before entering the longhouse since the social life of occupants in the longhouse can be viewed from the *tanju'* through the transparent wall that surrounds the *takso seleper*. Usually, there is no door (*lawang*) to obstruct guests from entering the longhouse.

Public space is also defined as a place to entertain others (i.e. Dayaks from other ethnic groups, non-Dayaks or strangers) by the longhouse occupants. Currently many Dayaks embrace the Catholic faith therefore, the *takso seleper* is a place to recieve and entertain people of other faiths i.e. moslems or Malays. In the Dayak community, if a family member or any other Dayak converts to Islam then that person is considered "Malay" (Alqadrie, 1990). Heliwell in Fox (1993) states that many Dayak groups tend to define themselves in opposition ethnically to the Malay, often using the term *orang Melayu* (Malay) to simply mean non-Dayak so they interpret Islam to be synonymous with being Malay.

Dayaks and Malays are considered “siblings”. In general, according to the people of West Kalimantan, the Malay are older brothers to the Dayak (Alqadrie, 1990). In daily interactions, both Dayaks and Malays have a mutual understanding. The Dayak understand that the Malay, as moslems, usually give distance to the dogs and pigs that are part of everyday Dayak life. For this reason, these animals, especially dogs are not

allowed in the *takso seleper*. The Dayak are also aware that moslems are forbidden to consume pork as well as anything that contains alcohol.

The *takso tandanan* is a space for longhouse occupants or visitors of the same sub-ethnic group to gather for meetings or ritual ceremonial activities and is the main place for community members to interact in the longhouse. In this area, pets such as dogs can interact with their owners. This is the "heart" of public space which is used to maintain harmony with other occupants of other *biliks* of the longhouse. It is here that they usually do activities together and interact with each other while fixing the daily cooking equipment, weaving mats, repairing fishing nets and so forth. Febriano (2006: 164) refers to this section as a public or community space as many different people with different natures, habits and characters gather in one large room without a separator. However, this community space is bound by customary rules (*adat*) that must obeyed by the all occupants so that it is comfortable for living harmoniously through the clearly defined communal function of the space due to the overlapping activities of its inhabitants. Each room has barriers or is differenciated by floor level and governed by customary roles (*adat*) which has been passed down from generation to generation.

As previously mentioned, the longhouse consists of public or semi-public spaces and private spaces. In some longhouse of other Dayak sub-ethnic groups, the *teluk,* a kind of ante-chamber can also be found. The floor of the *teluk,* meaning basin, is between 15 cm to 30 cm lower. The *teluk* which is comparatively smaller than other rooms of the longhouse, must be passed before entering into the private spaces and functions as a separator between public/semi public rooms and private rooms. This space serves as the filter for those who may come into the *bilik.* Actually, the filter starts at the outer room (*tanju*' if any) but it is more

clearly reinforced by the *teluk*. Only visiting relatives and family members are allowed to pass the *teluk* and enter into the *bilik*.

The *bilik* is covered by massive walls to provide a space for private activities while the *takso seleper*, *takso tandanan* and *teluk* (if any) have transparent walls to provide spaces for communal activities. This means that these rooms were formed by taking into account space grading as well as room grading; grading from public to semi public space and then to private; or from the areas without walls to areas with transparent walls; and then from the areas with transparent walls to areas with massive walls.

According Pebriano (2008), the *bilik* is the "home" for a single family. Each *bilik* is unique and completely equipped in order to do all the activities of a single household independently. Space in each can greatly vary in size as well as in use of space even within the same longhouse. Sometimes, the heads of families change the order of rooms in their *bilik* to adjust to their needs.

According to the study by Alexander in Fox (1993), the headman's (laja's) compartment is considerably larger than most others, but it does not have the raised roof with an extended gallery or elaborate paintings decorating the front wall. The headman, usually refered to as *pun* (or *temenggung*), was the community elder when the longhouse was first erected. He is considered to be the center of the community of the longhouse and the roominess of his *bilik* shows the honour that is bestowed upon him by the community. It is also clear to guests when entering the longhouse which is the headman's *bilik*.

An example was given by Santoso (2008: 70), who described the room compositions in the Dayak Desa village where the wall of the *pun bilik* or headman's compartment separates the longhouse into two main parts which have contradictory properties i.e. upstream *biliks* and downstream *biliks*. Here the *pun bilik*

is the center and main reference for the erection of new biliks in the longhouse. However, the door of each *bilik* opens in the direction opposite to each other dividing the longhouse into 2 main sections. *Biliks* located upstream along the river longhouse face are called *punggung ulu* or *bilik nga-pit* (upstream compartments) while those located downstream are called *punggung bilik or bilik nekop* (downstream compartments).

The the case of the longhouse at the Dayak Desa village, the *pun bilik* is positioned in the center of the longhouse and the wall downstream becomes the benchmark for the next new *biliks* to be erected. According to Santoso (2008), the difference between these two main sections in the longhuose can be seen from the door openings on each *bilik*. All doors in the *nga-pit bilik* are constructed on the left side while the doors of the *nekop biliks* are constructed on the right side of each apartment. The *pun bilik* is located in the *nekop bilik* and is formed by two walls which facing downstream but placed upstream.

Ulu' and *ili'* are very important symbols for the Dayak (Yekti (2004). In Jasmin, (2006: 51), the *ulu* symbolizes life of the Dayak while *ili'* symbolizes death. Door openings in each *bilik* acknowledge the river flow from upstream to downstream. Doors on the *punggung ulu* (upstream side) open to symbolicly 'catch' the flow from upstream so as to be "stored for longhouse occupants' needs". The *nekop bilik* is also placed in this section but with door opening installed in the opposite way. This is an illustration of Dayak thought where the good things that come from the river should be stored or utilized for daily needs. The *pun* bilik is located in the front most position of the *nekop bilik* section. As stated previously, the *pun* holds the position of the 'source' of the longhouse community. New occupants prefer to build their new *biliks* in the *bilik nekop* section because the direction of the river flow is considered to be the source of life. As a result, in more recent developments, the *pun bilik* is no longer located in the exact middle of the longhouse.

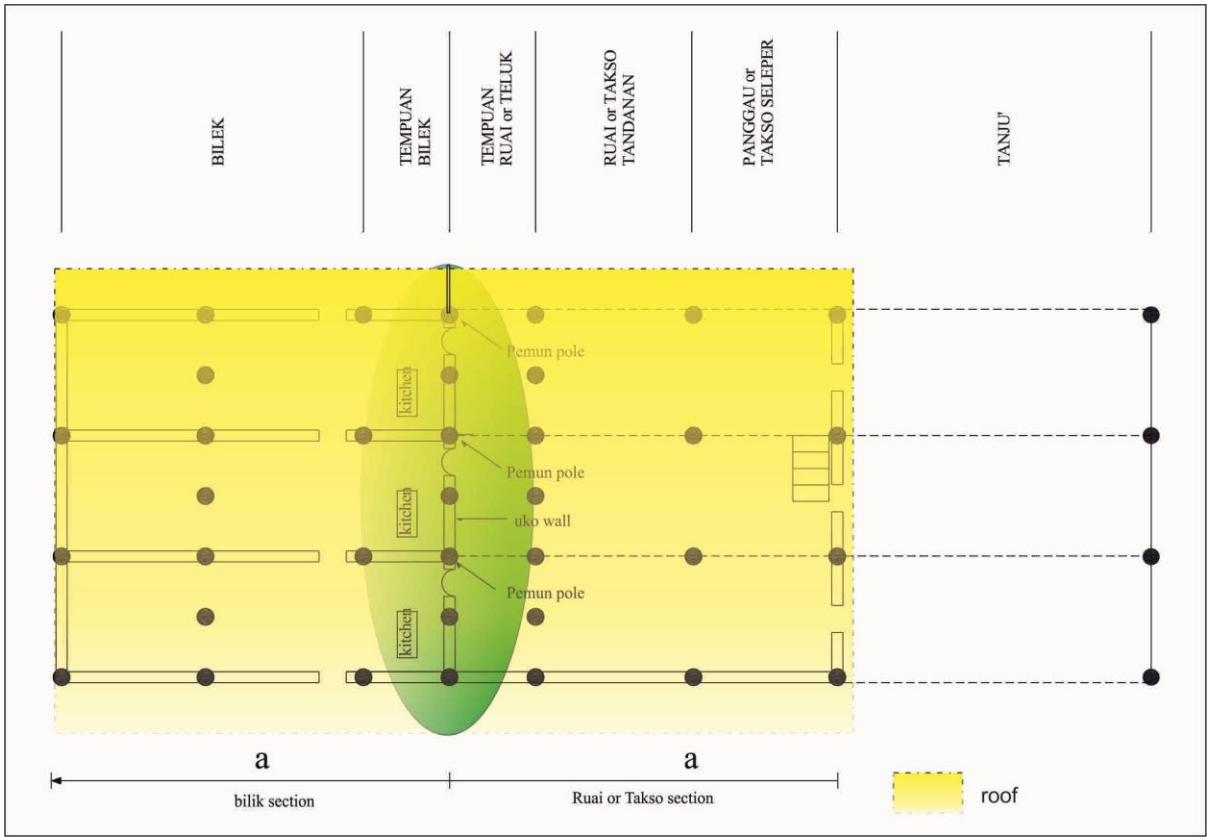
Another interesting fact, mentioned by Santoso and Sather (Santoso, 2008: 70; Sather in Fox, 1993), is about the *dinau ukoi* which is a wall that separates public/semi-public space and private space. This wall serves as a "barrier" from viewing from the community's activities directly inside the *bilik* as well as from observing the private activities of the *bilik* dwellers. The Dayak community upholds the traditional values to maintain privacy for family members. According to Alqadrie (1990: 113), family life among the Dayak is close-knit and emphasizes mutual aid or *pangari*. Usually there are two forms of family: 1) the nuclear family (*keluarga batih*); and 2) the extended family (*keluarga luas*), who live together in a longhouse. According to Thomson (2000: 32), traditionally, it is the Dayak women who play important roles in both religious functions and leadership within their respective families. The Dayak have the same general understanding like that of most the indigenous groups in Indonesia who believe that family is important and must be guarded from external interference. Family is the primary purpose of why men continue to work in an effort to make a living. The objective of a man's life is to guarantee the survival of his family and clan. When taking this into account, it is easy to see that families will try to have as many children as possible as this is considered to be a sign of prosperity.

For these reasons, partitioning for privacy from the sight of others is important. According to Sather in Fox (1993), individual families of each *bilik* have clearly delineated areas which are observed under a common body of normative rules (*adat*) and the ritual interdictions (*pemali*) which are enforced by the longhouse and express its status as the jural and ritual center of its domain.

In addition, the most important element of this wall is the existence of the *pemun* column (*tiang pemun*) which is placed in one corner of the wall of every *bilik*. These columns consist of the placement of a single tree trunk from the ground to the top of the roof construction without any joint connection.

According to Sather in Fox (1993) and also mentioned by Santoso (2008: 72), the *ukoi* wall is located in the middle of the longhouse and covered by the main roof (see figure 4.76.). The *tiang pemun* is positioned to prevent disruption caused by the influence of evil spirits or supernatural beings to occupants of each *bilik*. According to Santoso (2008: 72), the Dayak refer to the *tiang pemun* as the "*penyawa rumah* (life of the *bilik*)". The *tiang pemun* is located in the center of the floorplan of each *bilik.* It is consider to be the "source of life" of each bilik to maintain the lives of the *bilik* dwellers as well as to be a source of strengthen against interference from evil spirits or supernatural beings that may influence to the *bilik* dwellers or the longhouse community. Thus rituals and traditional ceremonies are regularly performed when first erecting a bilik. Offerings (*sesajen*) are usually placed at the top of the *tiang pemun* when it is first erected. The *dinau ukoi* is located in the middle of the floorplan and intended as a balance between family and neighborhood life or between private life in a *bilik* and social life within the longhouse community.

Figure 4.77.
The floor plan of the traditional Dayak longhouse



The Dayak are really concerned with the nature because their livelihoods depends upon the natural resources found within their enviroment. Therefore, they usually bring nature into every their daily life activities. The direction of the longhouse facade is orientated to the rising sun and/or a river as the main resources for continued exsistance. Orientation of the longhouse should be towards the river as major focus

which takes into consideration river flow (Sangalang and Sunarti Darjosanjoto, 2011). The Dayak also have deep respect for the sun's orbit so longhouse is also oriented to the sunrise (*Matari tumboh*) and the sunset (*Matari padam*). These are also linked to their understanding as to the placement of private space and public/semi-public space.

Spaces nearest the river are considered to be closer to the outside community activities of the longhouse in an effort to "open their space". Therefore, public space in the longhouse is more closely related to outside communal activities nearest the river. Since the river is also a main transportation route throughout Kalimantan the Dayak as well as other ethnic communities use the river to reach other villages (*dusun*) or towns. It can be see that the activity along river is very dynamic and is used as the main entrance to reach the longhouse. The tanju' which is public space, is placed in outerside the longhouse as a bridge between the longhouse community and the outside world.

In longhouse construction, rooms are formed according to the activities that they will be used for. Rooms covered by massive walls are to facilitate private activities in this closed space furthest from the river while the tanju' and padong are considered public spaces. These are placed nearest the river and formed by no walls or transparent walls in order to "get closer to nature" i.e. the river and the forest. This means that people of Dayak need nature to influence their lives even when they are at home.

According to Pebriano (2006: 156), the Dayak Dosan community believe that the river is controlled by spirits that live there and that supplications to these spirits must be made at certain times by performing rituals to honor them in the ritual refered to as the *Mibu Topet'n* ceremony. By this ritual, they wish to avoid any trouble or disaster that could be caused by evil spirits that live in the river.

The *bilik* massive wall constructions are usually located toward a mountain while the *tanju'* without walls is located toward the river. Dayak society considers the river to be inhabitied by spirits while mountains are considered to be the sacred places where gods dwell. According toThomson (2000: 63), the Dayak believe that the land exists as one of three realms that make up the natural order, and that different spiritual powers or types of beings are associated with each realm. There is the realm of "*jubata*" (god(s)) who is (are) usually believed to reside on the summit of a sacred mountains(s). The land (*talino*) is the place where people dwell. The *sabayatn* is the dwelling place of the spirits (*roh-roh halus*) together with the spirits of deceased humans. Alqadrie (1990: 96) states that the Dayak beliefs include invisible creatures and ghosts, objects endowed with the supernatural powers, and the ever-present souls of ancestors. There are beliefs concerning devils, ghosts and other invisible creatures who dwell in riverbanks, large rocks, trees and caves. They believe these to be the spirits of ancestors and departed warrior-heroes whose presence protects the villages from attacks from other villages, as well as from floods, bad harvests and other misfortunes.

The sun's movements are also considered before erecting a new longhouse. The sun is an analogy of life associated with sunrise and death associated with sunset according to Sather in Fox (1993). In Iban dialect, the east is referred to as *matahari tumboh*, literally, 'the direction of the growing sun', while the west is called *matahari padam* or 'the direction of the extinguishing sun.

Matahari tumboh marks the beginning of activities while *matahari padam* indicates the end of activities in outside the longhouse. The Dayak begin carrying out their daily activities in the fields (*ladang*) or in the forest after sunrise and must return home before sunset. According to Dayak understanding, human activity is synonymous with life but sleep is synonymous with death.

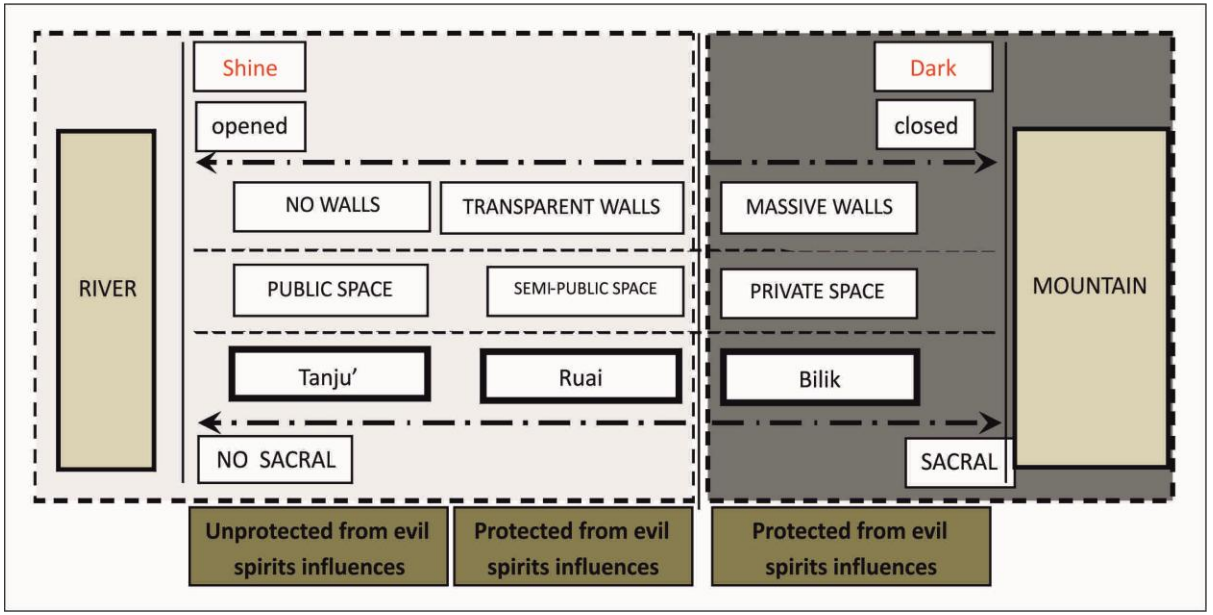


Figure 4.78.
The spatial division in longhouse by the influences of the surrounding environment and activities

The effect of the sun illuminating the rooms in the longhouse varies. Rooms without walls or with transparent walls are used as public or semi-public spaces. Here the Dayak are lively and active during daylight hours. On the other hand, rooms with massive walls obtain significantly less sunlight and were used as private spaces where the occupants rested or did private activities. For the Dayak consider their waking or "alive condition" to be necessary to guard themselves from the influence of evil spirits or supernatural beings. A bright room is placed in an effort to anticipate interference from evil spirits that might be "visible", while a dark room is considered to be a safe place where there is no need for "any surveillance" because the occupants are not active or are in what the Dayak believe to be "a death like condition" i.e. sleep.

For the Dayak, space is graded from common to very sacred, beginning with the *tanju'* and ending with the *bilik*. The section which is closest to the river is known as a common space while the section placed furthest away from the river is considered the most sacred space. Sacred means that the space offers "good surveillance" over evil spirit influences and is where a ritual ceremony can be performed to exorcise evil spirits. The sacred room in the longhouse is also related to private areas. Thus, the darker the room, the more sacred it is so it must not be entered into without permission from the family head. In other words, the Dayak people believe that the darker the room the more safety from the influence of evil spirits can be gained.

Currently the *tindoan* area generally consists of a familiy room, a bedroom and a kitchen. According to Santoso (2008: 77), the people of the Dayak Desa village call the family room, *bilik baruh* which is also used as a resting place for family guests. Only specific guests are allowed to stay overnight in the *bilik*. Generally, this place is also used as a sleeping place for other family members i.e. unmarried daughter(s) or son(s). The bedroom or *serambik* is usually used as resting place for family head and his wife. The kitchen or *peningkak* is not only the place to prepare meals but the place to consume said meals. The Dayak refer to the kitchen as the heart (Haliwell and Sather in Fox 1993). In the past, the kitchen was placed in the center, attached to the *dinau ukoi*. In Dayak dialect, things placed in the center are analogous to the heart (*jantung*) so the kitchen is considered to be the center of the life for the *bilik* occupants. Their openness in their way of life shows that the Dayak "do not hide or cover up" anything they possess including the meals they have cooked. Since the occupants of a longhouse usually work together in groups to collect forest products, to catch fish in the river or to harvest rice (padi) in the fields (*ladang*) they also feel that as members of a community living together in one house they should usually give a hand to help neighbors who do not have enough food.

The kitchen which is considered to be the heart of each *bilik* is placed in the most beneficial area of the bilik i.e. the source of life of the longhouse which is the *tiang pemun* (Sather in Fox (1993)). Therefore, the position of the kitchen being nearest to the *tiang pemun* certainly offers a guarantee of avoiding any annoyance from evil influences during the preparation of a meal for *bilik* dwellers.

UPPER SECTION

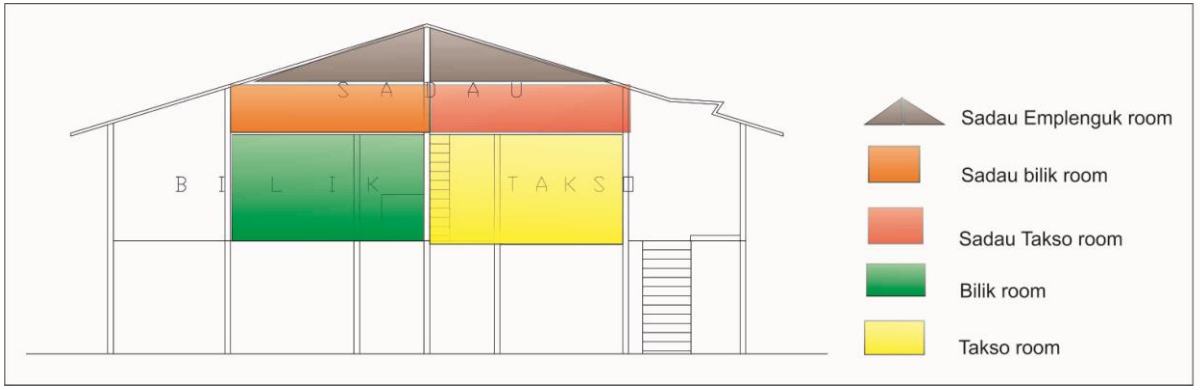
Dayak cosmology considers the upper section of the longhouse to be highly important, valuable, honourable and sacred. The *sadau* or attic area is located under the longhouse roof. Heirlooms that are often used in traditional ceremonies are safely stored here as it is the most sacred room in the longhouse.

The *sadau* is also interpreted by the Dayak as an intermediary world between *dunia tengah* (the central human world) and *dunia atas* (the world of gods or heaven) and is interpreted as "bridge" by which humans can reach heaven. Since it is a symbol of heaven (Santoso, 2008: 73) and as such is a symbolic dwelling place of the gods that are able to maintain human life in the world. The Dayak believe that anyone who has died will be reincarnated as a good spirit to live in the *dunia atas* or as a bad spirit to live in the *dunia bawah* depending upon their deeds in the world while they were alive.

The *takso tandanan* is in the center of the floorplan and positioned directly beneath the *Sadau*. According to Santoso (2008: 79), the *sadau* is divided into 3 parts; the *sadau ruai* (above the takso tandanan), the *sadau bilik* (above the *tindoan*) and the *sadau emplenguk* (see figure 4.78). The *sadau ruai* is the most sacred space where heirlooms are stored as it is the residence of spirits in the highest position of the longhouse being "closest to the sky". According to Santoso (2008: 79), the Dayaks believe that the *ruang atas* is heaven where the gods *petara* or *jubata* dwell. Special traditional ritual ceremonies conducted in the *ruai*

(Jasmin, 2006: 82) are performed in order to directly link *petara* or *jubata* through the *sadau* of the *bilik*. To strengthen these ritualistic ceremonies, heirlooms and offerings will usually be mediated upon and then the offerings will be placed after the ceremony at the top of the *sadau emplenguk* which is the space above the *sadau ruai* and the *sadau* of the *bilik*. These ceremonies are conducted to appease the natural authorities, who may have been damaged by the actions of one of the Dayak people in the community (Jasmin, 2006: 117).

Figure 4.79.
The takso room and bilik room positioning to the Sadau room setting



Similarly in the *takso tandanan*, the *bilik baruh* is located beneath the *sadau tindoan*. The *sadau bilik* is used to store rice and agricultural equipment. According to Santoso (2008: 79), the Dayak Desa believe that newly harvested rice (padi) also has a soul (*semengat*) like humans. The *bilik baruh* is a resting place for the occupants of the longhouse and where families can interact with other *bilik* dwellers. The soul of each *bilik* dweller will live in harmony as it is always maintained by the'soul' of the rice that is stored therein, and of course, the *sadau emplenguk* becomes a liason space for the souls of those who dwell in the *bilik* where they may show appreciation to the god, *petara*, by regularly providing offerings (*sesajen*).

Indigenous ritual and the belief systems, according to Pebriano (2006: 187), are the two parts of settled norms for Dayak society. Both of these norms are manifestated in Dayak worship and behaviour through their relationships with others within the longhouse. *Adat* or customary ritual is the manifestation of the Dayak worship system. In the past, most Dayak were animists and the longhouse has always been used by the community to perform rituals even until today. This is in spite of the fact that many Dayak communities have embraced the Catholic religion which has not greatly hindered their belief system. According to Pebriano (2008: 189), rituals are still being carried out. Although many rituals have been abandoned, they are still guarded by the Dayak. The rituals practiced today by the Dayak are usually related directly to their habitual life and are still important as traditions. Most of these rituals are performed when erecting a house or dealing with the exorcism of evil spirits.

The longhouse's upper part (head section) has the highest ratio than the middle part (body section) or bottom part (legs section). This illustrates the Dayak desire to reach out to heaven or "the dwelling of the gods" by using the upper part of the longhouse as a "bridge" to interact with the gods and to be on good terms with them. Humans will strive to get all of life's benefits and are willing to make any great sacrifice to avoid bad things from happening to them. The *sadau* is situated under the highest point of the huge roof and is where *sesajen* (offerings) are routinely made.

The forest, according to Dayak belief, is a special place created by god (Alqadrie (1990: 95)). The Dayak have a highly developed understanding of the forest plant life as a source of herbs, food and produce which they use for trade or export (see Uluk et.al., 2001: 7-51). According to Thomson (2000: 53), Dayaks are characterized by their close relationship with their land, water and the nature around them. The land is the

source of their livelihood. Their relationship to the land is more than pragmatic; it has religous and magical qualities to it. The creator (god) created the land as a place for humans to be born with the right to use the land to live and upon which to die. In fact, as Stefanus Djuweng in Thomson (2000: 53-54) mentions, the land for the Dayak stores their unwritten history i.e. the bones of their ancestors, holy places, and altars of worship. Furthermore, Vincentius Julipin in Thomson (2000: 53-54) also notes the land connects the Dayak to the invisible spirit realms since the land is also occupied by the spirits of distant ancestors, parents, and friends who have died as well as various other unidentified spirits that appear from time to time and relate through *adat* to the people who are still living.

As mentioned before, elevation of space plays an intergral role in Dayak life and is based on their natural environment with the river being the lowest most public area while the mountain is the highest most sacred area. These are reflected in longhouse construction where the *takso* or *ruai* which is lower and used as public space with the transparent walls that are the easiest to be influenced by bad spirits, while private space is placed in the highest position and protected by massive walls as it is under the patronage of the god *Jubata*. In addition, shape and positioning of the longhouse roof also shows the fundamental differences. The roof that covers public space and is close to the river is made lower than other sections as it leads down to the landline, meanwhile the roof that covers private space is the highest and it leads up to the mountain.

Roof height is important even when dealing with the death of a longhouse member. During the funeral or days of mourning, the body is placed in the *takso seleper* which is under a lower roof. According to Tamanic tradition, the body is placed there for 18 days to give an opportunity for the spirit to stay together with relatives. The spirit of the dead is understood to remain at the home even long after the body is buried

later. The dead body is placed under the lower roof while the living are under the highest roof with these two rooms being separated by the *takso tandanan*. The illustrates the separation the living from the dead as well as the importance that the living place on carrying out their lives without interference from the spirits.

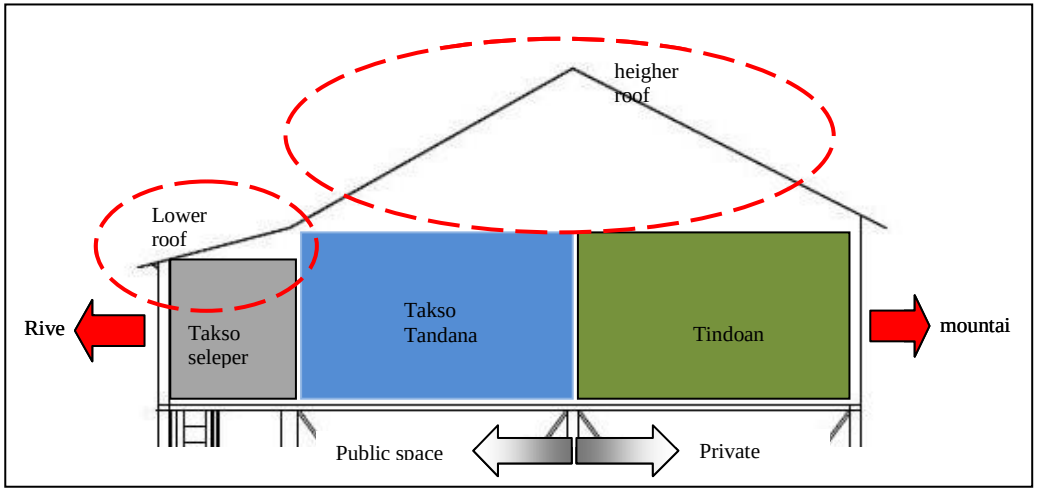


Figure 4.80.
The longhouse orientation dan the roof construction towards the space for the Tamanic sub-ethnic

4.3.2.d Anatomy of Structure

The structural design is intended to the building in order to stand properly and stature, to sheltering the occupant activities in inside, and also provide the security and the comfortability. Structures is the collection of systems which owned the functions and purposes in it parts and relates to each other.

STRENGTH

The Dayak longhouse strength is obtained from the use of building materials which have longterm durability. Like other traditional buildings in West Kalimantan, longhouses also use wood as the main

material for house construction. The use of *belian* timber is the primary choice for the main structure. *Belian* timber is used for longhouse columns as well as the foundation. In addition, wooden boards of *belian* are also commonly used to cover the floor and wall structures.

Strength is also obtained from the very large dimensions of the timber which is used for the main structure of the building. With these huge dimensions of columns or beams being the main structural elements, greater loads can be withstood.

STIFFNESS

Stiffness of the longhouse structure is obtained from the interlocking joints. Connections between the columns and beams are typically obtained by using the pin and hole system where *pasak* (wooden nails) are used. Stiffness is also obtained from the use of timber poles that act as the foundation and columns which extend up to the roof structure. This is to reduce the loss of structural stiffness that occurs due to weakening when there are connections among the joints. Furthermore, rattan is used as bindings to increase rigidity of the floor or roof covers.

Walls that serve as partitions reinforce longhouse columns and also make the construction of the wall more rigid. There are two types of layers that strengthen the walls on the structure. The first type is that of tightly fitted wooden boards which act like a skin, while the second type is that of small wooden logs installed with gaps between each which act like a net. Both, however, have the same function which is to bind the structure so that it will not shift and are usually further strengthened by the presence of additional columns and top beams which act as stiffeners. These stiffener beams are installed by penetrating through the main column, which is the base for the construction of floors and roofs. While foundation pillars are strengthened

by the presence of diagonal beams that give stiffness thereby reducing shifting of the columns due to external forces.



Figure 4.81.
Stiffener beams that became the base for the structure of floor (photos were taken from the front façade of case B.1.1 dan B.1.3.)

STABILITY

The stability of the structure is obtained from the symmetrical forms unique to each longhouse. Symmetry makes the structure become stable so that it can support loads. Symmetrical forms in construction and the symmetrical placement of columns guarantees the stability of the structure; so that the durability of the building is higher due to the force of the load itself.

Balance in the façade is formed by a stable structure. In all cases, longhouses have a balance of building mass on the axis; this balance is a reference in the formation of the framework of the roof structure.

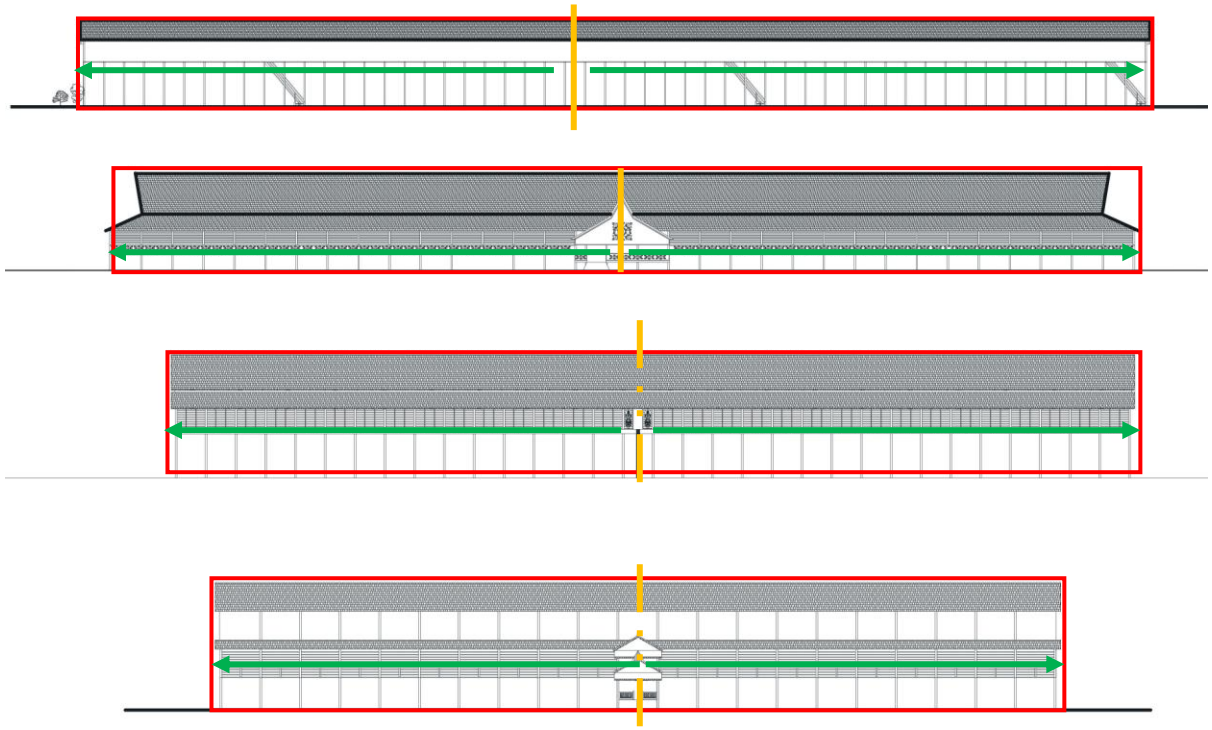


Figure 4.82.
Symmetric and balance on the facade of Dayak longhouse to give a stability for the house structure.

SYNERGY

Synergy in the building is obtained from the cooperation among all the elements of the structure. Synergy of the Dayak longhouse can be seen in the relationship between the structures, which are connected by a system of elements. There are two types of connection systems. The first type is the connection system of the main structure and the second is the connection system of the support structure. The main structure's connections use the pin and hole which are also found on the main structures of other traditional houses in

West Kalimantan and is the primary choice for connecting structural elements on the bottom section to the middle and the middle section to the top. The second type of connection for the supporting structure uses a binding system, which is usually accomplished with rattan. This type of connection is found on the floor and roof structures.

- The connections between wooden boards with columns or beams

The connections between wooden boards with columns or beams in the wall construction were found in two types, i.e.:

a. the tight composition of wooden boards, which is strengthened by the beams or columns

Generally, wooden boards used as for walls are assembled in a tight formation to cover all parts of the house. They may be installed either vertically or horizontally and inserted into and flanked by beams or columns. There are no nails of either steel or wood to strengthen these structural connections.

b. The attached wooden boards on the beams or columns

Wooden boards attached to the columns or beams use a *susun sirih* (tongue in groove) system and are specifically for the walls of support houses. The wooden boards are constructed horizontally being tightly fitted to one another and fastened by steel nails.

- The connections between columns and beams

There are many variations of connections between the beams and columns found in the Dayak longhouse. The most important wooden connection system is between the beams and the columns where wooden holes are made in the columns and then bound to the beams to strengthen them. The wooden nail connections were commonly found on connections between the structural parts, such as connections between

the bottom structure and the middle structure, and between the middle structure and the upper structure. However, there are different treatments made to the connection on each particular structure, which in this section are usually not given binders. These treatments are found on the beams of the wall structure, which are placed through the columns without binders. One other type of commonly used connection between beams and columns is the hole-and-pin connection.

The floor structure is also not bound by wooden nails or by steel nails. Instead, wooden boards, placed on the support structure, are strengthened by other structural weight upon it. In the past, the wooden boards on the floor would make a noise when stepped on, since they are not nailed down. This was intended as a security measure so that the occupants would immediately hear if anyone entered the house without permission.

EQUILIBRIUM

Equilibrium is defined as a condition or state of balance of mutual influences between the artefacts and their surrounding environment. Equilibrium of the Dayak traditional dwellings is achieved from the relationship between buildings as dwellings and their surrounding environment which is affected by the buildings. The balanced condition is obtained from the design adjustments made so that the buildings do not cause any undue negative influence or damage on the surrounding environment. The longhouse is constructed on a stage not only to avoid wild animals, but also to avoid covering the ground surface. Covered ground will preclude water infiltration into the ground, while uncovered ground will certainly not prevent the drainage of

water into the soil surface. Natural conditions, vulnerable to the tidal flow of rivers, cause the traditional Dayak dwelling design to be created in equilibrium with the river and the ground conditions.

Traditional dwellings which are always competing with the environment, are adjusted to create equilibrium by adapting to the local environmental conditions. These types of adjustments were found on the architectural elements in all cases and included the numbers of openings and the roof slope. Both elements were designed to create a balance between the needs of the occupants' comfort and the natural conditions which were encountered. The large openings were created for cross ventilation of air flow for the occupants' comfort, as well as to take advantage of the abundance of sunlight to illuminate all the rooms. The roof slope is beneficial for draining rain water quickly while simultaneously filling household water tanks for the purpose of providing daily water needs.

4.3.2.e Anatomy of Aesthetics

ELEMENTS OF DESIGN

Ornaments in the form of carvings and paintings are found in particular sections of the longhouse and each ornament has a particular meaning. Carvings are found on the stairs and doors, while paintings are found on the roof edges, backrests, or walls. The motifs are generally found in the form of:

- *Burung* or birds that are featured as carvings or painting are generally one of three types: the *Bungai*, the *Tingang* or the *Enggang* (hornbills) and represent the male sex with their magical bird names which are found in Dayak mythology. According to Isbat (2003: 53), the bird symbolizes the divinity of upper world (dunia atas);

- *Naga* or dragons which in the Dayak language are called *Tambon*, are a symbol of the divine nature which inhabits in lower world (dunia bawah);

Both of these animals are symbolic representations of the gods, *Mahatara* and *Jata*, that inhabit the upper and lower worlds respectively. Alqadrie (1990: 102) mentions that although the dragon plays an important in chinese culture, it also plays an important role in Dayak culture as a religious symbol in traditional decoration of ceremonial bowls and jars.

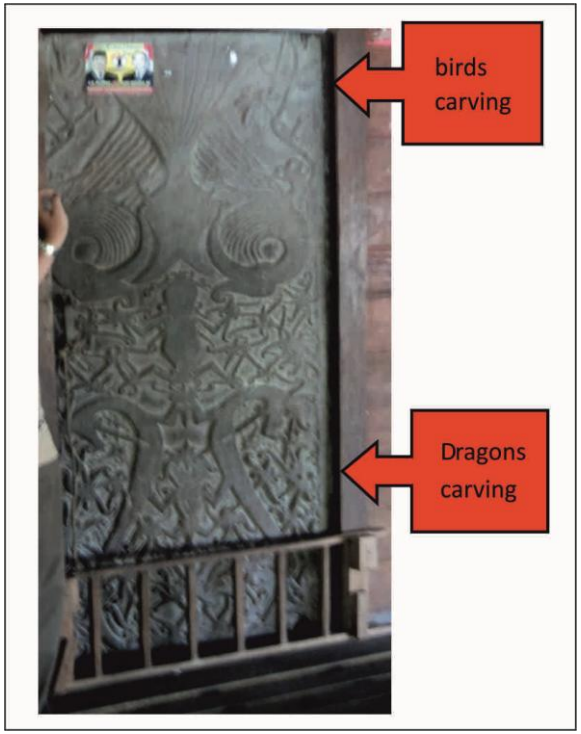


Figure 4.83.
The carving motif of bird and dragon is found on the door of bilik of B.1.1.



Figure 4.84.
Dragon's painting in the ornament of cases of B.1.2. and B.1.3.

Alqadrie (1990) further supports this when his states that the use of the animals, *burung tinggang* and *naga*, as symbols of the highest gods and their characteristics and are parallel to Durkheim's findings (1912; 1915) that three elements of Australian totemism – totemic emblem, the animals, plants, and the members of the clan. The use of *naga* and *burung Tinggang*, which symbolize the divinity of the "upper" and "lower" worlds, is a reflection of the simplicity of Dayak religious thinking.

THE PRINCIPLE OF ORNAMENTS

The use of animal symbols which are placed as ornaments, illustrate the powers that the Dayak submit to on a daily basis. This submission is the manifestation of their traditional beliefs of the past and is evidence that the Dayak have had a "religion" since long ago so then it would be very easy for them to understand and embrace modern religions. Traditionally, the indigenous people always symbolized the natural forces that affect their lives with things or beings that were considered to have great power and influence over

the environment like the *naga* (dragon) and *tinggang* the bird which are rooted in traditional myth as animals having enormous power and tremendous ability. According to myth, the dragon has such enormous power that it can release the fire from its mouth, while the mythical bird of *Tinggang* with its extraordinary beauty is considered to be an animal from heaven. Since the forest is, according to Alqadrie (1990: 106), the most important element in Dayak society, it is symbolized by the bird *Tinggang* which furthermore, symbolizes the "higher" world. Anything "above or higher" is considered to be something that is more important. On the other hand, the dragon's power represents Dayak social organization in the world "below".

In the Dayak world view, the bird *Tinggang* keeps the Dayak aware that natural balance should be maintained in a gentle manner in order to promote beauty instead of using the dragon's destructive force which will interfere with the natural balance. The *tinggang* birds, which actually live in the forests of West Kalimantan, are often referred to as *Enggang* or hornbills that now have become the mascot of West Kalimantan province. They are a symbol of the Dayak's love of balance, beauty and peace. On the other hand, the Dayak also have the power to defend themselves which is symbolized by a dragon with fire that bursts from the mouth. In the case of the ethnic riots in West Kalimantan, the Dayak find it easier to forgive their enemies than the other tribes in West Kalimantan since their basic attitude is to uphold their values and customary law. Problems can be solved very easily if all the parties (the Dayak and other ethnic group(s)) obey the decisions which are based on customary law (*adat*).

Furthermore, Bramble (2003: 21-23) explains that the five elements are wood, fire, earth, metal and water each of which is symbolized by their correspoinding colors of green, red, yellow, white and black (see Roberts, 2004: 182-189). Black, red and yellow are the dominant colors used in painted ornamentation of

Dayak longhouses that take the forms of animals and plants. Black and red in Chinese mythology is illustrated in the fullness of Yin and Yang, and is represented by fire and water, while yellow shows the balance of Yin and Yang and is symbolized by the earth or land. White is seldom used in ornaments but in Chinese mythology it symbolizes a new Yin and metal. Green can not be found on any ornaments of a longhouse.

Little information could be found about how these 4 colors became the main colors in the Dayak community. It can be supposed that the use of these colors are also related to the influence of Chinese culture. These 5 main elements of the traditional Chinese physical entities are also found in Dayak mythology. According to Sangalang and Sunarti Darjosanjoto (2011), the Dayak ancestors came from Yunan (a province in southern China). In fact, there have been many immigrants from China, particularly the *Hok Jia* people from Fujian province who came to trade in Kalimantan (see Alqadrie 1990: 83-86).

The 4 elements of water, fire, earth (soil) and metal are symbolized in their corresponding colors of black, red, yellow and white. These elements are commonly used or needed by the Dayak in their everyday life. The proximity of the Dayak to water can be seen in the orientation of the longhouse to the river which is the main source of Dayak livelihood (see Sangalang and Sunarti Darjosanjoto, 2011; Isbat, 2003: 33). The land is where the Dayak grow their food crops by using the system of shifting cultivation (swidden farming). Fire is used as a source of light and heat while metal has long been used in their agricultural and other tools as well as a medium of exchange in the payment of a traditional fine which is commonly in the form of a gong. While there is an absence of green, this is probably because the color is represented by the wood element of the longhouse or plants and flowers surrounding the settlement area so that the five elements are considered complete. This is also linked to the assumption of Wangyal (2002: 13-20) that he subtitued the element of

wood into space which as the important element for people and Roberts (2004: 183) who mentions that the element of green is associated with the plants and flowers.

The use of symbols and colors is not unexpected since the Chinese who have inhabited the island of Borneo for centuries have influenced this. Here, the ancestral culture of the Chinese people has been assimilated by the local indigenous inhabitants (Dayaks) as similar names are used in this microcosm or realm of symbols. There is also evidence of the assimilation of Hinduistic and Islamic influences as well. According Lontaan (1975: 449), Hinduistic influences play an important role in the symbols which are inherent in Dayak longhouses. The microcosm can clearly be seen in the making of a physical model realized in the architectural forms also illustrates of the forms of Dayak submission to the ruler of the universe.

4.3.2.f Anatomy of Utilities

The basic needs for humans are to maintain a constant body temperature and regulate metabolism in order to compensate for changes in the environment (Chadderton, 2004: 3). Utilities in the Dayak traditional longhouse are necessary to provide convenience for the occupants to dwell in comfort whild under the constraints of environmental conditions and extreme weather. The design of the Dayak traditional longhouse is adjusted in order to enable the occupants to survive against these environmental conditions. Therefore, the three building utilities which are required in a tropical zone are:

SUN RADIATION AVOIDANCE

To reduce the effect of solar radiation inside the house, the roof coverings are installed lower at the front of the longhouse. In addition, the horizontal logs which form the walls that surround the communal space also obstruct the entry of sunlight into the house. In the past no windows were found in any of the biliks so sunlight further reduced. Nowadays, however, a few windows can be found in each *bilik*. In order to reduce the redundant effects of sun radiation inside the house, a traditional Dayak longhouse usually places a canopy on all the roof edges around the entire house. In all cases, the houses were given a canopy on each roof edge generally, ranging in size from 1.5 meters up to 2 meters.

AIR CIRCULATION

Occupants are comfortable while conducting activities under the roof because wind can enter through the logs of the transparent wall as well as up through the floor boards. The large room volume in the public space (Takso) also allows for proper air circulation inside the longhouse. The roof cover which made of thin wood (*sirap*) shingles is another factor that contributes to making all the rooms in the longhouse comfortable. Occupants very rarely conduct activities inside the biliks during the day. Instead, after returning from the fields or plantation while it is still daylight, they gather in the Takso where they often socialize or do sedentary work such as fixing farming or plantation tools.

MODERATING EXTREME CLIMATE

The design of the traditional Dayak longhouse is to adapt to the extreme weather which occurs throughout the year in West Kalimantan. The use of the stage structure is the main choice for longhouse design since the soil surface is always humid and the possibility of the river flooding due to tidal cycles is a regular occurance. In the past, the floor (as in the case of B.1.1. or B.1.3. shown) was elevated very high from the ground level as it was intended to avoid attacks from enemies of other tribes as well as from wild animals of the forest or river. High rainfall in the rainy season along with extreme temperatures in the dry season and the extreme environmental conditions like that of the tidal river are regularly encountered in the areas where traditional houses are erected. Adjustments are found in the traditional Dayak longhouses of West Kalimantan in the use of materials and design that can reduce these enviromental influences. These adjustments are to controll the heating, cooling, and humidity in order to stabilize the internal environment of the longhouse.

The use of wood in all parts of the house helps to control excessive heating during the day and to retain the heat at night and during the rainy season. The large mass of the building with its huge volume of roof shape that includes high-elevation slopes retains heat while at the same time controls it. The transparent walls in the public space make this area comfortable for residents to congregate, while the private spaces have massive walls which envelope the bedrooms to provide warmth at night. The skin of the private space is formed by wooden boards tightly fitted together to avoid the entry of water and wind into the room. The installation methods of both elements make the traditional Dayak longhouses capable of stabilizing both temperature and humidity inside the rooms. During the dry season, humidity inside the house will be maintained because the stage house structure ‘catches’ the water vapor that rises from the soil’s surface. The

large volume of the community space with its transparent walls also assists in keeping the rooms cool during the dry season so that water vapor circulation can be maintained in the rooms at all times thereby preserving the stability of temperature inside.

CHAPTER V
COMPARISONS

In conducting the comparative study of the anatomy of traditional dwellings for the two of the indigenous architectures in West Kalimantan, the author did the research in 4 (four) phases, i.e.:

a. The first phase, by conducting comparisons based on the emerged architectural elements and linked to the object of study, which refers to the results of analysis in the previous chapter;

b. The second phase, by conducting comparisons based on the results of the respective six elements of the anatomy of dwellings that have been analyzed in the previous chapter;

c. The third stage, by conducting comparisons of the traditional dwelling houses against the human anatomy, with references to the two phases of comparison that have been done in the phases before, i.e., the comparison of architectural elements and the comparison of the anatomy of buildings; and

d. The fourth phase, by conducting comparisons towards the anthropometric science with references to the two phases of comparison that have been done in the phases before, i.e. the comparison of architectural elements and the comparison of the anatomy of buildings.

In each phase of comparisons, the two types of indigenous architecture of West Kalimantan were compared side by side in order to obtain a justification that, basically, people in the past learned from nature, including by examining themselves, for the creation of shelters that were beneficial for humans as an effort to obtain a comfortable life on earth.

5.1 The elements of Architecture

In this sub-chapter, the author did comparisons of architectural elements which had emerged during the analysis conducted on research objects. Each of the elements chosen are the units of analysis which are interesting to discuss more in depth, as the significant findings of this study and the next, and as the architectural characteristics of traditional dwellings in West Kalimantan.

5.1.1 Space composition and building masses

Viewed from the composition of masses for the buildings, there is a fundamental difference between the Malay dwellings and the Dayak longhouses in the amount of building masses. The Malay dwellings composition consists of two building masses of the main house (*rumah induk*) and the support house (*rumah anak*); meanwhile, the Dayak longhouses only have one large building mass. In the Malay dwellings, the building masses are apart from one another, facilitating the activities of the primary and supporters, while in the Dayak longhouse the primary and support activities are conducted in one large building. The main house in the Malay dwellings includes *serambi depan* (front *serambi*), *serambi tengah* (middle *serambi*) as a guest room, *serambi belakang* (rear *serambi*) as living room and family room and bedrooms, and the support house as the kitchen. By contrast, in a Dayak longhouse, all activities of the inhabitants are sheltered in one large space, integrated with one another in the same building. The kitchen, which was in the past placed in the *ruai* room, by the current social evolutions in Dayak societies has moved to the back of the longhouse.

Comparison of functions in the room sequence in the traditional Malay dwellings and the Dayak longhouses can be seen in the following table 5.1.

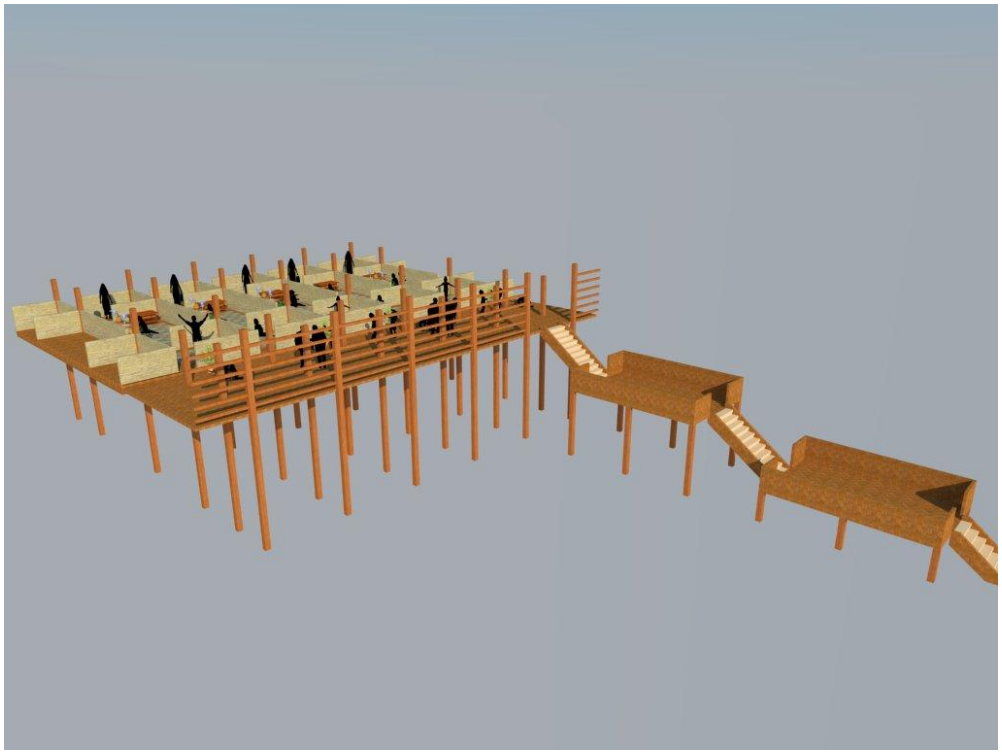
Table 5.1.
Comparison of functions in the rooms sequence in the traditional Malay dwellings and the Dayak longhouse

NO.	MALAY DWELLINGS	DAYAK LONGHOUSES	Function's comparison
1.	Front *Serambi*	*Takso Seleper*	Both have the same function i.e. as a place to receive and serve guests. Both for the Malays and Dayaks, this space is usually reserved for receiving the foreign guests. For daily activities, this place is used by inhabitants as a place to relax in the morning or evening.
2.	Middle *Serambi*	*Takso Tandanan*	This room had the same function as a place to hold the traditional ceremonies. However, besides that purpose, in the Malay house, the middle serambi of this gallery are used daily to receive the important and formal guests.
3.	Rear *Serambi*	*Tindoan*	The space basically has the same function, either for Malays or Dayaks, both as the family room for a break time and the interaction room. In the Malays' houses (Soenarpo et.al, 1986: 56), this space is separated by a partition wall which is not permanent or only lined by a curtain or closet. While in the Dayaks longhouse, the space currently is divided into several bedrooms with or without a family room. In the past of the Dayak longhouses, this space did not have room divisions, so then as the room partition for sleep at night, usually they used fabric curtains or bed nets (*kelambu*).
4.	Bedrooms		
5.	Kitchen (in separate house)	Kitchen (currently as the additional room)	This space is an element of the rooms which has become the fundamental difference between Malay dwellings by Dayak longhouses. Kitchens are a permanent space built to support the activities in the Malay dwellings, while in the Dayaks' longhouses in the past they were part of the ruai room; but at this time they are an additional room that is placed in the back of every *bilik* in the Dayak longhouses.



Figure 5.1.
Room's situation in the traditional Malay dwellings

Figure 5.2.
Room's situation in the Dayak longhouse



5.1.2 Buildings Orientation

The orientation of the house is also an interesting element to be discussed further. As for others, the orientation of houses is a major factor in building the traditional dwellings in West Kalimantan. The orientation of buildings was found in every traditional house used as a case for this research - towards the river, sun, and path. One of the aims of a building's orientation is the use of access in the front of the house as

the circulation and an important element to facilitate the movement of residents to other places. The main orientation of traditional houses in West Kalimantan in the past was a river. Rivers as major transportation routes in the past formed links between villages or cities in the interior of West Kalimantan. A fundamental difference can be found in two groups of cases in this study. In the traditional Malay dwellings, the orientation of the façade of the house does not use the river as the main orientation, but for Malays, the river is understood as the element of life support. Rivers, for the Malays, as for the other tribes in West Kalimantan, function as the source of life that provides many benefits for survival. Therefore, the Malay house will be near the water source (river), although the orientation of the house should not have to depend upon the river. Conversely, the Dayaks built longhouses towards the river as the main orientation, as well as a water source; this behavior is linked to the beliefs that are understood by the Dayak people about the forces of nature, which control the river.

Likewise to the orientation of the sun's circulation, the Malays did not make this orientation the main requirement that had to be met in their dwellings, but the opposite occurred in the Dayak longhouse, which makes the East - West orientation the primary basis for the front façade of a house. The belief in *matari tumboh* (sunrise) and *matari mati* (sunset), which is linked to the philosophy of the human life cycle, causes this orientation of front façades towards the river to become important for the Dayak longhouse.

As in the above explanation regarding the orientation of houses, there are facts found in the field that can explain the basic differences between the orientation of rivers in the front façades of the Malay dwellings, which did not become really important, and what happened in the Dayak longhouses. The beliefs embraced by the respective indigenous peoples of West Kalimantan distinguish the basic understanding about

orientation of the front façade of houses for both types of architecture. The Malays who embraced Islam as their religion banned as a cult the presence of elements or creatures excessively. According to Islamic teachings, the Malays well understood that everything created by God is good and can be used as fully as possible for the good of mankind. So if there are great benefits of God's creation which could be obtained, the Malays would no doubt use and exploit them. This attitude is based on Islamic teachings, so that the Malays have a habit to always be thankful for what they receive, and they should not be prejudiced against God's creation or sustenance received from God.

Different conditions happened to the Dayak longhouse orientation due to the the traditional beliefs that they carried out from the past and some of the Dayak people still maintain today. However, the implementation of the rules of traditional belief created a friction in which some of the inhabitants of the Dayak communities are no longer making the river the main orientation of longhouses, and these people have changed longhouse orientation in favor of following the path as a new orientation of the front façade of their longhouses.

5.1.1 Basic norms in implementing the customs and traditions

Essentially, the same basic philosophy understood and carried out, both by Malays and Dayaks, is that their lives on earth are a living story in which everything is in the control of large forces that regulate every aspect of human activities. In the physical manifestation, these activities are controlled by the laws that govern in the positive order and they should be obeyed as fixed rules by the respective communities.

Positive orders which are obeyed by the Malays are found in the Quran and Al-Hadith as guidelines in conducting their lives in this world. These guidelines regulate the two aspects of the life of Malays; i.e. the

human relationship with God (*hablumminallah*) and man's relationship with man (*hablumminannas*), while the rules that control the lives of the Dayak people are the customary laws (*hukum adat*), traditional customs (*adat kebiasaan*) and traditional beliefs (*adat keyakinan*). The same as for the Malays, these three guidelines also set up the various aspects of life of the Dayak people. The guidelines that regulate the relationship between man and the powerful forces that affect the lives of the Dayaks are found in the traditional beliefs, and the relationship between human beings obtained through the guidelines of the customary law and traditional customs. These guidelines are a hereditary law which is acquired from generations of ancestors of the Dayaks and generally understood and executed in the form of oral culture in their communities. People who have this ability to understand all the traditional customs are selected, and one of them and is appointed *tumenggung*.

From this point, we can see the similarities between the views of Malays and Dayaks about the norms in their lives: that their religious beliefs could not be separated from their daily lives. The religious belief is manifested in the creation of building forms and elements that support the space inside the dwellings. Additionally, the regulations both written and unwritten used as the basis for harnessing the space were created and should be obeyed by the users. This is an effort to shape the traditional cosmology as understood by the indigenous people in implementing the concept of macro and micro cosmos that is encompassed by the rules of the beliefs embraced by the Malay and Dayak communities respectively. According to Sudarto, the implementation of the concept of *habluminannas* in the lives of Malays is embodied in the form of customary rules, while the concept of *habluminallah* in its implementation refers to the written rules in the Qur'an and al-Hadith. So it is clear here that the customary rules are a complement of daily activities rules that are not

specified in the two of main norms for the Malay society. The same condition is also found in the life of the Dayak people where they divide norms that are unwritten and delivered as hereditary from the ancestors into both customary law and customs of the traditional beliefs (Alqadrie, 1990; Thomson, 2000; and Pebriano, 2006). These three elements are then, in their implementation, separated into two essential parts, which are also found in the norms of Malays. It is therefore the customary rules which then became an important element controlling all aspects of the lives of Dayak people, and they also limit their activities in compliance with the customary law, norms, and regulations of belief.

According Soenarpo et.al. (1986: 41-42), in general, for traditional societies in West Kalimantan, both Malays and Dayaks, they still believe that in human lives, beyond their lives dimensions, there are certain places which are also inhabited and controlled by kinds of fine creatures. If humans inadvertently disturb their lives, it will make them angry, which can result in pain and other psychiatric disorders in humans. Therefore, in several locations in West Kalimantan there remain the Malay people who run the traditional rituals that they acquired from their ancestors, though the rituals are quite contrary to the teachings of Islam. However, they contend that this is only a custom and is separate from the behaviour of giving worship to these spirits. According Soenarpo et. al. (1986), one of these customs, the ceremony of *robo-robo* is annually held in several coastal areas in West Kalimantan such as Mempawah, Pontianak, and Ketapang. Robo-robo is a ceremony to make offerings to the ruler of the sea as an effort to avoid disaster and misfortune. This, according to Thomson (2000), occurs because the Malays who live alongside the Dayak people also share many features of the Dayak worldview, and the Malay people, on the other hand, also run traditional ceremonies by using the concepts which seem similar to the Dayaks for the activities that relate to their lives.

5.1.2 Constructions

The constructions of traditional houses in West Kalimantan, like those found in several other regions of Indonesia, generally showed similarity in structures. This refers to the adjustment of the environmental conditions that affect to the lives of inhabitants, and they applied it to the architectural design of dwellings.

The natural conditions that are always experienced either by the Malays and Dayaks are the tidal conditions of rivers, the disruptions of wild animals, precipitation, and high humidity. These conditions caused the construction of dwellings made with the stage house structures, roofs covered with a high slope, and dwellings provided with a lot of openings.

The stage structure was the primary choice for the indigenous people in the past to suit the local conditions, where most of the traditional buildings in West Kalimantan were built close to the river stream. The river stream becomes a node of activity in the artery paths of the traditional societies, both as a source of life and also the transportation routes. But in addition to these benefits, on the other hand, the danger of the rivers overflowing and the conditions of low carrying capacity of the soil, make it challenging for them to build the houses. According to Zain (2003: 105-106), the structures of wood that formed the foundations as stage house constructions, and which were reinforced with pads in each of their points, made these structures able to withstand the construction loads, and also worked to avoid shifting the structure due to instability of the soil conditions.

Another distinguishing feature, in addition to the explanations previously, is that generally the Dayak longhouses have a floor elevation considerably higher than the dwellings of Malays. The main purpose of the stage house constructions, for the Dayaks, was to anticipate the attacks from other tribes which in the past

frequently occurred in the interior of West Kalimantan. Finally, the condition of the building with the higher stage house also causes the floor to remain cool, due to the air circulation under the floor.

The roof construction also shows the similarities of structure both in the Malay dwellings and the Dayak longhouses. High-sloped roofs are intended to anticipate the high rainfall and to create space under the roof that acts as a trap for the hot air. According to Zain (2003: 122) the high slope of the roof is intended to create elevation so that rainwater can flow away without sticking in the crevices of the roof. In addition, a large room underneath the roof gives benefits for the air circulation to move freely.

In the middle part, there are the fundamental differences between Malay dwellings and the Dayak longhouse. On Malay dwellings are found many openings, either doors or windows with the walls covered entirely using wooden boards fitted tightly. Meanwhile, on the Dayak longhouse, in the public space section, the walls are covered by many small wooden logs and fitted with some distance; but the opposite condition, in the private space, is that the walls are entirely covered by wooden boards fitted tightly. Furthermore, on the differences in wall constructions, both types of this architecture still provide the same comfortability in the room, because the air circulation can still flow freely. On the other hand, the lighting in each type of house is found in different conditions. The Dayak longhouses tend to be darker than the Malay dwellings because the sun is blocked by the lower position of the roof edge on the front façade, and also by the rows of small wooden logs.

5.1.3 Meanings

The traditional interest in a dwelling, with emphasis on the local wisdom, was used to create the architectural designs that are attached to both buildings. In addition, as previously mentioned, the ornaments,

colors, models, and the meanings applied to the building were considered as strongly reflecting the desire to accentuate the identity of each community. Specifications structured with local content, and wrapped with the special architectural elements strongly show both the specifications themselves, and their perceived ability to strengthen the traditional identity distinctiveness of each of the typical traditional dwellings of West Kalimantan. Both are specifically able to make a difference to the observer about the image of local traditional buildings. Observers will be able to distinguish the architectural image of Malay dwellings which are owned by Moslems from the Dayak longhouses through the architectural image of buildings which are owned by a group of Dayak people who live together with a strong guidance of the customary rules.

Islamic values have become the main source highly featured by Malays in the architecture of their homes. As author mentioned in previous chapters, the Malays always linked the problems of life in the world with the teachings of Islam. According Soenarpo et.al. (1986: 43), for the people of Malay ethnicity who obediently implement all the religion of Islam, the basis of religion is the most dominant in every aspect of their lives. The Islamic law of *sharia* could serve as the guidelines that govern the behavior of Malay people in their daily activities. Whatever events happen to them, they will always try find the references in the rules (*sharia*) of Islam. The same condition is also carried by the Dayaks. But the difference is that their rules on the system of knowledge about all the customary rules, they receive from the information passed on from generation to generation by their ancestors.

Another important finding is that the Malays also linked the section components of a house consisting of bottom, middle, and upper parts with the concept of phases of hierarchy in the practice of their religion: namely, faith (*Iman*), *Islam* and *Ihsan*. The third concept in this hierarchy is seen as a process of the phases of

attainment of perfection desired by all Moslems: *Iman* as a foundation, *Islam* as body section and *Ihsan* as deeds (*amal*). This is the conception of Moslems as they journey toward goodness in the world (*dunia*) and the hereafter (*akhirat*). *Iman* as the foundation includes the six basic things that should be recognized by persons proclaiming to be Moslems, *Islam* as a body section contains the five points of doctrine that must be implemented by Moslems, while *Ihsan* as deeds (*amal*) has meaning as a behavior that should characterize the Moslems, who always remember it (as the behaviour of their good deeds through the memory in the mind) so that they are able to establish or enhance the previous two concepts that are to be carried out well. These three concepts above are described as the process of building a dwelling in sequences, and each phase affects the others.

So here, the faith (*iman*) is acting as a foundation for a Moslem (Malay) in living life on earth. In the dwellings, architecture is described by numbers of wooden poles as the foundation that holds the whole load of house constructions. According to the teachings of Islam which they believe, *iman* is the foundation (base) before they should to carry out the other religious orders. If they already have faith (foundation or base), so then they will be taught further to perform the five basic Islamic teachings throughout their lives. Implementation of the five basic teachings of Islam is generally conducted in their respective houses. This condition is the main reason why the Malays always keep clean the rooms of the main house, because the house is a perfect place to carry out all orders of the five basic teachings of Islam. The next phase is the effort to achieve the level of Ihsan to strengthen the foundation and body that have been formed. Here also we find it expressed that Ihsan shades and keeps the Islamic faith for all of the inhabitants in the house (Malay

people), so that they will always be awake and continue to increase faith, by always running the religious orders as *amal* in daily life.

A similar understanding, with a different concept, is also found in the architecture of Dayak longhouse. The macrocosmos understanding that controls their lives on earth is also manifested by the division of houses into 3 parts: namely, the underworld, the middle world and the upper world. This understanding, if compared with the concepts used in Malay dwellings, is also relatively shown by the similar meanings. The underworld inhabited by the spirits of ancestors or the power of nature is a principle of belief (*iman* in Malay terminology), and for the Dayak people the powers that govern the universe (the macrocosm concept) are found in similarity with Malay people as the understanding through one of the six aspects of *iman*. In this case, both the Malays and Dayaks, are equally convinced that there is a powerful 'creature(s)' who regulating and controlling the universe.

Similarities are also found on the understanding of the middle world as a place inhabited by humans to perform their activities. For the Dayak people, this section serves as a place where the humans conduct various activities in life, and on the other hand also serves as a place to conduct traditional ceremonies. This traditional ceremony is a medium to ask for supplication or an expression of gratitude to the owners of great forces in nature. This is the same concept found in the residences of Malays. The different is that in the Malay dwellings the entire space in the main house is a place to practice their religion, while in the Dayak longhouse, because of their life as a community, the implementation of the ceremonies is performed in certain sections of the community space.

As mentioned previously, in the Dayak longhouse is found the concept that the world above is a symbol of God's world. The upper world which is bridged by the *sadau* room is the location that becomes the perfect point to deliver a request to the Lord who inhabits heaven. That concept still exists today, as people usually put the offerings in one of the poles under the roof. This understanding seems different from the concept of *ihsan* shown in the Malay dwellings. But the influence of the culture from the past could be found on the Malay dwellings. According Soenarpo et.al (1986), the traditional Malay society in the past still put some items as offerings that hung on the tip of the main pillar (*tiang seri*) when the house was first erected, and currently the placement of poles on the roof top (as a symbol of *tolak bala* to avoid catastrophes and misfortunes coming to the occupants of the house) is also still found.

The main factors underlying the concept of micro-macrocosmos applied to the both types of architecture is the difference in beliefs they held. The animist beliefs became the basic understanding of the Dayak people in all aspects of life, including homes, where the conditions already existed in the past life of the Dayak community, from generation to generation, delivered by the ancestors so that the Dayak people generally understood it as part of their belief, before they moved to embrace a new religion. This concept as a belief is still carried out by some indigenous Dayak people as a part of the essential customs for their lives. The different conditions in the understanding happen in the Malay people, who basically always linked all aspects of life to the Islamic religious teachings that they follow as the basic rules in life. According Sudarto (in interview of 2010), the habit of linking the concept of Malay Islamic teachings in daily life is partly to beautify their lives. Thus, the dwellings as artifacts are usually created with aims to follow the environmental conditions, but then they are shaped with the concepts of Islam, so that Malay people will always remember

their identity as Moslems. Therefore, usually in the views of the Western people who visit the communities of indigenous people in West Kalimantan, the Dayak people are closer to the mystical life if they are compared with the Malay people.

Considering the ratio as presented in the previous chapter, a comparison between the middle and upper part (the body section compared to the head) also showed differences in the appearance dominance of the two parts, both in the Malay dwellings and the Dayak longhouses. In the Dayak longhouses, the mass composition of the upper part appears more dominant when compared to the middle part, but different conditions are found on the Malay dwellings where between the middle and upper part is only found a little difference in the mass composition, and we tend not to observe a dominance in the overall appearance of the front façade. For the Malays, the top is a place for femals, which is very protected for honoring her activities, but the most important part is in the middle part as the place for daily activities. Whereas in the top of the Dayak longhouse, which called *sadau*, is the room to hang the offering items to *Jubata* (god); the room is considered as the liaison space to communicate with the world above. Here we can see that in both cases, artefacts have different functions, but generally have the same meaning about the importance of this section. And also in their understanding of cosmology, the conical shape of the roof facing toward the sky, for both the Malays and Dayaks, has the same meaning that all activities undertaken inside the house (in the middle part) will be sent directly to the heavens where God resides. Manifestation of activity for the intended meanings in the respective communities is found to be different. Malay activity is characterized by running the prayers, reading the Qur'an and other religious activities; whereas for the Dayak, it is characterized by conducting the customary ceremonies that give offerings (*sesajen*) which are hung on the structure under the roof.

5.1.4 Natural Light Conditions

The natural lighting conditions are the most perceived differences between the two traditional buildings in West Kalimantan. All rooms in the Malay dwellings exhibit a tendency to be brighter than the rooms found in the Dayak longhouse. This difference is produced by the number and characteristics of the openings found on respective of the works of architecture; they are indeed found in different conditions.

The Malay dwellings have more openings of doors and/or windows to let sunlight into the room, where all the openings are placed on entire space created. If the function of a room is a public space, there will be found more openings, but in the opposite condition, the number of openings will be decreased in the rooms that are considered private or semi-private. To restrict the incoming sunlight, such as in private and semi private rooms, the occupants usually install curtains.

The opposite condition is found in the Dayak longhouse, with few or no openings as the media to receive the sunlight into all functioning spaces, which causes all the rooms in the Dayak longhouse to tend to be dark. As the only source of lighting, the incoming sunlight is obtained from the sidelines of small wooden logs that cover the walls of the *takso* space, but because of the small distance between logs and the low position of the roof edge in the front of the longhouse, there is not enough space to make the sunlight illuminate the entire area of the *takso* room. The worst condition was also found in the *tindoan* room which did not have any windows to let the sunlight enter the room, so that the room is found to be darker than the *takso* room.

5.1.5 Term of Privacy

Differences in the terms of privacy are also found in the both traditional houses in West Kalimantan. Terms of privacy here is intended as the level of hierarchy of spaces to be accessible by the users. The cultural differences and characteristics of the building cause the spaces to have a similary of functions, but there is a differentiation in the privacy hierarchy.

The privacy in the Malay dwellings has hierarchy levels beginning from the public space that is represented by the serambi rooms in the front and middle, then semi-private space that is represented by the rear serambi, and the last is the private space that is represented by the bedroom. Meanwhile the privacy in the Dayak longhouses has hierarchy levels beginning from the public space that is represented by the takso seleper room, then semi-public space that is represented by the takso tandanan room, and the last is the tindoan room that serves as a private space for sleeping and gathering together the family members.

This is obtained because of differences in the concepts of the establishment of residences in these respective works of architecture. Malay dwellings are designed as a single house which is inhabited by only one family, and if any other family is present in the house, it usually consists of the daughter of the owners with her partner; whereas the Dayak longhouse is designed as a dwelling house with lots of *biliks* and inhabited by many families. Each bilik is also typically inhabited by more than one family, which is the daughter of the owner of the *bilik* with her partner.

The concept of a *bilik* in the Dayak longhouse is similar to a house in the Malay dwellings, i.e. as a place to cover the family activities from the observation of outsiders. The terms of privte family activities were found to be different in Malay and Dayak places. The ‘inside house’ for the Dayaks is in the *bilik*, while

for the Malays it is in the rear *serambi* and bedrooms. On the other hand, we can see that the current composition of room division in a bilik is similar to the 'inside house' of Malay dwellings. Therefore, privacy in the Dayak longhouse is the individual activities of family members in the conditions of a family atmosphere which carried out in the *bilik*, while in the Malay dwellings, privacy is emphasized as a private atmosphere for family activities located in the rear *serambi* and bedrooms. Although in the Malay dwellings, the serambi on the front and middle is also part of the house, the division of semi-private and private space with the public spaces was accomplished inside of the residence. A different condition is found in the Dayak longhouse, where division of the space is made between the public space and semi-public with the private spaces inside the bilik. Both parts of these houses, whether in the homes of Malays or Dayaks, preserve 'the inside house' as limited access for others.

Physical barriers that surround the space and also limit human access to the spaces cause the similarities and differences in the terms of privacy found in each of these traditional houses of West Kalimantan. The similar conception of privacy is found to limit the public and private space with massive walls, both in the Malay dwellings and the Dayak longhouses. In addition, there is a difference between the understanding of the terms of space division and also the room characteristics of semi-private rooms in the Malay dwellings and a semi-public space in the Dayak longhouse. Semi-public spaces in the Dayak longhouses are bounded physically by a row of poles. The space is said to be semi-public because it is used specifically for the ceremonial activities and the meeting rooms of villagers or residents of the longhouse. Except for such purposes, as author said in the previous chapter, the longhouse occupants rarely use it. Guests and the occupants of the longhouse use seleper takso rooms as the place to interact. The conditions of space

utilization are the same conditions as found on the middle serambi of the Malay dwellings, which is also rarely used for everyday activities except to receive the formal guests or for conducting the customary ceremonies. On the other hand, semi-private rooms in the Malay house are bounded by massive walls, with openings made by a curtain or a door. The space is said to be semi-private because it is only for family members, especially the mothers and daughters, and only female guests are allowed to enter.

The explanation above gives an overview why the Malay dwellings divide the private space into two parts while conversely the Dayak longhouses divide the public space into two parts. The purpose of first establishing houses and the different of needs is the reason why this condition occurs on both houses. The Malay dwellings require a private room for their family members, while in the Dayak longhouses, as the community buildings, require the privacy in public spaces to conduct customary ceremonies or meetings that need to be done by the occupants.

5.1.6 Units and Scales

In creating the spaces and their dimensions, both in the Malay dwellings and the Dayak longhouse in West Kalimantan, both are using the units of measurement and scale that refer to the human anatomy. Both are using units of the anatomical size of the head of the family as a basis for units in creating the space and its dimensions. The head of the family, in this case the husband or father who is considered to have the responsibility to protect all the family members, becomes the reference for the size of body parts that will taken and applied as the size units for the elements of the residence. Not only that, as the greatest in size among the adult family members physically, the use of measures referring to the head of the family is a rational reason why this option is chosen.

Pronounciation of the unit measurements of rooms is also found to be similar in both the terminology of the Malays and the Dayaks. The Malays sometimes mention the unit of *kilan* or *jengkal* for the same purpose, as well as the terminology of measurement which is mentioned by the Dayaks. The size of *se-hasta* in the terminology of Malays is the same point of meaning as the *se-badan* in the terminology of the Dayaks. *Se-* as referred to herein indicates the number one, so *se-hasta* or *se-badan* means the size of one unit of body width.

Units of *se-depak*, *se-badan* (*se-hasta*), *se-kilan* (*se-jengkal*), and *se-genggam* are used to form a spatial dimension such as length or width of the room, while other measurements are commonly used to estimate the height of the house's forming elements. Applications that are used to measure, such as the elevation of windows from the floor usually are *se-pinggang* (as the height of the waist), height of the railing using *se-lutut*, or as the height of a knee, a door's width as wide as the person sitting on the floor with legs straight; or, it is equal to *se-pinggang*. The height of curtains usually is *se-dada* (as the height of the chest), and other applications are conducted for many measurements, such as the floor height from ground level, the distance of the floor from the attic, or other purposes.

5.1.7 Materials and Construction Systems

The choosen material for building the traditional houses in West Kalimantan is wood. Wood is the material that is available in the entire region of West Kalimantan. According to Zain (2003), the wood used for the houses of Malays in West Kalimantan and also used for the Dayak longhouses is a type of *belian* wood (the strength of first class) and a type of the *mabang* or *meddang* woods (the strength of second class). This

type of *belian* wood is used for the main structures, such as for the foundations, columns, beams or roof structure, whereas a type of the *mabang* or *meddang* woods is used for the supporting structures, such as for the floor or wall or roof constructions.

Although they use the same type class of wood, there are different forms in the utilization of wood in the structure of the house. The Malay dwellings firmly use square timbers, both for the main structure and its supports. Meanwhile the Dayak longhouses, especially those built in the past, usually are found to use timber in rounded wood log forms for the main structure and in the square form of timber for the supporting structures. Another difference found is in the connections system. Generally, the Malay traditional dwellings are familiar with the "pen and hole" for connecting the joints of timber, while the Dayak longhouses use a bonding system for connecting the joints with ropes or rattans. In addition to which it is currently found that the newest longhouses are also using the traditional connections, as in the Malay dwellings (Bappeda Kabupaten Pontianak, 2009).

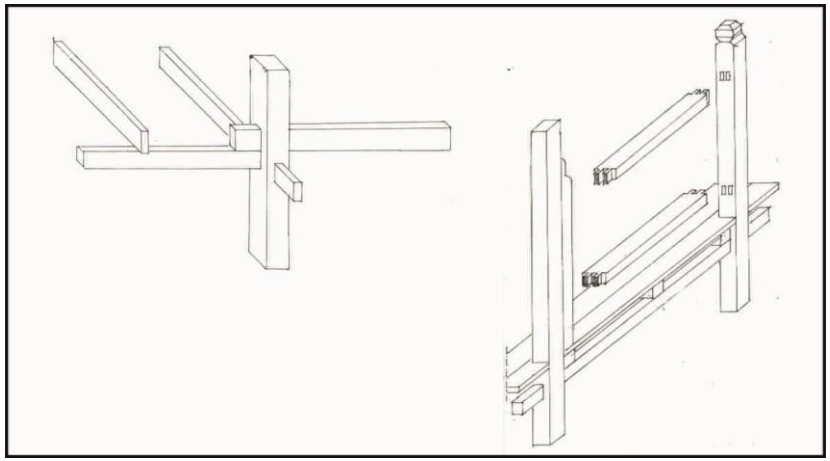


Figure 5.3.
Examples of the joints connection of timbers in the Malay dwellings



Figure 5.4.
Rows of the rounded wood logs as a division of the biliks or space (left) and bonding system used on the roof cover (right). Photographs was taken from the inside of Longhouse of B.1.1.

5.2 The Concepts of Building's Anatomy

In this section will conducted the comparison of Malay dwellings and the Dayak longhouse towards the six anatomical aspects of buildings that discussions was have been done in the previous chapter. This section provides an emphasis on the comparison that shows the similarities and / or differences found in each of the architecture of traditional houses that were analyzed.

5.2.1 Anatomy of Plan

In general, the Malay dwellings and Dayak longhouses consist of many spaces and are formed with different functions. Each spaces could be limited by the partitions, floor elevation or other markings to distinguishing between the functions of one space and another. Partitioning is a common mark found in both traditional dwellings. A firm partition is demonstrated by building with massive walls that separate between spaces, as an effort to distinguish the spaces between public and private. The partitions could also be formed by the curtains or furniture. Meanwhile, the pseudo-marks are indicated by a row of columns, floor elevation,

or beams placed above the floor. The marks confirm the space transition among the public spaces, public to a semi-public, or semi-private to private. Other marks used to distinguish the spaces are the presence of mats on the floor. Mats are used as a mark for the sitting area in the family room, the kitchen or guest room (in Dayak longhouses found in the *takso seleper*). In addition, the floor elevation is also intended to emphasize the boundary between the area of the outside with the inside the house, or emphasize the division of the dirty area outside from a clean area inside the house.

The hierarchy and composition of the floor plan in the Malay dwellings and Dayak longhouses also show the sequences of function based on the allocation of space for the kinds of activities which are usually performed in the room. In the hierarchy order of the floor plan composition created, the deeper a person entered into the house, the more private space is found. This privacy policy was created to provide the limitations for the guests and protect the occupants performing their activities from the observation of guests or others who are not expected.

The interesting thing found in the Malay dwellings and Dayak longhouses is the location to conducting the selection of guests before entering into one of the private rooms inside the house. As author noted in the previous chapter, in the Dayak longhouse as a dwelling with a lot of biliks, the guest selection is performed in two phases. The first time is conducted in the *pendopo* for the guests who will entering the longhouse (the public space) through the interrogation about the purpose of the guests. The next phase is a selection of guests in the public space before they are allowed to enter the private room (*bilik*). As in the Dayak longhouses, in the Malay house which is a single dwelling house, the guest selection is also performed for filtering the personal activities of residents, especially for women and girls, from unwanted guest

observations. Slightly different from the Dayak longhouse, the guest selection in the Malay dwellings is also done, but only once. The guest selection is performed in the front *serambi* to determine whether the guest received will be invited to enteri the middle or rear *serambi*. Selection is carried out to determine the guests who will enter a private room. In the Dayak longhouse, only the family guests were allowed to enter the semi-private room in the bilik, while in the Malay dwellings only family guests with female gender are allowed to enter the private room. The presence of door openings acts as the mark of limitation on the Dayak longhouse. To enter the public space, the guest should use doors that are available only at the three positions, while the second filter is the door of each *bilik*. Meanwhile, acting as a the filter in the Malay dwellings is the presence of a door opening at the front (the number varies between 1 and 3), and the second filter is the presence of openings with curtains.

The function of a wall inside the Dayak longhouse is separating the activities and selecting the kind of interactions that will be done by the family members with other bilik dwellers. The same condition is also found in the Malay dwellings, but they specify these conditions, emphasized to separate the activities and types of interaction between men and women. Walls, both in the Malay dwellings and the Dayak longhouses, although separating the activities and the kinds of interactions, do not separate the proximity of residents to their community. The wall made of wood is not a good material for sound insulation. Both the Malay and Dayak have the same behaviours of togetherness. Although limited by the walls, they still want to feel 'together' with other inhabitants. The feeling of wanting to stay together with others is perceived by still hearing the voices from another room in the Dayak longhouse, or other houses in the surrounding settlement of Malays. Likewise, with the smell of cooking from each house or bilik, the walls of a house will not be a

good insulation for limiting the smell from crossing the rooms or moving to another house. This condition is a sign of whether or not a neighbor's house or another bilik has foods that can be cooked on a particular day. If people did not smell the cooking preparation and felt the neighbor was not cooking on that day, then they, both the Malays and the Dayaks, would be happy to share their food with others.

5.2.2 Anatomy of Shape

The appearance of traditional houses in West Kalimantan, as well as the traditional buildings found in other regions of Indonesia, consists of three sections that traditionally most of people use to divide the building, i.e. the bottom, middle, and upper parts. In addition, basic shapes that make up each section of the structure are found in the form of squares (or rectangles) and triangles.

The stage-houses became icons of the architecture of traditional houses in West Kalimantan. Both the Malay dwellings and the Dayak longhouses were made with a high elevations from the ground. In the Dayak longhouse, which was made in the past, the composition of the bottom was made larger than the middle and upper parts, while in the Malay dwellings it does not exceed the middle and upper parts. Construction of stage-houses with high elevation does not make the Malay dwellings and the Dayak longhouses look tall, because both of these buildings also have large spans of building width, and are also consistent with the height of buildings in the middle and upper parts. Construction of the stage-houses gives the image of distinguishing between the human activities and nature, or distinguishing the humans activities in the 'inside' and 'outside'.

Another unique characteristic also found in both types of architecture is a large form of the upper part. Even in the Dayak longhouses, the height appearance of this part looks bigger than the body, while in the

Malay dwellings it is found almost in the same composition. The author also found another unique feature in the upper part: that the roof cover is formed in a high slope. The high slope of the roof cover is intended as an adaptation to the local environmental conditions that include high rainfall, so that rain water will immediately drain off.

The fundamental difference in the appearance of the façade between the dwellings of Malay and the Dayak longhouse is the number of openings shown; openings dominate the house façades of the Malay dwellings, especially at the front, while in the Dayak longhouses there are fewer openings. Meanwhile, the front façade is dominated by a wall formed from logs mounted with distance between them. Both of these elements demonstrate the openness and softness in the appearance of the façade of each dwelling.

In addition, generally the two types of traditional houses in West Kalimantan also did not to use color in coating the walls of buildings, so that the impression created by soft wood materials is increasingly prominent. Shapes of the buildings built along the river or following the direction of a road also make two types of this architecture give the impression of being 'integrated' with the surrounding environment, and demonstrate the openness to people around the house, expressing acceptance to guests. In both houses, the main door is always open during the day.

Balance in placement of the house elements is also shown by the two types of this architecture. The element of ladders as the entrance is placed in balance on the middle or on the both side of dwellings. Symmetry on the building volume is established by making an equal division between the left and right, if we make an imaginary vertical line on the building. Another thing clearly found, especially in the Malay

dwellings, is a balancing of components in the composition of the number and placement of the openings in each grid created.

5.2.3 Anatomy of Sections

In the vertical division of the house are also found similarities in the understanding of the three parts of house, i.e. bottom, middle, and upper sections.

The striking difference between the house elevations means both architectures are simply and easily distinguished. The whole height of elements of the Malay dwellings found to be lower than the Dayak longhouse. Floor elevation from the ground surface of the Malay dwellings was found to be smaller than thst of the Dayak longhouses. The floor surface elevation reaches up to 2.5 meters in the Malay dwellings, while in the Dayak longhouses it can reach up to 7 meters above the ground surface. Striking differences were also found in the upper sections, where in the Malay dwellings it was found that the maximum height was up to 5.39 meters, while in the Dayak longhouses the height was found to be up to 7.35 meters. Likewise, the total height of the buildings shows that the Malay dwellings have a maximum height of up to 11.7 meters while the Dayak longhouses of up to 13.94 meters.

The height differences make a comparison between the sections (toward the total height of the houses) and were found in the contrasts between the Malay dwellings and the Dayak longhouse. A very striking difference was found in the ratio between the bottom and upper section. In the Malay, the house has the ratio between the lower section of the total height of house was found to be in a constant of up to 2.5 digits; while in the Dayak, the ratio of the upper section of the total height of building was found to reach 5.3 digits. This explains the domination of the upper part on the Dayak longhouse. The difference is also found in the Dayak

longhouse, in which the ratio of the height of the bottom or top sections to the total height of the building is found to be interrelated. If the ratio is greater in the bottom, then ratio on the top will decrease, and vice versa. This condition is occurs because the overall height of longhouses have been found with almost no differences.

a. Bottom part

The main function of the bottom section of the Malay dwellings and the Dayak longhouses is found in similarity, as anticipation of the effects of environmental conditions. Both of them were found with the elevation above the ground surface.

The Malays believe that elevating the bottom section is an attempt to separate the places which are always full of dirty and unclean activities from the middle section as a place for human beings to live. For the same purpose but with a different concept, the Dayak people think of it as the underworld (the bottom section), the dwelling place of demons, so that (just like in the Malay dwellings) also must be distinguished from the place where humans dwell. Here is understood that the human world, in the concept of the Dayaks, is a place of the human activities and to reproduce descendants. But another thing is found in the concept of Malays, other than those mentioned above, that the area in the middle section is also a place to carry out the worship of God. Therefore, a distinction between the Malay dwellings and the Dayak longhouses is found on the division of spaces, as the family activities are on one side and the other side is for the ceremonial purposes or the community activities of the longhouse. The same condition also found in the Malay house, but its function as a place to perform traditional ceremonies is not specified clearly and can be mixed with other activities. There was not found a special place for worship in all parts of the room in the Malay main houses,

such as those found in the Dayak longhouses, with the specialized takso tandanan as a place for customary ceremonies or community activities.

There is a shared understanding for both the Malays and Dayaks in the meaning of two sections in the traditional houses they inhabit. Bottom sections for the Malays are formed to distinguish between the outside, which is considered as the place that is always dirty, with the inside which should always be clean of the impurities (*hadast*). On the other hand, it is also a place to demonstrate the difference between humans as *khalifatul fil-ard* (caliphs or leaders of the world life) from other beings that are created by God. There are different concepts. Meanwhile, with the same function, the bottom section is also understood by the Dayak people as the underworld inhabited by the spirits that could interfere with human life. Therefore, this section should be also separated from the others to accommodate the intended meaning. If we analogize the house as 'the palace' for the leader, so then the middle becomes a place where the humans reside (for high positions as the caliphs of the world in the concept of Malays) or a place where men dwell in the concept of the Dayaks. This also means to differentiate the bad things (evils spirit's, destructive elements, or dirty elements) and the benefits of the Good Things from nature for humankind.

b. Middle part

This section became an important element, because this section was where humans lived and performed activities. In addition to dwelling, this section for the Malays is also the place to practice their religion, either to worship God (*hablumminallah*) or interact with the fellow humans (*hablumminannas*). For the Dayaks, this section houses the secondary functions of longhouses as the protector, preventer, and place to obtain supplication from the evil spirits or supernatural beings by the rituals or ceremonies performed.

Elements are found in this section as symbols depicting a balance in life that is expected by the Malays or Dayaks. A *tiang pemun*, that was first erected as a central symbol of the activity of residents, is placed in a location that is also exactly at the centers of the houses. In the Malay dwellings is found a *tiang seri*, which was placed stacked with the wall envelopes between the public room and the semi-private and private rooms, so that it became an important part of the house, because it is the main pole and the spirit of the house. The same condition is found in the Dayak longhouse, *tiang pemun* as the first pole established in each bilik, called "*penyawa rumah*" (give life to the *bilik*). The *tiang pemun* position is also located in the center between the public / semi-public space and a private space. Dayak people believe this pole is 'a source of life" of each bilik. Both posts have the same meaning as the symbol of guarding the house or bilik occupants' activities, because they are situated at one corner of the living room that seems to be a symbol of monitoring the activities of residents. For the Malays, it became a symbol of the location of the pole at the center of daily activities, and worship, while for the Dayaks it exists as a symbol of life that should always be maintained by the bilik occupants, as well as a source of mystical power againt the interference of evil spirits that may influence the bilik occupants.

c. Upper part

The upper section to be an important element that protects the occupant activities from bad conditions in outside. This section is found in the Malay dwellings and the Dayak longhouse with different functions. In the Malay house, this section is called as *parak* which is functioned as a place for the activities of women or girls, whereas in the Dayak longhouse, this section which called as *sadau*, is a place to placement the crops (such as paddy), offerings, or customary objects. However, if we further investigated,

both is showed the same purpose that placing the items or beings is considered valuable for their life in the highest position. In Malay culture, women or girls who are members of the family is very precious and they must be preserved her honor and in accordance with the Islamic teachings, they must be protected from the observation of people who are not *muhrim* so they can performed activities without worries, while at the Dayak culture, paddy as a farming product regarded as having a life, while the offerings and customary goods are valuable in their customary law and beliefs.

The high position of main roof is used to cover the main and sacred spaces in the respective traditional house. In the Malay house, the main roof is covering the main space, i.e. rear *serambi* and bedrooms, while the lower slope of roof like found in the *potong limas*, the roof only covering the front *serambi* space. Furthermore, in a major roof of the Dayak longhouse, higher slope is covering the *takso tandanan* and *tindoan* space, while the lower slope of roof is only cover the *takso seleper* space. Here we can concluded that the higher roof is overshadow the important activities in the area which is hold a traditional ceremony (in the middle *serambi* or *takso tandanan*) and also the personal activities of family members (rear *serambi* room / bedroom or *tindoan*).

The condition of roof that forming an angle pointing to the sky is a function of cosmology is to be conveyed by the people in their respective architectural designs. The roof forms, for the Malays, is a symbol of the activities that carried out in the middle section is addressed to God. It is characterized by naming one of element in the roof constructions as a "*penunjuk langit*" (sky pointer) and the ornament of "*tolak bala*" (the catastroph avoidance) that are placed on top of the roof in the front of house and it both pointed to the sky. It is clear that all activities which performed in the house is dedicated as the worship to God (who lives

somewhere in the sky) and they also took refuge to the Lord (who is also reside in the somewhere supreme place of nature) from danger and disaster.

Meanwhile for the Dayaks, the upper section is a intermediates space to submit an supplication to the upper world where *Jubata* (god) lives. Therefore, because of its position as an intermediary section, this place is becomes a primary location to place the paddy that believe has a 'life' in order to always be protected by *Jubata*, and also as the location to put an offerings items or a storage location of the customary objects which intended as the supplication to God to always give avoidance from danger to all residents of the longhouse.

5.2.4 Anatomy of Structure

The strength of traditional frame construction home in West Kalimantan is obtained from the use of materials that have high strength and good durability to support the main structure. Traditional wooden houses generally use the main class that has high durability, and a common type of *ulin* or used timber that locals call as"*belian*". This wood has a fine fiber, so it is good to hold up the structure with high strength. This type of wood is used in structuring the frame at the bottom and middle. In addition, because of its high durability, the roofing materials also use a thin wood of *belian* materials; local people mentioned it as *sirap*. *Siraps* roof could last for 30 years, and the uniqueness of their use in construction was that they were superimposed on each other so then the parts had decayed because of age, it could be rotated 360 ° to be replaced with parts that were still good on the other side.

The strength of structures is also supported by the wall layers that enveloped the constructions. These layers are found in the form of wooden boards installed with tight fittings, and small logs mounted with

distances. Both the wooden board walls and small logs are like layers of skin that enable the structure to remain rigid and not shift.

In addition, the main thing that is found in the traditional architecture of West Kalimantan is use of the continuous timbers, as well as foundations and columns that are placed in each of the house grids. This condition ensures the structure will remain rigid, and is necessary due to the loss of strength of wood from weakening of the joints.

Another unique condition was found on the bottom structure of the traditional dwellings of West Kalimantan, especially in the Malay dwellings. To sustain the foundation structures in order to remain in proper positions, builders used continuous pads capable of withstanding the load for several foundation points at once. The use of continuous pads provides benefits to a traditional house structure, as it will minimize the shift on a structure that is not simultaneous in one of the grids, due to a weakness in the carrying capacity of the soil at the site.

Stiffness and stability of the structure also became the main things considered in the constructions of traditional houses in West Kalimantan, especially for the Malay dwellings and Dayak longhouses. Natural conditions are a major factor to consider in creating a rigid structure. Kalimantan regions generally do not experience earthquakes, but other conditions such as unstable soil, high rainfall, tidal patterns of the rivers, and high blasts of wind became major factors to consider for creating rigidity on the structures.

To create the stiffness of the structures has been done well on the bottom, middle and upper sections. On the bottom structure, rigidity is obtained by installation of the diagonal logs that connect the foundations to one another. It also firmly creates the rigidity of the joints by the presence of horizontal beams at the top of

foundations, which also became the basis for the floor structures, which are able to add stiffness to the bottom structure. In the middle structure, the rigidity is obtained by the presence of horizontal beams between the columns, and even in some traditional houses, there are also additional diagonal beams on the corners of the house as the bracing for the wall structure. The function of both elements is to avoid torsion caused by wind or other forces.

The connections between joints on the structure of traditional houses in West Kalimantan are also interesting aspects of house construction, because these connections are also an adaptation to unstable soil conditions in most sites of traditional houses. Generally, the traditional dwellings of West Kalimantan are erected on sites near a river side, with the unstable soil structure. With these constructions, if there were to be a failure on one side of the structure, the whole structure would not collapse. In addition, with such connection systems it will also be easier for the owner, if there are sections found with decayed structure elements, to replace them with a new ones without disturbing the other structures. As another example, if any rooms are not needed or the house grids are too large because of the lack of residents, then all structural elements on respective sections can be easily separated from one another. Another interesting result of this connection type is that such a structure can be disassembled and reassembled easily. This meant that if the house is easily moved in parts or there are some parts of the structure elements that are still in good condition, they will be re-used for the construction of a new house.

5.2.5 Anatomy of Aesthetics

Aesthetic values on the traditional houses of West Kalimantan are found as the identification of contents. Contents not only increase the aesthetic value, but also significantly aim to give meanings to the

created spaces in each residence. People used aesthetics as a symbol of culture inherent in their lives, and they wanted to show it on their respective houses, so that the guests who visited the houses would clearly discover the identity of the occupants. Religious culture becomes the main factor that is attached to the created symbols. For the Malays, the symbols of their adherence to Islamic teachings became the basis for making aesthetic designs to enhance the home; whereas for the Dayaks, symbols of identity with a form derived from nature are a way to express the divinity in the universe, which they understand. These symbols are found with a good variety of painting or engraving; in Malay residences they are shown in the calligraphy, star carvings of *tolak bala* (catasthrope avoidance carving), or carvings of the moon-stars; whereas in the Dayak longhouses symbols are found in the form of carvings or paintings: the *tinggang* bird or dragon motifs.

All the carvings or paintings attached to the traditional houses of West Kalimantan also considered the principles of composition that are generally accepted and known. Axis, rhythm and repetition, symmetry, hierarchy or proportion as the basis in forming the design show a high value of aesthetics. Design with the aesthetic cultural values is included in creating the ornaments by the respective occupants of the house to show the local architectural distinctiveness of West Kalimantan.

Other differences are also found in the selection of motifs used on both types of the architecture of West Kalimantan. Motifs that are used both in the Malay dwellings and the Dayak longhouses consist generally of the elements that can be found in the universe. The Malays used motifs attached to their residences with the elements of moons, stars, or plants, whereas in the Dayak longhouses the builders used the animal element motifs. However, if we considered more deeply, we found substantial differences in the

selection of elemental motifs. The ornaments used in the Dayak longhouses were consistent with the elements of living creatures that can move, while in the Malay dwellings the opposite conditions were found.

Additionally, in the selection of colors there are also found striking differences between the Malay dwellings and the Dayak longhouses. Generally, both the traditional houses of West Kalimantan did not coat the entire walls with colors. The walls of some houses of Malays were coated by using colors of green or yellow. Besides being used to coat the walls of houses, these types of colors were also used as a basis for coloring a carving or painting made; whereas in the Dayak longhouses, several are found using the colors, usually white, to coat the walls, and in addition, the colors such as red, white, black, or yellow, are used as a basis for painting the ornaments.

5.2.6 Anatomy of Utilities

Utilities for humans are needed to gain comfort when inhabiting the house. The comfort is necessary, in order to deal with the environmental conditions, which can sometimes become extreme. Comfort is needed by the human body to maintain the body temperature in a stable condition, regulates metabolism, and the heat flows from the body to compensate for changes in the environment.

To reduce the excessive effects of sunlight on the houses, most traditional houses of West Kalimantan provide canopies on each side of the roof edges, with units in the range of 1.5 up to 2 meters. Selections of the material elements to shape the openings were also conducted to limit or let the sunlight enter the rooms. The Malay dwellings distinguish these functions by making covers for openings, the doors or windows; these are made with massive materials such as woods or with transparent materials such as glass. Also, the addition of

curtains provided the way to block incoming, unneeded, or excessive sunlight. In the Dayak longhouses, very few openings were found, but there is a row of the small logs as the barrier to sunlight, in order for it to freely enter into their public spaces.

To moderate the extreme climate, the design application is also done so that the temperature inside the rooms remains cool during the day and warm at night. The structure of stage-houses achieves the comfort conditions in the living area above the ground, due to the circulation of air from the ground surface into the house. The use of wood material is also one of the supporting factors for the achievement of comfortable conditions in every room of the house. In addition, these advantages are also supported by the conditions of the large building mass and the middle section with a high ceiling as well.

Another condition that supports moderating the comfortability of the traditional houses of West Kalimantan is the presence of holes in the walls as the medium for exchange of air. Openings with sufficient quantities for each rooms in the Malay dwellings, and the walls formed by the small wooden logs with spacing on the Dayak longhouse, are the advantage obtained by supporting the moderation of comfortability inside the house. Both of these traditional houses are capable of maintaining the stability of temperature and humidity inside the rooms.

5.3 Reviews on the building anatomy's functions toward the human body's anatomy

This comparison is done on the anatomy of buildings and the architectural characteristics of the Malay dwellings and the Dayak longhouses, which has been conducted in the previous two sub-chapters. Both of them were subsequently compared with the anatomy of the human body to obtain descriptions: the human

body as a living work, compared with the work methods of buildings, in order to have benefits for the occupants. This phase is performed as an additional element to obtain the justification of the idea that human beings, in this case the traditional people of West Kalimantan, in creating architectural works, did not separate their minds from the example of what is available and to be learned from nature, one of aspect which is in the human body itself, which became a primary example for a creation in design that is also used for the benefit of mankind. Or, in other words, humans, or traditional people, considered themselves to be creating something (the dwelling) that would be used for their self-interest, in order to obtain the convenience of living in the world.

The anatomy of the human body can be viewed as a system that works in support of human activities. Also, in a similar understanding towards the anatomy of dwellings, a primary concern for the elements of the house is its function to protect the human activities, as users obtain benefits from houses.

Before doing the comparison on the study of the anatomy of buildings towards the functions of the human body anatomy, there was an interesting discovery in this research: the use of some sections of the human body as a unit to create the dimensions of space in houses. As already discussed in chapter 4, both the Malay dwellings and the Dayak longhouses used traditional units of measurement, which refered to the dimensions of parts of the anatomy of the heads of families who inhabit respective houses or biliks. The unit quantities used from small to the large units are successively as follows:

- *Se-genggam* or *se-kepal* (as the palm width)
- *Se-kilan* or *se-jengkal* (as the of the little finger and thumb stretched)
- *Se-kaki* (as the foot length)

- *Se-hasta* or *se-badan* (as the body width)
- *Se-depa'* (as length of the two hands strecthed)

In addition, the measurement units for the height of the house elements are organized from smallest to largest successively, as follows:

- *Se-lutut* (as the knee- height)
- *Se-pinggang* (as the waist height)
- *Se-dada* (as the chest height)
- *Se-bahu* (as the shoulder height)
- *Se-dagu* (as the chin height)
- *Se-taput kepala* (as the head height)

Traditional units are mentioned above as an evidence that the traditional people, particularly in West Kalimantan, understood the essential elements of the human body anatomy as an ideal example that can be used to create dimensions in the house for achieving a comfortability for the residents. The units are selected for certain functions with a definite purpose for humans, in this case that occupants felt the ease of using the house to support their activities in daily life.

Traditional units used by the people of the past in West Kalimantan for the dimensions of space and height were meant to create space and circulation, in accordance with the general anatomy of the prospective residents. They also took into account the space requirements (and number of users) in each room that the occupants needed for efficiency.

5.3.1 The Integumentary system as The Anatomy of Utility and Aesthetics

The integumentary system of the human body is associated with the skin covering the body frame and the vital organs of the human body which could be impacted by a fatal collision. Skin, through the cooperation with other systems, also serves as a stiffener frame for the human body in order for its parts to work together properly. This system could be presumed as a function of aesthetics in the building, because the skin (such as walls, floors, and roof coverings) is also provided to protect the main structure from damage or structure failure by the influence of weather, and it is given as a shelter for all activities within the building as well. The walls that formed the traditional house with the instalation of wooden boards covered the building structure as the skin, in addition to strengthening the structure by binding the columns and beams; it also had an aesthetic function in the way of smoothing the building façades. The skin on the building elements creates rigid connections between the joints on the structure of a traditional house, so that it can stand up straight.

The skin layer that enveloped the traditional house was not limited to the walls, but further present in the floor and the roof cover, which became a blanket for the traditional buildings at the bottom and top. Both the walls, and the floor and roof covers have the same function, as indicated by the skin of the human body. In addition, another important function of this layer is to protect 'the vital organs' in the house, i.e. the human activities that inhabit the house.

As 'the vital organs', human activities require the protection of human life, because here is the place where human life happens. Human activity is conducted by the traditional people in the public, semi-prvate, and private spaces, which should be covered in order to perform the activities of human life. If the structure is always 'alive', people feel that it is 'warm' in conducting and coloring their lives at home. If the 'vital organs'

are not functioning as they should, then the house will no longer be perceived as a shelter for humans, but only as a worthless artifact.

Human skin in the world is found in a variety of colors, depending on the geographical and climatic conditions where the humans came from. The geographical position of humans creates a need to adapt to their environmental conditions. The people described as “white” inhabited a cold environment in the northern and southern hemispheres, while people who inhabited the region near the equator tended to be described as “colored”, for example the “black” colored people found in Africa, or the yellow colored people found in Asia. The condition is then used as a basis for grouping of humans into different races or nations.

Likewise, with the wall layers that enveloped the "body" of the traditional dwellings. Factors of adaptation to the environment and local cultures that influenced 'skin type' were selected to envelop 'the vital organs' of houses - activities of occupants. Environmental condition becomes a major factor in considerations, while the cultural influences are then considered as the efforts to conduct adjustments to the local conditions. Adjustments were intended to be a choice given on the houses – for choosing "the skin type" for the spaces created in the traditional houses.

Skin chosen in the Malay houses could cover the activities of the inhabitants from the extreme conditions of the local environment, and also limit the observation of others from outside the house, respectively. The selected skin for a Malay house is also found in two types, i.e. 'the smooth skin surface' to cover the main house and the 'rough skin surface' to envelope the support house. Therein lies the aesthetic selected for the type of skin that enveloped each house. The smooth skin surface was maintained for the main house as the part of the house that was displayed to the people outside, who see the house from the front,

while the support house was located on the back section – just as the support element for the main activities so that the appearance of the skin chosen is a rough surface but it still pays attention to aesthetics. Despite this 'rough skin surface', the support house is also concerned with the aesthetics, by the wall instalation system arranged with *susun sirih* (clapboards).

Different conditions were found in the Dayak longhouse. The wall skins used to envelope the Dayak longhouses were found in two types: namely, the "skin" was formed from the composition of the small wood logs, which were placed with spacing, or the “skin” was formed from the composition of the wooden boards, which were installed tightly. The selection of skin types with small wooden logs was intended to cover the activities in the public spaces, while the skin formed with the composition of wooden boards was intended to covered the activities in the private rooms. The marking was conducted to distinguish between the communal property and the personal property. Condition of the front wall with the rough surface skin to covered the space that is shared with others while the smooth surface skin was covered the space which is owned by respectively of *bilik*'s occupants.

Either in the Malay dwellings or the Dayak longhouses, selection of the skin type was linked with the culture inherent in the each of these ethnic groups of West Kalimantan. As author had mentioned in the discussion of the previous chapter, the Islamic teaching embraced by the Malays strongly influences culture, and is taken into consideration in the selection of skin types (with the composition of the tight installation of wooden boards) and provides openings in all the rooms formed, whereas the culture of the Dayaks is based on local laws and customs derived from generation to generation of ancestors, and their lives as a communal

residence in a house as the consideration in selecting the skin type. Skin that is "hollow and rough" covers activities in the common rooms, while the skin that is "tight and smooth" cover activities in the private rooms.

The selection of materials for the walls, as the building skin that covers the building, is obtained from the forest around the residential environment, which also shows the function of the skin as a medium for presenting the local geographical identity where the traditional houses of West Kalimantan were established. The wood materials and particularities of the wood species obtained in the abundance of materials around the settlements made up the main materials of the skin and structure of the building. These materials also became a major characteristic that distinguishes this architecture from the architecture of other ethnic groups in Indonesia.

Another part of the house that also serves as a skin for the building, which is not less important than those author mentioned previously are the floor and the roof cover. These two elements also have an important role in maintaining the "organs" of residences, both in the Malay dwellings and the Dayak longhouses. The local environmental conditions, which at any time could change to become extreme, because of the rainfall, high temperatures, and tidal patterns, meant that these two elements effectively protected and provided for the comfort of residents in conducting activities inside the house. The soil conditions were always moist, so that the floor was made with an elevation from the soil surface; this caused the floor to remain dry, clean and safe. Moreover, by this condition and the type of materials used, the room-space in the house could always be maintained in warm and cool conditions through the years. Likewise, the roof covering, which is generally made of sirap wood with a high slope, was used for the same purposes to provide the comfortability for the occupants in conducting activities inside the house. The local wisdom is shown,

with the local people's intentions not to disturb the surrounding environment. On the other hand, the local people as users benefit from the environment; it is not disturbed and they can live together with nature to achieve comfort and safety.

5.3.2 The Skeletal System as the Anatomy of Structure and Section

Skeletal systems associated with the bones and muscles is structured as the frame of the human body. This system creates stiffness for the human body, and also keeps the organs of the human body always safe from the adverse effects of external influences. So, in the terms of physiology, skeletal systems in the body functions as support, protection and movement. The functions of this system may be analogous to the anatomy of structures or sections of the building. The building's structures and its sections were built to make the stiffness of the building, and to ensure that all parts of the structure work and keep the residents who live in it feeling safe from bad influences in outside environments. Both, either for the bones in the human body or the structural elements in the building, have a function as a frame to support and protect the vital organs within. This condition makes the human body or a building able to actually stand up, and the body can function properly.

As author noted in Chapter 2, the human body can be divided into sections of the bottom, middle, and top. In the vertical view, the house is also found with similarities in understanding, with the division of the house becoming three sections; i.e. bottom, middle, and upper parts. Within this division, both in residences as well as in the human body, there exists the concept, with the differences and similarities in the meaning of the parts.

Based on the three functions of the skeletal system in the human body mentioned above, only the movement functions are not found in the traditional houses of West Kalimantan, while the functions of support and protection are found in both architectures. But further, if author apply perceptions of the meanings to the structures and sections of the traditional Malay dwellings and the Dayak longhouses, then "movement" functioning as a building mass seems possible. Displacement of the entire structure of traditional buildings in West Kalimantan is possible because the system uses a connection type structure with the wooden joints nailed (*pasak-pasak*) or rattan bonded. With conditions in this system, connections will be make it easy for the homeowners to move the entire structure of house and other components without becoming worried that the elements of structure will be damaged. This characteristic is also found in some other locations of the Indonesian traditional architectures that use wood as the material for forming the structures and other elements.

Other special conditions are also found on the walls of rooms in semi-private and private spaces of the traditional Malay houses. The walls that create the bedroom can be dismantled or reassembled according to the existing grid to form a certain amount of space required as a place to sleep or as the family gathering space. The walls of bedrooms were deliberately made by the house owners as non-permanent elements, in order to satisfy the flexibility needs of bedrooms or family rooms, so it would be easy to do the addition to or substraction from the room. Currently, the same conditions are also found in the biliks of the Dayak longhouses, where they cover the space with non-permanent walls to create bedrooms and / or family rooms to meet the needs of space for families. This condition is a progression from the past division condition of the biliks, from a space without partition walls into the current room division with non-permanent walls.

Function of the structure and its sections as the support and protection of the building as a whole become the primary aspects that must be met in house constructions. Houses are designed as the facilitation of a safe shelter from extreme environmental influences on the outside. They also provide a comfortability for the occupants when the atmosphere outside feels uncomfortable for human life. Building a skeletal house makes this become a reality, because it is composed of frames that can provide the boundary between the spaces in the house and the environment outside. In addition, the building can also enable the room divisions in the house to adjust to the needs of its occupants. In this case, the function of rooms in the house is the same as the division in the human skeleton that protects the vital organs.

The skeleton of the building also forms sections as a boundary, and at the same time protectects the created spaces. Protection is conducted against the weather, temperature and other extreme environmental conditions that occur outside the home. Sections within the house may also be protective against unwanted observation of the occupants, so that they freely conduct various activities as desired. The division of space by setting up the separation of structures and their sections made occupants of the house able to classify the functions of room space utilities as public, semi-public or semi-private, and private. Walls as the sections of each room are also intended as the separation or mark for the functions of culture which are always maintained by the respective occupants. As an example for this statement, the structural sections of each room for the Malays serve well as a barrier, from the observation of outsiders who are not *mahram*, for the activities of women and their daughters in the room. There are different conditions for the Dayak people: namely, that the structural sections of each room are intended as a boundary between the space used by the community for ceremonial purposes and the space reserved for family groups inside a single *bilik*.

In addition, the vertical view of structure also shows the similarity in functions indicated by the skeletal system in the human body, with the anatomical structures and their sections indicated by the residential architecture as its design needs. Elevation of the human body, which is given at the bottom section, is intended to provide the distance between the soil surface and the vital organs in the human body, protecting them from the impact of hazardous substances on the ground, which it can disrupt the functions of the human vital organs. The same purposes are intended in the residential structures to avoid the contiguity of the environmental conditions outside that do not have positive impacts, towards the home where the vital organs reside, i.e. residents and their activities. Special emphasis is given by each of the traditional architecture of West Kalimantan to the cultural influences inherent in their community. For the Malays, the condition is to avoid the contiguity and create the distance between the clean room for worship inside the house, and the things that are dirty outside. For the Dayaks, their intention is to create a distance for the residents of the longhouse from the spirits that reside outside the home.

A part of the skeletal of structure of the human body, the spine is an important element that enables the body to stand up straight. In the structure of Malay houses, this is represented by the main pole (*tiang seri*), whereas in the Dayak longhouses it is also represented by the main pole (*tiang pemun*). The function of the spine, as the support of the human body, as well as in the traditional houses found in West Kalimantan, was to serve as the main pillar that became the "backbone" of the dwellings. These two poles, both *tiang seri* and *tiang pemun*, became the focus of sustaining the activities inside the house. These poles served as the spine for the house that became a marker of activity in the center of residences, which is evident as the first pillar was established in early in the development of the house, in supporting and protecting the private activities of

the household. As author already noted earlier, both *tiang seri* and *tiang pemun* were situated in the middle of the floor plan and supported the walls between the public and private spaces.

5.3.3 The Muscular system as the Anatomy of Shape

Muscular systems (e.g. muscles) associated with the motion system as a guarantor and also to keep the body upright. The muscles in the skeletal body will create movements in the human body through the navigation of the brain. The function of this system is analogous to the anatomy of shape. Like the muscles in the body, the elements that exist in every part of the building structure (for example, the columns, beams or diagonal beams in structural walls; beams and floor coverings in the floor structure; or roof coverings and frames of the roof structure) formed part of the building frame structure which could guarantee the safety and keep the house “body” upright, and could be used by the occupants for a long time. If the muscles in the muscular system are said to be making the human body able to move in order to perform activities, so then in the anatomy of shape, the structural elements can be said to create a structure able to withstand all of the load effects on buildings. This condition acts as a guarantee for humans to perform daily activities, so that 'the muscles' in the human body or 'the elements' in the house are functioning and 'live'.

Elements that acts as muscle for the dwellings can be divided into three parts: namely, 'the muscles' which are in the bottom structures, the muscles in the middle structure and the muscles in the upper structures. The muscles on each part assist in the work of structures, like as found in the muscles of human body, in maintaining the condition of the dwellings to remain standing upright.

At the bottom of the traditional houses in West Kalimantan, there are elements that serve as 'the muscles' in supporting the structure; i.e. pads (*alas*), *laci* (horizontal beams through each fondation) and the additional diagonal beams between foundations. These three elements have different functions. *Alas* and *laci* serve as a base for each foundation, so that they do not to sink into the ground in conditions that are not evenly distributed from one point to another. The pads and laci function to keep the foundations in the balanced conditions, in order, at a uniform elevation. In addition, both elements also maintain the position of the foundations, so it is not shifting due to unstable ground conditions. Selection of 'the muscle structure' in this manner was the answer to the local environmental conditions that are unfavorable, such as the low soil bearing capacity and the high tides. Both elements are reinforced by the presence of diagonal beams between foundations to support the position of each foundation, keeping it in place. The diagonal beams serve to ensure the foundations do not experience the torsional forces due to loads and forces they receive. The pads, *laci*, and the diagonal beams work together to maintain the foundation on its position and the conditions of the bottom structure remain at the desired elevation to support the structures above.

In the middle structure of traditional houses in West Kalimantan, the muscle functions are found in the form of frame structures of floors and walls. On the floor structures, beams, which are the 'muscle' on the 'skin' that covers the floor on the middle structure, are fitted with a certain distance, usually with a distance of about 2 *jengkal* (40 cm), to help the floor cover, which is made of wooden boards, support the weight it receives. The same condition is found on the 'skin' wall structure, where there are a lot of beams installed in addition to the columns that ensure and maintain the shape of a wall, or as the frame to make shapes with openings. The stiffener beams in the wall structure form the openings, in terms often used by traditional West

Kalimantan is these are known as the *sengkang*. Other beams in particular are also found, with the installation of diagonal beams and works as bracings for the wall structure.

Moreover, there are other 'muscles' found in the middle structure of the traditional houses of West Kalimantan, and these contributed to maximizing the functions of the residences. In the Malay dwellings and Dayak longhouses, stairs or ladders act as muscles and are meant to help the circulation of humans from the outside (ground) into the house or bring the occupants of the space on the first level to the space above it. Ladders as a transport medium from the outside into the house are generally a permanent element. In the Malay houses, the stairs in the form of permanent elements act as a connector between the rear *serambi* space to the *parak* above it, while on the some Dayak longhouses stairs connect *tindoan* space on the first level to the *sadau* room located above. The stairs leading the occupants to the *sadau* on Dayak longhouses is found in a form that is not permanent. Another element which also acts as a muscle in the traditional dwellings of West Kalimantan is the railings. The railings replace the function of walls in the open space at the front of a house. In the Malay dwellings, the fences are found on the front serambi or on the rear open-platforms (rear pelataran), whereas in the Dayak longhouses railings are found on the banister.

Meanwhile, on the upper structures of the traditional houses of West Kalimantan, the function of 'muscle' is manifested as the wooden beams of small dimensions that act to strengthen the elements of roof covers. This element acts as a medium to embed the layers of roof covers in the traditional houses of West Kalimantan, and it is found in the form of two small beams that intersect each other and are installed with one beam holding up the others. Other conditions that distinguish the two small beams usually found is the difference of dimensions. During the installation process first establishing a traditional house, the first beams

with small dimensions were installed after the main structure of the roof construction was established, and then builders would proceed with the installation of the second beams with smaller dimensions than those previously and place them in a cross position. Strengthening these elements would be accomplished by two types of methods, i.e. by using nails or rattan ties. In the terms used by local people, the first small beams installed, whether for the Malays or Dayaks, are called *kasau, usuk*, or rafter, while the small beams installed next are called *pluis* by the Dayaks or *reng* by the Malays (both are means as battens). Other elements of the 'muscles' are also found on the floor at the second level of both traditional houses. As author noted in previous chapters, in the Malay houses there are also spaces under the roof with a floor level, and also in the Dayak longhouses built during this decade, found with a floor level for bedrooms. Floor construction in this section exists in the same elements as on the ground floor.

5.3.4 Nervous system, Circulatory System, Endocrine System, Lymphatic System and Reproductive System as the anatomy of plan

In addition to its function as a reproductive system, all other systems in this group work for the certain functions that make the human body able to withstand the influence of factors outside the body, and those the functions also provide the ability for humans to interact with the environment. Meanwhile, the function of the reproductive system is to make the human body able to maintain descendants for the human race. All of the above systems, by performing a comparison to the inter-system functionality, can be analogous to the anatomy of floorplans in residences. Any specific functions within a particular system play an important role in the human body, and in the same intentions, but with different conditions, are also found on the floorplans

of houses, as all the space in a particular building has its own the specific functions and roles (as a building system) that are related to each other. The division of space in dwellings, as well as the distribution of space in the human body, is intended to accommodate the needs of certain functions with different types of activities. Here we see that the residence is also conducting the same conditions as those found in the human body by designing the specific spaces. In residences, as well, we know there are rooms designed with specific functions, respectively. These all will be needed by residents to perform activities, including interactions between inhabitants of the dwellings or interactions of the occupants with outsiders. Some rooms in the residence were designed to have a very specific function, such as a kitchen designed to serve other rooms, a bedroom as a private room, family rooms as semi-private space, or the living room as a public space etc.

Nervous system serve a function of sensory and motor control for the human body to move as needed. Damage to this system will cause malfunctions in the human body. The purpose of the nervous system is that the human body will be able change its performance in accordance with changes in the stimulation received from the environment. The endocrine system is a system whose function is to produce the hormones that regulate the body's activities. Endocrine systems, in relation to the nervous system, control and integrate the functions of the body. Both these systems work together to maintain homeostasis in the body. Their functions are interrelated, but can be distinguished by certain characteristics. So the two systems can work sequentially, or alternately, and can also work simultaneously. The difference between the two lies with the media that facilitate these activities; the nervous system works through the neurons, while the endocrine system works through the hormones. But both have the same function as the transmitter of information from one system to

another and aim to control a variety of other organ systems to form an output in the form of human activities (Thibodeau and Patton, 2000).

In the traditional homes of West Kalimantan, rooms which have functions similar to both of these systems are found in the rear serambi of the Malay dwellings, and family gathering spaces in the tindoan room of the Dayak longhouses. Both these rooms control the activities of occupants of the dwellings or biliks. The functionality of these rooms became central to controlling the activities of occupants, and the position of these rooms as the transmitter between the public space and a private space causes them to have an important role as 'a messenger of information' about the activities of residents to visitors, whether they are allowed, or not, to walk into another room.

As with the cardiac functions in the circulatory system as a vital organ in the human body, the family gathering space also becomes a vital space and becomes the 'heart' of the residence in shaping the behavior of occupants in the house or *bilik*. Local people in West Kalimantan consider the family room as the center of all the space in the house. In the terms of Malays, central is also connoted as *'jantung'* which relates to the importance of something. So then, the rear serambi was called *jantung rumah* (the heart of house), because it played the important roles in build the family character. This space becomes an important element for being a location for interaction for all the inhabitants of the house and the location for parents to provide instructions or advice (*nasehat*) about appropriate behavior according to the teachings and culture respectively. Parents try to establish good behavior from family members by the advice given when family members gather in this space.

If viewed from the components that make up the rooms of the rear *serambi* in the Malay dwellings, or family rooms in *tindoan* of the Dayak longhouses, there were found poles (called the *tiang seri* by Malays or the *tiang pemun* by Dayaks) that became 'protectors' of this space and were placed at one corner of the room. In the structure of the human body, the spine has a protective function for the nervous system in addition to the skull that protects the nerves of the brain. The presence of the *seri* or *pemun* poles became 'spine' for 'nerves' of activities the occupants of the house. The position of each pole appears very central in the middle of the floor plan, or in the location that supports the efforts to establish the behavior of the occupants to conform to the religious teachings and cultural norms prevailing in the respective communities.

The circulatory system in the human body, through the help of blood, mainly functions to transport the oxygen needed by cells throughout the human body. It also serves as a supply of nutrients to the tissues of the body, transports the metabolic waste substances, and contains the various materials that make up the immune system that serves as a body’s defence from various diseases. Meanwhile, the lymphatic system is an additional line where the liquid can flow from the interstitial spaces into the blood. The lymphatic system can transport proteins and substances out of the “room” with the large particles network, which cannot be moved in the process of direct absorption, into the blood capillaries.

Both systems as described above, in residences or other buildings, were found as a system of human movement or circulation inside the house. This movement system occurs through the paths provided for it. In the Malay dwellings, the movement path is created through the configuration of paths and spaces that are connected through the opening sequences in every room. As author noted in chapter 4, the space sequences in the Malay dwellings consist of two parts: the sequence of the open series and the sequence of limited series,

while in the Dayak longhouses, the path configurations of spaces and sequences are found in the order of the space hierarchy – the public/semi-public can be used as a circulation path between the *biliks*, and the public/semi-public to private spaces (*tindoan*) are a private lane with access limited only to the *bilik* dwellers or guests, but can also be turned into a public access path for all during the ceremonies held at the longhouse.

Reproductive systems on the human body are intended as a human attempt to beeding the human races. This condition may be interpreted to mean that the space in the dwelling is a place for humans to breed their races. Therefore, the entire space, as an integral part, is used to achieve that goal. Beeding and maintaining descendants is not limited only to conceiving and having descendants, but with a broader purpose to maintain the viability of the existing descendants that will always exist in order to obtain the next offspring. Maintaining the continuity also means that the human race is trying to transfer the cultures obtained from the previous generation to the next. This process takes place in simultaneously, by providing the nutrients that are processed in the support house or the kitchen, providing instructions in the family room about the teachings of the religion and culture, to the descendants so that they able to behave in the norms of the community, and also involves the physical and mental protection from environmental influences, as well as other needs that are facilitated by the spaces provided by a house.

5.3.5 Respiratory system, Digestive System, and Urinary System as the Anatomy of Utility

This system group is working as a guarantor to supply the needs of the human body and ensure that the substances not needed, after being used by the body, will flow out through the secretion channel. This is all analogous to the anatomy of the utility system of the house. Utilities are a comfortability factor in the

building that serves as a support system for the occupants, on the need to live in a residence with aims of achieving comforts for the occupants of the house.

Respiratory systems perform the function of providing the flow of oxygen into the blood, while the digestive and urinary systems are a disposal system that turns food or beverages into the form of fine or simple materials. In addition, the system disposes of the rest of the body's metabolism substances that contain toxins and are not useful for the human body. Other functions are as a system that regulates the concentration and excretion of body fluid volume (osmoregulation), and maintains body temperature within normal range (thermoregulation).

As a form of respiratory system in residences, particularly in the Malay dwellings and the Dayak longhouses, the element functions are intended to bring the fresh air from outside into the house, and also make the stale air inside the house able to flow to the outside. Here 'the respiratory' is defined as the process of changing the air inside the house and vice versa. Substitution of air in the house, both for the Malays and Dayaks, occurs from the openings such as doors, windows or ventilations, which can also happen through the sidelines of the walls or floors. Substitution of air inside the house provides the comfortability for the human body needs, so that the house could maintain its “body temperature” at stable levels, and regulate the metabolism and the heat flows from the body to compensate for changes in the environment.

The main house in the Malay dwellings as a primary place for occupants in performing activities also requires the support and supply of needs from the support house. The support house acts as a supplier of foods for the activity needs of residents and becomes a place to process the food, which is then supplied to the main house to be used by its occupants. Moreover, the support house also became a location to store the basic

needs of the homeowner such as food materials, clean water, and others. The support house is also a place to 'dispose' of the materials that have been used in the activities and are no longer needed by the occupants. The functions of the support house are found in several biliks at the Dayak longhouse by the presence of the kitchen, which is added at the back of the tindoan room. Its position in the back part with a lower floor elevation than the spaces in the main house confirmed that the function of support houses as a 'disposal space'. According to Sudarto (interview in 2010), 'the disposal space' is evidenced by the physical presence of *tungku*, which is called *perabuan* (a traditional stove for cooking) in the support house. Ashes (*abu*) are produced by the wood burning on *tungku* of the kitchen, considered a place of waste materials (ashes or *abu*) or to dispose of the remaining objects or the by-products of the occupants activities after they are used in the main house.

5.4 Reviews on the traditional dwellings concepts toward the anthropometric sciences

This sub chapter as the final part of the comparison is conducted to obtain a link between local knowledge and modern science developed at this time. In the past, parts of the anatomy of the human body were used as a simple method by traditional people to create the architectural designs, but in the present has been a special field of science (as applied studies) in helping people to obtain the desired level of comfort. This sub-chapter is only a few studies, and places more emphasis on discussions of the anthropometric science, specifically the units used to create architectural elements in the traditional houses, both in the Malay dwellings and the Dayak longhouses, including the current research findings about the measurements of human anatomy, so that the unit standards that benefit the architectural designs will become apparent.

Nurmianto (2008: 5) mentions that the anthropometric become a vital element in the scientific application of ergonomics in design. Ergonomics is needed in the design for:

- Ease of humans to conduct their activities (as a convenience / comfort);
- Help to determine the size of the elements forming the space, corresponding to its activities (as standard);
- as a benchmark to determine the size in designing the artefacts that is safe and convenient for users (for safety);
- to know the ideal size dimensions of humans, to obtain the efficient size (as an optimization);
- Determining the ideal scale for humans to provide for the ease of users (the scale), and
- Living standards (as subjective)

Nurmianto (2008: 65-69), conducts research on the anthropometric body of Indonesian people based on interpolation of the data that produce the average dimensions of the body sections of Indonesian males, with the results as shown in the table below (columns 2 and 3). This data is then compared with the data that author got in the field about the unit of measurement used by traditional communities in West Kalimantan (columns 4 and 5).

No. (1)	Body units (2)	average size (mm) (3)	Approximate size (mm) (4)	Traditional units (5)
1.	Body height in stature	1.632	1.650	Setaput kepala
2.	Shoulder height	1.338	1.320	Se-bahu
3.	Knee's height	403	400	Se-lutut
4.	Shoulder width	424	400	Se-badan
5.	Stretch of hands	1.663	1.700	Se-depak
6.	Length of grip hand to shoulder	708	600	Se-lengan
7.	Maximum length of the little finger and thumb stretched	192	200	Se-kilan/se-jengkal
8.	Palm width	98	100	Se-kepal
9.	Foot length	248		Se-kaki
10.	Waist height (Length of the knee to back + knee height)	403 + 450	800	Se-pinggang

Table 5.2.
Comparison of the average of Indonesian males body size (Nurmianto: 2008 65-69) with the measurement units in the traditional houses of West Kalimantan

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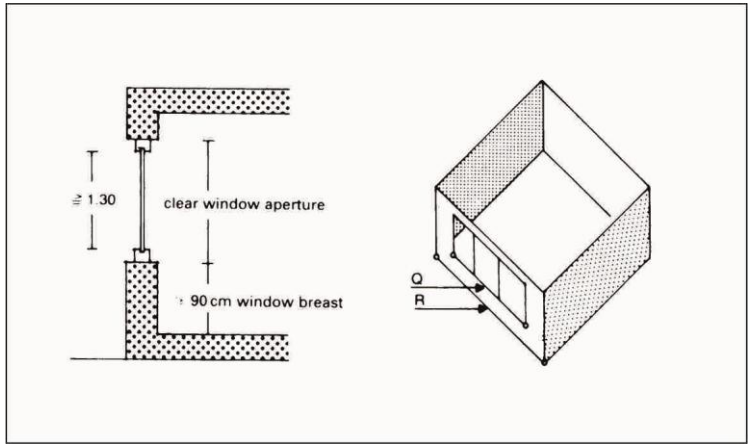
From the comparison of the data above, it is shown that the research findings conducted by Nurmianto did not indicate a wide difference with the units of measurement used by the traditional communities in West Kalimantan. Nurmianto mentioned that these data are used to obtain the anthropometrics of ergonomic factors in design. For that, the author tried to do a comparison between the results obtained from field measurements and the traditional measurement units that were used, and the further actions to find the ergonomic factors in the traditional dwellings design of West Kalimantan.

Ergonomic factors in the traditional dwellings design can be found in the openings (such as doors and windows), as well as stairs, railings, and floor elevation. Doors and windows are a circulation path for human

beings, but also a medium for circulation of fresh air and incoming of the sunlight. Human circulation through the door and according to Natsir, the width of a door, is the length of a man who sat on the floor with legs straight, or if converted, equal to the height of the waist of the standing man. From the table shown in chapter 4 the data refers to the size of 80 centimeters, or based on anthropometric measurements calculated by Nurmianto, it refers to 94.6 centimeters.

Neufert and Neufert (2000: 176, 186) mention that the height of window openings is 1300 milimeters, with a placement of 900 milimeters from the floor surface, while the width of a standard size for structural door openings is 875 milimeters, with a height of 1858 milimeters.

Figure 5.5.
The European standard of window openings



As the results of field measurements of the main houses of Malays of West Kalimantan, the data for main doors obtained is shown in the table 5.3.

No.	Objects code	Main House Openings in front facade				
		Doors		Windows		
		Width (cm)	Height without ventilation (cm)	Width (cm)	Height without ventilation (cm)	Height from floor (cm)
1.	A.1.1	137	180	111	134	50
2.	A.1.2	120	255	100	178	75
3.	A.1.3	114	248	133	188	60
4.	A.2.1	143	204	100	158	50
5	A.2.2	115	223	100	150	70
6	A.2.3	100	214	102	162	50
7	A.3.1	127	216	-	-	-
8	A.3.2	95	208	-	-	-
9	A.3.3	115	216	100	136	84
10	A.3.4	117	238	90	141	84
11	A.4.1	115	223	115	145	83
12	A.4.2	125	229	100	150	92
13	A.4.3	126	245	100	146	83
14	A.5.1	112	217	85	116	66
15	A.5.2	93	178	107	130	53
16	A.5.3	123	232	88	108	100
17	A.6.1	100	177	100	177	-
18	A.6.2	125	246	107	215	87
19	A.6.3	90	206	93	98	66
20	A.6.4	109	220	105	176	92
21	A.7.1	95	202	95	111	105
22	A.7.2	150	310	125	217	85
23	A.8.1	134	234	115	200	75
24	A.8.2	115	247	75	161	80
25	A.8.3	105	253	105	179	75
26	A.9.1	113	214	105	155	70
27	A.9.2	116	243	105	215	55
28	A.9.3	114	178	90	118	60
29	A.10.1	100	273	100	173	100
30	A.10.2	118	230	118	126	104
31	A.10.3	100	220	95	150	70

Table 5.3.
The data of main doors of the Malays main house of West Kalimantan

As mentioned by Natsir in interviews at the year of 2010, a door in the traditional home of West Kalimantan has a width of about 80 centimeters, which is almost equal to the estimated width of the sitting people with feet sprawled on the floor. Therefore, for 2 leafs (pieces) of the door, as is generally found with the main door in the traditional Malay house, so then the main door has the minimum width of 160 centimeters. The size of 80 centimeters for 1 leaf of door is a common width found in many places in Indonesia, particularly in West Kalimantan, which can be passed by people without tangent.

As mentioned previously, the width of the shoulders of Indonesians mentioned by Nurmianto is 42.4 centimeters. Therefore, with a width of 80 centimeters, so that there is still enough space for each of at least 18 centimeters on the left or right side, people could come and go without tangent. When compared to the standard provided by Neufert and Neufert of 875 milimeters (as the standard of Europeans), with the traditional units (equal to *se-pinggang* that converted into the calculations of Nurmianto about the waist height of Indonesian males being approximately is 853 milimeters), there is at least 20 centimeters more space on the left and right, each side. According to these conditions, 2 people do not tangent the shoulder with each other when coming and going into the home at the same time.

Looking at the data obtained from field measurements, the width of the door is found from the smallest size of 90 centimeters to the largest size of 150 centimeters. Some traditional Malay houses were found to have more than one door as circulation access in and out of the house. Looking at the data obtained, the scale based on the approximate size of the people sitting with legs sprawled out on the floor at 75 - 80 centimeters, which depends on the particular anatomy of household heads in the respective houses. These

estimations are taken with the assumption that the width is to accommodate the space on the left and right of the door, so that people can get in or out of the house comfortably.

	nominal standard building size		size of door panel				size of door frame	
	standard structural opening sizes for doors		standard overall door dimensions		door rebate size, nominal dimensions tolerance ± 1	+ 2;– 0	door opening width at the rebate tol. ± 1	door opening height at the rebate tol. + 0; –2
1	875	1875	860	1880	834	1847	841	1858
2	625	2000	610	1985	584	1972	591	1983
3	750	2000	735	1985	709	1972	716	1983
4	875	2000	860	1985	834	1972	841	1983
5	1000	2000	985	1985	959	1972	966	1983
6	750	2125	735	2110	709	2097	716	2108
7	875	2125	860	2110	834	2097	841	2108
8	1000	2125	985	2110	959	2097	966	2108
9	1125	2125	1110	2110	1084	2097	1091	2108

Table 5.4.
The structural standard of the opening sizes for doors and door frame

The traditional Malay house door heights obtained from the field data ranged from the smallest measure of 177 centimeters to the largest measure of 255 centimeters. Based on the data of Nurmianto, the average height of Indonesian males is 163 centimeters, while according to the traditional units used by the traditional communities in West Kalimantan, se-taput kepala (as the body stature's height) is 165 centimeters.

From these results, the minimum door height found in some cases is still comfortable to be passed by people without worrying about their heads crashing into the door frames.

The height of windows was found to vary in all main houses of Malays in West Kalimantan. The height is dependent on the combination of the height of the window and the height of window openings above the floor. The smallest combinations were found to be 173 centimeters and the largest combinations were nearly 300 centimeters. With these conditions, the height of the window size is still higher generally than the height of people (according Nurmianto it was 163 centimeters, while the traditional unit was 165 centimeters). These sizes allow people to look out of the window without worrying that their heads will clash with the window frames. The height of window openings above the floor surface is found to range from 50 centimeters to 105 centimeters. This fact shows that the window position is higher than the knee height of males (according to Nurmianto this was 40.3 centimeters, while the traditional unit was 40 centimeters). By this condition, the windows height is safe for occupants from the possibility of tripping or falling out of the window by accident. In addition the windows' height is also safe for children, from the danger of possibly of being climbed by them. According to the standards specified by Neufert and Neufert (2000), a minimum height of a window above the floor surface is 90 centimeters. Based on data from the field, just a few of the traditional Malay houses are found on the front façade to have windows above the floor level as mentioned by Neufert and Neufert. But if we pay attention to the other side of the façade, the height of windows above the floor is found to be more than 75 centimeters. These conditions show the fact that in a few houses the side windows are usually open more than the front ones. In these cases, the front windows are only the media for sunlight to enter the middle *serambi*. The same conditions were found on the size of the railing surrounding

the front *serambi* as the common height. The railing heights are generally found in the range between 70 centimeters and 75 centimeters. These conditions usually felt comfortable for people to sit on it, but still have security as a barrier from the possibility of people falling out of the house.

Height of footholds on the ladder in the traditional homes of West Kalimantan is also found in a range between ± 15 centimeters to 20 centimeters, with the minimum width of 120 centimeters. According Neufert and Neufert (2000: 191), a staircase of a dwelling at least has a width of 50 centimeters to 110 centimeters, with a height of footholds ranging from 15 centimeters up to 25 centimeters. Based on these conditions, the stairs in West Kalimantan Malay houses have been providing a comfortability for the user to pass into the house safely. The other interesting fact found in the Malay house is that the number of steps is always odd. It also strengthens the comfortability in movement that people who started to enter the house by one of the foot (usually the Malays still start the steps with the right foot) would end up with the same foot stepping as it reaches the house floor.

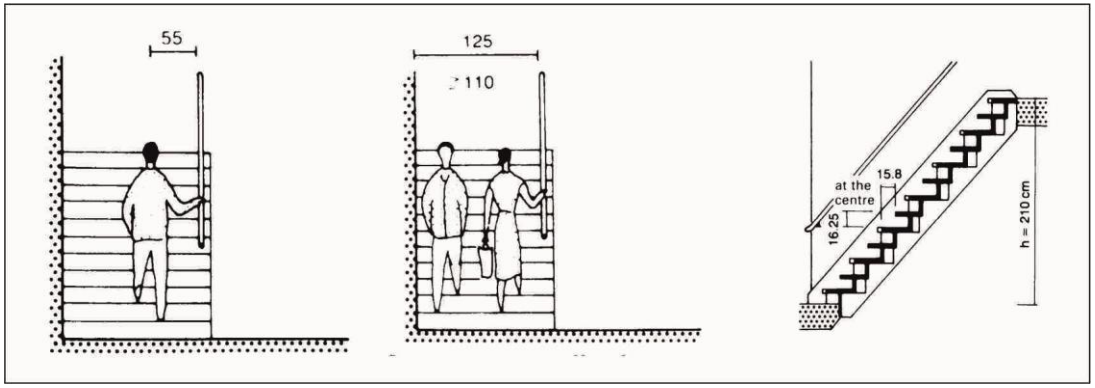


Figure 5.6.
European standard of stairs in the house

CHAPTER VI
FINAL REMARKS

This is the final chapter of this dissertation about the anatomy of traditional dwellings. Inside this chapter readers will find three important parts of this research. The first part contains an explanation of the characteristics of a traditional Malay dwelling and a Dayak longhouse of West Kalimantan, and a comparison in the studies on the architecture of traditional dwellings of the other regions in Indonesia. These sequences of sub-chapters were conducted to show a distinction and uniqueness between the traditional dwellings in West Kalimantan and the dwellings of other regions in Indonesia. Further, in the second part of this chapter are the conclusions containing the study's findings as the remarks on the research questions that have been described in chapter 1 of this dissertation. Finally, the recommendations of this research are given for the further investigation on traditional dwellings in the future.

6.1 The characteristics of traditional dwellings

The traditional house, especially in Indonesia, has its own characteristics that describe the architectural and cultural values of the Indonesian Archipelago. Characteristics of this traditional house are sometimes found in having the same of shape, similarity in spatial arrangement, or similarity in naming of architectural elements. This is possible because of the common basis of customs and the cultural roots that affect the architectural buildings. Likewise, the architecture of traditional houses in West Kalimantan, especially for the Malay house, was also to have the same conditions that influenced the architecture of other parts of the archipelago. This influence can be found by looking at similarities in the formation and the naming of house types, naming of the rooms, the ornaments, and other factors. In addition, the influence of

similar cultures and the common religious affiliation are the factors that influence the similarity in concept as applied to the architecture of traditional houses in respective regions.

Characteristics of traditional Malay houses of West Kalimantan in the next passages were excerpted from the discussion that has been done in previous chapters. This provides highlights for the reader to have a better understanding about the main elements of Malay dwellings. Likewise, the Dayak longhouse is also constructed from the previous discussions to describe the fundamental differences with the traditional Malay dwelling. To strengthen the conclusions in the writing of this dissertation, one example was taken from the architecture of a Malay dwelling in Palembang of South Sumatera as a comparison to show the similarities and differences as a product of the residential architecture of Malays which is located in other region, but has similarities in its cultural roots. This example also employs religion as a foothold to understanding the architectural concepts in residences.

6.1.1 Characteristics of Malay's traditional dwellings in West Kalimantan

6.1.1.a Room Sequences

The traditional Malay dwelling in West Kalimantan is comprised of three types differentiated by the roof shapes, namely the house type with roof form of *Limas* shape (*Potong Limas*); the roof form of *Kawat* shape (*Potong Kawat*); and the roof forms of *Godang* shape (*Potong Godang*). In general, the traditional Malay house of West Kalimantan is the stage-house that consists of two house masses, i.e. the main house and the support house. The main houses were found to have the floor plan with a grid number of 2, 3 or 4. The characteristic of the main house is the large mass building with the floor plan arranged in extention to the

rear of the building facade, while the support house has a grid number of 1 or 2 and the same width of the main house. The characteristic of the support house is the small building mass with the lower floor elevation if compared to the main house. So then we could find on the site of the Malay traditional dwelling the forms of two building masses. The largest one is on one side while the small one is on the back or on the other side of it.

Visually, the main house does look bigger and taller than the support house. The main house found in the field may be up to 11.73 meters high with an average height of 7.66 meters, while the support house found in the field may be up to 7.86 meters high with an average height of 6.35 meters. Considering the existing data, the author found that the middle and upper parts dominate the appearance of the Malay traditional dwellings in West Kalimantan. The proportion of middle and upper parts dominate the appearances as more than 80% of the total building facades. More specifically, it was found that the average height of the middle part is slightly larger than the upper part.

Main houses use wall partitions to separate the functions of the different spaces. The spaces commonly found in the main house are the front *Serambi* (verandah), Middle *Serambi* (guest room) rear *Serambi* (living room) and bedrooms. Support houses do not have any wall partitions to separate the function of spaces, but we also found a bedroom with the given wall. The main house is marked with a higher floor elevation than the support house. Generally, the difference between the floor elevation of the main house with support house ranges from 10 cm up to 30 cm.

The first space found in the front is *selang* or usually called the "front *selang*". Malay people usually called it as *pelataran depan* (the front platform). The front *selang* is the gap between the dirty outside and the

clean inside, so the dirty things should be cleaned before entering into the house. One other *selang* located on the rear section serves as the place to put items that are not brought into the rear *serambi*. Females usually entered the main house from the side door of the rear *selang*, or used the support house door. The rear *selang* is also called *pelataran belakang* (the rear platform). These platforms can be found in two forms, i.e. roofed or not roofed.

Front *Serambi* is the place to serve the male guests, while rear *Serambi* is the place to serve the female guests. Rooms for girls are located in *parak* (attic), with stairs or ladders as the access to *Parak* which is placed in the backward side of the rear *Serambi*. Middle *Serambi* was identified as the front room (*ruang depan*), In their daily conversations, Malay people usually asked the guest to sit in the *Ruang Depan* as the guest room.

The bedroom was mainly for parents and commonly found also for the girls. Bedrooms for parents were usually placed near of the main pillar called the *Seri* pole. This column became a central pillar for the surrounding spaces. Rear serambi or living room was the gathering place for family members. This space is usually located in front of or flanked by the bedrooms. In this space were usually the women and girls doing activities. In some cases can be found a special room called *Puadai*. *Puadai* is the special room in which a bride may stand and sit during the marriage ceremony. In addition, in some cases, there was also a special room for newly married couples staying in the house.

The spaces in the Malay traditional dwellings are formed in a sequence of connectedness. This appears as the linkage between the public, semi-private, and private space. Two of the sequence series are found in the following:

a. the sequence of open series: public - semi-private - semi-private (Front *Serambi* - middle *Serambi* - rear *Serambi* - rear *Selang* or kitchen)

b. the sequence of limited series: semi-private - private - semi-private (Middle *Serambi* - bedroom or *Parak* - kitchen or rear *Selang*)

The first sequence series is the circulation access that especially applies to the guests or males who are not *muhrim* of the women or girls in the house, while the second sequence is the circulation access of the family members, especially for the women and girls. The last sequence series aimed to protect the women or girls for the activities which could be observed by inappropiate people. For these purposes, in main house, the bedrooms are placed on the left or right of the semi-private space.

6.1.1.b Concepts and Meanings

The Malay people are associated with Islam and well-known as Moslems. Generally, the Malay people embraced Islam as a religion from birth and it applied in many ways to their life activities. Malay people always linked all their activities as the essence of worshipping God. By their cognition, the essences of life, are the interaction with other people as social community, and the the interaction with God as *ibadah* (religous services). By the objectives mentioned above, Malay people applied Islam as a doctrine also manifested in the manner of dwellings development.

Malay people also maintain the balancing between left and right, keeping the balance in life's concepts between the activities for the world's life and heaven's life, the balanced relationship between humans and the relationship with God (*hablumminannas* and *hablumminallah*). In the understanding of Malay people, all the

activities conducted in all sections of the house are also worship. So, underneath the triangle of the roof shape and at the center of the main house is the place to maintain the purity of their belief in Islam.

Proportion in symbols and contents as a whole, coherent message gives meaning to the shapes of Malay traditional dwellings, and to the ideals of the owners as Moslems. Messages are balance in life for the Malays. So, the Moslem profiles will be directly observed by the guests or the community when they look at the front facade of a Malay house or enter the house. Malay people usually put the symbols of Islam on the top of the door, calligraphy on walls of the living room, the attached ornaments on the element of the main house, etc.

This is reflected in the equilibrium of shape (symmetry) on the facade between the left and right, balances in the placement of openings, and the balance in placement of the symbols (i.e. ornamental). Whether located above or below, the elements significantly show the Malays as Moslems who always try to do good deeds (*amal ma'ruf*) and avoid doing bad deeds (*nahi mungkar*). All elements are usually placed on the right side as an act that has always been practiced by Moslems and it is always taught to children by their parents as part of Islamic religion. Well known in their understandings, the things positioned on right are more noble than those on the left. The right portions are described as kindness, while the left portions are illustrated as badness.

Meanwhile, inside of the roof construction, there is found a supported system of a simple beam construction (post and beam). Malay people described the vertical beam by naming it "*penunjuk langit*" (sky pointer). This because of the beam placed in the direction towards the sky, but furthermore the sky is a place

that is often analogous to God's belonging and the heavenly places. In fact, *penunjuk langit* could means that all activities inside the house are considered as worship and will be sent directly to the sky where God lives.

6.1.1.c Important elements

The important elements found in the Malay traditional dwellings of West Kalimantan are explained as follows:

1. *Tiang Seri*, The foundation of the main house in Malay traditional dwellings is generally built from five main pillars. The pillars consist of one main pole (*tiang seri*) at the center and four pieces as support poles (*tiang anak*) at each corner. These five of pillars were erected as continuous square timbers for foundations and at the same time also for the columns, which all support the entire structure of the main house. In Islam, doctrines always mentioned that God loved all things formed in the odd or singular. In addition, the placement of five pillars as the foundations of main house is analogous to the five pillars of faith in Islam, and the command to conduct prayers at five times a day that must be done by Malay people. Meanwhile, the locations of main pillars (*tiang seri*) in one corner of the parents bedroom is analogous to the parental roles as a main teaching source for the family, and also they act as role models for all family members. Location of *tiang seri* in the center of main house means parents act and give all their efforts to support all the family members to have good life in the world and blissfulness in heaven.
2. Stairs, The number of footholds on stairs is always odd. The stair foothold is calculated with the sequence that begins on the first foothold, the second foothold, the third foothold, and if the number of stairs is more than three, then the calculation will go back to the first count. The first foothold serves as the *tangga* for the meaning of climbing up, the second foothold serves as *tunggu* (waiting) for the meaning of

the longer stay at home and the third foothold serves as *tinggal* (leave) for the symbolic meaning that anyone who dwells in the house will not be in eternal occupation thereof. According to this calculation, if the number of steps allows for only 3 footholds then it is believed that people who stay in the house will experience unexpected events that cause the occupants to leave the house. Therefore, the popular number of footholds is 5 steps because it is believed that this number will give pleasure and eternity for the occupants living in the house; additionally, the figure also illustrates the number of the pillars of Islam.

3. Ornaments, carvings or paintings are found in the roof edges, railings or ventilation. The placement of ornaments in rooms, except as the functional roles and symbolic meanings, also plays an important role in giving emphasis on the organization of rooms. Certain forms on the ornaments of Malay traditional dwellings are found in the hierarchy of forms such as the welcoming guests motifs, the motifs of religious belief, or local culture.
4. The shape with a large roof, the main rooms shaded by this large roof. The roof shape with a smaller angle at the top pointing towards the sky describes the underneath activities in the house conducted with the view toward the highest place to reach God's heaven. So, rooms under this rooftop were also described as the most sacred rooms. Bedrooms and living rooms (serambi belakang) were placed under the rooftop in the main house. These two rooms were used as the place to develop family characters.

6.1.2 Characteristics of Dayak's traditional longhouse in West Kalimantan

6.1.2.a Room sequences

In the bottom part of the Dayak traditional longhouse of the Tamanic sub-ethnic we find the lowest elevation at the unit of 2.10 meters and the highest at the unit of 6.90 meters, while the elevation of the middle part from the floor surface of the lowest at unit of 2.74 meters and the highest at the unit of 4.03 meters; finally, the elevation of the upper part of the lowest at the unit of 3.74 meters and the highest at the unit of 7.35 meters. Elevation from ground level of the total building ranges from 12.42 meters up to 14 meters.

The *Pendopo* is the first building that should be passed by the guests before reaching the longhouse. The *Pendopo* serves as the main entrance and the screening place for guests before entering into the longhouse. Like many longhouses, the Dayaks have restrictions (*pantangan*) that must be obeyed by the inhabitants and guests. The violations of restrictions will be subject to the *adat* penalty in the form of paying a fine of customs. The subject of restrictions is posted in the Pendopo to notify the guests and inhabitants whether they are allowed enter into the longhouse or forbidden.

Takso seleper is a relaxing place for occupants of longhouse. In this room is usually placed a *bale-bale* or a mat as the marks of each bilik for sitting or lying down. The position of this room is close to the hollow wall that allows the occupants to be able to view the outside environment while the people outside would be blocked by the line of small logs that formed the walls. Next is the room of *takso tandanan* as the place especially to conduct the traditional ceremonies. The characteristic of this room is the provision of wooden boards as the backrest which was attached to the columns of respective compartments (*biliks*).

Further is the other room in the longhouse that was covered by the massive walls. Rooms with massive walls are called *tindoan*, which in the past was the space without partitions with the functions of the bedroom as well as the family gathering space. Currently, the *tindoan* space has been given walled partitions, which generally divide the room into two sections, i.e. the family room and the several bedrooms. Meanwhile, the rear section of the longhouse is the space for the kitchen. This space is generally an addition to the building development of the longhouse. There are no spatial standards for the kitchen area in the longhouse. Capacities of the kitchen are suited to the needs of occupants of each *bilik*.

In the past, on the top of the longhouse was a place for storage of heirlooms, paddy, etc., which is used currently as the storage room for mats or agriculture tools in the Sadau room. This placement intended that heirlooms would be safely stored in very important, valuable, honourable and sacred rooms in longhouse.

6.1.2.b Concepts and Meanings

The most important thing in the social life of the Dayaks is their religious behavior, always shown and manifested in daily life. Dayak people understand that there are large natural forces that govern their lives. The nature of supreme divinity in almost the whole concept of belief of the Dayaks is formed by the "duumvirate" (*dwi-tunggal*) which respectively inhabits in the upper world (*dunia atas*) and the lower world (*dunia bawah*).

The concept of divinity described above illustrates the divine principle of Dayak people symbolizing the great power of the creator of the world and its contents. The two highest gods in the belief of Dayaks have the respective totemic emblems. *Mahatara* is symbolized by *tinggang* and spear (*tombak*), while *Jata* is symbolized by *tambon* and *keris* (creese).

The Dayak concepts on beliefs and traditions are fundamentally intended to provide abilities for humans to exert some control over forces of nature. The controls move and act in very physical ways with material results, yet they have invisible motives and means. The Dayak live by asking supplication from “the natural force”, and when one believes that the supplication of the natural force has been granted, that person will live under the protection of the same powers.

Dayak people divided the world into three divisions, first division is "*dunia bawah*" as a place of the supernatural beings or the spirits of dead people who during their lifetimes often did evil things; second division is "*dunia tengah*" as a place for humankind and the third division is "*dunia atas*" as a place of gods. By giving the floor in the longhouse high elevation from the ground, builders intended to provide security for mankind from the evil disruptions of *dunia bawah*. Longhouse elevation acts as the "stage of life" of the Dayak community.

The ritual to send greetings to the holy spirits in the upper world is the objective function of the *takso tandanan* room as a room "to facilitate" the holy spirits to go into *biliks*. On the other hand, the ritual ceremony conducted in the *takso tandanan*, positioned vertically as "*ruang tengah*” is conducted in order to request supplication from the evil spirits or supernatural beings, asking them not to disrupt the *mensia* world (human life). The ritual ceremonies performed at the "*ruang tengah*" as one of the objective functions of the longhouse protects, prevents, or requests the permission of evil spirits, or supernatural beings. These activities are also conducted in order to express the Dayak people’s gratitude to the natural forces for the foods obtained during their life in the world.

Sadau can also be interpreted for Dayak people as the intermediary world between *dunia tengah* (*mensia* world) and *dunia atas* (God's world or heaven). This room is interpreted as a "bridge" for humans to ride to heaven. In the Dayak people's belief, *dunia atas* is a symbol of heaven.

6.1.2.c Important elements

1. The *pemun* pole, which is the main pillar of each bilik, comes from the trees taken from the forest around where the longhouse is erected. *Tiang Pemun* is the description of parents (people who became elders of the community or the group leaders) who will be able to protect all the occupants of a longhouse. Dayak people called *Tiang Pemun* serve as a "*Penyawa Rumah* (life of the *bilik*)". Placement of tiang pemun located in the middle floorplan of each bilik is intended as a "source of life" of each bilik to maintain the life of bilik dwellers, as well as a source of strength and their power against interference from evil spirits or supernatural beings that may influence bilik dwellers or the longhouse community.
2. Roof style, The shape of the gable roof with a high slope is an adaptation to the local weather conditions. The head looks more dominant with the shapes of a high roof, and larger. The choosen shapes with a larger part in the head than the body illustrate that the Dayaks are always maintaining and providing the best place for the holy spirits or *Mahatara*.
3. Fewer openings, The Dayaks' longhouses characteristically are found with fewer openings generally.
4. Additional door inside the biliks, The indoan, An important element found in the room is the existence of the wide door. This aditional door can be opened and connected with the tindoan room of the other

neighboring biliks. This wide door would be open at the time when they held a traditional ceremony in the longhouse, so that each chamber could be used to prepare the dishes together with other neighbors.

5. The ladder, To climb the ladders of the longhouse, the guests should be careful, and when they reach the end of ladder, they should be slightly looking down to avoid collision with the floor. The behaviour of slightly looking down shows that the guests must always be humble as visitors of the longhouse and should respect the host and the customs prevailing in the longhouse.
6. Ornaments and carvings, Carvings are found on the stairs and doors, while painted ornaments are found on the roof edges, backrest, or walls. The general motifs found are in the forms of:
   - *Burung* or birds, generally, bird ornaments which are carved or painted as the birds of Bungai or Tingang or Enggang (hornbills), with male sex, which are the magic bird names in the mythology Dayak people. This bird symbolizes the divinity in the upper world (Dunia Atas);
   - *Naga* or dragons, In the Dayak language called *tambon*, a symbol of the divine nature which inhabits the lower world (Dunia Bawah);

   Both of these animals are a symbol of Mahatara and Jata, the gods who each were inhabiting the upper and lower world. Alqadrie (1990:102) mentioned that the dragons, which are an important symbol in the Chinese culture, play an important role in Dyaknese culture as a religous symbol, in the traditional decoration of ceremonial bowls and jars.

6.1.3 Characteristics of Malay's traditional dwelling in Palembang of South Sumatera

As also found in West Kalimantan, the traditional house in Palembang of South Sumatra found in 3 types, i.e. *rumah rakit* (*rakit* house), *rumah gudang* (*gudang* house) and *rumah limasan* (*limasan* house). All had a hierarchy of ownership of their homes which was hereditary and followed by the traditional people in Palembang. According Firmansyah (2003: 49-51), a *rakit* house, in West Kalimantan known as the *lanting* house, is a house that floats on the river tethered to a stump on the land. This house can go up and down with the ebb and flow of the river. In the past, only the natives were allowed to build a house on the ground, while the migrants were only allowed to build a house on the river. The rakit house was originally a settlement for newcomers or Chinese.

Another type of house in Palembang is the *gudang* house, in West Kalimantan known as *rumah potong godang*. It is a dwelling built on the land surface with a height of 2.5 to 3 meters. The most often used building materials were wood, the roof with this type of saddle and the roof cover material from tile. In general, spatial divisions of the main house of a gudang house are as follows:

- The front section (a *serambi* and a front room);
- The middle of the front (used as the sitting area and for a ceremony / customary event (such as the celebration, marriage, and death);
- The middle of the back (used as the bedrooms and living rooms)

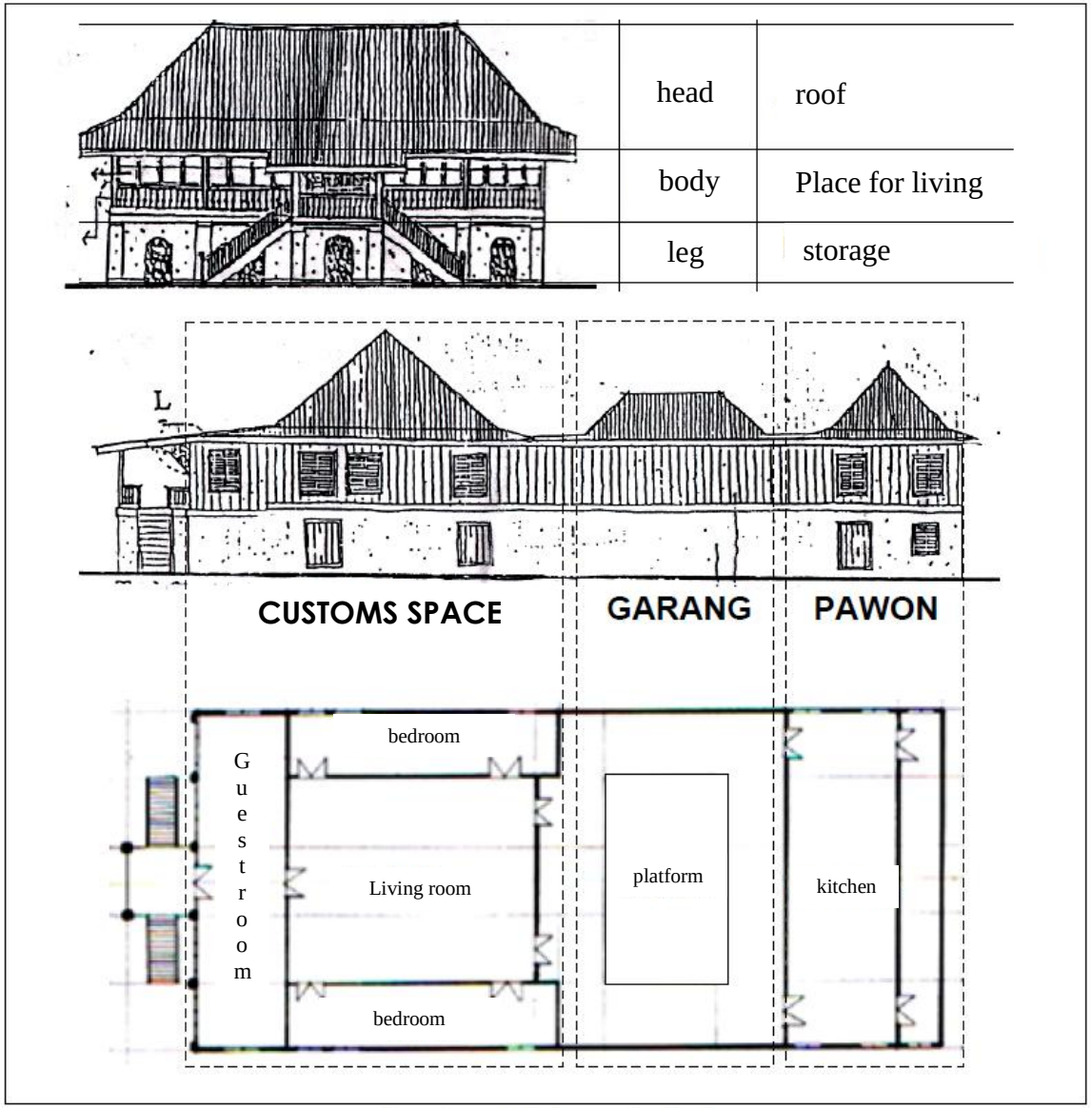


Figure 6.1.
Rooms division in the Gudang house of the traditional Palembang house

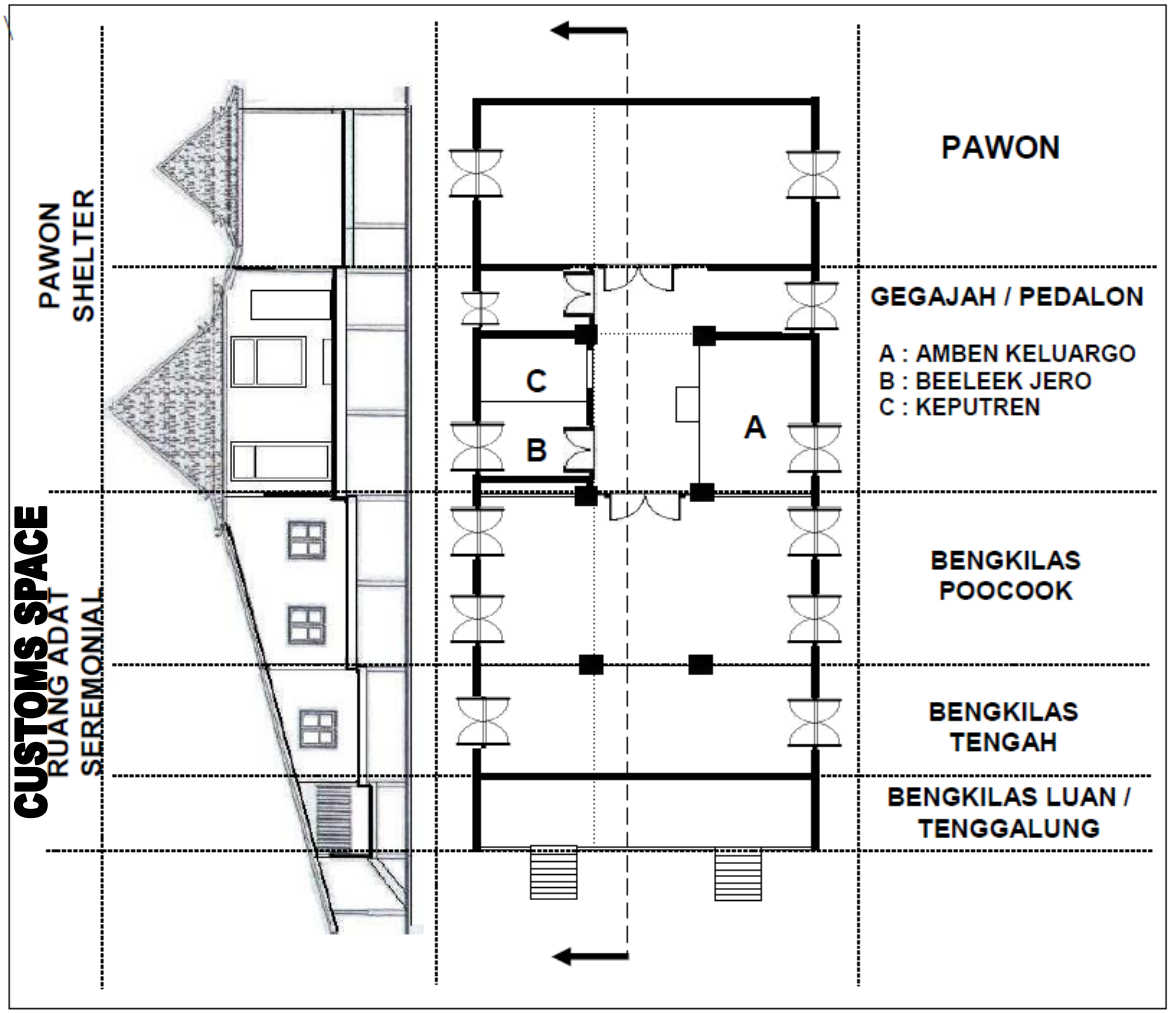


Figure 6.2.
Room's division in the Limasan house of the ttraditional Palembang house

Limasan houses of Palembang in South Sumatra are also included in the Malay architecture. According Firmansyah (2003: 16), the *limasan* house already existed as a form of transformation from the architectural era of the Buddhist influences to the architecture which is influenced by Islam. Therefore, some parts and architectural concepts of the *limasan* house were greatly influenced by the concepts of Buddhism.

The following is the architecture of the *Limasan* house of Palembang extracted from the master's thesis research by KGS Firmansyah. This thesis was completed at the Gadjah Mada University -Yogyakarta in 2003.

Rumah limas in general have the same spatial pattern, which is divided into two sections. The first section is in the front of the house, which consists of *bengkilas* and *gegajah*, and both are designated as space for customs (ceremonial), while the second section is in back of the house as a place for the daily activities (shelter) and is called *pawon*.

The *limasan* house was found in several types that are affected by factors of the *bengkilas* number. Each type has a variation in the width of rooms. In the era of the Buddhist influence, *bengkilas* were believed to be a vertical hierarchy towards heaven, while in the Palembang sultanate era the *bengkilas* functioned as a status level in community. Generally, the *limasan* house was found in three or four *bengkilas* and erected for the gentry and their offspring. But currently, *bengkilas* are used by the elders or ulamas as a tribute to them.

In the *limasan* houses of Palembang was found the *imam* pole (*tiang imam*) which is located on the west side of the house walls, but the exact position would depend on the number of poles (*cagak*) of the *bengkilas* wall on this side. If the number of poles is odd then the faith pole position is found in the center of the wall of the direction of the Qibla. If the poles are in even numbers then the faith pole would found in the

position of the second pole, counted from the left of wall of the house in the direction of Qibla. Qibla is the position of the Ka'bah location and the direction Moslems face during prayers. In Indonesia, Qibla direction is generally specified toward the West.

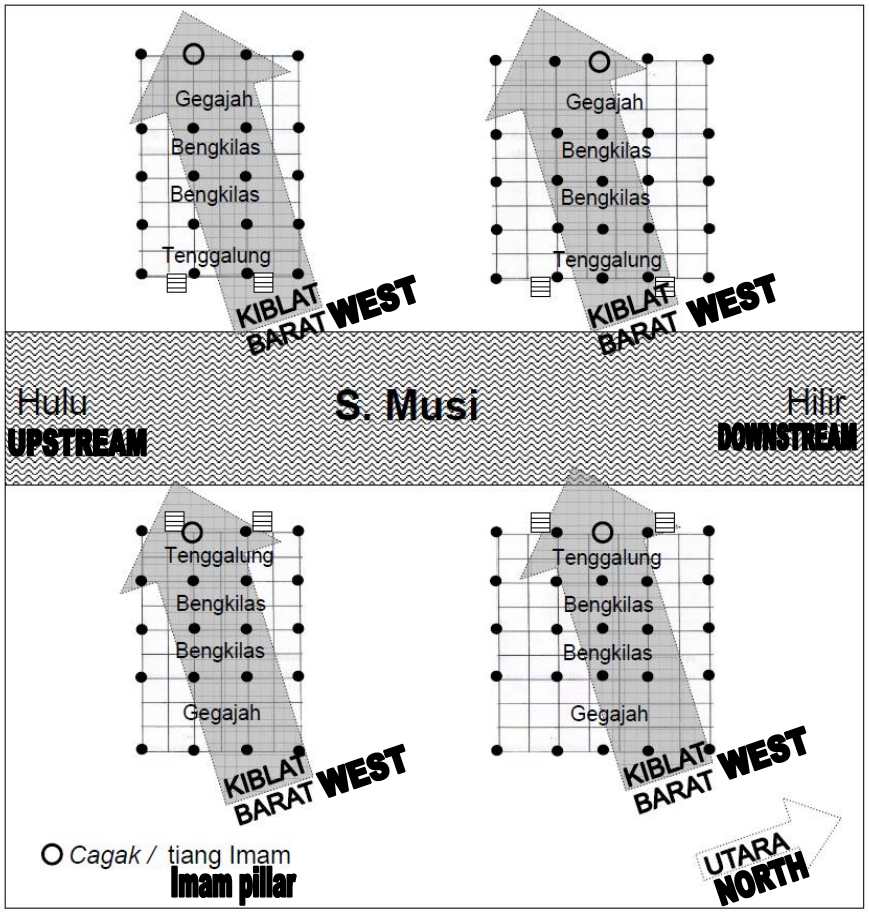


Figure 6.3.
Location of tiang imam in the limasan house of Palembang

Special conditions on the customary ceremonial procession at the *limasan* house are also apparent in the existence of gender segregation. The females are always placed in the room of *gegajah* and *pawon* while the men are always placed in the front room, i.e. *bengkilas* and *tenggalung*. Although the hierarchy of space at a *limasan* house has sections for up to five bengkilas and is physically demonstrated by differences in the floor height, in the composition of the building mass, the limas house of Palembang is divided into two parts. The front section of the main house consists of a room of *tenggalung*, *bengkilas* and *gegajah* / *pedalon* and all were often referred to as the customary space (ceremonial). The building which has a mass smaller than the main house erected behind it as a place of daily activities (shelter) is often called the *pawon*. The *pawon* on a *limasan* house is found in two conditions, i.e. separated from or fused with the main house. The two masses of buildings were usually linked with a bridge called the *garang*.



Figure 6.4.
The composition of building masses of Palembang Limasan's House

Plans on the *limasan* house are rectangular. When investigated further as to the overall plan of the building, the author discovered that the floor-plan form is longitudinal to the rear, but when it is seen as the composition of each room, it is a rectangular floor plan with transverse direction relative to the position of the building facade. Another thing that also found in the floor-plan of the Limas house is the presence of visual symmetry in the motifs of the *pager tenggalung* and the number of doors on the house facade.

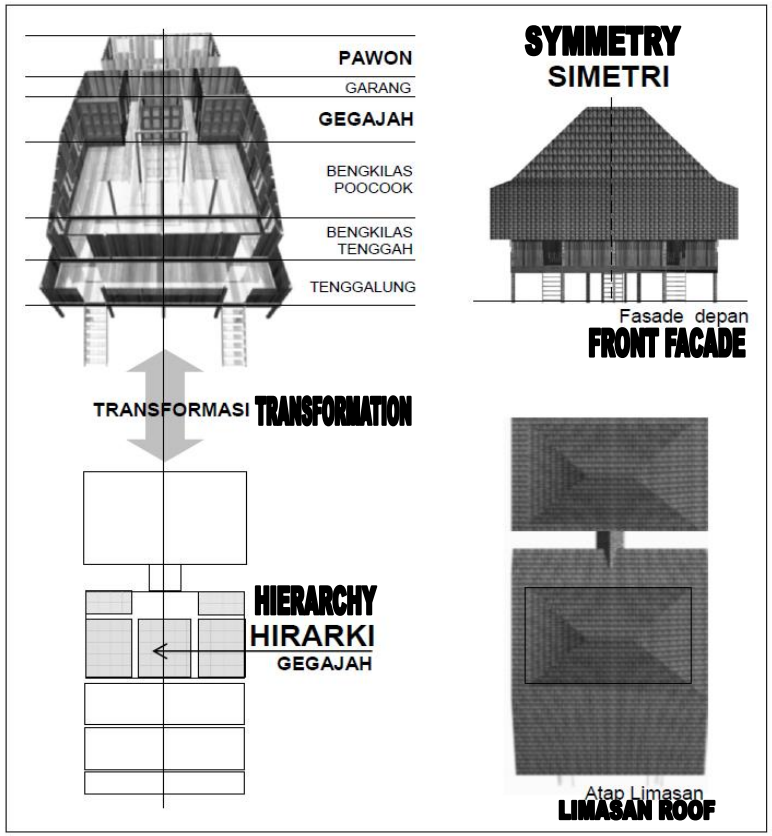


Figure 6.5.
Room's sequences and the building symmetry of Palembang Limasan's house

6.1.3.a Room Sequences

- *Langkan*

  Langkan (balcony) is the term given for the additional space on the front terrace of a *Limasan* house with one or two *bengkilas*. *Langkan* serves as a place to relax and interact in the afternoon. *Langkan* could also serve as a place to receive guests.

- *Tenggalung*

  Tenggalung spaces are also called *bengkilas luan* (the front *bengkilas*). Tenggalung serves as a space of *pamarekan* (temporary space to receive guests). As a marker of the room then before entering the *tenggalung* space, guests will find *pager tenggalung* as a hollow wall made from vertical wooden stick structures that form the lattice.

- *Bengkilas*

  The *bengkilas* room is a space after *tenggalung*. To enter this room, guests must pass through the door called *lawang kereng*. *Lawang kereng* was found in two forms. The first form is the partition wall with three pieces of door openings, and the second form is the partition wall as door openings that can be opened with a motion like the movement of a hand fan, therefore the door is called *lawang kipas/kiam* (a door of hand fan).

- *Gegajah* / *Pedalon*

  In the room of *gegajah* / *pedalon* we could find *beeleek jeroo*, *keputren* and *amben keluargo*, as well. Ambeen keluargo is used as a place for worship such as prayers, dhikr (reciting of God's

name) and recitation of the Qur'an. In the front of *ambeen keluargo* is found *beeleek jeroo* that serves as a bedroom for a child who is not married, but it is usually found unused. *Beeleek jeroo*, during the traditional wedding ceremony serves as *beeleek mempelai* (room of wedding couple) and it will be decorated with various ornaments. Furthermore, behind of *beeleek jeroo* is a room which called as *keputren*. This is the girls' bedroom or the elders' bedroom (*pangkeng orang tua*).

- *Pawon*

  The Pawon often used as a place to perform activities of daily living, more than the other sections of the house. *Pawon* ia often called a kitchen. Pawon is regarded as a multipurpose space, because women often spend the day with a lot of activities in this room.

- *Garang*

  The term "*garang*" was formerly a designation for the bridge which connected the rear section of main house, *gegajah*, with *pawon*.

6.1.3.b Concepts and Meanings

The architectural meanings of the concept of vertical axis in the *limasan* house has been attached to the building since the beginning of the its establishment, which was influenced by the concepts of Buddhism. As we know, the Buddhist concepts influenced the house with the belief that the universe has layers, known as the concept of concentric vertical axis. The concepts of Buddhism are found in the *gegajah* room, which is a manifestation of *Khayangan* as the concept of universe. While the *limasan* house is the influenced by

Buddhism, the concept of a concentric position towards the vertical axis is manifested by the presence of *bengkilas* and their floor level in the house, which is associated with the meaning of *Swarga* in the teachings of Buddhism. In addition, the most sacred room as the center or the vertical axis is the *gegajah* room. So then, the axis in the *gegajah* room is strengthened with the presence of an *amben keluargo* and a pyramid-shaped roof that is supported by four continous pillars without connection.

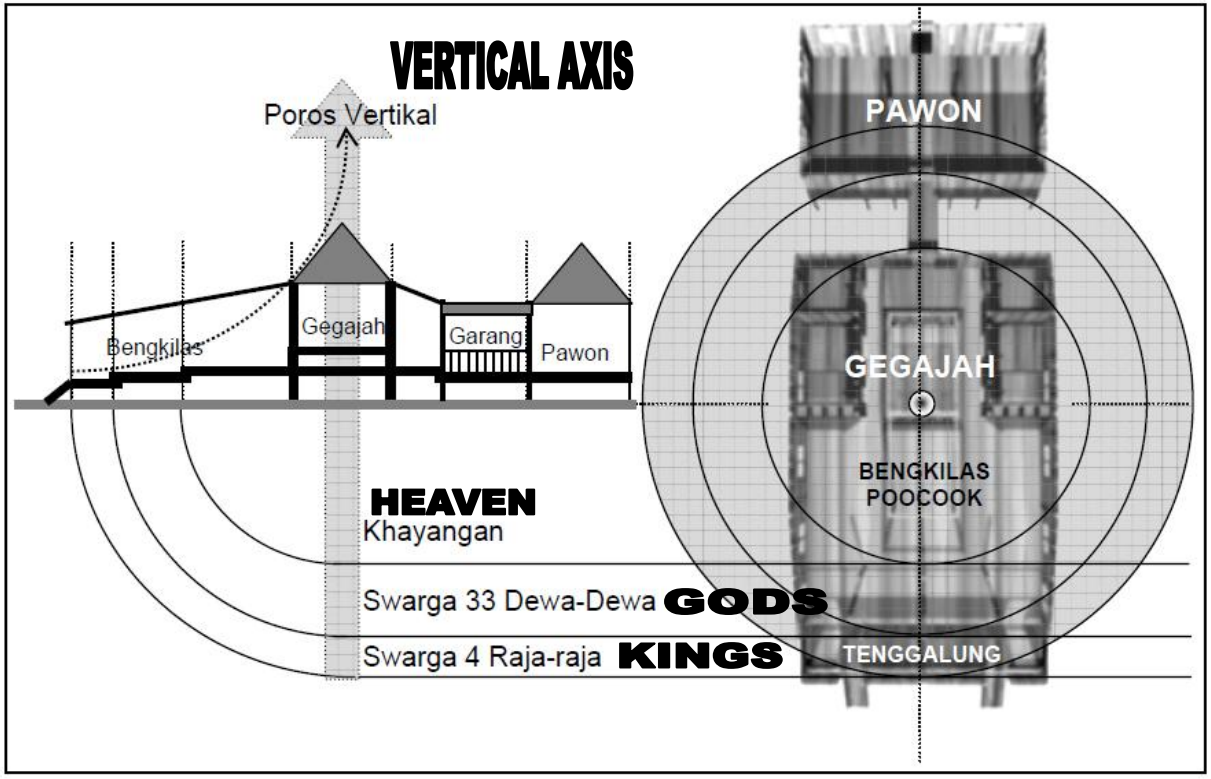


Figure 6.6.
The concepts of vertical axis and concentric on the Limasan house of Palembang

Application of an imaginary line that forms the vertical axis is also found in the *limasan* houses of the Sultanate era, which were influenced by the culture that comes from the teachings of Islam, which was still strong. During the next period after the end of the Sultanate of Palembang, the application of the concept of a vertical axis can still be found through the symbols of the physical elements or activities.

Orientation towards the Qibla or the west has always been a reference to the carrying out of customary ceremonies conducted in *limasan* houses. On limas houses, west orientation / direction is strengthened by the presence of the *cagak imam* (*imam* pole), placed on a wall in the west.

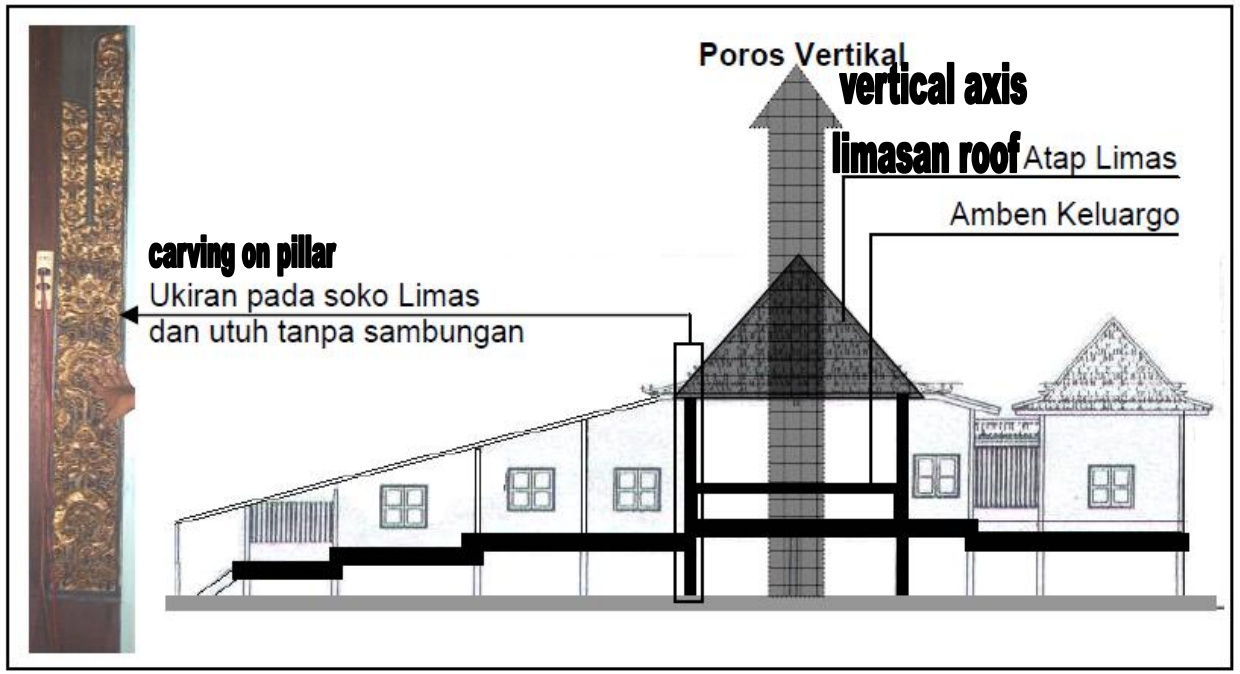


Figure 6.7.
Vertical axis in the limasan house of Palembang

In addition to the orientation of west / Qibla, at a limas house can also be found the placement of house elements based on right and left positions. According to most residents of *limasan* houses, the right side is a good position and the left side is a bad position. On the limas house, left and right positions were found with the presence of *lawang burotan* (*burotan*'s door) placed separately on the right and left of the *lawang kipas* (*kipas*'s door) as the circulation path to exit and enter the house.

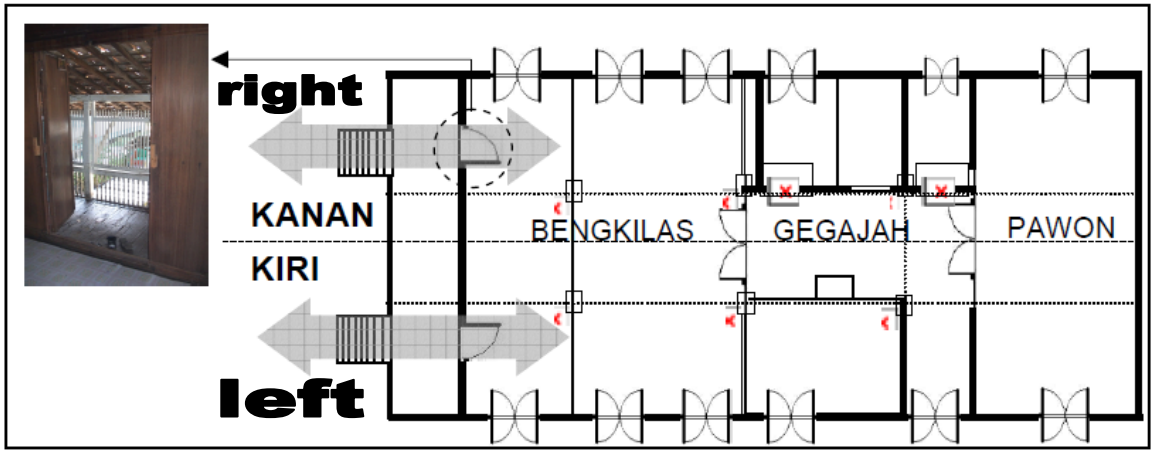


Figure 6.8.
Door's position as circulation path in the limasan house of Palembang

The utilization of space in a *rumah limasan* is characterized by gender-based division, which is applied both in traditional ceremonies as well as on the activities in daily life. In this condition, the division of space based on gender occurs in the separation of sitting areas for males from a sitting area for females. Seating areas for females are usually in the core room and the back i.e. the *gegajah* / *pedalon* and *pawon* while the sitting areas for males are in the front room, i.e. in the room of *bengkilas* and *tenggalung*.

6.1.3.c Important elements

On the limas house were found some architectural elements that physically have become characteristic of the traditional Malay houses of Palembang, namely:

1. *Pager tenggalung*, this element is a manifestation of the symbol of the rocks for the concept of the universe in Buddhism. At the customary ceremonies of Palembang, the presence of *pager tenggalung* and *lawang kipas* is a symbol of sincerity of the homeowners to serve guests.
2. Pole of *imam*, its existence as a symbol strengthened the activities oriented towards the west or Qibla. Offerings were found and the remains of the first erected process of the *imam* pole are believed to be part of the charity of the culture before Islam became the main religion of the Palembang Malays.
3. The stairs called *kiai-kemulan muka* are an important element of the *limasan* house which also specify the presence of good or bad for the house occupants.
4. *Sako pengadep* (pole of *pengadep*), the main function of this pillar is to support the roof structure. *Pengadep* means "facing of" so it describes that this *sako* or pole is facing toward the front of the limas house as a symbol of welcoming guests who will visit. *Limasan* houses have a sako pengadep of five poles as a symbol of the five pillars of Islam. In this condition, the pole is also a symbol of facing to God with the obligation of worship.
5. The roof form of *limas* is the most recognizable symbol of Palembang people to identifiy the *limasan* House. For most people of Palembang, they mentioned that the "*limas*" word is meant as five golden words, i.e. grandeur or greatness, peace or harmony, traditional behaviour, serenity, prosperity.

6. *Simbar*, is the decoration located above as a symbol of a crown. On *limasan* houses, the decoration of *simbar* is found attached to the roof structure, known as *tandung kambing* (the goat horns). In addition, *simbar* is also found on the *lawang kereng* (*kereng*'s door), *lawang pangkeng* (*pangkeng*'s door) and *gerobok leket.*

6.2 Conclusions

As the final summary of the study, the author made conclusions based on the objectives of this dissertation research as noted in chapter 1, as follows:

1. The use of human anatomy on the traditional architecture of the Malays and the Dayaks in West Kalimantan
   a. They use the body's anatomical size for the head of the family as a benchmark in creating the space and its dimensions. The head of the family, in this case a husband or father who has a responsibility to protect all the family members (other than adults) and who has the largest size of physical anatomy in the family;
   b. Sizes of se-*depak*, *se-badan* (or *se-hasta*), *se-kilan* (or *se-jengkal*), and se-*genggam* are used to form a spatial dimension in the house, such as for length and width of the room, while for other units such as *se-pinggang*, *se-lutut* and *se-taput kepala* are commonly used to estimate the height of the architectural elements forming the house. In its application, it is used as a unit for the height of windows, doors, fences, or width of the door;

c. The function of many systems in the anatomy of the human body is to protect and facilitate the vital organs in the human body to work properly. Likewise, the anatomy of dwellings functions to facilitate the vital organs of the house, i.e. the occupants and their activities as users. Those both make an effort to avoid bad influences of the environment that can interfere with human comfort in conducting activities as a main goal of the existence of these systems, working in each section.

2. The comparative study between the building anatomy of the traditional Malay dwellings and the traditional Dayak longhouses in West Kalimantan.
   a. Natural conditions that routinely occur around the traditional Malay dwellings and the Dayak longhouses are the tidal rivers, the disturbance of wild animals, rainfall and high humidity. These conditions cause the construction of houses made with stage structures, roof coverings with a high slope, and many openings;
   b. Generally, the floor elevation of the Dayak longhouse is much higher than the traditional Malay dwellings. Except as an adjustment to natural conditions, this condition is embedded in the concept of culture and beliefs which is inherent in each ethnic group;
   c. There are many openings found on the traditional Malay dwellings, either doors and windows, with walls covering the entire side of facades with tightly installed wooden boards. On the Dayak longhouse, the section of public space is covered by the hollow walls formed with the small wooden logs while the section of private space is covered by the massive walls with the instalation of wooden boards. This condition is embedded in the concept of culture and beliefs which is inherent in each ethnic.

3. The characteristics of elements on the traditional Malay dwellings and the Dayak longhouses in West Kalimantan.
    a. *Orientation to the river*, The main orientation of traditional houses in West Kalimantan in the past was the river. In the traditional Malay house, the front facade of the house does not make the river the main orientation, but the Malays understand the river as life support. In the Dayak longhouse, as well as supporting their lives, the river also is the central orientation associated with the belief of the Dayak people towards the forces of nature which control the river;
    b. *The orientation to the circulation of sun*, the Malay houses did not make this the main element that must be met, but the opposite condition occurred in the Dayak longhouse, which made the East - West circulation of the sun the main criterion for the orientation of the house. For the Dayaks, the rotation of the sun is analogous to the cycle of human life;
    c. *Openings*, Residences of Malays have more openings of doors and windows to receive the sunlight into the room, so that all the rooms tend to be bright. The opposite condition is found in the Dayak longhouse, which has fewer openings as a medium for introducing the sunlight into all rooms; so then, the spaces in Dayak longhouses tend to be dark;
    d. *Terms of privacy*, The concepts of *bilik* in the longhouse as a dwelling house are the same as in the Malay house. The family privacy in the Dayak longhouse is maintained by a private environment of biliks, as the private area for occupants of the house is located on the rear serambi and bedroom. The differences in the understanding of space are also found in the segregation of semi-private rooms of the Malay house and semi-public rooms of the Dayak longhouse. But in the common interpretation,

both spaces are the transition area of a special nature for guests who will be allowed to enter the personal space;

e. *Main pole*, The existence of seri poles in the traditional Malay dwellings and the pemun pole in the Dayak longhouse as the center of all rooms of the respective houses acts as "the source of life". These poles are the symbolic nodes for the activities which are undertaken by occupants inside the house.

4. The local culture and the religion (belief) influenced the building anatomy of the traditional Malay dwellings and the traditional Dayak dwellings in West Kalimantan.
   a. The inherent beliefs as the benchmark to distinguish the understanding of house elements on these two types of architecture. The Malays who embraced Islam strictly prohibited cults on the elements of the house. Different things happened with many elements of Dayak longhouses being made or installed associated with traditional beliefs that they held in the past, and some of them still occur today. But to both types of architecture are equally attached the beliefs, values, or cultural symbols on architectural concepts of the respective houses;
   b. The positive orders which are obeyed by the Malays are the Quran and Al-Hadith as the guidelines in running their lives. This guide is set up for the two most important aspects of life for the Malays, i.e. the human relationship with God (*hablumminallah*) and human relationships with others (*hablumnimannas*), while the positive rules that control the lives of the Dayaks are the customary law, customs, and traditional beliefs. Like the Malays, the three guidelines govern the lives of the Dayak people in their dealings with man, and with the great power that affects people's lives through the guidance of traditional beliefs, and also the relationship between human beings and others through the

guide of customary law and customs. These orders are applied in creating the spaces and forms in the respective residential architecture;

c. Islamic values become the main feature highlighted by the Malays in the architectural elements of their houses. They always linked the problems in the world with the teachings of Islam they embraced. For the Malays, Islam as the basis of all aspects of daily activities is the most dominant. The Islamic sharia law is strong enough to guide the everyday behavior. Whatever the problem of life, it always returned to the matter of religion. By contrast, the knowledge system of all the needs of indigenous Dayak people is based on the customary law, in which the information obtained from their ancestors is the main feature presented in the longhouse.

6.3 Recommendations

As the final part of this research, the author will deliver recommendations to those concerned for the development of this research in the future.

a. This research proposed the idea of applying the anatomy of the human body, which was transformed into a system that formed the traditional dwellings. The aspects of inherent culture, including the religious influences, are a major focus in this study. The idea of this research could be developed with a focus on the anatomical pattern of each section of the building, in order to reveal the ideal proportions of human anatomy and their application in the traditional dwellings. This research should be further developed with the mathematical methods applied to the house sections, with the goal of obtaining the ideal ratio of the dwellings as found on the human body;

b. The measurement data in this research is useful for the continuation of future research in finding a grammar pattern on the facade and layout of traditional houses in the West Kalimantan. In addition, these data are also useful as a basis for future research in obtaining the level of thermal comfort of traditional houses in West Kalimantan. The traditional measurement units can also be traced further to obtain the standard size of architectural elements of traditional dwellings that can be applied to a modern home for both the region of West Kalimantan and other regions in Indonesia;

c. The findings of this research can also be used in enriching the architectural treasures of the archipelago as a basis for comparing the relationships of the regional architecture linkage. For researchers in the future, there will also be opportunities to make a comparative study on the anatomy of other dwellings which have a similar type of architecture to another regions, either in Indonesia or other countries in Southeast Asia such as Malaysia and Brunei Darussalam;

d. Open opportunities to pursuing the study of the traditional architecture by tracing the patterns of structure and the connection systems of wooden beams or logs, in order to compare the changing patterns of structure among the regions that are similar to the type sof the traditional residential architecture discussed herein; these are spread over all regions of Indonesia, Malaysia and Brunei Darussalam, or other southeast Asian countries.

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Appendix 2 2D and 3D of research objects

Dissertation

The Anatomy of Traditional Dwellings:
Comparative Study between Malay and Dayak Indigenous Architecture in West Kalimantan

Ausgeführt zum Zweck der Erlangung des akademischen Grades eines Doktors der technischen Wissenschaften

Unter der Leitung von

Ao. Univ.Prof.Dipl.-Ing.Dr.techn. Erich Lehner
Institut für Kunstgeschichte, Bauforschung und Denkmalpflege

und

Dr.phil.habil. Sri Tjahjani Kuhnt-Saptodewo
Leiterin der Sammlung Insulares Südostasien
Museum für Völkerkunde

Eingereicht an der Fakultät für Architektur und Raumplanung
Technische Universität Wien

von

Zairin Zain
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Wien, Juni 2012

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Comparative Study between Malay and Dayak Indigenous Architecture in West Kalimantan

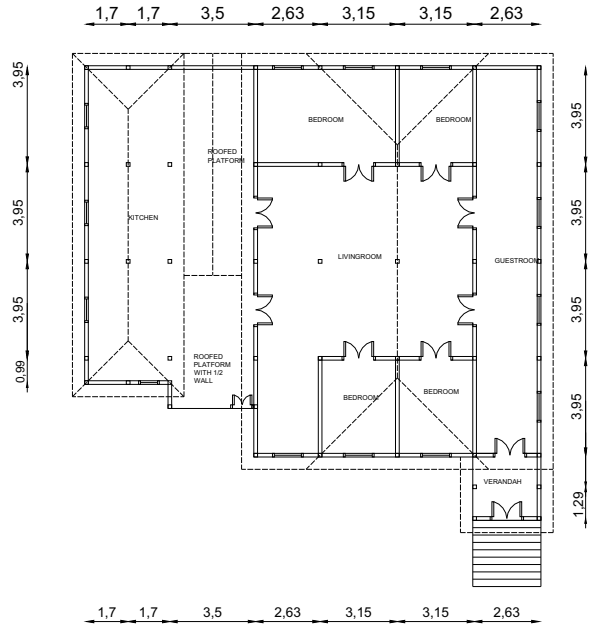
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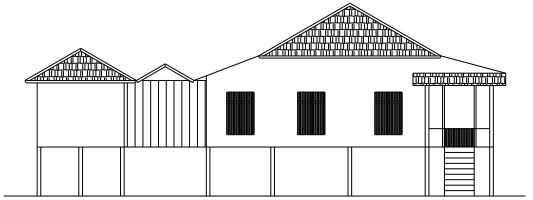
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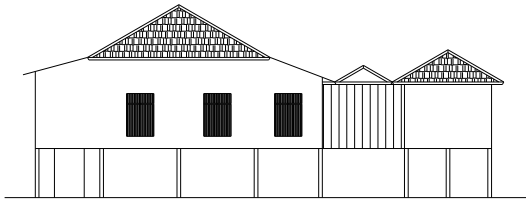
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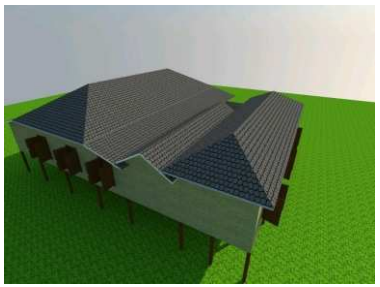
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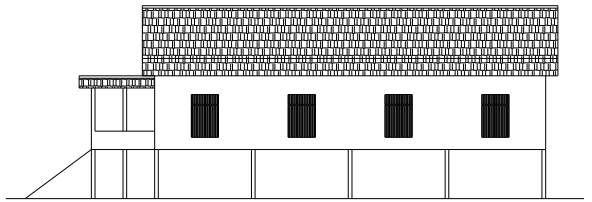




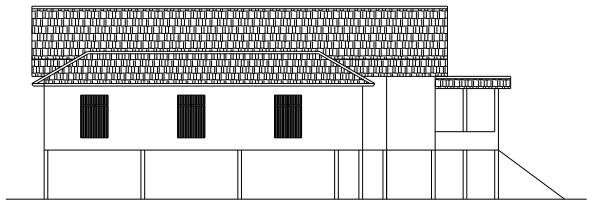




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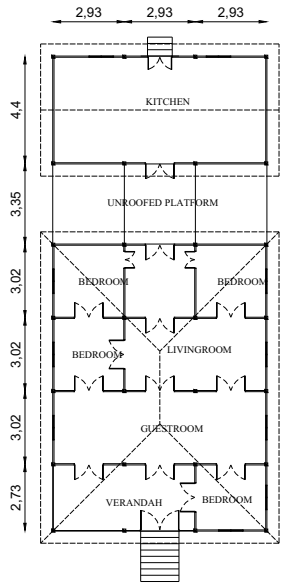
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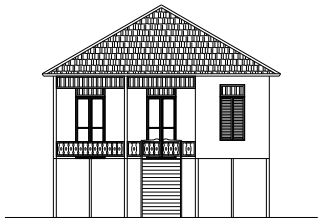
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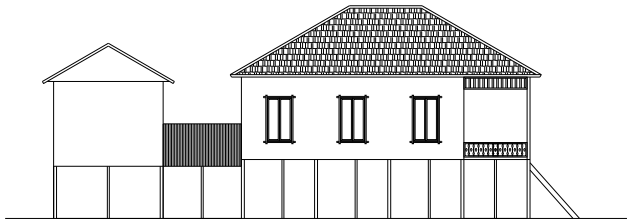




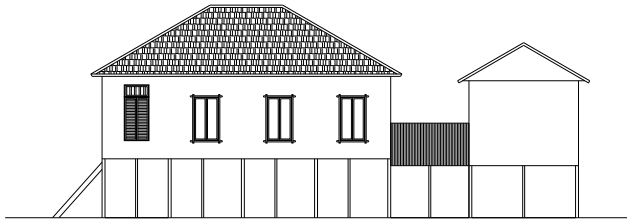




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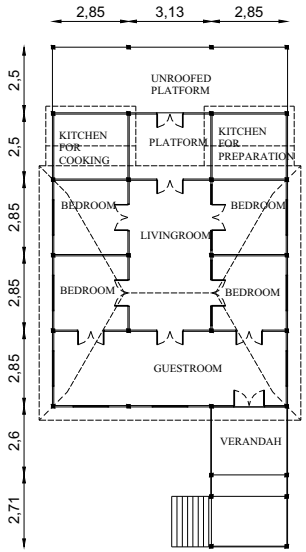
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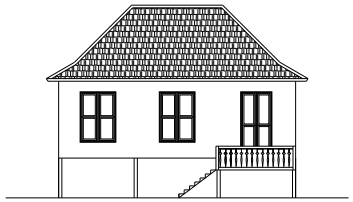




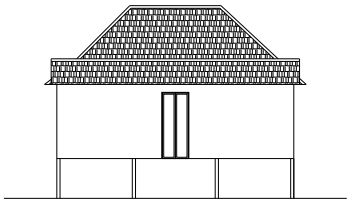




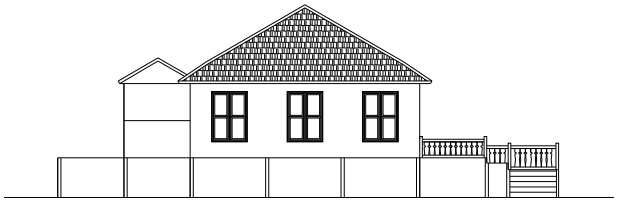
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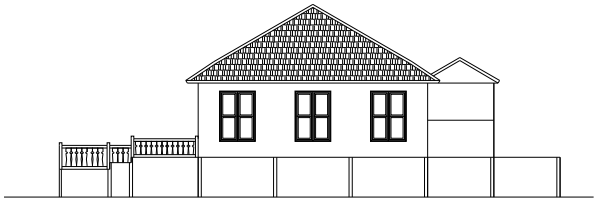
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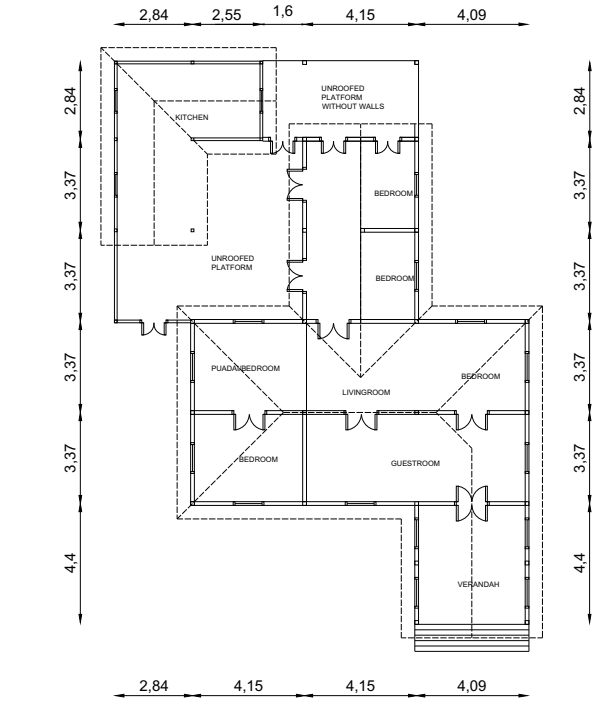
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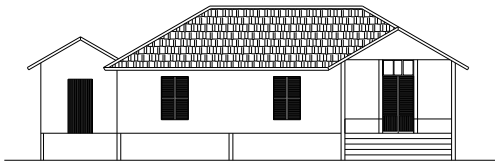
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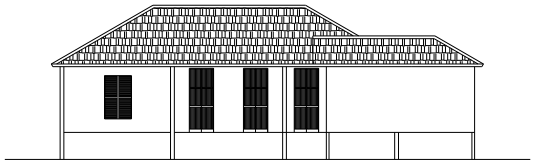
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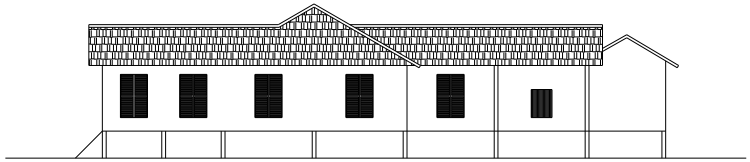
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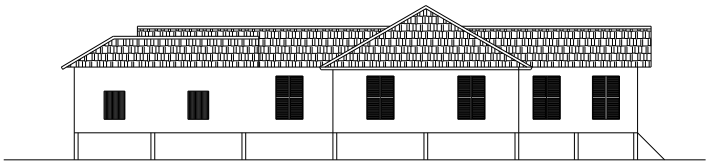
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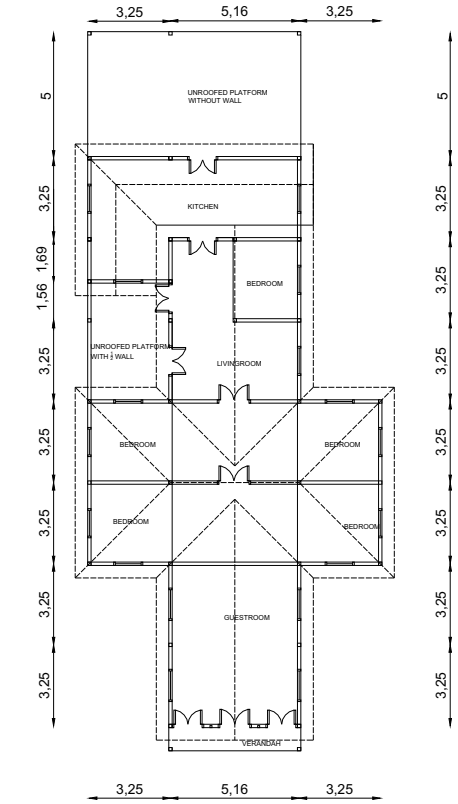
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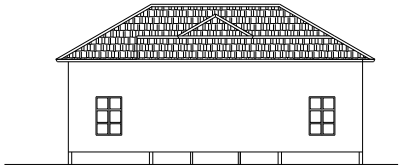
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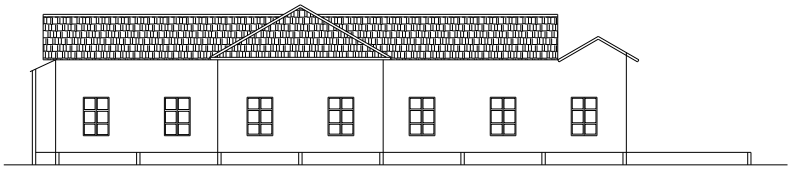
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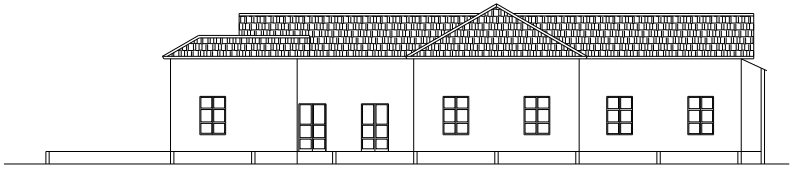
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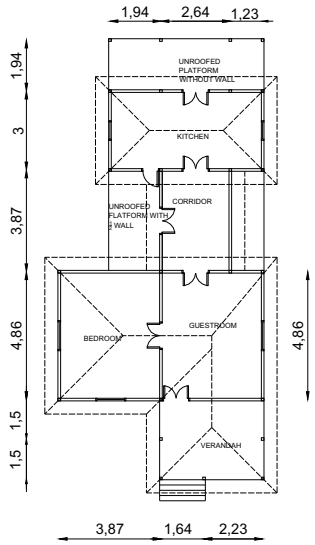
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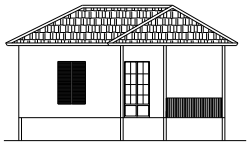
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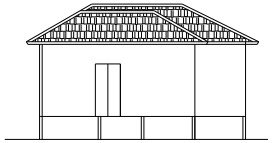
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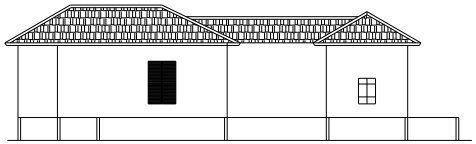




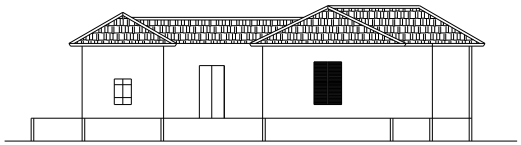




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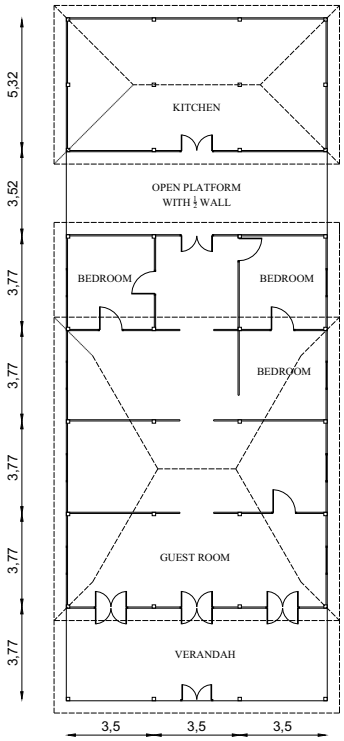
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ZAIRIN ZAIN
Matr. Nr. : 0928565

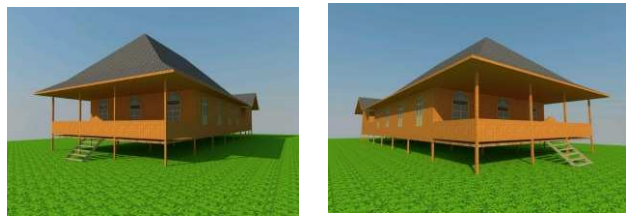
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Virza Firdaus
Wahyu Buana Putra
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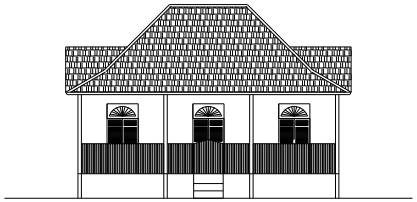
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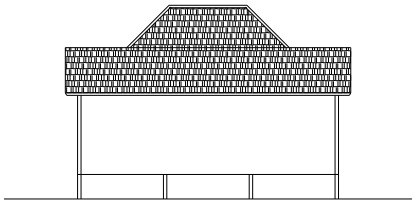
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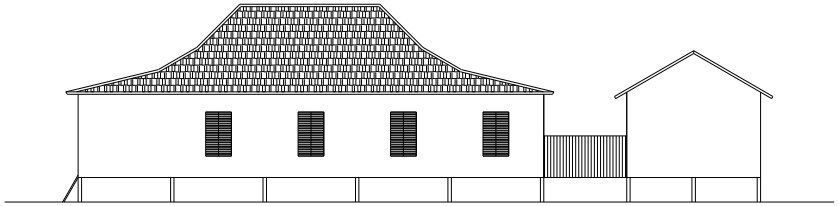
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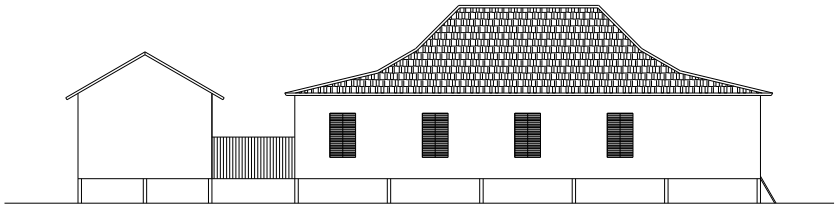
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BACK VIEW
SCALE 1 : 100



RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
SCALE 1 : 100

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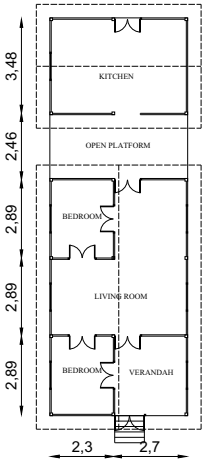
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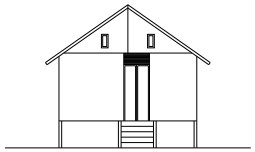
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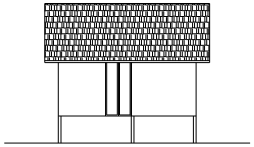
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FRONT VIEW
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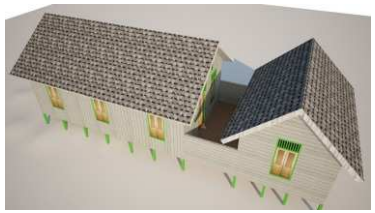


BACK VIEW
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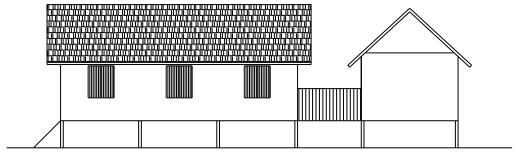




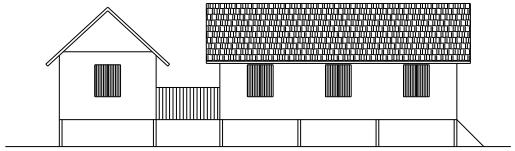




3D OBJECTS
NOT TO SCALE



RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
SCALE 1 : 100

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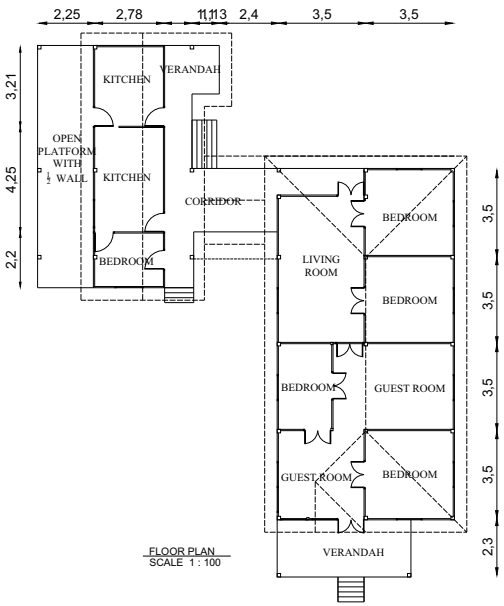
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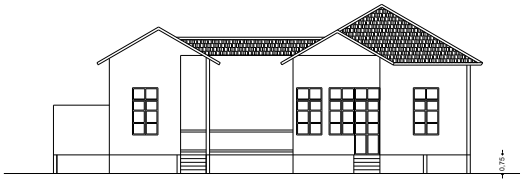
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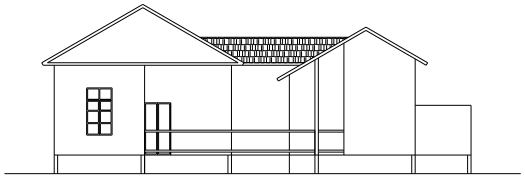
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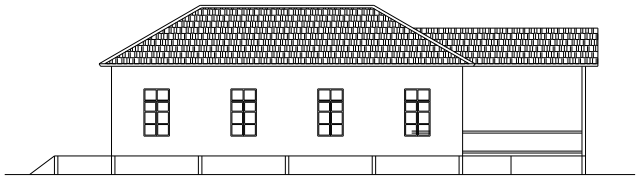
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FRONT VIEW
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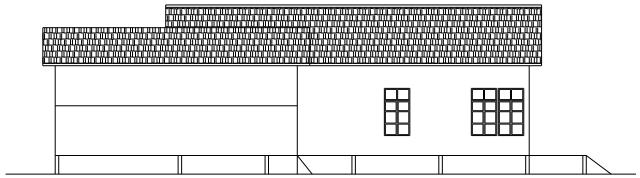
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RIGHT VIEW
SCALE 1 : 100



3D OBJECTS
NOT TO SCALE



LEFT VIEW
SCALE 1 : 100

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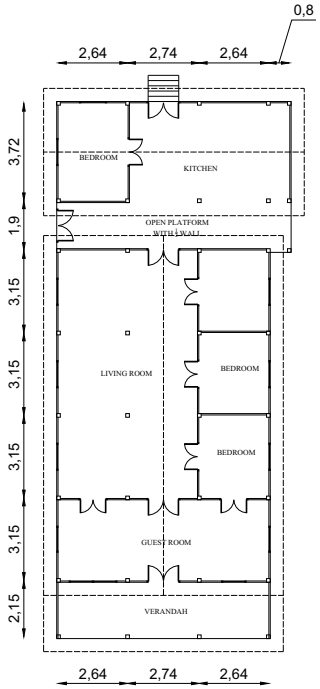
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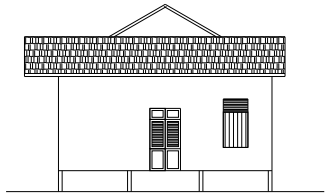
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FRONT VIEW
SCALE 1 : 100



BACK VIEW
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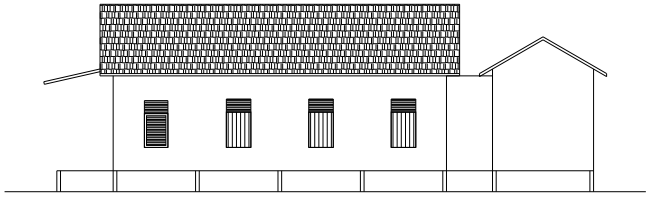




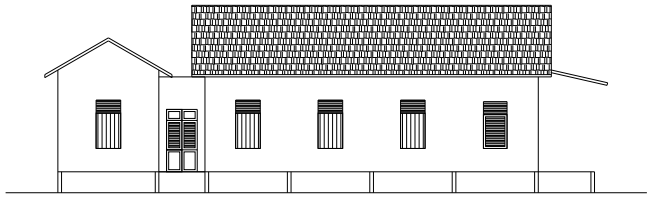




3D OBJECTS
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RIGHT VIEW
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LEFT VIEW
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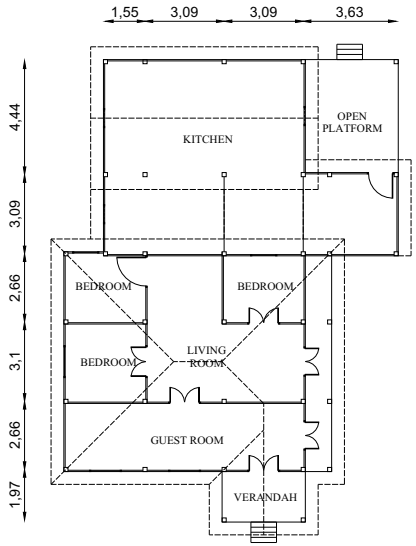
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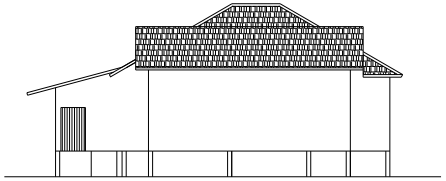
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FRONT VIEW
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BACK VIEW
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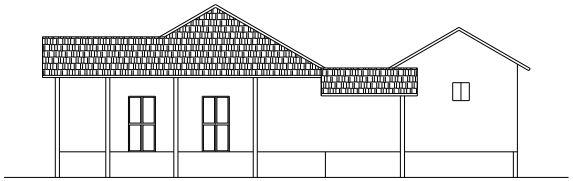




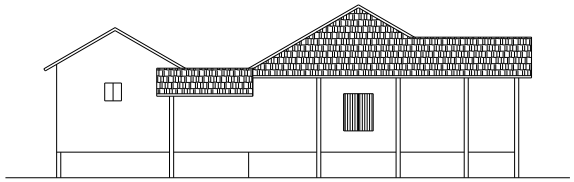




3D OBJECTS
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RIGHT VIEW
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LEFT VIEW
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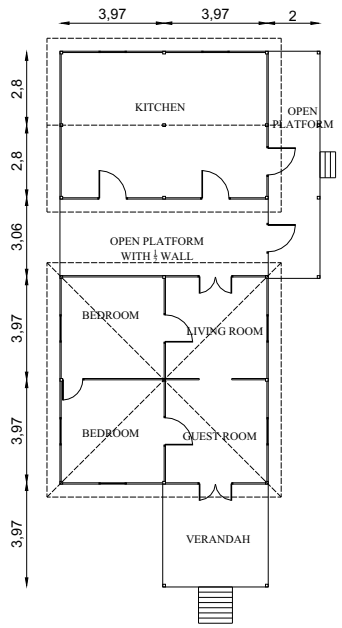
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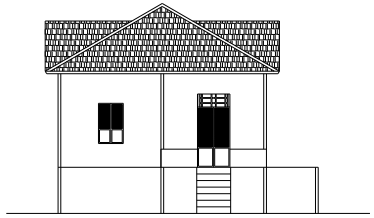
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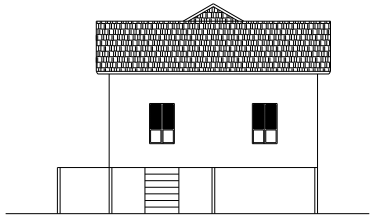
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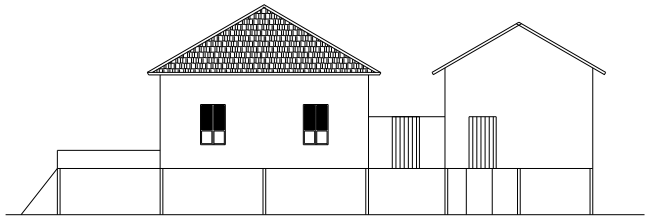
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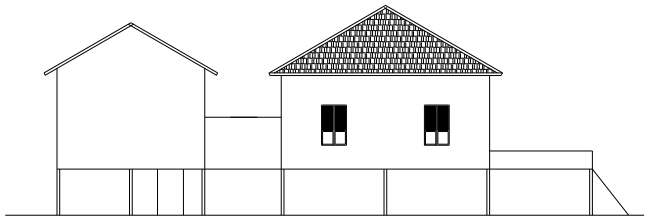
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RIGHT VIEW
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3D OBJECTS
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LEFT VIEW
SCALE 1 : 100

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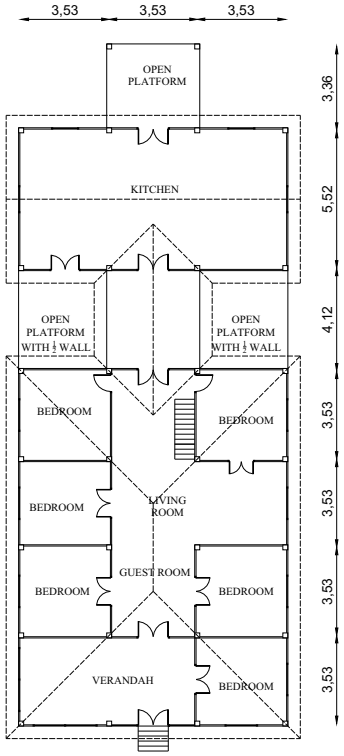
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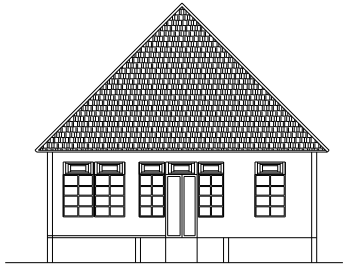
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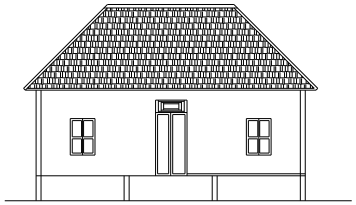
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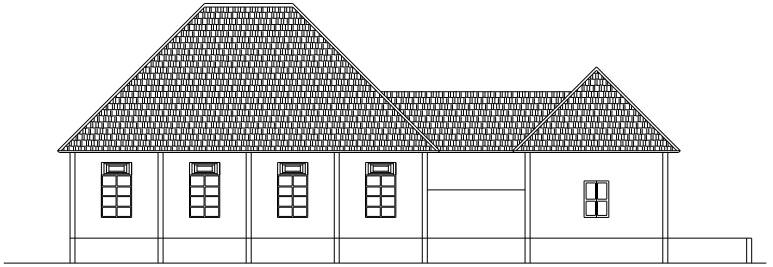
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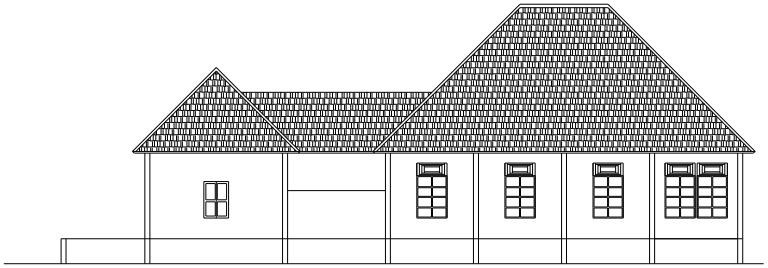
FRONT VIEW
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BACK VIEW
SCALE 1 : 100



RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
SCALE 1 : 100

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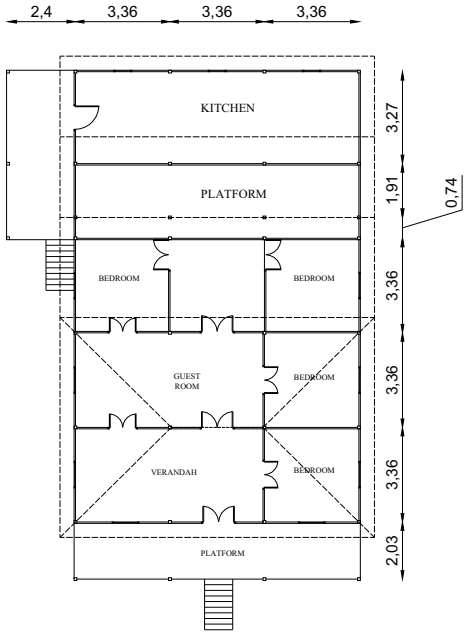
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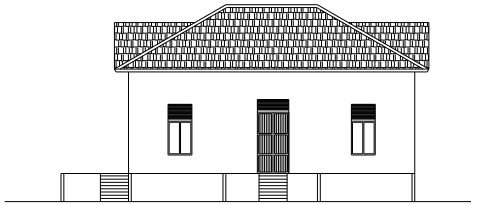
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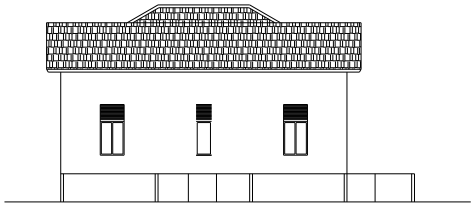
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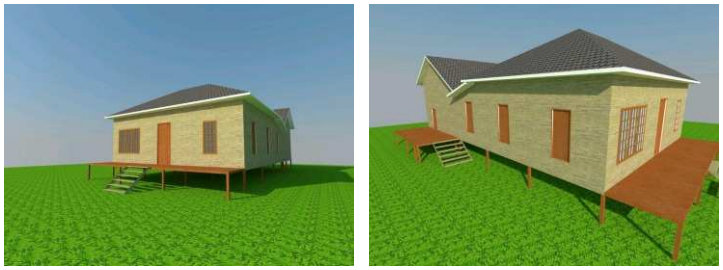
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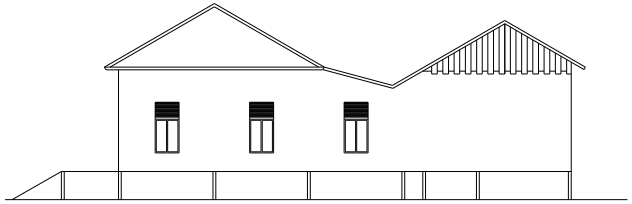
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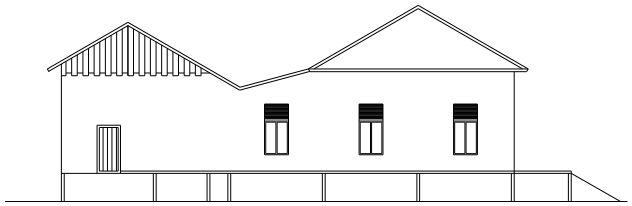
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3D OBJECTS
NOT TO SCALE



RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
SCALE 1 : 100

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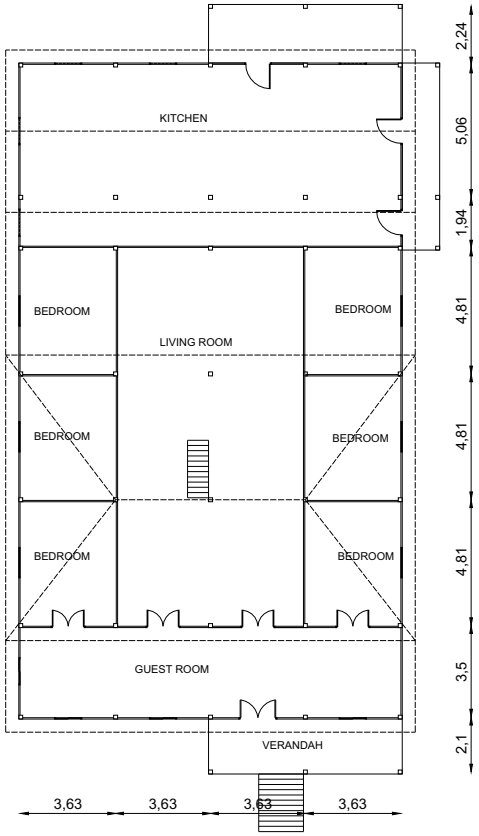
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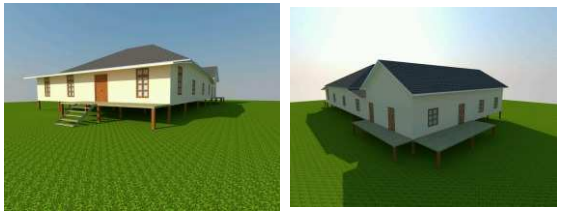
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Wahyu Buana Putra
Marselinus Lamanepa

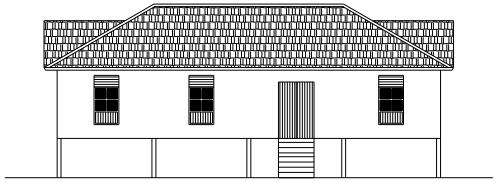
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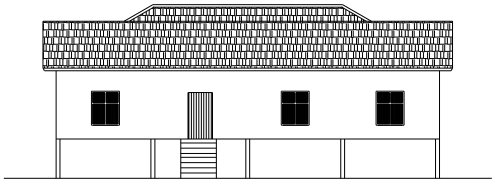
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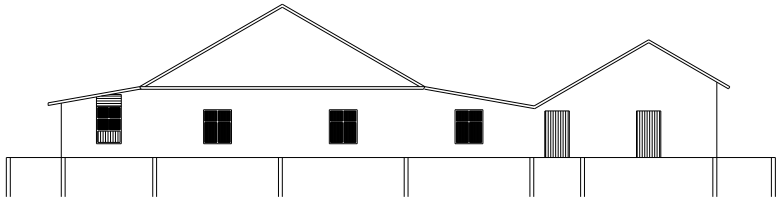
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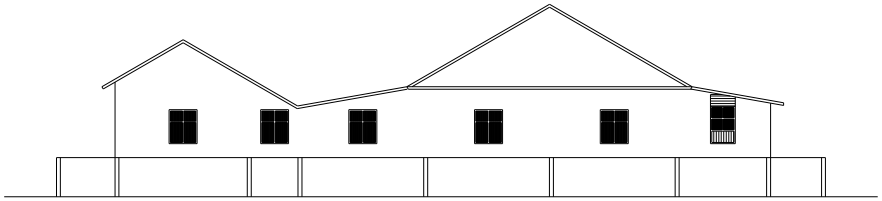
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BACK VIEW
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RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
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INFORMATION

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THE ANATOMY OF TRADITIONAL DWELLINGS: Comparative Study between Malay and Dayak Indigenous Architecture in West Kalimantan

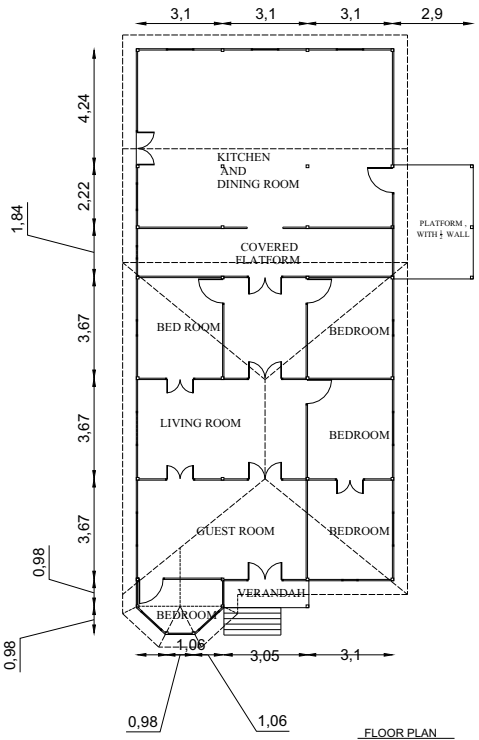
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ZAIRIN ZAIN
Matr. Nr. : 0928565

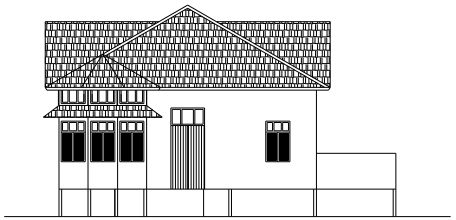
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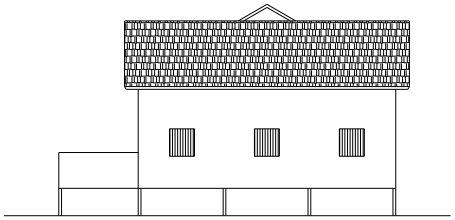
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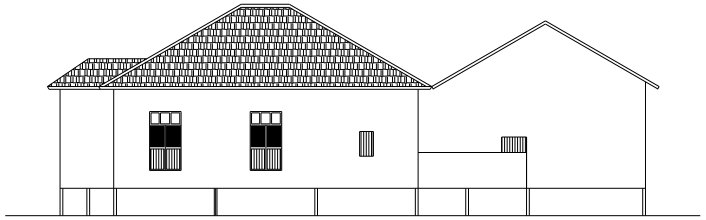
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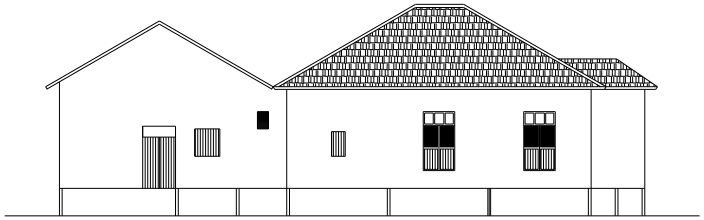
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BACK VIEW
SCALE 1 : 100



RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
SCALE 1 : 100



3D OBJECTS
NOT TO SCALE

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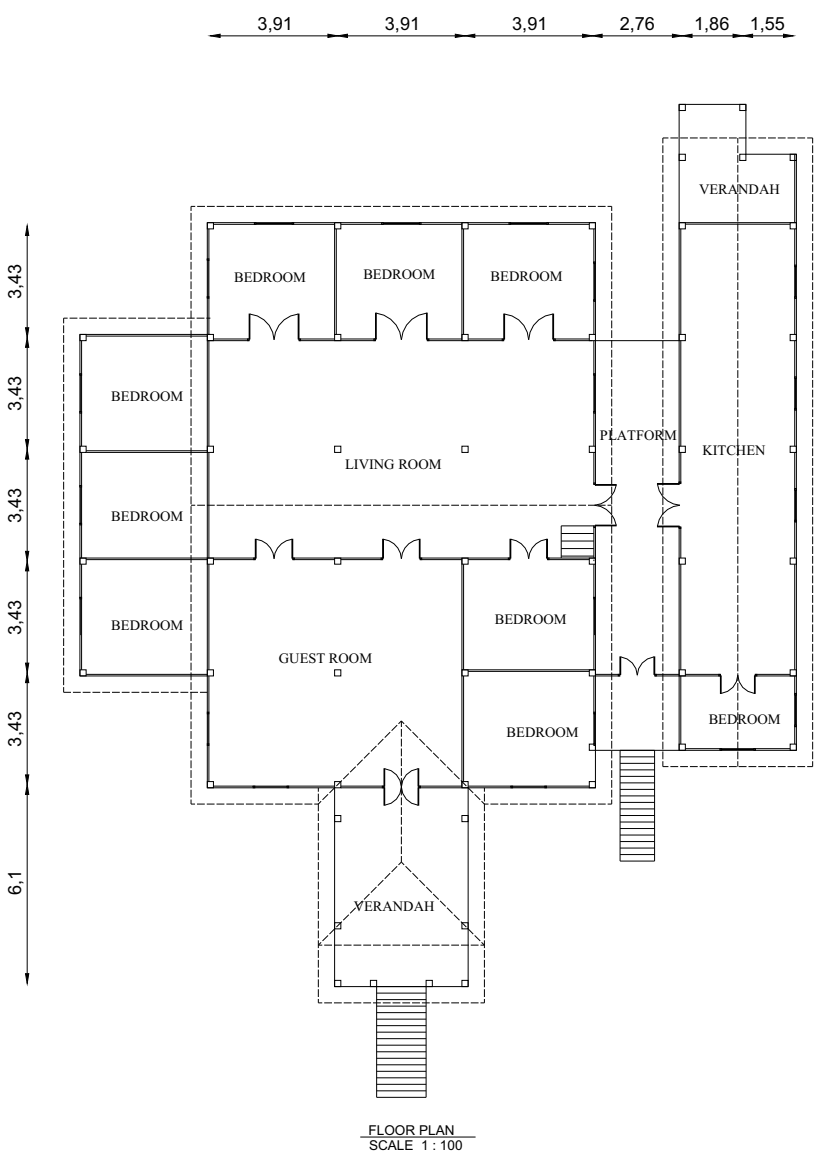
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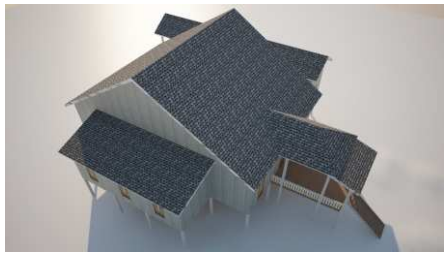
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FLOOR PLAN
SCALE 1 : 100









3D OBJECTS
NOT TO SCALE

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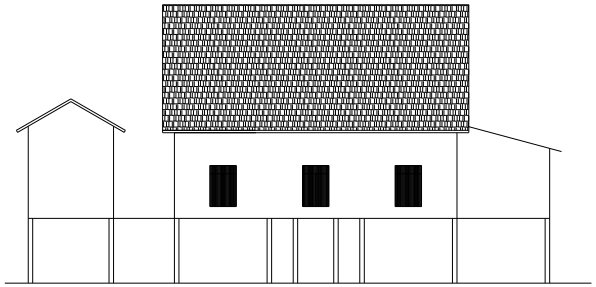
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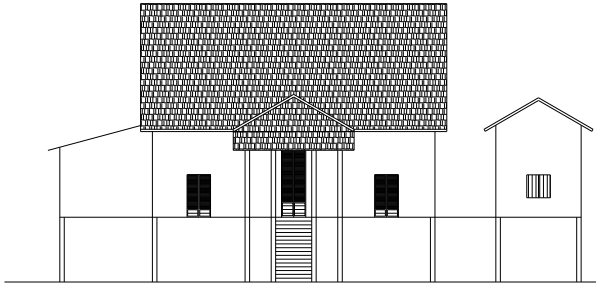
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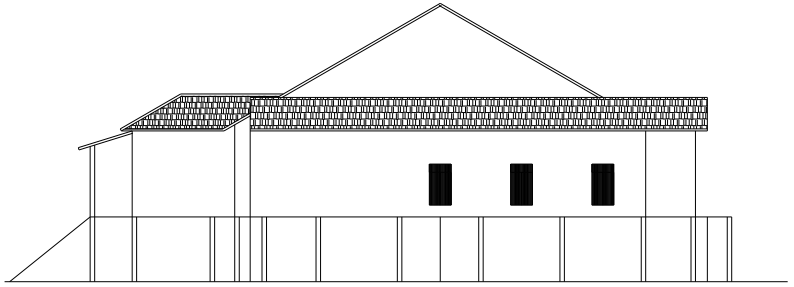
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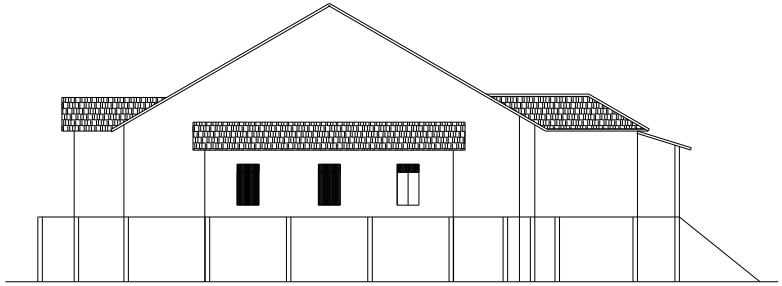
BACK VIEW
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FRONT VIEW
SCALE 1 : 100



RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
SCALE 1 : 100

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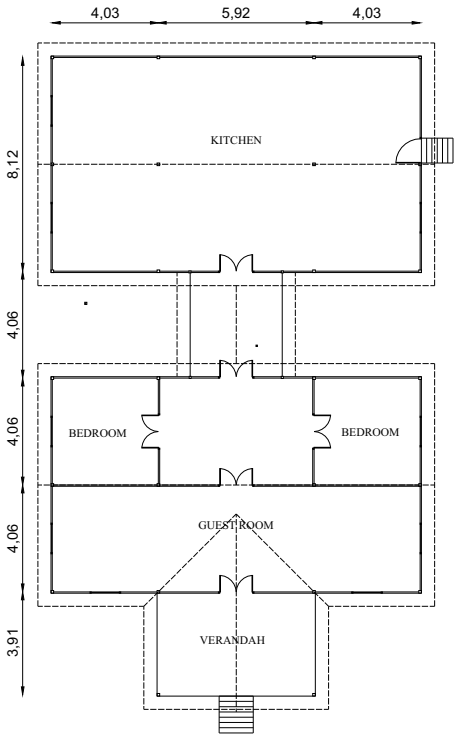
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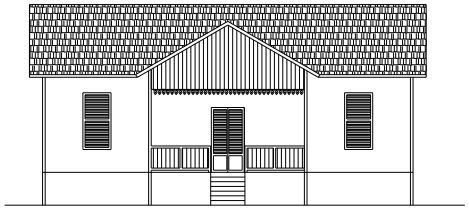
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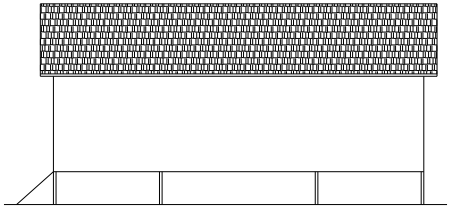
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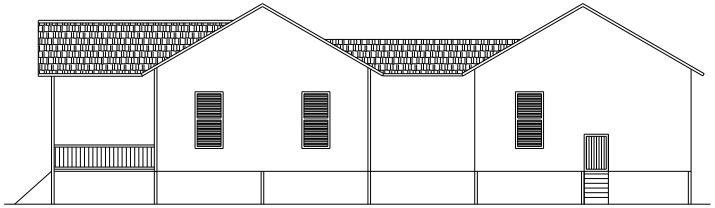
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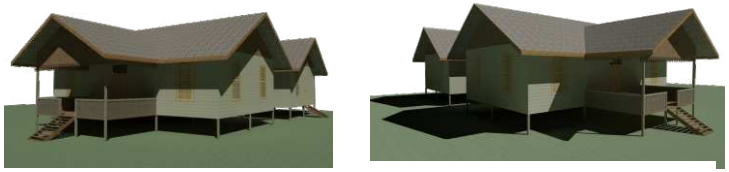
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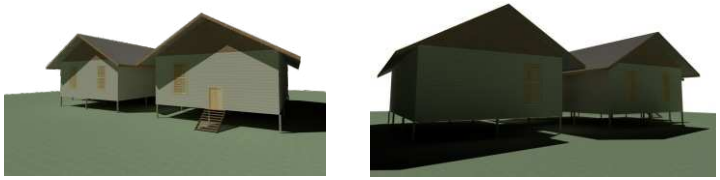


BACK VIEW
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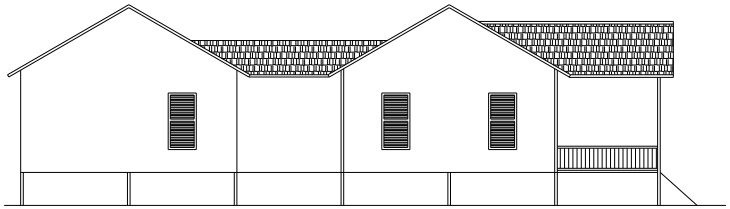


RIGHT VIEW
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3D OBJECTS
NOT TO SCALE



LEFT VIEW
SCALE 1 : 100

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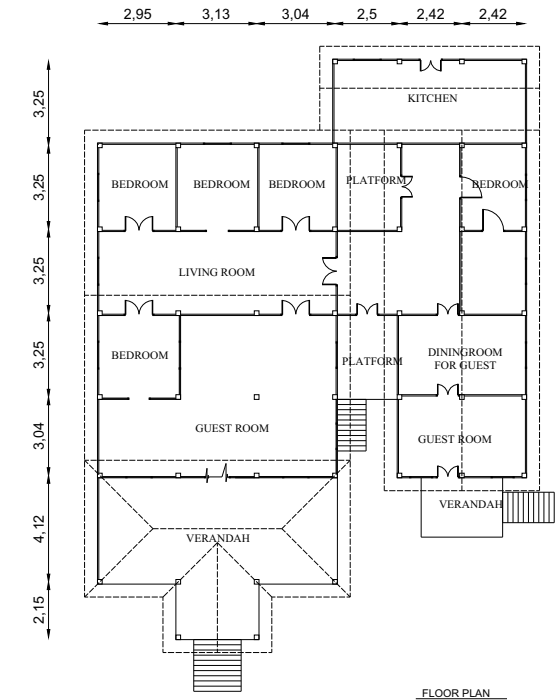
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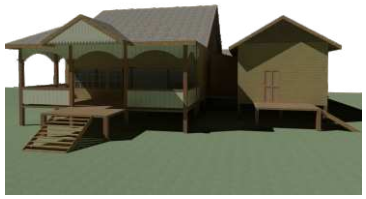
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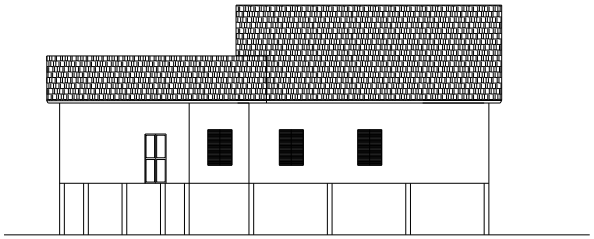




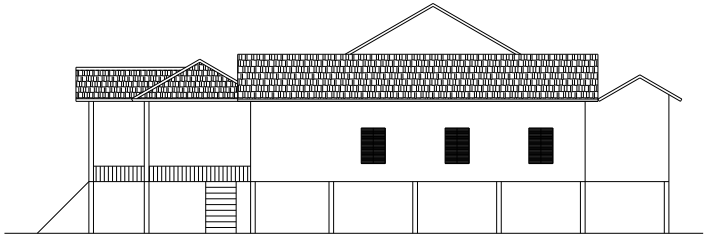
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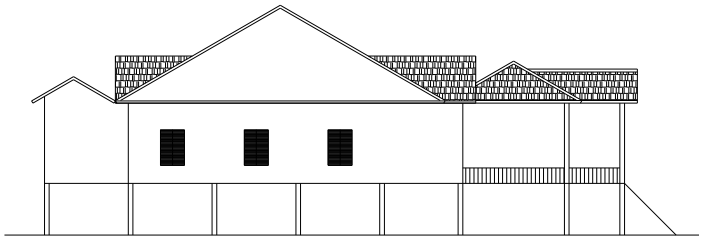
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BACK VIEW
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RIGHT VIEW
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LEFT VIEW
SCALE 1 : 100

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INFORMATION

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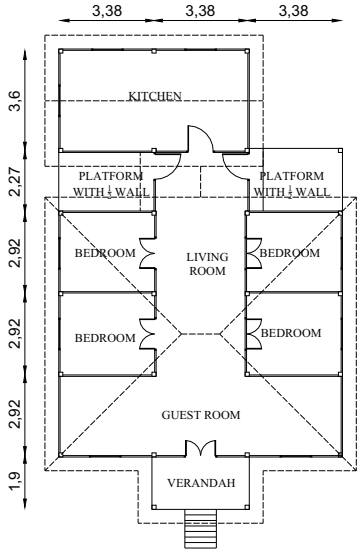
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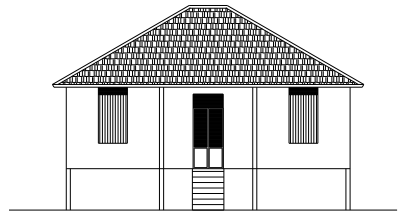
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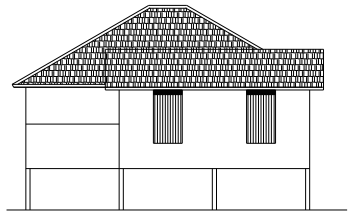
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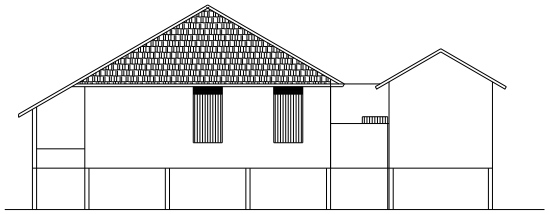
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BACK VIEW
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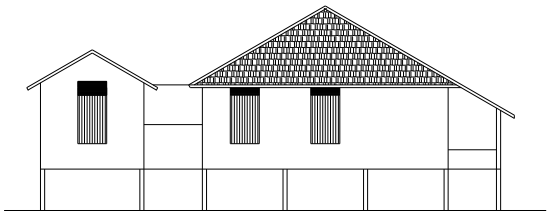


RIGHT VIEW
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3D OBJECTS
NOT TO SCALE



LEFT VIEW
SCALE 1 : 100

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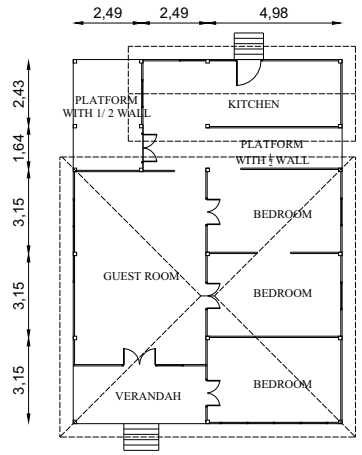
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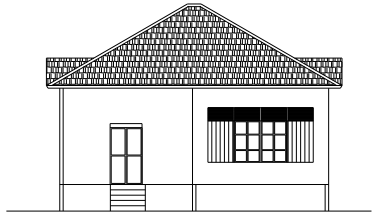
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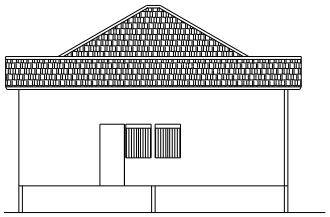
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FRONT VIEW
SCALE 1 : 100

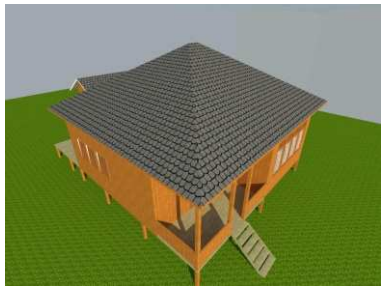


BACK VIEW
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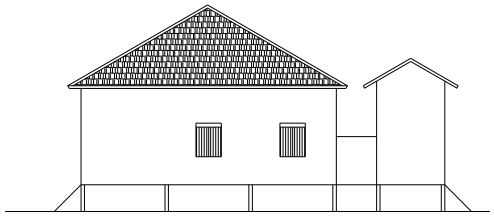




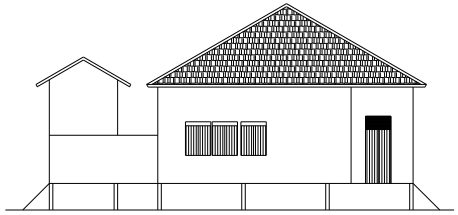




3D OBJECTS
NOT TO SCALE



RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
SCALE 1 : 100

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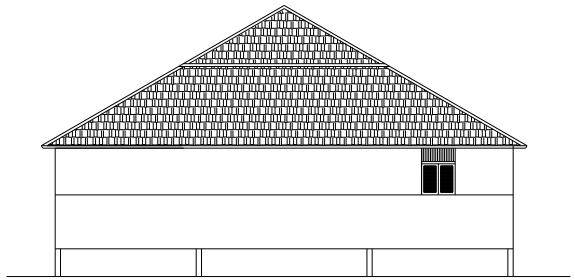
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Wahyu Buana Putra
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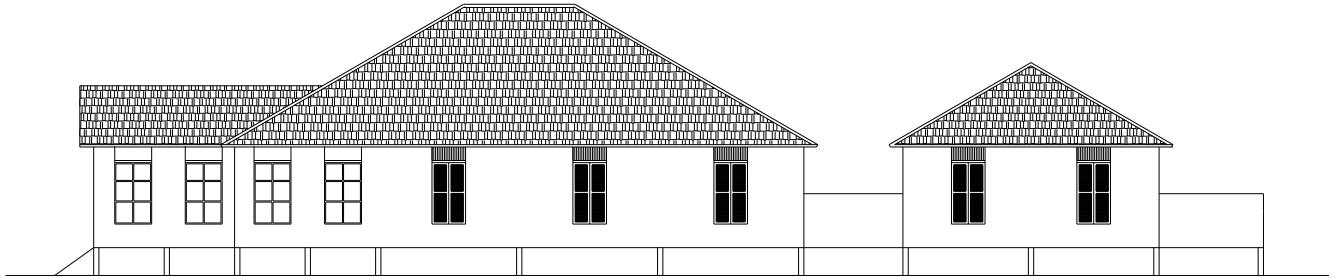
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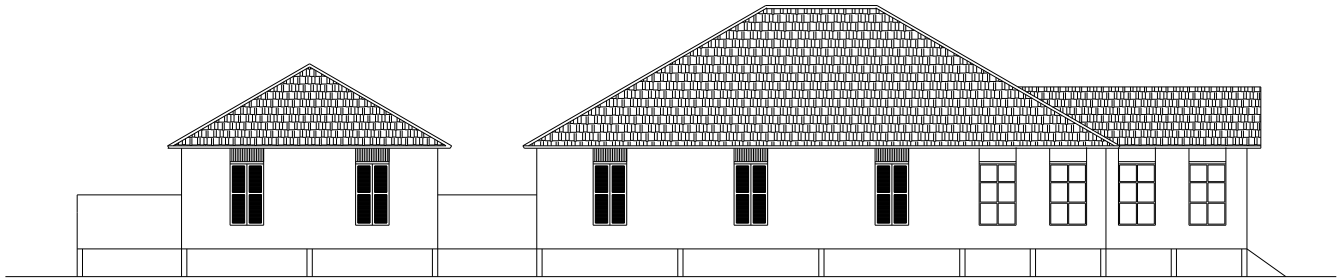
FRONT VIEW
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BACK VIEW
SCALE 1 : 100



RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
SCALE 1 : 100

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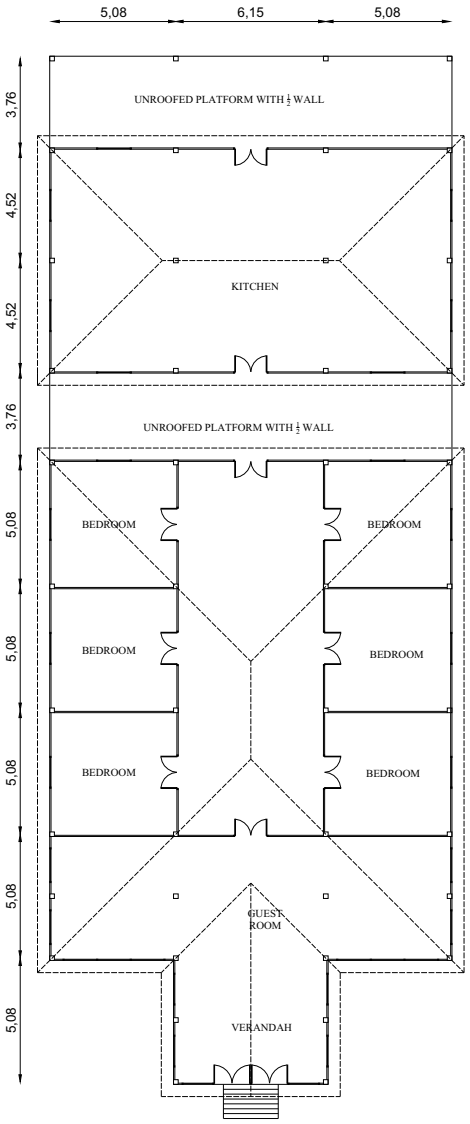
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Code of the case	Page number
A.7.2	23 of 42



FLOOR PLAN
SCALE 1 : 100









3D OBJECTS
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Insitute for History of Arts and Architecture, Building Archaeology and Preservation

INFORMATION

DOCTORATE THESIS

THE ANATOMY OF TRADITIONAL DWELLINGS: Comparative Study between Malay and Dayak Indigenous Architecture in West Kalimantan

COMPILED BY

ZAIRIN ZAIN
Matr. Nr. : 0928565

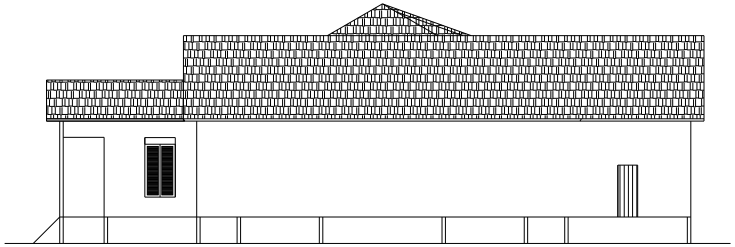
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Virza Firdaus
Wahyu Buana Putra
Marselinus Lamanepa

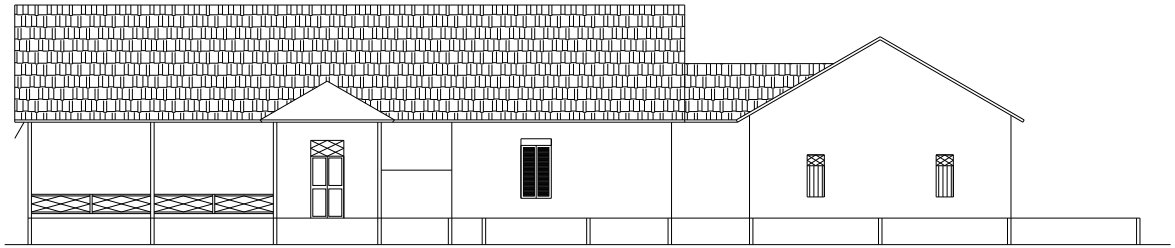
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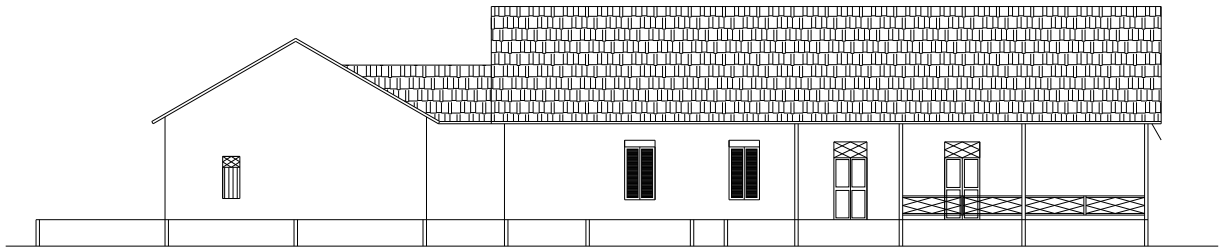
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BACK VIEW
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RIGHT VIEW
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LEFT VIEW
SCALE 1 : 100

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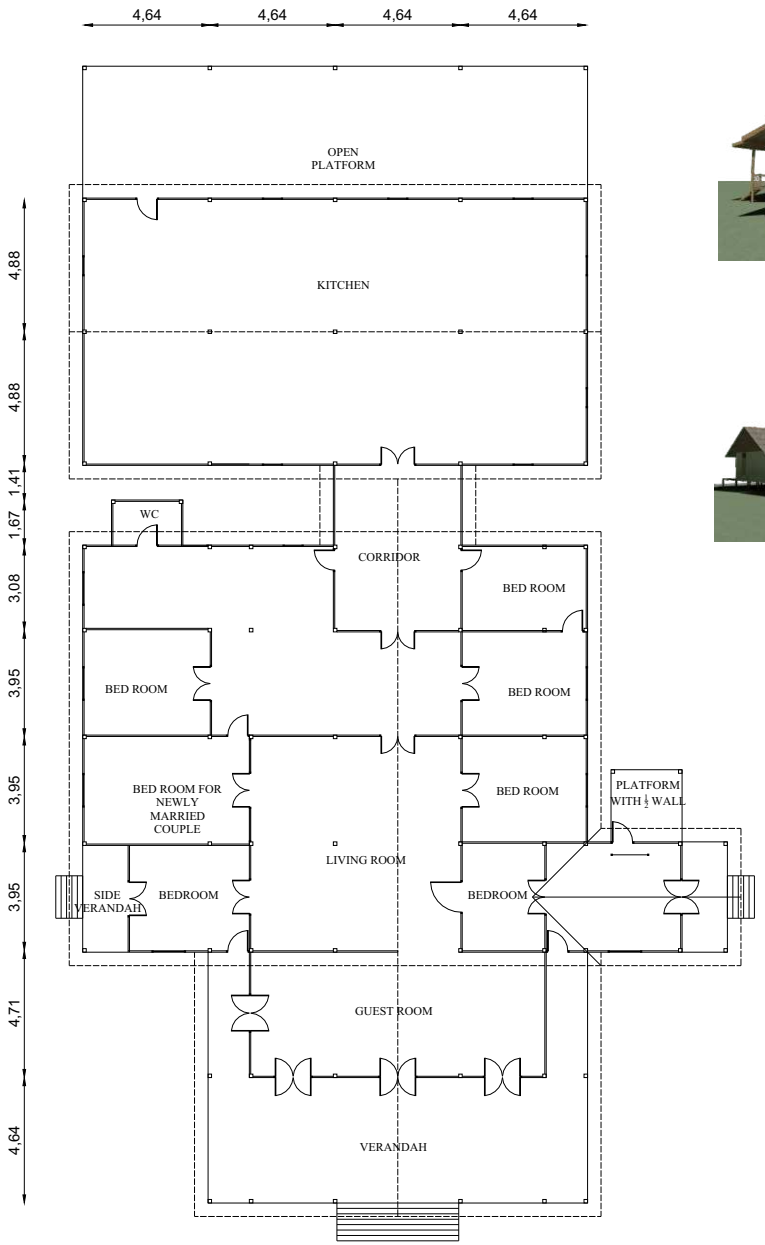
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Code of the case	Page number
A.8.1	25 of 42



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3D OBJECTS
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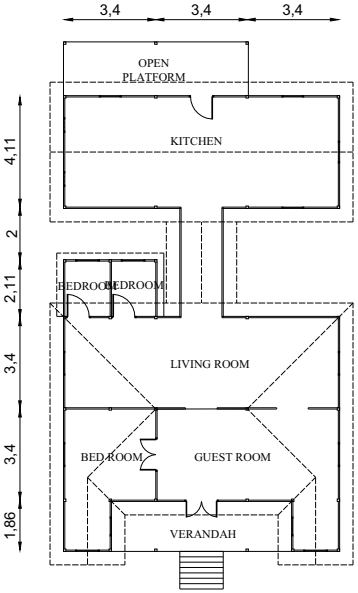
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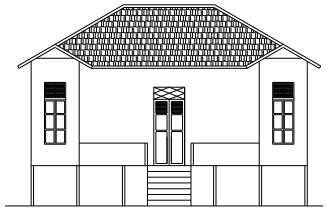
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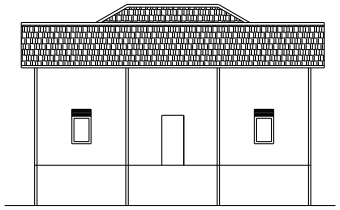
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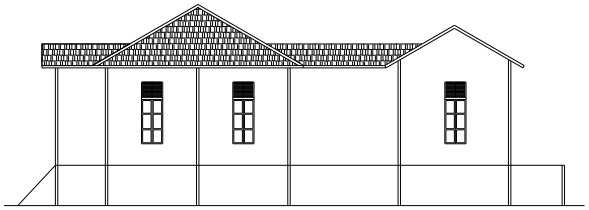
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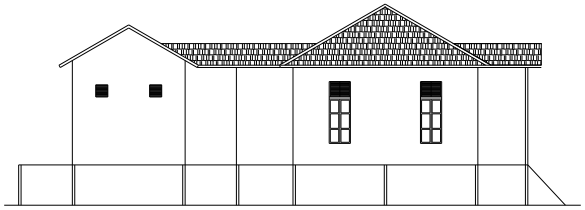
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3D OBJECTS
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LEFT VIEW
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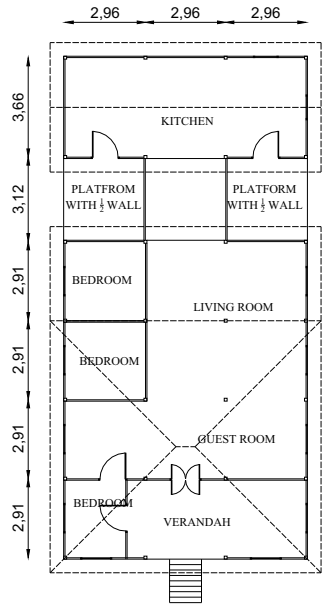
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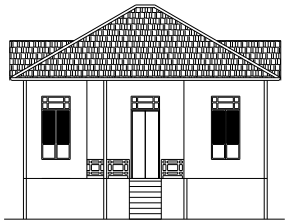
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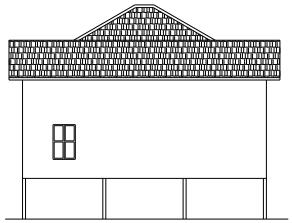
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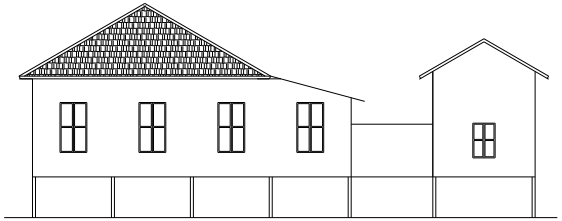
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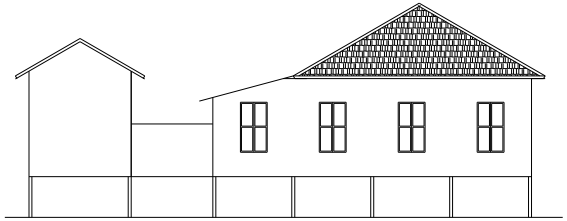
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3D OBJECTS
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LEFT VIEW
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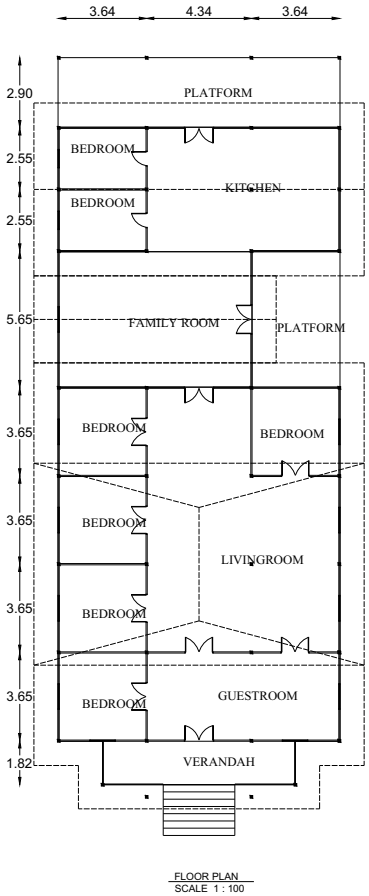
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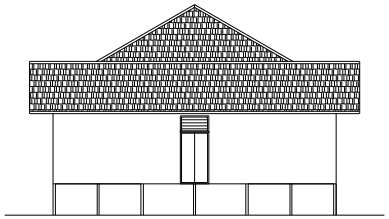
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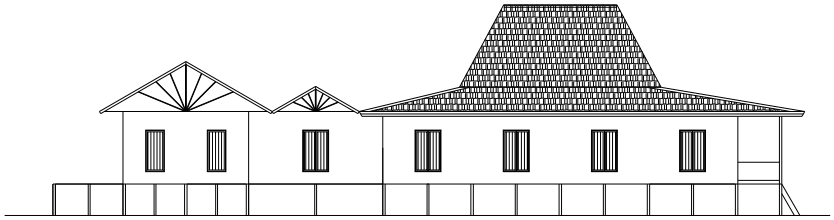
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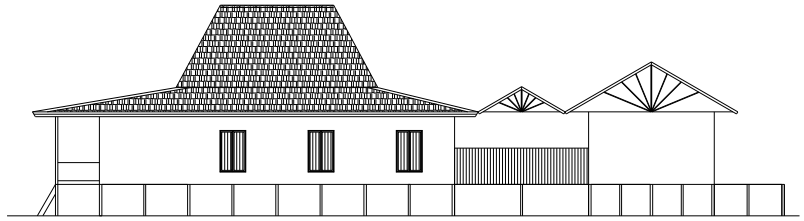
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LEFT VIEW
SCALE 1 : 100









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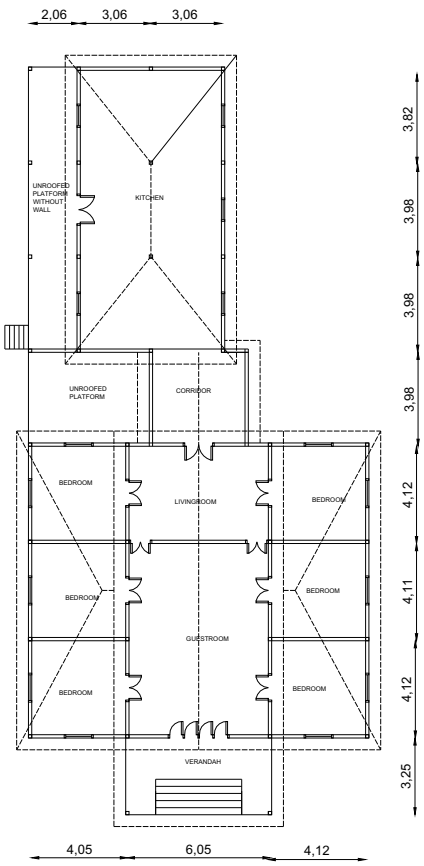
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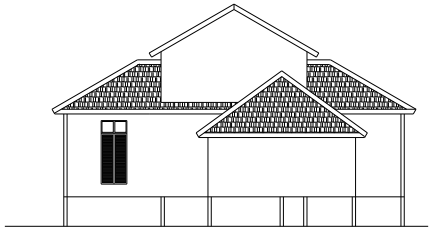
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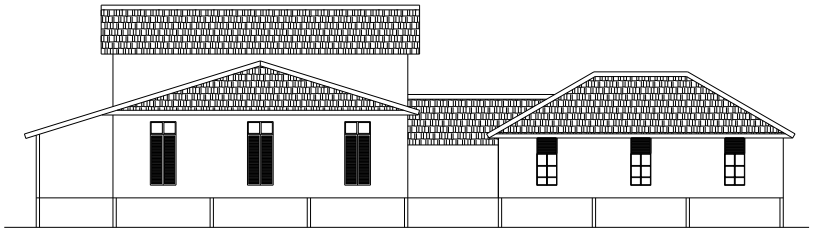
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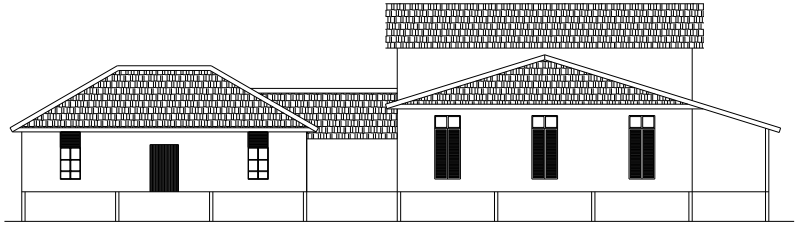
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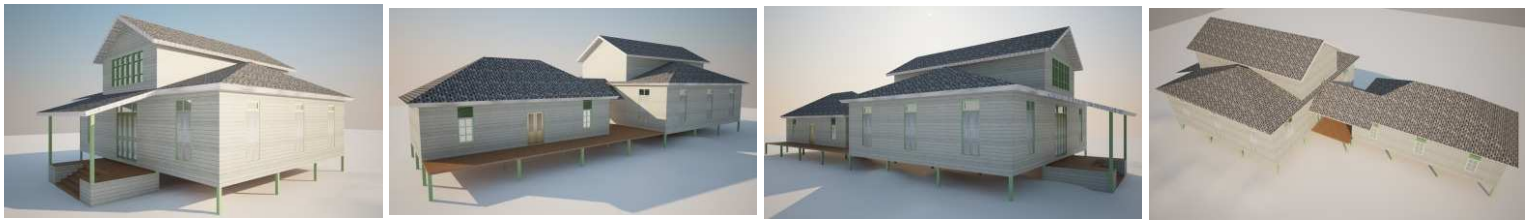
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RIGHT VIEW
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LEFT VIEW
SCALE 1 : 100



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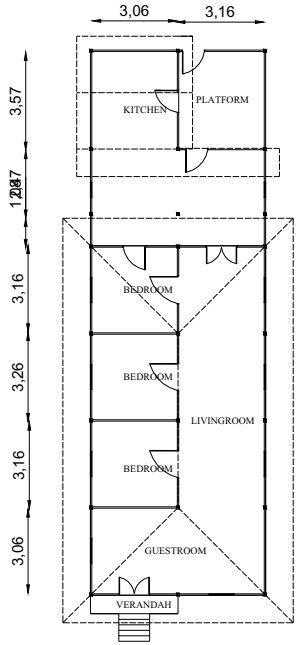
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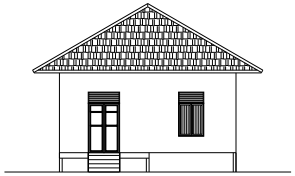
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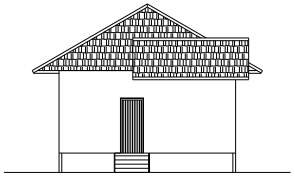
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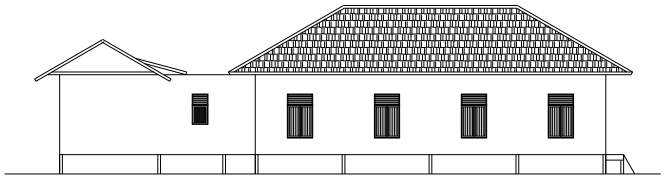
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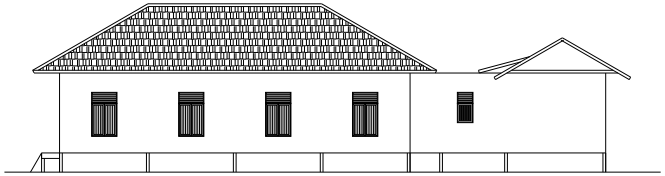
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RIGHT VIEW
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LEFT VIEW
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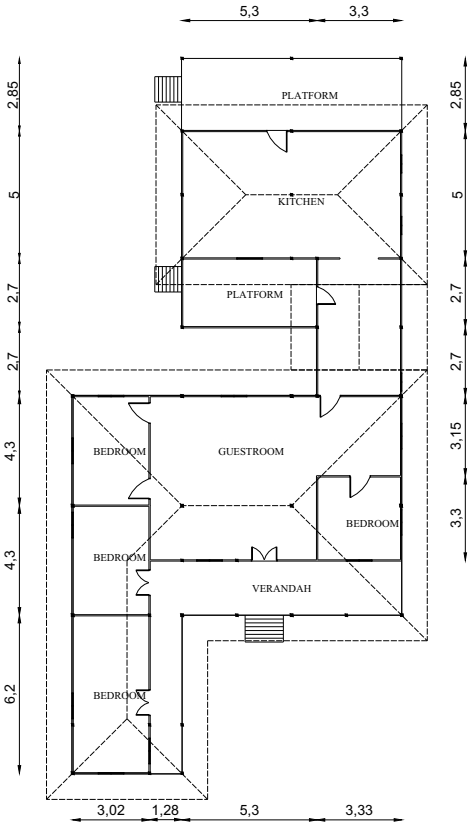
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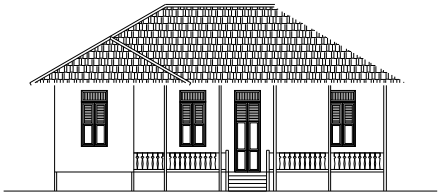
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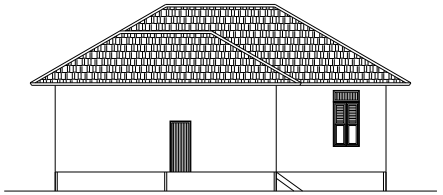
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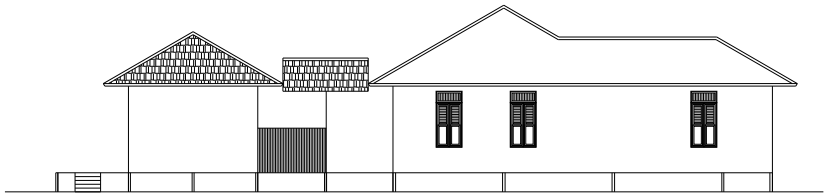
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LEFT VIEW
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3D OBJECTS
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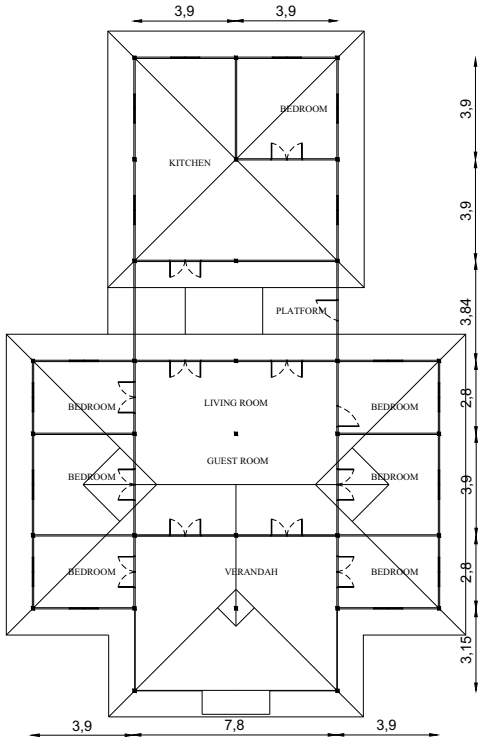
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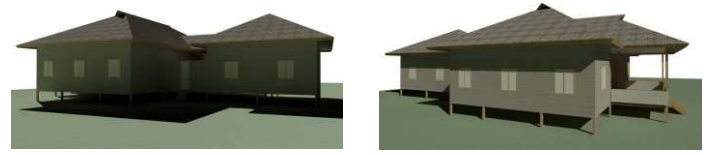
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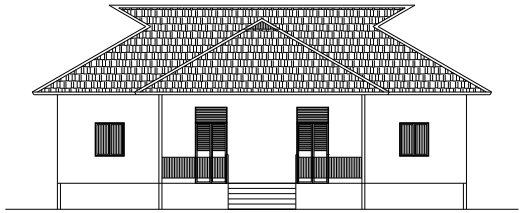


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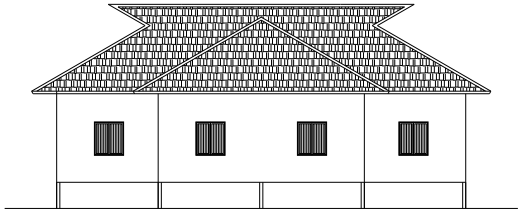




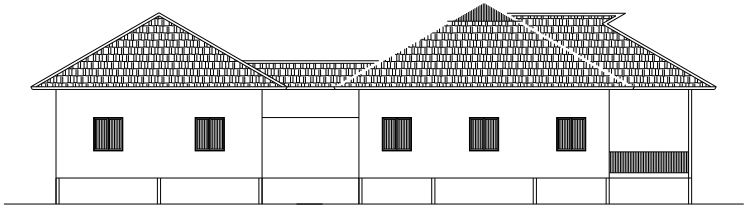
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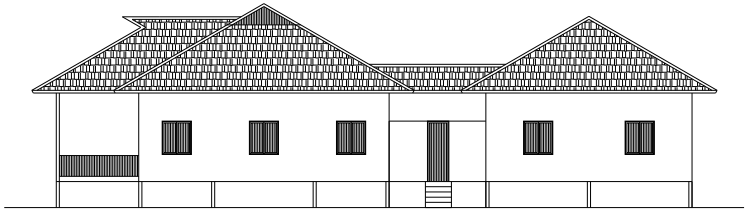
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LEFT VIEW
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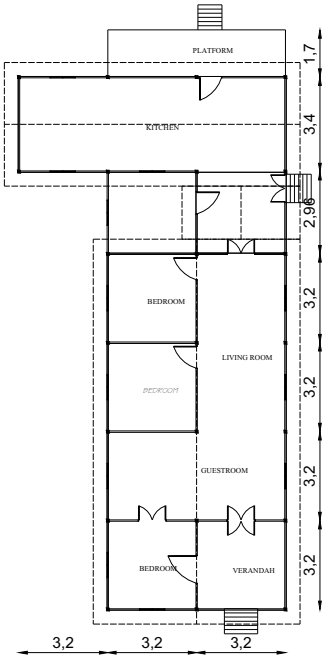
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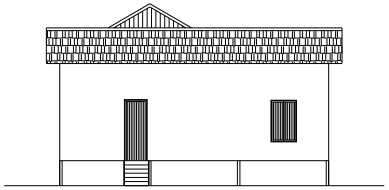
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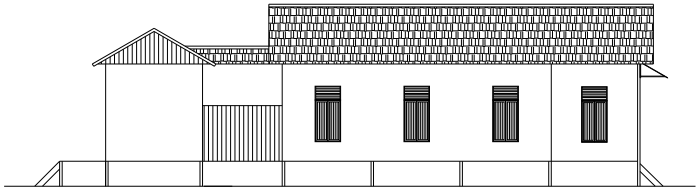
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FRONT VIEW
SCALE 1 : 100



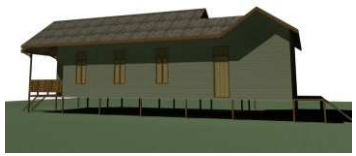
BACK VIEW
SCALE 1 : 100



RIGHT VIEW
SCALE 1 : 100

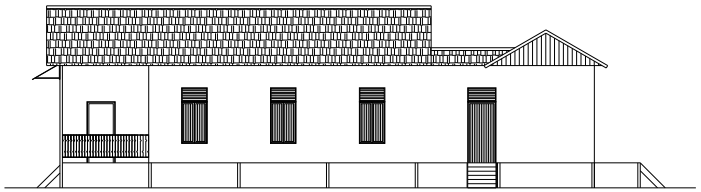








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LEFT VIEW
SCALE 1 : 100

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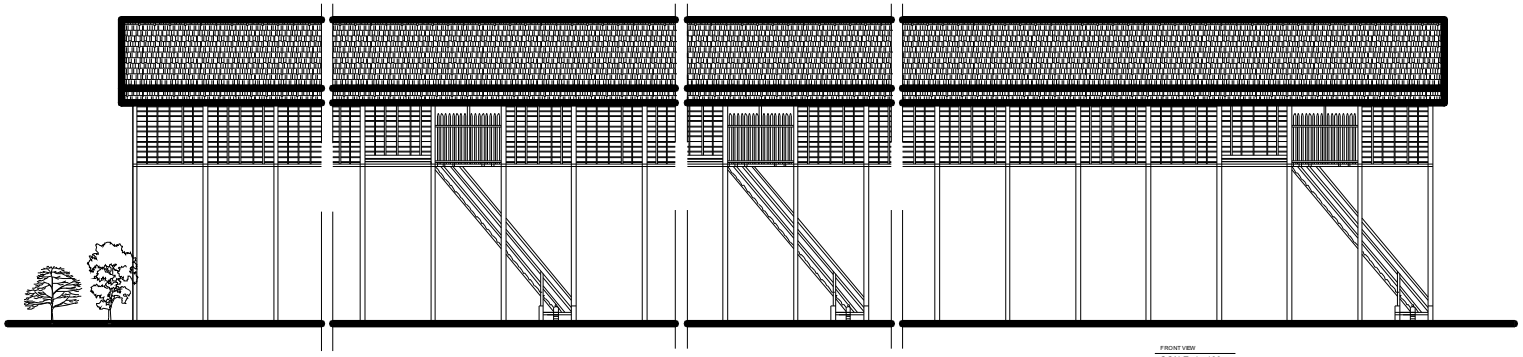
COMPILED BY

ZAIRIN ZAIN
Matr. Nr. : 0928565

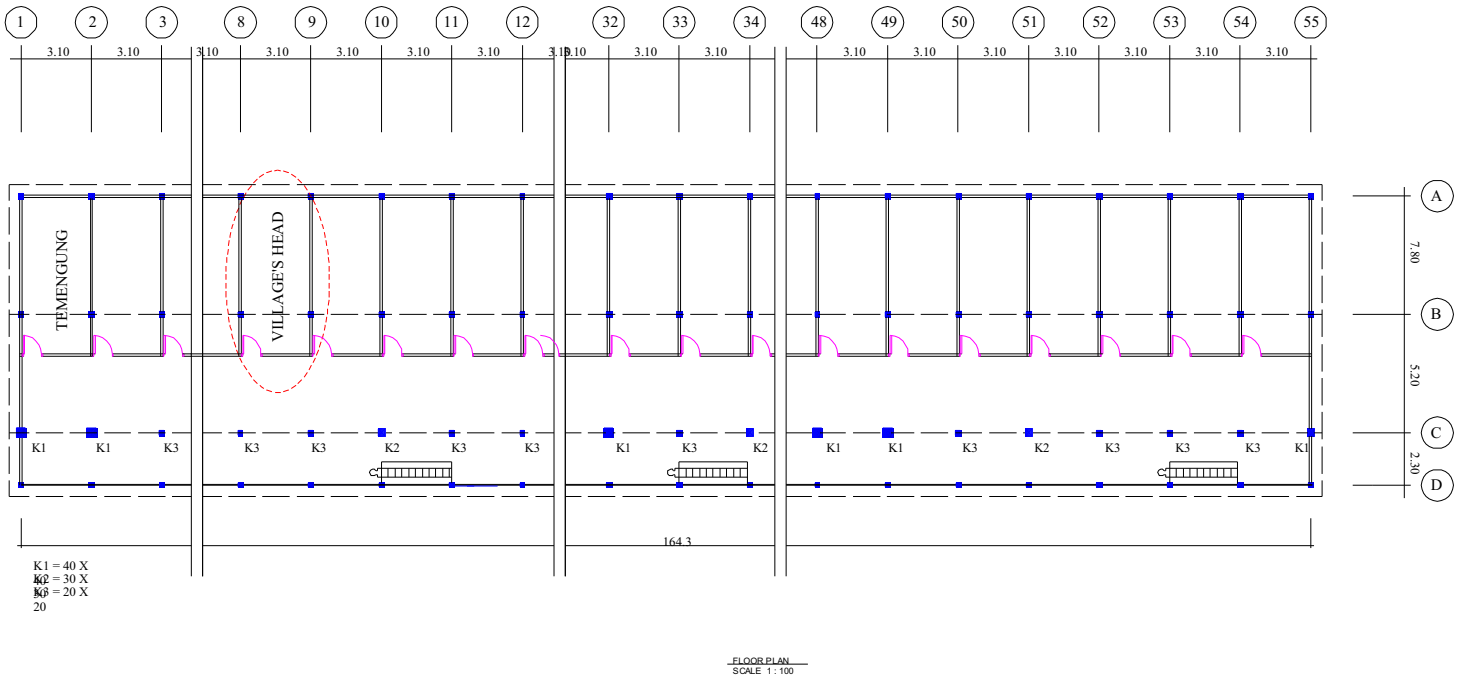
DRAFTED BY

Virza Firdaus
Wahyu Buana Putra
Marselinus Lamanepa

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FRONT VIEW
SCALE 1 : 100



FLOOR PLAN
SCALE 1 : 100

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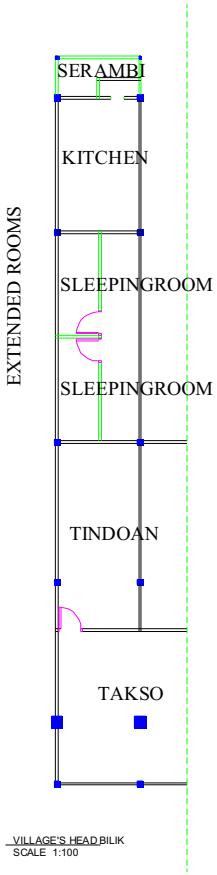
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ZAIRIN ZAIN
Matr. Nr. : 0928565

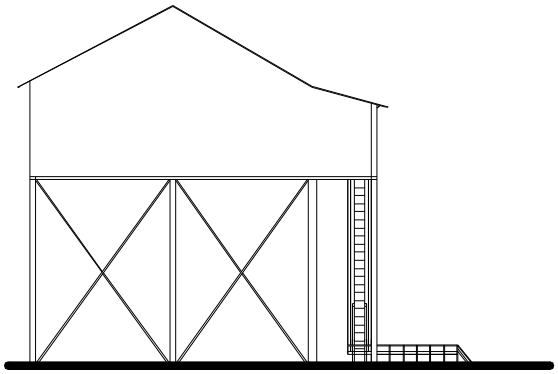
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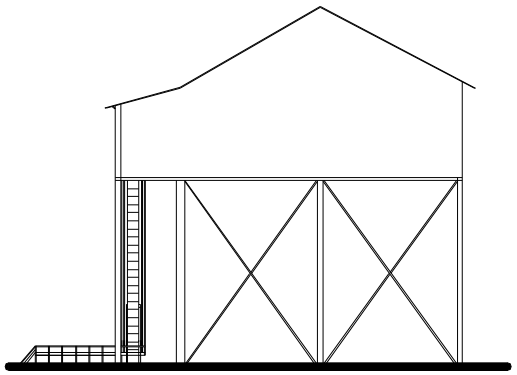
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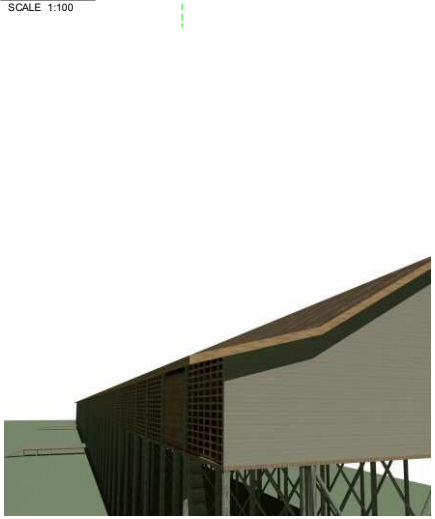
VILLAGE'S HEAD BILIK
SCALE 1:100



RIGHT VIEW
SCALE 1 : 100



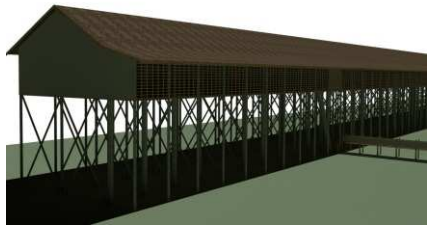
LEFT VIEW
SCALE 1 : 100











3D OBJECTS
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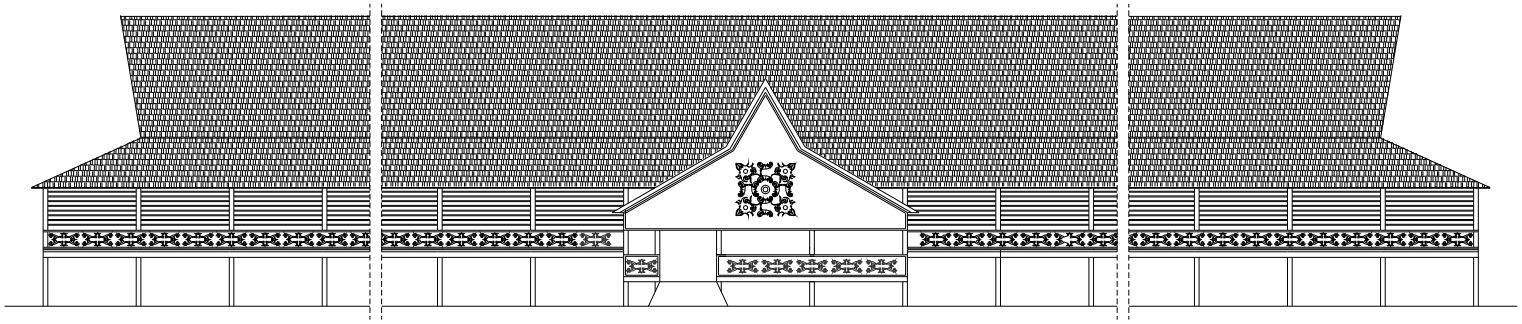
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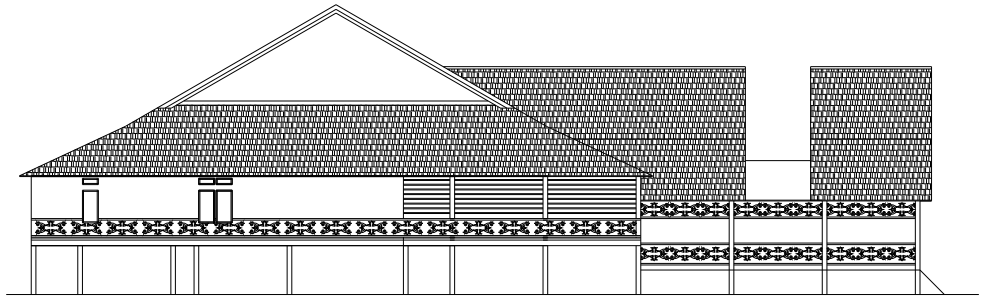
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Marselinus Lamanepa

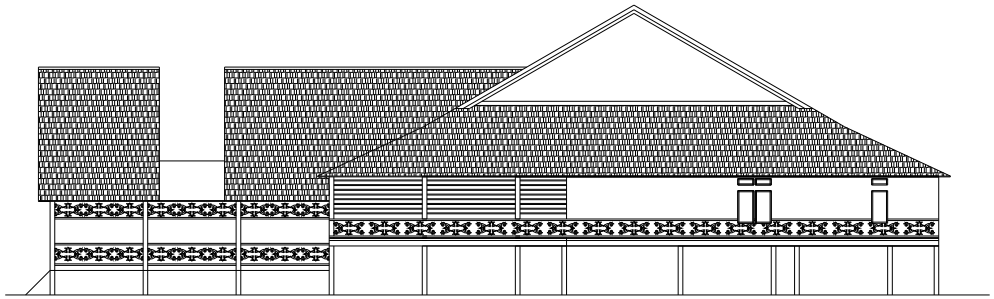
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FRONT VIEW
SCALE 1 : 100



RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
SCALE 1 : 100

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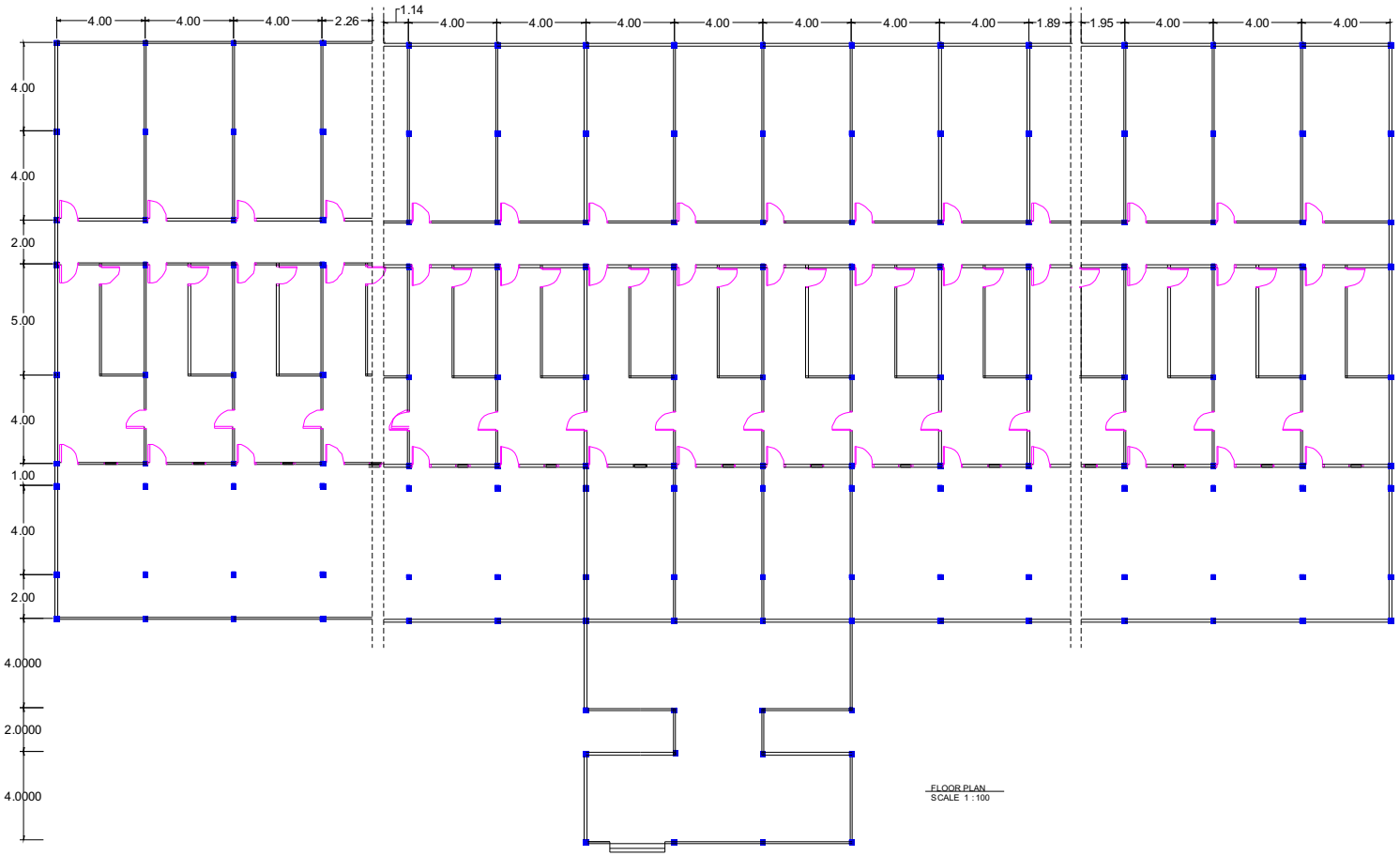
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FLOOR PLAN
SCALE 1 : 100



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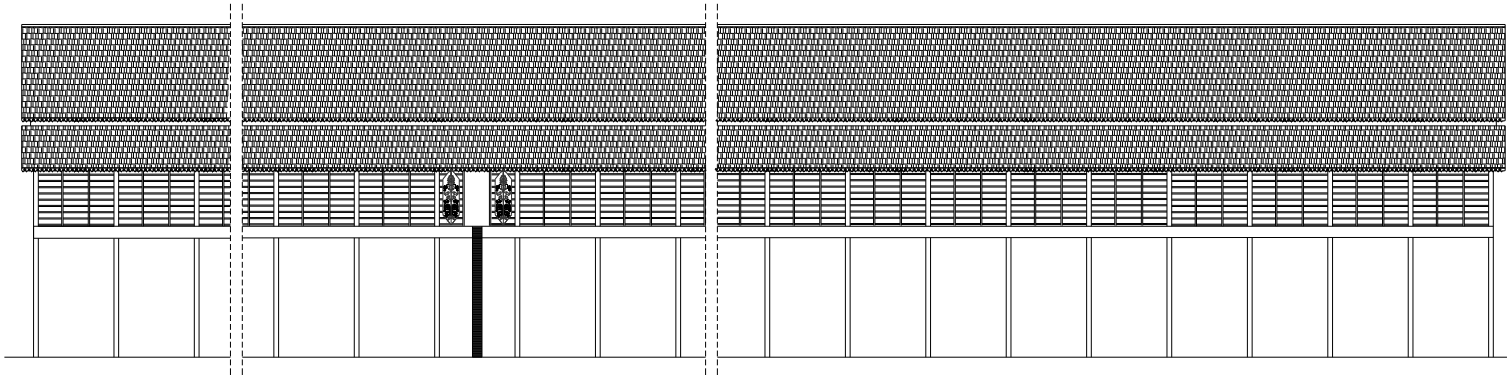
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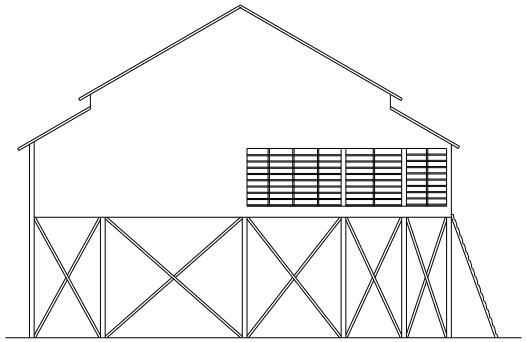
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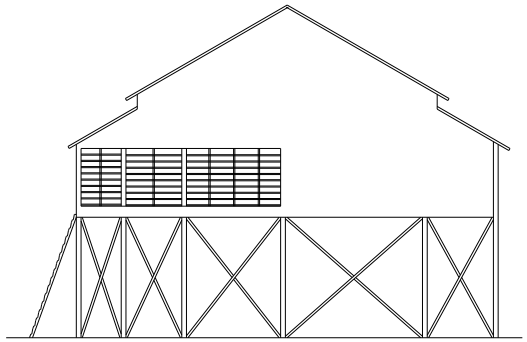
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FRONT VIEW
SCALE 1 : 100



RIGHT VIEW
SCALE 1 : 100



LEFT VIEW
SCALE 1 : 100

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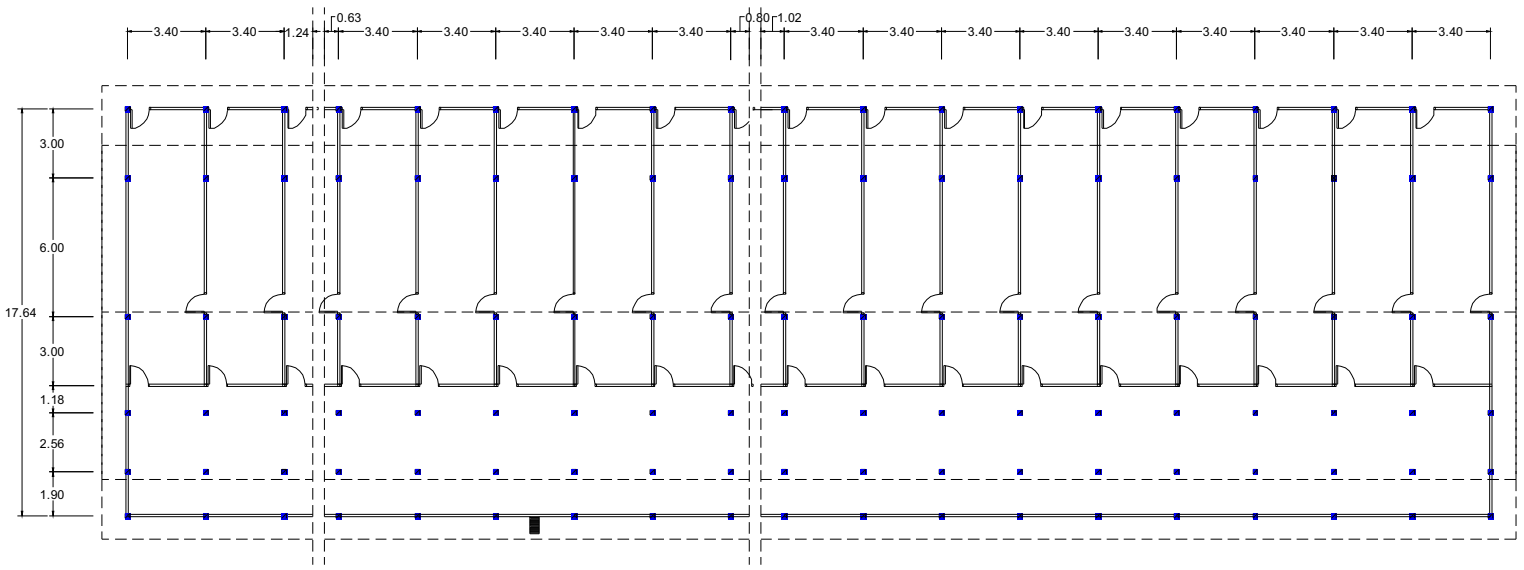
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B.3	39 of 42



FLOOR PLAN
SCALE 1 : 100









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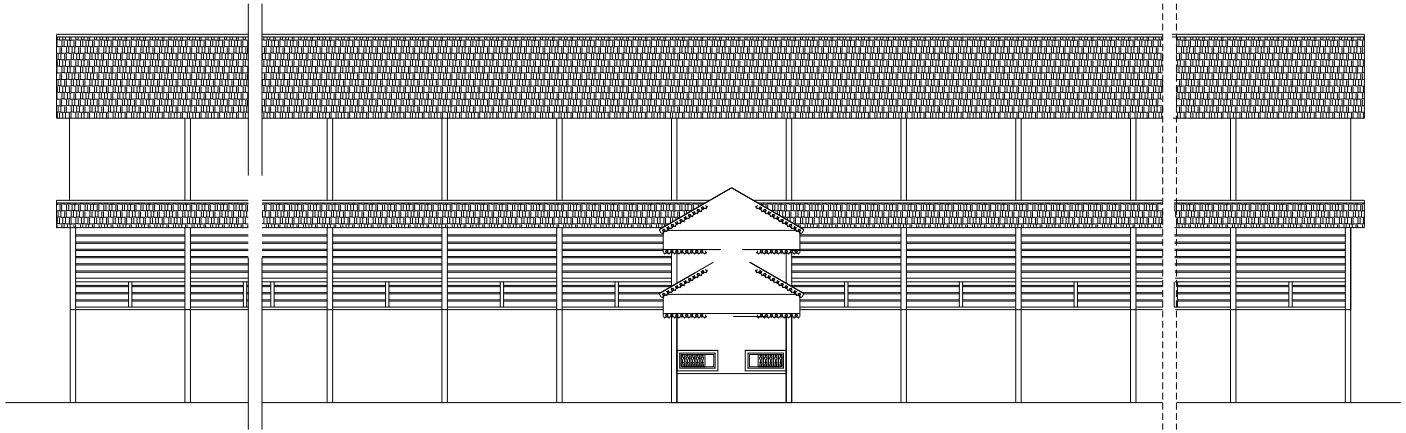
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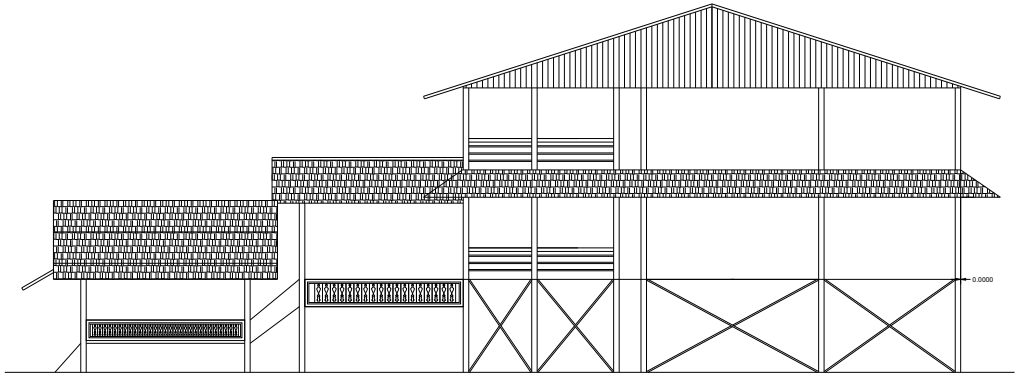
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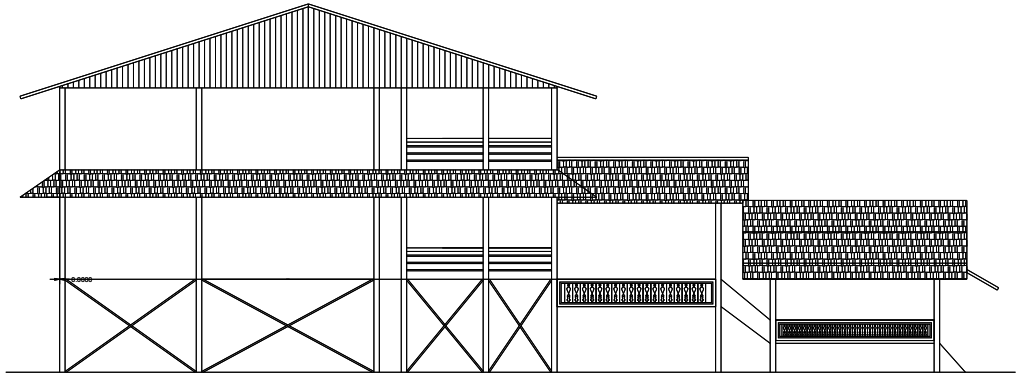
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FRONT VIEW
SCALE 1 : 100



RIGHT VIEW
SCALE 1 :100



LEFT VIEW
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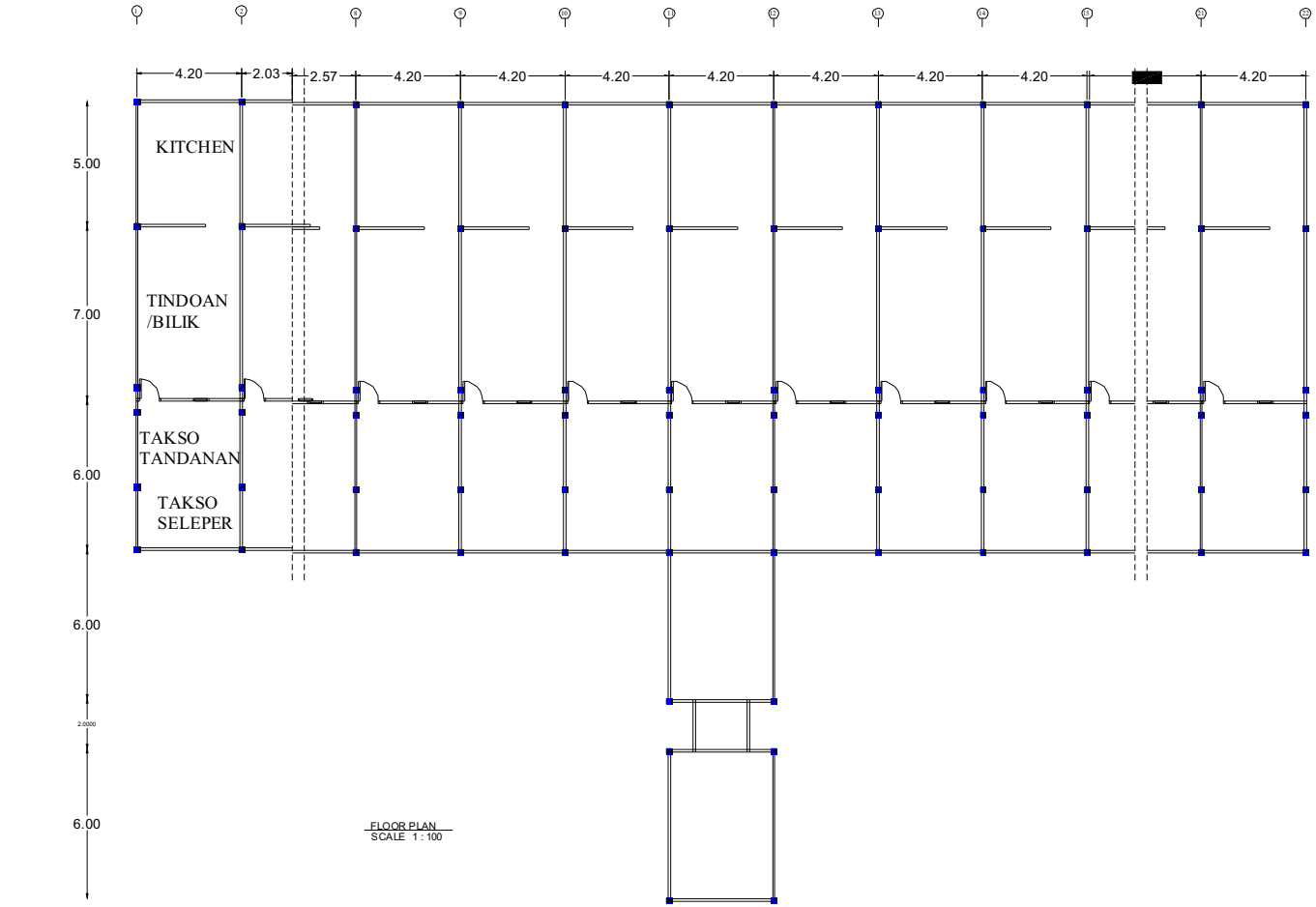
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FLOOR PLAN
SCALE 1 : 100











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Curriculum Vitae

Zairin Zain	Correspondence address
A lecturer of the Department of Architectural Engineering Faculty of Engineering University of Tanjungpura Indonesia. He was born in Pontianak (West Kalimantan). June 16th, 1976.	Home : Jalan Imam Bonjol Gg. A. Manaf No. 3 Pontianak 78124 West Kalimantan Indonesia; phone: +62 561 738241 Office : Dekanat of the Faculty of Engineering; Jalan Ahmad Yani Pontianak 78124 West Kalimantan Indonesia; Phone/fax: (+62 561) 740186 E-mail : zairin.zain@gmail.com

Education

2009 – 2012 Doctor of Engineering (Dr.techn.) from Institute for History of Arts and Architecture, Building Archaeology and Preservation Faculty of Architecture and Spatial Planning Vienna University of Technology Austria

2001 – 2003 Master of Engineering (M.T.) from the Department of Architectural Engineering Faculty of Engineering University of Gadjah Mada Indonesia

1994 – 1999 Bachelor of Engineering (S.T.) from the Department of Civil Engineering Faculty of Engineering University of Tanjungpura Indonesia

1991 – 1994 Public Senior Highschool in Pontianak (SMA Negeri 3 Pontianak) West Kalimantan Indonesia

1988 – 1991 Public Junior Highschool in Pontianak (SMP Negeri 11 Pontianak) West Kalimantan Indonesia

1982 – 1988 Private Elementary School in Pontianak (SD Subsidi Islamiyah Pontianak) West Kalimantan

Work Experience

2005 – now Lecturer at the Department of Architectural Engineering Faculty of Engineering University of Tanjungpura Indonesia with a responsibility in the teaching for subjects of structure, construction and research methodology

2004 - 2009 Head of the section for academic and administration, Civil Engineering Graduate Program University of Tanjungpura Indonesia

2008 - 2009 Head of the Drafting Studio of the Faculty of Engineering Tanjungpura University Indonesia

2007 - 2009 Treasurer of the research center, researcher, Center for the Design Studies University of Tanjungpura Indonesia

Research Projects

2007 – 2008 "*A study of an economic mixture by utilizing the charcoals of the palm shell incineration as model to produce a concrete brick with high-quality and undemanding*" An applied research grant from the Ministery of Research and Technology, Republic of Indonesia

2006 – 2007 *"Type of Participation in the Community of Sei Jawi Luar of the West Pontianak District within the quality upgrading of the city settlement"* Young Lecturer Research grant from the Directorate General of Higher Education, Republic of Indonesia

Research interest

the culture studies, traditional architecture, building research, building materials.