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# THE TRADITIONAL MALAY MOSQUE: DESIGN AND CONSTRUCTION

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## Abstract

The mosque architecture has always been symbolized as the past culture, building technologies and community values of the local traditional Islamic community. Differ from the traditional time, modern mosques which do not incorporate local community participation have resulted detachment of the society from the mosque. The modern society is no longer *mengimarah* (frequented) the mosque as previously performed by the traditional community. Therefore, acquaintance on the basic principles of the traditional Malaysian mosque construction is essential to discover the bond between the society and its mosque architecture. It is critical to identify and understand the concept of design and construction of traditional mosques particularly in the aspect of building components and materials, method of construction, passive design application as well as the community participation in order to design better mosques for the Muslim communities in the future.

**Keywords:** Mosque; architecture; construction; traditional; principles

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## 1. Introduction

The mosque has historically served as a central model and expression of Islamic culture throughout the centuries. Mosques have also been the primary focal points of Muslim cities and have always represented the physical centers of Islamic society in general. It was created as the most sacred place in Islam. It is defined as a place where one prostrates oneself before God (Frishman & Khan, 1994). Traditional mosque construction implies more than simply the physical attributes of a building method. It also encompasses the social and religious structure that produces that building method.

*Jabatan Kemajuan Islam Malaysia* (JAKIM) has listed more than 10,000 operating mosques throughout Malaysia in 2007. However, the current Malaysian modern mosques are only been utilized during the five time daily prayers, Friday prayer and the Eid prayers (Saabin, 2001). Obviously, the modern society is no longer *mengimarah* (frequented) the mosque. Modern mosques which do not incorporate local community participation have resulted detachment of the society from the mosque (Holod & Khan, 1997). Besides, the demand for building on a grand scale modern mosque has meant that visual and verbal communication breakdown. The vastness of the space has often worked to separate rather than unite the congregations. Modern mosques are also highly “object-centered” rather than “value-centered” (Rasdi, 1998).

There are many ways of providing better modern mosques for the congregation which responds to the need of contemporary Muslim societies. In addition to these formal concerns, the social context must also be evaluated. The study of architecture cannot be undertaken without an understanding of the society that produces it. Therefore, it is important to identify and understand the basic principles of the traditional Malaysian mosque construction to learn the relationship between the society and its mosque architecture.

In this study, example of a traditional mosque of a totally timber material and construction at Kampung Tuan (circa 1830's) and a mosque of brick and timber material at Kampung Hulu (1728) were chosen. To ascertain the basic principles of traditional mosque construction, the study will focus on the building components, choice of building materials, the structural and construction method, the employment of passive design technology, alongside the working system of the mosque erection.

## 2. The Malay Traditional Mosques

There are several numbers of traditional Malay mosques still surviving and popularly utilized throughout the country in present time. Some examples of the mosques are the Kampung Laut Mosque, Nilam Puri, Kelantan (1730's), Langgar Mosque, Kota Bharu, Kelantan (1871), Tengkeri Mosque, Malacca (1728), Kampung Keling Mosque, Malacca (1748), Tanjung Keling Mosque, Malacca (1930) and Lebuah Aceh Mosque, Penang (1808).

Kampung Tuan Mosque is one of the oldest surviving timber mosques in Peninsula Malaysia built in the early 19<sup>th</sup> century near the town of Chukai in Kemaman, Terengganu. The foundation of the mosque was laid by Sheikh Abdul Rahman, the son of the famed scholar Sheikh Abdul Samad al-Palembangi. Another oldest surviving traditional mosque in Malaysia built in early 18<sup>th</sup> Century is Kampung Hulu Mosque which located in Malacca Town. A wealthy Muslim from the area known as Shamsuddin Arom bequeathed his land to build the mosque. He was the second *kapitan* or headman of the Malays in Malacca Town during the Dutch governance.

Generally, the traditional Malay style mosques attributes are small scale buildings, employing pitched roofs and used locally available building materials such as timber, bricks, stones and clay roof tiles. In order to avoid floods, mosques were usually built on stilts to raise it above ground level. It is very norm to find that the methods of building construction and materials were similar to the local house architecture. The design of traditional mosques influenced by the four major factors including climatic conditions, availability of building materials, craftsmanship and ethnic background as well as the *shariah* laws from the Qur'an.

The Kampung Tuan Mosque is made entirely of *cengal* timber except for the clay roof tiles. It was built on stilts and originally possesses no *serambi* or verandah space. The mosque display a single space layout with no indication of spatial subdivision can be found. It is a sole building with a single prayer space enclosed within the four vertical paneled walls and the four tier roof. Originally, it only has one formal entrance and staircase directly opposite the *mihrab*. The Kampung Hulu Mosque employs the load bearing wall along with the 4 central timber post and beam constructions. It was built on stone plinth raised about half a meter high. The layout consists of the enclosed prayer area and the *serambi* or verandah attached to the three walls of the square plan. The three doorways of this mosque are connected with a stone staircase accessing to the main prayer floor area. Table 1 briefly describes the case study traditional mosques' attributes.

## 3. The principles of traditional Malay mosque design and construction

### 3.1 The building components and materials

The traditional Kampung Tuan Mosque and Kampung Hulu Mosque are comprised of building components and construction method that can be re-produced and re-assembled by the local community. Local craftsmen can repair and replace the traditional mosque building components themselves. The building was built as a non-permanent structure using a simple component assembly system. The components employed the modular system assembly that easy to replace when rotten. Every component of the traditional mosque employed the human measurement system, thus creating a human scale building. The replacement of the decayed components of traditional mosques for every few years allows the act of worship (*ibadah*) to the local craftsmen and builders.

Most of the materials used for Kampung Tuan Mosque and Kampung Hulu Mosque are locally produced and available in surrounding area. Those natural materials such as timber and stones are bio-degradable. Another special characteristic of the materials is that the decay components can be replaced without disturbing the main structure. This is due to the modular system employed and the adjoined components being easily dismantled. Timber as the main structural and component material was available in surrounding area. Low technology was needed to produce, fabricate, maintain and replace the building components. In Malaysia, timber was considered the most acceptable building material, primarily because it is locally available and did not retain heat during the day to radiate it back in the evening. Table 2 shows the traditional mosques' building components and materials.

Table 1. The traditional mosques' attributes.

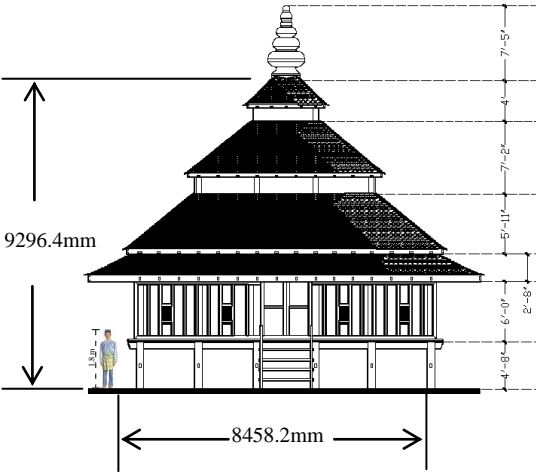
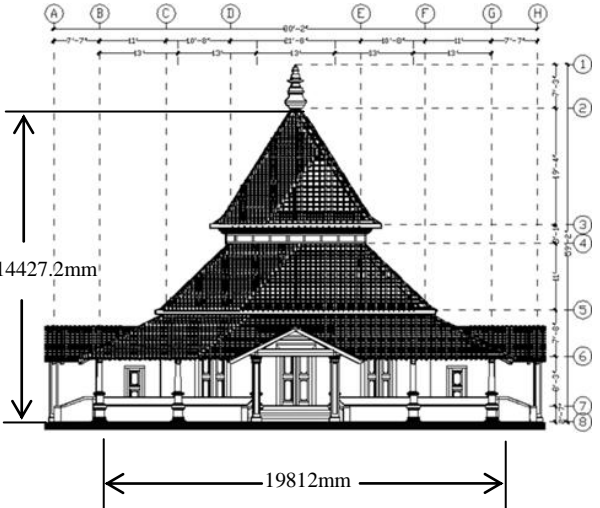
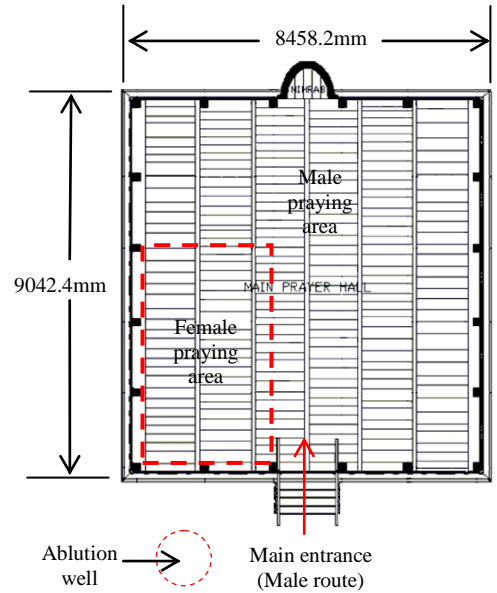
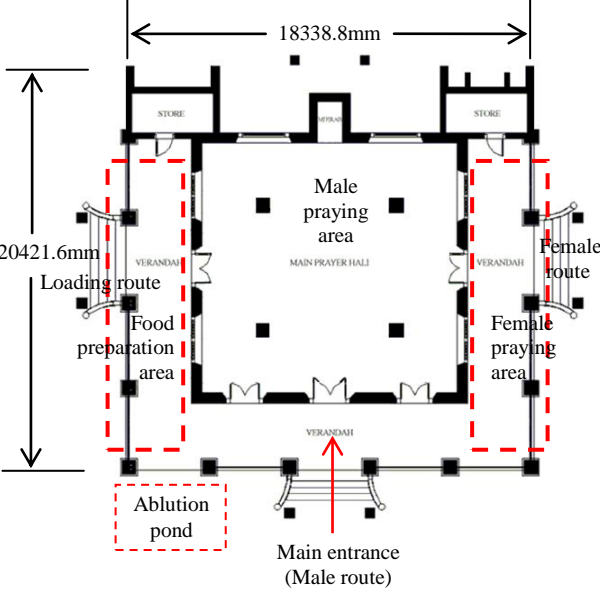
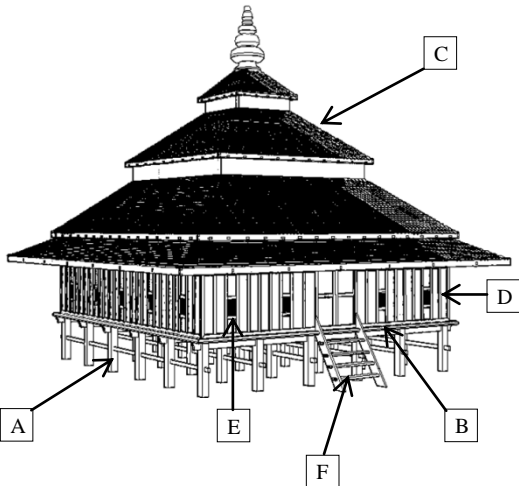
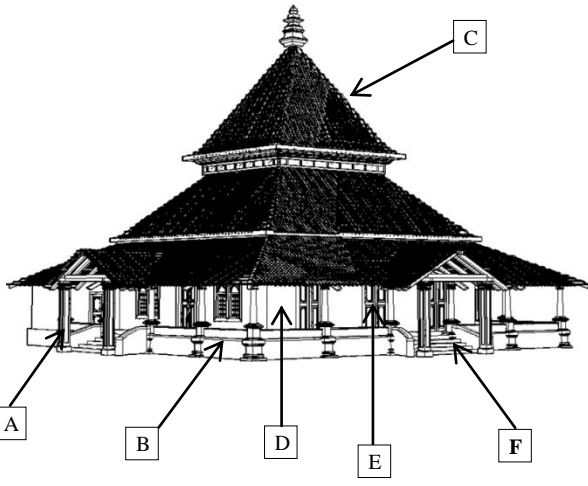
Kampung Tuan Mosque, Terengganu (1830's)	Kampung Hulu Mosque, Malacca (1728)
	
<ol style="list-style-type: none"> <li>1. Small scale building.</li> <li>2. Four tier timber roof with pinnacle.</li> <li>3. Timber panel walls.</li> <li>4. No minaret.</li> <li>5. Built on stilts.</li> <li>6. Single entrance to prayer hall.</li> <li>7. No internal column in main prayer hall.</li> </ol>	<ol style="list-style-type: none"> <li>1. Small scale building.</li> <li>2. Three tier roof with pinnacle.</li> <li>3. Brick walls.</li> <li>4. Stone minaret.</li> <li>5. Built on stone plinth.</li> <li>6. Three entrances to prayer hall.</li> <li>7. Four internal columns in main prayer hall.</li> </ol>
	
<p>Total floor area: 794 sqf (73.77 meter<sup>2</sup>).                  Separate entrance routes for male (main entrance) and female (underneath the floor board).                  Same floor of praying area, but separated by cloth veil.</p>	<p>Total floor area: 3,416 sqf (317.36 meter<sup>2</sup>).                  Separate entrance routes for male (main entrance) and female (right entrance).                  Different space of praying area;                  Male : Main prayer hall                  Female: Right side verandah</p>

Table 2. The traditional mosques' building components and materials.

Kampung Tuan Mosque	Kampung Hulu Mosque
	
<p>A: Structure (column, beam): <i>cengal</i> timber.                      B: Flooring: <i>cengal</i> timber.                      C: Roof: <i>cengal</i> timber, clay roof tiles.                      D: Wall: <i>cengal</i> timber.                      E: Opening (door, window): <i>cengal</i> timber.                      F: Staircase: <i>cengal</i> timber.</p> <p>Note: No minaret.</p>	<p>A: Structure (column, beam): <i>belian</i> timber.                      B: Flooring: stone, marble, granite.                      C: Roof: <i>belian</i> timber, clay roof tiles.                      D: Wall: brick, lime plaster.                      E: Opening (door, window): <i>belian</i> timber.                      F: Staircase: stone, granite.</p> <p>Note: Has minaret.</p>

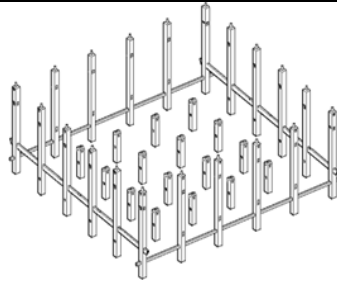
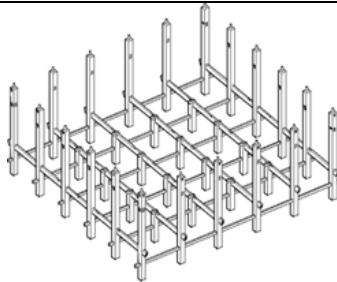
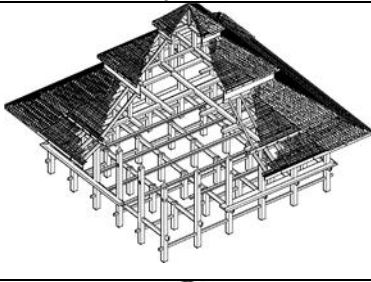
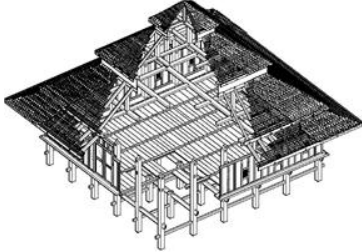
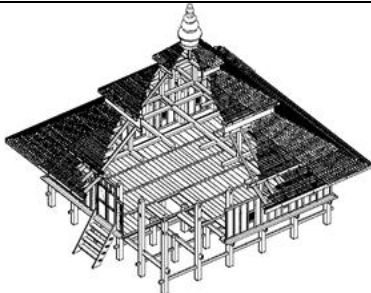
### 3.2 The construction method

The basic building components and construction methods of a traditional house and its local mosque is basically the same, except that the mosque is of a bigger structure that belonged to the entire community. The traditional method produces works of architecture slowly, which are highly distinctive and regionally identifiable. The traditional builders learned the building skills through apprenticeship. They make use of local materials and have evolved to cope with local climatic and environmental conditions.

The building methods was developed to use the most economical materials available, that provides specific design functions and will give adequate standards of performance. Traditional Malay mosque usually emphasized the regional expression of architecture. As in the case of the Kampung Tuan mosque, the house *tukang* (craftsman) invented a new suspended roof structure that was supported entirely by perimeter columns. The usual internal columns found in the construction of local houses and mosques were eliminated to provide a column-free prayer hall. Another characteristic feature was the utilization and incorporation of special traditions of local craftsmanship and the indigenous arts of the area. The building of the mosque, as the building of houses, allows participation of local craftsmen and community. The initial construction and the later maintenance of the mosque building are carried out by the village congregants and without payments. This charitable and voluntary deed is also part of the religious duty (*ibadah*).

The stages of traditional mosque construction consist of three major phases including the pre-building construction work, erection of the building and the building completion. The local craftsman, the apprentices and villagers all work together to participate in the building and maintenance of the mosque building. The traditional mosque building is able to employ the human labour due to the factors of human scale structure using the modular building components, lightweight materials, easily assemble and dismantle construction. Besides, it use low energy technology which is less in mechanization to produce the building materials. Table 3 shows the stages of traditional Kampung Tuan Mosque construction process which made of entirely human and animal labour.

Table 3. Stages of construction for traditional Kampung Tuan Mosque timber building.

STAGES OF CONSTRUCTION	TRADITIONAL MOSQUE BUILDING PROCESS (Kampung Tuan Mosque)	
Pre-building construction work	<ol style="list-style-type: none"> <li>1. Selecting the site.</li> <li>2. Acquiring materials from the jungle.</li> <li>3. Site clearance/preparation.</li> <li>4. Preparing building components from local raw materials (modular components).</li> </ol>	
Erection of the building	<ol style="list-style-type: none"> <li>1. The setting up of the grid and erection of the 20 perimeter column.</li> <li>2. The perimeter floor beam and cross-beam will be slipped into position to tie up the perimeter columns.</li> <li>3. The 16 units or 4 rows of supporting columns will next be erected.</li> </ol>	
	<ol style="list-style-type: none"> <li>4. Four rows of floor beams were placed into the mortise hole of each column in a row.</li> <li>5. The 4 rows of cross-beams were fixed into the opposite direction, through the 2 perimeter columns and 4 supporting columns.</li> </ol>	
	<ol style="list-style-type: none"> <li>6. The first, second, third and fourth layer of roof structure are constructed.</li> <li>7. Laying the roof tiles begins from the eaves and progresses upwards to the apex.</li> <li>8. The external joists were placed at two sides of the mosque. The other five internal joists placed onto the floor beams.</li> <li>9. The <i>bendul</i> were placed surround the perimeter wall at the external side.</li> </ol>	
	<ol style="list-style-type: none"> <li>10. The wall and wall opening (door and windows) components of the building are constructed.</li> <li>11. The floor boards were placed in between the floor joists.</li> </ol>	
	<ol style="list-style-type: none"> <li>12. The prefabricated staircase was attached to the <i>bendul</i>.</li> <li>13. The final stage would be placing the <i>mastaka</i> made of copper up to sixth layers.</li> </ol>	
	Completion of building	<ol style="list-style-type: none"> <li>1. <i>Kenduri</i> (socio-religious feast).</li> </ol>

### 3.3 The passive design technology

A traditional mosque construction was engineered to adopt with the Malaysian climate because it becomes a part of natural environment once it is constructed. Climatic balance was taken into account in most traditional buildings. The construction respected the site especially when it comes to digging, filling up and uprooting trees and the final completion of the building.

The mosques were design with deep understanding and consideration towards the natural elements such as sun, rain and wind. Its employ the passive design strategies as the solution to the natural factors that affect the building interior environment. Both traditional mosques were built for human comfort in response to the warm and humid climatic conditions by using pitched roofs to enable rain water to run off quickly and to control the thermal heat inside the building. The roofs sections were design to have some gap to allow the penetration of daylight and natural cross ventilation inside the building. The interior space is then illuminated with natural lighting. The overhang at the roof eaves and small opening serves as a filter to avoid glare and direct sunlight into the building.

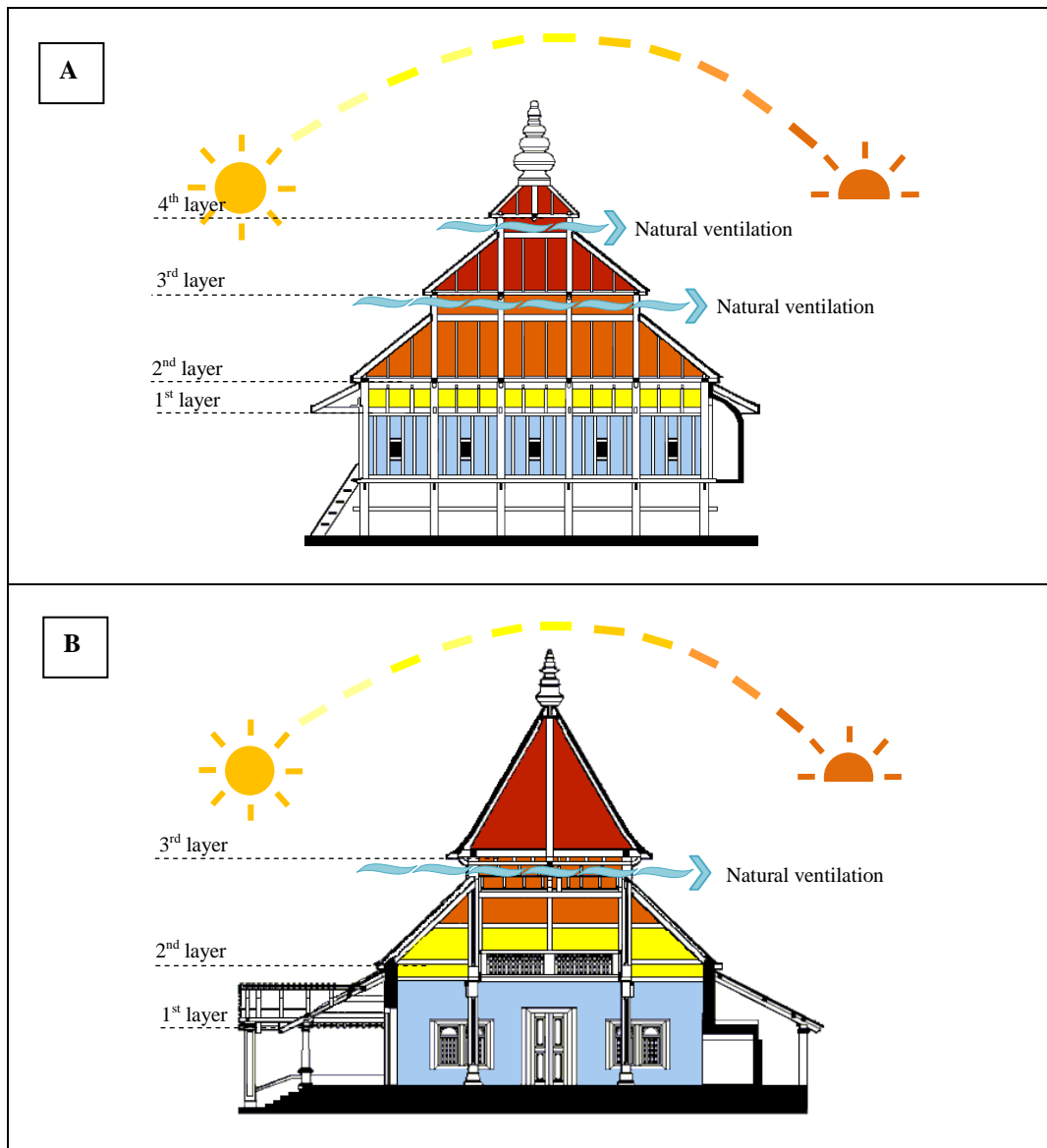


Fig. 1. Buffer zone of Kampung Tuan Mosque (A) and Kampung Hulu Mosque (B).

The verandah of Kampung Hulu Mosque was designed as the heat buffer to the main prayer hall area yet still allowing the natural light to reach the hall. As for the Kampung Tuan Mosque, the generous overhang of the first layer roofing together with the small openings assist to filter direct sunlight into the building. The roof overhangs also function to avoid excess rain water to the interior space during heavy rainfall. In order to provide for a clean (*suci*) prayer hall and to avoid floods, it was built on stilts and stone plinth to raise its floor above ground level.

Theoretically, warm air rises from the lower to the higher level roof spaces. This understanding leads to the creation of high and large volume space in the mosques prayer hall. The natural hot air flow from the bottom to the top area of the roof space explains the need of gaps at the higher roof sections. The gap permits the rising hot air to exit the building and keeping the building cool all day. The buildings are further cooled with natural ventilation which ventilates through the openings of door and windows. Figure 1 illustrates the possibility of solar radiation and ventilation inside the mosques.

### 3.4 The Work Force

In Islam, aside from daily prayers, the fulfillment of the social responsibilities such as participating on the building of a local mosque constitutes an act of worship (*ibadah*). The construction of traditional buildings usually require extensive period of time to be completed. The process of traditional building erection entangles a complex activities related to religious and cultural believe and the local technological aspects. As for both traditional mosques, the method of building construction and materials were similar to the local house architecture, thus it allows participation of local craftsmen and the community at large. So do in the future maintenance of the mosque.

Building a mosque is a community responsibility that involves the local builders and congregants. The process requires expertises, such as the master builder (*tukang*) and other house component makers and apprentices. Though the master builder was the leader, assistance from the apprentices and the local community is still needed during buildings construction. Generally, the master builder possesses almost all the basic knowledge about the building construction. However, several component parts of the building may require specialized services of others, such as the preparation of the roof finishes, walls, staircases and the various decorative components. Due to the modular concept of construction, some of the components were prepared in advance. Figure 2 shows the organization structure of the work force required to build a traditional Malay mosque.

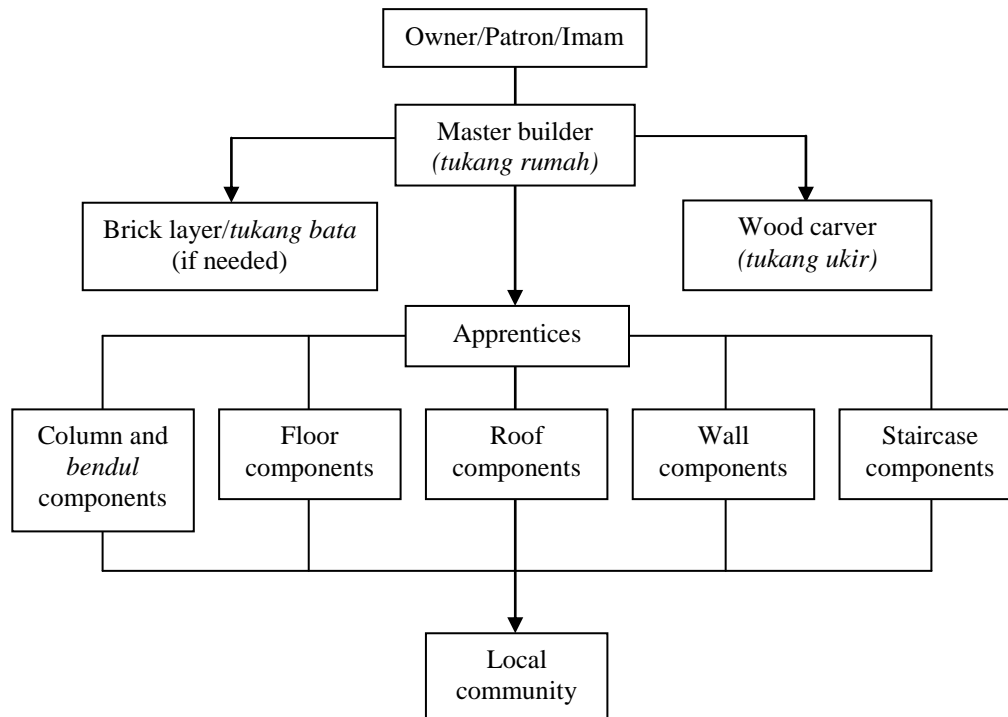


Fig. 2. The work force organization structure of building a traditional Malay mosque.



## CONCLUSION

This study intends to give understanding on the design and construction principles of traditional mosque and how these principles can be applied for the contemporary Muslims. It attempts to address solutions to the detachment of congregants from mosques. What we can learn from the traditional construction is their use of local and sustainable building materials, their small scale structure and the community participation. Traditional Islam sensibility saw the world in its transient aspect, hence the architecture erected sought to avoid the grandiose and the worldly (Nasr, 1978). To nurture brotherhood in Islam, the small mosque is sufficient to create chances for congregants to get to know one another.

The traditional mosques were built as an act of worship and with the intention to submit oneself to the Creator. It was erected as a reminder of the Permanence of Allah and the transient nature of Man and his built environment. The patron intended to construct the mosque for the local community usage and will be bequeathed as a public property. The idea is to make it as a place of worship, as a gathering place for congregants to meet each other, to hold religious classes and to celebrate communal festivities that make the mosque frequented. More importantly, the erection of a mosque is a communal activity able to bond the fraternity, cooperation and understanding among the community.

Timber as the main building material for the building components is the most effective and reliable material to control the interior environment within an equatorial climatic conditions. It is also biodegradable and easily replaceable for the local consumption. The need of a religious duty has brought together the local community in the construction, completion and maintenance of the traditional mosque building. It is a community responsibility and helps to strengthen brotherhood among the congregants.

The use of the modular system to the mosque building components will give opportunities for the congregants to maintain and refurbish some of the decaying component parts. The cost to replace a small building component will not be as expensive. In addition, the modular components were designed in the human scale making it easy to be repaired by one or two persons at a time. Moreover, local society involvement in mosque building is important to ensure the sense of belonging towards the building. The involvement and engagement of congregants will lead the congregant to care and frequently visit the building. The concept/principles of the traditional architecture and its applications on the traditional mosque construction can be summarized as the following Table 4.

Table 4. The traditional mosque concept/principles of building.

CONCEPT/ PRINCIPLES	APPLICATION ON TRADITIONAL MOSQUE CONSTRUCTION
Concept of materials	<ul style="list-style-type: none"> <li>- Use of available local materials.</li> <li>- Low maintenance, local materials and craftsmen.</li> <li>- Biodegradable and nature friendly materials.</li> <li>- Materials are easy to find, replace, modify, extend and maintain.</li> </ul>
Concept of building components	<ul style="list-style-type: none"> <li>- Not a permanent structure.</li> <li>- Modular system component, human scale, simple assembly and replacement.</li> <li>- Employ human measurement system, thus creating human scale building.</li> <li>- Lightweight and transportable.</li> </ul>
Concept of construction method	<ul style="list-style-type: none"> <li>- Uses human and animal labour with traditional technology to construct a building and to produce building components.</li> <li>- Application and refinement of local construction methods.</li> </ul>
Passive design technology	<ul style="list-style-type: none"> <li>- Consideration on the human comfort.</li> <li>- Application of natural lighting and ventilation.</li> <li>- Creation of heat buffer zone.</li> <li>- Sophisticated understanding of the climatic condition with practical solutions.</li> </ul>
Concept of working system	<ul style="list-style-type: none"> <li>- Act of worship (<i>ibadah</i>)</li> <li>- Communal contribution, society participation.</li> <li>- Human energy, hand work.</li> <li>- Uses of local <i>tukang</i> or craftsmen, apprentices and local community.</li> <li>- To bond the fraternity between community.</li> </ul>

Finally, it is for Muslims of today to re-evaluate the traditional building design principles and to adapt it to current and future applications. One should not copy blindly the traditional forms and elements of the past construction without understanding the design principles of the Malay traditional architectural principles and the local traits/expressions. It would be a real test and task of our ingenuity to combine the beauty and spirit of the traditional Malay and Islamic architecture, interpreted in a modern idiom consistent with the technological advances of today.

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