

## Research Article

### Defects Investigation in Old Timber Building: Case Study of Masjid Lama Mulong, Kelantan

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**Abstract:** The aim of this study is to identify and highlights the importance parts of a conservation programs, particularly for timber building. Masjid Lama Mulong is one of a remaining cultural heritage experiencing conservation works as to restore the uniqueness of the building and its history that once existed. Made from cengal, one of the famous local hardwoods, however, it is not spared to the threat of decay and deterioration from its agent. In conservation, one of the important stages is to inspect and investigate defects, as to assure the implementations of appropriate improvements are made accordance with the conditions and the state of deteriorations. In this part, some of the important features of the investigators should take into account before any investigation is made. From the overall investigation, defects are mostly caused by mechanical and biological category. Decay due to termite attacks and soft rot are among the highest rank which is mostly found contributed for the seriousness deterioration due to the presence of dampness.

**Keywords:** Building survey, conservation, old mosque, repair works, timber building defects

## INTRODUCTION

Mosque is one of the contributors to the diversity of architectural pattern in Malaysia. Traditional types of mosque are one of the elements that's portray the diversity of cultural property which should be protect and conserve as part as to maintain the continuity of vernacular architecture and history of the country. The importance of its conservation other than to promote the diversity of architecture and promoting heritage trail, it is part of an important evidence in history education.

Masjid Lama Mulong or known as Masjid Ar-Rahman by the local residents are one of the local heritage buildings and was among of the building conservation projects monitored by the Department of National Heritage. The projects starts in the middle of 2008 and completed in 2009. A handover ceremony had been held and officiated by the Minister of Information, Communication and Culture of Malaysia, by giving a heritage plaque as a symbolic of acknowledgment (Tahir *et al.*, 2009). The building was formerly a 'madrasa' or Islamic studies center for residents around the Mulong area in Kelantan. It is a 50-years old structure and was rebuilt on its original site through the process of moving and conservation works. The building was formerly a part of the residential house to

Raja Dewa Tuan Zainal Abidin, the prince to Baginda Sultan Kelantan, Sultan Muhammad III. It was built around 1900 and located in Kota Baharu, close to Istana Balai Besar and had been vacant after the World War II. The part was used to be a 'Balairung Seri Raja Dewa' and bought with the price of RM 1000 by the residents of Kampung Kedai Mulong and converted to be used as a mosque.

The original structure had been revamped, transported and re-established by mutual assistance from the local residents of the Kampung Kedai Mulong (Tahir *et al.*, 2009). The reformation are remaining the original building structure but only erected on endowment land of Lot 495, Surau Lama Kedai Mulong, Km 11, Jalan Kuala Krai, Kota Bharu, Kelantan. The erection process completed in December 1958. The mosque are 1200 sq ft, originally maintained, but as time goes by, it may no longer able to accommodate users especially due to the increasing number of congregation and numbers of students from the nearby Islamic center in Nilam Puri. Based on the needs to hold a large number for Muslim community during the Friday prayer, a new mosque was built 500 m from the Masjid Lama Mulong, featured with a modern style of mosque in 1959.

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Fig. 1: Masjid lama Mulong, before (in 2008) and after (in 2009) the conservation program (Johar, 2012)

Before the restoration works, the building served as a mosque to the community and once to be as an academic institutions (Fig. 1). It no longer used to hold for the Friday prayer since a bigger mosque is built nearby. With the conservation program, the poor state condition of the building is repaired and history maintained and continuously to serve to the community as another house of worship and educational institutions to the community.

One of the important stages of conservation is to investigate defects, where the state of deterioration will be analyzed and the degree of intervention will be decided. Every intervention must be careful examine and should be in minimal state as to retain much of the original significance (Mustafa *et al.*, 2011). Before any repair is made, it is crucial to understanding the cause of defects as to ensure the best way of repair. In fact, understanding the causes and agents of defects can reduce the risk of greater damage (Richardson, 2001). This study objectively to highlight the condition survey process in the local conservation practice and the finding of timber defects found in the case study. The analysis describes the overall condition of the building by clustering the timber decay agents found during the survey.

#### DEFINITIONS AND THE IMPORTANCE OF DEFECTS INVESTIGATION

Generally, conservation is known as an activity to extend life of an object. It is an activity to prevent decay, which contains all acts to extend life of a cultural and natural heritage (Fielden, 2000). Conservation can be anything which in terms to conserve, which the program includes preservation, restoration, reconstruction, rehabilitation and adaptation or any combination (NHA, 2006), while Burra (2000) define it as all the processes of looking after a place so as to retain its cultural significance. In preserving a cultural property, one of the important stages is the condition investigation as to assist in identifying techniques or methods which are suitable for preparing the repair works on the next stage (Johar, 2012).

Building condition investigation or also known as dilapidation survey and condition survey is important part in the process of building conservation. The main goal of the investigation is to provide adequate

information and identify further actions and necessary resources to the building (Ahmad, 2004). The process includes identifying defects and the cause of deterioration before any repair and improvement work can be acquiring (Glover, 2003). According to Ramly (2007), dilapidation survey is a combination process of investigation and documentation of buildings to recognizing the extent of damages causes and describes in repair and maintenance works. Implemented as a whole, which start from roof to site and surroundings, requires systematically and comprehensive investigation in avoiding repetitive assignment.

The process requires skills and expertise in diagnosing defects; therefore an investigator should have in depth knowledge on types and cause of defects in a building together with how the building is constructed. It should be carried by specialize trained profession, assures for correct and comprehensive report can be obtain. Generally, this non-destructive condition survey is carried by and responsible to qualified Building Surveyor. The duties are broaden from defect diagnosis to the care and maintenance recommendations and to generate reports which best viewed and understood by non-specialist readers (RICS, 2009). For an in depth analysis, the involvement from certain specialist services are requires especially on the details of structural information and material composition.

As according to Kamal *et al.* (2006) several important features of a building surveyor are:

- Able to, knowledgeable and practically understanding the process of building construction, services and facilities together with the building materials
- Have the ability to sketch and draw buildings and its installed services
- Understand the basic design and structural concept
- Ability to define and sign defects symptoms and the effect
- Knowledgeable of using building inspection equipment
- Understand the safety requirements in carrying the building inspections

One should also able to produce a comprehensive inspection report which easily understood to facilitate

parties in the repair stage. The purpose is to obtain the correct way of building repairs wherein if improper investigation might leads for ineffective and economically wasteful improvements (Kamal *et al.*, 2006).

**THE DEFECTS INVESTIGATION IN TIMBER BUILDING: THE MASJID LAMA MULONG**

Generally, the investigation divided under three stages,

- The preliminary
- The specialist
- The detailed survey

The preliminary investigations are to provide an understanding of the building structures and defects and how these may interact to a given situation. With visual investigation, this can provide a good indication of the parts that require a thorough inspection, such as in concealed and cavity sections, as to formulate an appropriate method of investigations.

The condition of concealed timber and cavities are usually difficult to inspect. Only demolition or exposure work can enable the condition of timber to be determined with certainty. To eliminate uncertainty, the non-destructive approach required as to aid the surveyor in the investigation. The non-destructive inspection includes the use of instruments and test equipment such as moisture meter, fiber optic

inspection, ultrasonic and infrared techniques (Singh, 1996).

Further up to the next stage, detailed investigations is a must in determining the extend of defects and deteriorations. The investigation includes searching for the source of defects and its occurrence. There may be significant decay even when the decay organisms that caused it have been dead for many years, but as for certainty, the investigation is needed. The information gained from the laboratory test to determine the type of such decay organisms or fungi is essential as to assist in explaining the situation that allow for it occurrence and this is done by taking samples (Singh, 1996).

The inspection of old timber mosque is almost the same as to any other buildings. The stages of preparation include:

- The documentation process (building plan preparations, checklist, building’s background, the survey form)
- Tools and equipment (cameras, torch light, magnifying glass, measuring tape, moisture meter, etc.)
- Security preparation (ladders, safety helmets, scaffoldings, insurance, etc.) (Ramly, 2007; Glover, 2003; Richardson, 2001)

To this building, the inspections are carried out in a systematic way. The strategy begins by preparing the

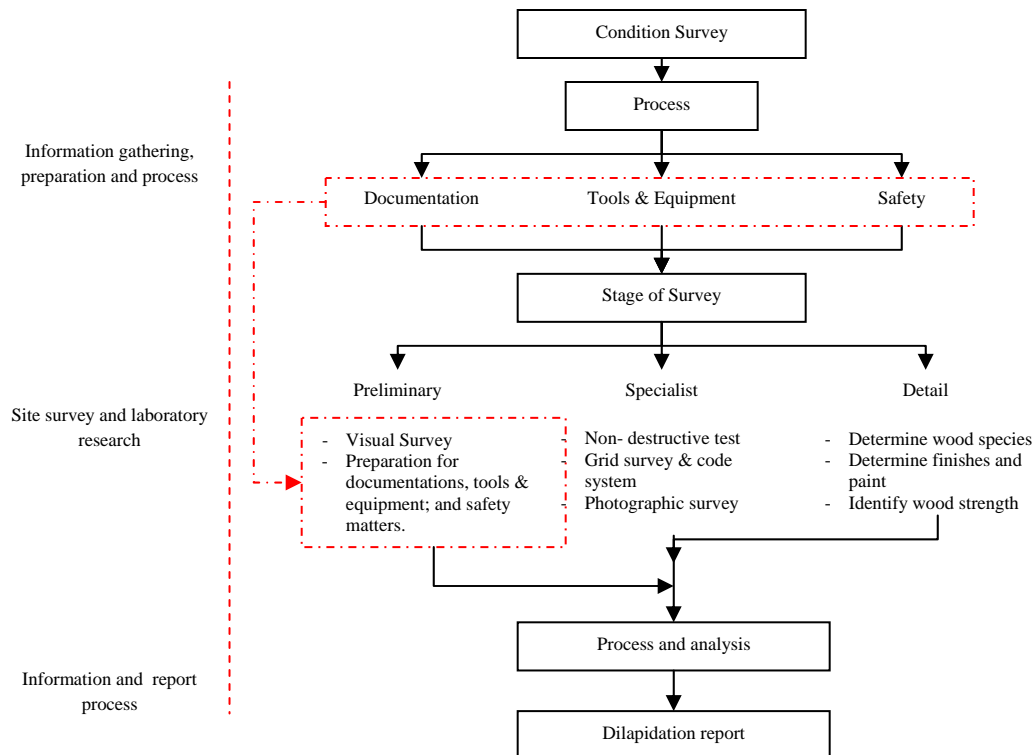


Fig. 2: Chart of building conditions and investigations of Masjid Lama Mulong, Kelantan (Johar, 2012)

Table 1: Defects inspection in Masjid Mulong, Kelantan

Element	Biological	Rot (fungi)	a)	b)	c)	d)	e) Stain mold	Insect and small animal attack	a)	b)	c)	d)	e)
			Soft rot	White rot	Brown rot (Dry)	Brown rot (Wet)			Termites	Beetles	Ants	Bees and wasps	Small eirds
Column						x			x		x		
Floor													
Beam													
Floor			x				x		x				
Wall								x					
Roof										x			
Door											x		
Window			x						x		x		
Stair													
Total		13	2	0	0	2	1		4	1	3	0	0

Element	Environ mental agent	a)	b)	Liquid and chemical	a) Acids and lkaline	b) Water and moisture	Mechanical	a)	b)Blistering paint (finishes, coating)	c) Rain water Outlet Problem	d)Missing elements, broken	Total
		UV (photode gradation)	Small plants			Cracks						
Column			x			x			x			6
Floor								x				1
Beam												
Floor			x			x		x				6
Wall			x					x	x			4
Roof			x			x			x	x		6
Door								x	x			3
Window								x	x			3
Stair												0
Total		0	4		0	3		5	5	1	1	29
		4		3		12						

\*The table shows on the variety of defects found in an element; defects that belong to a particular category (ie: dampness, cracks, etc.) is counted as one, though it is found in various parts of the case subject; total numbers of defects are not present in this table as overall findings shown that the building is in good condition

plans and layout, tools and equipment, checklist and preliminary site visits as to give an overview of the conditions and situations of the building and its surrounding. The plans and layout preparations are made due to the absence of achievable reference which can be used in the repair process. It also part of the documentation requirements as to plot for the damage and building defects in the investigation (Johar, 2012). Figure 2 show the schematic flow of the building condition survey of Masjid Lama Mulong.

On the site investigations, started by dividing and making grid on the building and each building defects found are recorded according to the grid system and with consistent codes. In certain parts, a detailed investigation requires especially to those parts which severely damage by decay agents. The parts need for further investigation as to determine the extent of defects and to assess the existing strength. A test to verify the types of wood can be done on the site by a qualified timber grader through the wood vessel examination. To determine the properties and composition of patinas, or coats which found on the timber surface, a laboratory test is conducted by taking samples and examinations.

### DEFECTS ANALYSIS

In any building inspection and investigation, the liable surveyor should have a sound knowledge on the various kinds of defects that may exist in a timber building. A checklist of timber defects in building provides a preliminary hint on the symptoms and conditions on the surveyed structures. Typically, there are 4 groups of agents of wood defects in building,

classified into physical and environmental agents, mechanical, chemical and biological (Ridout, 2000; Singh, 1996; Desch and Dinwoodie, 1983) and these are break down to several causes which can be referred in Table 1.

From the inspection and investigation, the results shows most of the defects are caused by the mechanical and biological actions. Among the highest rank is the decay due to termite attacks and soft rot, followed with surface degradations; the UV photo degradation and environmental erosions. The serious defects to the timber structure are caused by the termites and soft rot attack due to the continuous presence of dampness. Refer to Table 1.

From the inspection, a report is made and to formulate for the dilapidation repair works. Overall, the building structures are in good conditions and a few special repair is required as to keep on maintain the uniqueness of the building. Conservation in this term are to restored back the original features of the building and to make good repair of what have been found deteriorated.

### CONCLUSION

Building condition investigations or somehow called dilapidation survey is important part in conserving a historical building. Defects need to be look holistically; hence it is an important stage before moving up for the repair and remedial works. Repair and remedial works without referring to the actual defects are wasteful and could cause more damage or would may be the trigger problems in the future. It is important of understanding how materials react into

certain condition and factor which cause to defects. In depth knowledge is essential for any building inspector particularly for a surveyor in conservation practice, as to avoid errors in defects diagnose as well as to eliminate repetitive assignment. As in the case study, by knowing the serious deterioration caused by the biological agent and parts where the existence of dampness, may help to plan for best approach of repair, treatment and design improvement. The exact cause and symptoms of the building defects must be understand, thus future maintenance program can be properly organized. Survey report is another essential part serves not only a basis for repair and improvement works yet as a reference for maintenance program framework carries later on.

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