



Maintenance Procedure in Dealing with Defect on Shophouses Heritage Building at George Town: Insight from Building Owners and Heritage Experts

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ABSTRACT

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Historic buildings play a dual role as outstanding tourist attractions and guardians of the nation's historical legacy, ensuring its preservation for posterity and making them invaluable national assets. However, few owners of historic buildings have the lack of knowledge to deal with defects issues at shophouse heritage buildings, and the majority of historic structures remain in "poor" condition with no renovation in a proactive manner. Therefore, this study aimed to address the mentioned issues by identifying flaws in shophouses in George Town and investigating the most effective maintenance protocol for dealing with these flaws in heritage buildings. The present study employed a qualitative research methodology, specifically utilizing the strategy of qualitative inquiry. This research also employed observation and interviews to gather data. This study enriches knowledge by exploring critical issues affecting the conservation of heritage buildings. Furthermore, the findings from this study are valuable to industry practitioners and users since they provide an effective maintenance procedure to follow in maintaining and sustaining heritage buildings.

1. Introduction

The Planning Authority of Malaysia has designated heritage buildings as gazette due to its architectural, aesthetic, historical and cultural value, since they may serve as a mirror into the local community's past and culture [8]. It is the identity and religious practices that arouse the awe of today's generation because the country's unique intellectual and aesthetic values are still maintained. Society also needs to bear the same responsibility as government in the preservation and conservation of heritage buildings because many heritage buildings are owned by individuals rather than the government [7]. One of the conservation actions is maintenance [10]. Maintenance differs from other conservation-related actions in that it has to be done continuously rather than only when necessary. Building maintenance is the process of safeguarding and upholding the structure to a set quality for the benefit of management, users and the preservation of the building's

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operation. All technical and practical work required to maintain heritage structures in a way that preserves its significance and worth is referred to as maintenance work [4]. The biggest maintenance tasks involve not only keeping the building functional but also protecting its personality over time and maintaining the facade of the building [3]. In ensuring the sustainable management of heritage buildings (HBs), it is important to implement heritage building maintenance management (HBMM) appropriately. This requires the implementation of pragmatic and administrative procedures to guarantee that HBs are used for sustainable purposes, such as minimizing building cases [1].

2. Literature Review

2.1 Heritage Building

According to Harun, (2011) [7], heritage is a part of our past that has been preserved for the present and will be passed onto future generations. Heritage is also described as knowledge defined in social, political and cultural frameworks and conceptualized as meaning associated with the past. Context, integrity and historical significance are the three criteria that determine whether a place is eligible for heritage listing. Structures, buildings, artifacts and historic locations of aesthetic and architectural importance are all considered part of human heritage [2]. Heritage bills are historically significant, architecturally significant structures that require ongoing maintenance and protection to preserve their historical, architectural, artistic, spiritual, archaeological, social, political and economic significance [12]. The parameters and extent of heritage despite an international agreement to include "tangible," "intangible" and "environments" in the definition of heritage, the more specific word for "heritage" has not been simplified or standardized, and as a result there is no uniformity among nations [2].

2.2 Shophouse

"Shophouse" is one of the structures that is a part of the commercial and residential areas. The shop houses in George Town can be broadly classified into six historical styles: Early "Penang" style, "South China" Eclectic style, Early Straits Eclectic style, Late Straits Eclectic style, Art Deco style and Early Modern style. These styles correspond to different building requirements [13]. According to Savage, (2001) [15], definitions of the shophouse are relatively recent. Based on the criteria of the general plan of the shophouse, the first Singapore Master Plan of 1955 defined the shophouse as a form of housing with a 'narrow frontage of 20 feet (6 m) or less, built in terraces without side ventilation to a depth of 60 or 70 feet (18 to 20 m)'.

The Southeast Asian shophouse which originated in Malaysia in the late 18th century and persisted until the 1960s, is a long-standing architectural style that blends residential and commercial space. It is a common tradition in this region, not unique to it, to have the family company on the first floor and the house on the upper stories [16]. Maintenance is the most pragmatic and philosophical conservation method [5]. Furthermore, according to Kerr and Riede, (2022) [11] "maintenance is the single most important process of all heritage building conservation processes". A delicate balancing act, restoration and conservation require the ability to determine when and how much intervention is necessary. A multidisciplinary approach is needed for architectural heritage restoration. Heritage buildings are recognized for their expertly planned and built construction. For their survival, a plan that is equally capable and suitable is needed. The first step should be an investigation to determine the structural system and the load transfer mechanism [12].

3. Methodology

3.1 Case Study

This research approach involved a fully qualitative data analysis. The objective of carrying out this research was to identify the current concerns faced among building owners about the specific treatment of maintenance works for shophouse heritage buildings and to find out the defects that commonly occur in heritage shophouses. To be successful in qualitative interviews, the researcher must be able to effectively build relationships with participants, elicit details, emotions and facts that provide a rich description of events or experiences, and establish a sense of trust so that participants share their stories honestly without bias. The chosen heritage buildings were Baked Fresh Daily, Harvest Time and Ban Ho Seng located in Penang [14].

3.2 Visual Inspection

To achieve the objective, visual inspections were carried out throughout the building, particularly on the architecture and structure components. Each component defect was identified and evaluated according to its condition and maintenance priority as categorized in Tables 1 to 4. This visual inspection uses other aids such as cameras, rulers and notes.

Table 1

Overall building rating

No.	Building rating	Score
1	Good (compliance)	1 to 4
2	Fair (observation)	5 to 12
3	Dilapidated	13 to 20

Table 2

Maintenance priority ratings

Rating	Description	Condition
1	Functional, only cosmetic defect	Normal
2	Minor defect, but can lead to serious defect if no action taken	Routine
3	Serious defect, cannot function to an acceptable standard	Urgent
4	Element / structure does not function at all; or risks that can lead to fatality / injury	Emergency

Table 3

Condition survey protocol (CSP) 1 matrix



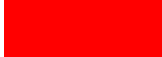
No.	Type	Matrix	Score	Colour code
1	Minor	Plan Maintenance (Non-Compliance – CAT 3)	1 to 4	
2	Quite Significant	Condition Monitoring (Non-compliance – CAT 2)	2 to 12	
3	Serious Attention	Serious Attention (Non-Compliance – CAT 1)	13 to 20	

Table 4
Condition defect assessment

Condition	Scale	Description (Value)
1	New / as new	Minor Servicing
2	Fair	Minor Repair
3	Poor	Major Repair/ Replacement
4	Very poor	Malfunction
5	Dilapidated	Damage/ Missing

3.3 Interview

3.3.1 Interview with building owners

Another qualitative method used was interviewing. Interviews were conducted with six heritage building owners, to obtain data on the concerns faced by building owners in carrying out the maintenance of heritage buildings. The building owners' demographic profile is shown in Table 5.

Table 5
Demographic of building owner

Respondent	Years of owning a shophouse	Address
Mr. U	More than 25 years	93, Beach Street, 10300 George Town, Penang
Mr. V	More than 25 years	162, Armenian Street, 10200 George Town, Penang
Mr. W	8 years	Beach Street, 10300 George Town, Penang
Mr. X	More than 25 years	Beach Street, 10300 George Town, Penang
Mr. Y	More than 25 years	Kapitan Keling Mosque Street, 10200 George Town, Penang
Mr. Z	More than 25 years	Carnarvon Street, 10100 George Town, Penang

3.3.2 Interview with building experts

Interview with experts in building heritage and conservation was conducted to capture the recommendation of the best approaches of maintenance procedure in dealing with defects at shophouse heritage buildings. Three experts (Table 6) were approached to give their insights on the best approaches in maintaining the heritage building's defects.

Table 6
Demographic of experts

Respondent	Position	Experience
A	Engineer	10 Years
B	Technical assistant architecture	6 years
C	Architect	18 Years

4. Results and Discussion

4.1 Building Rating (Visual Inspection at Case Study)

The implementation of BCA in this study involved all the structural and architectural elements of Baked Fresh Daily (Case study 1), Harvest Time (Case study 2) and Ban Ho Seng (Case study 3). From the rating table based on BARIS, the matrix of each defect was calculated to get the overall rating of the building (case study) in this study. Table 7 shows the list of defects identified during the visual assessment on site. Based on the inspection works, it was found that peeling paint defects recorded

the highest percentage of 29 %, followed by discoloration of 17 %, termite attack and loose plaster which recorded a percentage of 13 %. Cracking, moisture and mould growth accounted 8 % while dampness, blistering of paint work and uneven surface recorded a percentage of 4 %.

Table 7
 List of defects identified on site

No.	Component	Defect	Condition rating	Maintenance Priority Rating	Matrix Analysis
1	Wall	Dampness	2	2	4
2	Wall	Blistering	2	2	4
3	Wall	Loose of plastering	3	3	6
4	Wall	Peeling paint	1	1	1
5	Wall	Peeling paint	2	2	4
6	Wall	Cracks	3	4	12
7	Wall	Discoloration	4	3	12
8	Wall	Discoloration	2	2	4
9	Wall	Peeling paint	4	3	12
10	Wall	Mould growth	3	3	9
11	Wall	Discoloration	2	2	4
12	Wall	Peeling paint	2	2	4
13	Wall	Peeling paint	2	2	4
14	Wall	Efflorescence	2	2	4
15	Column	Peeling paint	2	2	4
16	column	Loose of plastering	1	1	2
17	column	Discoloration	2	2	4
18	Floor	Uneven surface	3	3	9
19	Floor	Cracking	3	2	6
20	Door	Discoloration	2	2	4
21	Door	Termite attack	2	2	4
22	Door	Termite attack	2	2	4
23	Window	Peeling paint	2	2	4
24	Ceiling	Peeling paint	2	2	4

The condition rating indicated the severity or extent of the defect on a scale from 1 (minor) to 4 (severe). The maintenance priority rating reflects the urgency of addressing the defect, also on a scale from 1 (low priority) to 4 (high priority). The matrix analysis was derived by multiplying the condition rating by the maintenance priority rating, providing a combined measure to prioritize defects based on their severity and urgency.

4.2 Best Approach of Maintenance Procedure in Dealing with Defects at Shophouses Heritage Building

Respondents for the collection of interview data for this research paper consisted of 6 respondents which consisted of shophouse owners in George Town (Table 8). Mr. U, V, X, Y and Z have owned the heritage shop buildings for more than 25 years. While Mr. W has only owned a heritage shop building for 8 years because he inherited the shop house from his family (Table 5).

Based on the answers given, the majority of respondents said that the main concern they face as owners of heritage buildings is that there is no clear guide to be consulted to carry out the maintenance of heritage buildings. However, Mr. V and Z stated that they face financial concerns because the maintenance of heritage buildings requires high costs because as stated by Mr. Z, owners of heritage buildings are not given any incentive to carry out heritage maintenance.

Table 8
Building owner answers

No.	Questions	Respondent	Answers
1.	What are your main concerns as a building owner about the specific treatment of maintenance works in heritage buildings?	Mr. U	"...there are no clear guidelines to refer to..."
		Mr. V	"...Replacing with the same material is time consuming and expensive ..."
		Mr. W	"...There are no guidelines on the specific management of heritage buildings ..."
		Mr. X	"...Not exposed to proper heritage building maintenance guidelines ..."
		Mr. Y	"...High cost ..."
		Mr. Z	"...No incentive is given for maintenance ..."
2.	As the owner of a heritage building, do you have any knowledge about the specific treatment of heritage building maintenance works?	Mr. U	"...Don't know, because there is no disclosure about the specific treatment of heritage buildings ..."
		Mr. V	"...There is little knowledge, therefore since 15 years of buying this store house, until today no major maintenance has been done ..."
		Mr. W	"...There is little knowledge, therefore since 15 years of buying this shop house, until today no major maintenance has been done ..."
		Mr. X	"...There is little knowledge, therefore since 15 years of buying this shop house, until today no major maintenance has been done ..."
		Mr. Y	"...Lack of knowledge on specific maintenance due to lack of exposure ..."
		Mr. Z	"...Lack of knowledge of specific maintenance specifications due to lack of exposure ..."
3.	Are there incentives from any company for building conservation?	Mr. U	"...No incentives ..."
		Mr. V	"...No incentives ..."
		Mr. W	"...No incentives ..."
		Mr. X	"...No incentives ..."
		Mr. Y	"...No incentives ..."
		Mr. Z	"...No incentives ..."
4.	Are there any guidelines in the care of heritage buildings that need to be consulted?	Mr. U	"...no guideline ..."
		Mr. V	"...no guideline ..."
		Mr. W	"...Yes, have a guideline ..."
		Mr. X	"...no guideline ..."
		Mr. Y	"...no guideline ..."
		Mr. Z	"...no guideline ..."
5.	Are there specific maintenance works that you have done or considered for your heritage shophouse building?	Mr. U	"...Replace all windows, doors and floors made of wood due to reputation by termites and insects ..."
		Mr. V	"...Changed all the designs on the ground floor and repainted the exterior and interior of the building without the same materials ..."
		Mr. W	"...Do not perform major maintenance but only perform necessary maintenance to prevent damage such as leaking roofs and building cracks ..."
		Mr. X	"...Changed and even opened the door of the shop but did not keep the original material ..."
		Mr. Y	"...Replace all windows, doors and floors made of wood due to reputation by termites and insects ..."
		Mr. Z	"...Replaced the damaged wood on the stairs and floor on the 1st floor. However, the materials used were different...."

6. What are the main concerns you face when planning or carrying out the maintenance works of your heritage building?	Mr. U	"...Lack of knowledge about heritage building maintenance procedures...."
	Mr. V	"...There is no procedure to perform maintenance...."
	Mr. W	"...High cost...."
	Mr. X	"...There is no procedure to perform maintenance...."
	Mr. Y	"...It is difficult to find a building maintenance group, because there is no knowledge about building maintenance...."
7. Do you face any challenges related to the preservation of historical features during maintenance works? If so, can you describe the challenges?	Mr. Z	"...High cost...."
	Mr. U	"...Yes, because of lack of budget to do building maintenance...."
	Mr. V	"...Yes, because I don't know any steps and procedures taken to do any maintenance of heritage buildings, then all the features of heritage buildings have been changed and not maintained...."
	Mr. W	"...Yes, because it is difficult to get the original material...."
	Mr. X	"...Yes, because it requires a high cost to get the original material...."
	Mr. Y	"...No...."
	Mr. Z	"...Yes, because there is no reference to do any maintenance of heritage buildings...."
8. Are you looking for any professional advice or guidance when dealing with specific maintenance issues of heritage shophouse buildings? If so, are there recommendations or key insights provided?	Mr. U	"...No...."
	Mr. V	"...No...."
	Mr. W	"...No...."
	Mr. X	"...No...."
	Mr. Y	"...No...."
9. In your opinion, what are the key factors influencing the decision-making process when prioritizing maintenance tasks for shophouse heritage buildings?	Mr. Z	"...No...."
	Mr. U	"...Age of the building...."
	Mr. V	"...Security of tenants and customers...."
	Mr. W	"...Age of the building...."
	Mr. X	"...Serious and persistent building defects...."
	Mr. Y	"...Building condition...."
	Mr. Z	"...Building condition...."

Based on the respondents' answers, the majority of respondents do not have specific knowledge of heritage building maintenance because they do not get specific exposure to each heritage building material. Only Mr. V and W have little knowledge about the specific treatments of heritage buildings, however they change the materials not according to the origin and do not make any changes to the materials. Based on the table above, most respondents do not have any incentives from the government and non-government bodies to maintain shophouse buildings. Also based on the table above most respondents do not have any reference to perform maintenance on heritage buildings. Most of them have done maintenance on their shop building but only Mr. W and Y still maintained the original materials. Mr. U, V, X and Z however, have done major renovations to the building causing them to change the original materials and change the interior of the shop. Most of them expressed the main concern when planning to develop the heritage building, which is not having knowledge of the correct procedures to carry out the maintenance of heritage buildings. Owners of heritage buildings X and Z have concerns regarding the high cost of carrying out maintenance of heritage buildings and owners of heritage buildings Y find it difficult to find a heritage building maintenance group. In addition, majority of respondents faced problems in preserving the characteristics of historic buildings. Respondents U and X stated that they face financial problems because replacing with original materials requires high costs while respondent V faces the challenge of not having

knowledge about the steps and procedures of heritage building maintenance. Respondent Z does not have any challenges related to the conservation of heritage buildings.

Based on the respondents, the majority of them stated that the challenges in maintaining heritage buildings are due to the guidelines for the maintenance of heritage buildings. Respondent U stated that the building owner did not follow the set guidelines because as stated by respondent W, the building owner lacked knowledge about the maintenance guidelines for heritage buildings. While respondent V stated that maintaining the integrity of the building, fuel and wood is a challenge in maintaining heritage buildings. Based on the answers of the respondents, all of them stated that the building owner needs to send the plan to the local authority first to get approval from the local authority. If the building owner needs advice, the building owner should seek advice from George Town World Heritage Incorporated (GTWHI) first. Based on the table above, all respondents stated the guidelines that building owners need to refer to before and during maintenance in the shophouse. Among the references provided are George Town UNESCO World Heritage Site Special Area Plan Replacement Volume II: Development Control, National Heritage Act 2005 (Act 645), Roads, Drainage and Buildings Act 1974 (Act 133) and Local Government Act 1976 (Act 171). For the convenience of building owners, all guidelines and acts will be uploaded on the MBPP and GTWHI websites. Based on the respondents, the majority stated that before doing any maintenance, building owners should get approval from the local authorities first. Get advice from GTWHI regarding the procedures to be done especially for building owners who lack knowledge regarding maintenance procedures. Based on the answers of the respondents, there are steps taken by the local authorities in collaboration with GTWHI namely Heritage Building Restoration Workshops, Regulatory Compliance and Support program organized by GTWHI and MPPP and Technical Advisory Services. This aims to provide exposure and knowledge to building owners regarding the maintenance procedures of heritage buildings and also the treatment carried out for heritage buildings. Based on the answers from the respondents, all of them stated the actions that will be imposed on them and the maintenance team if they fail to get the approval and compliance of the plan from the local authority. Respondents X and Z stated that the case would be taken to court and a notice would be issued. While respondent Y stated the action that will be taken on the maintenance team, namely the architect and engineer, that the license of both will be suspended for 2 years if they fail to comply with the regulations from the local authorities.

In Table 9 however, it summarizes the answers from the three experts (Engineer, Technical assistant architecture and architect) as listed in Table 6.

Table 9

Maintenance team answer

No.	Questions	Respondent	Answers
1.	What are the problems faced in maintaining heritage buildings?	A	"...Owners do not follow set guidelines ..."
		B	"...Moisture, wood material integrity, fire risks ..."
		C	"...Structural integrity and lack of owner knowledge ..."
2.	Is there a procedure to be carried out by the owner of the heritage shop building before the maintenance of this heritage building?	A	"...Proposals and plans must be approved by local authorities ..."
		B	"...Seek advice from GTWHI and get plan approval from Penang City Council ..."
		C	"...Plans need approval from Penang City Council, with advice from GTWHI if needed ..."

3. Are there any guidelines provided as a reference for building owners and maintenance groups to carry out maintenance work?	A	"...GEORGE TOWN UNESCO WORLD HERITAGE SITE Special Area Plan Replacement VOLUME II: DEVELOPMENTS CONTROL ..."
	B	"...National Heritage Act 2005 (Act 645), Street, Drainage and Building Act 1974 (Act 133), Local Government Act 1976 (Act 171) ..."
	C	"...National Heritage Act 2005 (Act 645), Street, Drainage and Building Act 1974 (Act 133), Local Government Act 1976 (Act 171) ..."
4. What is the best procedure for carrying out maintenance work in dealing with defects in heritage buildings in George Town, Penang?	A	"...Advice from GTWHI, appoint certified professionals, submit plans, notify MBPP after completion ..."
	B	"...there are no clear guidelines to refer Minor maintenance doesn't need approval; major requires GTWHI advice, plan submission, certified professionals, final approval..."
	C	"...Emphasis on certified professionals and approval process ..."
5. What steps have been taken to increase the knowledge and awareness of heritage building owners regarding the maintenance of heritage buildings and guidelines?	A	"...Attend seminars and classes held by GTWHI ..."
	B	
	C	
6. Are the actions imposed if the owner of the heritage building fails to obtain approval from the local authority to repair and maintain the shophouse building?	A	"...Notice issued, court action, possible demolition ..."
	B	"...Suspension of architects' and engineers' licenses ..."
	C	"...Case taken to court ..."

5. Conclusions

The visual inspection led to the conclusion that the shop buildings have 24 defects. The most commented defects were peeling of paint, discoloration, termite attack and loose of plaster. The main cause of this defect was paint peeling due to natural weathering, high moisture and poor maintenance causing paint peeling to occur. Repairing defects right away is necessary to prevent more significant ones from developing. However, the owner of a heritage building must follow the established protocol and obtain prior authorization from the local government before beginning any repairs on the structure. On the other hand, the majority of building owners do not request for permission from municipal authorities to perform minimal repairs. Building owners should initially consult GTWHI for guidance if they are unfamiliar with the protocols and practices involved in maintaining historic structures. Building owners were seemingly having few concerns regarding the treatment work at their heritage buildings. Firstly, building owners were concerned on the specific treatment of heritage buildings which were related to no clear guidelines, maintaining the same material on the elements due to height and that there was no incentive given to building maintenance. A lack of exposure on maintenance procedures for heritage buildings caused building owners to change the original internal form of the building that suit the current function of the building, without obtaining approval from the local authority. The original materials on the building elements were also not preserved because the materials were hard to find and it takes a long time

to get them. Factors that enable the conversion of original materials on building elements were due to that there was no incentive given by the government and to obtain the same materials required high cost.

As suggested by the experts, before starting any maintenance of a heritage building, the building owner must follow the procedure that has been set and ask permission from the local authority. However, if the building owner wanted to carry out minor maintenance, he or she does not need to obtain approval from the local authority. For building owners who do not know of any procedures and acts involved in the maintenance of heritage buildings should seek advice from GTWHI first. However, if carrying out major maintenance building owners should seek advice from GTWHI. After getting advice, the building owner needs to appoint a certified architect and engineer. Once the process is complete, the building owner must submit a building maintenance plan and deliver it to the local authority. Therefore, future research on this area is suggested to be conducted in order to develop a comprehensive set of specific guidelines, as a reference for owners of heritage buildings, especially related to the maintenance procedure and conservation work at heritage buildings.

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