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### **Condition and Defect Surveys on Penang Heritage Centre: A Case Study on Georgetown World Heritage Building**

*Condition and defect surveys are process which appropriate experts investigates the existing condition of a building, carry out necessary tasks, evaluate the data collected, make the recommendations professionally about the remedial and predict performance of the building. This paper focuses on condition and defect surveys on Penang Heritage Centre, Malaysia. This building is listed as one of the buildings under Georgetown World Heritage Site. Penang Heritage Trust is a heritage shop house designed with Southern Chinese Eclectic Style. It has Chinese, European and Indian style influence. Chinese style influence on the carved timber door, air vents, gable and end, air-well and etc. While, European and Indian influences can be seen from the design of the louvered shutters and U/V-shaped terracotta roof tiles.*

**Keywords:** *Building Survey, Inspection, Building Defects, Building Failures, Remedy*

#### **1. Introduction**

It should be pointed out that defects and failures are common phenomenon occurred in buildings. The age of buildings influence the defects and failures on particular building. Hence, the building survey principle is to underline the significant issues and provide a methodical perceptive of the property either is in good condition or bad [1]. The owners of building will be alarmed about the defects occurred in their property that may lead to serious problems and surveyor will find cause of the defects and remedial for it. Pictures, notes or maybe a video will be taken by a surveyor as prove of the building defects. In order to overcome this predicament, a building survey must be conducted in order to recognize which part of building needs a treatment or a further examination. The ignorance about the defects on a building will direct to negative impacts that may take place towards

safety and costs. Besides, if the defects and failures are left unrequited and untreated, the building may fall to pieces. For a heritage building, the restoration is significant in order to preserve the physical strength, traditional value and longer the age of building [2]. Therefore, the building survey is a need to give an answer of solution to treat the sick part of particular building.

The principles of building diagnostic are part of building pathology that deals with methodology and techniques for determining and adopt a systematic method while exercising professional judgment [1]. Building pathology provide an interdisciplinary approach to the study of defects and performance in order to develop remedial and solutions. It will consider how the structure and materials of building relate to the environment such as air humidity, dampness, thermal, weather, and moisture [2]. The purpose of building pathology branch is to provide understanding of building failure. While building diagnostic is characterizing the damage, it is process called damage assessment. It is like we employ state of the art analysis to determine the distribution and severity of current damages while building assessment means we make building better for work, live and play [3]. In order to carry out this condition and defect surveys, Penang Heritage Trust building was chosen. For Penang Heritage Trust that exists more than 20 years, the defects must be a lot but since this property just undergoes restoration works, the overall performance of this property is in good acceptable order. There are fewer defects presented, and the cause of the defects will be given as well.

At past, the first office was located at Stewart Lane, and later relocated to Church Street, just opposite Pinang Peranakan Mansion. Both venues occupy a shop house, which is synonym to the landscape of old George Town. It is also not a coincidence that the logo for PHT depicts a Strait Chinese Style Shop house. The membership of the trust is open to everyone, regardless of nationalities. There are two types of membership, ordinary membership which is a renewable annually or lifetime membership, which would entitle you to several privileges. Because of the joint effort of PHT members, the people of Penang and the local government, George Town achieved the status of UNESCO's historic city. The passion and commitment from this group of extraordinary people is astounding.

## **2. Methodology**

In sequence to conduct condition and defect surveys on this property, a few procedures are followed. First of all, the approvals from the owner or his representative must be obtained. After got the permission, the building condition survey and inspection was done with all required observation and reasonable skills. All the defects, failures, crack and any damaged elements was observed and recorded except for areas which is inaccessible such as floor fitting, covered with finished or furniture and etc. For the unseen areas, the further inspection is recommended to avoid risks to the property.

### **3. Observation, Result and Discussion**

#### ***a. Roof***

There is no inspection that has been done since the roof part is inaccessible. The leakage of the roof is absence based on inspection inside the property does not mean the roof is free from any defects or failures. From general sight, the condition of roof is in good order

#### ***b. Rainwater Goods***

No evidence of any significant defects was found. There is also no leakage on pipes. The Legal Adviser will be able to check if the surface water and foul sewer are together channelled or the systems are separate. Figure 1 shows the drainage and rainwater pipes on the inspected building. It should be pointed out that the drainage and rainwater pipes were in good condition. Regular maintenance was done in order to make sure the drainage and rainwater pipes for this building works well.



**Figure 1.** The drainage and rainwater pipes was in good condition from accessible inspection

#### ***c. External walls and elevation***

Figure 2 visualizes the condition of external walls and elevation of the building. It can be clearly seen that there are some of minor defects on the external walls. There are peeling paintings and crack on left column of walls. There also had a stain coating on upper of the walls.



**Figure 2.** From left: the paint layer was peeling. Second: there is crack on upper part of column. Third: There is colour change, Right: effect from dampness

The eroded painting may cause by the constantly exposed to temperature fluctuations, so the paint will expand and contract according to the chances in temperature. Over time, this will result in small cracks and openings that will allow the infiltration of moisture, salt and other chemicals that will cause rust and rapid deterioration of the paint. There is also effect from dampness and concrete render as shown in picture below.

#### ***d. Windows, door and external joinery***

There is no defects can be detected and the windows are in satisfactory order. The doors also have no defects or timber decay presence. It is free from termite an insects attack. Figure 3 shows the windows, door and external joinery of the inspected building. It been fixed with timber frame window and timber glazed door.



**Figure 3.** From left: timber frame window. Right: Timber glazed door

***e. External decorations***

The exterior decoration has peeling paint. It may be caused by the exposure of temperature outside the building. Figure 4 shows exterior decoration of the building. Upper floor uses mostly wood and ground floor uses paint as internal finishing for decorations.



**Figure 4.** Exterior decoration and appearance

***f. Ceilings***

The ceilings have been inspected from within the balcony and room. No opening up has been taken. Ceilings surfaces appear to be in reasonable condition and no signs of significant damage and distortion. There is present of maintenance ceiling in first floor ceiling. Figure 5 shows the ceiling of the first floor which is free from any defects.



**Figure 5.** The ceiling of the first floor free from defects

#### ***g. Internal walls and partitions***

Since the property is a small building, the partition used to divide the room is dining door. There is no concrete or wall partition. The door using timber and no decay and defect are detected. The internal wall of property is a good satisfactory condition. There is no peeling paint and defects

#### ***h. Floors***

There is limited inspection since some parts of the floors were covered by furniture and fitted covering. Based on the general inspection, there is no defect detected on terracotta tiles floor. At the first floor, the timber is used. On the room, the condition of timber is good.

No crack, colour changing, decay and sound are produced during walking on it. But in the balcony there is colour change in timber (Figure 6) but the strength of timber is in satisfactory grade. This may be due to age of buildings and the balcony part is exposed to outside factors like sun and other elements.



**Figure 6.** Black marks on the timber surface at balcony area

#### ***i. Internal joinery***

The timber folding door is in satisfactory order condition. There is no defects, colour changing, crack, timber decay and termite attack. The staircase also appears serviceable and satisfactory handrails.

#### ***j. Dampness***

During the inspection, the instruments of electronic meter were not carried out. But from bare eyes, it could be obviously seen the evidence of penetrating damp. It occurs when rain penetrates the external fabric of the building (Figure 7).



**Figure 7.** Penetrating damp evidence

***k. Timber decay and infestation***

All timber material use in accessible area is in satisfactory condition. No is no evidence of decay and infestation. There is only colour changing in balcony at first floor. But it is consider normal and safe considering the property age

***l. Thermal insulation***

The inspection on thermal insulation is not covered as detail as Energy Performance. You may ask Legal Advisor copy of certificate that have all relevant information and detail on this section or further assessment can be done

***m. Electricity***

The consumer unit is a modern switch device. The installation has plastic covered cables and reasonably modern switch gear. The lighting was enough and there is no need for upgrading the lights. In term of safety, the wiring and fitting is safe and in good order. The entire appliance was tested and there is no un-functional socket, plug, switch and any electricity appliances. However it is inaccessible to fully assess the condition of electricity based on visual inspection. There are many factors relating to the efficiency of electrical installation which can be only identified by Legal Advisor.

***n. Water supply***

External of the building, the main water is connected to copper plumbing. The internal stop tap is located in front of building. The water connected to toilet and sink inside the property. The pipe at sink and toilet were tested and in good satisfactory order.

#### 4. Conclusion

Historical buildings need building maintenance more than other newly built building to make sure it does not fall into several defects. If the defects were not taken seriously, it may lead to structural failure. In term of safety, it can help us to be more secure, safe and comfortable in building if the building performs high efficiency. The absent of defects, failures, crack and any others element that harm the performance of the building should be taken care and treat.

With regards to the condition survey and defect surveys carried out at Penang Heritage Trust building, it was found that Penang Heritage Trust can be considered as a well maintained historical building under the UNESCO World Heritage City of Penang. It has not much defects as compared to some other historical building under the Core Zone of heritage city. Penang Heritage Trust building has undergoes the restoration two years ago. Anyhow it should be pointed out that the building needs regular checking and maintenance from time to time.

In conclusion, to protect the general structural stability and life of a building, it is important to regularly inspect not only the main structural elements including foundations, walls and roofs, but other common building problems. As a conservation architect, engineer, surveyor, historian, planner or anyone who has the interest in saving our architectural heritage, we have to make certain that our historic buildings are handed to the next generation in good conditions.

#### References

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