COST CENTRES FOR RESTORATION WORK OF HISTORICAL BUILDING: A CASE STUDY IN GEORGE TOWN

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ABSTRACT

Conserving a building normally involve works that is rather different from new building construction. Nevertheless, there is still a need to prepare cost estimates before commencement of work and the norm for a quantity surveyor (QS) is to estimate the cost based on his experience in new building works. However, this method has its flaws where the QS tend to overlook the costs of highly specialized works that are critical to conservation work. Having said that, the QS do not have much option as anecdotal evidence suggests that there is insufficient cost data on restoration works to historical building. As such, a study was conducted to identify the cost centres of conservation works to heritage building in George Town. This paper discusses the findings from the case study of one of the selected buildings in George Town. The case study method is adopted in this research to enable in-depth and detail probing of the cost centres from the total costs of conservation works and also to understand the reasons for the high costs in certain work items. Generally, the major costs found in building conservation works are for restoration works and upgrading or improvement of M&E services to the building. Further studies on the various costs under restoration works revealed that columns, walls and partitions, roof, ceiling finishes, wall finishes, windows and doors and floors elements are the major cost centres for restoration works. The paper then further discusses the reasons for the above findings.

Keywords: Building Conservation Works, Cost Centres, George Town, Restoration Works, Cost Studies

1.0 INTRODUCTION

Building conservation generally involves the renovation of old structures, which could bring them back to fulfilling their original functions by contemporary standards or adapt them to new uses. According to Ahmad, A.G. (1998), historical buildings are preserved and conserved for various reasons, namely retention of historical values and development and also to promote tourism. The state of Penang is well known for the heritage character of its capital city, Georgetown. Compared to the fast industrializing and urbanizing landscape of Penang State, the old city still retains its charms and historical ambience. The Penang Island Municipal Council (MPPP) has adopted a heritage conservation policy for Georgetown and on 7th July 2008, UNESCO has listed Melaka and George Town as Historic Cities of the Straits of Melaka to the World Heritage List. According to the document submitted to UNESCO, the nominated property in the Historic City of George Town covers 109.38 ha and consists of the historic inner city on the north-east cape of Penang Island.

There are more than 1700 historic buildings within the core zone aligned on four main streets of Pengkalan Weld, Lebuh Pantai, Jalan Masjid Kapitan Keling and Lorong Love besides other perpendicular streets of Jalan Tun Syed Barakbah, Lebuh Light, Lebuh Bishop, Lebuh Gereja, Lebuh China, Lebuh Pasar, Lebuh Chulia, Lebuh Armenian and Lebuh Archeh.

Due to the listing, more property owners are starting to have an interest in restoring their property to take advantage of the city new status, causing an increase in restoration works. As such the demand for professionals such as conservation architect, quantity surveyors, building surveyors has also increase. However, the education and training of a quantity surveyor has always focussed on new building works. Due to the lack of experience in this area, many quantity surveyors are not familiar with the pricing for building conservation works. Unlike new building works where there are cost data to refer to, anecdotal evidence suggests that there is very limited cost data that quantity surveyors can refer to for historical building conservation work. Experience in new building works has shown that cost data plays an important role in the construction industry as it is an important source of reference for construction cost to both the quantity surveyor and the contractor. As such, the objective of this study is to define and identify cost centres for building conservation works to provide a guide for quantity surveyors in estimating such works in the future.

2.0 COST CENTRES OF BUILDING CONSERVATION WORKS

It is important to start out this paper with a clear definition of the terms 'cost centre', 'building conservation' and 'historical building'. According to Ashworth, A. (1988), 'cost centre' is defined as items of cost importance identified within a building project. In old buildings, the demolition and structural costs are minimal and the major factors that determine the overall cost of a project lie in the architectural and mechanical work (Fitch, 1992). Frequently, costs for mechanical and electrical work are high due to the complex nature of the systems installed. This element of the work is likely to remain an expensive item because historical buildings do not lend themselves to the installation of the quantity of ductwork and chases normally associated with mechanical and electrical equipment. Feilden (1994) recognises that, whilst the general renewal of building engineering services gives 'life' to these historic structures, their installation also causes acute technical and artistic problems. Fidler (1987) fears that old buildings are under threat from adaptive use, because it is often difficult to reconcile the technical requirements with the principles of conservation.

According to Lee (2006), Building Restoration Works and Mechanical and Electrical Works are the two major cost centres that need to be considered when preparing costs for all restoration projects. He also divided the restoration works into two elements called major and minor elements. Major elements are considered as important elements that must be priced and taken into account during the preparation of the estimate for restoration works. These major elements include roof and rainwater goods, floor structure and finishes, wall and column finishes and ceiling structure and finishes. The minor elements only appear on certain circumstances or can be interpreted as uncommon building trades or activities.

Ahmad, A.G., (1998) has defined 'building conservation' as the practice of keeping historical buildings intact. The term 'historical buildings' usually refers to old building that has historical and architectural value. The scopes of works for conservation works to historical building are different from new building works. There are some special scopes of works that is specifically for conservation works. These special scopes include the preparation of the dilapidation survey report and from this report defect repair methods and techniques can be identified. All building defects, methods and techniques will be recorded systematically by using the Historical Architectural Building Survey (HABS) documentation method. Scientific studies and laboratory tests will also be carried out before the completion of building conservation works.

3.0 METHODOLOGY

The case study building is selected through criterion sampling because the nature of the study which focus on understanding the cost centres of heritage conservation works. The criterion for selection is first laid down and samples that fulfil the criterion will be selected. Below are the criteria used to select the sampling for this study:

- The building must be a historical building.
- The building must be within Georgetown area.
- It must have complete bill of quantities in the tender document.
- No study has been conducted on the building before.

From a survey of all conservation works in George Town, fifteen projects are short-listed and upon closer examination, Building No. 57 is chosen as the case study as it fulfils all criteria. The other projects are rejected because some have been studied by other researcher while some does not have sufficient information for case study or the information is too old. As part of the data collection, the contract document for this project was reviewed to obtain the relevant information. Other than secondary data, interviews were also carried out with the consultants who have been involved in this project. In order to determine the cost centres, the study applied the Pareto principle which is also commonly known as the 80-20 rule. The Pareto principle states that, for many events, roughly 80% of the effects come from 20% of the causes (John Ref, F., 1997). Based on this principle, the study will define cost centre as those elements that contribute to 80% of the total cost.

4.0 ANALYSIS AND RESULTS

This section of the paper discusses the analyses conducted in this study. The analysis is performed using data obtained from the bill of quantities (BQ) for the case study building. The conservation works of this building was done in the year 2006.

Figure 1: Case study – Before restoration
(Source: www.hbp.usm.my/conservation/biodata.htm)

Figure 2: Case study – After restoration
(Source: www.pht.org.my/57-macalister-road.htm)

4.1 Historical background

The case study building came about from a proposal initiated in 1912 by two gentlemen, William Evans and William Peel, for a maternity hospital be set up in memory to King Edward VII (1901-1910). Among the major donors to the hospital fund included the Huttenbach brothers, Tye Kee Yoon, the 4th Chinese Consul to Penang, the Sarkies Brothers of E & O Hotel fame, the various

clan associations, and other pillars of early 20th century Penang society. The complex was used as the King Edward VII Memorial Hospital from 1915 until 1955. In 1955, the maternity hospital moved to its present premises along Jalan Residensi. A court order was called for the building to be used for charitable purposes. In order to generate an income for its upkeep, a petition was made that a part of the building be rented out to that regard. Between the 1950's to the 1980's, the case study building was occupied by many different tenants including the St John's Ambulance and the Red Crescent Society. It was also used as a training centre for adult education. The centre acted as a school providing skills training in electronics, metalwork and the like to youth who were unable to proceed beyond Form Three. These youth attended evening classes while being employed as parking attendants during the day. From year 1980 until 2006, there is no information available regarding the building. In the year 2006, restoration works was commenced by the Penang Municipal Council and in 2008, plans are underway to convert this case study building which is owned by the Penang Municipal Council into a museum and art gallery.

4.2 Elemental cost breakdown

The case study building is a combination of five blocks of building which are block A, B, C, D and E. The restoration works included all five blocks. The total cost for the works can divided into seven bills which consist of preliminaries, general works, restoration works, additional works, infrastructure works, prime cost and provisional sums and mechanical and electrical works. From the literature review, restoration works and mechanical and electrical works are the two major cost centres. However, only the elements under restoration works, general works and prime cost and provisional sums will be subject to further study.

Table I: Elemental Cost Breakdown

Bill No.	Item	Amount (RM)
1	Preliminaries	309,563
2	General Works	82,008
3	Restoration Works	3,348,820
4	Additional Works	392,280
5	Infrastructure Works	357,399
6	Prime Cost and Provisional Sums	700,000
7	Mechanical and Electrical Works	409,094
	TOTAL	**5,599,164**

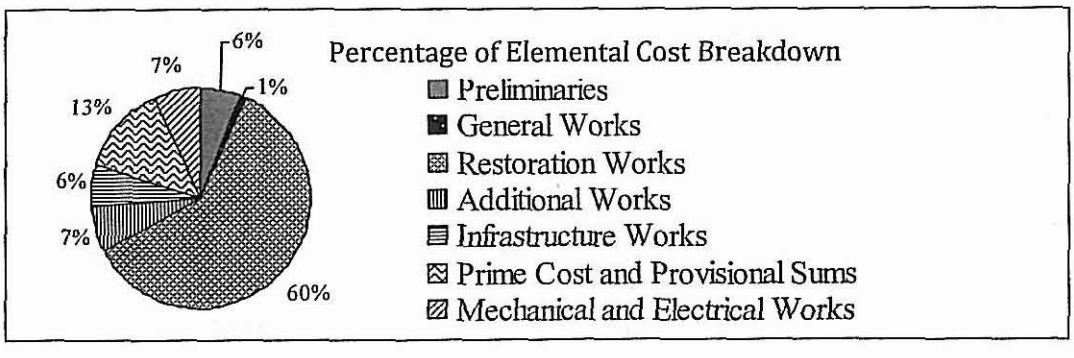

Figure 3: Percentage of elemental cost breakdown

The above cost breakdown clearly shows the cost for restoration works forms the highest cost. It takes up more than half of the overall cost which is 60% of the total cost of this project. The second major cost for this project is prime cost and provisional sums. Although general works forms only 1% of the total cost, the element under general works will still be investigated. This is

because the elements under this bill are works such as archaeological excavation, structural investigation and testing and anti termite treatment which are pertinent to building conservation projects.

4.3 Determination of Cost Centres

Table II below shows the elemental cost breakdown for restoration works, prime cost and provisional sums and general works. The elements are arranged according to the cost of the element in descending order. The contingency sum will not be taken into account because this element is a sum allocate for unforeseen works.

Table II: Cost breakdown for restoration works, prime cost and provisional sums and general works

No.	Item	Amount (RM)
1	Columns, Walls and Partitions	749,100
2	Roof	729,950
3	Ceiling Finishes	544,800
4	Wall Finishes	517,300
5	Windows and Doors	289,048
6	Floors	159,200
7	Historical Architecture Building Survey (HABS) drawings and documentation	150,000
8	Structural Repair Works	150,000
9	Demolition Works	104,440
10	Scientific Testing and Analysis	100,000
11	Floor Finishes	98,492
12	Plumbing Installation	77,200
13	Staircase	55,200
14	Bird/Bat Surveying Control	50,000
15	Rising Damp Control	50,000
16	Structural Investigation and Testing	41,008
17	Anti Termite Treatment	35,000
18	Sanitary Appliances	24,090
19	Archaeological Excavation	6,000
	Total	**3,930.828**

Table III: Percentage Calculation of Elements

Item No.	Percentage of Cost (%)	Percentage of Element (%)
1	19	5
1 & 2	38	11
1, 2 & 3	51	16
1, 2, 3 & 4	65	21
1, 2, 3, 4 & 5	72	26
1, 2, 3, 4, 5 & 6	76	32
1, 2, 3, 4, 5, 6 & 7	80	37

From the table III above, it shows that the top seven elements which constitute 37% of the entire element contribute to 80% of cost. The top seven elements are columns, walls and partitions, roof, ceiling finishes, wall finishes, windows and doors, floors and HABS report. There are some reasons for chosen HABS report as the cost centre instead of structural repair works although both of them are having the same cost. According to the interviewee, the structural for this building is 90% defective and thus strengthening of the foundation is needed. So the cost for this item is higher if compare to other buildings. Nevertheless, under the requirement by the Museum and Antiquity Department of Malaysia, conservation work should involve a systematic method of recording and

documentation based on the HABS and according to the interviewee the minimum fee for prepare a HABS report is RM150,000.00 per building. So, the cost centre is chosen base on above reasons.

4.4 Detail Breakdown of Cost Centre

Detail Breakdown for Columns, Walls and Partitions Element

Table IV: Detail Breakdown for Columns, Walls and Partitions Element

No.	Item	Amount (RM)
1	New walls	5,300
2	Restore existing walls and columns	143,000
3	Restore existing concrete railing and balustrades	65,000
4	Restore existing timber railing and balustrades	5,500
5	Restore existing decorative cornices and ornaments	423,000
6	Restore existing timber partitions	3,200
7	Restore existing timber louvered sunshades	66,000
8	Restore existing timber framed fixed glass panel	7,500
9	Restore existing wire mesh panels	1,000
10	Sundries	30,000
11	Credit value of item	(400)
	Total	**749,100**

The item contributing to the highest cost for the restoration of columns, walls and partitions element is the restoration of existing decorative cornices and ornaments. It takes up 56.47% of the total cost for restoration of this element. The scopes of work under this item include:

- Remove all loose and flaking paint; make good surface cracks on brickworks with approved grouting.
- Repair, restore and replace where necessary all chipped, cracked and damaged decorative cornices and ornaments; column pedestals and capitals.
- Reconstruct all missing decorative cornices, ornaments, column capitals to original design and specification to original design and specification.

The second highest cost for restoration of columns, walls and partitions element is the restoration of existing walls and columns item. The scopes of work under this item include:

- Remove all loose and flaking paint; make good surface cracks with approved grouting.
- Repair, restore and replace where necessary all weakened, cracked and damaged brick walls or / and columns with new bricks and technique.
- Carefully remove all defective mortar joints on brick walls or / and columns and replace with new approved mortar including all pointing works.

Detail Breakdown for Roof Element

Table V: Detail Breakdown of Roof Element

No.	Item	Amount (RM)
1	Temporary roof	113,700
2	Disposal of birds waste	58,000
3	Roof tiles	194,800
4	Sisalation	12,000
5	Timber roof framing	190,950
6	Steel roof trusses	99,000
7	Restore existing concrete roof slab	4,400
8	Galvanised iron flashing and valley gutters	27,600
9	Rainwater goods	29,500
	Total	**729,950**

The item contributing to the highest cost for the restoration of roof element is roof tiles. Type of roof tile used in this building is Marseille roof tile. The cost for one piece of this type of tile is around RM3.50. The scope of work under this item includes:

- Carefully dismantle and remove existing roof tile.
- Select, clean and treat existing roof tiles which are still in reasonable good condition.
- Supply, clean and treat as described and install second-hand similar roof tiles and accessories to replace damaged or missing roof tiles.
- Prepare and apply approved anti-fungus treatment to surface of Marseille tiles.

The second highest cost for roof restoration is timber roof framing item. The scope of work under this item includes:

- Treat all timber roof components; identify all deterioration due to rot, insect attack, termite infestation or other defects.
- Check all existing joints, repair or replace all damaged parts; clean, scrape off existing paint and repaint all metal plates, bolts, nuts and all metal surfaces with approved antirust painting system.
- Cut off carefully all infected and deteriorated timber, replace with well seasoned second-hand or new similar timber to batten and fascia board.
- Scrape off and remove existing painting works and prepare and making good surfaces to receive new finishes on timber surface of fascia board.
- Prepare and apply anti-termite and anti-fungus treatment to timber surfaces of timber batten and fascia board.
- Prepare and apply one undercoat and two finishing coats of 'ICI satinwood' matt finish paint on timber surfaces of fascia board.

These roof defects are one of the common building defects that occur in this country. There are some reasons why roof tiles and timber roof framing form the major cost. The damaged or missing roof tiles are unavailable in the current market and to specially manufacture it will incur extra cost. Besides that, some of the restoration works may require skilled artisan or skilled labourer from overseas. These factors must be taken into consideration when pricing for the conservation works.

Detail Breakdown for Ceiling Finishes Element

Table VI: Detail Breakdown of Ceiling Finishes Element

No.	Item	Amount (RM)
1	New timber strip ceiling	152,500
2	Restore existing plastered ceiling	60,600
3	Restore existing timber strip ceiling	331,700
	Total	**544,800**

The item contributing to the highest cost for the restoration of ceiling finishes element is restoration of existing timber strip ceiling. It takes up 60.88% of the total cost for restoration of this element. This is because almost 80% of the ceiling finish is timber strip ceiling finish. The scope of work under this item includes:

- Trace all timber strip ceiling joists and board, identify rot, insect infested and defective timber members.
- Check all existing joints, repair or replace all damaged parts as described; clean and scrape off existing paint and repaint all metal plates, bolts, nuts and all metal surfaces.
- Cut off carefully infested and defective timber strip ceiling joints and board as described, replace with well seasoned second-hand or new similar timber with approved jointing technique including stainless steel plates, bolts and nuts and all necessary fixing accessories.
- Repair and restore cracked, chipped, stained, loose and squeaking timber strip ceiling by approved techniques.
- Scrape off and remove existing painting works of timber strip ceiling boards and joints including preparing and making good surfaces to receive new finishes.
- Prepare and apply anti-termite and anti-fungus treatment to the surfaces of timber strip ceiling.
- Prepare, sand down, apply two coats of 'Siscoceal' wood stain varnish with polyurethane dressing finish to timber strip ceiling boards and joints.

Detail Breakdown for Wall Finishes Element

Table VII: Detail Breakdown of Wall Finishes Element

No.	Item	Amount (RM)
1	New wall finishes	40,100
2	Restore existing wall finishes	477,700
3	Credit value of item	(500)
	Total	**517,300**

The scope of work for the restoration of existing wall finishes includes:

- Scrape off and remove existing painting works including preparing and making good surfaces to receive new finishes.
- Remove existing cement patching works, repair and restore existing crumbled, loose, weakened lime plastering as specified to match existing including preparing and making good surfaces to receive finishes.
- Prepare and apply anti-termite and anti-fungus treatment.
- Prepare and apply one undercoat and two finishing coats to wall.

The cost for this item is high due to a big portion of the wall (80%) needed to be repainted. The works for repainting existing wall is more difficult as compare to new wall. So, the cost for this item is higher.

Detail Breakdown for Windows and Doors Element

Table VIII: Detail Breakdown of Windows and Doors Element

No.	Item	Amount (RM)
1	New windows	9,400
2	New doors	42,902
3	Sundries	8,750
4	New glazings	18,670
5	Restore existing windows	50,590
6	Restore existing doors	68,890
7	Sundries	4,560
8	New ironmongeries	85,486
9	Credit value of item	(200)
	Total	**289,048**

The item contributing to the highest cost for the restoration of windows and doors element is new ironmongeries. It takes up around 30% of the total cost for restoration of this element. This is because almost 90% of the ironmongeries are damaged. The ironmongeries that needed to be changed are lockset, latches, hinges, window stay and bolts.

Detail Breakdown for Floors Element

Table IX: Detail Breakdown for Floors Element

No.	Item	Amount (RM)
1	New concrete flooring	39,200
2	Restore existing concrete flooring	70,000
3	Restore existing timber strip flooring	50,000
	Total	**159,200**

The item contributing to the highest cost for the restoration of floors element is the restoration of existing concrete flooring. The concrete flooring is the major type of flooring for this case study building. The scope of work under this item includes:

- Trace all concrete floor slab, identify al cracks, chipped and weakened and defective slab.
- Repair all structural cracks by means of epoxy resin pressure injection technique or equivalent as specified.

5.0 DISCUSSION

Although the above case study uses only one building but the breakdown of costs derived from the case study is still useful as a costing guide for future conservation projects. The breakdown of costs provides an indicator to a quantity surveyor on the major costs of conserving a building. Having this indicator would enable a quantity surveyor to focus on the critical items and ensure that the costs for items specific to conservation works are included in the estimate or tender.

The cost centres derived from this case study consists of columns, walls and partitions, roof, ceiling finishes, wall finishes, windows and doors, floors and HABS drawings and documentation.

The cost centres found in this study would be applicable to buildings of similar type and age to the case-study building. Usually building elements that are exposed to the weather would have a higher degree of damaged than the internal parts. As such, columns, especially external columns, walls and roof would need extensive repairs. Finishes to the building would experience damage due to wear and tear and the conservation effort may see the need to perform extensive restoration. Sometimes, restorations are also needed to remove the existing finishes and reinstate back the original design. Timber elements, such as windows and doors are also susceptible to damage and therefore would be expensive to replace especially if there is a need for custom-made windows and doors to match with the original piece. HABS drawings and documentation are an integral part of heritage conservation works but is totally not needed in new building projects. The details and documentations required for HABS entails laborious work and this would not come cheap. As such, by following the cost centres derived above, a quantity surveyor would be adequately reminded to include all the major costs that are pertinent to building conservation works. It is not the intention of this study to provide the cost range for the works but only an indication of the major cost centres to provide a useful guide for estimating building conservation works. In order to capture the complete costs, a quantity surveyor would need to be mindful of the works involved, be it repairs work, restorations or compliance with heritage guidelines.

6.0 CONCLUSION

Much research has been done on the restoration methods for building conservation works but studies on cost centres in building conservation works are rarely carried out. As such, this study attempts to identify the cost centres of conservation works for a historical building. Its aim is to obtain an indication of which elements form the cost centres for building conservation works. It is hopes that the findings may be use as a baseline reference for future conservation projects. The total cost for the case study building is RM5,599,164.00 Based on pareto principles, 80% of the cost will come from the 20% of the elements. Although the ratio for the case study is not exact 80:20 but it is a close 80:37. This means that 80% of the total cost comes from the 37% of the elements. As such, the cost centres identified for this building are wall, columns and partitions, roof, ceiling finishes, wall finishes, windows and doors, floors and HABS drawings and documentation. This is because these seven elements constitute 80% of the total building restoration cost. By understanding the major cost centres in building conservation works, a quantity surveyor would be able to provide a better estimate of the cost as the major elements are given careful consideration.

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Authos's Biography

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