Maintenance Costs of Condomuniums in João Pessoa - Brazil

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Abstract

Life cycle costing includes the costs of acquisition and the subsequent costs of operation, maintenance and disposal. This paper focuses attention on the cost of keeping the building in good repair and working condition (maintenance costs). It describes the results of a research developed in three condominiums in João Pessoa city. It was investigated all the maintenance costs for the buildings over a period of twenty months. It demonstrates that some items such as lifts are responsible for much of the maintenance. It also shows that maintenance costs represent some 18% of the total running costs of the condominiums analyzed. As unfortunately the maintenance costs of buildings are frequently difficult to asses the results of this paper are important in special for similar buildings.

Keywords: Maintenance cost, running cost, condominium.

1. Introduction

The operating costs of an asset can be defined as the costs associated with operating the building itself. They include the cost of cleaning, rates, energy and security (AL-HAJJ, 1999). In cases of condominiums it includes also administrative costs.

The maintenance costs are defined as all costs of keeping the building in good repair and working condition. This includes painting, repairs and renewals.

Very little consideration has been given to maintenance, operation and support. This practice has been expensive because the cost of maintenance, operation and support constitute a major portion of the asset life cycle cost (LCC) (EL-HARAM & HORNER, 2002).

Either the operating costs or the maintenance costs vary according a great number of aspects. There are various statistics related to several countries regarding the operation and maintenance of facilities.

In Canada, more than half the residential construction expenditure is on renovation and restoration works. Maintenance and renovation works in the United Kingdom were estimated to be about 46% of the total construction output in 1986, whereas for Singapore, with about 50% of its building stock below 10 years of age, such works accounted only for about 21% of the total construction output (KIANG, 1991).

In Sweden and Germany these costs are estimated to be 3% of the value of annual construction production (HAMMARLUND & JOSEPHSON, 1991, apud KOSKELA, 2000). For Norway, the corresponding figure is 5% (INGVALDSEN, 1994, apud KOSKELA, 2000).

In an analysis of occupancy costs for a range of commercial organizations, located in Hong Kong, Davis (2000) found that rent forms the major component of occupancy cost in Hong Kong and maintenance and running costs are the third most expensive item.

Marteinsson & Jónsson (1999) show that costs of maintenance are quite variable according to the age. The average annual maintenance cost for housing, calculated over 60 years, is 2% of the building cost for a new house. Other authors present similar results of maintenance costs in terms of building age (ASTERISK REALTY, 2009; ANDERSEN, 1995).

McEwan (2000) presented a research on Government buildings across the state of Queensland, taking into consideration several key factors including geographical location, size and complexity of asset design, to determine cost variances and possible funding models. One of the observation of the analysis was that there was a general decrease in maintenance cost as the gross floor area of facilities increased.

Other researches evaluate the maintenance cost for each item of the construction. Analyzing maintenance and operation costs in blocks of flats in Argentina during three years, Amarilla

(1992) showed that the main costs correspond to sanitary system, lifts, façade and roof waterproofing.

Based in a study realized in 20 university buildings over a period of 18 years, Al-Hajj (1999) and Al-Hajj & Horner (1998) concluded that 30% to 40% of the items of a building contribute to 80% to 90% of the maintenance costs.

In terms of maintenance costs related to condominiums there are still little research, in special in Brazil (MEIRA, 2002). In this work, a total ten buildings were chosen to be investigated. The author found that cleaning and maintenance contribute to 5% to 14% of the annual costs in the condominiums.

In the research described in this paper, the maintenance cost of twenty months of three condominiums were compiled and analyzed. The hypothesis applied in this research is that few items of maintenance concentrate the most of maintenance cost. The objective of the research is to analyze maintenance costs of condominiums in the city of João Pessoa- Brazil, determining the high-cost components. Moreover, it will investigate the effect of age on maintenance costs.

2. Methodology

This study was developed in João Pessoa city, located in the Paraíba state in the northeast part of Brazil.

The criteria to select the sample were:

- Building multi-storey, residential, with similar standard level of finishes.
- Located in the same area of the city (near the beach).
- The data collected, in terms of costs, should begin for all the buildings in the same period (month and year).
- Different ages of the buildings.

Thus, the first two criteria show that the effects on maintenance costs of location, size and finishes were not investigated.

The sample originally aimed to capture a great number of buildings (approximately twenty). However, in the most of cases the building managers did not permitted the access to condominiums costs. Then, after the period reserved for data collection, only three buildings (residential condominiums) were analyzed. This number of buildings undertook the analysis of the effect of age on maintenance costs, as will be seen in the results.

The maintenance cost data was collected during twenty months. The data collection began for all condominiums in the same month and year. During this period (January 2008 until August 2009) it was felt that the inflationary effects would be minimal and could therefore be ignored.

The authors were entirely responsible for collecting, checking and in some cases rechecking the data. They were available for consultation only in each condominium.

The costs of the twenty months for the three buildings were divided by the total area of all buildings to produce uniform costs. Thus, all the data are presented in dollars per built area.

Statistical data were obtained. They were analyzed and represented through graphs and tables.

It is important to point that the results of this study are valid for the building analyzed. However, similar results can be obtained for condominiums with similar characteristics.

3. Condominiums description

Three residential condominiums located in João Pessoa city were analyzed. They were identified by the letters A, B and C in order to preserve them. All of them were built near the beach. Table 1 shows distributions of age, neighborhood, built area, height, number of apartments and existence of lift.

Table 1: Characteristics of each condominium

Condominium	Age (years)	Neighborhood	Built area (m^2)	Height (number of paviments)	Number of apartments	Lift
A	5	Tambau	16.424,29	25	100	Yes
B	20	Bessa	3.144,00	03	24	No
C	25	Tambau	1.592,00	04	16	Yes

All buildings are under 30 years of age and the condominium identified by A is the newest and the largest of all them.

4. Costs of condominiums

A summary of average monthly maintenance cost (in $ per m^2) for the entire 20-month period of the study is given in Figure 1. Condominium A obtained the highest average cost of maintenance (0.33$/$m^2$).
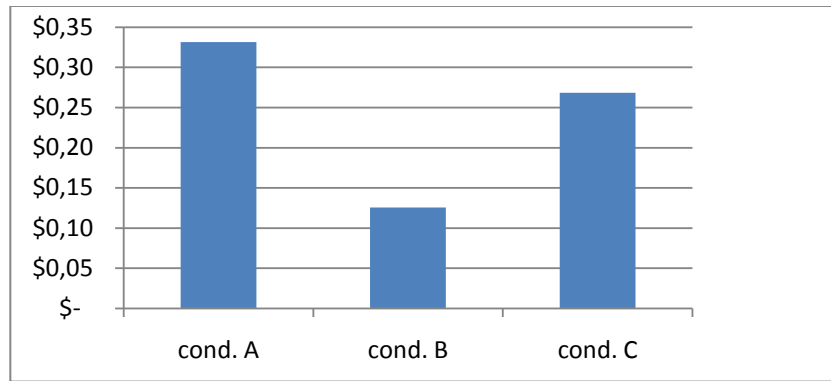
Figure 1: Average maintenance cost for the 20-month period ($/m²)

Comparing condominiums, the data collected showed noticeable variations of average costs of maintenance. The same variability can be observed for the maintenance costs of each condominium throughout the twenty months. Then, to better understand this variability it is important to analyze each building.

Condominium A

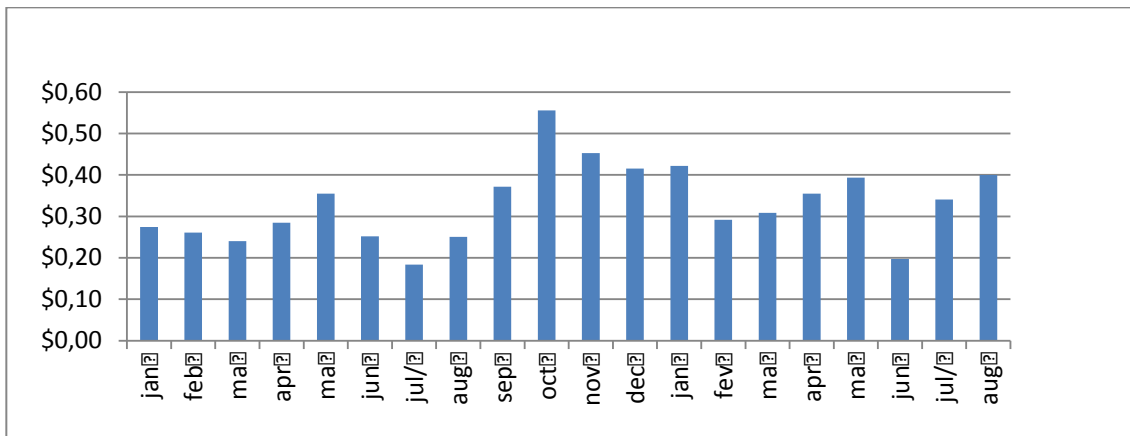Figure 2 shows distributions of monthly average costs of maintenance during the period studied.

Figure 2: Monthly average cost of maintenance

It can be observed that most of the cost is tightly grouped below 0.40$/m². Some months with outstandingly higher costs were due the repair in the expansion joints in this building. This item is responsible for almost 30% of the maintenance cost of the Condominium. In October 2008 it was observed the higher maintenance cost of maintenance. Besides spending on the repair in the expansion joints it was also the repair in the waterproofing. This occurred soon after the rainy season in the region, which justifies higher maintenance costs with these particular items.

Distributions for each of the maintenance cost items are given in Figures 3 and 4.
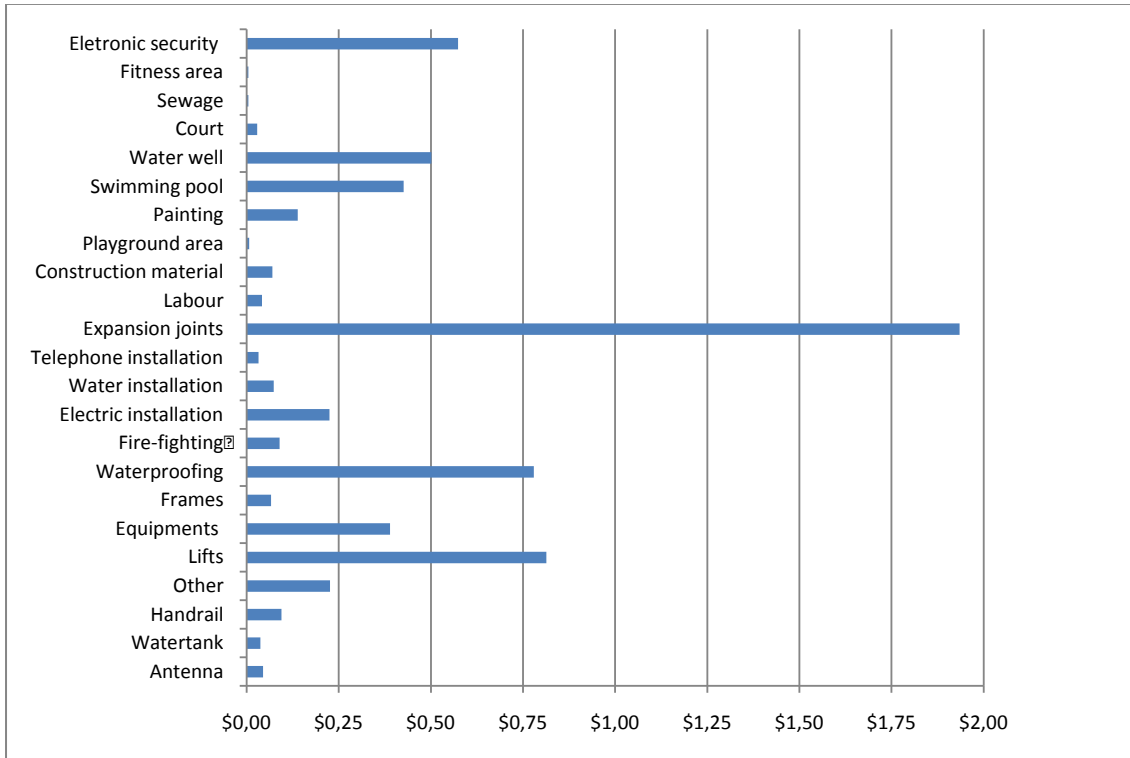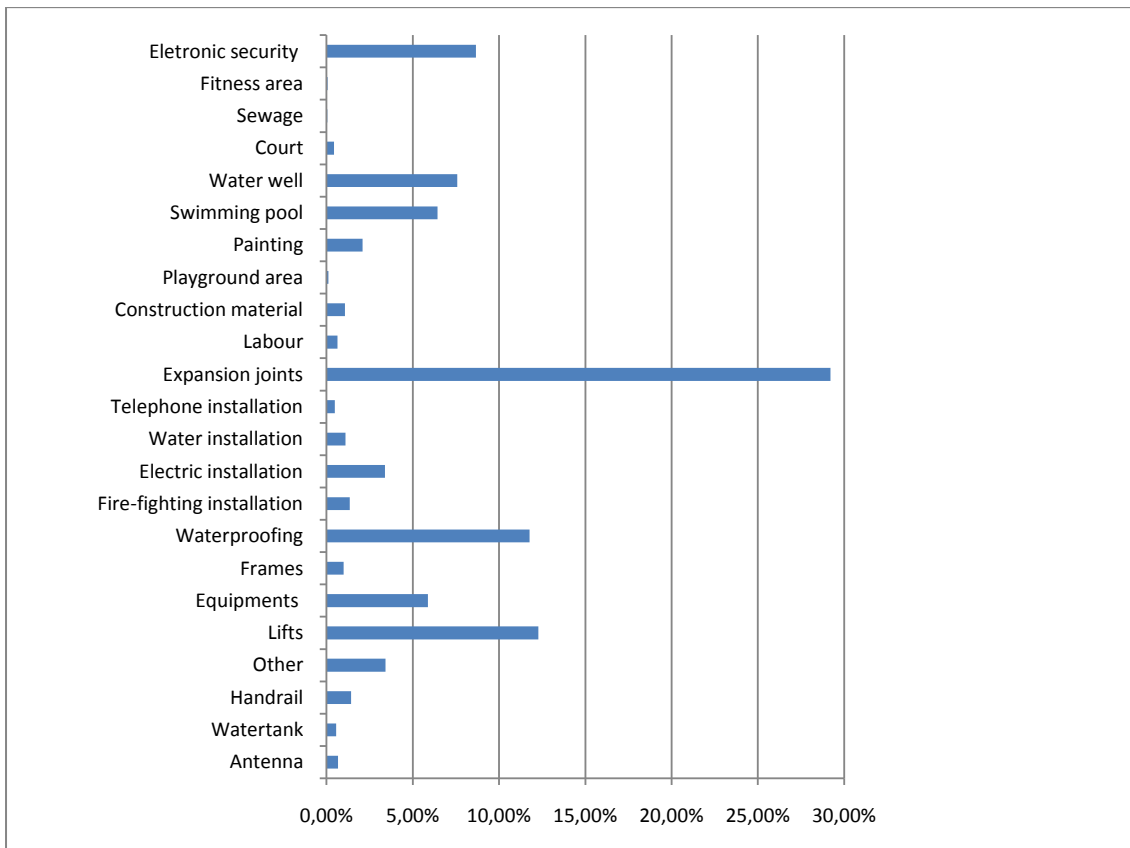
Figure 3: Total expenses per item ($/m²)

Figure 4: Distribution of items of maintenance costs (%)

It was observed that expansion joints maintenance does not occur continuously in this condominium. Moreover, the other two buildings had not this type of maintenance item. Then, to better compare the data, this item was removed and the new average maintenance cost of Condominium A decreased of 0.33$/m^2 to 0.21$/m^2. This new value is between the average maintenance cost of the two other buildings (Figure 1).

Considering the withdrawal of that item, lifts and waterproofing /grout were the most representative items in terms o maintenance costs. Each one represented around 17% of maintenance cost for this condominium.

Condominium B

In this case the average cost of maintenance was 0.13$/m^2. The distribution of monthly average costs of maintenance during the period is showed in Figure 5.
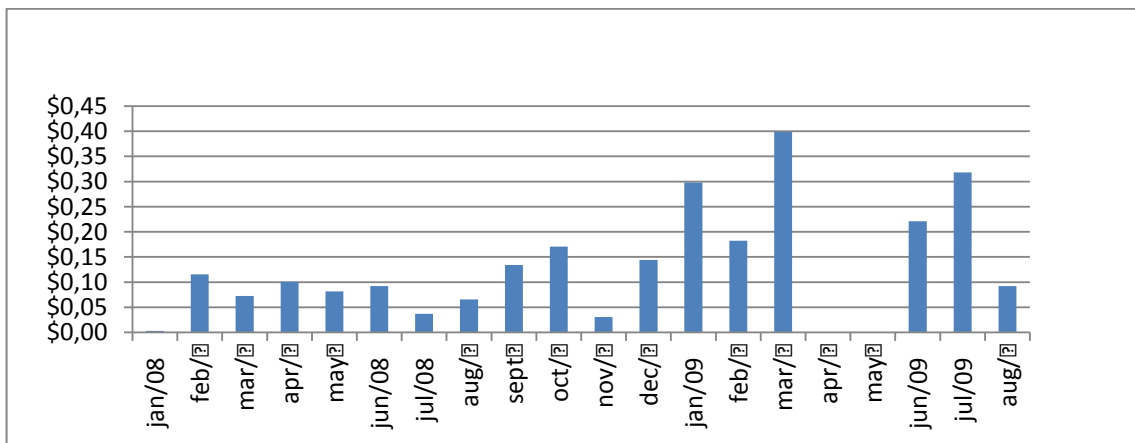

Figure 5: Monthly average cost of maintenance

It can be observed that maintenance costs present a very large variability during the twenty months studied. In some one it wasn't identified maintenance expenses. In April and May 2009, for example, there has been no maintenance cost. The use of corrective maintenance strategy justifies this result, because in this period no abnormality was identified in common areas. Moreover, in march 2010 it was identified the highest cost (0.40$/m^2). The maintenance in the electronic security system was responsible for much of that in this month. January and July 2009 were also high cost because of the maintenance in equipments in common area

In this condominium it wasn´t identified increase in maintenance costs after the rainy season, as observed in condominium A.

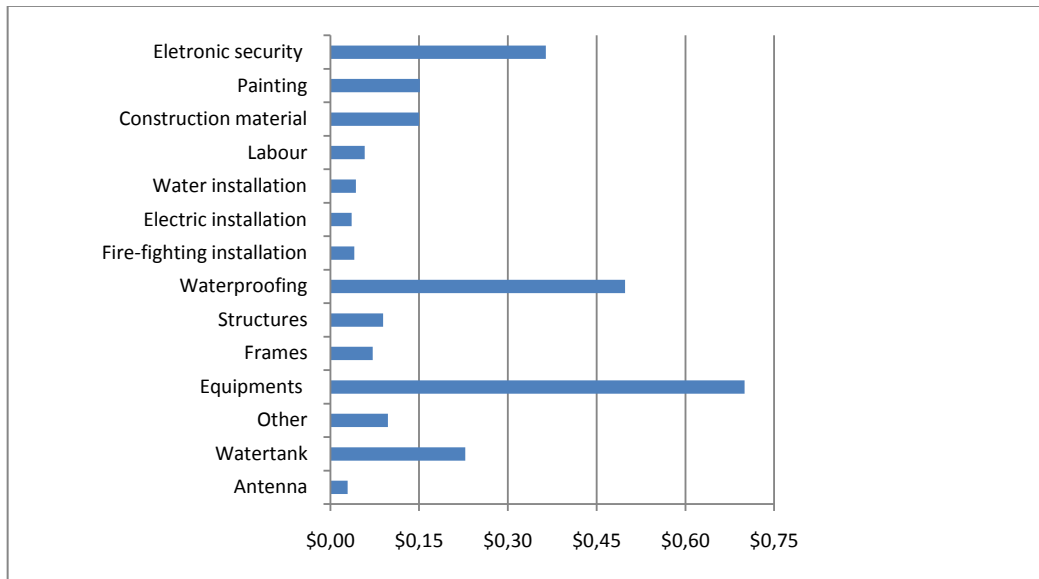Distributions for each of the maintenance cost items are given in Figures 6 and 7.

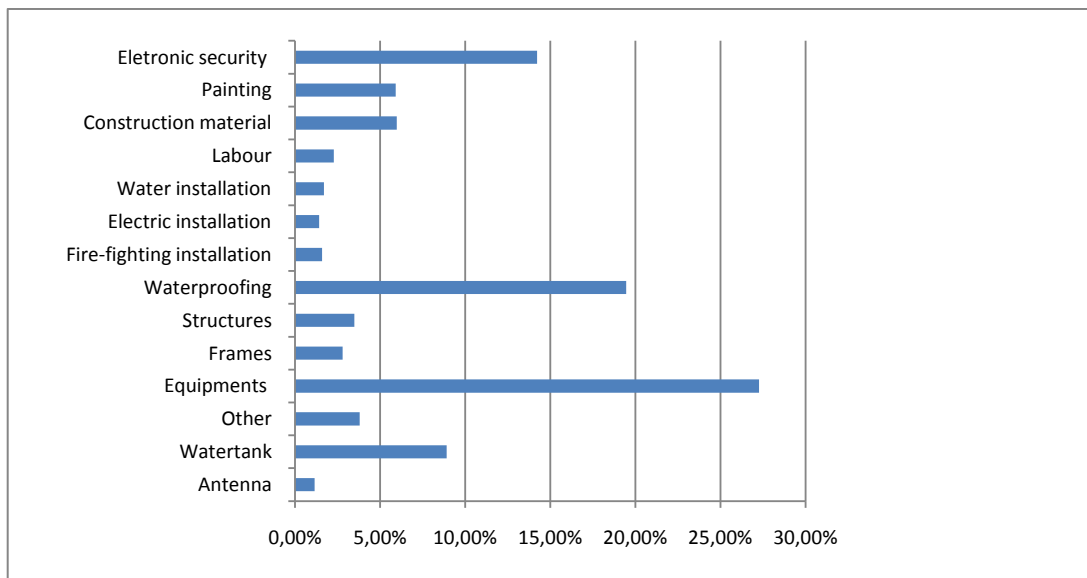*Figure 6: Total expenses per item ($/m²)*

Figure 7: Distribution of items of maintenance costs (%)

Equipment, waterproofing and electronic security were the most representative item of this condominium. These three items accounted for almost 60% of maintenance costs and only equipment was responsible for around 26% of the costs. The cost of waterproofing was around 19%. This value is closed to that found in Condominium A.

Condominium C

The average maintenance cost for this building was 0.26\$/m^2. The monthly distribution of costs is given in Figure 8.
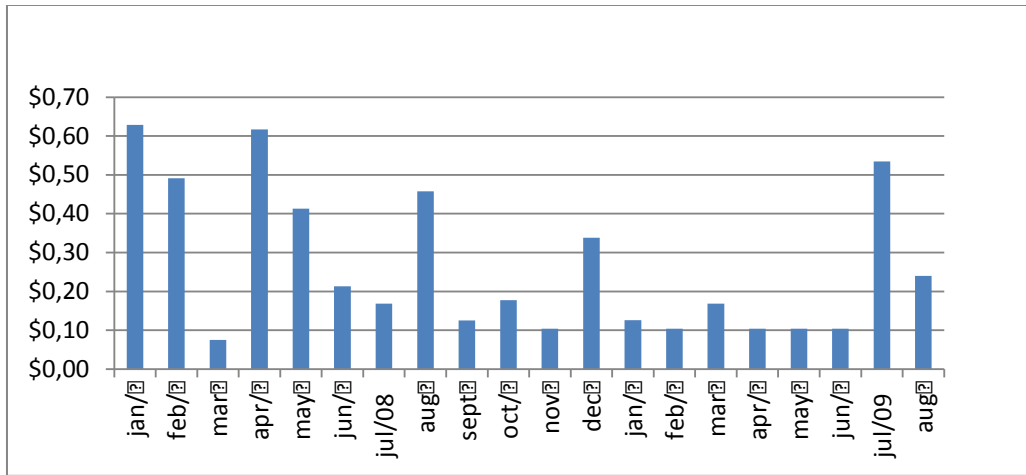

Figure 8: Monthly average cost of maintenance

During the twenty months, maintenance cost varied from 0.07 – 0.63\$/m^2, although for 60% of the months the cost was in the range from 0.07 – 0.21\$/m^2. January and April 2008 had high maintenance costs because of the extra services in the lifts and in the floors. Rainy season affect a little some maintenance costs, specifically in August 2008, where it was realized maintenance in the waterproofing of the condominium. Already in July 2009 there was an atypical spending on maintenance in the watertank which contributed to the increase in the cost this month.

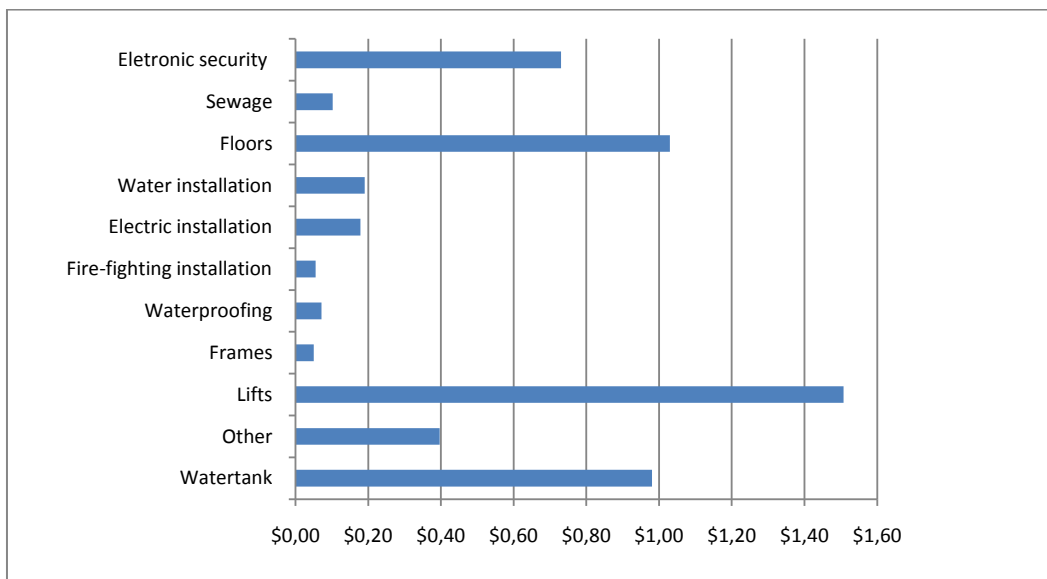Distributions for each of the maintenance cost items are given in Figures 9 and 10.

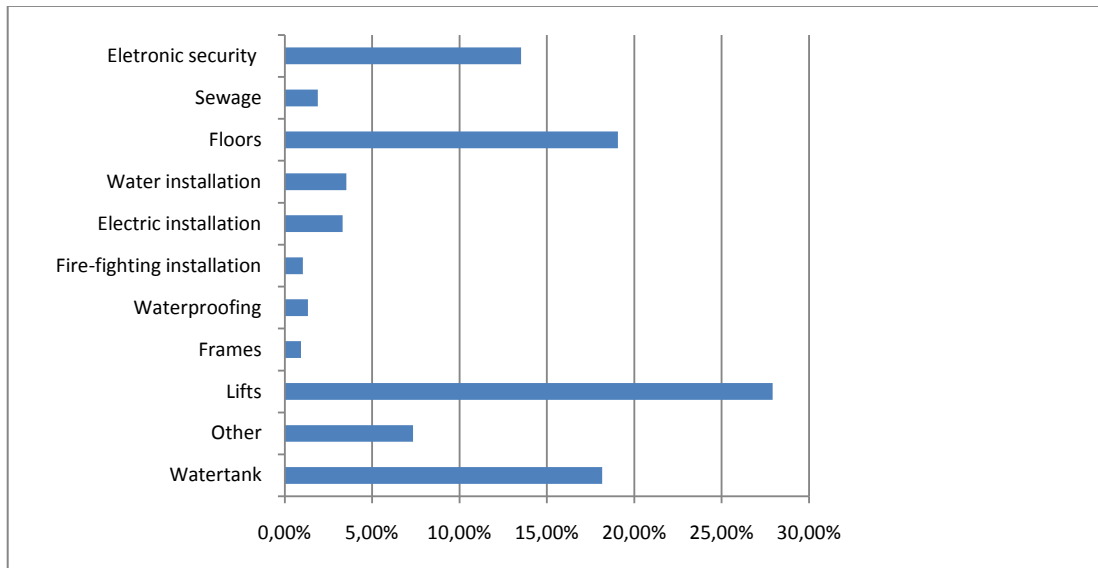*Figure 9: Total expenses per item (\$/m^2)*

Figure 10: Distribution of items of maintenance costs (%)

For the twenty months analysed, it can be observed that expenditures were concentrated in few items (only 11) and the most expensive items in terms of maintenance were lifts, floors, pumps and watertank. These three items account for 65.2% of the total maintenance cost. Other items had very little effect on the total maintenance cost.

An analysis of the most representative items of the other condominium shows that, for Condominium A, lifts is an item with a large percentage of cost at around 17%. For Condominium C the percentage of cost at almost 28%. It is noteworthy that in Condominium B there aren't lifts.

Comparative analysis

It is important to know how much of total running cost (operating cost and maintenance cost) is allocated for maintenance cost. This investigation can be seen in Figure 11.
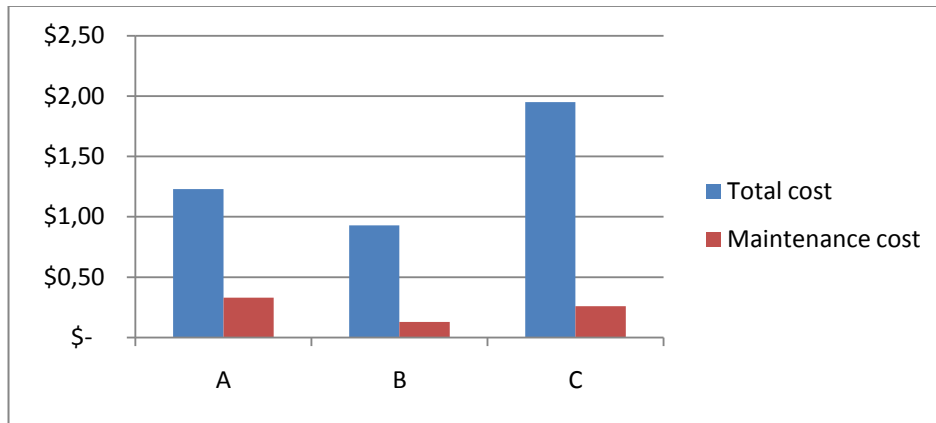
Figure 11: Average monthly running cost and average monthly maintenance cost

It is possible to see that Condominium C is the one with the highest total running cost (1.95$/m^2). From this value it is allocated 0.26$/m^2 for maintenance. It represents less than 15% of the total running cost. Condominium B has the lowest current cost (0.93$/m^2) and the lowest maintenance cost (0.13$/m^2). Maintenance represents almost 14% of the running cost. Condominium A has the largest number of items of maintenance (21 items) and the highest average monthly maintenance (0.33$/m^2). Running cost is responsible for 1.23$/m^2. Maintenance represents 26.8% of total running cost.

The average monthly running cost for the three condominiums is 1.37$/m^2 and the average monthly maintenance cost is 0.24$/m^2. The percentage of running cost is closed to 18%.

Figure 12 shows how the maintenance cost of the condominiums varies according to the age of them.
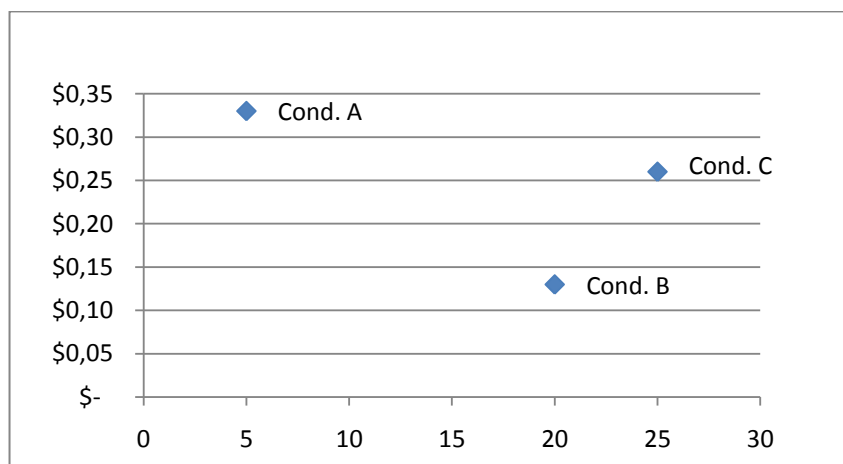

Figure 12: Average monthly maintenance cost by age of the building

The results demonstrate that there isn't a strong relationship between maintenance cost and age of the building, as several authors reported (MARTEINSSON and JÓNSSON, 1999; ANDERSEN, 1995).

5. Conclusions

Some aspects were concluded during this work:

- Few items concentrate most of the maintenance cost of the condominiums. This result in a very irregular distribution of costs.

- Lifts and waterproofing are the items responsible for higher costs in condominiums.

- It wasn't identified relationship between maintenance cost and age of the condominium, in contradiction with some authors. Although the number of condominiums studied was small, what makes the results representative only for the sample, the research could be more thorough in these cases, increasing the number of months analyzed. Twenty months is insufficient to study the effect of age on maintenance costs. Thus, for future works, it is suggested a longer period of investigated months.

- The rainy season in the region usually occurs during the months from May to July. It was observed some increases in the cost of some maintenance items in the months subsequent to such periods, as a consequence of the rainy season.

Finally, it is important to say that if maintenance costs are taken into account from design and construction stages, better buildings will be achieved, with moderate costs of maintenance during the life cycle. Moreover, if the studies related to maintenance were used by the buildings, it would be possible improve its services and reduce maintenance costs. However, it is interesting to note that only 5% of the organisations use the data collected from the maintenance function for any analysis (BRADSHAW, 2000).

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