

MAINTENANCE ISSUES CONSIDERING CONCEPTION OF COMPOSITE CITIES

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Abstract

The strong development of the majority of the cities motivated by transformation processes at the level of culture, social, economic and political and consequent build models, in many cases, without proper planning, without public spaces qualified, without attention to issues of accessibility and security, raise questions at the level of the organization, distribution and consumption, both at local level and on a global scale.

This paper intends to focus the discussion on the mechanisms that can ensure the permanence of the same quality in heterogeneous urban experience. Being a reality that the city may incur in fragmentation caused by discontinuities in its process of growth at various levels, it is considered that the maintenance can take a catalytic role, as a way to allow them to plan and control the mechanisms of degradation during the in-service behavior of its buildings and urban spaces. Without strategies and policies of maintenance the degradation mechanisms are much more accelerated.

The methodology provides simple tools that the author (s) of the project can use in design stage. Relevant maintenance actions are defined: Inspection, Pro-action, Cleaning, Correction, Sustainability Replacement, Legal enforcement, Limits of use. Using a Multicriteria Analysis (MCA) it is obtained a qualitative evaluation of different options based on maintenance requirements accomplishment.

As main conclusions it is considered that the building and their urban public spaces maintenance contribute to that fragmentation occurred by emerging conditions and transformations of contemporary society and the city can be integrated into policies and strategies that have been repaired with a planning throughout their service life become really and can ensure the heterogeneous quality of spaces that we inhabit.

Keywords: Maintenance; Architectural Design; Cities and Urban Scale; Decision Supporting System.

1. INTRODUCTION

An important contribution to the understanding of urban development of a city is the study of the structure, form, development and operation of its public spaces, because they are places of great dynamics and urban experience.

As far as the uses and activities, these are the basic pillars of any public space. They are the primary reason that leads an individual to go to space and back again. The operation of public spaces is also conditioned by the comfort and image. In fact, the perceiving than safety, cleanliness, the scale of the surrounding buildings and the own charm of space are fundamental characteristics at the time of choosing a public space where to go. These aspects have underlying maintenance issues.

In fact, the use phase and ownership of public space is based on a cyclic behaviour, which depend on the constructive solutions adopted among other factors. If there is maintenance of these spaces in service behaviour is much faster.

To think that the public space is designed with a life expectancy of several decades, it is clear that the need for maintenance actions to which this has to be subject to long their life. For this, it will be important to implement maintenance plans appropriate to the functionality and use of the public space, in order to avoid the adoption of corrective measures late that lead to the implementation of interventions very often inadequate.

It is therefore important to address the issue of management and maintenance of public spaces.

2. INTERVENTION STRATEGY

The need to identify a methodology supported by a decision support model, appears by stating the fact that there is a poor or absent implementation of processes and hole maintenance procedures during the process of design stage, because constructive solutions are not indifferent to the maintenance. (Figure 1)

One of the possible causes is the evidence of that, the architect in their conceptual options, is not aware of the implications of maintenance, resulting in constructive options with a framework does not intentional behaviour in service of these. The construction of a evaluation methodology aims to serve as a tool to support the project author during the design process. Faced with the choice of a particular solution, this approach seeks to identify what are the implications at the level of maintenance.



Figure 1. Example of equipment degraded urban and little functional. (Photo of Teresa Gomes)

A public space that is comfortable, safe, durable, that functions effectively, should take into account various aspects. The accessibility and vandal resistance, lighting, as well as the choice of urban furniture and equipment must be taken into account throughout the process.

2.1. Requirements of functional performance

The ISO 15686-10 (2010) defines requirement of functional performance as "the type and level of functionality that is required by the parties of a facility, building, or other property constructed, or even of a fitting, component or product, or well built mobile for a specific function". This performance takes place under conditions of specific use. The above-mentioned requirements, i.e. the general criteria, can be subdivided into more specific criteria, i.e. the requirements. The basic requirements of the building, in terms of human needs require that is convenient and comfortable, safe and durable. This translates into demands for comfort, safety and durability. (Fernandes Rocha, 2014)

In the specific context of maintenance and being aware of its importance in anticipation and prediction of possible malfunctions, it is important to establish a set of requirements in support of the same. There is a consensus that it should be in the design stage process that rise up the main issues related to the importance of an anticipation of what is intended, it will be the functional performance of the elements of a particular object architectonic building. It is at this stage that actually put the main issues that will be crucial to ensure the functional performance of a constructive solution. Must be considered:

Security Conditions - should be free from dangers for all users.

Comfort Conditions - should be careful with criteria such as the climate, the materials, the sound quality, the quality ergonomic and visual quality.

Conditions of adequacy - must be adaptable, that is, be prepared to respond to the changes that the space will have.

Conditions of durability - must take into account the resistance and durability of materials and equipment.

Conditions of economy - must take into account the costs involved in such a way as to ensure its sustainability.

2.2. Maintenance processes and procedures

The maintenance processes encompass a set of procedures and actions necessary for its implementation. It is through these last that is possible to ensure the life of the various elements and components of a building. The main maintenance procedures were called "big five" by Calejo Rodrigues (2004): Inspection, Pro-action, Cleaning, Repair and Replacement.

In the case of this study go to consider the same processes to the public space. After the framework carried out in this area of knowledge and bearing in mind the framework in the field of architecture, it is considered that, in addition to these processes are also to consider Sustainability in maintenance, the Legal Compliance and the Conditions of use. These processes are divided according to their nature and characterization in, execution operations, conditional and advice.

3. DECISION SUPPORT MODEL

The programs of retraining and design of public spaces should be designed and structured in order to maximize the effectiveness of their implementation. Were defined criteria and indicators considered relevant:

Importance Indicator (Idi) - evaluation of the importance of a maintenance process to ensure a particular requirement of functional performance and hole requirements;

Ease Indicator (Idf) - evaluation of the ease implementation of maintenance procedures/actions of each process, for a given constructive solution.

These indicators are assigned weights in accordance with a percentage between [0.100], with the objective to define at the end as mentioned, an Maintainability Index (**Ime**) for a constructive solution. The evaluation aims to be qualitative, since the purpose of this tool to help you be guiding and not prescriptive. (Fernandes Rocha, 2014)

The values for the Importance Indicator (**Idi**) have been previously defined by the author of the project, and were obtained with the completion of an audit supported by a personal interview and with the completion of a questionnaire.

The values for the Facility Indicator (**Idf**) are assigned by the project author, and is specific to each constructive solution, and has as a basis for guidance the assumptions set out in Table 1.

Table 1. Assessment of Ease Indicator. (**Idf**)

Ease Indicator		
Weighing %	Appreciation	Description
[0;20]	No ease for maintenance	The implementation of maintenance procedures/actions requires an very plus effort;
]20;40]	Little ease for maintenance	The implementation of maintenance procedures/actions requires a greater effort.
]40;60]	Moderate ease for maintenance	The implementation of maintenance procedures/actions requires little extra effort.
]60;80]	High for maintenance	The implementation of maintenance procedures/actions requires very little extra effort.
]80;100]	Very high for maintenance	The implementation of maintenance procedures/actions does not require any extra effort.

The combination of these two indicators determines a Maintainability Index (**Ime**) for each of the eight maintenance processes and is assigned to each constructive solution considered. This Index determines the predisposition of a solution for the performance of maintenance procedures. The conversions obtained at the end allow you to define a scale of assessment]0.5[the Maintainability Index for each maintenance process for each constructive solution. (Table 2)

Table 2. Index Assessment of Maintainability.

Index (Imex)		
CODE	Appreciation	Description
Ime0	Insufficient	No predisposition for maintenance performance procedures.
Ime1	Very weak	Very little predisposition for maintenance performance procedures.
Ime2	Weak	Little predisposition for maintenance performance procedures.
Ime3	Sufficient	Reasonable predisposition for maintenance performance procedures.
Ime4	Good	Good predisposition for maintenance performance procedures.
Ime5	Very Good	Very Good predisposition for maintenance performance procedures.

This final assessment on a qualitative scale want to be a tool to aid the project author, so that it can decide consciously and intentionally the constructive solution that best matches in response to its project, taking maintenance as part of this process of approach from the outset.

The present study is in phase of analysis, we present examples of maintenance recommendations possible to obtain with the methodology developed through the example shown in Figure 1.

Recommendations for the process/operation of Inspection:

- Carry out a visual inspection and functional in order to detect the existence of deformations, misaligned, irregularities in the texture of the wood, color changes, among others;
- Carry out a visual inspection and functional in order to check and detect the presence of corrosion in metallic elements.

Recommendations for the process/operation of Pro-action:

- Assess the need to readjust the hygroscopic behavior of wood before changes in humidity and temperature of the place in which it is installed. The wood reacts absorbing or dropping part of the content of moisture, which produces dilation or retraction;

Recommendations for the process/operation of Cleaning:

- Carry out a periodic cleaning to remove dust and dust, leaves and junk, among others;
- Carry out a routine cleaning in case of presence of small spots, with a dry cloth, or slightly moistened, never use abrasive and not abuse the water and dry immediately surfaces that are wet;

Recommendations for the process/operation of Correction:

- Proceed to a repair of small erosions or humidity non-persistent, with materials similar to the original coating;
- Proceed to repair of any defects are observed, as the example of components raised or loose.

Recommendations for the process/operation of Replacement:

- Possible future need for replacement of parts and components, it is necessary to evaluate the resistance of the wood, the presence of defects such as cracks, gaps, warpage, among others.

Recommendations for the process/operation of Sustainability:

- Weighting of the various solutions, and assessment of the consequences in the event of the need for implementation of the maintenance procedures. It should also be considered the impact of the solutions before the occurrence of damage.

Recommendations for the process/operation of Conditions of use:

- Prevent inappropriate use of the furniture, or use it for other purposes. As for example damage with excessive weight or apply risks on the wood and metal elements.

4. CONCLUSIONS

The present work shows how the management and maintenance of public space is essential as a way of guaranteeing the performance in service of all its architectural elements.

The definition of a methodology for the evaluation supported by a support decision model to include the issues of maintenance during the architectural design process gives to the project author aid instruments to conscious and intentional act of decision-making, and also alert to the needs of maintenance that each constructive solution adopted will have and the consequences during their lifetime. The maintenance should be considered an area of knowledge that allows you to maintain and return a status that allows you to ensure the function(s) for the designed space and, as such, should be considered as a continuous process, in contrast, the majority of the processes and strategies of intervention.

5. REFERENCES

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6. BIOGRAPHY

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