Building Pathology: A Systemic Approach

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INTRODUCTION

The study of building pathology focuses on the operation and maintenance stage of a building's life cycle, during which buildings need to be followed periodically. Technical inspections allow estimating different types of degradation through observation. They also allow assessing the performance of the building elements and, thus, of the building. Well-informed decisions on maintenance planning, sudden repairs, local replacements, or overall rehabilitation should only be made considering the data collected in technical building inspections.

Building inspection systems are an important tool as they provide objective information. Inspections should be performed regularly, at predetermined intervals, collecting predefined types of data. A building inspection system should include location information about the degradation phenomena concerning: the building and its surroundings; the building element within the building; the detected defects and their causes within a building element. Furthermore, building inspection systems provide unambiguous designations for all concepts involved in technical inspections, such as defects, causes, diagnosis methods and repair techniques. Building inspection systems may also determine the use of in situ or laboratory tests to obtain qualitative or quantitative information, whether on the first inspection or a more detailed one. Information like the area of deteriorated zones, the width of cracks, the temperature of the building element and its moisture content may help to characterize the defects and confirm their causes. Finally, a building inspection system should classify levels of degradation according to a predetermined quantification system. Those levels will influence the determination of the urgency of repair. To sum up, building inspection systems aim at an independent inspection, keeping subjectivity to the minimum.

COMPONENTS OF THE INSPECTION SYSTEM

The authors' research team at Instituto Superior Técnico, University of Lisbon, has defined the structure of an inspection system, presented in Figure 1. Considering the non-structural building envelope of buildings (façades and roofs), two classification lists are highlighted [1]: defects and their causes. The classification list of defects is organized in four categories: defects of physical nature; defects of chemical nature; defects of mechanical nature; and other defects. In total, 38 types of defects are included in the list. The classification list of causes of defects is arranged in five categories: design errors; execution errors; mechanical actions; environmental actions; and use and maintenance errors. The list includes a total of 108 causes of defects. According to the structure of the inspection system (Figure 1), the relationships between the items in these lists are represented in a defects–probable causes correlation matrix [2].

BUILDING DEFECTS

To ease the identification of defects, the use of photographic examples of the listed defects is encouraged [3]. Figure 1 shows three different types of defects from the classification list of defects.

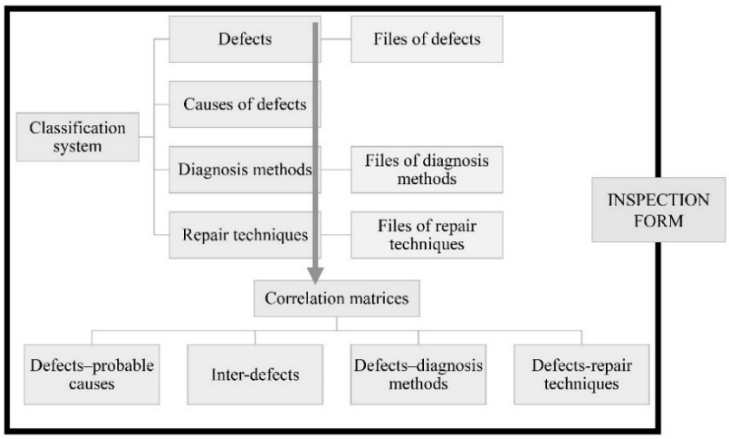

Figure 1. Organogram of the building inspection system developed at Instituto Superior Técnico, University of Lisbon

Figure 2. Examples of three types of defects [1]: a)“A-B1 Biodeterioration/biological growth”; b) “A-B2 Vegetation growth”; c) “A-B3 Efflorescence/cryptoflorescence and carbonation”

FINAL REMARKS

Nevertheless, although having a catalogue of defects may speed up the inspection process, a full diagnosis comprises more steps. After identifying the type of observed defect, its causes should also be determined. The surveyor should also analyze the need for carrying out additional diagnosis methods. Then, according to the findings, the surveyor should be able to recommend a course of action, namely: adjusting the maintenance plan with periodic maintenance works or performing curative or preventive repairs.

Finally, full data should be provided for decision-makers in view of more enlightened decisions.

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