



# Elaboration of the Articles Portfolio for the Theme: Pathological Manifestations in Structural Masonry

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**Abstract-** The works that use the structural masonry represent the majority of the financing of the real estate loan plan of the Caixa Econômica Federal. This system presents itself as an alternative for the conclusion of works with reduced costs, with greater possibilities of profit for the constructors. However, to obtain a satisfactory result, guaranteeing the quality of the buildings, it is necessary the effective control of the components and the execution of the works, following a well elaborated project. Failure to comply with the standards in each of these stages may lead to the appearance of pathological manifestations. Through building inspections, it is possible to identify the causes and origins of constructive problems, with the purpose of proposing actions that would avoid these manifestations. Seeking to identify the state of the art in relation to the exposed theme, this work seeks to identify and study published articles that have as a theme the identification of pathological manifestations in structural masonry by means of property inspections. This work aimed to construct a set of articles related to this topic, so that sufficient knowledge to produce works in this area can be acquired. It was possible to select a relevant article portfolio for consistent scientific research on the proposed topic.

**Keywords-** *Set of Articles, ProKnow-C, Structural Masonry*

## I. INTRODUCTION

The construction industry has a large share of Brazil's Gross Domestic Product (GDP), with 8.5%, contributing to the growth of the country in recent years [1]. According to data from [2], more than 2 million and 300 thousand Brazilian workers were employed by the sector in more than 70 thousand companies in 2010. By 2014, the sector employed almost 3 million people and had almost 120 thousand companies active.

The civil construction sector encompasses works of different construction systems such as reinforced concrete and structural masonry. Before being established in the Brazilian market, structural masonry was considered a solution of dubious quality, of popular works and few architectural variations. However, it represents an economic application, being responsible for the use of this system in most of the works financed by the Caixa Econômica Federal [3]. According to [4], this institution invested thirty eight billion in real estate credit, providing favorable conditions for the construction sector and encouraging its growth

Structural masonry, in general, is more competitive than other systems in the economic aspect in buildings up to twelve floors. The great advantage of the system is the low quantity of manpower and the ease of the work of the masons. [5].

Despite the favorable conditions, a lot of care is needed in the development of the enterprise. [6] Affirms that these should be more rigorous in the construction of the project and in the execution of the work, since they are essential to avoid the appearance of pathological manifestations and to guarantee the quality of the constructions in structural masonry.

To maintain the quality of a building, it is necessary that inspections are carried out. The purpose of building inspections is to find fault of use, operation and maintenance that reduce the performance of the enterprise and also to analyze anomalies, allowing determining their causes and origins [7].

For the construction of buildings in high quality structural masonry, care is needed in projects, execution, maintenance and use of the developments. By identifying the most frequent pathological manifestations in these buildings, it is possible to avoid errors in these phases of the life of the buildings, emphasizing the resolutions of these problems [6].

In this context, the present work aims to select articles capable of producing necessary knowledge for the study of pathological manifestations in buildings in structural masonry in order to avoid them in future constructions, improving the quality of the buildings conceived in this constructive system. These articles have as main characteristics: alignment with the theme, scientific recognition, relevant places of publication and prominent authors.

## II. METHODOLOGY

The research is an instrument that allows producing knowledge with the objective of understanding the reality of what is being studied, responding to a question of research. In order to answer this question, previous knowledge is necessary. This knowledge is theories, fundamental to the understanding of the object of investigation [8].

To obtain sufficient and relevant materials for understanding the state of the art of the subject, and thus to begin studies to answer the research question, this paper selected papers published in journals. The selection of these

articles was done following steps of the ProKnow-C process, elaborated by [9]. The steps proposed by this method are: portfolio selection, bibliometric portfolio analysis, systemic analysis and definition of the research question and research object. Figure 1 shows the steps and the logical path proposed by the author.

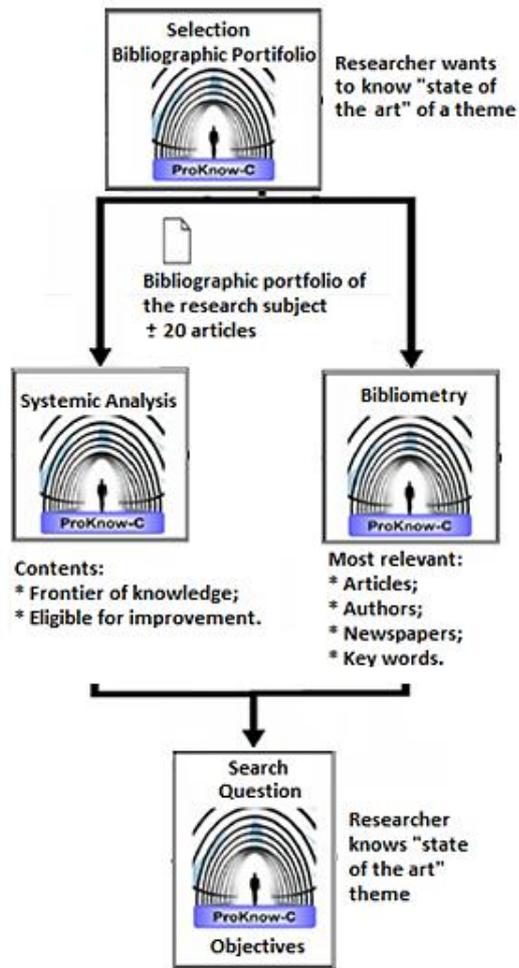


Figure 1. Proknow-C. Source: Adapted from [9].

In this work, the steps of Portfolio Selection and Bibliometric Portfolio Analysis were used. The steps of systemic analysis and definition of the research question and research object were not performed by this method and were defined based on knowledge acquired in previous studies to this work.

### III. SELECTION OF BIBLIOGRAPHIC PORTFOLIO

The Bibliographic Portfolio is a set of articles that are relevant to the research topic and contain information capable of producing knowledge about this topic. To obtain these articles, two main steps are required: selecting the articles in the databases and filtering those articles [9].

#### A. Selection of articles in databases

For this step to be started, it is necessary to define the axes of the research [10]. For the theme of this work, three research axes were defined. Firstly, the axis of greater relevance is the central subject of the research, "Pathology of Constructions". The second defined axis is related to the place where the central subject will be studied, that is, in buildings in "Structural Masonry". The third axis is intended for the "Inspection of Buildings" tool, which will be used to find the pathological manifestations (central issue, axis 1) in structural masonry buildings (local, axis 2).

From the defined axes, the selection consists of 4 phases: definition of key words, definition of the databases, search of the articles in the chosen databases using the keywords defined in the first phase and accomplishment of test of adhesion of the key words.

##### 1) Definition of keywords

Keywords were defined for each search axis:

- Pathology of buildings: "pathologies", "cracks", "defects" and "deterioration".
- Structural masonry: "masonry", "structural masonry", "masonry structure", "masonry walls" and "masonry wall construction".
- Inspection of buildings: "building inspection", "survey" e "check".

Due to the high number of keywords and consequently the number of searches required to cover all combinations, they were reduced to the words shown in Figure 2.

Subject	Where:	Tool:
<b>Pathology of buildings</b>	<b>Structural masonry</b>	<b>Inspection of buildings</b>
"pathologies", "cracks", "defects", "deterioration".	"masonry"	"building inspection", "survey", "check".

Figure 2. Keywords. Source: Author (2017).

With these keywords, initially, combinations of one word of each axis were defined, that is, 12 combinations.

##### 2) Definition of databases

The chosen databases were "Scopus" and "Science Direct". These two databases present a significant amount of articles related to the subject studied and have good research tools. In both databases, a 10-year time sample (2006-2016) was established.

##### 3) Search for articles

The first research was carried out with the 12 combinations defined previously, however the number of articles returned was not satisfactory. With this, another definition was made, containing combinations of the key word of axis 2 (Structural masonry) with the other key words of axes 1 and 2, resulting in 7 combinations.

From the 7 keywords combinations and searching these combinations separately in the databases, with the criterion of time sample established, the Articles Bank was created, with 1735 publications, as shown in Table I.

TABLE I. ARTICLES BANK

Search Keywords		Bases		Total
K2	K1 e K 3	Scopus	Science Direct	
Masonry	Pathologies	24	9	33
Masonry	Cracks	566	297	863
Masonry	Defects	78	33	111
Masonry	Deterioration	118	60	178
Masonry	Building inspection	62	15	77
Masonry	Survey	277	118	395
Masonry	Check	46	32	78
Total		1171	564	1735

The selected articles were transported to the EndNote tool, available for free on the internet.

4) *Keyword Adherence Testing*

The adhesion test was carried out from 2 articles of the Bank of Crude Articles. These were randomly selected and listed their keywords (7 words). Of these, 5 were present in the list of the 8 selected keywords for the survey.

B. *Filtering of articles*

In this phase, articles were eliminated due to characteristic aspects of each phase, which are: repeated articles, title alignment with the research theme, scientific recognition, abstracts aligned with the research topic, and full text of articles aligned with the research theme.

1) *Repeat articles*

Initially, to find repeated articles, an EndNote function was used, which discarded 246 articles, leaving 1489. However, the function does not detect all duplications, since some articles present formatting differences such as upper and lower case letters of authors, which do not are detected by the tool. With this, a manual verification was performed, discarding another 199 articles repeated, leaving 1290 articles.

2) *Title alignment with search theme*

The titles of the remaining 1290 articles from the previous phase were read and analyzed and 1254 articles did not present a title aligned with the research theme, leaving a total of 36 articles.

3) *Scientific Recognition*

Due to the number of articles (36) resulting from the previous selection stage, the authors chose to work with all the articles, not selecting articles by their scientific recognition (given the number of citations that each obtained until the execution of the article).

4) *Summary Alignment with Search Topic*

The abstracts of the 36 articles were read and analyzed and, among them, they were withdrawn. With this, 19 articles were

selected, with the title and the abstract aligned with theme, for the reading phase of the articles.

5) *Full text aligned with the search theme*

In the last phase, out of 19 articles, two did not have the full text available. Then, 17 articles were read integrally, and 11 were selected for the Bibliographic Portfolio. Table II shows the list of selected articles.

TABLE II. BIBLIOGRAPHIC PORTFOLIO

Articles
1. Non destructive quality control of reinforced masonry Billings.
2. Investigationon Wall Crack Damage and Its Proposed Repair Method.
3. Radar investigation as a complementary tool for the diagnosis of historic masonry buildings.
4. Diagnosis of historic masonry structures using Non-Destructive techniques.
5. Durability of masonry systems: a laboratory study.
6. Defects of non-load bearing masonry walls due to partial basal supports.
7. Causes of Cracks in Sealing Masonry: Case Study.
8. Determination of masonry crack evolution due to differential displacements: a numerical study.
9. Systematic approach toinspect, diagnose, and repair masonry walls.
10. Investigation and Repair of Structural Deficiencies in Projected Masonry Bay Construction.
Causes of deformations and crack formation in na administrative building in Magadan.

IV. BIBLIOMETRIC PORTFOLIO ANALYSIS

Bibliometric Analysis aims to quantify the terms or publications presented to the scientific community [11]. The bibliometry used in this work consists of two phases: degree of relevance of the journals and degree of scientific recognition of the articles.

A. *Degree of Relevance of the periodicals*

The Degree of Relevance of the journals was estimated through the CAPES classification of the periodicals to which the articles are published. The 11 articles were published in journals ranked among the 5 best quality levels. Figure 3 shows the distribution of articles in journals.

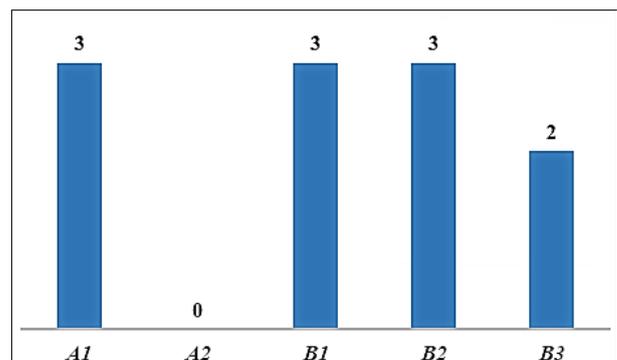


Figure 3. Publications by CAPES.

### B. Degree of Scientific Recognition of Articles

In order to estimate the degree of scientific recognition of the articles, the citations of each article were quantified, and the result obtained is illustrated in Figure 4. The search for the number of citations was done through *Google Scholar*.

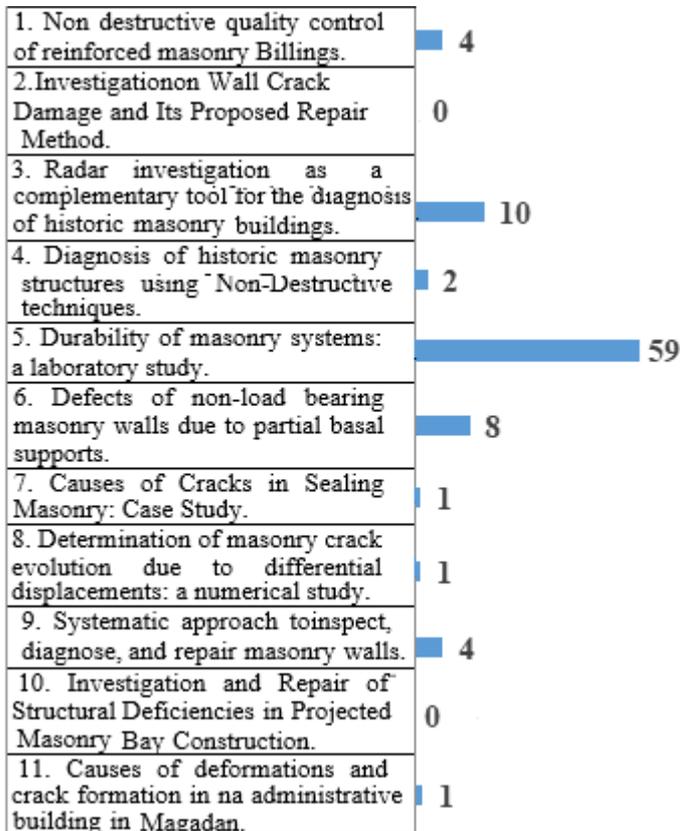


Figure 4. Number of Quotations

### V. CONCLUSIONS

The ProKnow-C (Structured process for selection and analysis of bibliographic references developed by the Laboratory of Multicriteria Methodology in Decision Support - LabMCDA / UFSC) allowed the selection of a set of articles capable of obtaining the knowledge of the state of the art.

In relation to the article selection stage, it was important to define the axes to determine the key words. The change of combinations was easily modified due to this definition. In addition to this phase of the selection stage, the definition of the databases, together with the sample time, sought more relevant articles for the research. The EndNote tool made it possible to organize articles more effectively, making the process more agile.

In the Filtration stage, two phases were highlighted which demanded more time and attention. The withdrawal phase of the repeated articles, despite EndNote's help, has taken a long time to complete, and is a tiring process. The reading phase of the titles, in addition to having also demanded more time, requires attention and interpretation of what the article may be addressing, so deciding on that article may contain important information for the topic.

The Bibliographic Portfolio obtained was analyzed under two aspects: the classification of the journals to which they were inserted and the number of citations. Although 5 articles have only one or no citations, they are included in journals ranked among the 5 best levels (A1 and B3) according to the CAPES classification.

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