

## **Research on calculation methodologies adopted by project companies for cold water sizing**

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### **ABSTRACT**

The possibilities to determine a design flow rate for a cold-water network is a subject much discussed among hydraulic designers in Brazil, especially after the update of NBR 5626 in 2020, which allowed the use of various sizing methods, as long as they are within the technical and hydraulic standards stipulated by ABNT.

**Keywords:** Water network, Hydraulic designers, Building systems.

### **INTRODUCTION**

The possibilities to determine a design flow rate for a cold-water network is a subject much discussed among hydraulic designers in Brazil, especially after the update of NBR 5626 in 2020, which allowed the use of various sizing methods, as long as they are within the technical and hydraulic standards stipulated by ABNT.

In the academic context, the empirical method, the main method of NBR5626 until 2020, is still the flagship of the curriculum of subjects related to Building Systems, as it is considered the most traditional method of design in the country.

To bring the connection between the academic branch and the market closer, it was seen the need to identify the methods most currently used by hydraulic designers in the country and as an extension of the research it was sought to understand the methodologies adopted in other countries, such as Bolivia and Sweden. A simplified way of approximation between the sectors is given by the internet and the Google Forms platform, with the possibility of reaching several cities without the need to travel.

### **OBJECTIVE**

The present work aims to understand the methods of flow calculation for cold water sizing most adopted by designers of building systems in Brazil, as a secondary objective is presented the possibility of expanding the research to designers in Bolivia and Sweden.

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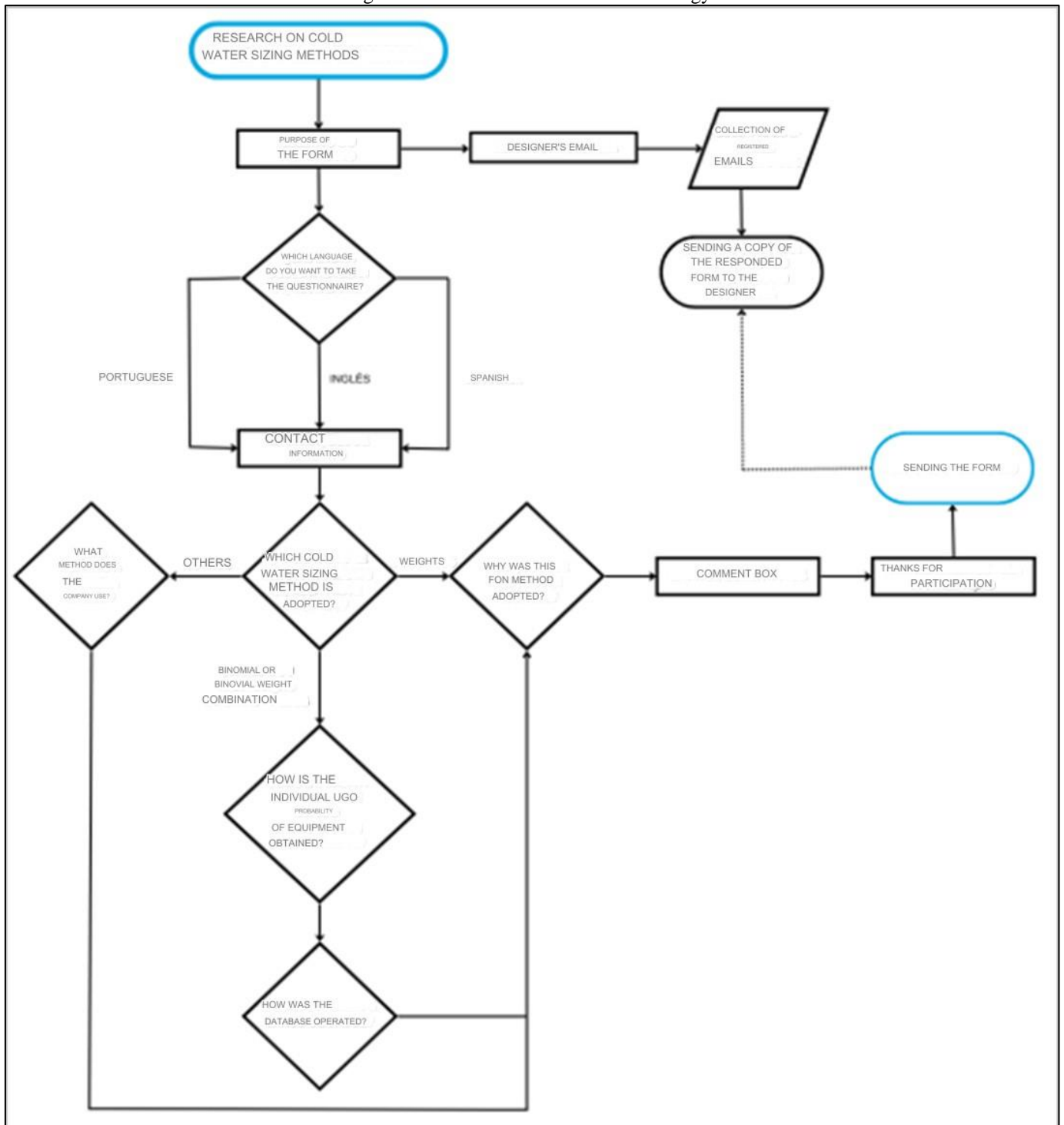
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## METHODOLOGY

The Google Forms platform was used to apply the research in a questionnaire/survey model with qualitative and quantitative approaches. The target audience of the research is designers of cold-water building systems in Brazil, but three language options were applied for possible expansion of the target audience.

Figure 1 – Flowchart: research methodology



Source: author.

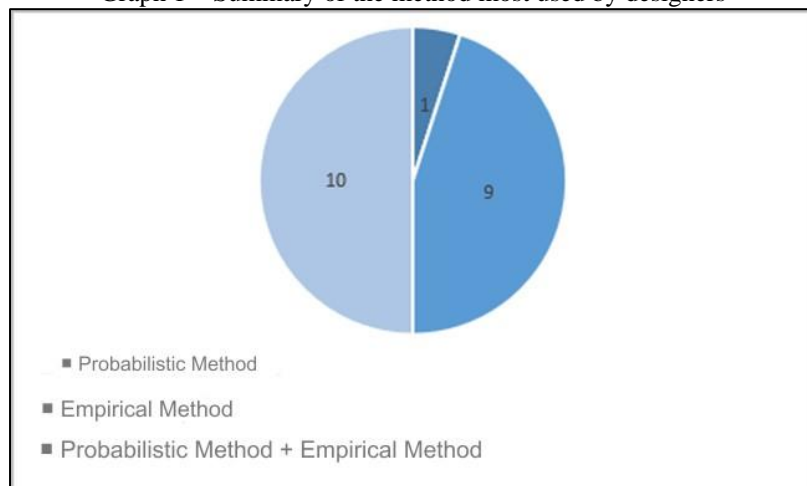
## DEVELOPMENT

The survey was disseminated, by electronic means, to more than 60 companies of hydraulic projects/building systems in Brazil and 4 international companies. Of the companies contacted, there was a return of 16 Brazilian designers, representing a return rate of less than 30%. This rate may be related to the level of confidence of companies in answering surveys conducted by electronic means.

The Brazilian designers who participated in the research are divided into four states: Goiás, São Paulo, Minas Gerais and Rondônia. The main state among the responses was São Paulo, with 13 participating designers, while Goiás, Minas Gerais and Rondônia with 1 designer each.

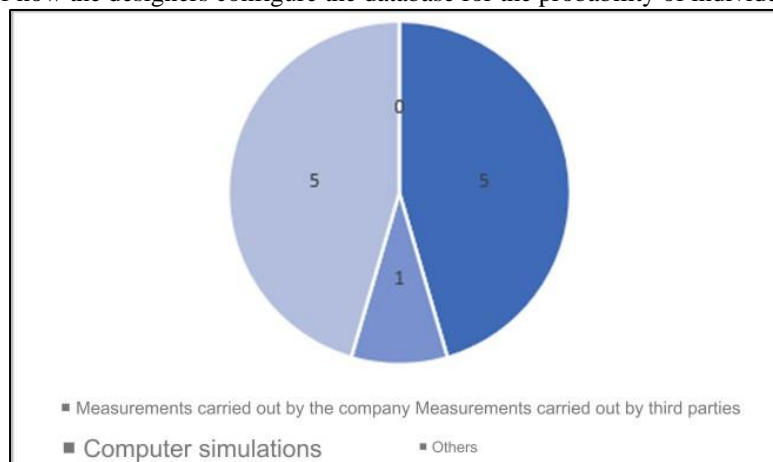
Regarding the international designers, it was possible to obtain responses from Bolivia and Sweden, with 4 responses in total. Of these answers, only 1 refers to Sweden and 3 to Bolivia.

Graph 1 – Summary of the method most used by designers



Source: Google Forms

Graph 2 – Summary of how the designers configure the database for the probability of individual use of the equipment



Font: Google Forms



The comments made by the designers are highlighted, such as the use of software that performs the calculations instead of the company's own spreadsheets, in this scenario the range of methods used by the designers depended on the portfolio of the company that provided the software. There is in addition the suggestion to expand the search to these companies.

In another scenario, designers who opted for the empirical method scored the practicality and familiarity with the method, as it does not require a database to understand the simultaneous use of the devices, as is the case with the probabilistic method.

In more than one case, it was pointed out by the participating designers that the empirical method was used, as this was the method learned in college. In addition, the interviewees highlighted the need to bring the university closer to the market, so that there could be a practical direction together with the project offices as a result of the research.

## **FINAL THOUGHTS**

Thus, it is concluded that although the internet is a versatile tool and allows the reach of different parts of the country, when it comes to a survey with companies, there is caution on the part of employees to answer this type of survey without prior knowledge of the author, as it is a means of preserving the company's confidential information.

More than 50% of the participating designers use a combination of empirical and probabilistic methods, and it is possible to increase the effectiveness of design by checking in two methods. Therefore, a tendency to migrate from the empirical to the probabilistic method is identified, because the probabilistic method presents more variables that are closer to the reality of different types of projects, but there are caveats because it is not a method in the domain of all designers and companies.

With the updating of the NBR5626 and the reports of the participating designers, there is a need for academic training focused on new forms of dimensioning, either through the use of software or individual spreadsheets, but which focus mainly on probabilistic methodologies, because there is little knowledge in the market about databases that enable the application of probabilistic variables and the calculation method in full.



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