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Elasticity Modulus of concrete with recycled aggregate

Módulo de elasticidade de concretos com agregados reciclados

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1. INTRODUCTION

There is no way to build without causing an environmental impact. What is being researched is to decrease this impact of the concrete use, since it is an excellent material to be used in buildings, because of their mobility in shapes, durability and low manufacturing and maintenance costs. Among the traditional civil construction materials: concrete, steel and wood, concrete is the material that most deteriorates the nature to be used, because in addition to the extraction of the materials that make up the cement, its manufacture is the largest emitter of carbon dioxide in the atmosphere by burning charcoal.

Following the concept of sustainability, the cement and concrete industry has sought alternative solutions to minimize the environmental impact of using concrete, which is the most widely consumed material in the world after water. Extraction of natural materials for use in Civil Construction has been a worldwide concern, and research in several countries in this area has sought to find a way to minimize this impact on society.

In spite of the concern with the environment is not only in the manufacture of cement, but also in the generation of waste caused by several factors.

Civil construction today generates a large amount of waste, causing significant environmental impacts and likely disruption to the population, ie there is a need to identify environmental impacts to find suitable and efficient solutions so that these impacts are minimized, avoiding thus more serious future problems (ABRELPE [1]).

One way of minimizing the negative environmental impact caused by the use of natural raw materials in concrete is by partially or completely replacing the natural aggregates with waste materials. Thus, both rock extraction and silting of rivers would be reduced, as well as the generation of debris generated by construction and demolition wastes (Jacintho [2]).

In order to minimize the extraction of natural aggregates, researchers in Brazil and abroad have proposed to study alternative materials for partial or total replacement of natural aggregates in concrete. Among the alternative materials considered are: porcelain from electrical isolators (Figure 1), Asphalt Milling (Figure 2), and Construction and Demolition Waste (RCD) (Figure 3), which has been the most used world level.

The technical and scientific knowledge of the physical and mechanical behavior of concrete with recycled aggregates is not well established, and this is a knowledge gap, especially considering the use in structural elements.

The experimental evaluation of the modulus of elasticity of conventional concretes and with the reported alternative materials, making a comparison with the specifications given by NBR 6118: 2014 [3], which are also currently focus of discussion in the technical environment.

Traditionally the modulus of elasticity of concrete depends on its compressive strength, specific weight and type of aggregate, according to SADATI et al. [4], ESTOLANO et. al. [5], SOUZA et.al. [6] and CAMPOS et.al. [7]. According to the authors, there is a need to estimate the mechanical properties of concrete with recycled aggregates, of a very varied nature, one of these properties being the modulus of elasticity, since in the United States the estimated generation of construction and demolition was over 530 million tons for the years 2013 and 2014. As natural resources tend to become increasingly scarce, one alternative is to reuse such building and demolition waste as component material of concrete. The results of the research by

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SADATI et al [4] indicate an acceptable performance of the concrete with recycled aggregates and correlation coefficient ranging from 0.74 to 0.89 for the tests performed.

Therefore, this is a topic with wide scope of national and international research for Civil Construction.

Figure 1: Insulators supporting for substations and metal panels (Source: http://www.atseletrica.com.br/ isoladores-porcelana.php.)

Figure 2: Recycled asphalt pavement (Source: https://blendplants.com/fr/grave-emulsion/)

Figure 3: Construction and demolition waste (Souce: https://abrecon.org.br/residuos-da-construcao-e-demolicao-geracao-de-emprego-e-renda/)

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