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Research Concerning the Evaluation of the Degree of Homogeneity of the Mechanical Properties of Materials Experimentally Determined and of the Random Effects in the Structural Response

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Summary

Homogeneity is an important property with many theoretical and practical significations. The research concerning the degree of homogeneity of some experimentally evaluated properties through the representative characteristic values enlarging availabilities for a more rigorous and economical design and an execution of constructions. A statistical and probabilistic analysis of the different material characteristics of homogeneity is imposed and the complementary research in the field allows a profound study and a refining of the measuring techniques of homogeneity.

The relation between the characteristics in the meaning of homogeneity and correlation analysis is important to study thoroughly the structural systems

Florentina Chira

behaviour. The way in which the homogeneity is described and the variation of the ideal homogeneity are a necessity that should not be ignored.

The studies, the analyses and the developments from this thesis aim at answering some problems and studying thoroughly some aspects less developed. In this thesis are made developments concerning the definition of homogeneity with mathematics basis and physical, technical and practical aspects. The examples of case study with values obtained experimentally are illustrated. The homogeneity coefficients are defined in ratio with the homogeneity interval. It has been made experimental study concerning homogeneity of the mechanical characteristics and correlation among these, the experimental tests of the author, the checking tests on samples of some materials, performed in the accredited laboratories and analysis of the measured data.

The analysis of the elasticity modulus and the sectional stiffness from an experimental, statistical and homogeneity point of view is illustrated on steel square tubular bars. The purpose was to determine the parameters of the statistical distribution, the distribution graphics, the homogeneity coefficients, the concentration coefficients.

In the chapter "The homogeneity on designing the structural systems" it has been analyzed the variation effects and chosen the way of elasticity modulus upon loads transformation into efforts on the elastic designing of the structural systems. The obtained results are illustrated on a case study.

Keywords: homogeneity, elasticity modulus, statistics, probabilistic, correlation