

STATISTIC ASSESSMENT OF STRONG
EARTHQUAKE INTENSITIES VARIATION IN URBAN AREAS

by
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INTRODUCTION

For analysis of the influence of soil conditions and characteristics of buildings upon the strong earthquake effect, beside an adequate estimation for an average intensity, elaboration of detail map of intensity variation in an urban area, is very important.

In Yugoslavia, such maps are elaborated after the earthquake of Skopje (1963), Leskovac (1968) and Banja Luka (1969), are proved as good base maps for planning of investigations, verification of the results of seismic micro-zoning, town planning and other engineering purposes. In the elaboration procedure a statistic approach was used which is based on the principles explained in this paper.

BASIC PRINCIPLES OF THE STATISTIC APPROACH

Basis for the statistic elaboration are taken from seismic scale MSK-64. As seismic intensity function (I) it gives a scale of individual damage degrees of different types of buildings (d), which classifies the damage degree into 6 categories including undamaged buildings.

Assessment of the intensity is achieved by application of statistic criteria in selection of sample buildings and damage estimation. It has been found that a given number of damaged buildings of the same type distributed according to the degree of damage follows a normal distribution. The mean value of standard deviation of individual damage degree (\bar{d}) is $\sigma_d = \pm 0.75$ and is defined from the equation $\sigma_d = \sqrt{\sum d_i^2 - n\bar{d}^2} / \sqrt{n-1}$. The average degree of damage \bar{d} for a group of (n) buildings is defined by the equation $\bar{d} = \sum d_i / n$ and its standard deviation is $\sigma_d = \sigma_d / \sqrt{n}$. Errors appear during definition of (\bar{d}) and in the transition from (\bar{d}) to (I). The former is controlled by the number of structures (n), while the later is not bigger than ± 0.25 degrees.

Applying the above mentioned to the city area, the most uniformly applied type of buildings is selected. The density of the selected sample structure is 10 in a square of 0.10 km² in order to obtain (\bar{d}) in square with an error of ± 0.25 . For the net of such squares (\bar{d}_i) values are obtained and isolines are plotted, which in the transition from (\bar{d}) to (I) gives the variation of intensity for the city area.

With correction of individual values of (d) for the influence of building characteristics in respect to (\bar{d}) of a uniform-representative building, by using the same procedure isolines are plotted, which, quantitatively accurately determine the soil conditions only.

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