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SEISMIC VULNERABILITY OF EXISTING MASONRY BUILDINGS IN MACEDONIA, PROJECT SEISMOZID

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1. INTRODUCTION

Regions with serious seismic hazard are facing different level of risk which, besides from the hazard, depends on existing building occupancy. Managing seismic risk is conducted mainly in two directions: establishing provisions for design of new seismic resistant structures and evaluation of vulnerability of the existing structures as basis for their reinforcing.

The paper presents research program of the project *SeismoZid* with main goal is creation of fragility curves for selected masonry structures in Republic of Macedonia, as well as creating a fragility curves for a class of structures. Significant number of old masonry buildings host public institutions (schools, administration offices, courts, museums, theaters, etc.), the need of seismic risk evaluation of these existing structures is of a high priority.

2. DESCRIPTION OF THE PROJECT

Taking into consideration large number of existing public buildings (mainly masonry) built before the actual provisions for seismic design were in power; mitigation of the seismic risk is possible only if information for their vulnerability is gathered. In the frame of the proposed research, twenty buildings are selected, all built between the end of the nineteenth century and the first half of the twentieth century, which based on their architecture, structural system and materials used, represent typical examples of the chosen class of buildings, Figure 1. Important part of the analytical methodology is definition of the seismic hazard in Republic of Macedonia. For that purpose, available data from the Seismological observatory will be used, and depending on the quality of those data, method of defining of the seismic hazard for the chosen structures will be adopted.

Activities of the research are organized in four working packages (WP):

WP1: Definition and analysis of representative buildings

Leader of this package is prof. Grozde Aleksovski. In this working package, young researchers, students of the Master program at the Faculty of Civil Engineering participate. The goal of the package is definition of geometric characteristics of the buildings necessary for the mathematical modeling of the structure, conducting static and seismic analysis of the structures and calculation of the seismic capacity according to PPISV'81 (technical Regulations for Design and Construction of Buildings in Seismic Regions).

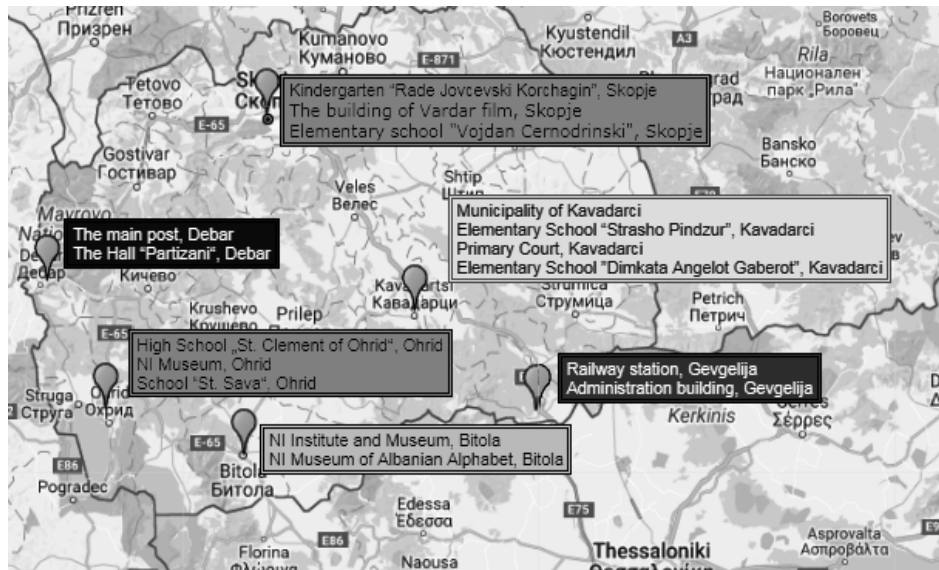


Fig. 1. Map of representative buildings

WP2: Experimental investigations

Leader of this working package is prof. Sergey Churilov. In this package experimental investigations are planned for all buildings, which generally may be divided in two parts: laboratory tests of bricks from selected buildings for definition of mechanical properties and dynamic testing for definition of the dynamic parameters of the buildings by ambient vibration testing.

WP3: Experimental investigations of models from measured and simulated structural response of the structures

Leader of this working package is prof. Liljana Denkovska. The first stage of this working package is identification of the dynamic characteristics of the structural systems with methods based on measured response of the structure (ambient vibration tests) and the second step is optimization and numerical simulation of the model based on the finite element analysis.

WP4: Determination of the seismic fragility curves for the selected buildings

Main researcher of this working package is prof. Elena Dumova-Jovanoska. The objectives of this package are: definition of the local seismic hazard using a scenario-based neo-deterministic approach that includes existing geological, seismotectonic and geotechnical databases, determination of the capacity curves and calculation of the fragility curves of the selected structures.

3. EXPECTED RESULTS FROM THE RESEARCH PROJECT

- Calculation of the seismic capacity of the chosen structures according to PIOVSP'81 (Technical Regulations for Design and Construction of Buildings in Seismic Regions).
- Defining of a methodology for determination of the seismic fragility curves of selected masonry buildings, including:
 - Definition of seismic hazard
 - Selection of method for nonlinear analysis of the masonry structures
 - Selection of damage indicators and damage thresholds values
- Application of the chosen methodology to all selected structures and calculation of fragility curves.
- Comparison of the calculated fragility curves of particular buildings with available fragility curves for masonry structural classes.

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