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The abstract of the doctoral thesis entitled:

„The analysis of the deformation of residential buildings generated by the curvature of the mining area”

Promoter:

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The doctoral thesis raises a question of the relations between the curvature of the ground and the curvature of residential buildings in the area of mining activity. Deformations of the mining area surface create great danger for buildings. Notably special are residential facilities because every year mines allocate considerable part of the costs incurred for their damages. It results from the character of housing construction since most of residential buildings are brick – built houses constructed using traditional masonry methods. They often require preventive actions designed to their reinforcement. Then the problem of indicating internal forces developed inside the construction of such buildings as a consequence of the ground being deformed appears. The knowledge of the deformations of buildings generated by distortions of mining areas is the key issue while conducting verifiable static – durability calculations for a construction located on the deforming ground. In order to determine the relations between the deformation of buildings and the deformation of mining areas, in the field research and measurements in close neighbourhood are necessary.

The aim of the research is to indicate the relation between the curvature of the mining area and the curvature of the construction of traditional residential buildings. In order to find the relation between the both curvatures, in the field geodetic measurements of the buildings located on active mining area, as well as the surface of the neighbouring terrain were conducted.

In the further part of the thesis numerical analysis of the monitored buildings was conducted. The aim of the analysis was to compare results of these calculations to the results obtained in the field and then to develop the information on the searched relations between the curvature of the terrain and the building.

In the process of the conducted works, the searched relation between the curvature of the residential buildings constructed using traditional masonry methods and the curvature of

the terrain was determined. Thanks to the fact it is possible to fix the curvature of the building based upon the known (predicted) curvature of the terrain. It allows obtaining credible results of the static – durability calculations and simplification of the calculation process. The relation defined in the present work forms an useful tool for an engineer who conducts the analysis of the input of the curvature of the terrain on the construction of the residential building.

The thesis is divided into eight chapters.

Chapter 1 is a short introduction to the issues of the analysis of the construction of residential buildings located on curved mining area. These deliberations create a foundation of the scientific aim of the thesis presented in the same chapter.

Chapter 2 includes basic details on the mining area deformations and their impact on the construction of buildings. The chapter describes dangers created by the deforming ground on the buildings and the infrastructure based on the literature review and the materials collected by the author during the implementation of the work. Then the impact of the ground deformation on cubature buildings was described in details with a special emphasis placed on the curvature of the terrain.

Chapter 3 forms a review of methods of measurements applied in surveying of the terrain and the buildings. Possibilities given by modern technologies of surveying used in order to monitor changes of the shape of the terrain and deformations of buildings were characterized here. Other methods of measuring used for these purposes were also described.

Chapter 4 forms a description of the research conducted in the field within the framework of the thesis. Both scientific objects on which the surveying in the field was conducted were characterized. The location of the objects as well as the technology of the geodetic measurement used in the work for the ground deformation monitoring and for the construction of the monitored buildings were described in details.

Chapter 5 is a presentation of the surveying results in the field. The results of the deformation of the buildings as well as the deformation of the terrain in the close neighbourhood were presented here. Then the relation between these two searched values - the curvature of the terrain and the curvature of the monitored objects in the field – was presented.

Chapter 6 includes a numerical analysis of the ground – building grids. For the monitored buildings in the field, numerical models and then the results of the model objects deformations were compared to the results collected in the field. On the grounds of the

conducted analysis with the variable stiffness of the model buildings and different sensibility of the ground, the graphs of the relation between the curvature of the terrain and the curvature of the residential buildings constructed using traditional technology were created. The chapter also presents the input of the curvature of the terrain on the distribution of the tensions in the construction depending on the size of the building.

Chapter 7 presents possibilities of application of the determined relations between the curvature of the terrain and the curvature of the building in calculations designed to define internal forces in a construction located on a curved terrain.

Chapter 8 includes the summary of the work, the conclusions of the conducted research, as well as the author's vision of further activities in the subject described in the thesis.