

Tomasz WIEJA

AGH University of Science and Technology

Faculty of Mining and Geoengineering

Department of Geomechanics, Civil Engineering and Geotechnics

al., Mickiewicza 30, 30-059 Cracow, Poland

phone./fax: 601 66 90 23

e-mail: wieja@agh.edu.pl

INFLUENCE OF SPATIAL FORM OF UNDERGROUND GALLERIES ON GEOMETRY AND STRUCTURAL DESIGN OF OLD MINE SUPPORT CONSTRUCTIONS

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Underground galleries built in the course of mining activities in the natural surroundings underground bear witness to the development of engineering expertise, demonstrating the symbiosis between human activities and geological environment. The spatial structure of underground headings, galleries, pits and caverns was created in the course of dynamic interactions between the rock strata and human activities within its surroundings. On one hand its spatial form is the result of geological structure of the rock mass, and on the other- it is a derivative of mining methods developed over the course of time.

Mine supports as the elements securing the underground sites are an inherent man-made components of underground galleries. Their structure was adapted to various mining techniques: block mining, drift mining, dependent on the type of material available in situ, engineers' invention, mining traditions and local conditions in the area. The supports were provided alongside the progressing mining operations. Their actual design structure and geometry depended on the available space opened by mining methods. There were several types of support design structures, provided in underground headings, galleries, pits and caverns. Construction methods and techniques varied too, and the materials used included rock, bricks, wood or steel.

This study examines the geometry of old mine support structures, starting from simple props and chock supports to polygonal supports to refined truss or basket supports. The focus is on spatial structures of mine supports, geometry of their structural components' cross-profiles and the locking (anchor) systems. The purpose of the present study is to define the geometric and spatial relations between the actual shape of structural elements and the man-made underground spatial structure. A systematic description of the geometry and forms of structural elements used in old underground roof supports is a vital aspect involved in protection of heritage present underground.

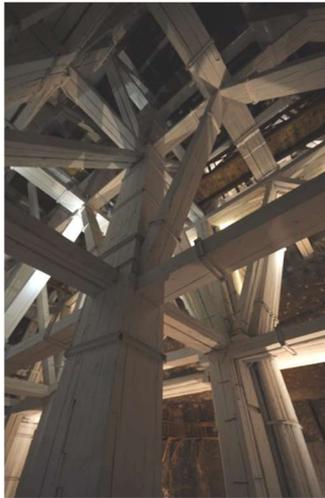


Fig 1. Wooden truss-type support in an excavation mined by block working- Michałowski cavern, salt mine Wieliczka (author: ACM).

References:

- [1] Bartos M., Chmura J., Wieja T.: Organizational, design and technology issues in the process of protection of underground historic monuments. *Civil and Environmental Engineering Reports*, Vol. – 17, 2015, p. 5 – 24.
- [2] Butra J., Cała M., Dębkowski R., Szpak M.: Comprehensive method of technical condition assessment of chamber excavations in salt mines. *CUPRUM*, nr 2(71), pp. 5-16, 2014, p. 5-16.
- [3] Chmura J., Wieja T.: Architectural detail in the design and construction of underground tourist routes. *Budownictwo Górnicze i Tunelowe*, Vol. – 2, 2013, p. 39 – 48.
- [4] Mikoś T.: Methodology of complex revitalization, adaptation and restoration procedures of underground sites of significance with the application of mining technology. AGH University of Science and Technology Press, Cracow, 2005.