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THE ASSESSMENT OF GEOMETRIC RELATIONS IN THE HISTORIC WINDOWS OF GOTHIC BUILDINGS

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For several years, building and architectural design has been supported by the booming BIM-technology ("Building Information Modelling" known also as "Building Information Management"). This technology uses advanced software to manage an engineering project in a complete way - from designing all structural components to finishing and completing indoor design. Due to its complexity and the multitude of tasks it serves, BIM is seen as a methodology, and it is a simplified approach employing specific computer designing programs. BIM is used both in the design of the newly erected facilities as well as in the so-called "reverse engineering". It's main application is the reconstruction of design assumptions and geometric relationships in structures that have been verified using known geodetic technologies (laser scanning, short-range photogrammetry or scanning total-stations). Reverse engineering is usually used when there is a shortage of design and as-built documentation. It is mainly used in the case for historical objects - mainly architectural monuments. Reconstructive works help us to answer the questions related to the ancient art of civil engineering. The measurements performed after many centuries allow for the accurate revitalization of the object with its style. Reverse engineering technology is also successfully used in the virtual reality and in reconstruction works. Correct object modelling depends on the geometry of individual objects. In gothic structures, the shape of vaults and windows is of particular importance. In this article, the authors focused on the evaluation of window geometry, and the work constitutes a contribution to further modelling the elements of historical objects. Considerations were limited to the most common shapes of historical Gothic buildings set up from the 12th to 14th century. Each of the discussed examples of the radius of the entered circle ("rose") is characterized by one particular geometric rule. By applying this rule, we can calculate the dimensions of all gothic windows with different configurations. This approach will make

it possible to define appropriate elements in the BIM system, which in turn will allow the window to be best described in the reconstruction works based on reverse engineering.

References:

[1] Pevsner Nikolaus, Historia architektury Europejskiej. Tom 1. Warszawa 1979 (in Polish)

[2] Reporter, das Magazin der Leica Geosystems, No.52, Leica Geosystems AG, Heerbrugg, Schweiz, 2005 (in German)

[3] Tomana A. BIM – innowacyjna technologia w budownictwie, podstawy, standardy, narzędzia. PWB Media Zdziebłowski Sp. J., Kraków 2016 (in Polish)

[4] Zarys problematyki ochrony zabytków. Skrypt dla uczestników kursów Towarzystwa Opieki nad Zabytkami. Pod red. dr. Tadeusza Rudkowskiego. Warszawa 1996 (in Polish)

[5] Zaokrąglenia w oknach gotyckich // Estetyka techniczna i projektowanie. – K. KPYBA, 2012. – edycja 10, str. 74-78 (co-authors: A. Kalinin, T. Kalinina, W. Dumanska) – in Ukrainian.