ASSESSMENT AND STRUCTURAL REHABILITATION OF THE TECHNICAL MUSEUM IN ZAGREB

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Technical Museum is one of the most visited Museums in Zagreb, Croatia. The museum is scientific and educational centre in the field of technical sciences. The entire structure of the Museum is built in timber and as such represents a rare existing example of the European engineering concept of expo-halls timber structures with large span (85m x 40m) from the early 20th century. In technical terms, it is example of European architectural heritage. The Museum is under the protection of the Conservation Department in Zagreb, Protection of Cultural Heritage. Museum was built in the 1948 as temporary structure for Zagreb International Fair. During the years this facility was used for various social and sport activities but now it is property of Technical Museum Zagreb. Designed by Marijan Haberle, B. Sc. architect as temporary building, three building units (after 66 years) are still in intensive use, with a very large number of annual visits.

Layout of the main exhibition hall of Technical Museum is designed as a circular segment of a ring. External dimensions of the main hall are 81.27m (east facade)/87.75m (west facade) x 25.40m. Total area of ground plan is about 2137m². East and west facade are partly glazed and partly covered with wooden panels, while the north and south facade are entirely covered with wooden panels. The main load-bearing system is 13 truss frames with spacing of 6.8 to 7.3m. Main timber frames are interconnected with 11 secondary trusses with spacing 1.6m to 3m. The highest elevation of the hall is 19.74m. Vertical load-bearing structure - columns are designed as four or six assembled vertical beams with “N” lattice infill. Spatial stabilization of the building was done with three horizontal transverse, four longitudinal horizontal wind stabilizations and two vertical wind bracings.

In the period 2010-2014, the Chair for Timber structure, Faculty of Civil Engineering (UNIZG), is leading the assessment and reconstruction project of timber structure. When the replacement of old facade in the main hall has been scheduled, damage and excessive strains on the respective revision spots on the timber structure were found. It was concluded that only few original architectural drawings of the building are present and that there was no original static design of structural elements bearing capacity and stability. Therefore, the detailed survey of the timber structure (visual inspection, geometry recording, condition of structural elements and NDT determination of residual strength and stiffness) with static analyses was conducted. Visual inspection revealed that many of the complex build-up columns suffered huge damage because of moisture. Deep cracks were found in many of the elements and are fixed with the epoxy resin mixed with the sawdust. Some connections are either poorly executed or irregularities occur over time. Carpentry joints are generally in good condition but there are a number of which were initially wrongly executed. On some main and facade columns torsion effects are visible. Bracing system on the roof structure is poorly designed so has to be strengthening by additional elements. Also, the part of spatial vertical stabilization was missing and additional steel bracings were added.