HBIM Application to Historical Steel Structures: the Case Study of Lapela Bridge

Ignacio del Rio[1], Manuel Cabaleiro[1], Borja Conde[1], Belén Riveiro[1], José C Caamaño[1]
[1]Department of Materials Engineering, Applied Mechanics and Construction,
School of Industrial Engineering, University of Vigo, C.P. 36208, Vigo, Spain.
nardric505@gmail.com; mcabaleiro@uvigo.es; bconde@uvigo.es;
belenriveiro@uvigo.es; jccaam@uvigo.es

Abstract - Historical steel structures are present all around the world. Besides being a common part of the cultural heritage, many of them are still in service. As an example, we can cite the case of riveted bridges, railway stations, exhibition pavilions, or industrial buildings. The maintenance of these ancient constructions is crucial since they are prone to have suffered significant damage over time due to effects such as corrosion, human actions, or the exposure to heavy loads for which they were not originally conceived. Further, in many cases, these steel structures have to be strengthened in order to adapt them to new uses. HBIM (Historical Buildings Information Modeling) is a new methodology in structural design and construction that could be used as the ideal tool for the maintenance management of these historical structures. HBIM technology is adopted in this paper for structural engineering purposes. Departing from the geometric survey carried out by terrestrial laser scanning, a 3D model is obtained which apart of gathering the main dimensions and details regarding the composition of the structure, it allows collecting all the information concerning the deterioration grade or the different inspections and retrofitting actions performed over time. Thus, by introducing different time stages in the 3D model, the evolution of the structural health over time can be analyzed, which allows the decision-making regarding maintenance and, if required, the undertaking of repairing works. The proposed methodology will be applied to the case study of the Lapela Bridge, in Portugal.

Keywords: Maintenance, Laser scanner, Structural health monitoring, 3D Modelling, FEM simulation.