



POLITECNICO  
DI TORINO

# Honors thesis

---

## COURSE OF ARCHITECTURE CONSTRUCTION CITY

*Abstract*

**BIM for cultural heritage: new parametric methodologies applied to the case study of the "Padiglione V", part of the historic exhibition halls system known as "Torino Esposizioni".**

*Tutors*

Massimiliano Lo Turco  
Edoardo Bruno

*by*

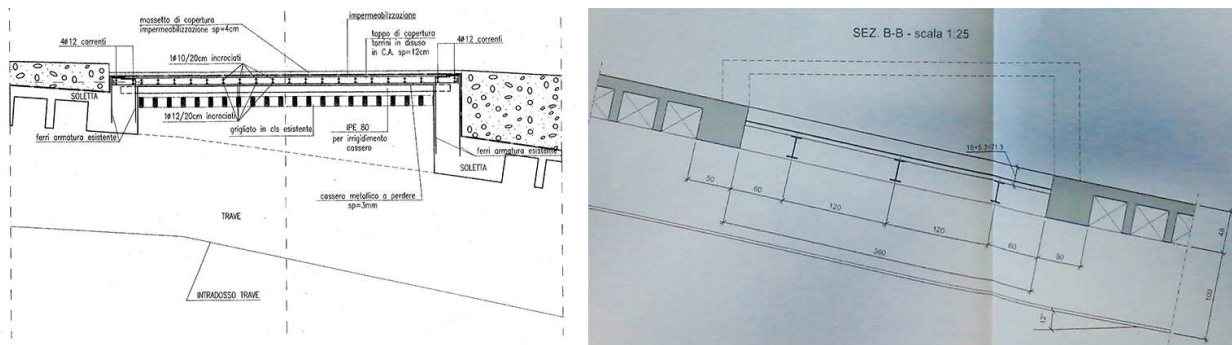
Edoardo Barberis

February 2016

The study realized was focused on the verification of the possibilities offered by the new three-dimensional modeling methods in the analysis and conservation of the existing architectural heritage, with particular reference to the so called "Padiglione V" of the exhibition complex named "Torino Esposizioni". It's a former exhibition building designed by the Italian engineers Riccardo Morandi and Vittorio Bonadè Bottino in 1959; it's currently involved - 2016 - in the scenarios of transformation of the axis of the River Po, and it has been involved over time in prolonged periods of neglect, as well as by many projects of transformation.

The work consists of two interdependent thematic blocks, the first is the historical one, in which, due to the archival researches that have been made, the evolutionary phases of the pavilion have been analyzed. The second thematic block it deals with the practical phase of the work: it's about the modeling phase and it's based on the study of the building, like it appears nowadays, like it used to appear in the past and like it would have appeared after different design choices.

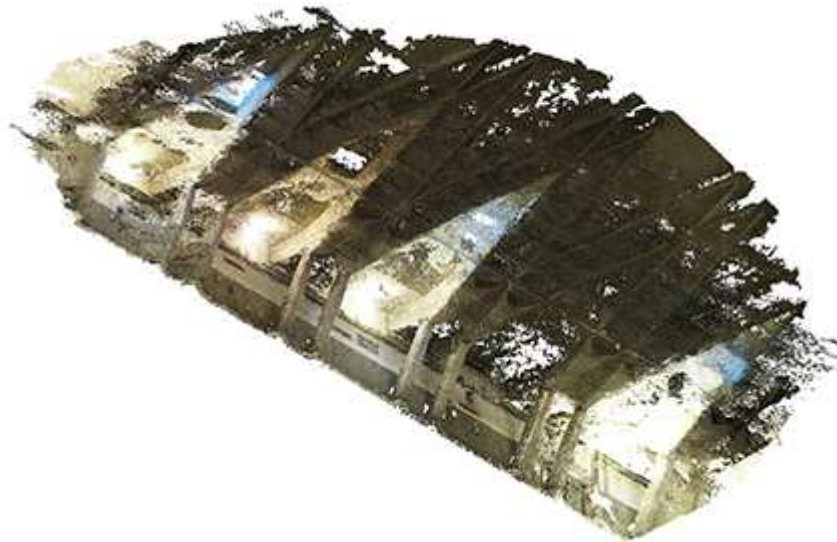
Specifically, it was brought to light the metamorphosis process of the site that hosts the artifact, a process made by a complex succession: an artificial lake took place before various exhibition halls and before an outdoor riding ring. In 1959, after a tortuous process of approval, the "Padiglione V" was built, completely buried: for its realization the renowned engineer Morandi has adapted the typical elements of the static diagram of the cantilever beam. The new exhibition hall, however, was never fully exploited partly because of its poor economic sustainability, which is why in the mid-90s it was converted into parking. The intervention was not so accepted by the citizens, and it was not so respectful of the preexistence: the building, forgotten and degraded, was subsequently subjected in the early years of this decade to further analysis and remediation interventions.



Picture 1: comparison between archival papers of 1996 and 2005 related to pavilion skylights.

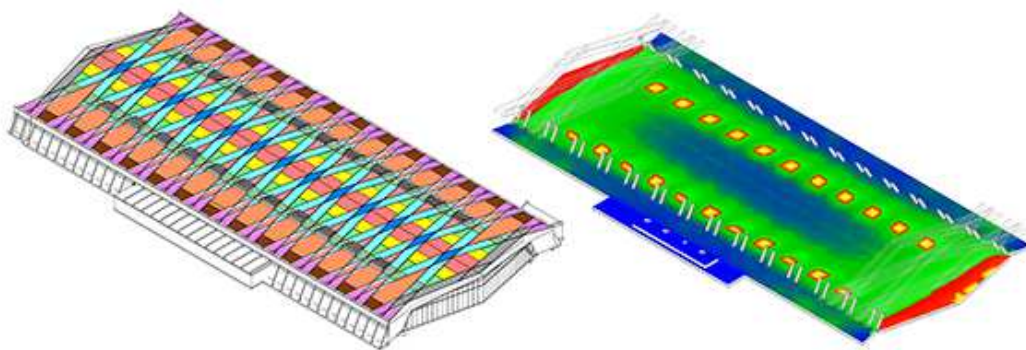
The layering of transformations of "Padiglione V", often ignored, has been the focus of the modeling phase, for which the advantages of BIM have been exploited. The use of BIM technologies, combined with the digital photogrammetry, has been suggested by selected methodological references. The study of the pavilion began with the modeling of the eight ever made design variants that preceded the final shape of the building: these virtual reproductions were subjected to graphic and quantitative investigations related to building components and related to natural lighting levels which would have enjoyed variants. This phase is helpful to explore the evolution of the design themes that led to the final design of the pavilion V and to enrich the wealth of information about the past of the artifact.

Then, thanks to the photogrammetric techniques, the points cloud of a typical portion of the existing building was generated: these spatial coordinates were the reference for modeling with Autodesk Revit. The inclined connecting rods have been modeled, like the beams of the hall, and the point cloud has been useful to support the critical refutation of archival papers found.



Picture 2: points cloud obtained with photogrammetric techniques.

Particular attention has been given also for the modeling of different roof typologies and for the digital reproduction of skylights, through which it was possible to demonstrate the possibilities offered by BIM applications in terms of simulation, control and analysis of the temporal dimension of an architectural project. Finally, after making quantitative analysis on pavilion natural lighting, at the years 1959, 1996 and 2005, it was decided to make the virtual model created an added value from which to any transformations of the building: the 3D entities created they have been linked to the images of the archival documents used for their modeling, trying to overcome the problems of heterogeneity and limited accessibility of archives from which they come.



Picture 3: analysis of roof typologies and distribution of natural lighting.

---

For further information please contact:  
Edoardo Barberis, [edoardo.barberis@live.it](mailto:edoardo.barberis@live.it)