23 24 MARCH VENEZIA

THE CONSERVATION OF PONTE DELL'ACCADEMIA IN VENICE

How to maintain the historical appearence with updated technologies

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HISTORICAL BACKGROUND

In the day of November 20th 1854, citizens of Venice have finally witnessed the inauguration of the second pedestrian bridge crossing the "Canal Granda", which was an iron structure spanned about 50 meters, designed by the British engineer Alfredo Neville. This had been the precursor of "il ponte dell'accademia".

As a matter of fact, the iron bridge of Neville has never been fully appreciated by the Venetians. In their constant criticism, its industrial and modern configuration has been considered as dissonant element of the ancient Venice. And the outrageously high cost of maintenance made the government had no choice but to limit the use of it to decelerate its serious deterioration. In the year of 1931, a wooden bridge designed by engineer Eugenio Miozzi has been built, in order to function as a temporary solution replacing the previous bridge by Neville. At the same time, the discussion searching for an official and permanent scheme has never ceased. Contemporarily with the completion of the wooden one, a design proposed by Architect Dullio and Engineer Ottorin has been announced as the winning scheme. Unfortunately, restrained by the break out of war and financial difficulties, the official design had never had a chance to be built. Consequently, the temporary has become permanent. The name "ponte dell'accademia" derived from the fact that it locates next to "Accademia di belle arti di Venezia (now converted into Gallerie dell'accademia)".

The principle structure consists with two Metallica arch supported by brick stacks sit on each side of the canal. The span of the both arches is around 50 meters, and the height from arch top to water is about 7 meters. Between the arches locates a metal wind resist system, it works side by side with the arches forming a solid base, on which a wooden structure of steps and platforms has been built.

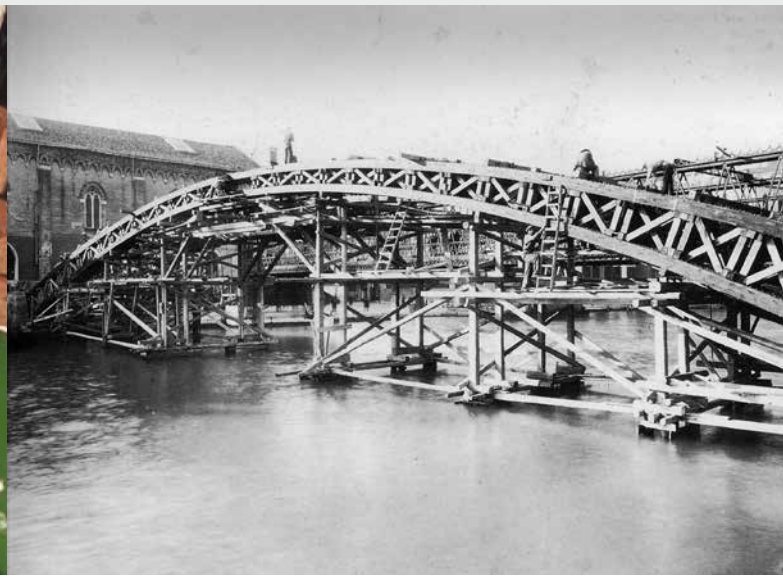
As it has been designed and constructed as a temporary structure, the economically se-

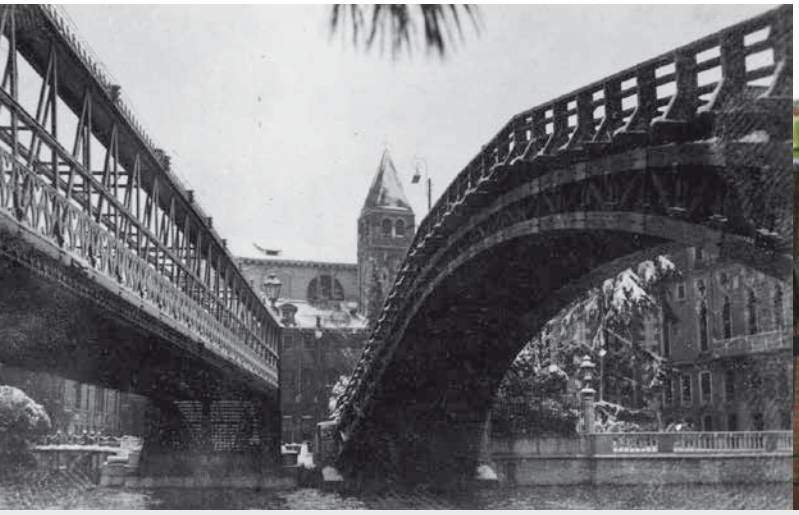
lected materials, the highly simplified construction methods and the intensely compressed working duration, are bound to be problematical during the utilization of the bridge. Furthermore, the high humidity of Venice and the corrosive sea water accelerate considerably the degradation of wooden and metallic components. The constantly increased number of tourist, the damaging caused by overloaded pedestrian traffic is becoming more and more critical. The bridge has gone through several major conservations in history, the resistance of the structure has always been the main concerns of the previous interventions. Under the premise of maintaining the original exterior configuration, the majority of structural now are made of steel with a larch coasting resembling the original wooden structural. The most recent conversation has been completed not long ago.

DEGRADATION PERCEPTION AND VALUATION

Before drawing to a conclusion of definite intervention methods, the perception of existing degradation and the valuation of the risk causing by the damages should be very crucial. The process of sampling study includes works as following: partial dismantling of the most representative and essential sessions of the bridge (for example the wooden trusses on each end of the bridge which bear the most load and suffer the most severe corrosion from the sea water); observation the condition of each component of various materials; mapping of the existing damages on each components; mapping of the existing connecting situations between the components, especially between those made of different materials; valuation of soldering joints between Metallica components; valuation of damage situation of wooden coating ; valuation of corrosion situation of metallic components.

The foremost outcomes of the sampling study are listed as following: the most evident decay is the corruption of wooden components especially those function as coating, contacting directly with metallic materials. The stagnated sea water without being efficiently ventilated is the key factor that exacerbates the deterioration of the wood; However, the most critical damage concerns the rusting of metallic components, which occurs most frequently also on the joints where the various materials meet. For instance, the steel profiles with a C section, coated with larch panels, are the most essential structural elements of the two arches with a span of 50 meters that bear all the load of the upper structure. The sea water enters the gap between wood and steel frequently, due to its concealed





position, the serious corruption of steel revealed only after the demolition of wood during the sampling study. The concealment of degradation increases tremendously the level of potential structural risks. Another unignorable phenomenon is the sever abrasion of the wooden steps and platforms cause by the daily traverse of outrageous number of tourists.

THE INTERVENTION EXECUTED

Throughout the analysis towards the existing condition and outcome of the damaging valuation, it's very obvious that the majority of the damages are caused by the corrosive sea water and the unsuitable connection between components that exacerbates the effect of corruption. Based on the principle of reducing the risks of corrosion a series of comprehensive and meticulous intervention have been practiced, which can be generally catalogued into three basic categories: the amelioration of the existing joints between components; the corrosion prevention intervention applied on the existing structure; the substitution of over degraded components and the adjustment on the repairable parts. The specifics are listed are following:

The amelioration of the existing joints between components: the insertion of a spacer between wooden and metallic components, made of xylene with a thickness of 1cm. This method allows the circulation of air and water between the wood and metal in order to

create a relatively dry microenvironment avoiding the corrosive effect of the stagnated sea water.

The corrosion prevention intervention applied on the existing structure: the complete removal of rust on surfaces of metallic components; two layers of Zinc phosphate coating treatment on all the accessible metallic surfaces; three layers of polyurethane enamel treatment for all the micro metallic components; Multiple layers of corrosion resistant treatment on all the wooden components.

the substitution of over degraded components and the adjustment on the repairable parts: the replacement of unrepairable metallic components follows the principle of avoiding applying the profile with enclosed section in order to avoid undetectable decay in the future; the replacement of unrepairable wooden components follows the principle of applying the larch with the similar appearance to the original one, in order to obtain the harmony between the past and the present; proper adjustments for those parts which are slightly deformed.

The conservation of “il ponte dell’accademia” respected the historical appearance of the bridge, in the meanwhile considered comprehensively the updated functional requirements of modern times and the security of structural. For the sake of prolonging the duration, regular maintenance and verification is definitely required.