ROAD INFRASTRUCTURES: SITES, ARCHITECTURES, LANDSCAPES

Siviero E.
Full professor –IUAV University of Venice – siviero@iuav.it
Culatti M.
Phd Student, Trento University – michele_culatti@fastwebnet.it

ABSTRACT

The most important problem related to the road network infrastructures, as for its shape building, is the "junction" management, that is to say the layout intersections. Such interventions have usually been carried out taking away part of the soil and modifying, in some cases with negative effects, the landscape. Thanks to the architectural design of infrastructures and their formal integration in the surrounding area, it is possible to redevelop these sites.

Three significant examples of junction project have been devised within some graduation thesis of the Department of Architectural Construction at the IUAV University of Venice. Their purpose is to explain the development design taking into account the links between the infrastructure and the area, both in connection with the junction functional difficulty and with the landscape peculiarities.

The first example concerns a curved infrastructure, which lines are in keeping with the landscape elements. The second one regards a multilevel intersection aiming to ensure the traffic safety and fluidity in an area in which a viaduct will be built and well integrated with its surrounding landscape thanks to different horizontal and vertical curves. The third one concerns a junction placed near a toll gate in which the intervention difficulty is represented by the multi-functionality of the designed infrastructure. In fact, such area is characterised by an oblong shape and its car parks, commercial areas, landscape observation points are organised within an architectural construction which is, at the same time, function, symbol and relationship with its land.

Keywords: road network junctions, infrastructure - landscape relationship

1. INTRODUCTION

The structures mentioned above represent the evolution of the study of the infrastructure – landscape relationship, where a great attention has been given to the problem of the road junction. Such problem is tackled from different points of view: formal value (represented by the infrastructures of which it is composed), the functional relationship with the surrounding area and the local and European territory characterisation.
The purpose of this study is not only to underline their technical value within the project in which they are physically placed, but also to think about the opportunity offered by the area in which a structure is integrated in.
A linear infrastructure always separates a specific area, which has not only a physical dimension but also a human one: in fact, such separation occurs also in society and landscape relationships breaking the very delicate links, above all in Veneto region.
Thus the “junction" management, its spatial configuration, the aesthetic value suggested to the permanent or transit user, could give the opportunity to design a recognizable infrastructure, restore the blocked connections and restyling or constituting its new symbolic, functional and subsequently social values.

2. VIADUCT PROJECT IN VEDELAGO AREA (TV) AND ITS INTEGRATION IN THE LANDSCAPE

The project description mentioned below concerns the requalification of the main road SS 53 and the building of a viaduct near Vedelago (TV).

The basic argument of the project, drawn up during the graduation thesis by the architects Alberto Simioni and Guido Stella, was the impossibility to separate the infrastructure design and the study of the landscape in which it will be settled-in.

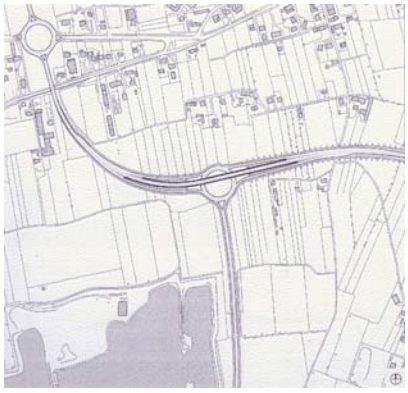


Figure 1 Project layout plan

The bridge, like any other infrastructure which strongly influences the landscape in which it is built, can not be thought as a structure separated from or independent to the surrounding lands. The site should be analysed with reference to every natural and artificial component: such elements together with other characteristics should be taken into account for the project design as, during its construction, the related area is inexorably modified.

Thus structure, materials and construction should be studied in connection with the surrounding area in order to achieve a proper environmental integration including the element "landscape", which results from the combination of different elements in keeping with each others at different levels.

When we analyse the landscape, we study, above all, its structure that is to say its morphological, environmental and anthropic aspects.

By means of these guidelines, we have studied the project area placed in the core of Veneto region, west of Treviso province, in the middle of Treviso plain; a site characterised by cereal fields regularly divided, lawns, vineyards, hedges, a landscape basically flat, and, in background, the hills and Monte Grappa and Monte Cesen peaks.

Such area, even if it was damaged by an irregular growth of industrial areas and by the extractive activities, is still characterised by its naturalistic value.

In addition to the trees in the farm courtyards or delimiting the different properties, and in addition to the arboreal culture for wood or fruits, the only "vertical" elements, present on the area, are the bell tower and the waterworks "head".

The lack of construction elements characterised by a relevant verticality obliged the architects to devise a project excluding some kinds of infrastructures which clash with the surrounding environment.

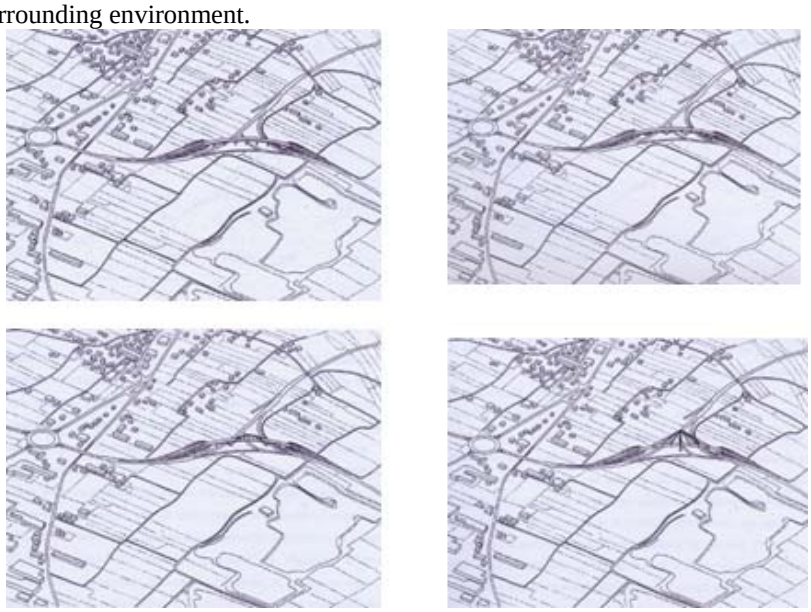


Figure 2 Contextualization of different infrastructure typologies

Structure typologies which could strongly adapt to this kind of territory are characterised by a significant horizontality, such as the truss bridge, frame bridge or lower arch bridge, whose longitudinal profile could be integrated into the skyline without changing the landscape perception. On the contrary, an infrastructure characterised by a relevant verticality, such as a cable stayed bridge, could focus all attention on it and not on the main peculiarities of the territory and, at same time, could not protect the landscape.

The usage of a continuous beam structure on three abutments is related to the research of a high-standard quality and compatibility with the surrounding landscape in which the infrastructure has to be placed, and to a further design of formal possibilities offered by such typology.

From this point of view, we have also considered the choice of concrete like main material for the infrastructure construction because it permits a certain freedom in the creation of plastic shapes, even if within some technical and economic limits.

In order to establish a deep relationship between the landscape and infrastructure and to reduce its impact on the area, an asymmetric section of the plank covering has been developed with two views. Subsequently they have been differently conceived because the structure gives from one side onto the built-up area of Vedelago and from the other onto the countryside.

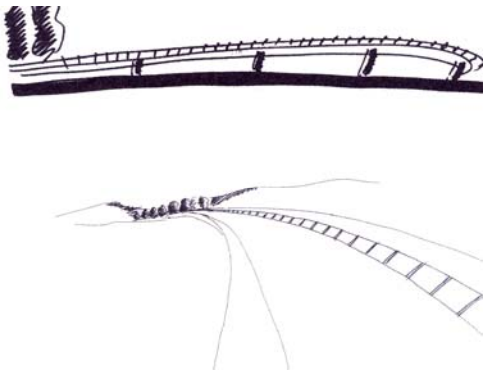


Figure 3 Project outlines

The built-up area view has a raising part compared to the main plank covering, having the function to hide the vehicle flow. On the contrary, the countryside view has an intrados characterised by a bend which contributes to make it looking thinner: it gives the perception that it does not touch the supporting elements providing an overall idea of lightness.

The project design was also inspired and enriched by the observation of natural shapes.

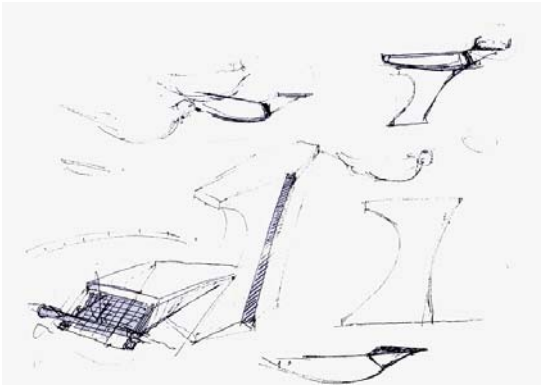


Figure 4 Project outlines – section of plank covering pier with zoomorphic references

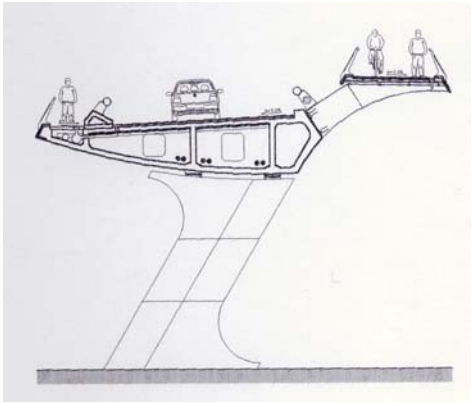


Figure 5 Final section of the bridge: splitting the traffic flows: pedestrian, vehicular, cycle

Studying the section it can be easily noticed how all the structural elements give a typical zoomorphic aspect to the area, thus resulting in a structure highly compatible with the context characterised by a strong naturalistic value. The sloping piers (legs) support the spindle-shaped and asymmetric plank covering (body) from which stick out the overhang brackets (neck) supporting the pedestrian and cycle track (head); these elements remind the silhouette of one of the birds sheltering inside the close Parco del Sile.

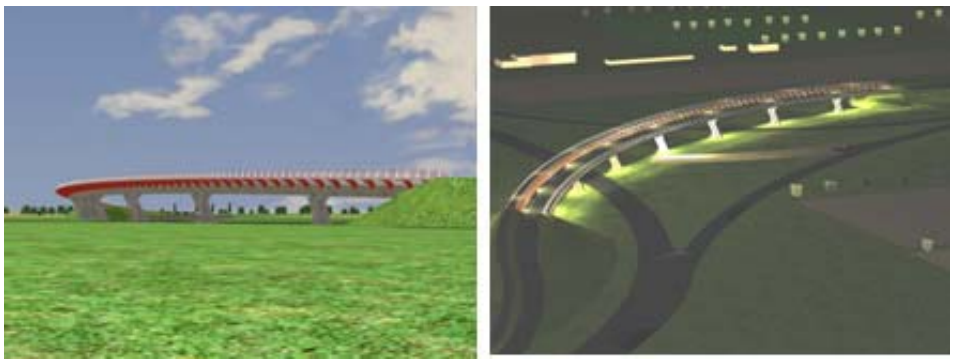
The apparently complex shapes of the elements that constitute the bridge itself are made to provide the structure with harmony and formal expressiveness, while the overall boundless dimensions allow to perceive it perfectly integrated with the landscape.

To overcome the bypass road modifying the main road SS 53 and the unidirectional link road towards Treviso, it will be built a viaduct that along the horizontal plan plots a curve, which radius is 300 m long. In addition to that, along the vertical plan, the structure plots a second arch, which radius is 3,000 m long, so that there will be an height clearance of 5.50 m as for the ground level.

The plank covering, which the viaduct will be made of, has the following features: multicellular caisson, constant height, it is asymmetric and eight spans continuous curved: the six central ones are 36 m long while the ones at both ends are 28.80 m long, so that the total length is 273.60 m.

The cycle and pedestrian track will be placed in the overhanging part of the structure, in a special location raised 1.50 m above the vehicular traffic level. This solution allows on the one hand to strongly separate the different types of users, on the other hand to “protect from the eyes" the surrounding spaces so that cyclists and pedestrians can not see the cars passing through the viaduct; whereas they can only see each other and at the same time enjoy a very good landscape.

Moreover the series of the supporting metal elements of the cycle and pedestrian lane and the shadows casting over the plank covering create the rhythm of its presence all along the viaduct.



Figures 6 - 7 Final result: viaduct rendering

A series of special lights designed and created for being embedded in the pavement and aligned with the surface will illuminate the pedestrian and cycle track. Moreover a series of spotlights will be placed in the intrados of the viaduct near the supports for the pedestrian and cycle track in order to guarantee the possibility of perceiving the formal aspect of the structure even during the night.

3. PROJECT OF A BRIDGE-VIADUCT FOR THE BYPASS ROAD MODIFYING THE MAIN ROAD No.47 NEAR BASSANO DEL GRAPPA (VI)

This project was developed by the Architect Leonardo Zen for his graduation thesis of 1998 regarding the constitution of a junction near Bassano del Grappa extending along the new link road between Bassano and Cittadella. The problem on the road system roots in the fact that the current main road connecting the two small towns has become a commercial road. Thus it was necessary to identify the new soil in which settling an alternative road layout.

The planned solution, which in the direction north-south runs parallel to the railway line, crosses a main road system near Bassano del Grappa: this problem was solved by planning the junction as a multilevel one.

Studying the morphological characteristics of the place led to identify the links between the project and the context in order to find out the most suitable planning solution.

The study of the land, together with its cultural, anthropic and landscape features contributed to focus the planning ideas on a “geometrical” management of the junction: this will mean to minimize the quantity of soil to be used and to reorganize the road functionality in a vertical system made of tunnels, viaducts and ground level parts. In particular for the drawing of the viaduct, the landscape was analysed: in this area, it is essentially a flat landscape, transformed by the irregular growth of industrial urban spaces. Since there are no reliefs and building vertical elements and the cultivations are regular, the choices regarding the project excluded the construction typologies in contrast with these landscape features. Indeed, such place can not handle a structure that formally breaks the traditional context, focusing all the attention on itself. For that reason, the viaduct type chosen is a viaduct with horizontal static schemes with truss or arch bridges so that the longitudinal profile could be introduced in the skyline in a impressive way but at the same time without interfering with the landscape elements.

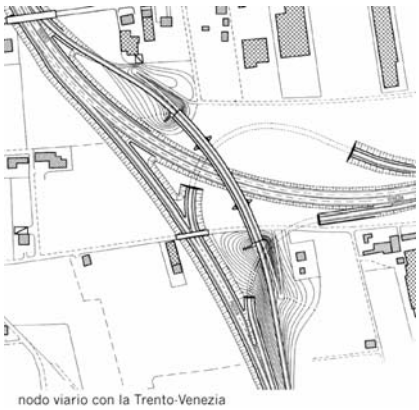


Figure 8 Project layout plan

Aiming to achieve an high formal quality and to make the structure compatible with the landscape in which it will be settled were the core objectives for planning the layout and the junction; especially the latter led to choose a formal solution involving the use of the arch.
For that reason the junction has been designed to minimize the quantity of soil to be used, organizing the system on three levels: underpass, "ground", viaduct, where the latter maintains the "horizontal" characteristic leaving uncorrupted the landscape view *from* the road and *of* the road.

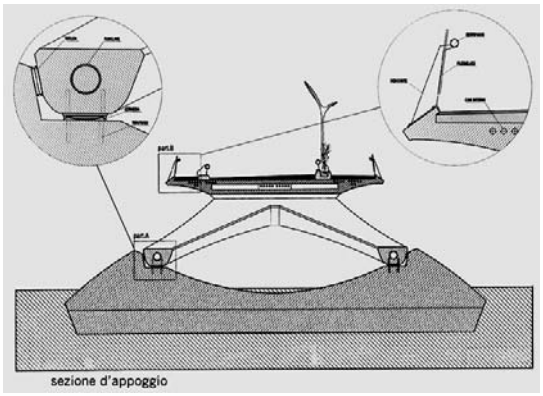


Figure 9 cross-section

Figure 10 Viaduct rendering

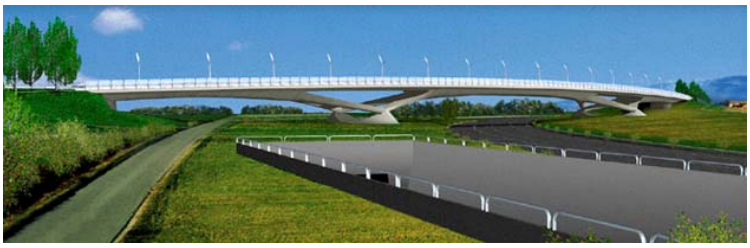


Figure 11 Contextualization of three levels

4. MOTORWAY GATE TO VENICE

This project was developed in 2005 by the Architects Barbara Mocellin and Lino Paolin: it is located near the junction of Dolo, in proximity of the connection with the "Passante di Mestre" (a bypass road for Mestre area), currently under construction. In this case the connecting junction has been designed including a series of different functions at the service of the road system and of the land, with an architecture meant to set different levels of internal and external links with the structure itself. The road becomes rest area, panoramic point of view, convention centre, hotel, parking, shopping centre and at the same time symbolic element converting the landmarks in a physical element without dominating them.

The basic idea derives from checking the possibility of a dialogue regarding the project between the road and the building within an infrastructural junction: the opportunity has been given by the introduction of the "Passante largo" (large bypass road) of Mestre (located in Vetrego, Dolo - Venice), connecting it with the motorway A4 Padua-Venice.

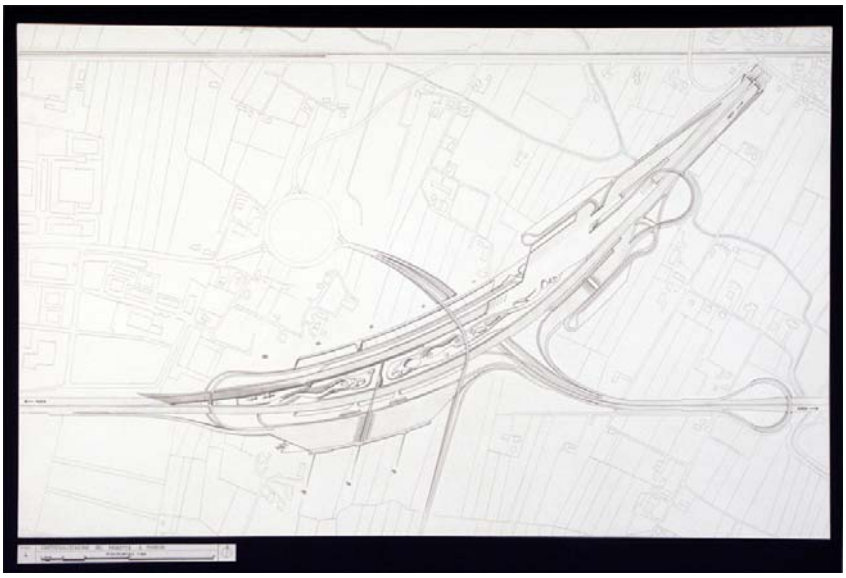


Figure 12 Project layout plan

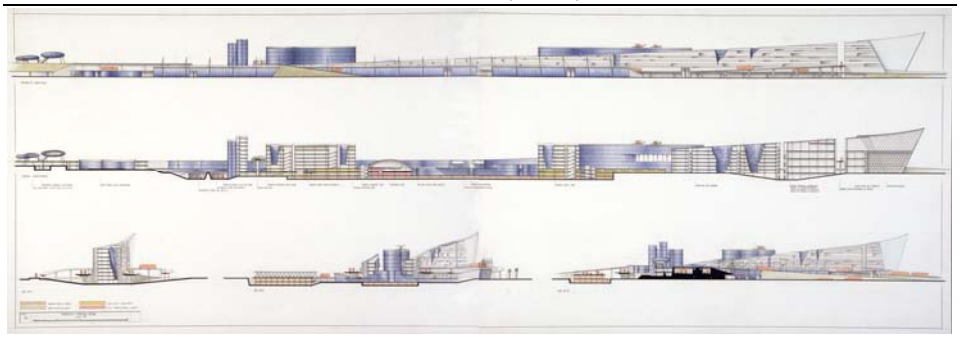


Figure 13 Front views

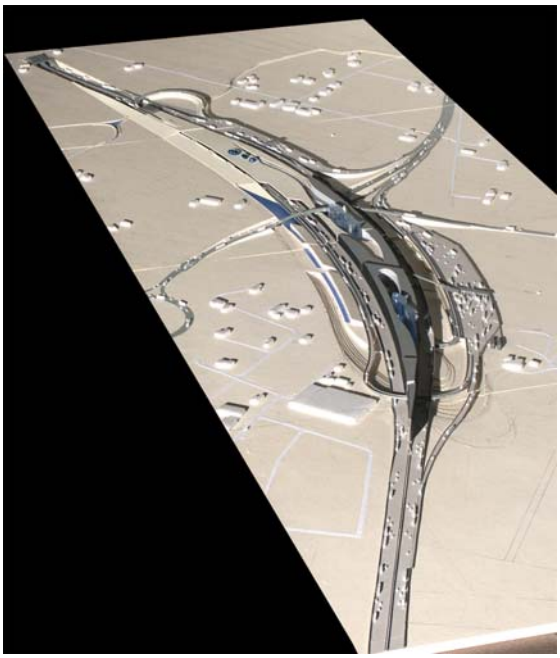


Figure 14 Scale model

Guidelines for the road planning have been taken as a starting point since they can be integrated in a drawing that overcomes the geometrical directions pursuant the current regulation. This enabled to “shape” the geometry of the junction obtaining paths with smooth twists and turns which interact with the buildings guaranteeing easy connections in all the directions requested, minimizing at the same time the amount of soil to be used.

Through an adequate check of the geometry of the road the idea of producing a “loose junction” has been proposed: a junction with frayed ends developing mainly along the motorway roadways. The entrances and the exits of the turnoff have been split and placed all over the big bend of the motorway and along the roadways, which have been designed with different radiuses of curvature. These roadways have been partially placed in the central part of the building. The earthmovings located in the final part of the volume (in an eastern and western position as for the project) represent the “accumulation” and the “excavation”: they are supposed to help the integration of the junction being filtering elements with the surrounding area.

Basically the activities taking place along the junction will concern the tertiary sector with the presence of specific services for the motorway users: that is why it is possible to summarize the longitudinal development of the project in three main parts: a first part, towards Padua, basically designed for the tertiary sector; a second one dedicated to commercial activities and a third one, towards Venice, planned to provide the motorway users with useful specific services: then the whole structure becomes a sort of *European transit gateway*, which signals the passage from east to west. “8-16-24 – Metrogate” conveys this idea: an infrastructural junction, with multiple levels, where different ways of living the day (8, 16, 24 stand for the main opening hours) constantly interchange, boosting and distinguishing this metropolitan area of Veneto region.

CONCLUSIONS

Usually we manage the road structures construction with an approach strictly linked with a "separate" logic, in which realizing the project comes first and as a consequence its mitigation has a minor role. Opposed to this traditional point of view, conceiving a planning phase in which there is a mutual exchange of planning ideas and limits/opportunities conditions of the area allows to take advantage of countless inspirations able to give birth to projects with unexpected results.

As described above, in the three mentioned examples, it has been analyzed the link between the structure and its context with all its shades according to the landscape and its basic functions: this analysis has been carried out for what it concerns the landscape through transparencies and concealments; regarding the definition of the road functions through the multilevel arrangement, and finally with reference to the multifunction exchange area of the different means of transport through minimizing the amount of soil to be used and at the same time creating symbolic links with the context.

These interpretations of the link between the junction and its context should be thought as a part of a larger and overall project, carried out by the Department of Architectural Construction of the IUAV University of Venice: this project goes beyond the environmental integration of the structure and focuses on internalizing in a conscious and controlled way an element that might be under the label of “added value”.

The “added value” of a road and its relating junctions should not result only by adding together the single parts analyzed separately (as it often happens in our country) but, by means of the organization of the different functions, it should rise from the several existing links, also considering the exchange possibilities that the architecture of

the road provides, along with its final results that affect the social environment and the quality of life.

REFERENCES

SIMIONI A., STELLA G., (2000) – " Riqualificazione della SS 53 e progetto di un viadotto a Vedelago (Tv)" - *Graduate Thesis* – IUAV University of Venice.
ZEN L., (1998) – "Progetto per un ponte-viadotto per la variante alla SS 47 in prossimità di Bassano del Grappa" - *Graduate Thesis* – IUAV University of Venice.
MOCELLIN B., PAOLIN L., (2005) - "Porta autostradale per Venezia" - *Graduate Thesis* – IUAV University of Venice.
SIVIERO E., CULATTI M., SIVIERO F., (2007) - "Il guasto del territorio"- Pubblication: "Il modello veneto fra storia e futuro" - Il Poligrafo, 2007.