THE FRAMING OF ART WORKS WITHIN THE ENVIRONMENT

ÎNCADRAREA LUCRĂRILOR DE ARTĂ ÎN MEDIUL ÎNCONJURĂTOR

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Abstract: *The paper points out the studies made by the authors, concerning the aesthetic aspects while designing and executing the art works (bridges, retaining walls, etc.) realized on a series of roads developed on hilly areas or along waters belonging to the Regional Directorate for Roads and Bridges Timişoara (DRDP). Each art work has its own particularities which cannot be realized according to general patterns, being the results of careful measurements on the spot. The execution of infrastructure works is realized so that the potential contamination of water streams, lakes or underground water is avoided. Taking into account that the alignments of the studied roads run close to the river bank almost entirely, at many points the slope being instable or potentially instable, sustaining and consolidation works have been designed and executed, which consisted of embankment and cut retaining walls. While designing and executing the art works, the existing situation, previous to the beginning of the construction works, is taken into account, elaborating thus a concrete program both for the work's protection and integration within the environment and for the rehabilitation of the affected area, insisting on a cohabitation between environment and work, without disturbing one another.*

Rezumat: *Lucrarea scoate în evidenţă studiile făcute de autori privind aspectele estetice în proiectarea şi execuţia lucrărilor de artă (poduri, ziduri de sprijin, etc.) executate pe o serie de drumuri dezvoltate în zone colinare sau de-a lungul apelor din cadrul Direcţiei Regionale de Drumuri şi Poduri Timişoara. Fiecare lucrare de artă îşi are particularităţile ei, acestea nu se pot realiza după tipare generale, sunt rezultatul unor minuţioase măsurători la faţa locului. Execuţia lucrărilor de infrastructură se face astfel încât contaminarea potenţială a cursurilor de apă, lacurilor, pânzei freatice să fie evitată. Având în vedere că traseele drumurilor studiate se desfăşoară aproape de malul râului pe cea mai mare parte a traseului, în multe puncte versantul fiind instabil sau potenţial instabil s-au proiectat şi executat lucrări de susţinere şi de consolidare care au constat din ziduri de sprijin de debleu şi rambleu. La proiectarea şi execuţia lucrărilor de artă s-a ţinut seama de situaţia existentă înaintea începerii lucrărilor de construcţie, elaborându-se un program concret de protecţie şi încadrare a lucrării în mediul înconjurător cât şi de refacere a zonei afectate, insistându-se pe o coabitare între mediu şi lucrare, fără a se deranja una pe cealaltă.*

Key words: *art works, environment, road*
Cuvinte cheie: *lucrări de artă, mediu înconjurător, drum*

INTRODUCTION

The framing of art works within the environment is a permanent concern for those who work in the road field. In the literature of specialty, the term art works refers to bridges, viaducts, tunnels, retaining walls. While realizing the art works, at the present stage, more specialists concur so that the final result seems a natural product.

The paper broadly presents the pattern used to frame the art works (bridges, viaducts, tunnels, retaining walls) within the environment.

In the architecture and engineering books, the bridges are included, together with the retaining walls and tunnels, in the category named art works.

Every art work must look spontaneous as a natural product, realized by an artist in the same way as the nature itself creates. Therefore, the art works realized in the environment

must be part of it and, by this, avoid damaging somehow the ambient; they must represent a natural continuation, a prolongation of this.

People have noticed that, in order to avoid major problems, it is better not to derange, but to preserve and spare nature, keeping it the way it was created.

As it is known, generally, the roads passing through forests or areas with a rich fauna fragment the fauna's habitat, causing unbalance, and, thus, major consequences for the crossed area. This is why the art works must be harmoniously framed within the environment and they must have a pleasant appearance. Also, the construction must have a structural constitution able to fit the static requirements and those of resistance to future actions.

The paper points out the studies made by the authors, concerning the aesthetic aspects while designing and executing the art works (bridges, retaining walls, etc.) realized on a series of roads developed on hilly areas or along waters belonging to the Regional Directorate for Roads and Bridges Timişoara (DRDP).

The framing in the area has been done through constructive forms and colors harmonized with the environment where they are set, taking into account the fact that the framing of an art work within the environment must not "repress" the landscape but adapt to it.

Each art work has its own particularities which cannot be realized according to general patterns, being the results of careful measurements on the spot.

DN 66A Câmpu lui Neag

DN 57 Orşova – Moldova Nouă

MATERIAL AND METHODS

The execution of infrastructure works is realized so that the potential contamination of water streams, lakes or underground water is avoided. The positioning of the art works – bridges, viaducts, retaining walls and tunnels – was done in order to avoid:

- the modification of dynamic drainage by reducing the river bed section;
- the cut-off of underground drainage.

These principles have been taken into account when designing and executing the link road between the intersection DN 66A Câmpu lui Neag and Cantonul Silvic Câmpuşel, stage II, km 37+440 - 47+600 and when modernizing the national road DN 57 Orşova – Moldova Nouă.

Both roads cross areas of a particular beauty, whose conservation was one of the constructors' objectives.

The execution of the link road between Câmpu lui Neag and Cantonul Silvic Câmpuşel, raised special problems at the moment of choosing the best solution for the reduction of the impact road-environment to minimum. Passing through the mountain area of the Mountains Retezat and Vâlcan (Arcanu peak), the works for slope consolidation and embankment stabilization were real trial points. The alignment of the designed and executed road has followed the route of an existing forester road, with the exception of some sections where new bridges or other art works have been designed. The materials have been chosen

considering the needs for both ecosystem preservation and observation of the static and resistance to future actions on the structure requirements. Taking into account that the road alignments run close to the bank of the Jiului de Vest River, on the largest part of the alignment, the slope being instable or potentially instable at many points, sustaining and consolidation works, consisting of cut and embankment retaining walls, have been designed and executed.

The works for cut sustaining and harnessing have been adapted to the soil. For each case, the designer offered solutions, on site, according to the soil configuration.

According to the form and quality of the rock, resulted from the adobe excavation, solutions for the retaining works have been adopted from:

- plain concrete;
- reinforced concrete;
- rubble stone masonry;
- gabions filled with rubble stone.

The shapes and dimensions of the foundations have been adopted taking into account the local conditions, with the designer's permission.

After the execution of the works in cut, according to the soil nature, the corrosion degree of the rocky material and its corrosion directions, it has been established the necessity for works of cut retaining or revetment.

Cut retaining walls have been executed on the sector km 41+125 – 41+155 on a distance of 30 m and with an elevation height of 5 m. The works contain retaining walls executed from plain concrete. For the execution of cut sustaining, it was required the capping of some hill crests from alluvial soil. Drains have been foreseen in order to collect the water from behind the walls. The water collected by the drains is evacuated through weepers in the gutter before the wall.

Embankment retaining walls have been designed with the solution monolith retaining wall with an anchored cantilever. They have been designed to assure the drainage of the Jiului de Vest waters, which flow parallel to the national road. The anchored cantilever has been designed and executed in order to assure the width of the carriageway. The sectors where embankment retaining walls with anchored cantilevers have been realized are km 38+568 – 38+592, where 24m have been executed, and 38+623 – 38+707, where 84m have been executed. This solution has been chosen both in order to assure the necessary width of a national road and to avoid large-scale works which could "harm" the mountain.

The majority of the drainage elements within the road area have been executed from local material. If pre-cast elements have been used at the execution of culverts, rubble stone has been used at the execution of ditches and gutters. The execution of ripraps, at ditches and gutters, has assured their perfect framing within the landscape in the area, the material being in tune with the environment. At culverts, upstream overflow chambers and upstream and

downstream harnessing have been foreseen also from pitched rubble stone.

The rubble stone ripraps have also been used when executing the torrents' correction and for routing them towards the drainage elements within the road area (culverts, ditches and gutters).

In some cases, the visibility resulted from designing has not been taken into account, due to the fact that the necessity of huge works to remove the stones would have endangered the instable or potentially instable slope, having serious effects on the stability of the ecosystem in the area.

In order not to affect the drainage of Jiului de Vest waters throughout the mountain pass sector km 38+500 – 39+500, where the entry in the slope is practically impossible due to the height of the slope, widening in curves has been reduced.

Behind the retaining walls there has been foreseen a dry masonry, of rubble stone drain, weepers inclusively with unwoven synthetic material filter type TERASIN, all these in order to avoid both the cutting-off of the underground drainage and the waters' contamination.

For the execution of the three bridges km 43+500, km 44+615, km 46+890, the route of the existing road has not been followed on short distances. This deviation has been necessary in order to fulfil the technical requirements imposed while building a bridge. At the execution of bridges, classical materials (reinforced concrete, pre-stressed concrete) have been used to assure the construction's stability and resistance. Local materials, by which their framing in the environment is assured, have been used at different works where ripraps can be realized (slope protection downstream and upstream the bridge, side ditches, quarter cones).

Throughout the whole period of works, the execution of stone removal in the area of the Retezat National Park has been avoided.

Within the hydro-technical works, the following has been executed:

- rubble stone walls: 4250m;
- plain concrete retaining walls: 1380m;
- box retaining walls: 2733m.

The drains executed behind the walls were drains from dry masonry realized by rubble stone. All these have been executed in order to avoid both the cutting-off of the underground drainage and the waters' contamination.

The execution of works for the link road between Câmpu lui Neag and Cantonul Silvic Câmpuşel (DN 66A km 37+440 – 47+600) has represented a positive result for the designer and constructor, after having found the least devastating solutions for the work area and having naturally framed the road within the landscape, as nature itself would have done it.

In order to avoid the fragmentation of the habitat, passages for fauna have been built under the existing communication ways (undercrossings with diameters of 0.4 – 2.0m for small animals).

Another trial point for the designers and constructors has been the consolidation and modernization works of the national road DN 57, Orşova – Moldova Nouă, km 9+000 - 99+100.

The route in this case is situated in between the Danube and the roots of the Almăjului and Locvei mountains. Closed for many years to the tourist traffic because of its position, lately, the road needed massive works of rehabilitation in order to bring it to a normal stability.

The executed works were very different, from slopes consolidation to torrents correction and banks protection.

In many areas, the banks have been eroded because of the Danube's aggressive actions. There are many areas, km 18+500 – 22+000, where caverns in the road have appeared which could endanger the road traffic in the zone. In order to eliminate the scouring found on the Danube banks and to assure participants' safety in traffic, the designers have had a low

number of solutions taking into account that the works take place within the National Reservation Porțile de Fier, where the flora and fauna are protected by law. The solution found, with the lowest impact on the ecosystem in the area, is the execution of a foot slope. The foot slope is realized only from local materials. By this, the aggressive actions of the Danube waters are reduced.

It was necessary to realize a high number of cut retaining walls to assure the slope stability. The predominant rock in the area is the calcareous type with a high degree of weathering, which has required many resistance walls and pre-cast gutters in order to stop the flow of the materials from the slopes on the road area.

The adopted solutions were varied:

- resistance retaining walls from rubble stone masonry;
- gabion retaining walls.

The characteristic of the area is the slopes' instability due to, on one side, the weathered rock and, on the other, the actions of the environmental factors characteristic to the area of the Danube Gorge. The building of the retaining walls from local materials helped the landscape not to look "hurt" after their execution. The binding between walls and environment is done naturally, without any discrepancy between nature's construction and man's one. The slope consolidation works have been the more difficult to design and execute so as the highlighting of some tourist area was necessary, without provoking the false effect found in many construction works.

The rubble stone walls have been built by using rocky material obtained from the pit existing in the area, so that there is no colour difference between slope and retaining wall. For the realization of the necessary resistance and stability, reinforced concrete piles have been used.

Gabion retaining walls are realized using the same material obtained from the pits in the area. The ordered placement of stones in net boxes gives a tidy air to the realized construction without being in discrepancy with the surrounding landscape.

For the drainage of waters from the road area, ditches and gutters have been realized. The material used is the same material in the area. The solution adopted for them was the realization of ditches and gutters in the rubble stone ripraps' solution. At the executed culverts, pre-cast elements have been used. The downstream and upstream harnessing has been executed using rubble stone from the area.

The earthworks have been protected by gunite covering of cuts, by seeding and planting of cuts and embankments.

The correction of the local torrents was done also in the solution rubble stone riprap. The use of this solution makes these constructions to be practically confounded with the slope structure.

RESULTS AND DISCUSSIONS

The entire range of works designed and executed in this area of special beauty which is part of the Natural Reservation Porțile de Fier has represented a real exam of competence and ingenuity confirmation for everybody that has concurred in the realization of this works. The materials have been used in tune with the environment. A special attention has been paid not to affect the flora and fauna in the area, which have a special importance due to their uniqueness.

CONCLUSIONS

Due to the fact that, whenever one builds an infrastructure, inevitably, there is a certain degree of fragmentation of the natural habitat, the implementation of certain phenomenon reduction measures becomes essential, paying special attention to rivers, brooks, riparian forests, etc., thus, implicitly, to art works' construction.

The implementation of measures for the reduction of the construction's impact is more expensive and troublesome than the realization of some projects and an execution based on the assurance of modifying as little as possible the environment.

While designing and executing the art works, the existing situation, previous to the beginning of the construction works, is taken into account, elaborating thus a concrete program both for the work's protection and integration within the environment and for the rehabilitation of the affected area, insisting on cohabitation between environment and work, without disturbing one another.

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