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THE INFLUENCE OF ROAD INFRASTRUCTURE DEVELOPMENT IN LAND IMPROVEMENT ARRANGEMENTS

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Abstract: The infrastructure programs carried out by the Ministry of Development, Public Works and Administration in our country are proof of the development line of our country, a concern of the Government to achieve living conditions according to European requirements in our country, but which, due to the lack of funding sources, have not been able to develop at the pace required by the real needs of the inhabitants. Mainly, these programs aim at supplying water to villages in a centralized system, building sewage and water purification systems, treating wastewater, creating, modernizing, as appropriate, waste platforms, improving access roads by paving, rehabilitation, asphalting, building, expanding or modernizing bridges, footbridges or footbridges and developing sports facilities.
The design, execution and exploitation of land improvement works are carried out in close connection with water management works, management of communication routes, in accordance with the interests of land owners, with urban planning and territorial planning documentation, also taking into account environmental protection requirements. Given the importance of land improvement works in terms of quality of life, water, and the environment, the determining role of these works in the social and economic development of society, it is necessary to carry out new infrastructure works in conjunction with the existence and judicious exploitation of land improvement arrangements.
Keywords: infrastructure works, quality of life, land improvement works, land improvement arrangements.

1. INTRODUCTION

The arrangements of communication routes and intersections are carried out according to the "Regulation 600/2010 on the arrangement of level intersections on public roads" [1] with the aim of ensuring the flow of road traffic in safe and comfortable conditions, calming traffic in order to reduce the risk of accidents and reducing the level of air pollution by reducing waiting times when crossing the intersection as a whole and thus improving the quality of the environment.

From a functional and administrative point of view, according to O.G. no. 43/1997 on the road regime and the Order of the Ministry of Transport no. 1,296/2017 "Technical norms regarding the design, construction and modernization of roads", [2] respectively no. 50/27.01.1998 "Technical norms regarding the design and construction of streets in rural localities", published in the Official Gazette of Romania, part I, no. 746/18.09.2017, [3] with the consultation of the provisions of STAS 10144/1-90 "Layers. Transverse profiles" [4] and the Order of the Ministry of Transport no. 1.295/2017 "Technical norms regarding the establishment of the technical class of public roads" [5].

Also, for the dimensioning of the intersection area, the recommendations of the Traffic Study are taken into account, in which traffic data by vehicle categories and directions of travel, collected in the proposed development areas, were analysed.

2. CASE STUDY OF THE INTERSECTION OF COUNTY ROADS WITH CANALS THAT ARE PART OF LAND IMPROVEMENT ARRANGEMENTS

On the route of county roads that cross administrative territories of administrative-territorial units, intersections are often found between them, but also with other mandatory objectives existing in the field.

From the point of view of traffic safety, there is vertical road signalling (through signs) at the intersection that regulates priority, but horizontal road signalling (through markings) is often deficient in the area of connections with different categories of county roads.

Although the connection radii for county roads are relatively large, they are sometimes not sufficient, especially in the case of long or articulated vehicles that need to make sharp turns, thus leaving the roadway and being put at risk from a safety point of view.

Another inconvenience is the poor technical condition of the devices for collecting and evacuating surface rainwater and the lack of maintenance of ditches and footbridges, making it necessary to build new ditches and footbridges.

In the area of the intersections proposed for development, according to the cadastral plans, the county roads cross existing earth channels, for which it is important to identify the elements of the channels in the land improvement development under the administration of National Land Improvement Agency.

Field situations of the drainage channels in the intersections with the county roads are also illustrated in the photographs below:

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Figure 1 Existing footbridge, which will be replaced due to the change in the geometry of the intersection



Figure 2 Image of existing surface drainage channel



Figure 3 Intersection with county road and surface drainage channel view 1



Figure 4 Intersection with county road and surface drainage channel view 2

By building the intersections, the following objectives are aimed at being achieved:

- traffic flow in safe and comfortable conditions;
- traffic calming in order to reduce the risk of accidents;
- reducing air pollution levels by reducing waiting times when crossing the intersection as a whole and thus improving environmental quality.

Existing intersections on county roads can be improved in terms of road and pedestrian traffic flow and safety by creating an intersection according to the regulations in force, which regulate priority and reduce the number of conflict points.

3. DESIGNED SOLUTION

In the case of intersections between county roads for the arrangement of roundabouts, the following characteristics are taken into account:

- Inner radius (Ri): m;
- Outer radius (Re): m;
- Connecting radius at the entrance (Rint): m;
- Connecting radius at the exit (Ries): m;
- Width of the roadway on the ring road (Wcirc): m;
- Width of the roadway at the entrance (Wint): m;
- Width of the roadway at the exit (Wies): m;
- Over-widening on the inside (S1): m;
- Width of the signal ring (with arrows to the right): m;
- Length of the uneven separating island (Lins): m;
- Width of the uneven separating island (lmin): m;
- Width of the dedicated lane for the right turn/forward movement: m.

Following the results obtained from the analysis of traffic data by direction of travel, found in the traffic study carried out for the proposed investments, the needs for the arrangement of dedicated traffic lanes for the forward direction of travel, for road traffic, respectively the arrangement of dedicated traffic lanes for turns for road traffic, arise.

Road structures for ring roads and access arms at intersections will be dimensioned for flexible or mixed structures according to the "Standard for dimensioning flexible and semi-rigid road systems (analytical method)", Indicative PD 177-2001 [6], and for rigid

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structures, according to the "Standard for dimensioning rigid road structures", Indicative NP 081-2002 [7].

Also, the designed road structures will be verified from the point of view of resistance to the action of the freeze-thaw phenomenon, according to the provisions of STAS 1709/1 [8] and STAS 1709/2 [9].

Between the existing road structures of county roads and newly designed road structures (where applicable), it is recommended to lay an anti-cracking geocomposite with a width of 1.00 m at the base of the bituminous coating to prevent the appearance of cracks in the asphalt coating.

Safety zones (interior over-widening), with a single slope of 5%, bordered by curbs placed at the same level on the roadway side, are made up of a succession of layers:

- self-locking concrete slab pavement;
- cement mortar surface layer;
- cement-stabilized ballast upper foundation layer;
- ballast lower foundation layer;
- soil form layer stabilized with hydraulic binder.

The central islands can be made of an earth fill, and the signaling ring, with a slope of 50% towards the safety zone, is made up of the following layers:

- self-locking concrete slab pavement, red and gray, inscribed with white reflective paint (painted prior to installation), so as to create arrows indicating the direction of travel (to the right);
- cement mortar surface layer;
- cement-stabilized ballast upper foundation layer;
- ballast foundation layer.

The separating islands located on each arm of the intersection, bordered by uneven curbs, on the roadway side, are made up of the following layers:

- green self-locking concrete slab pavement;
- sand surface layer;
- ballast foundation layer.

The shoulders can have different widths and road structures.

In order to ensure the collection and drainage of rainwater from the road platform, transverse slopes of the roadway and shoulders will be adopted, respectively longitudinal slopes that facilitate their conduction and discharge into existing ditches or channels, outside the road area, according to O.G. 43/1997 updated on the road regime), owned by the holder of the Territorial Administrative Unit within whose radius the actual investment is being carried out.

Depending on the characteristics of the geometric and hydraulic elements of the drainage channels of different sizes in the inventory at National Land Improvement Agency, the hydraulic calculation of the flow transport for the intubated sections is performed. Most often, the design solutions propose to create a bridge made of prefabricated concrete frames type P2, with monolithic tympani made of C30/37 concrete.

The prefabricated concrete frames of type P2 have a rectangular shape, with a length of 1200 mm, a width of 2340 mm and a height of 1600 mm and are made of concrete of class C35/45, and are usually placed on a foundation of plain concrete C30/37.

In order to avoid the phenomenon of blowing away, the S2 channel foundation must be walled with concrete over a length of 2.00 m before and after the footbridge. The channel slopes in the walled areas will have a slope of 1:1.5 and a width at the channel foundation of variable.

Monolithic tympanums of concrete C30/37 will be reinforced at the top with a reinforcement shell consisting of 10 bars Φ14 mm and stirrups Φ8 mm arranged every 15 cm.

The class of concrete used to make the simple concrete and reinforced concrete elements for the bridge shall be chosen according to the recommendations of the NE 012/1-2022 Indicative [10].

The cleaning and profiling of the channel bed of waste, vegetation or debris from the resulting works that could obstruct the outflow during floods is planned, over a distance of 10 m upstream and downstream.

Horizontal road markings (through markings) and vertical road markings (through signs) will be carried out in accordance with SR 1848-7:2015/A91:2021 [11], respectively SR 1848-1:2011/A91:2021 [12].

The intersection lighting will be carried out in accordance with the provisions of AND 603/2012 [13], respectively AND 600/2010 [14].

The determination of the transport capacity of the canal on the areas of rectangular bridges made of prefabricated concrete frames type P 2

is carried out according to the geometric characteristics on the segment interested in the works: b (m), m = 1,50, and hydraulic characteristics on the segment interested in the works: $Qt_{ransport}$ (m^3/s); I(‰);

The dimensioning of rectangular bridges made of frames to ensure the transported flows of the drainage channels was carried out using the Manning - Strickler method. The equations that are used:

$Q = S \times V$; $V = C\sqrt{R.I}$; $C = 1/n \times R^{1/6}$

For the execution of the bridge, the solution was chosen to create a rectangular bridge made of concrete frames, with a maximum opening of 2.00 m and a height of 1.2 m, with monolithic concrete tympans.

The geometric elements of this profile are:

-Maximum opening: m;
-Maximum height: m,
-Section: m^2;
-Perimeter: m;
-Roughness coefficient: ;
-Longitudinal slope: ‰;

Table 1 Example 1 of calculation of transport capacity

H	i	l	h	A	P	Rh	1/n	C	V	Q
1.20	0.001	2.00	0.00	0.000	2.000	0.000	66.66	0.000	0.000	0.000
1.20	0.001	2.00	0.15	0.300	2.300	0.130	66.66	47.471	0.542	0.163
1.20	0.001	2.00	0.18	0.360	2.360	0.153	66.66	48.726	0.602	0.217
1.20	0.001	2.00	0.19	0.380	2.380	0.160	66.66	49.098	0.620	0.236
1.20	**0.001**	**2.00**	**0.195**	**0.390**	**2.390**	**0.163**	**66.66**	**49.277**	**0.629**	**0.245**
1.20	0.001	2.00	0.20	0.400	2.400	0.167	66.66	49.451	0.638	0.255
1.20	**0.001**	2.00	**1.20**	**2.400**	**6.400**	**0.375**	66.66	**56.607**	**1.096**	**2.631**

Table 2 Example 2 of calculation of transport capacity

H	i	l	h	A	P	Rh	1/n	C	V	Q
1.20	0.001	2.00	0.00	0.000	2.000	0.000	66.66	0.000	0.000	0.000
1.20	0.001	2.00	0.18	0.360	2.360	0.153	66.66	48.726	0.602	0.217
1.20	0.001	2.00	0.20	0.400	2.400	0.167	66.66	49.451	0.638	0.255
1.20	0.001	2.00	0.40	0.800	2.800	0.286	66.66	54.099	0.914	0.732
1.20	0.001	2.00	0.60	1.200	3.200	0.375	66.66	56.607	1.096	1.315
1.20	0.001	2.00	0.65	1.300	3.300	0.394	66.66	57.074	1.133	1.473
1.20	**0.001**	**2.00**	**0.66**	**1.320**	**3.320**	**0.398**	**66.66**	**57.162**	**1.140**	**1.505**
1.20	0.001	2.00	0.70	1.400	3.400	0.412	66.66	57.496	1.167	1.633
1.20	**0.001**	**2.00**	**1.20**	**2.400**	**6.400**	**0.375**	**66.66**	**56.607**	**1.096**	**2.631**

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The calculations performed must highlight the fact that the dimensioned structure for the proposed rectangular bridge, made of concrete frames, ensures the transport of the flow of the drainage channel under the administration of National Land Improvement Agency for different surface channel transport capacities (h/H) and water depths (h).

4. CONCLUSIONS

The designed intersections must ensure all the geometric elements necessary for road access for fire trucks or special vehicles, respecting all regulatory acts regarding P.S.I. measures, labor protection and traffic safety.

The beneficiaries of the investments are the administrative-territorial units within the localities or county councils, with the works to be financed from funds from the state budget / county budget and / or other legally established sources, of them.

REFERENCES

[1] *Regulation 600/2010* on "The arrangement of level intersections on public road";

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[4] *STAS 10144/1-90 "*Layers. Transverse profiles";

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[6] *Indicative PD 177-2001* "Standard for dimensioning flexible and semi-rigid road systems (analytical method)",

[7] *Indicative NP 081-2002* "Standard for dimensioning rigid road structures",

[8] *STAS 1709/1* "Freezing thawing effect on road works. Freezing depth in structure of the pavement";

[9] STAS 1709/2 "Freezing thawing effect on road works. Prevention and curing of damages due to freezing thawing effect. Technical specifications";

[10] *Indicative NE 012/1-2022* Concrete production;

[11] *SR 1848-7:2015/A91:2021* "Road signs. Road markings";

[12] *SR 1848-1:2011/A91:2021* "Road signs and signals. Road signs and signals. Part 1: Classification, symbols and location. "

[13] *AND 603/2012* "Guide to lighting conditions on national roads and motorways";

[14] *AND 600/2010* "Standard for the arrangement of level crossings on public

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