TOPOGRAPHIC SURVEYS TO IMPROVE THE INFRASTRUCTURE FOR ROAD TRANSPORT

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ABSTRACT

The paper reveals the topography contribution to the rehabilitation and modernization of infrastructure for road transport. Specifically, the surveying contribution in this case consisted of: bringing in the work area of new points needed to trace and for detail surveying; the processing of data gathered from the field resulted a significant amount of information with topo-cadastral interest; graphic representation of all elements measured and processed according to the needs and desired aspects to be highlighted.

INTRODUCTION

Carrying out field studies involves data collection, processing and representation of plans and maps of all the planimetric and levelling details, also the use of topographic equipment and methods of calculation and graphical reporting, for which is necessary to know the theoretical and practical notions of almost all technical areas (Calina, 2010; Calina, 2015; Păunescu, 2001).

The roads are part of the the national transport system and are terrestrial communication paths specially built for vehicles and pedestrians. Are part of the roads: bridges, viaducts, passages, tunnels, construction of defense, sidewalks, bike lanes, parking, traffic signs and other facilities for traffic safety, land forming part of the road less protection zones. Road Administration aims the design, construction, rehabilitation, modernization, maintenance and operation of the roads.

Topographic survey is an important step in the rehabilitation and upgrading of transport infrastructure (Calina, 2012, Miluț, 2014). Digital topographic plan represents the technical basis for the realization of the Road Informational System. Worldwide and Romania, process of automation for topographic works is continuous, both in the equipment, and technologies of collection and processing of data (in some cases directly on the ground) and reporting plans using specialized software for certain applications, leading to true automated production lines (Călina, 2014a; Călina, 2014b;Tămâioagă, 2007).

Road section surveyed in this paper ensures the traffic through Craiova and connects Bucharest with Drobeta Turnu-Severin. The street network (Figure 1) of Craiova is developed and very complex. It shows a higher density in the central and southern part, while in the northern part prevail railway network of Craiova.

Figure. 1. Road network

MATERIALS AND METHODS

The purpose of the work was planimetrical and levelling survey of Nicolae Titulescu Boulevard - Calea Severinului km 0+000 - km 1+440, over a length of 1430 m. Nicolae Titulescu Boulevard is located between major intersections in Craiova and start from the intersection of Stefan cel Mare, Calea Unirii and Calea Bucureşti to the intersection Paşcani, Toporasi and Maria Tanase. The location of work fits functionally and urbanistic in the area which includes construction with complex functions: residential (apartment H1, H2, H3, G1, G2, I1, I2, I3, B1, B2, B3, 7, 9, A1, 4, 23, 20 etc.), public interest (Court of Appeal Craiova, Philanthropy Hospital, Church) and general interest (Union Complex, restaurants, shops, etc.). Surveying was executed in Stereo'70 projection system and the quota system Black Sea 1975, using as support network new points determined with the help of modern equipment such as: Leica TC 407 total station and Leica Sprinter 150M digital level.

In the field were executed two supported traverses:

- First supported traverse was performed on a length of 1430 m (Figure 2, Table 1) starting from C1.3 landmark with orientation visa on T1, going through station points 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000 closing on C29.1 landmark with orientation visas on T29 and T72;
- The second supported traverse, starting from the absolute coordinates and altitude of C1.3 included 58 stations from 1 to 58 being closed on the coordinates and the absolute altitude of C29.1 point (Figure 3, Table 1).

Table 1. Old support points

Point no.	***Absolute coordinates***		***Altitude***
	X	***Y***	***Z***
T1	313849.678	405068.436	0.000
T29	314878.633	402778.064	0.000
C1.3	314211.250	403924.607	93.278
C29.1	314879.737	402690.438	87.998

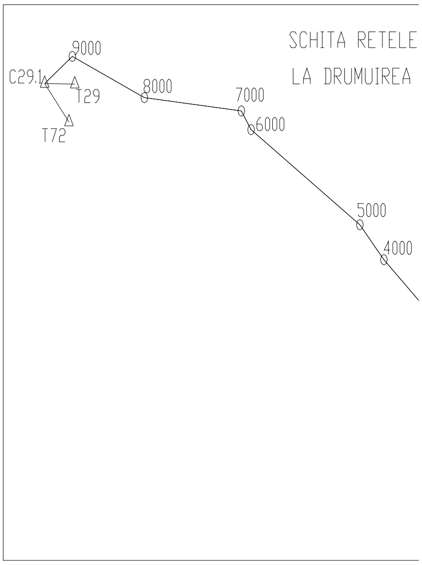

Figure 2. First supported traverse

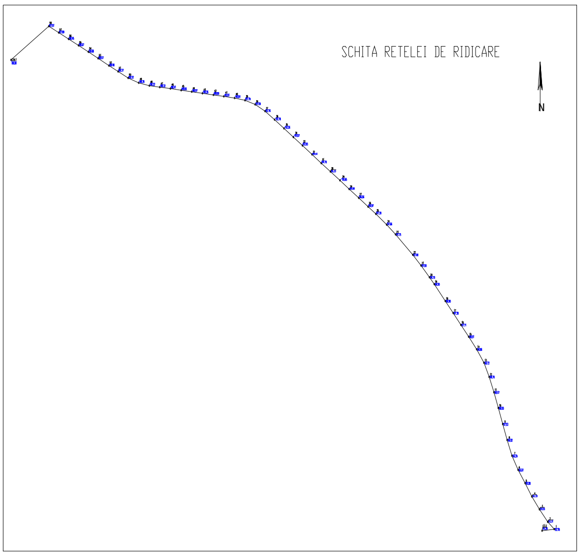

Figure 3. Second supported traverse

Details existing along the boulevard and next to it were measured using radiation. Data processing was done in the specialized program CalTOP, to obtain altitude and absolute rectangular coordinates of measured points.

For all the planimetric and levelling details plotting at AutoCAD LT 2000 programme have been attached TopoLT and Topograph subprograms.

RESULTS AND DISCUSSION

Delimiting points of edge of the road, culverts and sidewalks (Table 2) were taken from: C1.3, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000 and C29.1. Following the topographic work enforced in the area, resulted a level difference of 5.288 m, land altitude of starting point being 93.278 m and the final altitude was 87.998 m. Works for rehabilitation and modernization were conducted generally in the current footprint of the road, however there are road sections in which the works for rehabilitation are located outside the current footprint such as consolidation, some small corrections to the route to be removed blackheads. Road footprint is the land area occupied by the constructive elements of the road: the roadway, sidewalks, shoulders, ditches, culverts, embankments, retaining walls and artwork.

Table. 2

Coordinate inventory – partially
Projection System Stereo’70, Black Sea altitude system 1975

Point no.	Absolute coordinates		Altitude
	X	*Y*	*Z*
1	314262.959	404030.090	93.988
2	314263.782	404029.771	94.064
3	314263.799	404029.748	94.061
4	314254.736	404009.004	93.598
5	314247.654	404009.697	93.575
6	314240.796	403992.314	93.341
7	314247.029	403989.625	93.195
8	314247.524	403989.511	93.348
9	314251.194	403987.229	93.367
170	314314.988	403848.781	95.813
171	314313.648	403845.171	95.745
172	314313.577	403845.100	95.798
173	314313.441	403843.461	95.867

174	314311.602	403840.004	95.902
175	314309.856	403836.444	96.077
176	314317.912	403858.273	95.774
177	314319.968	403861.710	95.724
178	314322.297	403864.649	95.698
179	314322.307	403864.872	95.803
180	314324.266	403868.541	95.823
258	314401.138	403828.074	97.867
259	314402.488	403832.813	98.145
260	314399.682	403833.992	98.009
261	314383.429	403821.084	97.591
262	314381.753	403817.494	97.475
277	314417.084	403808.042	98.282
278	314421.808	403818.780	98.166
279	314426.218	403816.738	98.219
280	314424.468	403822.997	98.464
281	314427.264	403821.923	98.482

Longitudinal profile design was done taking into account the following principles: maximum allowable slope of 7%; the minimum design step 50 m; the compensation principle of earthwork volumes; principle of avoiding high embankments and deep cuts. In the longitudinal profile, the road follow STAS limitation there are no higher declivity than those admitted (Figure 4).

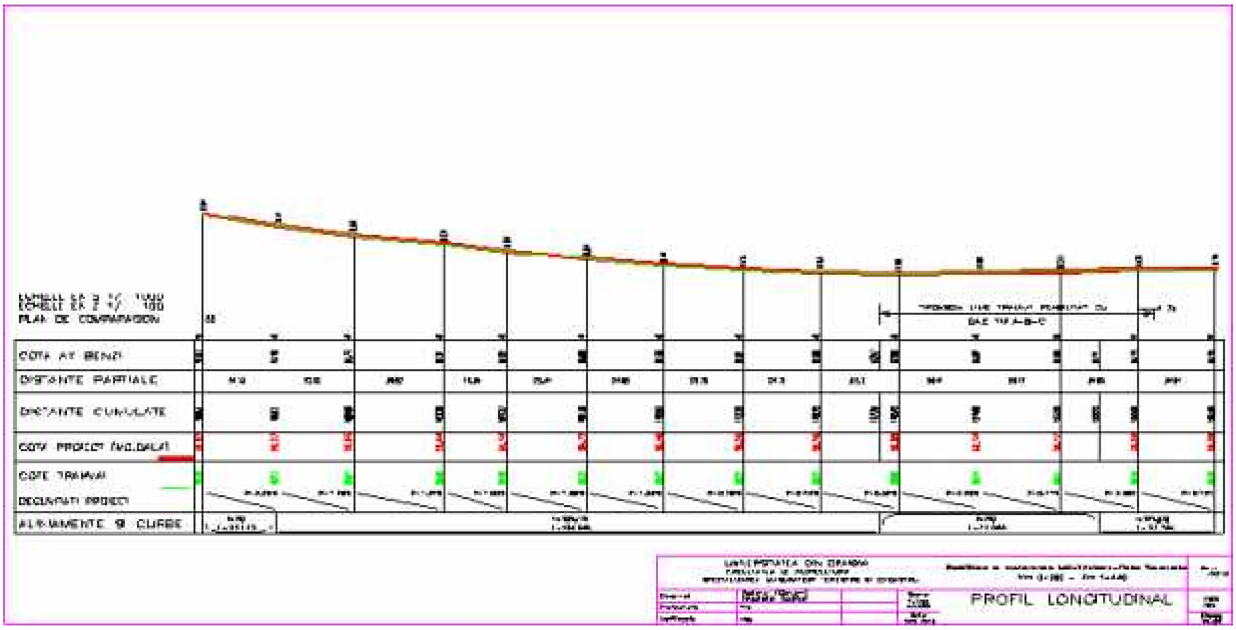

Figure 4. Longitudinal profile

Crosswise profile of a terrestrial communication routes represents normal vertical section on road axis in any point of the route (Calina, 2010, 2014a). Cross profiles were executed at a distance of 10 m from each other to the outer edges of the corridor and contain representative points of detail in sufficient quantity (Figure 5).

Figure 5. Crosswise profile

CONCLUSIONS

In the context of the work required to rehabilitate and modernize a road topographic contribution consisted of: identifying points of geodetic network and determination (in the work area) of new points necessary to surveying details and tracing it; in the surveying stage was collected and recorded important information which by processing generated a considerable amount of topo-cadastral data; based on data analysis results we were chosen the most optimal solutions for consolidation, route adjustments, the design of the road structure, etc.

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