APPLYING UP-TO-DATE SURVEY TECHNOLOGIES FOR PROJECTING A ROAD SECTION IN CHIŞODA, TIMIŞ DISTRICT

APLICAREA TEHNOLOGIEI ACTUALE DE RIDICARE TOPOGRAFICĂ PENTRU PROIECTAREA UNUI TRONSON DE DRUM ÎN LOCALITATEA CHIŞODA, COMUNA GIROC, JUDEȚUL TIMIŞ

LUMINIȚA LIVIA BÂRLIBA*, C.BÂRLIBA*,G. ELEŞ**

**Agricultural and Veterinary University of the Banat, Timişoara, Romania*
***Politehnical University of Timisoara*

Abstract: *After Romanian adherence to UE, the necessity of rural development, simultaneously with a new framing of functional categories of public roads appear. The paper studied the topography influence and the topography application approach in the field of infrastructure as a future field of activity in developing the rural areas. The paper is having as background the results of topographical survey for a road sector designated for asphalting in Chisoda, Timis district. The topo-cadastral operations consist in topographical measurements with Leica TCR 307 total station, a close traverse to determine the profile feed ends and subsequent the leveling works for the longitudinal and transversal profiles. All topographical works were executed in projecting system of coordinates STEREO-70 and 1975 Black Sea elevation system.*

Rezumat: *În urma aderării la Uniunea Europeană a apărut necesitatea dezvoltării rurale şi totodată stabilirea unei noi încadrări în categorii funcționale a drumurilor publice de toate rangurile deschise circulației publice. În cadrul lucrării s-a studiat influența şi modul de aplicare a topografiei în domeniul infrastructurii ca un domeniu de viitor pentru dezvoltarea zonelor rurale. Elaborarea lucrării are la bază rezultatele lucrării de ridicare topografică a unei porțiuni de drum în vederea asfaltării, executate în localitatea CHIŞODA, județul TIMIŞ. Operațiunile topo-cadastrale au constat în efectuarea măsurătorilor cu stația totală Leica TCR 307, executându-se o drumuire închisă pentru determinarea capetelor de profil, ulterior măsurători de nivelment pentru profilele transversale şi longitudinale. Lucrarea s-a executat în sistem de coordonate STEREO 1970 sistem de cote Marea Neagră.*

Key words**:** *Leica TCR 307 total station, cadastral work.*
Cuvinte cheie: *stație totală* ***Leica TCR 307****, plan cadastral, profil longitudinal, profil transversal*

INTODUCTION

The rural development of Romania can be consider a synthesis result of field researches, a challenge for treating the complexity of the problem and its policy related with the sustainable development supporting the human activities, in order to improve his living standard and to stimulate the youth people to carry on countryside activities.

According to the UE integration a new range of selection for public roads and for private open utility roads designated for public traffic has appeared. Considering this aspects, the length and the communal roads inventory for each county, including the land section must to be modify.

The rural infrastructure development and improvement include the roads and rural bridges modernization and construction; the modernization of water supply network; the construction of sewage network finalized with the cleaning water station.

The proposals for 2005-2008 period and after 2008 were limited at the anterior objectives where asphalting procedures are justified from economical and social point of view, having as backgrounds the following criteria: the traffic study, the area importance, village connections with the county centre and other cities, European and national roads, railway

stations or important production centres, memorial houses, natural reservations and other touristic objectives.

In order to achieve the proposed desideratum, a major step consists in the topographical works. According to the purpose of topographical survey, lots of specific approach and programs for each branch are in the stage of continuous development and research.

Special topography use to accomplish the infrastructure serve in order to achieve topographic plans with applicability for the planning steps and field projects using precise measurements and obtaining the points coordinates in numeric format.

Special Topography is in strong relation with General Topography, being used in general infrastructure field but also in local programs of rural development.

MATERIALS AND METHOD

The background of the paper is represented by a topographic survey of a road section in order to asphalt the city roads of Chisoda, Timiş County.

To project the road section, the topographic survey consists in realizing the longitudinal section and the transversal sections of the road, in order to achieve the execution project.

From juridical point of view the roads of Chişoda city are the propriety of Giroc City Council. The beneficiary of the work is The City Council of Giroc, Timiş County.

Figure1. Framing plan, at scale 1:2500

The street position is situated in the East side of the city and is having a length of 900m actually named Retezat Street, being part of modernizing plan (fig.1). The topo-cadastral operations necessary for the work execution consist in field measurements with the Leica TCR 307 total station.

For the field measurements and the data processing operations the projecting system of coordinates STEREO-70 has been used together with the level reference system Marea Neagră 1975.

In order to determine the starting point coordinate, a coordinate resection was used for the station point 100, by using 5 point of known coordinates (tab.1).

Table 1

Points of knowing coordinates from the national coordinates network used to determine the coordinates of station point 100

Point description	X[m]	Y[m]
Catedrală	479269.5800	206452.170
Castel apă Spumotim	477718.42	208844.24
ATV	475866.62	208725.60
Bis Ort Chişoda	473984.79	205278.89
Bis Kat Chişoda	474162.43	205302.81

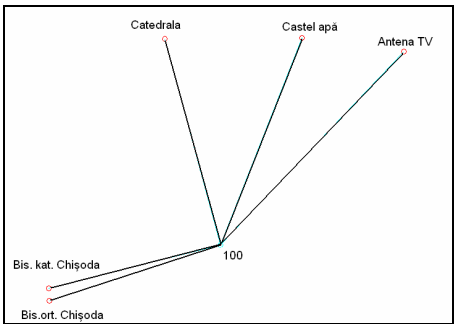

Figure 2. Resection draft for station point 100

To determine the side limits of a cross section a close traverse was execute. The mark 100 from behind the MU Giroc has been use as starting point of the close traverse (fig.2). The close traverse consists in 13 station points (tab.2), with the last points situated in Chisoda city.

Table 2

Points coordinate of close traverse inventory

Point code	X[m]	Y[m]
100	207674.57	474762.82
101	207369.67	474672.16
102	207009.84	474583.51
103	206676.92	474360.73
104	206442.93	474215.78
105	206215.28	473855.77
106	205972.07	473893.76
107	205832.74	473909.12
108	205698.45	473918.27
109	205480.62	473947.71
110	205271.71	473957.25
111	205283.24	474075.15
112	205294.50	474192.85
113	205306.78	474322.58

After making the traverse and after computing it the land mark of whole city was made, using metallic pipes, necessary to conserve the station points used.

On field operation after choosing the sides parts of the section, the horizontal angles and the horizontal distances (using indirect method) and the level difference was measure.

As detail points the following points were take into account:

- cvartal corners,
- road sides,
- propriety limits,
- ditches,
- channels,
- gutter,
- mid road,
- sidewalk,
- electricity pile,
- gas ventilation,
- networks,
- electrical facilities,
- railway roads.

RESULTS AND DISCUSSION

To achieve the documentation, after the field measurements, the recorded data stored in the internal memory of the total station TCR 307 are transferred into the computer memory in GSI format using the adequate software Leica Survey Office.

The next step in data processing consist in transforming the .GSI file format into .DXF file format used to import the data into AutoCAD software.

The data processing in order to obtain the points coordinate for the measured points was processed by using the TOPOSYS and TOPOLT software.

The TOPOSYS software is used to compute and processing topographical and geodesic data, by using statistical methods for error analyze and compensation of out coming data.

TOPOSYS, allows us to process and compute all kind of geodesic field measurements used to enlarge the geodesic local network.

Primary data:

- coordinate list – fixed points
- lists of angle measurements, horizontal, vertical or zenithal and distances.
- lists of points height
- lists of height difference between points

The data can be introduced manual from ASCII files either by data transferring from the total stations into the desired file format. The measured distances can horizontal distances or slope distances.

Computing methods of approximate coordinates.

- Forward intersection
- Resection
- traverse / traverse networks
- surveying as a method of approximate points determination
- surveying as a method to determine the coordinates of detail points

Balance method to compensate planimetric and altimetric networks:

- bounded network
- Free network
- measured coordinate network

The balance of planimetric and altimetric can be made using the Smallest Square Method.

• Precision parameters of the balance; the medium square error of pondered units, the medium square errors of coordinates, the ellipse errors data.

• DXF AutoCAD files having points disposal, sights and errors ellipse;

• ASCII files.

After field measurements data processing, in order to obtain the values of points coordinate, - by coordinate export, heights, measurements and heights data using the TOPOSYS facilities result:

- DXF graphic export;
- Graphic surface determination using AUTODESK 2006;

In addition the following elements are necessary

- Sight draft
- Framing plan
- Longitudinal cross section (fig.3).

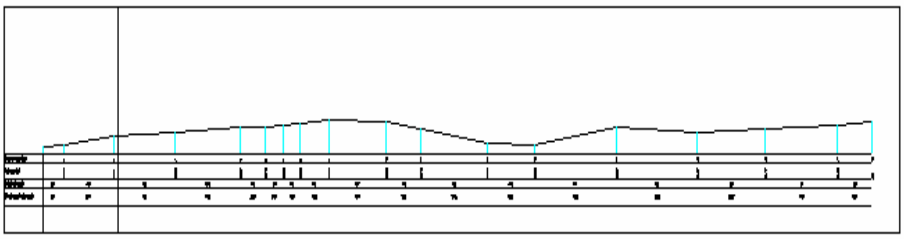

Figure3. Road, longitudinal cross section

- Transversal cross section P1-11 (fig.4).

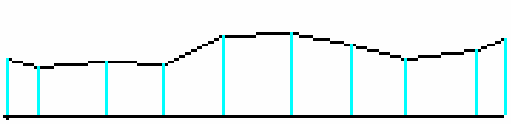

Figure4. Sample of transversal cross section

- The general plan of works for the beneficiary (fig.5).

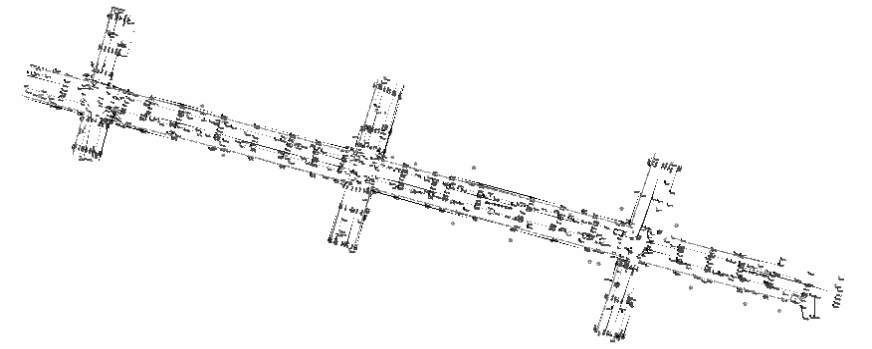

Figure 5. The general plan (overview) of the works

The documentation has been achieved in 3D coordinate system in digital format on optical support and also plotted on appropriate paper format.

CONCLUSIONS

Analyzing the problems occurred in the project the basic aspects of topography and topography were emphasis and all new aspects of physics and mathematics and execution techniques in construction were reveal.

Once with the beginning of roads execution, the necessity of solving difficult problems related to the setting out base and to elaborate adequate approaches to apply the project in the execution phase can not be made without having a solid base in fields of topography and data processing techniques.

In the last years topography, has contribute with its specialty works for:

- Achieving the topographical documentation to elaborate the systematization project of populated urban areas and for planning the investment projects, applying the construction and projects and also for the roads cadastre.

- Determine the construction slides and deformation, slide land movement at the beginning of execution and also along the exploitation stage;

The topographic works in the stage of roads planning-projecting refers to:

- Achieving the planimetric and altimetric topo-geosesic base;
- Achieving the topo-photogrammetrical works at different scales;
- Achieving the necessary longitudinal and transversal cross sections;
- Setting out the access roads, the electric energy network, main axes for construction works;

Finally, it can be concluded that the terrestrial measurements have a major importance in the economy, being necessary in various fields of activities.

LITERATURE

1. BADEA, G., 2002, Măsurători Terestre-fundamente, Volumul II, Cadastru, Editura Matrix Rom, Bucureşti, 2002.
2. BOŞ, N, Cadastru general, Editura All Beck, Bucureşti, 2003,pg.1-37.
3. MICLEA, M. , Cadastrul şi cartea funciară, Editura All Bucureşti, 1995.
4. NEUNER, J., Măsurători Terestre-fundamente, Volumul I, Instrumente şi metode de măsurare, Editura Matrix Rom, Bucureşti, 1995.