



BANAT'S UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY
MEDICINE "KING MICHAEL I OF ROMANIA" FROM TIMISOARA
*Multidisciplinary Conference on Sustainable
Development*

08-09 October 2020



TOPOGRAPHIC-CADASTER WORKS FOR THE DESIGN OF AN ECOLOGIC PARKING FOR THE ȘAG-TIMIȘENI MONASTERY

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ABSTRACT

The herein work has as objective the performance of the topographic works and the information update for the plot in the administration of Șag-Timișeni Monastery, on the destination, height regime and constructions areas, as well as the registration of the geometry of the related plot, in the integrated system of the cadaster and land registry. For the measurements performance we used the total station Leica Viva TS06, and for the measurements registration in the coordinates system Stereografic 1970, respectively Marea Neagră 1975 we used the equipment GPS Leica Viva GS06, in order to determine the station coordinates, an extremely flexible equipment and that contains many applications. In the herein document, in order to determine the station points coordinates it has been used the RTK (Real Time Kinematic) method, using the reference station from Timișoara, that is TIM_2.3.

INTRODUCTION

The appearance of electronic total stations [1,2] represents a huge step in the performance of land measurements by increasing the precision, the working speed and finally the productiveness, considering that in this period we assist to a revolution in this field, starting from the robotic total stations and arriving to the scanning LIDAR systems [3], mobile, fix or of backpack type, installed on vehicles or on tripod, which are capable to fulfill huge performances in order to collect information on site of maximum 1 million points/second. The use of equipments using the GNSS technology presents the advantage that there are no necessary angle and distance measurements, eliminating this way the inconvenience of using the total stations, being mentioned also that by the development of the Stop&Go (or Real Time Kinematic) method it is possible to determine the coordinates with a precision comparative to the one assured in the total stations and in a convenient time interval [6]. In parallel with this advantages, it has to be taken into consideration also the necessity that Romania has to fulfill the European and international standards by performing a geodesy network of GNSS reference, of high precision, whose points shall be determined and included in the European EUREF GPS geodesic network.

MATERIAL AND METHOD

Topographic surveys have been performed using the Leica Viva TS06 total station, which is a tachometer with measurement device of distances incorporated. With this electronic device there can be measured horizontal and vertical angles and at the same time, distances. A total station is composed by a theodolite with a measuring device with an incorporated distomat and this way, can measure angles and distances at the same time. Nowadays electronic total stations are the ones provisioned with an optical-electronic device that measures distances (EDM) and with electronic scanning of angles. The complex total station presents multiple possibilities, from the USB port, for the data import and export, and the Bluetooth connectivity, to the cable connection, the station offering complete access to the data collected on site. FlexLine Soft is very easy to operate, and data collection is fast, while the multitude of applications makes the operator to perform, using different operations directly on site.



Besides the total station Leica TS06 it has been also used the Leica GS06 equipment with working possibilities in real time with double frequency internal radio. Depending on the satellite systems and on the configured signals, it is assigned a number of maximum 72 channels for GS06. The ROMPOS connection (a system assuring precise positions in the European Frame of Reference and the ETRS89 coordinates) and the control of parameters control points related to the station reading is done with a lot of attention. For data processing we have used the following softs:

- Leica Geo Office Combined: for GPS data downloading
- Leica Geo Office Tools: for data downloading from the total station
- Leica Infinity
- AutoCad: for data processing



The working methods adopted for this work are the roading method, supported on ends on the coordinates points and known orientations and the radiation method with the total station.

Roading is represented in the plan as an broken polygon line, where the reciprocal position of points is determined by the measurement of distances between the break points and by the measurement of angles in break points of the polygon route.

Roading supposes the geodesic network thickening in order to determine the detail points coordinates on site. Geodesic network thickening has been done by determining coordinates of some points of V order that shall become the main elements of the topographic survey. For this reason, their determination supposes a very precise measurement.

For the roading design, it has been considered that its route to be chosen depending on the accessible alleys of the ares, the roading points to be fixed in order to allow the visibility between them and towards the radiated points, but also in areas protected by destruction, so that the station device is done easily.

The characteristic points of planimetry points and of levelling have been done by the radiation method, a method used in any situation, where it can be taken a visa and it is possible to measure a distance. The position in the plan of a radiated point (new) is defined depending on the old points from the survey network, by a polar angle or θ orientation and of course, from the distance reduced to the d horizon. Generally, radiated points have been disposed radially around the station and have been controlled successively by going through the horizon tour.

RESULTS AND DISCUSSIONS

Topographic survey has been performed at the Șag-Timișeni Monastery, where it has been stationed on the station point S2 and the device orientation has been done from the station point S1 by the automatic method for the device orienting, points whose coordinates have been obtained using the equipment GNSS Leica GS06. Control points within the roading, that are the station points S1 and S2, have been surveyed using the GPS. The start point of roading is representing from the station point S2 located in the ecologic parking of the Monastery, marked on site by a metallic bolt. Orientation has been done from the station point S1 that, afterwards, has been also read. From the station point S2, it has been assigned a visa in the frontal area and has been read the station point S3, and the procedure continued until the roading has been finalized. Roading has been closed on the station points S3 and S4 and read from the station point S2. Station point S5 has been surveyed with GPS, but due to the creation of the multi-path effect registered a level difference of approximately 1 m and for this reason it hasn't been taken into consideration as a station point in the roading calculation.

For the detail points radiation it has been used the roading method supported on ends, on known orientation and coordinates points, where there have been determined based on the roading the following thickening points of he geodesic network

No.	X	Y	No.	X	Y
Point	[m]	[m]	Point	[m]	[m]
S2.1	468445.2344	204497.4894	S3.1	468622.0386	204521.1082
S2.2	468454.8743	204498.3386	S3.2	468643.0311	204525.3070
S2.3	468463.5122	204501.4573	S3.3	468649.5271	204524.0297
S2.4	468477.8534	204499.1148	S3.4	468665.1431	204523.1181
S2.5	468478.3832	204501.7272	S3.5	468656.3927	204532.4652
S2.6	468485.0845	204502.5051	S3.6	468652.7041	204533.5956
S2.7	468486.2364	204499.4051	S3.7	468651.1844	204533.8283
S2.8	468499.7348	204500.3412	S3.8	468644.0210	204535.2902
S2.9	468499.7206	204506.6232	S3.9	468636.7927	204539.1977
S2.10	468499.4971	204497.9012	S3.10	468634.3713	204538.4020

The roading method occupies a central position in the assembly of surveys on site by the volume and frequency of works in which it is requested. The main place is held for the determination of the survey network and for details positioning, but it can be used also for the thickening network performance.

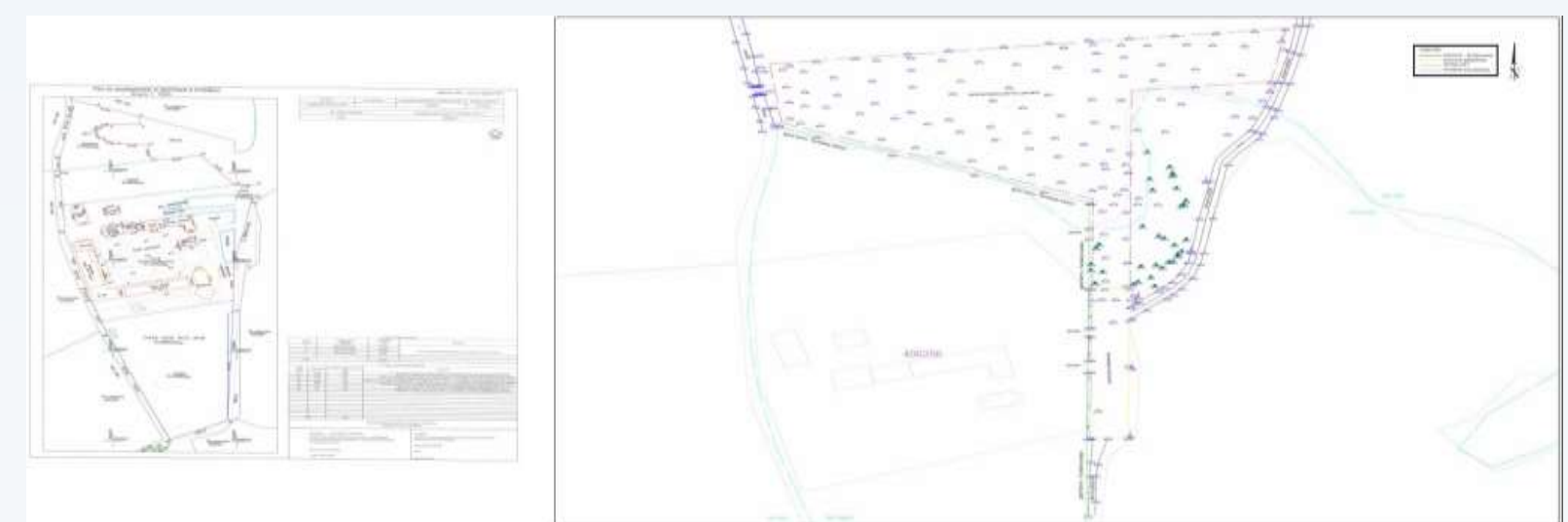
After finalizing roading using the total station of fix elements nearby the studied immobile, we have performed a topographic survey in real time using the GNSS system inside the immobile for obtaining the plot heights in the studied area.

Based on the performance of topographic measurements on site, it has been proceeded to the data processing and to the performance of layout plans.

For the measurements control, processing result has been overlapped to the orthophotoplan corresponding to that area.



After finalizing the topograhic measurements it has been drawn up a layout plan, as well as a topographic plan.



Due to the fact that all data introduced in the 2D plan are from a coordinates system, it can be used also in the design and arrangement activity [SIMON, M et., al. 2020]. The proposed arrangement example can be delimited and materialized in the future. Depending on the beneficiary's requirements, we have performed three parking arrangement proposals, one for 165 parking places + 5 places for the bus, the second variant includes 187 parking places + 7 places for the bus and the last proposal has been drawn up for 331 parking places + 10 autobus places



CONCLUSIONS

Topographic works from this document have been performed in order to update topographic and cadaster information for the arrangement of an ecologic parking for the Sag Monastery, where there have been done also updates on the immobiles identified on site and obtained based on the topographic surveys.

The total station, by the offered possibilities and structure, became the representative instrument, used today in exclusivity for the readings measurements, being, at the same time, the only serious competitor of the GPS system.