Some Consideration Regarding Realization Using Technologis GPS, Network Elevations Using Rapid Static Metod Comparation RTK Measurement

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***Abstract**: Is presented the realization nets of lift with help GPS technologies, through method of the quick static measurements the respective through method of measure RTK(Real Times Kinematics). Is presented the methods in itself(static speedster, RTK) and these combinations optimized the realization net of necessary lift of the measurements topo the element key for his utilization how much in the many maul lines waves is utilized the measurements. The receivers used GPS the by from the area the precise maul, one of geodesic guy the topographic refer to measurements for big scales 1: 500, 1: 1000. To ultimate is done a crossing an in a review else an efficient methods and techniques of utilize the methods of respective measurements, and a comparative study with method of respective measurements, with some recommendations from the author, by experience he practices and theoretical.*

***Keywords:** GPS technologis, network elevation, RTK measurement, rapid static method*

1. Accomplishing and Placing Topo-Geodesic Works

The goal of this paper is the determination of several new points for the land-surveying network, using points from the existing National Geodesic Network, by means of measurements and satellite determinations. The geodesic network is placed on the administrative territory of Dumbrăvița, Timiş county.

2. The Existing Geodesic Network

The geodesic points existent in the work area and used for determinations through GPS measurements, belong to the State Geodesic Network having 6 triangulation points which have remained after the GPS measurements have been carried out:

Table 1

Nr. crt.	Name point
1111	CORNEŞTI JADANI (IV)
1112	GIARMATA NORTH (IV)
1113	MOŞNIȚA (I)
1114	FREIDORF SOUTH(IV)
1115	MOVILA SURDUC(IV)
1116	SIGNAL DUMBRAVIȚA SOUTH-WEST(IV)

3. Reference Documents: In what basis are these measurements done?

3.1. The Works' Technic Execution Project

The technic project, made on a 1 : 25000 scale map has been finalized after the field recognition of the existent state geodesic network's points. The 6 points in the geodesic network have been spatially determined by means of satellite methods. 111 points have been projected for the surveying network, numbered according to the beneficiary's requests.

The following things have benn taken into consideration when chosing the location of the points:

- the new points should be placed near easy accessible roads during the whole year;
- the points will be placed close to the objectives that will be surveyed, considering the fact that plenty of houses, residential neighbourhoods, access roads and so on will be built in this area;
- to avoid material obstacles, high voltage posts or electric transformation stations close to the receivers (elevation angle > 15^G)
- preserving the points on long term.

3.2. Materialization of the Geodesic Network Thickening Points

The materialization of the new determined points by using GPS procedure for the surveying network has been done with FENO type landmarks according to the present legislation, also accepted by the beneficiary.

3.3. The Apparatus Used for the Measurements

The measurements were done with 4 LEICA SR20 L1 receivers and 2 Sokkia ISX 2700 RTK - L1,L2 type receivers, using the static and the RTK measurement procedures, for the points which have determined the polygone (the points in the national geodesic network – the 6 points) and the static and RTK measurement procedures, for the new points (the 111 points) determined from the respective point's surveying network.

3.4. G.P.S. Measurements Achievement

G.P.S. and GLONNAS measurements have been achieved during 26.09.2006 – 13.04.2007 by means of the static method with processing intervals of G.P.S signals chosen on 5 seconds, rapid static and RTK, for the new surveying points. The bases determined by the points where GPS receivers have been stabilized have lengths in between ~ 20 m and 23 km.

The PDOP values are framed in the optimum limits 1.5 – 4. During the measurements, on certain bases, the PDOP had bigger values due to the fact that it came across with other receivers' measurement period but on short periods (< 5 min), or due to the "bad" configuration of the satellites, these bases being eliminated from the processing. The number of the observed satellites varied between 5 and 15.

3.5. GPS Measurements Estimation and Compensation

The acquisition of GPS measurement data, the estimation and the compensation of the thickening geodesic network have been achieved by means of LEICA Geo Office 6.0 soft.

The accuracy imposed for the processing of this data is of 5cm +/- 2ppm. The points in the surveying network have a lower accuracy than the imposed one which in the field areas must reach

a maximum of ± 20 cm and there have been determined from minimum three vectors. The following standard values for the base determination deviation have been assessed after data processing by means of LEICA Geo Office 6.0 soft:

dx=12 mm, dy=12 mm dz=15 mm for the surveying network

The accuracy obtained after the processing and the compensation of new points determined by means of GPS technology, the Rapid Static procedure, extracted from the achieved measurements:

Table 2

Name point	X[m]	Y[m]	Z[m]	mx[m]	my[m]	mz[m]
1111	496087.547	205922.917	128.366	0.003	0.000	0.010
1112	490596.135	213989.576	142.877	0.005	0.001	0.012
1113	477465.010	215854.540	96.752	0.005	0.008	0.008
1114	474890.373	202127.378	86.492	0.011	0.009	0.013
1115	493852.768	202360.266	112.896	0.008	0.011	0.015
1116	484213.451	206957.183	94.422	0.002	0.012	0.014
1680	485635.144	205069.474	91.046	0.003	0.009	0.007
28000	485603.700	205614.938	94.316	0.001	0.005	0.005
1010	485137.808	210606.474	101.436	0.008	0.006	0.002
1080	484980.825	211516.648	102.706	0.007	0.008	0.012
1200	485115.566	211561.465	102.270	0.011	0.006	0.009
1210	485203.930	211598.105	102.723	0.012	0.004	0.012
1220	485292.863	211659.220	103.002	0.001	0.005	0.007
1230	485392.702	211693.384	103.340	0.008	0.012	0.005
1240	485473.813	211724.190	103.329	0.005	0.007	0.008

The accuracy obtained after the processing and the compensation of new points determined by means of GPS technology, the RTK procedure, extracted from the achieved measurements:

Table 3

Name point	X[m]	Y[m]	Z[m]	mx[m]	my[m]	mz[m]
1111	496087.552	205922.912	128.369	0.020	0.000	0.012
1112	490596.143	213989.572	142.875	0.021	0.001	0.015
1113	477465.019	215854.547	96.753	0.011	0.000	0.009
1114	474890.362	202127.372	86.484	0.013	0.000	0.007
1115	493852.774	202360.268	112.886	0.009	0.000	0.011
1116	484213.439	206957.188	94.426	0.007	0.000	0.001
1680	485635.148	205069.482	91.052	0.013	0.001	0.012
28000	485603.718	205614.942	94.326	0.020	0.001	0.013
1010	485137.818	210606.478	101.429	0.009	0.001	0.006
1080	484980.829	211516.652	102.717	0.007	0.001	0.014
1200	485115.567	211561.460	102.279	0.015	0.001	0.021
1210	485203.936	211598.115	102.725	0.016	0.001	0.016
1220	485292.852	211659.228	103.012	0.017	0.001	0.012
1230	485392.723	211693.382	103.343	0.012	0.001	0.008
1240	485473.818	211724.196	103.335	0.009	0.000	0.004

The transcalculation of coordinates from the WGS '84 reference system in Stereografic'70 system has been achieved by means of Toposys 5.0. program, for the Rapid Static determined points.

The estimation of the conversion cooefficients has been achieved based on the common points chosen from the national geodesic network. This was chosen due to the fact that at the end of the transcalculation, a good global accuracy of the coordinates is being achieved. This conversion results in a file of X,Y,Z stereographic coordinates on Krasovski ellipsoid.

A spatial conversion has been achieved with 7 parameters (3 rotations, 3 translations and the scale factor). The estimation of the conversion coefficients has been done based on the common points chosen from the national geodesic network, also stated above. The resulted conversion parameters are:

- Spatial conversion with common points
- Coordinate differences in common points

Table 4

Nrp	dX[m]	dY[m]	dZ[m]
1111	-0.037	0.021	-0.125
1112	-0.065	0.158	0.036
1113	-0.074	0.026	-0.003
1114	0.049	0.165	-0.026
1115	-0.010	-0.085	0.103
1116	0.138	-0.284	0.015

- Average coordinate error

Table 5

mX[m]	mY[m]	mZ[m]
0.081	0.168	0.076

- The 7 tridimensional conversion parameters

Table 6

X0 = 24.383
Y0 = 2.674
Z0 = -0.019
rX = 0.000002261
rY = 0.000000986
rZ = -0.000008049
k = 0.999989252

The backward process of transcalculation starts after the spatial conversion. Thus, from geocentric coordinates ==> geographic coordinates => stereographice'70 coordinates, both for the points in the national geodesic network and for the points in the thickening network.

The points in the surveying network determined through satellite methods have been achieved with a 2-3 mm accuracy, the compensation being assessed as for a free network, and after the tridimensional conversion the conversion acuracy has been achieved, in fact the differences between the coordinates of the old points belonging to the National Geodesic Network and those of the same points determined by means of GPS technology.

3.6. The Accuracy of the Determinations after Measurements' Estimation and Compensation

Based on the comparison between the stereographic 1970 triangulation points' coordinates and those resulting from the GPS determination of the same points, the conclusion is that the differences between the coordinates of the points determined by means of the triangulation method and those determined by means of the G.P.S method are good.

The differences between the coordinates of the points belonging to the national geodesic network determined by means of G.P.S measurements in case of spatial conversion are the following:

Table 7

Nr.crt.	Name point	dX [m]	dX [m]	dZ [m]
1111	CORNEŞTI - JADANI (IV)	-0.037	0.021	-0.125
1112	GIARMATA NORTH (IV)	-0.065	0.158	0.036
1113	MOŞNIŢA (I)	-0.074	0.026	-0.003
1114	FREIDORF SOUTH(IV)	-0.049	0.165	-0.026
1115	MOVILA SURDUC(IV)	-0.010	-0.085	0.103
1116	DUMBRAVIŢA SOUTH-WEST(IV)	0.138	-0.284	0.015

4. Conclusions and recommedations

From a technical geodesic and topographic point of view the accuracy imposed by the beneficiary and by the present technical legislation approved by A.N.C.P.I. is assured. The determined points from the surveying network can be used for this work and for future topographic measurements in the area.

GPS-GLONNAS measurements by means of RTK technology, compared to Rapid Static, are comparable when it comes to accuracy, but RTK measurement method is faster, with a necessary stop of maximum 30 seconds up to a minute, at distances under 10 km, and for the Rapid Static of minimum 4-5 minutes.

The use of the two methods combined will assure a greater productivity and an increased efficiency.

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