TOPOGRAPHICAL WORKS FOR THE EXPANSION OF WAREHOUSE LOGISTICS CENTER STAGE 2, IN LOC. JUCU-HERGHELIE STR.3,TETEROM III, JUD.CLUJ

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Abstract. *The work aims to stakeout a storage warehouse in village JUCU.The stakeout works were done in five stages.In the first stage was made a polygonal traverse of four terminals located in the four corners of the land limit on which the investment is located.The network was determined with the total station model"Leica TS06 Plus", two of the terminals being determined "ROMPOS" which is a Romanian position determination system that ensures precise placement in the reference system and european coordinates ETRS89 with the help of a GPS Rover model South S82V.In the second stage were materialized the foundation pits with vat by GPS kinematic measurements, the reference being located on one of the four site network terminals.In the third stage, after pouring the concrete equalization of the foundation at elevation of -3.8m determined using optical level model "Leica NA720",on the edge of each pit it was sationated with the total station which was determined with the "FREE STATION" program of the total station, estimated error being about 3-4 mm and were materialized the corners of the base foundation with nails.In the case of the foundation collar it was done the same as the base foundation case.In fourth stage, on the foundation it was materialized with paint the axes of the investment with "REFERENCE LINE" program of total station.Fifth stage.After mounting the poles in positions,it proceeded to verticalization of the poles with the help of two total stations which were used as simple theodolite,arranged approximately perpendicular and positioned to be in alignment with the signs marked with paint on the poles and foundation, the sign must match on the crosshair of the instrument.The operations were done according STAS 9824/0-74(land measurements,land marking of buildings/facilities, general perceptions),STAS 9824/1-87(land measurments,land marking of civil,industrial,zootechnical and agricultural facilities),guide C83-75 (guide for detail marking in construction).*

Key words: *Total station, GPS, FREE STATION, REFERENCE LINE , ROMPOS*

INTRODUCTION

As a part of terestrial measurements, engineering surveying studies topographical metods related to preparing topographical plans and special documents needed for designing industrial, civil, agricultural and mining buildings, ensure the application of these projects on the field and follows the behave of the constructions during operations.

To achive the objective of the investment, topography involves in all phases:projection, executions and development .

In projection phase, topography provides the designers with large or huge plans, obtained by topographical measurements or photogrammetry.

The execution phase involve firstly topographical marking but also control measurements and reception.

Topographical markings includes topographical works for applying the projects on the field.The main marking works are:

-makeing the marking base as a triangulation, trilateration or polygonal network and addicted of these the topographical network;

-marking the main axes'

-detailed marking of the constructions;

-measureing the execution to determine the real precision, necessary for preparation of the general plan of the finished construction;

The development phase follows the behavior of buildings in order to know how they are maintained at the design parameters.[1]

MATERIAL AND METHODS

In order to achieve the marking works of the objective, we used the total station model" Leica TS06 Plus (fig 1) which is a complex total station with multiple connection possibilities, from USB port and Bluetooth connectivity to cable connection, the station provides full acces to data collected form the field.The FlexLine soft is very easy to operate, data collection being fast and the multitude of the applications helps the operator to perform various operations directly on the field.Beside the total stations,we used GPS equipment model "South S82V"(fig 2) with possibilities of work in real time with internal radio with 433 MHz frequency and 4GB memory in the following configuration:receiver GNSS rover with GSM/GPRS modem integrated(GPS,Glonass,Galileo,Compass),field book with SurvCE GPS with TRANSDAT 4.01-Stereo 70 system integrated.[2][3]

For data processing were used the following softweres:

-Leica geo office combined: for downloading GPS data

-Leica geo office tools: for downloading data from the total station

-Autocat :used for data processing

Figure 1 Total station Leica Ts06+

Figure 2 GPS South S82V

To determine two of the terminals, were performed GPS measurements using RTK method using the reference station from Cluj-Napoca.The application used was SurvCE, the terminals being measured with "Averege" function which make an average of the readings for high precision.The data obtained were entered into total station in order to measure the polygonal traverse.After it was measured the data were compensated in order to obtain the most probable values as for evaluation as accurate and complete of the precision.

RESULTS AND DISCUSSIONS

The works aim positioning in plan according to the project, of the elements, for achieving the component of the construction(formwork) or directly of it(for buildings made of prefabricated elements).Positioning require:

-marking the position and materialising it;

-positioning elements in relation to materialized landmark;

Marking and materialising the position runs in relation with landmark of the construction base (materialized by terminals or signs on the surrounding perimeter of the building) and require:

-marking and materialising the reference lines and intersections of lines;

-measurements in relations with materialized lines;

Marking of the main reference lines in relations to the others in plan, are perform with precision optical instruments(Theodolites).For marking very long lines, will be used only high precision optical instruments.

Marking on the field includes two phases:fixing the position of the constructions on the site of the project followed by marking the detailed works of each construction.Marking earthwork for foundations are part of detailed marking works and are done based on the marking plan ,after determining the position of the construction on the site of the project using engineering surveying methods.[4][5][6]

At the beginning the polygonal traverse was determined, the all four terminal being represented in the following image(fig 3), following the compensation.(fig 3.1)

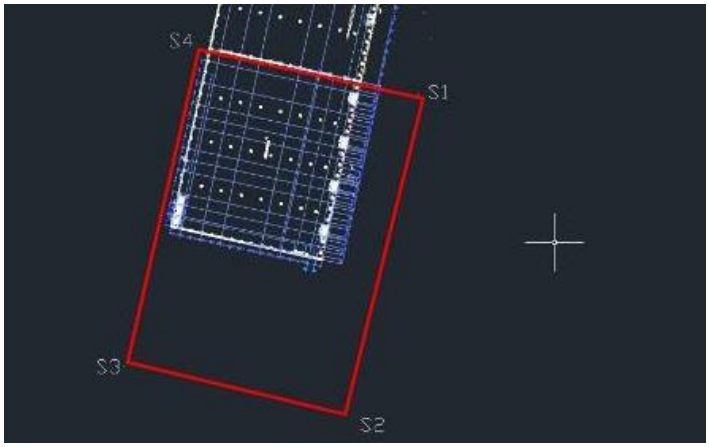

Figure 3 The polygonal traverse

The marking works begin in stage two by materialising with vat the foundation pits(fig. 4, fig. 5) by GPS measurements with the help of two GPS receivers, one used as a reference on one of the four terminals and the second one being mobile.For marking the pits boundaries it was used the “Stakeout” function from SurvCE application, the coordinates were already introduced in the GPS controller.

	Statia	Pct vizat	d 0	inapoi	inainte	Orientare I	Orientare II	x I	y I	x II	y II	X	Y	Pct vizat
		A2				215.4422						597777.017	407378.209	S1
1	S1	S2	198.261	215.4422	215.4422	215.4422	215.4405	-192.458	-47.616	-192.459	-47.616	597584.558	407330.593	S2
2	S2	S4	136.6775	15.4412	314.8391	314.8400	314.8367	31.566	-132.982	31.566	-132.982	597616.124	407197.611	S4
3	S4	S3	195.7935	114.8359	14.26054	14.2647	14.2597	190.902	43.490	190.902	43.490	597807.026	407241.102	S3
4	S3	S1	140.352	214.2605	113.7201	113.7243	113.7176	-30.009	137.106	-30.009	137.107	597777.017	407378.209	S1
5	S1	A2		313.7160	215.4422	215.4505	215.4422					597777.017	407378.209	S1
			671.084			215.4422								
						-0.001663								

delta +	222.468	180.596	222.468	180.598		
delta -	-222.467	-180.599	-222.468	-180.598		
DELTA	0.001	-0.002	0.000	0.000	0.000	0.000
	222.469	180.598				
	-222.467	-180.598				
Verificare	444.935	361.195				
eroare	0.001	0.002				
	444.935	361.195				
corectie +	0.000	0.001				
corectie -	0.000	-0.001				
corectie	0.9999979	1.000006				
corectie	1.0000021	0.999994				

Figure 3.1 The compensation table

Figure 4 - 5 The pits after being materialized with vat

After the pits were dug, the equalization concrete was poured(fig 6).The concrete was poured at -3.8m elevation determined using the level "Leica NA 720".Marking the levelment of any component of the construction are done in relation with a landmark materialized at level ± 0,00 or another conventional level and must be executed and protected in order to preserve during the execution of the construction. This landmark must be accesible to the outside of the construction, being a checkpoint, regarding the level of the construction in relation with the level of the exterior reference landmarks.

Figure 6 Foundation pit after the concrete was poured

To materialize the corners of the base foundation with nails, it was done as follows: on the edge of the foundation pits, it was stationated with the total station, the position being determined with "FREE STATION" program, aiming each terminal and to determine the position of the base foundation corners, was used the "STAKEOUT" program of the total station, the same procedure was used in the case of the foundation collar (fig 7-8).

Figure 7-8 The foundation base and the foundation collar.

In the next stage the axes of the investment were materialized with paint on the upper face of the foundation collar.The axes were marked with the total sation using "REFERENCE LINE" program, an example is in fig 9, haveing as reference line the E axis, it was able to materialize on the collar the axes of the pillars on the entire length of the axis.

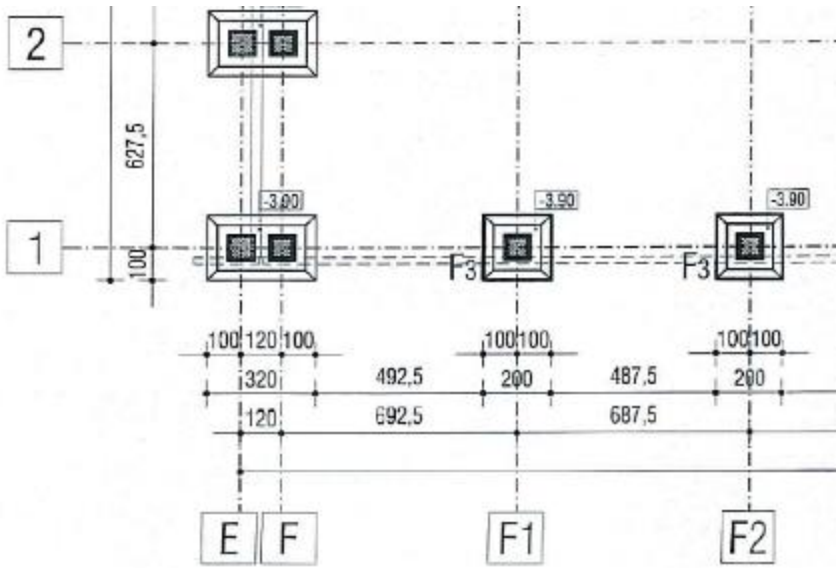

Figure 9 Example of the axes

After marking the axes on the foundation collars, the pillars were installed on position, following to be verticalized.Checking the verticalization of the prefabricated pillars with the height above 3m, it will be achieved by using theodolite, which will control the verticality of an edge or the midan axis of two adjcent sides, in the case of controling verticality of the median axes, the theodolite must be positionated successively on the two lines which intersect in straight angle the pillar,in the right center of the pillar base.On the lower and upper side of the two sides of the pillar will be marked in advance with their median axes.The crosshairs of the theodolite it will be adjusted so that the image of the median axis of the lower side will coincide with the crosshairs and then by rotating the instrument vertically it will track the upper side of the pillar. By adjusting, the pillar will be brought so that the image of the median axis of the upper side to coincide with the crosshairs(fig 10).[9]

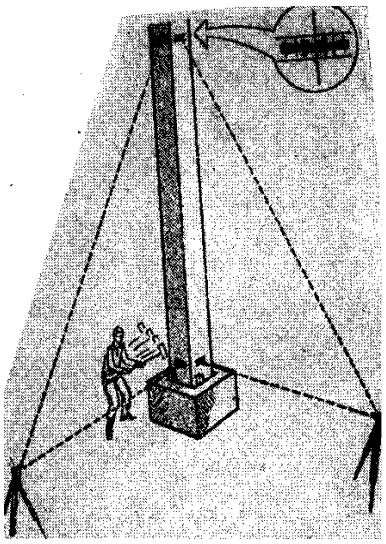

Figure 10. The verticalisation of the pillars

CONCLUSIONS

The work aims the expanding of a warehouse, logistics center. Execution of the detail marking in constructions were performed by a professional team, able to use properly various instruments and to interpret in correspondence with the real conditions of measureing. The workers must know:

-the principles of composition and operation of the instruments they use;

-the demands of the corrections which must be brought to the reading results in relation with inherent disorders occured during operating the instruments;

-the corrections that must be made to the readings depending on the difference of real conditions of measuring in relation with calibrations of instruments.

It is necessary to periodicaly, the instruments that were used, to undergo metrological verification according to prescriptions.

Whenever it is found that corrections do not lead to reduction or elimination of errors found, they will no longer be used until the errors will be eliminated or reduced by certified workshops.

The execution of the marking works will respect the rules of labor protection.[9]

The operations were done according STAS 9824/0-74(land measurements,land marking of buildings/facilities, general perceptions),STAS 9824/1-87(land measurments,land marking of civil,industrial,zootechnical and agricultural facilities),guide C83-75 (guide for detail marking in construction).[7][8]

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