THE IMPLICATIONS OF TOPOGRAPHY IN THE PROJECTS OF INDUSTRIAL INFRASTRUCTURE

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***Abstract**: The industrial objectives are the place of the activity necessary for the production of industrial goods intended for the consumption of the population. Due to the technological progress marked by the evolution of techniques and technology, the production and assembly lines of the industrial product have become increasingly complex including automation components such as conveyor belts, machine tools, manipulating robots, cranes, tunnels and other like these. These components, being connected to each other, require the need for special surveying to be placed in the field.*

In this context, the topographer engineer is present at every stage of the "life" of an industrial hall, starting with the plot, plotting the axes, positioning the posts in the construction phase, marking it in the cadastral registers, drawing machine tools and auxiliary equipment in its endowment phase, the behavior and deformation of the construction during its exploitation and the deletion of the construction during its demolition.

***Keywords:** industrial hall, topographical surveys, setting out surveys, industrial installations, axes, reference point*

1. Introduction

The special surveying works are dedicated to solving the problems raised by the needs of the economic agents carrying out industrial activities and aim to materialize the beneficiary's vision in the form of industrial halls, industrial platforms, equipment location or other such works.

These works are necessary in all branches of industry so the engineering branch of the topography deals with the problem of the transposition of industrial infrastructure projects into the field taking into account all the conditions the designer imposes in terms of both the geometry of the object and the location in the existing topographic environment.

Due to the complexity of the industrial infrastructure projects, these cannot be fully achieved without equipment and topography specialists that must coordinate the activities of setting industrial objectives and putting into operation machine tools in combination with robots, conveyor belts or other functional devices.

2. Materials and Methods

Tracking works consist of the transposition of a project that has as object the contour of a building, the defining elements of special purpose machines, property limits, axes, or other defining elements of a project. The metric elements of the projected object are analyzed in the topographical preparation process, the completion of which is the topographic plotting plan.

For this paper here will be tackled topographical problems related to the increase of the industrial facilities of a hall.

Land Recognition

At the stage of land recognition, it will be establish the methodology for resolving the project, the approximate positions of the points of the network and their uniform distribution in order to satisfy their availability from any position will be established. For the case study approached, the position of the network points will be established to ensure a visa line between at least 3 points and the unobstructed visual field of the hall elements (pillars, walls, crane structures, etc.).

Due to crowding inside the hall due to the location of the machines, bridges and auxiliary equipment, the points will be located by consulting the halls project beforehand. In this way, it will be possible to establish areas that will not be obstructed and will allow visa lines to one or more points of the support network.

Marking and signaling points

The body of the point network was logically and conveniently distributed approximately at half of the axes of a two successive poles and at the imaginary intersection of diagonals joining the posts of the poles.

The points were embedded in the floor of the industrial hall materialized by topographic bolts to give them durability. Due to the shape of the bolt, the prism positioning error has been eliminated, thus increasing the precision of the prism regardless of the measurement period. At the same time, these points were signaled through topographic targets to increase visibility and facilitate repertoire.

Secondary network points were logically distributed over the metal anchors of the metal structures and the concrete belts of the walls, thus being preserved in the perspective of the rehabilitation action of the floor.

This location has been chosen due to the dynamic of the working environment (the disappearance of the topographical points due to sanding and floor rehabilitation), ensuring visibility to the points of the support network from any position and also to ensure the possibility of meshing the network in the necessary places.

Topographic measurement of the hall contour details

As a follow-up to the goal-building work, in order to satisfy the set-up accuracy required for the industrial objectives and installations, it was used to carry out the hall survey, which represents the fitting of the objectives. At this stage the representative details of the walls, he transverse and longitudinal axes of the hall and the position of the expansion joints have been redefined in order to highlight the real situation in the field.

The redetermination of the hall geometry is necessary because the plan layout of the industrial installations shows that the machine tools are located in areas exaggerated close to the face of a pillar or the crane structures must be placed very close to the walls. This requires an exact data frame in terms of location of the objectives so as to respect the design distances to the axes and to avoid overlaps with structural elements of the construction.

Digital plans

For the location of industrial installations, were taken the design plans of the location of the component gears of the objective together with the descriptive sheets and the connection design of machine tools and attachments.

The realization of digital plans involves the location of industrial objectives and installations, respecting the drawing dimensions of the details and the reciprocal orientations (parallelism and perpendicularity) to a fundamental point of the objective, called "reference point 0".

This name derives from the fact that this point is considered a reference in the connection of the equipment and later in the location objective in relation to the hall axes, the machine tool spacing distances being reported at this point.

The "0" point is characterized by five points arranged crosswise, the point of reference of the lens being located at the median intersection of the transverse axes, respectively longitudinal determined by the other four points. This point is characteristic of both the object and the machinery belonging to it.

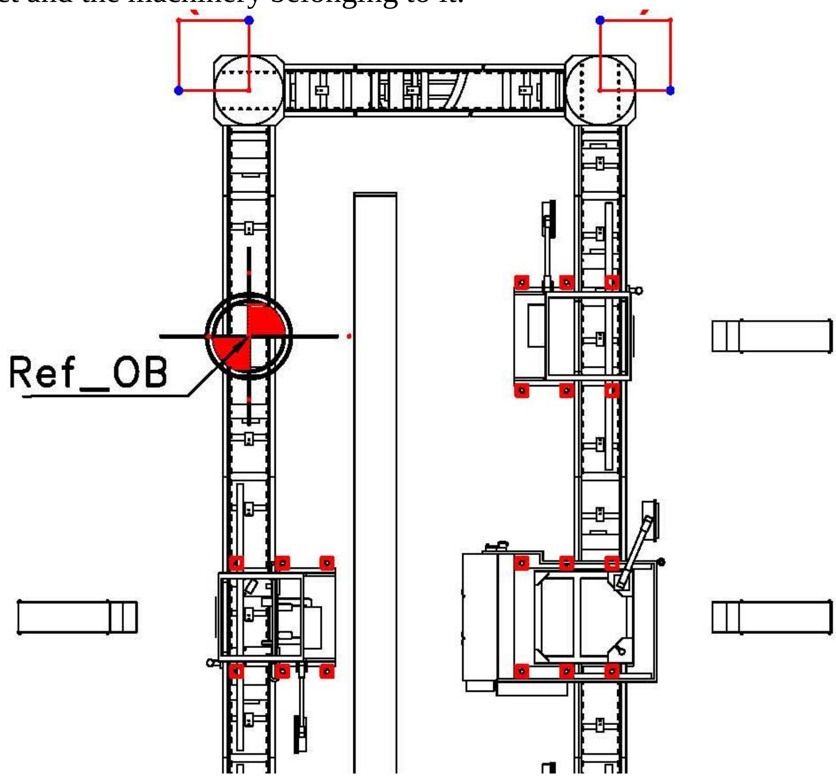

Fig. 1 Representation of "Reference point 0"

The position of the machines relative to the "0" point is made by consulting the objective design to determine the position of each machine relative to the fundamental point.

3. Results and Discussion

For the purpose of setting out a point into the field, the general layout plan will take into account the following aspects:

- establish station points in the immediate vicinity of the target;
- the convenient location of the topographic instrument will be chosen so as to provide a visa line to as many points as possible;
- the topographic instrument will be positioned approximately mid-point to equally distribute the points.

The orientation points will be chosen based on the position of the machine so that at least 3 orientation points are placed in 3 different dials.

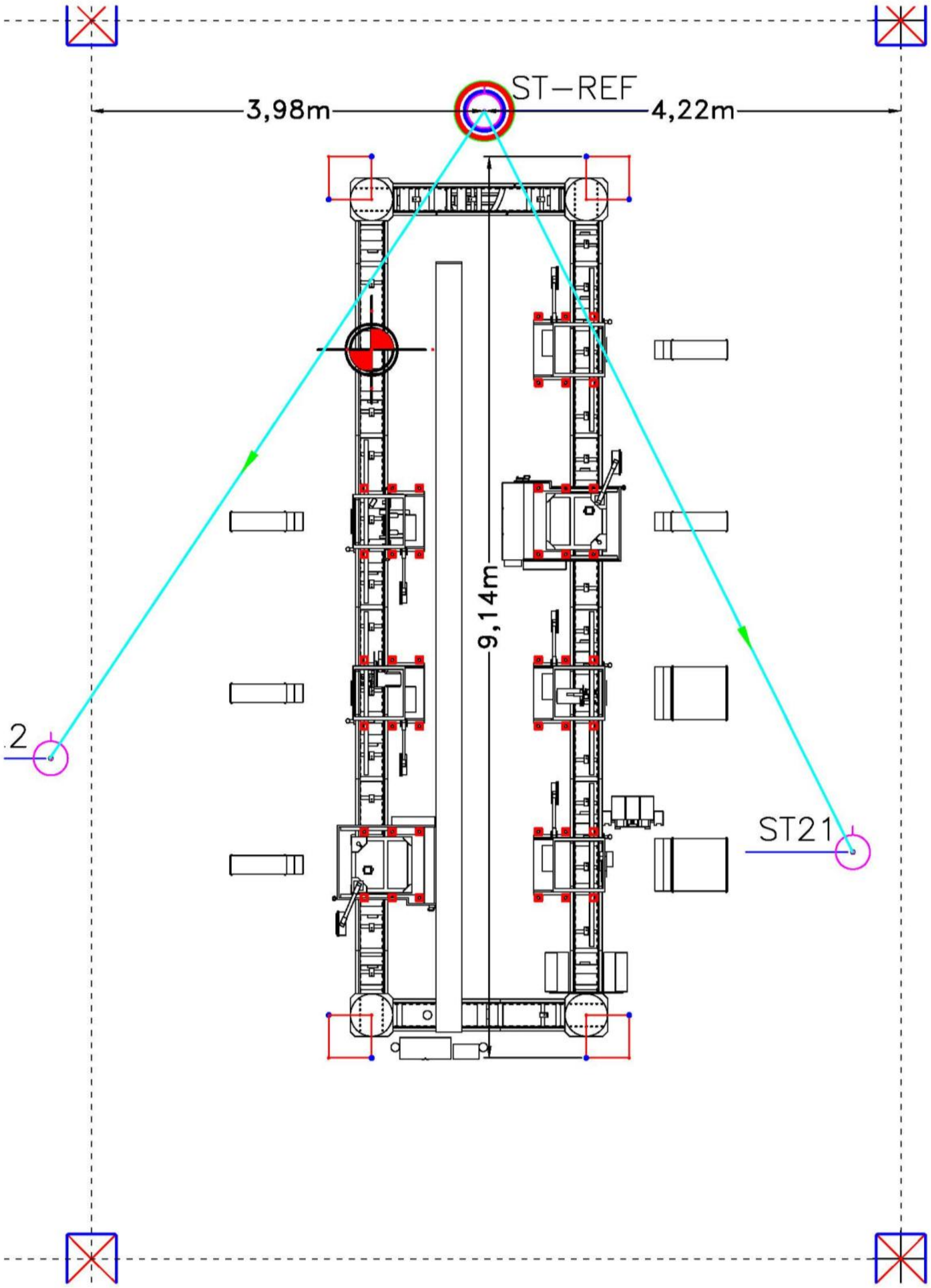

Fig. 2 The procedure for determining the location of the topographical instrument

For high-end objectives and facilities, topographic tracing of characteristic points will be required from several station points, with the condition of checking the points previously traced. If there are differences in tracing, those differences will systematically be allocated to the new points, thus preserving the transposition accuracy, the distance of setting out being small.

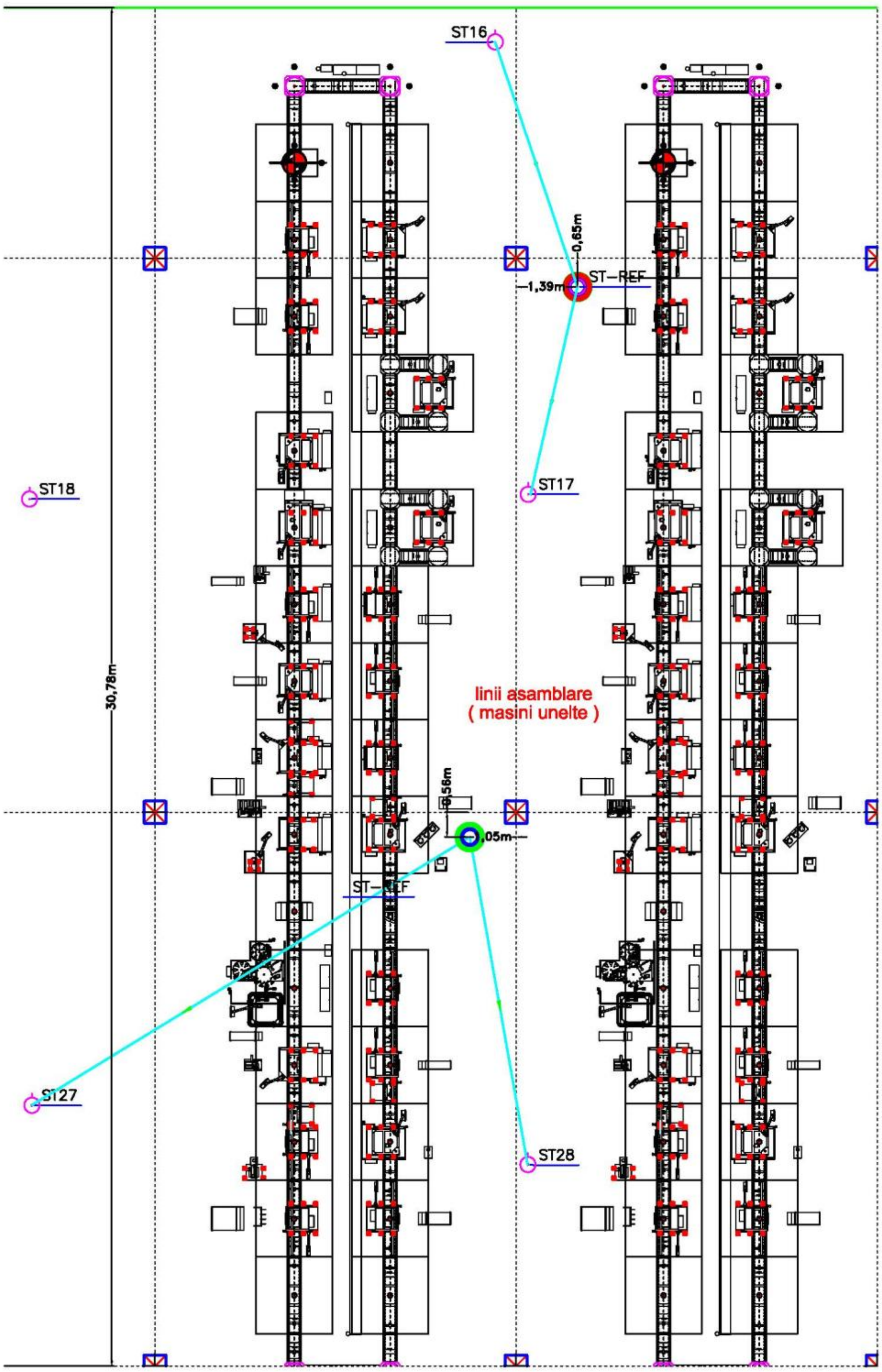

Fig. 3 Equal distribution of stationary points in the design of industrial facilities of long lengths

Drawing boards of foundations

To establish a foundation plates, it will be drawn a network designed for the purpose, and by joining the centers of the chalk line will form a rectangular network. After the materialization of the network it was used a 1:1 scale template that faithfully respects the size and shape of the foundation plates. In order, to draw the plates, the pattern is placed at the intersection of the axes of the rectangular mesh, so that the axes of the pattern with the axes of the drawn mesh perfectly coincide and with a liner it will be draw the contour of the plate and the position of the bore serving the chemical anchor bolts. In order to preserve the markings, a layer of auto lacquer was applied to the base plate anchoring.

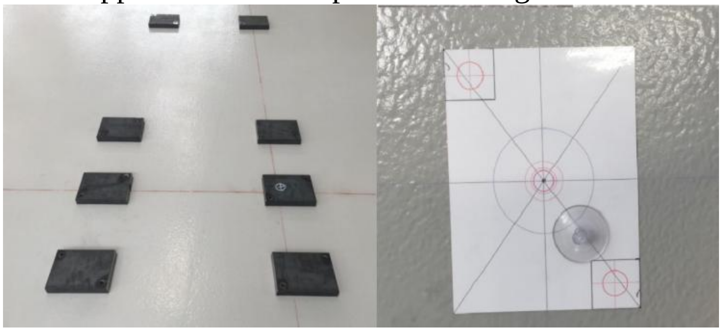

Fig. 4 Using the Chalk Line and the Template

Setting out the position of the conveyor belts

In view of setting out the conveyor belts, will materialize points in the land that defines the belt axe sand turntable centers.

Checking the axes after they were drawn was done using a chalk line, studying possible deviations from this line. The chalk line gives satisfactory precision to determine deviations from alignment. It will stretch from 25 to 25 meters, tensed with a force of 8 NM. Additionally, a lead wire, supported at two ends, is placed so that the plotting of the size materialized in the field is carried out.

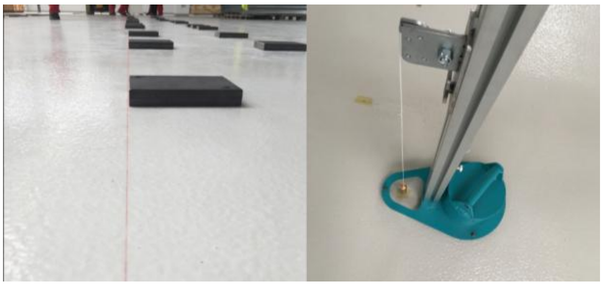

Fig. 5 Using the lead wire and chalk line

Drawing the position of manipulating robots

In order to place the manipulating robots, the anchor attachment of the robot will be drawn, usually in the form of a square, setting out with three points. After the anchorage of the basement, its corners will be checked and the reference point of the robot tribrach will be setting out by the materialization of the cross point.

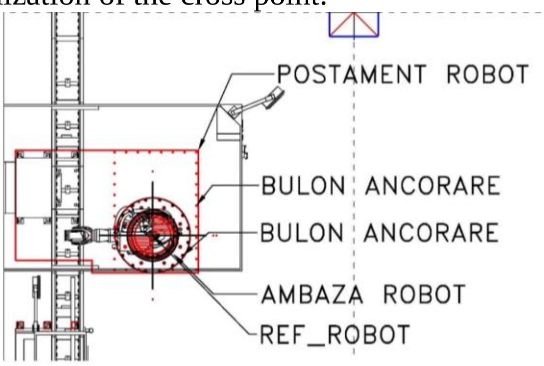

Fig. 6 Robot specific elements

Setting out the level point for machine tools

In order to locate machines who need special condition that require a location on granite plates, that do not tolerate large level differences on the floor contact surface, measurements have been made to align some sectors within certain targets with a determination tolerance of +/- 0.001cm.

In order to delimit the area of interest, the site plan of the machine was consulted and four points were drawn with the help of the total station to delimit the area where the leveling works will be carried out.

After drawing the perimeter, it was contoured with adhesive tape and a grid with a side length of 50 cm was created using the chalk line. This grid has been developed with a double role. In the first instance, it serves as a guide for detailing details (altimetry values and planimetric position), facilitating the physical numbering of points and their quota values, and in the second instance it provides a uniform distribution of points.

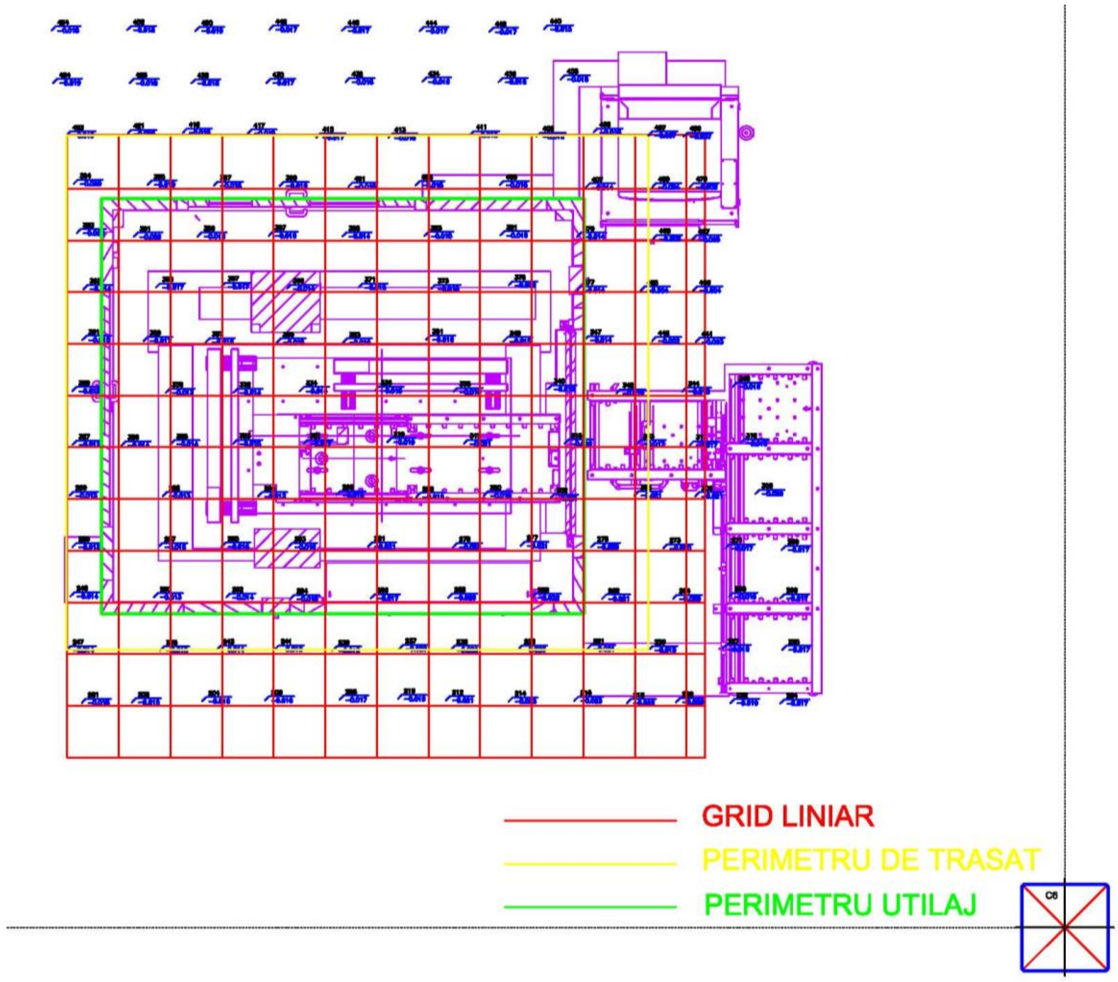

Fig.7 Delimitation the perimeter of the machine tools location

As a result of the measurements, there were found differences in the level exceeding the tolerances of the machine's location and recourse was made to leveling the sector of interest. To do this, four points have been drawn to designate the perimeter of the machine and the relative share was specified to which the self-leveling screed has to be poured.

4. Conclusions

The set of topographic works necessary for the design of the industrial infrastructure objectives is laborious and requires special attention both in the data processing phase and in the drawing of the topographic plan and in the materialization stage of the ground, the errors being expensive because the delay of the works commissioning in conjunction with the value of the equipment and the costs of assembly teams and entails financial penalties. It can increase work efficiency both in terms of precision and reduction of execution time making use the adequate topographical equipment and applying the appropriate working methods.

Due to the practical solutions presented, the completion of the target proved to be faster than expected, respecting the required precision. The topographer specialist has to solve any problem that threatens the end of the project and finds solutions that are economical and fast in relation to the principle of topographical management: time is money, and the satisfaction of the beneficiary's needs brings prestige to the topographer engineer.

5. References

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