THE CHECKING „IN SITU” OF THE PILLAR’S AND THEIR COAXIALITY SALT MINES GEOMETRY

Arsene C.
Technical University of Cluj-Napoca, Romania; cornelarsen@yahoo.com

Abstract. This paper presents a simple method of an „in situ” determination for the geometry of the pillars and the verification of compliance with their coaxiality at all horizons, in the case of solid salt exploitation, with total station.

Keywords: stumps, coaxiality

INTRODUCTION

The exploitation of salt deposits enables the performance of large underground excavations - rooms, supported by safety panels (stump) – areas which are not operated, without danger of collapsing. The lack of special support ceiling construction is an advantage, but supplies of salt fixed by panels are wasted. Therefore, it is necessary that by judicious placement and shape of the panels, that the losses are as small as possible, achieving in the same time an adequate working protection. The form of rooms and panels is chosen so as not to allow the accumulation of dangerous tensions in isolated points and in the ceiling to be produced small or null tensions.

The method of operating with small rooms and square panels (Fig. 1.) ensures these requirements; the operating multiplier is about 30-40 % for the mines located at depths of 100-500 m and 20-30 % for those at depths of 500 - 1000 m. The opening mines is through cliff galleries, continued with a sloping land for the first floors exploitation and for subsequent stages a inclined spiral field is realized, which is located outside or inside the mining field from case to case. Once the opening works are realized, between the sloping land and the ventilation shaft, proceed into making the network of rooms and panels.

MATERIAL AND METHOD

Safely exploitation of the salt deposits with the method of small rooms and square panels implies the observance of the designed measurements of the panels, and also the coaxial arrangement at all horizons operated and the maintenance of the general orientation for all the mine’s horizons. A room-panel assembly has the dimensions of 30x30 m (Fig. 1.).

At the first floors, the rooms have a width of 16m and side panel of 14 m. As the depth increases the dimensions for the room-panel assembly is kept at 30 m, but the width of the room decreases and the panel’s side increases. This lowers the multiplier of extraction by the immobilization of some supplies that are increasingly significant in the panels. The thickness of the floor slab is about 7-8m.

For the „in situ” determination of the panel’s geometry a total station is used, in this case a TCR407power Leica type instrument that is included in the library of a
polygonal outline area calculation programs. The work is prepared by creating a new „job” for example << PILIERI >> (Fig. 2.).

From the project extract the designed coordinates of the panel’s corners, and if on that horizon other measurements have been made and there are landmarks materialized, extract them all. The naming (ID) of the points on the outline panels design will be chosen so as to refer to a specific panel. For example, panel II-6, the points will have IDs: P261, P262, P263, P264, P265 (P - panel design, 26 - panel row 2, column 6, 1-5 - points on the outline of the designed panel).

Point P265 has the same coordinates with P261, it is necessary however, to make the transition from the polygonal outline of designed panel onto the finished panel. The file ASCII, is shown in Fig. 3. This file will be converted into a GSI type one with specific transfer software and transferred to the total station.
When making observations in the mine there will be ensured that each stump, for the points on the outline, specific IDs are used; in this case these are: R261, R262, ..., R2610, R2611 (R - stump finished, 26 – stump on row 2, column 6, 1-11 – points on the outline of the finished stump). Point R2611 has the same coordinates with R261, but is necessary to make the transition from the polygonal outline of the finished stump into the designed stump ones.

RESULTS AND DISCUSSION

After all measurements have been made, check the geometry and coaxiality of the stumps directly into the field.

With the key [MENU], select the application Area & Volume from Programs (Fig. 4.), then select with LIST or FIND command, the points from the designed stump’s outline (P261 - P265), and those on outline of the finished stump (R261 - R2611).

After the selection of the displayed stump’s points its surface will be shown (Fig. 5.) In this case $S_P = 196,000$ sqm (the stump’s side being 14m), and on the display the geometry is represented; after the points on the stump’s outline are also selected, the surface shown is the sum of the two surfaces, in this case $S_P + S_R = 390.898$ sqm – so the stump’s accomplished surface is $S_R = 194.898$ sqm, and on the display is shown the made stump’s geometry overlapped on the geometry of the designed stump (Fig. 6.).
CONCLUSIONS

The presented method provides precise informations, directly from the field, about how, after the exploitation, the geometry and coaxiality of the stumps follow the project. The value of the accomplished stump’s surface results directly. For the portions where it is found – regarding the contours shown on the display - and coaxiality and geometry deviations, their values are also calculated „in situ” from the coordinates of the points. As the maximum deviation from coaxiality can be 0.5 m, the measured values can lead to taking necessary measures when this limit is exceeded.

REFERENCES

1. Arsene, C., Cercetări asupra fenomenelor de mişcare și protecţie a suprafeţelor ca urmare a influenţei exploatarii sârâi în stare solidă sau în soluţie.