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ASSESSMENT OF THE STATE OF TENSION OF THE WALKING TUNNEL, TAKING INTO ACCOUNT THE CHANGE IN THE DEPTH AND STEEPNESS OF THE LAYING OF THE SOIL ARRAY

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ABSTRACT

In this article, the assessment of the state of tension of the walking tunnel, taking into account the change in the depth and steepness of the laying of the soil array, is given on the basis of graphs. Also indicated are the relief of the working conditions of the coating structure and large strength reserves, which are taken into account during the design of the coating.

Key words: tonnel, soil, fossil place, shield method, tension, deformation, displacement.

INTRODUCTION

Leading positions are occupied by the construction of modern transport tunnels using new innovative solutions of tunnel coating around the world, the improvement of methods for calculating them in strength and durability, as well as the application of Advanced Design Technologies and technical means to them [1]. Analysis of work devoted to the study of shallow-lying tunnels the sequence of walking tunnels has a significant impact on static performance, which requires consideration at the design stage. For this reason, below is an example of calculating the effect of the sequence of construction of two parallel tunnels of the metropolitan area, as well as taking into account the assessment of the state of tension of its coatings. Due to the complexity of the calculation work of the shallow-located Tunnel coating, it will be necessary to use the developed method, based on the condition that the displacement of the "coating-soil array" system with its deformation occurs together.

METHODS

Modern technologies for the installation of high-precision reinforced concrete coatings of walk-behind tunnels ensure that the coating is quickly and densely adjacent, as well as the space interval between the installation of the coating with a fossil site is minimally small. This can cause the array and coating to deform together so that either the probability of formation of the dome (interacting deformation mode) is completely excluded, or the dome height is reduced (combined Mode) [2.3]. But the methods for calculating the circular coatings of Metropoliten walking tonne are largely based on M.M. Protodyakonov's theory, which he developed at the beginning of the last century [3], as well as these calculation methods do not allow observing the process of increasing contact loading as the structure moves away from the place of creation of the fossil site. It should be understood that after the installation of a coating with a certain steepness, which depends on the thickness of the subsurface structure and the deformability characteristics of the material from which it is made, the voltages in the array are redistributed. In this case, if the coating is installed directly after the opening of the section of the fossil site, additional voltages that are removed by the impact by the array pass as the load pressure on the full array itself.

In case a problem has arisen directly, but in case of a problem at a distance of l_0 the distance to rodiligan bohls, the parable of the eight-lig joining the effect of this function f(x) the settlement account can be made [4, 5, 6]

Many scientific works were devoted to the issue of determining the displacement of the contour of the artificial cavity by binding to the distance to the fossil site, among which the work of N.A. Davidov [7] and M.

Baudendistels [8] can be separately indicated. For example, based on the results obtained by M. Baudendistel, Prof. N.S. Bulichev proposed the use of exponential bonding as a result of correlation analysis of the correlation between the value α* and the relative distance to the fossil site of the artificial gap l_0 /R_0 [3]:

$$a^* = 1 - f(x) = 0{,}64\left(e^{-1{,}75 l_0 / R_1}\right) \qquad (1)$$

here,

l_0 – distance from the surface of the fossil to the settlement;

R_1 – hole radius equal to the radius of the artificial cavity.

RESULTS

The plot of the track between the stations "Shahristan" and "Yunusabad" in Tashkent, located at a depth of 7 m to 20 m, will be considered. On this plot, the soil Massif is composed of Crumpy soils and Sandy soils. The deformation module of the Soil array changes on average in the range of 8-18 MPa. In the calculations, the depth of placement of the tunnel on the site under consideration is 7, 15, and 20 m. In addition to the location chtsqur, the deformation module of the soil array also changes: Poisson coefficients υ_{gr} =0.35, 032, 0.30 with E_{tr} =8, 12 and 18 MPa. In addition, the calculations also took into account the increased (strained) condition of the model after the injection of the tamponage layer on the back of the tonnel coating under pressure. Then the deformation modules of the coating and tamponage layer were taken with E_{ob} =37500 MPa and E_t =10000 MPa and Poisson coefficients υ_{ob} =0.2, υ_t =0.2. Thus, three models of different depths were implemented based on the physical and mechanical properties of the soil array of The Walking tunnel. (1) when the coefficient of the impact of a fossil place according to the formula is equal to the following, we will consider the situation when the tonnel zaboyi begins to work in a massive organized form with a coating at a distance equal to one radius:

$$a^* = 1 - f(x) = 0{,}64\left(e^{-1{,}75 l_0 / R_1}\right) = 0.343$$

Figure 1 shows tangential stresses in the inner contour of the coating at a depth of 7 m from the dome rack, Figure 2 - at a depth of 15 m, and Figure 3 - at a depth of 20 m. The qualitatively Epicurean value of tangential stresses on the inner contour of the coating is a horizontally oriented ellipse that does not change its horizontal position to vertical in the specified range of its array properties. In the given models of general deformation of the soil mass, the greatest tensile stresses are formed in the shelves of the dome and the reverse dome of the tunnel coating, while the greatest compression stresses occur on the sides of the coating.

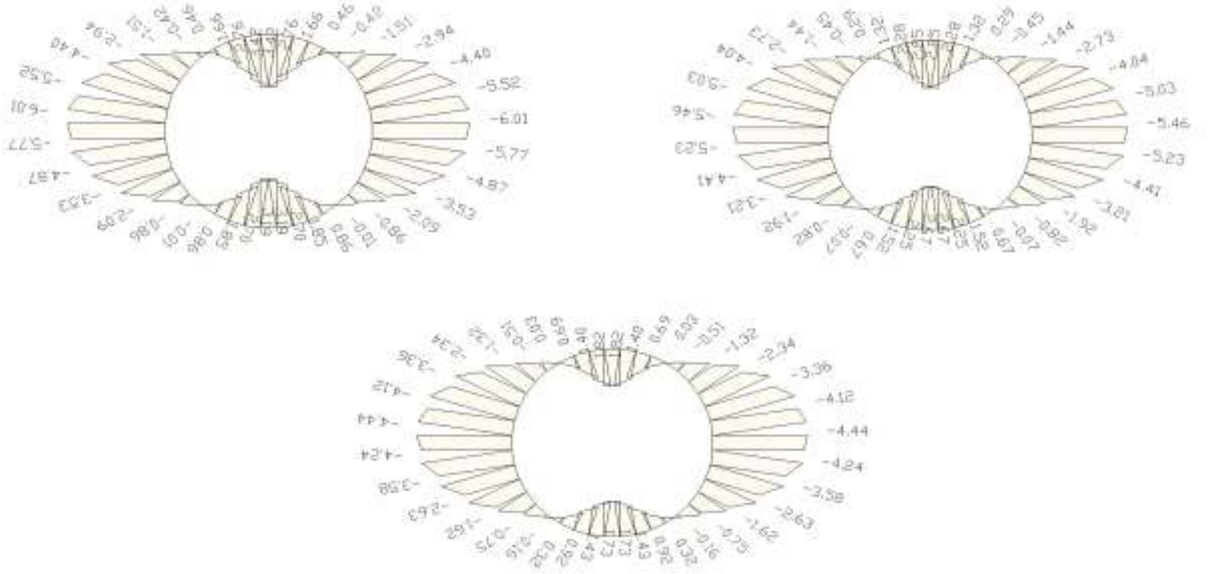

Figure 1. Distribution of tangential voltages in the inner contour of the coating at a depth of 7 m when the deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa (MPa)

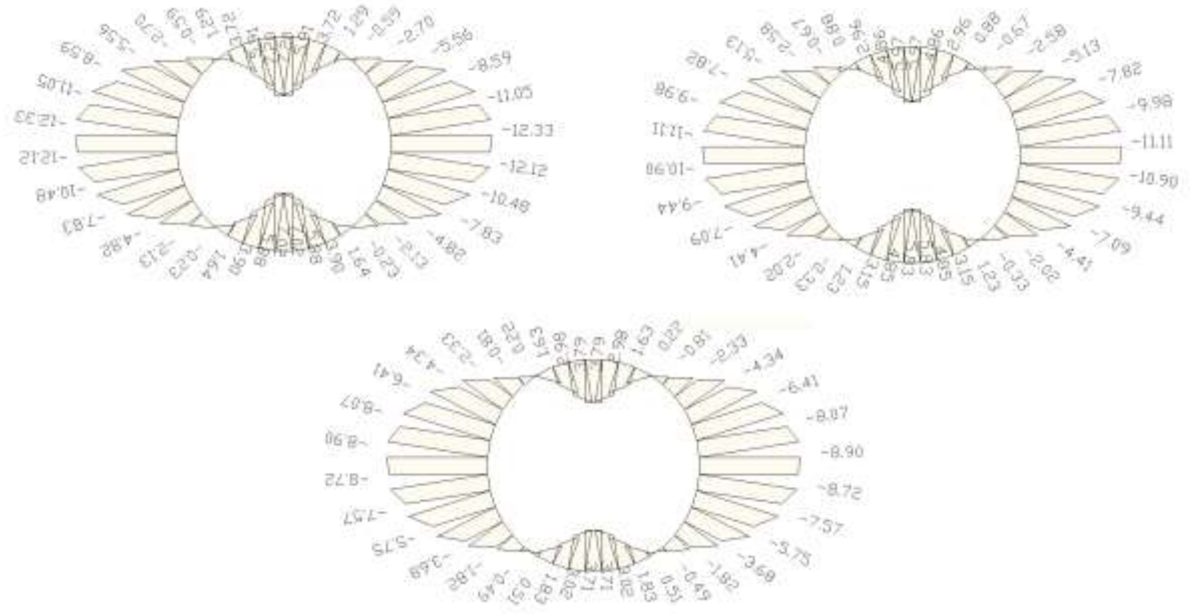

Figure 2. Distribution of tangential voltages in the inner contour of the coating at a depth of 15 m when the deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa (MPa

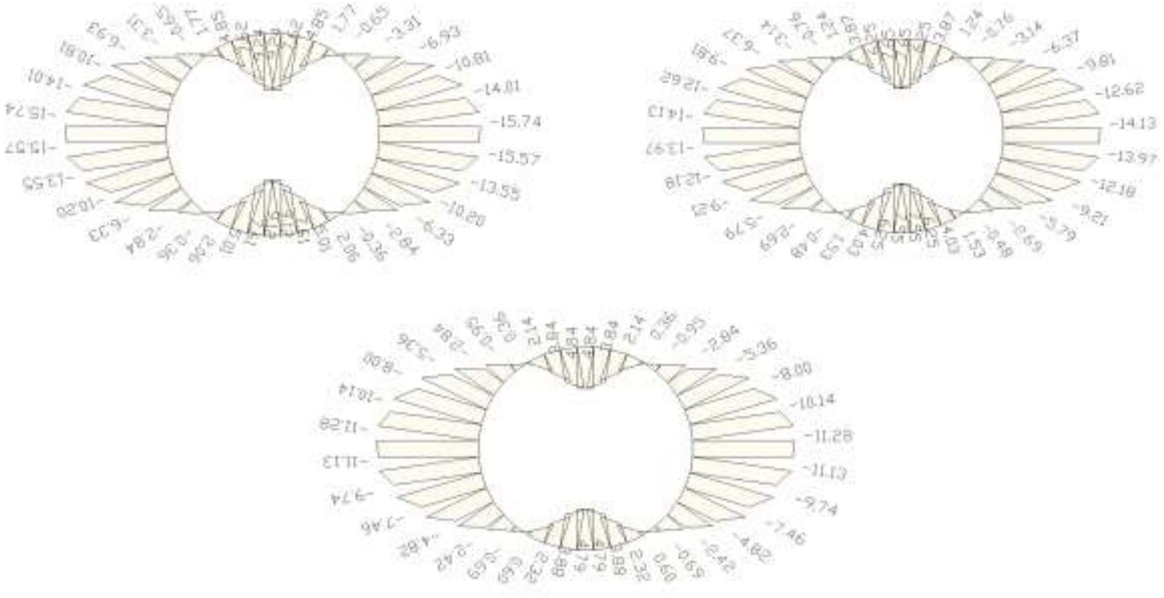

Figure 3. Distribution of tangential voltages in the inner contour of the coating at a depth of 20 m when the deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa (MPa)

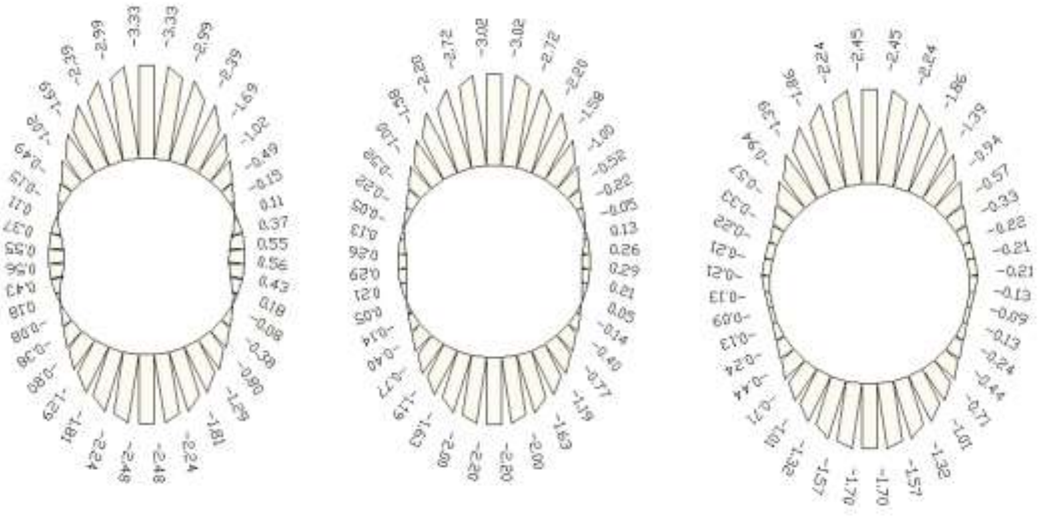

Figure 4. Distribution of tangential voltages on the outer contour of the coating at a depth of 7 m when the deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa (MPa)

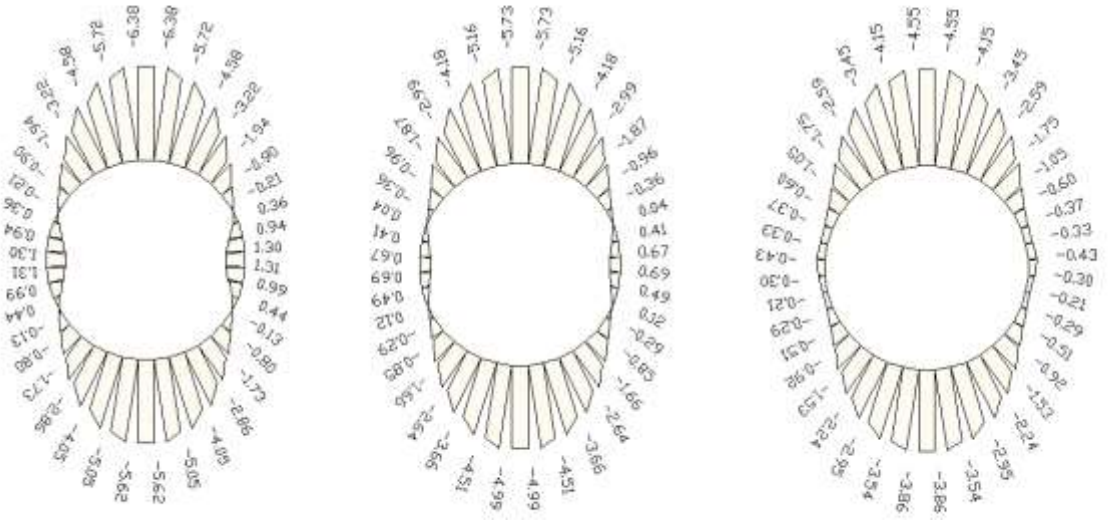

Figure 5. Distribution of tangential voltages in the outer contour of the coating at a depth of 15 m when the deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa (MPa

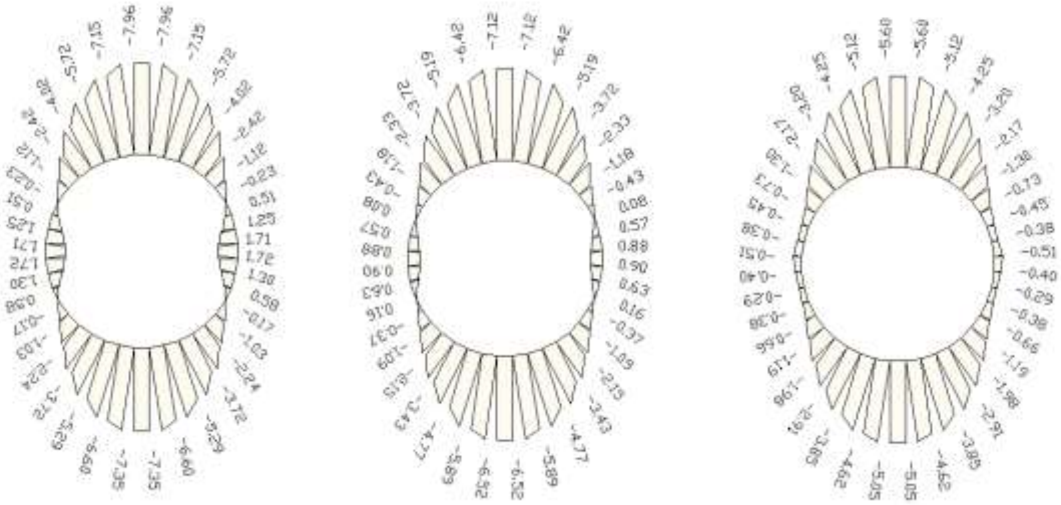

Figure 6. Distribution of tangential voltages in the outer contour of the coating at a depth of 20 m when the deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa (MPa)

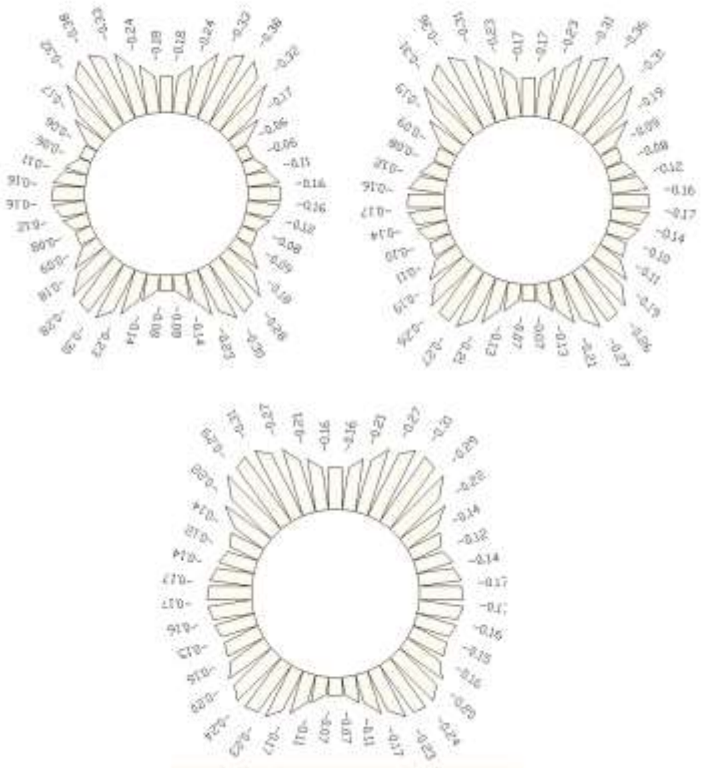

Figure 7. Distribution of radial voltages in a coating tampon age Layer 7 m deep when the deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa (MPa)

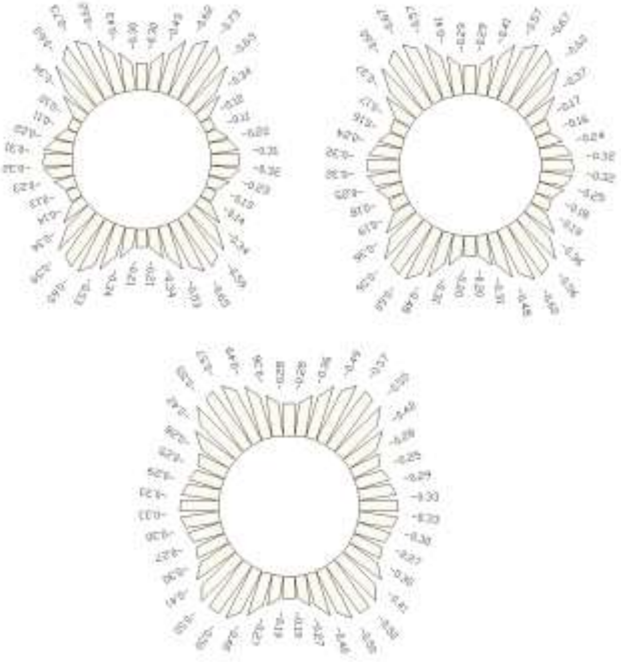

Figure 8. Distribution of radial voltages in the coating tampon age layer at a depth of 15 m when the deformation module of the array in which the Tunnel is located is equal to 8, 12, 18 MPa (MPa)

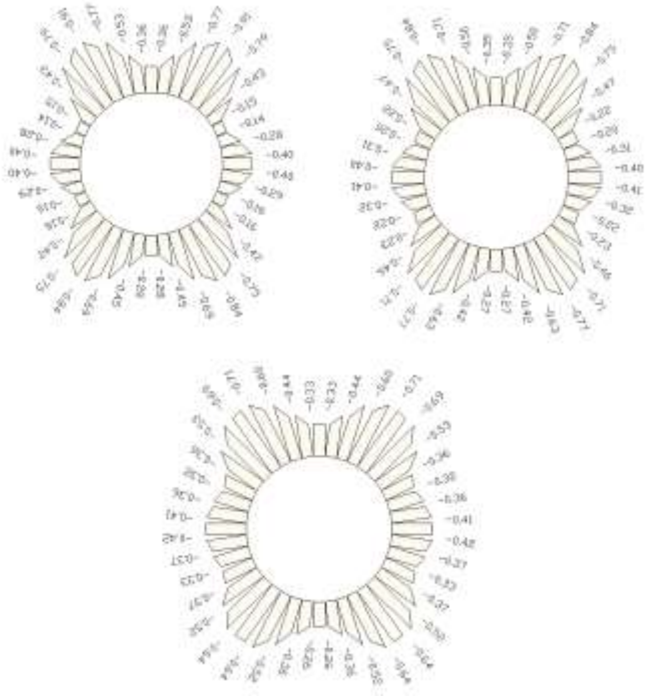

Figure 9. Distribution of radial voltages in the coating tampon age layer 20 m deep when the deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa (MPa)

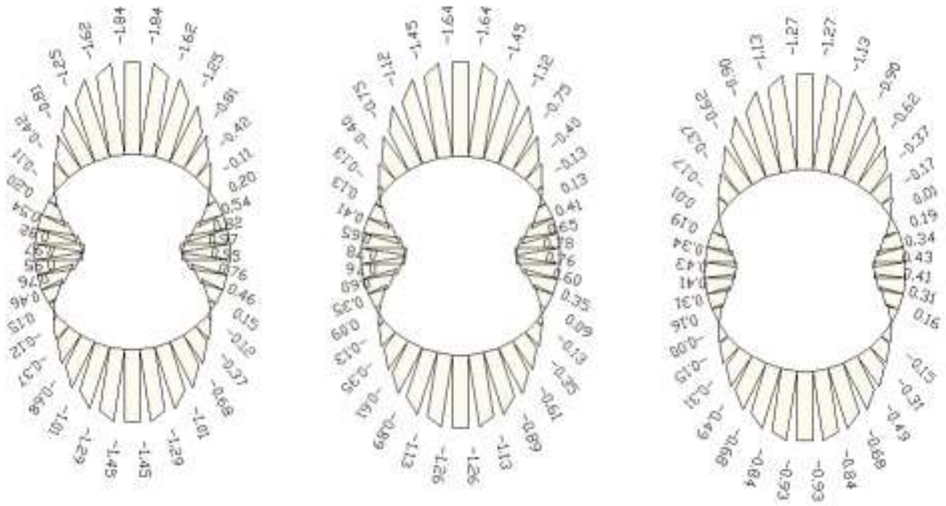

Figure 10. Distribution of radial voltages in the coating layer at a depth of 7 m (MPa) when the deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa

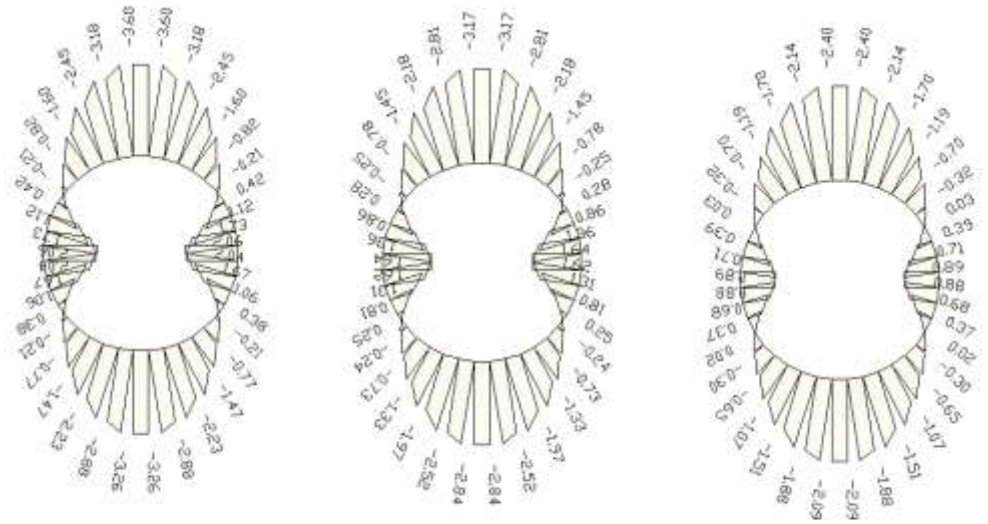

Figure 11. Distribution of radial voltages in the coating layer 15 m deep when the deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa (MPa)

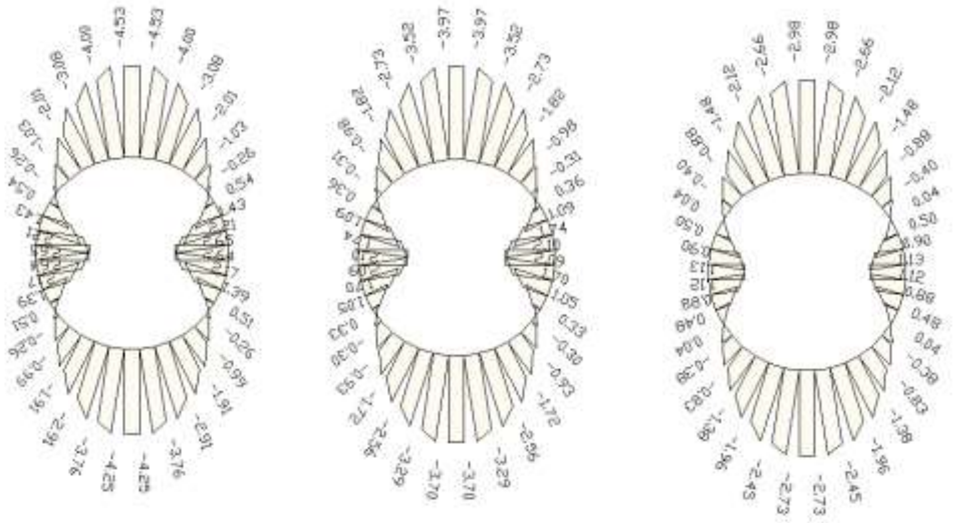

Figure 12. The deformation module of the array in which the Tunnel is located is 8, 12, 18 MPa when the coating at a depth of 20 m is the distribution of radial voltages in the tampon age layer (MPa).

DISCUSSION

The maximum of radial stresses in absolute value is observed in the lateral parts of the tunnel, and the minimum is in the dome, and this corresponds to the classical idea of the distribution of radial stresses.

Changes in the modulus of deformation of the array affect the magnitude of radial stresses in the buffer layer of the main tunnel. The change in the overall modulus of deformation of the array in which the rod is located will not be as large as the effect on radial stresses in the grouting layer, as the depth of the rod location. Radial stresses on the external circuit are compression stresses and do not change their value. It is also true that in the grouting layer at the bottom of the tunnel, the value of radial stresses is less than its value in the dome rack [11.12].

Tangential stress plots are ellipses that do not change their position from horizontal to vertical within the specified properties of the array.

The greatest compressive stresses occur in the covering of the sheliga dome, as well as in the reverse dome. In the lateral parts, the stresses are tensile stresses, the signal of which does not change.

CONCLUSION

A peculiar striking scientific and practical result was obtained that the increase in the depth of location of the tunnel has a much greater effect on the increase in voltages in the tonnel coating compared to the decrease in the values of the deformation module of the soil array. From the graph it can be seen that the largest tangential voltages appear next to the tunnel, whose value is 15.74 MPa. These are compression voltages. When the coating dome has E_{gr}=18 MPa, the largest tangential voltages equal to 9.24 MPa will be stretching voltages. The largest compression tangential voltages in tamponage coatings will be twice as small as the voltages on the outer contour of the coating. Thanks to this, the working conditions of the coating structure are facilitated, and large reserves of strength are formed, which are taken into account during the design of the coating.

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