ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Numerical Analysis Of Engineering Geological Elements While Strengthening The Base Of A Construction Site.

Olga Georgievna Degtyareva*, Dmitriy Anatol'evich Dats'o, Elena Fedorovna Chebanova, Natalia Nikolaevna Krylova, and Ekaterina Ivanovna Khatkhokhu.

Kuban State Agrarian University named after I.T. Trubilina, 13, Kalinin street, Krasnodar 350044, Russia

ABSTRACT

The engineering industry increasingly requires highly accurate calculations, which are necessary both to optimize design solutions and to reduce the risks of engineering error. To solve these problems, a modern engineer must possess advanced software systems that meet the objectives. One of such complexes is the software product MIDAS GTS NX, which specializes in the calculation of geotechnical problems. On the basis of this product, the task of justifying the adopted constructive decisions to strengthen the site was solved. The tasks are formulated on the basis of data obtained directly from the construction site, such as:

- physical and mechanical properties of engineering and geological elements;
- the depth and nature of the occurrence of geological elements;
- effective loads on construction sites.

At the end of the calculations, a reasonable conclusion on the task was formed.

Keywords: construction site, foundation sludge, engineering-geological elements, multifunctional software complex, non-linear calculation of engineering-geological elements.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

This calculation was made using a multifunctional software package for calculating, researching and designing structures for various purposes “MIDAS GTS NX”. The design model describes in detail the structural scheme of the structure. This calculation is performed according to the requirements of the following regulatory documents:

- SP 22.13330.2011 "Foundations of buildings and structures";
- SP 63.13330.2012 "Concrete and reinforced concrete structures";
- GOST 32960-2014 “Public roads. Regulatory loads, design load schemes ".

MATERIALS AND METHODS

Initial data

- Regulatory wind pressure according to SP 20.13330.2011 - 0.30 kN / m2;
- Weight of snow cover according to SP 20.13330.2011 - 1.2 kN / m2;
- Seismicity of the construction site - 5 points.

Geotechnical data

Data on engineering-geological elements (IGE) are taken on the basis of the technical report WENENG PRURPD and are presented in table 1.

Table 1: Dedicated IGE

№ IGE	Index	IGE description
1c	pdQIV	Soillayer
1	mQIV	The sand is fine, loose, moderate water saturation
2	mQIV	Siltclay, greenish brown
3	lglQIIIvd-	Heavy, dusty loam, from light gray to gray-brown
4	fglQIIIvd	Sand silty, gray, dense, saturated with water
5	fglQIIIvd	Powdered silt, plastic, gray, with interlayers of light loam
6	fglQIIIvd	Dusty loam, from soft plastic to refractory, gray, uniform
7	fglQIIIvd	Powdered loam, semi-solid, gray, homogeneous
8	aQIV	Sand is fine, dark brown, loose, water-saturated

Constructive scheme

The design scheme adopted on the basis of the following data:

- draft design solutions;
- the program of work "Integrated engineering surveys on the object: Construction of the Nord Stream - 2 gas pipeline" (DOW site with off-site facilities and a suitable land section of the gas pipeline with a length of 3.7 km);

The Nord Stream 2 gas pipeline includes:

- DOW site with associated facilities of 6.5 hectares;
- access road with a length of about 1200 meters located on agricultural land;
- the access road adjoins the existing public highway of regional significance “Lusatian – 1 May”;
- land area for the access road 0.2 ha;

Baseline data for calculating the site pre-school

The physicomechanical properties of the soil were taken on triaxial tests in accordance with the KD scheme.

ISSN: 0975-8585

The occurrence of the soil was determined in accordance with geological wells.

RESULTS AND DISCUSSION

When calculating the consolidation, the following phasing was taken into account:

- Initial phase - in this phase, the array was calculated without taking into account the influence of external factors;
- The first phase - in this phase, the array was calculated taking into account the embankment of the DOW site;
- The second phase - in this phase, the calculation of the array was carried out taking into account the foundations on the DOW site;
- The third phase - in this phase the calculation of the array was carried out taking into account the construction of structures on the foundations;
- The fourth phase - the calculation of consolidation for a period of 50 years.

The results of the calculation of the embankment in the fourth phase are presented in Figure 1.

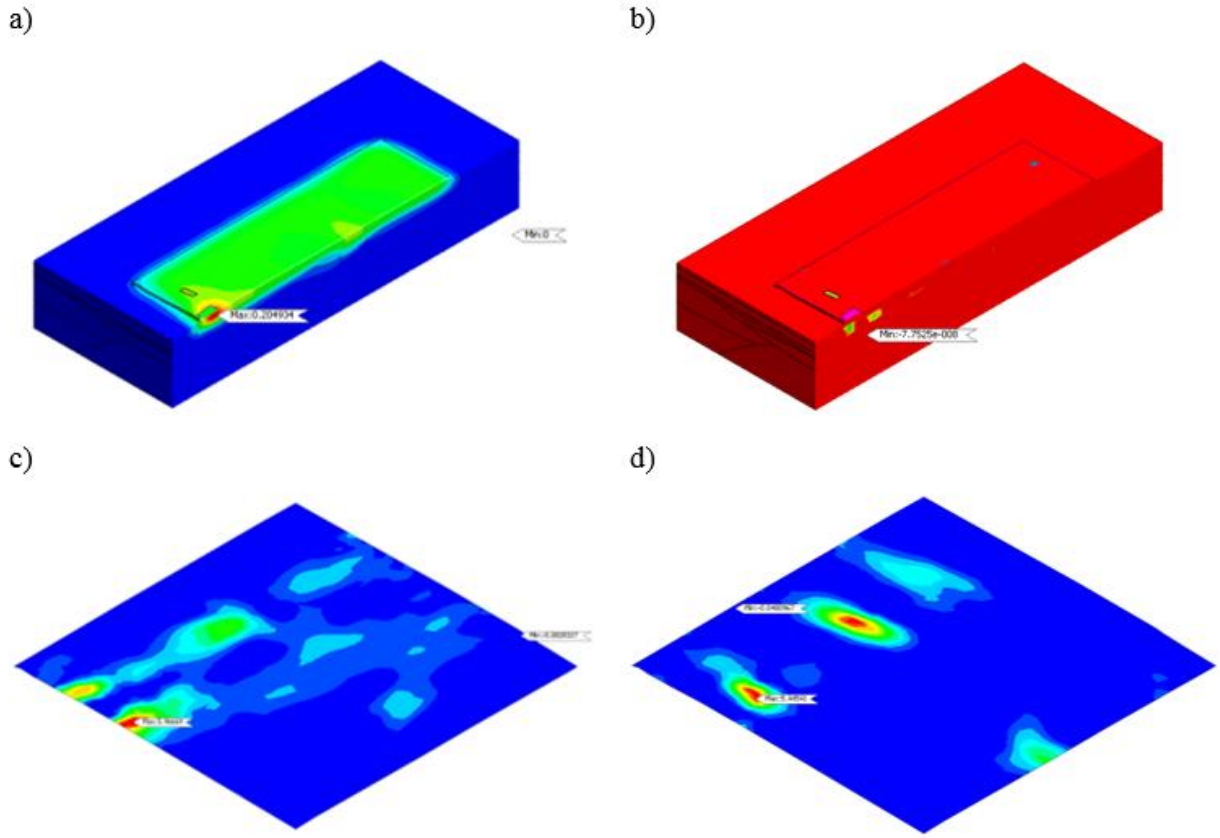

Figure 1: The results of the calculation of the embankment in the fourth phase:
a) draft, m; b) overpressure, kN / m^2; c) main stresses XX, kN/m; d) the main voltage YY, kN/m

Based on the above results, we state:

- The maximum settlement of the embankment in the fourth calculated phase is 20.5 cm;
- the maximum excess pore pressure in the fourth design phase is 7.75 e-008 kN/m^2;
- the maximum main voltage XX in the gain element is 5.96 kN/m^2;
- the maximum principal voltage YY in the gain element is 5.44 kN/m^2.

The results of the calculation of the site doe without gain
The results of the calculation of the embankment in the fourth phase are presented in Figure 2.

ISSN: 0975-8585

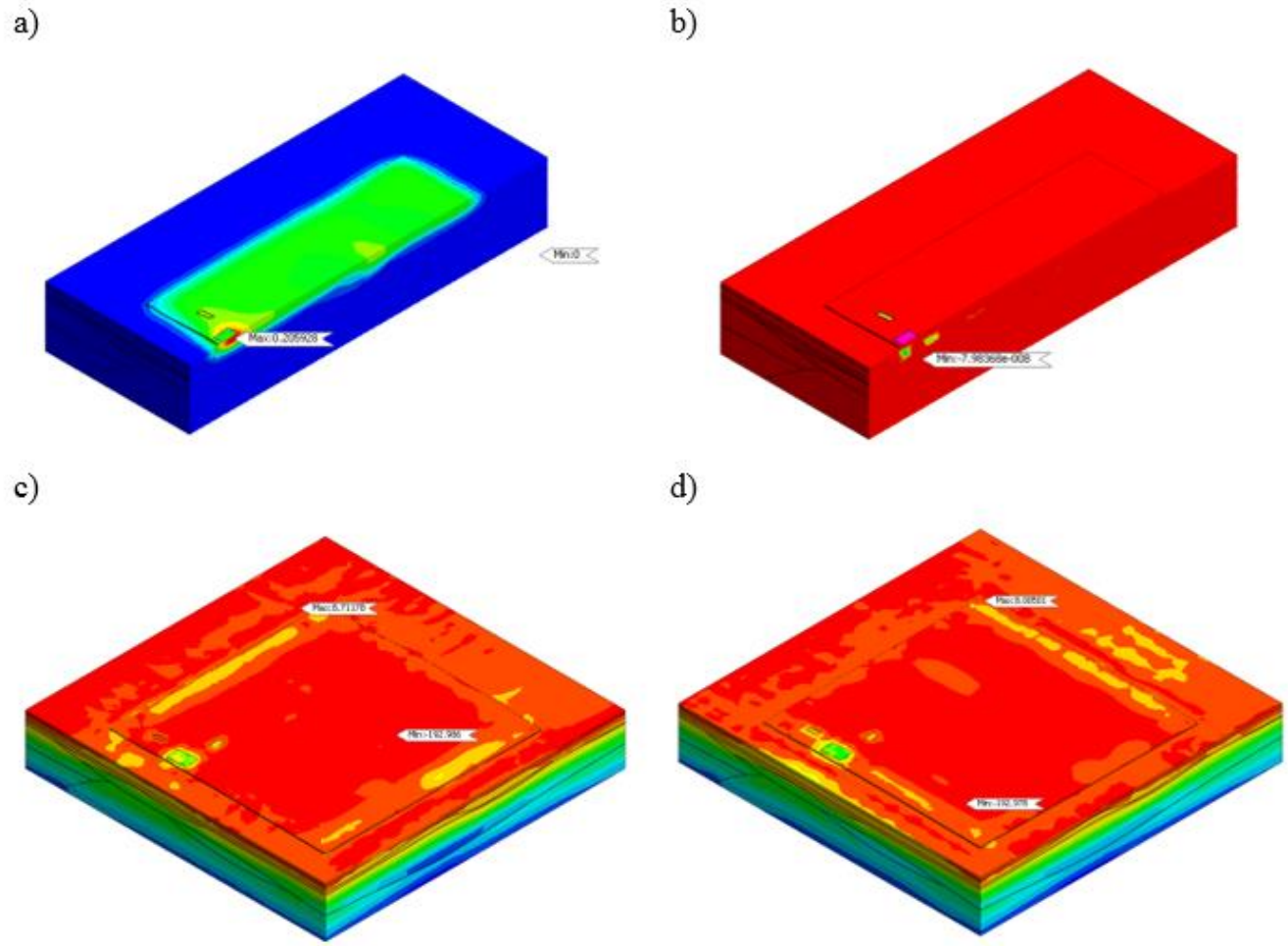

Figure 2: The results of the calculation of the embankment in the fourth phase: a) draft, m; b) overpressure,kN/m^2; c) main stresses XX, kN/m; d) the main voltage YY, kN/m

CONCLUSION

Based on the above results, we state:

- The maximum settlement of the embankment in the fourth design phase is 20.6 cm;
- the maximum excess pore pressure in the fourth design phase is 7.98e-008 kN / m^2;
- the maximum main voltage XX in the array of soil material is 192.98 kN / m^2;
- the maximum main voltage YY in the soil material array is 192.97 kN / m^2.

The analysis of the data presented above allows us to conclude that the presence of reinforcement, which works solely in tension, directed perpendicularly to the actual load, practically does not compensate for the draft, and thus its introduction into the design solution and subsequent implementation in practice is not advisable [1-10].

REFERENCES

[1] Degtyarev G.V., Datsyo D.A. Features of the calculation of the slab cover as a carrier. Proceedings of the Kuban State Agrarian University. Krasnodar. 2016. 5(62). pp. 157-165.

[2] Volosukhin V.A., Bandurin M.A., Vanzha V.V., Mikheev A.V., Volosukhin Y.V., "Numerical analysis of static strength for different damages of hydraulic structures when changing stressed and strained state". Journal of Physics: Conference Series.2018. 1015(4). 042061.

[3] Degtyarev G.V., Degtyarev V.G., Tabaev I.A. Mathematical modeling of weakened vertical supporting structures of a building when reinforced by self-stressed concrete. Works of Kuban State Agrarian University. Krasnodar. 2015. 1(52). pp. 192-198.

[4] Degtyarev G.V., Molotkov G.S., Sekisov A.N., Datsjo D.A.Numerical modeling of condition of the bridge structure based on the results of national surveys. International Journal of Engineering & Technology. 2018. 7(2.13). 13, pp. 226-230.

[5] Degtyarev G.V., Belokur K.A., Sokolova I.V. Modeling of the Building by Numerical Methods at Assessment of the Technical Condition of Structures. International conference on Construction and Architecture: theory and practice of industry development (CATPID-2018). Trans Tech Publications, Switzerland. 2018. 931.pp. 141-147.

[6] Degtyarev G.V., Datsjo D.A., Vysokovsky D.A., Turko M.S. The Foundation Pit Deep Site Ground State Design Modelling Process. International conference on Construction and Architecture: theory and practice of industry development (CATPID-2018). Trans Tech Publications, Switzerland. 2018. 931.pp. 396-404.

[7] Degtyareva O.G., Safronova T.I., Sokolova I.V. The Calculation of a Drain Seasonal Regulation Reservoir Volume Probability. International conference on Construction and Architecture: theory and practice of industry development (CATPID-2018). Trans Tech Publications, Switzerland. 2018. 931.pp. 991-995.

[8] Lazareva N.V., Takhumova O.V., KrivokoraY.N., Vershitskaya E.R., Batisheva E.A. Model Of Small Business Development And Its Competitiveness In Conditions Of Institutional Transformations. RJPBCS. 2018. 9(6).pp. 755-762.

[9] Reznichenko S.M., Takhumova O.V., Zaitseva N.A., Larionova A.A., Dashkova E.V., Zotikova O.N., Filatov V.V. Methodological aspects of assessing factors affecting the sustainable development of the region. Modern Journal of Language Teaching Methods. 2018. 8(11).pp. 69-79.

[10] Takhumova O.V., Kasatkina E.V., Maslikhova E.A., Yumashev A.V., Yumasheva M.A. The main directions of increasing theinvestment attractiveness of theRussian regions in the conditions ofinstitutional transformations. ESPACIOS. 2018. 39(37). P. 06.