

The Investigations of Foundation Displacements of the Nukus City (Uzbekistan) Buildings

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Abstract: *The results of calculations of displacements of buildings in 40 points of the city of Nukus (Uzbekistan) are presented. The calculations cover soils up to a depth of 8.0. The research area is 122 square kilometers. The displacements was calculate by summarizing of displacements layers where was used the results of investigation obtained by local geological organizations. As a result, the systematization of building displacements was carried out depending on the type of soil underlying the foundation. Sand, sandy loam, loam and clay served as bases at the depth of the sole of the belt foundation of one meter. The dependences of the foundation displacements pressure are constructed, which showed that the displacements-pressure dependences have a close linear one. The results of investigations snowed, that limit displacements occurs under not more limit pressure under foundations*

Keywords: Nukus city, belt foundation, displacements, pressure, map

1. Introduction

Currently, number of modern civil buildings are being designed and constructed in Nukus (Uzbekistan). The foundations of the constructed and projected buildings in Nukus are mainly of a belt structure of shallow foundation. Quaternary deposits represented by fine sands, sandy loams, loams and clays of alluvial origin are mainly used as bases. Currently, design and construction works are being carried out for the construction of modern high-rise buildings. For effective using of the city area, it is necessary to develop a construction plan taking into account engineering and geological conditions. Since the engineering-geological condition is important for reliable and economical design of foundations of high-rise buildings. For the development of the construction master plan of the city of Nukus needs systematic information about engineering and geological conditions and a preliminary estimation of displacements of the foundations of buildings, which will allow to make the most optimal design decisions of foundations.

2. Purpose of work

Systematization and estimation of foundations displacements of buildings in Nukus (Uzbekistan).

3. Materials and methods

To assess the calculated pressure of the bases composed of alluvial soils, the results of existing engineering and geological studies conducted in Nukus were collected.[1] Aimbetov I. K., etk (2016). The total area of research was about 122 square kilometers. Figure 1. shows a schematic map showing the locations of wells, the studied territory of the Nukus city. In this article the results of studies of the limits of bearing capacity of soils in Nukus are presented. The results of determination of physical and mechanical properties of soils taken from archival materials were used for calculations. Physical and mechanical properties were determined on the soils selected from the wells shown in figure 1. Engineering and geological sections of the city of

Nukus are given in article [1] Aimbetov I. K. ,etk (2016). The depth of the wells was 8 m. In the calculations, it was assumed that the depth of the foundation is 1.0 m, and the width of the foundation sole is 1.0 m. The density of soil above the base of the foundation is 1.8g /sm³. Table 3.1 shows the results of calculations of the limits of bearing capacity of soils. For the final acceptance of the size of the sole and the depth of the foundation, it is necessary to calculate the displacements of the foundation.

4. Results and Discussion

To assess the displacements of building foundations in the conditions of the city of Nukus, special calculations of the displacements of belt type foundations were carried out calculations.

The calculations of the displacements of building foundations were performed by method layer-by-layer summation.[5] Tsytoich N. A.(1963). The calculations used the physical and mechanical properties of the soils defined at the points shown in figure 1. in this case, the calculations were grouped by type of soil under the foundation sole, which was determined by the limits of bearing capacity of soils. Other types of soil are found in deeper horizons. Calculations were performed for various values of increasing pressure. During calculations, the pressure increased to the value of the conditional design pressure of the soil under the foundation sole. Figure 1 shows the dependence of the foundation displacements on pressure, which shows that in general, the dependence of displacements on pressure is close to linear.

Table 3.1: Limits of bearing capacity of soils

№	Type of soils	Limits of bearing capacity, kPa		
		min	max	middle
1	Sand	405	6565	506
2	Sandy loam	323	454	386
3	Loam	322	393	354
4	Clay	326	543	370

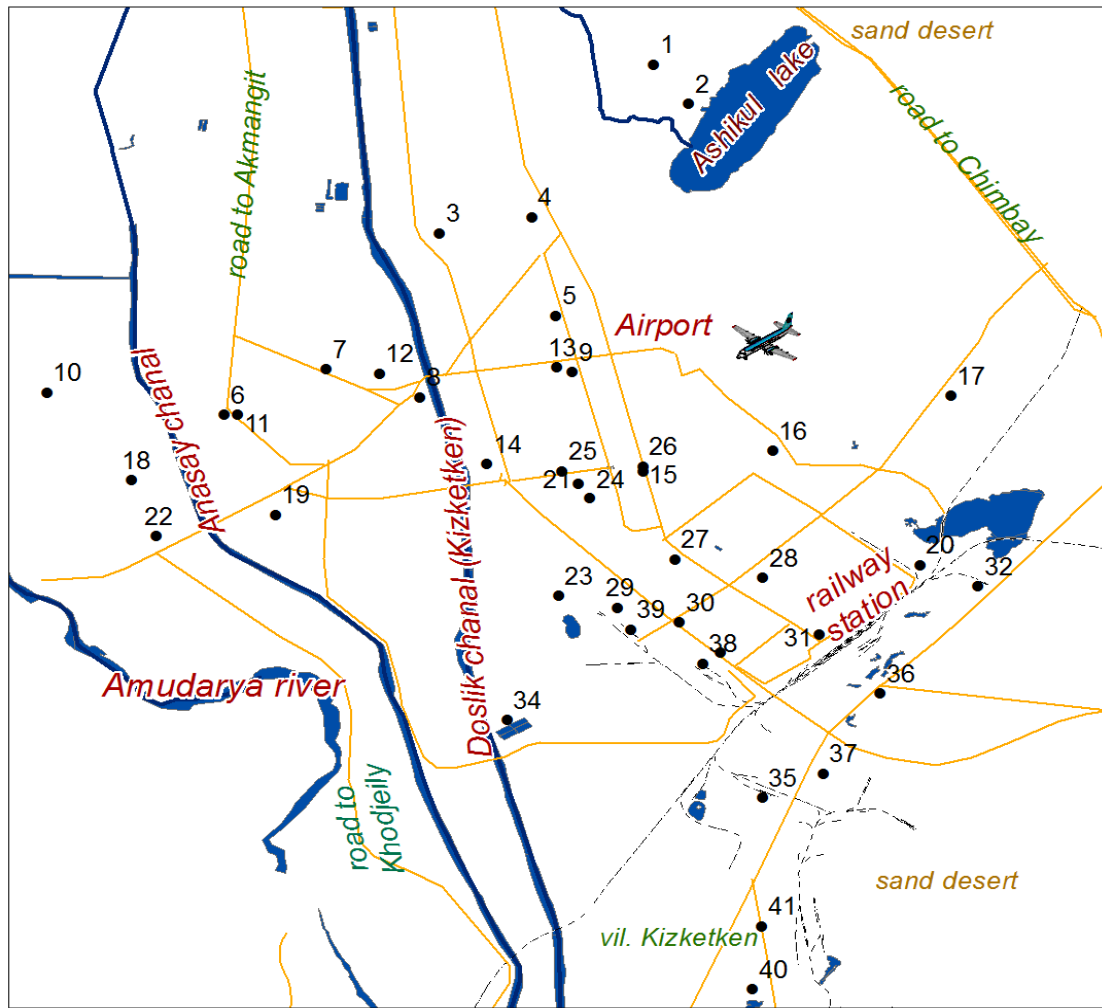


Figure 1: Schematic map of the studied area and location of wells

Currently, the construction of brick buildings with reinforced concrete belts is practiced in Nukus. According to current standards [2]. in such buildings, the maximum foundation displacements is 150 mm. For cases where the underlying layers are sand, the maximum displacement occurs at a

pressure of 400-600 kPa. when limits of bearing capacity of 506 kPa out of 5 cases, only in three cases displacements is to fall inside limits of bearing capacity when loading the foundation to the value of .limits of bearing capacity.

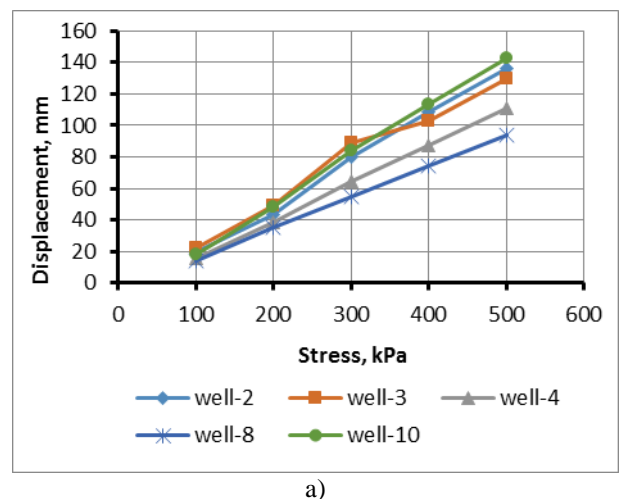
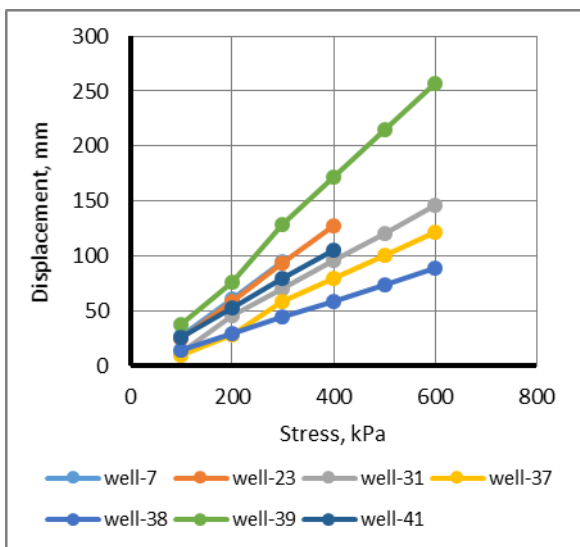
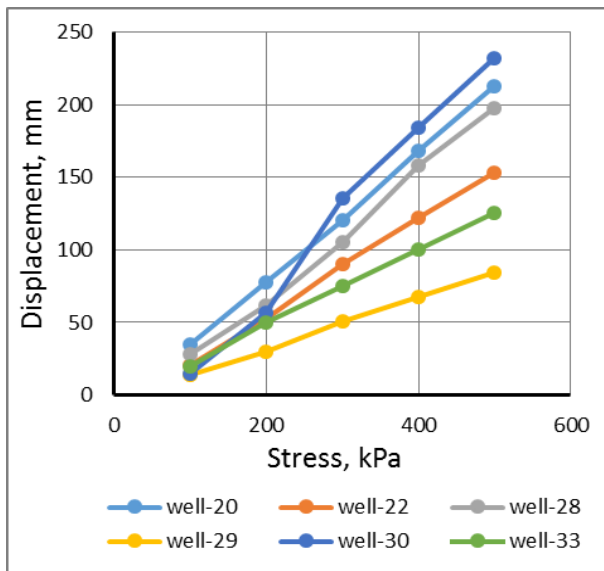
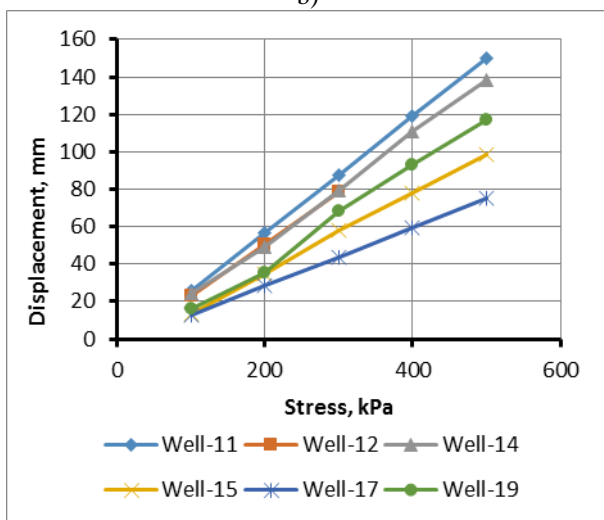


Figure 2: Dependences of the foundation displacements on the pressure (basement soil-sand).



b)



c)

Figure 3: Dependences of the foundation displacements on the pressure (basement soil-sandy loam)

Similar graphs are shown in Figure 3 for cases when there are sandy loams under the sole of the belt foundation. For limits of bearing capacity soils 386 kPa in all 18 cases, the maximum displacement did not occur when loading the foundation until to the limits of bearing capacity.

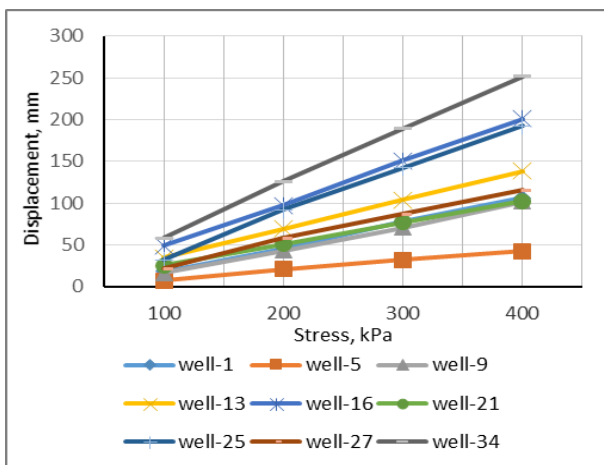


Figure 4: Dependences of the foundation displacements on the pressure (soil-loam)

Figure 4 shows the results of similar calculations for cases where the underlying layer is loam. Analysis of the graphs presented in figure 4 shows that for almost all 6 cases, the maximum displacement of 15 sm did not occur within the pressure equal to limits of bearing capacity of the loam.

Figure 5 shows of similar calculations are presented for cases when the underlying layer is clay.

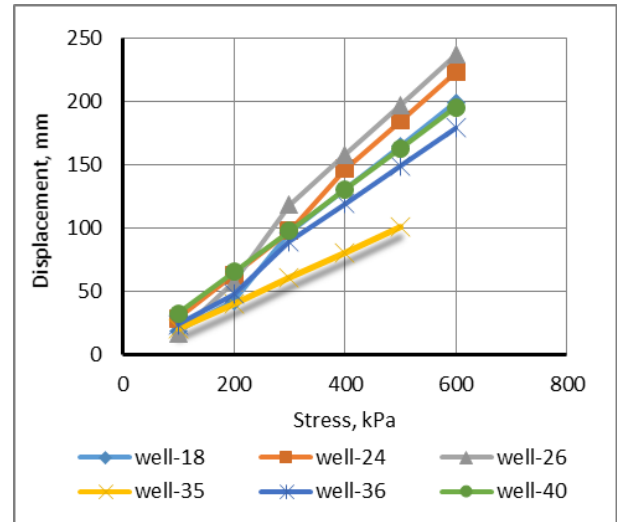


Figure 5: Dependence of the Foundation displacements on pressure (soil-clay)

Analysis of the calculation results shows that in this case, the maximum displacement occurs in three cases (before the pressure reaches the value of the limits of bearing capacity). In three cases, the maximum displacement is with in the limits allowed limits of bearing capacity soil is reached.

5. Conclusions

- 1) The results of calculations of the displacement of belt foundations in the conditions of the city of Nukus showed: The results of calculations of the displacement of belt foundations showed that the dependence of the foundation displacement on pressure is close to linear. The least displacement of foundations occurs when the underlying layer is sandy loam, loam and clay.
- 2) In the case where the underlying layer in foundation is, the sands may occur unacceptable displacement when the pressure on the foundation does not reach the value of the of bearing capacity soil.
- 3) The most favorable basement is when the underlying layer of the foundation is sandy loam.

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