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Investigation of the Cross Section of the Pile Foundation on the Combined Effect of Calculated Stresses on the Resistance of Materials.

Penelitian mengenai Penampang Tumpukan Fondasi pada Pengaruh Gabungan Beban Terhitung terhadap Ketahanan Material.

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Abstract

This study investigates the cross-sectional behavior of pile foundations under the simultaneous influence of bending moments, transverse and longitudinal forces, assessing calculated stresses in accordance with material resistance. The goals involve determining non-central compression or elongation in pile foundations due to the combined effects to evaluate cross-sectional resistance. Employing analytical methods, the study presents results revealing the intricate interplay of these forces on the foundation's behavior. The implication of this research lies in enhancing the understanding of pile foundation response to complex loading conditions, providing valuable insights for optimizing foundation design in diverse geotechnical contexts.

Highlights:

- Integrated Analysis: Comprehensive investigation of pile foundations, considering the combined effects of bending moments, transverse and longitudinal forces, offering insights into their holistic behavior.
- Material Resistance Assessment: Evaluation of calculated stresses in pile foundations, determining non-central compression or elongation, contributing to a refined understanding of cross-sectional resistance.
- Optimization Implications: Implications for geotechnical engineering, providing valuable insights for optimizing pile foundation design under diverse loading conditions, with potential applications in real-world structural projects.

Keywords: Pile foundations, Combined loading, Cross-sectional behavior, Material resistance, Geotechnical engineering.

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Introduction

Inspection of the cross section of the pile foundation on the combined effect of bending moment, transverse and longitudinal forces, calculated stresses according to the resistance of materials. Determination of non-central compression or elongation of pile foundations from the combined effect of bending moment, transverse and longitudinal forces to evaluate the resistance of the cross-section of the pile foundation [1].

Methods

Cross sections of a pile foundation made of the conical foundation moment materials, to test the effect of joint forces during longitudinal and transverse mixing. Naturally, the incisions for assessing the resistance of the pile foundation to the stress moment, as well as the longitudinal forces acting on the joint due to the impact of the central or tapering foundation pile, should look stretched [2]. The moment of foundation of the bending moment and the longitudinal forces are combined when calculating the impact of transverse 2.02.03 building regulations. -98 the number of piles attached to the grillage purchased according to the recommendations should be taken into account depending on how much eccentricity and strain is required in vertical power

Result and Discussion

Investigation of the cross section of the pile foundation on the combined effect of calculated stresses on the resistance of materials.

a) low stationary structures that limit the pile of the pile foundation, the values grillage are rotated for this purpose as follows: the moment value and power of calculated bending moment and transverse force are derived [3].

$$\eta_{nj} = \frac{1}{1 - \frac{a_{n.j} N}{\alpha_{\varepsilon}^{2} EJ}} \quad (1)$$

$$\text{here } a_{n.j} = \frac{A_0 C_0}{B_0} - B_0$$

Figure 1.

b) high stationary structures that limit the pile of the pile foundation, the values grillage are rotated for this purpose as follows: the value of the moment and the power of calculated bending moment and transverse force coefficients K are derived.

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$$\eta_{b.j} = \frac{1}{1 - \frac{a_1 N}{a_2 EJ}} \quad (2)$$

here $a_1 = a_3 - a_2 a_4$; $\quad a_2 = \frac{a_4}{\frac{C_0}{\alpha_D} + l_0}$; $\quad a_3 = \frac{A_0}{\alpha_D^3} + \frac{2B_0 l_0}{\alpha_D^2} + \frac{C_0 l_0^2}{\alpha_D} + \frac{l_0^3}{3}$;

$$a_4 = \frac{B_0}{\alpha_D^2} + \frac{C_0 l_0}{\alpha_1} + \frac{l_0^2}{2};$$

Figure 2.

v) stationary structures of a grill way with a low pile foundation, pile the values appeal to people with a request astransverse incisions in the depth of the foundation pile determine its torque and the value of the bending transverse force as follows determined by the formula

$$M_z^{'} = M_z + \eta_{n.c} N\left(y_0 - \frac{\alpha_D \sigma_z}{k_z}\right); \quad (3)$$

$$Q_z^{'} = Q_z + \alpha_D \eta_{n.c} N\left(A_4 B_0 - B_4 C_0 + C_4\right); \quad (4)$$

here $$\eta_{n.c} = \frac{1}{1 - \frac{B_0 N}{\alpha_D^2 EJ}} \quad (5)$$

Figure 3.

g) high-pile foundation, grillage, stationary structures, the values, capable of turning to people behind this turn, put the ground plane of the mouth transverse incisions to the depth of the foundation pile computational bending cross the value of the moment and power (3) and (4) is determined by the formula, then the external M_0 and N_0 impact of internal planar soil deformations on pile sections.

$$M_0^{'} = M + Hl_0 + N\left[\eta_{B.C} \Delta_{\tilde{A}}\left(1 - \frac{B_0 N}{\alpha^2 EJ} - y_0\right)\right]; \quad (6)$$

$$H_0^{'} = H; \quad (7)$$

here $$\eta_{b.c} = \frac{1}{1 - \frac{\alpha_4 N}{EJ}}; \quad (8)$$

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Figure 4.

Seismic design of emergency situations on pile foundations The foundation pile is the basis of the most commonly used low-mounted to rostverks structures. After all that they piled up, the subscriber got the values because of the restriction of the maximum pile moment in the pile in the plane of the base of the heel incisions bending center of the transverse and maximum power the following value is determined by the formula [4].

$$M_{макс}^{изг..} = \frac{\alpha_M H}{\alpha} \cdot \frac{1}{1 - \frac{a_{н.з} N}{\alpha_D^2 EJ}}; \qquad (9)$$

$$Q_{макс} = \frac{H}{1 - \frac{a_{н.з} N}{\alpha_D^2 EJ}}; \qquad (10)$$

$$\text{here} \qquad a_m = A_0 A_3(0) - B_0 C_3(0) + D_3(0); \qquad (11)$$

Figure 5.

(1) – (11) 2.02.03-98 designations all building codes and regulations are specified in the formula. In accordance, it turns out

A prismatic stone that bumps into a pile foundation is most often used in industrial and civil construction. This is a pile (foundation for 9) - (11) in the formula α_m and α_{nz}depending on the depth of the stone, the coefficient determining the pile size is as follows: =2; $\alpha_м$=*1,06;* $\alpha_{н з}$ =1,04: $\alpha_м$=*0,93;*$\alpha_{н з}$ =1,01*;*

Conclusion

This study delves into the comprehensive examination of pile foundation cross-sections, considering the amalgamated impact of bending moment, transverse and longitudinal forces, and stresses calculated in accordance with material resistance. The determination of non-central compression or elongation of pile foundations resulting from these combined effects serves as a pivotal aspect in evaluating the resistance of the cross-section of the pile foundation. The investigation specifically explores the cross-sectional characteristics of pile foundations constructed with conical foundation materials, assessing the effects of joint forces during longitudinal and transverse interactions. The incorporation of building regulations, such as the 2.02.03-98 standards, in the calculation of the combined impact of bending moment and longitudinal forces when subjected to transverse forces adds a regulatory dimension to the study. The formulaic derivations for various scenarios of low and high stationary structures, in conjunction with grillage values and coefficients, provide a structured framework for practical application in foundation design. Further implications of this research extend to seismic design considerations, emphasizing the importance of restricting maximum pile moments and the subsequent determination of values for optimal foundation performance. The presented formulas and designations conform to established building codes, adding credibility to the study's findings. As future research avenues, exploring the dynamic behavior of pile foundations under varying soil conditions and incorporating advancements in material science could enhance the robustness of foundation design methodologies. In conclusion, this study contributes valuable insights to the nuanced understanding of pile foundation behavior under diverse forces, offering a foundation for further advancements in geotechnical engineering and structural design.

References

1. M. Mucciacciaro and S. Sica, "Bending of Pile Foundation in the Presence of Elastic and Elasto-Plastic Interaction Zones with Soil Environment," Dynamics of Soil and Earthquake Engineering, 2018, vol. 107, pp. 195-213. [Online]. Available: https://scholar.google.com/citations?view_op=view_citation&hl=en&user=MvlUvegAAAAJ&citation_for_view=MvlUvegAAAAJ:2osOgNQ5qMEC.
2. H. Melakhessou, A. Berlioz, and G. Ferraris, "Transverse Vibrations of a Rod Interacting with Rock Environment," Journal of Vibration and Acoustics, 2003, vol. 125, no. 1, pp. 46-52. [Online]. Available: https://scholar.google.com/citations?view_op=view_citation&hl=en&user=MvlUvegAAAAJ&citation_for_view=MvlUvegAAAAJ:9yKSN-GCB0IC.
3. S. Oveissi, D. Toghraie, and S.A. Eftekhari, "Effects of Earthquake Measures on Brick Buildings on External Wall Properties," Physica E: Low-dimensional Systems and Nanostructures, 2016, vol. 83, pp. 275-283. [Online]. Available: https://scholar.google.com/citations?view_op=view_citation&hl=en&user=MvlUvegAAAAJ&citation_for_view=MvlUvegAAAAJ:u5HHmVD_uO8C.
4. L. Li, Y. Hu, and X. Li, "Free Oscillations of the Plate Considering the Influence of Longitudinal Forces Perceived by the Support Rods," International Journal of Mechanical Sciences, 2016, vol. 115, pp. 135-144. [Online]. Available: https://scholar.google.com/citations?view_op=view_citation&hl=en&user=MvlUvegAAAAJ&citation_for_view=MvlUvegAAAAJ:d1gkVwhDpl0C.

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