Spectrum Journal of Innovation, Reforms and Development
Volume 21, November, 2023 | ISSN (E): 2751-1731
Website: www.sjird.journalspark.org

DESIGN OF BASES AND FOUNDATIONS ON SALINY SOILS

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Abstract

The influence of aggressiveness and variability of the properties of saline soil on the performance of bases and foundations was studied. Materials with non-corrosive properties are given. Electrokinetic stabilization reduces the salt content in soils and increases its bearing capacity.

Keywords: saline soils, suffusion, concrete corrosion, fiber polymers, electrokinetic stabilization, green infrastructure, protective coatings.

Introduction

Footing and foundation design takes center stage when faced with the unique challenges presented by saline soils. Saline soils, characterized by high concentrations of salts, present a number of obstacles for both engineers and designers[1,6,7]. In this article, we delve into the intricacies of designing foundations that can withstand the corrosive nature of saline soils, exploring innovative approaches and technologies that redefine traditional ideas about structural resilience.

Saline soils are common in many regions of the world, presenting a serious problem for construction projects. These soils are often rich in dissolved salts, including sodium chloride, which can have a detrimental effect on the structural integrity of foundations. The corrosive nature of saline soils can compromise the stability of traditional foundation materials such as concrete and steel, requiring a re-evaluation of design principles.

Methods

The corrosive effect of salts on foundation materials is multifaceted. In the case of concrete, moisture containing salts can penetrate the material, causing internal expansion and possible cracking. The reinforcing steel inside concrete is also susceptible to corrosion in the presence of salt, resulting in reduced structural strength. Such deterioration poses a significant risk to the long-term stability of structures in regions with saline soils[1,8]. One of the key points when designing foundations on saline soils is careful selection of materials. Engineers are increasingly exploring alternative building materials that provide improved resistance to salt corrosion. Fiber reinforced polymers (FRPs) are gaining popularity due to their non-corrosive properties, providing a viable replacement for traditional steel reinforcement in concrete[2,3,4,5]. In addition, the use of corrosion-resistant alloys and specially developed concrete mixtures can mitigate the impact of saline soils on foundation materials. The goal is to create a foundation that will not only withstand a corrosive environment, but also maintain its structural integrity over time.

Applying protective coatings to foundation materials is a preventive strategy to combat the corrosive effects of saline soils. Various coatings, such as epoxy or zinc, act as a barrier, preventing salts from penetrating the material and deteriorating. These coatings are particularly effective at extending the life of steel foundation components, ensuring their strength in harsh soil conditions.

Designing foundations for saline soils requires a thorough understanding of the specific site conditions. On-site investigations should include soil testing to assess salt concentrations, soil structure, and moisture content. This data informs engineers about the severity of salinity conditions, allowing them to adapt foundation designs accordingly. In some cases, improvement techniques may be required soils, such as leaching or soil replacement, to reduce the salt content in the foundation area. Site-specific design takes into account the unique challenges associated with saline soils, providing a customized approach to foundation construction.

Innovation in Fundamental Technologies

The growing field of foundation engineering has seen the emergence of innovative technologies designed specifically for saline soil conditions. Electrokinetic stabilization, for example, involves the application of an electric field to the soil, reducing the salt content in it and increasing its load-bearing capacity [9]. This technology offers a sustainable and effective solution for stabilizing foundations in regions with saline soils. Additionally, advances in geosynthetic materials have paved the way for the development of salt-resistant membranes that act as a barrier between the foundation and the surrounding soil. These membranes prevent salts from entering the foundation, maintaining its structural integrity.

In the search for sustainable construction methods, holistic design approaches are being explored that go beyond mitigating the immediate problems associated with saline soils. Green infrastructure, such as vegetation cover and permeable pavements, can play a role in managing soil salinity by promoting natural salt removal processes. Integrating sustainable drainage systems into foundation designs helps maintain a balance between soil health and environmental protection.

Conclusion

Design of foundations in saline soils requires an interdisciplinary approach combining geotechnical engineering, materials science and innovative technologies. Researchers and engineers must collaborate to develop solutions that not only solve immediate problems but also promote resilience and resilience of structures in saline regions. As we continue to push the boundaries of foundation design and engineering, finding designs that will perform successfully in challenging

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