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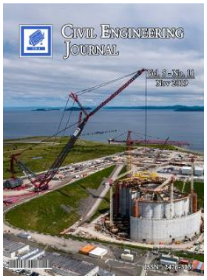

Study Numerical Simulation of Stress-Strain Behavior of Reinforced Concrete Bar in Soil using Theoretical Models

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Abstract

Nonlinear analysis for reinforced concrete members (R.C.) with two types of bars also with unsaturated and saturated soils was used to represent the models. To control the corrosion in the steel bar that used in R.C. member and decrease the cost, the geogrid with steel bar reinforcement are taken in this study to determine the effect of load-deflection and stress-strain relationships. The finite element method is used to model the R.C. member, bars and soil. A three-dimensional finite element model by ABAQUS version 6.9 software program is used to predict the load versus deflection and stress versus strain response with soil. The results for the model in this study are compared with the experimental results from other research, and the results are very good. Therefore, it was concluded that the models developed in this study can accurately capture the behavior and predict the load-carrying capacity of such R.C. members with soil and the maximum stresses with strains. The results show plastic strain values in the R.C. member with saturated soil are larger than their values in unsaturated soil about (54%, 58%, and 55% and 52%) when the geogrid ratios are (without geogrid, 60%, 40% and 20%) respectively, with the same values of stresses.

Keywords: Numerical; Reinforced; Concrete; Bar; Geogrid; Saturated Soil; Models; Stress; Strain; Method; Analysis.

1. Introduction

The effect of Soil-structure interaction between soil and member for any structures is very interesting and important field of study in civil engineering. Reinforced concrete member as a structure is the most important part of whole structures and their behavior has an important effect on quality of buildings. Member can influence of many parameters in the building. For the best design it is necessary to known behavior of the reinforced concrete member with the soil [1- 4].

Modern reinforced concrete R.C. members are used to develop deformations in their regions [5]. The occurrence of longitudinal bar regions can crucially affect the behavior of such members. This study extends a previously proposed modeling approach for R.C. bar elements whose response is affected by R.C. member with soil. The model is representing to steel and geogrid bars as a reinforcement.

The geogrid have advantage for its strength as reinforcement in reinforced concrete member [6] .This geogrid used in the soil- structure members to treat corrosion and its shape gives it more bonds with concrete. Therefore, this geogrid is useful in structures that have contact with soil or saturated soil which may be contents many types of liquids where it represents bars reinforcement for this structure like any member with soil.

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