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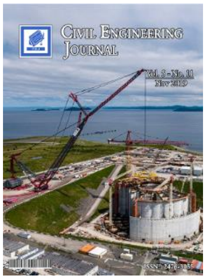

Footing Soil Pressure from Biaxial Loading

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Abstract

A symmetrical isolated rectangular footing with centered biaxial overturning develops soil pressure that shifts to counter balance the loads. The highest soil pressure is at a corner. The objective of this paper is to extend the uniaxial soil pressure solution to include biaxial loads and to document a simple and understandable way to directly calculate the shape of the soil pressure distribution. Another objective is to make the solution suitable for automation. In uniaxial overturning there are two transition shapes, trapezoidal and triangular. In biaxial overturning there are three transition shapes and they form 4, 5 & 6 sided polyhedrons. This analysis calculates those volumes and compares them to the design vertical load to determine the characteristic shape of the soil pressure distribution. The calculation then proceeds to converge on the precise shape and calculate its centroid and moment capacity. Assemblies of tetrahedrons are used to model all of the soil pressure shapes. The advantage of this methodology is that matrix algebra can be used to organize the calculations and make them computationally efficient. The assumed soil pressure and footing dimensions can be adjusted until the calculated moment capacity matches the overturning moment.

Keywords: Footing; Soil Pressure; Biaxial; Tetrahedron; Determinant.

1. Introduction

A symmetrical isolated rectangular footing with centered biaxial overturning loads develop soil pressure that shifts to counter balance the loads. The highest soil pressure is at a corner.

Figure 1 shows a footing with biaxial loading. All the loads are resolved to the center of the footing and they are perpendicular to one another. For soil pressure calculations all of the loads are projected to the foundation soil contact plane.

The input variables are as follows;

- V_f Footing vertical load
- W Footing Width
- L Footing Length
- MPL Moment parallel
- MPR Moment perpendicular

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