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Modern Technology for the Design of Turbo Foundation Structural Engineering Using a Comparative Study of Two Dimensional and Three Dimensional Stresses Using Finite Element Method

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Abstract

The application of finite element approach were made in power house turbo foundation structure .Three dimensional excavation using finite element method for design of foundation required less area of foundation compared to two dimensional excavation using finite element method .The intensity of the pressure for three dimensional excavation using finite element were estimated more than the two dimensional excavation using finite element method. The maximum bending moment for three dimension were estimated more than the value of two dimensional excavation using finite element. The area of steel was more for the two dimensional excavation using finite element method. The area of steel for distribution was estimated less in three dimension excavation using finite element.

1. Introduction

The forgoing study reported concerned, the application of two dimensional and three dimensional excavation using finite element method in clay. The turbo generator had been analyzed for the a depth of 12.0 m from the ground level .The design of foundation structure parameter were to analyze the two dimensional and three dimensional stresses in two and three dimensional excavation during application of static and self weight of the foundation, applied on the surface of the excavated surface .The application of the static ,dynamic and foundation weight were applied on the top surface of the foundation .The speed of the turbo generator was 3200 r.p.m. .The eccentricity of the loading equal to 0.005 m and the thickness of base of raft were

taken as 1500mm .The plan area of the excavated surface was taken as 7000mmx4400mm .The unit weight of the concrete was 24 KN/m2,young's modulus of framed foundation materials was taken 3x10e+7 KN/m2,poisson's ratio of concrete = 0.25,weight of raft was taken 7.000mx4.400mx1.500mx24. Beam were expressed as c1, c2, c3 .The dimension of B1=1.0 m X 1.2 m , B2= 1.4 m X1.2 m ,B3=1.2 m X 1.2 m ,B4=1.0 mX1.2 m,C1=1.0 mX1.0 m ,C2=1.4 mX1.0 m,C3=1.2 mX1.0 m . The load over the turbo generator should be visualized based on the static and dynamic load .Based on the finite element value and experimental value of soil parameter as such major principal stresses and minor principal stresses, normal stresses, shear stresses, bearing pressure were analyzed for the analysis of foundation structure .The analyses of factor bending moment, intensity of pressure, maximum pressure , main area of steel ,distribution of steel were carried out for a comparative statement of the two dimensional and three dimensional approach .Three dimensional approach became realistic and exact approach over two dimensional approach .

2. Result and Discussion

2.1 FEM-2D

The two dimensional excavation stresses using element method made for 12.0 depth The evaluation of bearing pressures were estimated based on the stresses of two dimensional excavation using finite element method .The finite element value of bearing pressure were correlated to the power house static including the self weight of the foundation .The finite element value based on the two dimensional excavation were analyzed and their experimental verification were conducted in the lab .The bearing pressures were estimated based on the experimental result .The values of the experimental bearing pressures were more than the finite element bearing pressures .The foundation area required based on the experimental bearing pressure were 12.5% more than the finite element method bearing pressure value for two dimensional excavation for a depth of excavation 12.0 m from the ground level. The maximum intensity of pressures were estimated based on the finite element value .The intensity of pressure obtained based on the experimental verification verification were 66.68 % less than the value of finite element bearing pressure for a depth of excavation 12.0m below the ground level .

The working bending moment and factor bending moment based on the worst possible combination of hogging and sagging moment developed during the vibration of structure .The vertical and horizontal amplitude gave an exact analysis of the moment .The above bending moment were estimated 55.49% less than the experimental value of bearing pressure in two dimensional excavation using finite element .The main area of steel based on the finite element method were estimated .The area of steel were estimated with the worst possible combination of bending pressure were estimated . The experimental verified values of bearing pressure were estimated .The area of main steel were estimated 22.63% higher than the finite element bearing pressure value. The analyses of two dimensional excavation using finite

element method and experimental verification gave an exact analysis of foundation structure, if the finite element method values were experimentally verified.

2.2 FEM-3D

As the excavation was made for a deeper depth ,the bearing pressure for three dimensional excavation using finite element method were estimated .The bearing pressure based on experimental values were estimated .The area of foundation compared to experimental verified values were estimated as 23.35% more than the finite element method bearing pressure values. The maximum intensity of pressures were estimated based on the finite element values and experimentally verified values were 18.75 % more than experimental values .The worst possible combination of bending moment were estimated based on vibration of power house. The working bending moment and factor bending moment were estimated as 15.49% less than experimental values .The main area of steel were estimated based on the finite element bearing pressure and experimental values of bearing pressure .The area of steel were estimated 15.13% higher than the finite element values of area of steel .The spacing of reinforcements for shear forces were estimated based on the analyses of bearing pressure for two dimensional excavation using finite element method and their experimental verified value. The % of spacing variation were 62.5% more than experimental value estimated based on the two dimensional excavation using finite element method.

Conclusion of Comparative statement of two dimensional and three dimensional excavation using finite element method in turbo foundation structural engineering :

Two Dimensional Excavation	**Three dimensional Excavation**
FEM -2D	**FEM-3D**
i)The area of foundation for two dimensional analyses were 2.25 m2 based on the finite element approach .	i)The area of foundation for three dimensional analyses were 1.516 m2 based on the finite element approach .
ii)The maximum pressure intensity was estimated as 544.25 KN/m2 based on finite element method .	ii)The maximum pressure intensity was estimated as 850.876 KN/m2 based on finite element method .
iii)The total pressure on the cantilever was estimated as 238 KN based on finite element method .	iii) The total pressure on the cantilever was estimated as 405 KN based on finite lement method .
iv)The working bending moment was estimated as 158.746 KN-m based on finite element method .	iv)The working bending moment was estimated as 175.737 KN-m based on finite element method .
v)The factor bending moment was estimated as 237.669 KN-m based on finite element method .	v)The factor bending moment was estimated as 263.6 KN-m based on finite element method .

vi)The area of steel based on two dimensional finite element method was estimated as 7786 mm2.	vi)The area of steel was estimated 7041 mm2 based on finite element method .
2D-Experimental	**3D-Experimental**
The area of foundation for two dimensional analyses were 2.00 m2 based on the finite element approach .	i)The area of foundation for three dimensional analyses were 1.874 m2 based on the finite element approach .
ii)The maximum pressure intensity was estimated as 907 KN/m2 based on finite element method .	ii)The maximum pressure intensity was estimated as 716.52 KN/m2 based on finite element method .
iii)The total pressure on the cantilever was estimated as 378.75 KN based on finite element method .	iii) The total pressure on the cantilever was estimated as 315.837 KN based on finite element method .
iv)The working bending moment was estimated as 252.126 KN-m based on finite element method .	iv)The working bending moment was estimated as 152.644 KN-m based on finite element method .
v)The factor bending moment was estimated as 378.185 KN-m based on finite element method .	v)The factor bending moment was estimated as 228.96 KN-m based on finite element method .
vi)The area of steel based on two dimensional finite element method was estimated as 6024 mm2	vi)The area of steel was estimated 7761.5 mm2 based on finite element method .

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