

## Experimental Studies of the Response of Single Piles Under Torsional and Vertical Combined Loads in Contaminated Sand

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**Abstract :** Contaminated soil can weaken the stability of buildings and infrastructure, posing serious risks to their structural integrity. Therefore, this study aims to understand how oil contamination affects the torsion behavior of model steel piles at different soil densities. This research is crucial for evaluating the structural integrity and stability of piles in oil-contaminated environments. Clean sand samples and heavy motor oil were mixed in amounts ranging from 0 to 6% of the soil's dry weight. The mixture was thoroughly mixed to ensure uniform distribution of the oil throughout the sandy soil for simulating the field conditions. In these investigations, the relative densities ( $D_r$ ), pile slenderness ratio ( $L_p/D_p$ ), oil content (O.C%), and contaminated sand layer thickness (LC) were all different. Also, the paper presents an analysis of piles that are loaded both vertically and torsionally. The findings demonstrated that the pre-applied torsion load led to a decrease in the vertical bearing ability of the pile. Also, at  $D_r = 80\%$ , the ultimate vertical load under combined load at constant torsional load  $T = (1/3T_u, 2/3T_u, \text{ and } T_u)$  in the cases of  $(L_c/L_p) = 0.5$  and  $(L_p/D_p) = 13.3$  was found to be reduced by (1.48, 2.78, and 4.15%) less than piles under independent vertical load, respectively so it is crucial to consider the torsion load during pile design.

**Keywords :** torsion-vertical load, oil-contaminated sand, twist angle, steel pile

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