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水泥土桩桩土应力分担及曲线形式研究

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摘要　通过在单桩、四桩、九桩承台下的桩周土和桩顶埋设土压力盒，获得系统的水泥土桩复合地基的桩土应力等原位试验数据。利用这些试验数据，分析试验条件下水泥土桩桩土应力比的分布形式，同时分析桩长、桩间距、桩数等因素对桩土应力比的影响。按照Mindlin应力解及分层总和法，取用试验条件下的参数，获得计算桩土应力比。发现试验与计算桩土应力比分布形式相似，桩土应力比曲线由两段构成，即荷载水平较小时的下降段及荷载水平较大时的水平段。水平段的桩土应力比试验值为4.0～7.0，为设计用桩土应力比取为常量提供试验及理论依据。实测和计算结果均表明，随着面积置换率的减小，桩体效应变的明显，桩顶应力集中系数增大，桩间土体应力减小系数也增大。实测应力集中系数变化幅度为2.00～3.25，应力减小系数变化幅度为0.35～0.70；计算应力集中系数为2.40～4.50，应力减小系数为0.40～0.55。

关键词　土力学；水泥土桩；桩土应力比；原位试验；应力集中系数；应力减小系数；复合地基

分类号

STUDY ON STRESS DISTRIBUTION AND CURVE STYLES OF CEMENT-SOIL PILES COMPOSITE GROUND

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Abstract

Stresses under the caps in cement-soil piles composite ground are obtained by putting earth-cell under the caps with one pile，four piles and nine piles respectively in field test. Three important factors，i.e. pile length，pile space and pile number，which influence the stress ratios are studied in detail. Under the same condition，the stress ratio distribution curve styles obtained by tests are compared with those by theoretic calculation according to Mindlin¢s stress solution

and layer summation. It is demonstrated that the stress ratio curve is composed of two segments，the descending segment at lower load levels and the ascending segment at higher load level，and that the pile-soil stress ratio of the ascending segment is between 4.0 and 7.0，which provides experimental and theoretical references when the pile-soil stress ratio is constant. It is also shown that the stress concentration coefficient at the top of the pile and the soil lessening coefficient increase while the replacement reduces，but the pile function is enhanced. The stress concentration coefficient varies from 2.00 to 3.25，and the lessening coefficient varies from 0.35 to 0.70 by field test；the stress concentration coefficient varies from 2.40 to 4.50，and the lessening coefficient varies from 0.40 to 0.55 by theoretic calculation.

Key words soil mechanics；cement-soil piles；pile-soil stress ratio；in-situ experiment；stress concentration coefficient；stress lessening coefficient；composite ground

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