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CONTENTS

PART I

ANALYSIS AND MEASUREMENT OF MACHINE FOUNDATION VIBRATIONS

Experiments with Shallow and Deep Foundations	
Milos Novak	1
Vibration Analysis of Foundations on Layered Media	
F. F. Tajirian and M. Tabatabaie	27
Simple Approach for Evaluation of Compliance Matrix of Pile Groups	
T. Nogami and K. Konagai	47
Dynamic Stiffness and Damping of Foundations using Simple Methods	
Ricardo Dobry and George Gazetas	75
Numerical Modeling for Soil-Structure Interaction	
Fancisco Medina	108
Low Tuned Compressor Foundations in Soft Clay	
C. Madshus, F. Nadim, A. Engen, and A. M. Lerstol	117
Dynamic Analysis and Performance of Compressor Foundations	
K. Kumar, S. Prakash, M. K. Dalal, and P. K. M. Bhandari	286
Vibration Isolation of Machine Foundations	
D. E. Beskos, B. Dasgupta, and I. G. Vardoulakis	138

PART II

DETRIMENTAL GROUND MOVEMENT FROM MAN-MADE VIBRATIONS

Settlement from Pile Driving in Sands	
Hugh S. Lacy and James P. Gould	152
Pile Driving Induced Settlements of a Pier Foundation	
Miguel Picornell and Evaristo del Monte	174
Vehicle Induced Ground Motion	
John A. Barneich	187
Observed High-Rise Building Response to Construction Blast Vibrations	
Lewis L. Oriard, Thomas L. Richardson, and Kenneth P. Akins	203
Energy-Attenuation Relationships from Contruction Vibrations	
Richard D. Woods and Larry P. Jedele	229
Ground Vibrations during Dynamic Compaction	
Paul W. Mayne	247
Investigation of Potential Detrimental Vibrational Effects Resulting	
From Blasting in Oilsand	
B. R. List, E. R. F. Lord, and A. E. Fair	266
Subject Index	301
Author Index	303

EXPERIMENTS WITH SHALLOW AND DEEP FOUNDATIONS

Milos Novak*, M.ASCE

Abstract: Field experiments conducted on vibrating foundations are reviewed and the main findings derived from their comparison with theoretical predictions are summarized. The experiments involved surface foundations, embedded foundations, single piles and pile groups under harmonic excitation and a hammer foundation exposed to shock loading.

INTRODUCTION

Design and analysis of machine foundations is an activity closely related to industrial development and is one of the oldest civil engineering disciplines in which the theory of vibration has been systematically employed. Over the years, various theories applicable to individual machine foundation types were formulated and refined but their experimental verification lagged these developments.

Experimental investigations can involve full scale foundations, small scale field experiments or very small laboratory models. The advantages of small scale field experiments are that the conditions of the experiments can be fully controlled, the excitation forces are well defined and the propagation of elastic waves is not obstructured by artificial boundaries as is the case in laboratory experiments.

In this paper, observations derived from small scale field experiments conducted over the years by the author and his associates are described and summarized. The experiments concerned surface foundations, embedded foundations, single piles and pile groups. In most cases the excitation was harmonic generated by means of a mechanical oscillator. One full scale experiment with an operating hammer foundation exposed to impact loading is also discussed.

The focus is not on the description of experimental detail, but rather on the lessons one can learn from the comparison of the theory with experiments.

SETUP AND EVALUATION OF EXPERIMENTS

Experiments with surface foundations were conducted on rigid steel test bodies assembled of different numbers of steel sheets and bases. The base areas were square and ranged from 0.5 m^2 (5.38 ft²) to 1.5 m^2 (16.15 ft²); the masses ranged from 970 kg (2139 lb) to 3770 kg (8313 lb). The soil was a very deep deposit of loess loam. Detailed data on these experiments can be found in Ref. 14.

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