

Geo-Congress 2023

GSP 341

Foundations, Retaining Structures, and Geosynthetics

Selected Papers from Geo-Congress 2023
Los Angeles, California • March 26–29, 2023

Edited by
Ellen Rathje, Ph.D., P.E.
Brina M. Montoya, Ph.D., P.E.
Mark H. Wayne, Ph.D., P.E.

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GEOTECHNICAL SPECIAL PUBLICATION NO. 341

GEO-CONGRESS 2023

FOUNDATIONS, RETAINING STRUCTURES, AND GEOSYNTHETICS

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American Society of Civil Engineers

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Published by the American Society of Civil Engineers

Published by American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, Virginia, 20191-4382
www.asce.org/publications | ascelibrary.org

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Errata: **Errata, if any, can be found at https://doi.org/10.1061/9780784484685**

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ISBN 978-0-7844-8468-5 (PDF)
Manufactured in the United States of America.

Preface

This is the fourth volume of six Geotechnical Special Publications (GSPs) containing papers from the 2023 Geo-Congress: Sustainable Infrastructure Solutions from the Ground Up, held in Los Angeles, California on March 26–29, 2023. These six volumes contain over 350 contributions that span 22 topic areas of the ASCE Geo-Institute's standing technical committee as well as 11 special topics unique to Geo-Congress 2023.

This volume includes contributions from foundation engineering (both shallow and deep foundations), earth retaining structures, and the use of geosynthetics in geotechnical systems.

This publication culminates two years of effort by the technical planning committee whose focus has been to continue the success of the previous Geo-Congress conference series. Many individuals are responsible for the content of this volume, all of whom served in the efforts to maintain the standard set by previous proceedings. An international call for papers and a rigorous peer review process yielded more than 350 accepted technical papers, that were presented in a wide range of technical sessions, in addition to invited keynote presentations. Papers were reviewed in accordance with ASCE GSP standards. Accordingly, each paper was subjected to technical review by two or more independent peer reviewers. Publication requires concurrence by at least two peer reviewers.

The Editors would like to express their appreciation for having been provided the opportunity to be a part of this Congress' organization, their sincere thanks to the numerous session chairs and reviewers, and we hope that these proceedings will be of use to the geotechnical engineering community for many years to come.

The Editors,

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Acknowledgments

Thanks are due to the authors, primary reviewers, session chairs, and program committee, without whom this publication would not be possible.

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Comparative Study on Performance of CFA Piles and Drilled Shafts in Dos Bocas, Mexico

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ABSTRACT

This paper presents observations and findings gained from a case study which includes the design and construction of around 10,000 CFA piles and drilled shafts for a refinery project in Mexico. A dedicated pile load testing program, i.e., static and dynamic load tests, was developed and executed to check and verify the construction procedure and pile resistance and also for quality control of production piles. This study mainly compares the construction procedures and load-displacement behaviors for the two different types of non-displacement piles. Site-specific correlations between geotechnical parameters such as SPT-N versus CPT-q_c and estimation of fines contents of soils from CPT data are also presented based on results from extensive geotechnical site characterization campaign. The observed production rate of CFA piles was about five times higher than that of drilled shafts. Static pile load test results suggest that the axial compressive pile resistance of CFA piles was approximately 10%–30% larger than that of drilled shafts, while CFA piles showed a slightly lower lateral resistance compared to drilled shafts.

INTRODUCTION

More than 10,000 CFA (Continuous Flight Auger) piles and drilled shafts were recently designed and constructed for a new oil and gas refinery in Mexico. There are two types of piles from the perspective of changes caused in the soil stress during pile installation: displacement and non-displacement piles (Salgado 2008). Displacement piles are installed by driving or pressing into the ground without removing soil before the pile installation. As a consequence, the soils surrounding the pile experience large displacements. On the other hand, non-displacement piles are cast in situ in a borehole left after removal of a volume of soil and soils around the pile are not displaced from their original position during pile installation. Both drilled shafts (also known as bored piles) and conventional CFA piles (also known as Augured Cast In-situ Piles) are generally classified as non-displacement piles (Brown et al., 2007).

CFA piles and drilled shafts are, however, different in terms of construction procedure and each has its own advantages and disadvantages over the other. The main difference is that conventional drilled shafts usually use casing or slurry to support temporarily the hole while CFA piles do not need temporary casing or slurry for support. Drilled shaft construction requires lowering and raising the drilling auger and bucket multiple times in order to complete drilling. CFA piles, however, are installed in one continuous process using a continuous flight auger.

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