Deep and Underground Excavations

Geotechnical Special Publication No. 206

Edited by

Fulvio Tonon
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Wei Wu

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G-I GEO-INSTITUTE

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Preface

At the current rate of population increase, only 650 years will elapse before each human being will have only 1 m^2 of land available. This is a paradoxical situation and something must happen before it is reached. On a geological scale, 650 years are a blink of an eye. Since the good of Society is at the top of Civil Engineers' ethics, Civil Engineers are urged to find solutions to cope with an ever increasing population. The pressure exerted by the population increase, the sensitivity toward the environment, and the ever increasing cost of the land all call for underground excavations as sustainable Civil Engineering infrastructures of this century to provide room for services, transportation of people and goods, water supply and disposal, sanitation, storage, etc.

Against this backdrop, the papers contained in this ASCE Geotechnical Special Publication testify to the research and practical implementations carried out around the world, and specially in China, to use the subsurface as a Civil Engineering dimension to solve today's Society's needs. Deep excavations and retaining structures, tunnels and underground excavations are covered in this volume together with new frontiers in urban geotechnology.

The hope of the Editors is that the volume be of interest to engineers that operate in the underground construction industry and to those that are approaching such a fascinating field. The Editors also wish that this set of papers contributes to increase the visibility of underground construction in the eyes of decision makers as a feasible and effective solution to the Society's needs.

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Contents

Deep Excavations and Retaining Structures

Design and construction of reinforced steel chain wall

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ABSTRACT: This paper reports the result of insitu pullout test of chain reinforced wall constructed in mountainous region of Japan. The insitu test was performed for chain with and without end bearing plate anchor and horizontal bar. Test results revealed that the end bearing anchor greatly improved the pullout force of chain than the horizontal bar. The horizontal bar was found to be weak in tension and therefore did not greatly enhance the pullout force of chain. Comparison of the measured field values and the design values calculated from existing design methods yielded results that were in good agreement.

INTRODUCTION

Chain has been used as a reinforcement inclusion in the reinforcement of earthfill in Japan. Despite the fact that little is known about the mechanisms that generate pullout force of chain, field construction of reinforced wall using chain has already been done. Flexibility of chain that is its ability to be folded easing its transportation is one of the factors that have contributed in its use for fill slope reinforcement in recent times. It has been though that due to its flexibility, chain can follow the deformation of the soil around it incase of uncertainty such as a consolidation of the ground. Its ability to generate high frictional coefficient is another factor that has given rise to its use in the recent days. Comparative study on chains of different shapes and sizes with other reinforcement materials such as rounds bars and ribbed steel bars revealed that chain generates higher frictional resistance than these materials (Fukuda et al., 2007). In addition, separate studies reveled that pullout force of chain is dependent on the outer width of the chain (Kitamura et al., 2006).