EXTRACTION STRENGTH OF COMPACT COLUMN-PILE JOINTS

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Abstract

Japanese metropolitan railway stations experience high user traffic and demand efficient, space-saving construction methods. In particular, providing foundations for large platform sheds is costly and requires a long construction period. Our team has been researching ways to economize with more compact and efficient column-pile joints with double steel pipes, without using foundation footing. We have focused on enhancing tensile strength by assessing the bearing strength of column-pile joints with anchorage mechanisms that involve anchor and fixing plates. The key purpose is to clarify the degree of resistance when the angle exceeds 45 degrees. The aim of our experiments using eleven different specimens was to establish an evaluation formula for tensile strength and find a correlation between load capacity and the angle between plates.

Keywords: Column-pile joint; Steel pile; Anchor plate; Push-out test, Fixing plate, Mortar injection

1 Introduction

Construction at Japanese railway stations is conducted at night, allowing passengers and trains to use facilities in the daytime, when fresh concrete from construction is allowed to dry. Construction involving the provision of foundations for large platform sheds is particularly costly and requires a long construction period. Therefore, it is essential to find a way to economize on the size of column-pile joints.

The authors have conducted research on joint structures using double steel pipes, eliminating the need for foundation footings [1]. In this study, our purpose was to clarify the degree of tensile strength by assessing the bearing strength of column-pile joints with anchorage mechanisms that involve anchor and fixing plates.

As shown in Figure 1, the steel pipe is filled with non-shrinking mortar, and extraction force is transmitted through the mortar between the anchor plate and the fixing plate located at the top of the steel pipe. Since the strength formula for cases in which the fixing plate is installed inside a steel pipe and the angle between the outer edge of the fixing plate and the inner edge of the reinforcing plate exceeds 45 degrees has not been established, its strength is determined by a punch-out test.

This paper also considers the results of punch-out tests and proposes a method for evaluating maximum tensile strength.

2 Test plan

2.1 Test specimens

A list of test specimens is presented in Table 1. The authors fabricated specimens to simulate the pile-head section of steel pipe piles. Specimen No. 1 (267-06-P) was designated as the standard. The embedded portion of the anchor plate was lengthened for specimens No. 2 (267-12-P) and No. 3 (267-18-P), . For test Specimen No. 4 (267-18-D), the reinforcing steel plate was round with a diameter of 9 mm, assuming that a round steel plate would be welded in place on site of the

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