



Investigation the effect of new sheet piling on behavior of highly-corroded steel sheet pile structures

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Abstract

Steel sheet piles driven in harsh marine environments are sometimes so corroded that cannot be repaired effectively through coating them with retrofitting materials since due to high corrosion rates –commonly happens in splash/tidal zones– the connection between the tie rod and sheet pile is gradually removed. It endangers structural safety and causes big displacements in the whole soil- structure system. These displacements in turn cause failure in the soil behind sheet pile wall. In this condition –in which the sheet pile has lost one of its supports and its stiffness had been significantly reduced– application of convenient retrofitting methods for rehabilitation of structural sheet pile performance is not considered to be a suitable procedure. In this research, PLAXIS is used as modeling software. The primary models are created with a

row of existing (corroded) sheet piles, anchored with tie rods of different reduced cross sections in the location of connection due to corroding ambient. It gives the critical amount of corrosion in tie rod cross section. The next model is created with the previous existing sheet piles, tie rods of critical reduced cross section and a row of new (auxiliary) sheet piles –having two-thirds of cross sectional strength properties of the existing sheet piles. The aim of this paper is to investigate if new sheet piling could limit displacements and stresses in existing soil-structure system.

Keywords: corrosion, steel sheet pile, soil, anchorage system, deformation

1. INTRODUCTION

The term sheet piling is referred to any retaining wall type that is installed into the ground by driving or pushing rather than pouring or injection and is of relatively thin cross section and low weight so that the weight of the wall does not assist in the wall's stability.

Sheet piles are generally used to resist horizontal pressures of soil and water. They gain their strength from the horizontal strength of the soil they are driven into and from horizontal supports which are provided by tie rods and anchors installed in a higher level.

Corrosion is a very usual phenomenon in marine environments. It is often caused due to atmospheric conditions and splash/tidal regimes. Placing steel sheet pile in water provides essential conditions for starting chemical corrosion reactions. With increasing the amount of corrosion, the connection between tie rods and sheet pile removes. It endangers structural safety and causes big displacements in the whole soil- structure system. These displacements in turn cause failure in the soil behind sheet pile wall. In this condition –in which the sheet pile has lost one of its supports and its stiffness had been significantly reduced– application of convenient retrofitting methods for rehabilitation of structural sheet pile performance is not considered to be a suitable procedure.