Effects of Axial Compression Ratio in Socketed Precast Pier-Footing Connection

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Abstract

A socket connection is one of the emerging and most recommended joint connections in prefabricated substructures. At present, a large number of researches on socket connections has been carried out and most of them deal with pier-spread footing in the shallow foundation. This paper aims to study the effect of axial compression ratio using quasi-static tests of 2 specimens with socket connections. Specimen M1 is subjected to vertical and horizontal loading, whereas Specimen M2 is subjected to horizontal loading only. The experimental results showed that the axial compression ratio has a huge influence on the socket wall stress, i.e., the greater the axial compression ratio, the greater the socket maximum wall stress. But under the same horizontal force, the greater the axial compression ratio, the smaller the socket wall stress. And during increment of axial compression ratio, horizontal bearing capacity and horizontal stiffness of pier increase significantly.

Keywords: socket connection; axial compression ratio; socket wall stress; precast; pier-footing.

Introduction

Bridge construction is one of the most important sectors for any country's infrastructural development. Recently, Accelerated Bridge Construction (ABC) has focused on the development of bridge substructures because of its vulnerability to seismic activities. Generally, the connection region of precast members is critical in the high seismic area as the structural integrity under large cyclic deformation is hard to maintain. Therefore, various methods have been developed and evaluated to connect precast members, such as bar couplers, grouted ducts, and socket connections [1].

In prefabricated bridge construction, a socket connection is vastly emerging and most recommended joint connection with both precast pier and footing or with precast column and cast-in-place (CIP) footing. Socket connections can be classified in different ways according to the types of joint (dry and wet), geometrical shapes (internal, embedded, and partially), socket interface (smooth and rough), and the energy dissipating materials (grout, sleeves, etc.) used [1]. Among all types of connections, the socket connection that is constructed by embedding a precast element inside another member offers numerous benefits

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