



## Pseudo-Static Tests of Precast Bridge Pier with Half Grouted Sleeves

Qi Gao, Zhiqiang Wang

*College of Civil Engineering, Tongji University, Shanghai, China.*

Tao Zhang, Xingfei Yan

*Shanghai Urban Construction Design and Research Institute, Shanghai, China; Shanghai Engineering Research Center of Industrialized and Prefabricated Municipal Civil Engineering, China.*

Tong Yang

*Shanghai Urban Construction Design and Research Institute, Shanghai, China.*

Contact: [gaoq2396@163.com](mailto:gaoq2396@163.com)

### Abstract

The seismic performance of precast bridge piers with half grouted sleeves is studied by quasi-static test and compared with precast bridge pier with full grouted sleeves. The main failure modes of the precast bridge pier with half grouted sleeves are concrete crushing failure at the joint of column-to-footing and bond-slip failure of the longitudinal reinforcements in the half sleeves, there is no obvious crushing and spalling of the pier concrete. The ultimate horizontal strength of the precast bridge pier with half sleeves is small and shows a rapid decline trend after reaching the ultimate strength, hysteresis loops are flat and narrow while the residual displacement is small. On the whole, the seismic performance of the precast piers connected by half grouted sleeves is weak due to the bond-slip of the longitudinal bars in the half grouted sleeves. further researches are needed for precast bridge piers with half grouted sleeves without bond-slip behaviour.

**Keywords:** bridge pier; half grouted sleeves; pseudo-static test; seismic performance.

### 1 Introduction

With the development of economy and the progress of society, the construction method of substructure of bridge has gradually changed from high pollution, high noise and low efficiency to green, environmental protection, high quality and high efficiency of precast construction method. A reasonable and reliable connection method is an important part of precast bridge piers. The main connection methods existing include grouted

sleeve connection, prestressed reinforcement connection, socket connection etc<sup>[1-4]</sup>. Among them grouted sleeve connection is widely used in many countries and regions due to its economic and reliability.

Grouted sleeve can be divided into full grouted sleeve and half grouted sleeve. As for the full grouted sleeve, both ends are connected by grouting. At present, many scholars have carried out researches on the seismic performance of precast pier connected by the full grouted sleeves.