Comparative study on seismic design and check of piers by Chinese and European Codes

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Abstract

The function of bridges would be significantly influenced by the damage of piers during the earthquake, which would affect the rescue and reconstruction after the earthquake. Therefore, it is of great significance to carry out the comparative study on the seismic design and check of piers by the Chinese and European codes. The results show that the seismic design concepts of piers in the Chinese and European codes are the same. The behaviour factor and the seismic importance factor are used to reduce the seismic action in the European code and the Chinese code, respectively. For the check of shear capacity, the contributions of stirrups and concrete are separately considered in the European code, while they are simultaneously considered in the Chinese code. The steel weight of the pier designing by using Chinese codes is lower than that using European codes. The requirement on the minimum transverse reinforcement ratio in the European code is higher than that in the Chinese code.

Keywords: bridge engineering; pier; seismic design; seismic check; Chinese code; European code; comparative study; behaviour factor; seismic importance factor; minimum transverse.

1 Introduction

The bridges play an important role in human life and economic development. Once the bridge is damaged during the earthquake, it would not only cause the economic loss, but also interrupt the traffic lines, which would influence the rescue and reconstruction after the earthquake, resulting in more casualties and larger economic losses [1-2]. The pier is the fundamental structural component in the bridge designed to support the superstructure, transfer the load from the superstructure to the foundations and consume the seismic energy. During the earthquake, the damaged pier would cause serious damages to the bridge, or even influence the function of bridges [2-3]. To protect bridges during earthquakes, different codes for seismic design of bridges were published in different countries due to the economic and technical conditions and regional environment of each country [4-6]. The codes for seismic design of bridges was optimized and improved with the continuous development of seismic records, post-earthquake investigation and seismic theoretical research technologies [7]. By comparing with the codes for seismic design of bridges in the countries with more earthquakes, seismic theory and experience, some suggestions can be considered to

https://doi.org/10.2749/christchurch.2021.0505
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