Deformation Capacity of Web Perforated H-Shaped Beams

Toru Inaba, Tetsu Usami, Kenji Yamazaki, Fumi Ushiwata

Research and Development Institute, Takenaka Corporation, Chiba, Japan

Nobuyuki Odajima, Okamoto Jun

Design Department, Takenaka Corporation, Tokyo, Japan

Contact: inaba.tooru@takenaka.co.jp

Abstract

When designing web perforated H-shaped beams, it is common to reinforce the holes due to the deficit in section's area. However, previous studies revealed that non-reinforced web-perforated H-Shaped beams had similar performances as non-perforated H-shaped beams without holes when the position and shape of holes were designed considering the relationship between the acting stress for beams and the strength at the reduced sections. While this design method of non-reinforced web perforated H-shaped beams assumes a stress state of beams in the elastic state, it cannot always guarantee an appropriate performance in the ultimate stage similarly to non-perforated H-shaped beams. So the purpose of this study is to confirm the ultimate behavior of perforated H-shaped beams by experiment and FEM.

Keywords: Perforated Beams; Deformation Capacity; Static Loading test; Finite Element Method Analysis

1 Introduction

When designing web perforated H-shaped beams, it is common to reinforce the holes due to the reduced web sectional area. However, previous studies revealed that web-perforated H-Shaped beams without reinforcement had similar performances as non-perforated H-shaped beams (in Figure 1) when the position and shape of holes were designed considering the relationship between the acting stress for beams and the strength at the reduced sections in [1] and [2]. While this design method of non-reinforced perforated H-shaped beams assumes a stress state of beams in the elastic state, it cannot always guarantee an appropriate performance in the ultimate stage similarly to non-perforated H-shaped beams. Therefore, recent design method is applied for many buildings considering the ultimate behavior of beams when an unexpected huge earthquake occurs. For this reason, it is important to establish an appropriate design method for non-reinforced perforated H-shaped beams considering their ultimate behavior. Therefore, the purpose of this study is to confirm the ultimate behavior of non-reinforced perforated H-shaped beams by experiment. The authors present in this paper the experiment

Figure 1. Non-reinforced perforated H-shaped Beams

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