



Method of Designing a Plate-like Ultra High-rise Building

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Abstract

This paper describes the method of structural design of a plate-like ultra high-rise building, taking the Shinjuku Toho Building as an example. In particular the major problems in the structural design of this building are described, namely ensuring safety during earthquakes, ensuring habitability during strong winds, and ensuring the load resistance of the columns that are subject to large axial forces. Also, the test results and performance of an "improved non-scallop method" for beam-column joint are described. Finally the method of structural designing "Godzilla's Head" is described.

Keywords: Plate-like high-rise building; 780N/mm² steel; CFT columns; active mass dumper; beam-column joint.

1 Introduction

The Shinjuku Toho Building was completed in Kabukicho, Shinjuku-ku, Tokyo in 2015. It is a multi-purpose building with a height of 130 m, 1 basement level, and 30 stories above ground, and contains a cinema, shops, and a hotel. Kabukicho is one of the most famous entertainment districts of Tokyo, and this building is located in the center of an area bustling with people at all times of the day and night.

The slim impressive façade of this building can be seen from the main street on the south side (Fig. 1). The external walls of the high-rise part are made from PC panels, and the external walls of the low-rise part are made from metal sandwich panels folded into a plaited shape. On the 8th floor outdoor terrace located 40 m above the

ground, "Godzilla's head" (height 12 m) appears, forming a new landmark in Kabukicho.



Figure 1. Building external view