

Analytical Study on Seismic Performance of Column with Secondary Wall

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Summary

In this study, 3D non-linear finite element analyses were conducted under repeated loading, additionally involving imaginary specimens, on reinforced concrete columns with secondary walls subject to a horizontal force, using test specimens, used in previous experiments, for which existence of eccentric joints or partial slits are the variable factors. The results were then compared to experimental results and the analysis method was examined. Investigations that include 3D observations were conducted on items for which experimental observation is difficult such as stress distribution, failure mechanisms, and cumulative strain energy consumption. Effects of secondary walls and slits on the seismic properties of column members were studied in detail.

Keywords: spandrel wall, hanging wall, reinforced concrete, FEM, partial slit, eccentric joint, short column

1. Introduction

With regards to reinforced concrete buildings, most schools and residential blocks have columns to which secondary walls such as spandrel and hanging walls are attached. Such columns are prone to brittle shear failure during major earthquake, and cause reduction in seismic performance of such buildings. Reinforcement works are being conducted throughout Japan to improve seismic performance. For such buildings that have local columns with secondary walls, providing structural slits is an effective reinforcement method that improves the balance in planar and 3-dimensional (3D) stiffness and enhances column ductility.

Table 1: Test specimen shape and variable factors

Test specimen	Slit(Width ×Depth) (mm)	Eccentric Joint	Shape
No.4	15×25	Eccentric Joint	
No.5		Eccentric Joint Partial Slit	
No.9	15×25	Non-Eccentric	
No.10		Non-Eccentric Partial Slit	
No.11 (Imaginary Specimens)	15×50	Non-Eccentric Complete Slit	

2. Summary of analysis

2.1 Analysis specimens

RC short columns with spandrel and hanging walls and with partial slits, subject to horizontal load, as used by Hirosawa *et al.*¹⁾ of Kogakuin University in 2004, were used as specimens for analysis. Five specimens were used, including one