

## Research Trends and Results

# Full-scale structural experiment of a partial frame reinforced concrete construction using fiber reinforced concrete on the nonstructural wall

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### 1. Foreword

The Great East Japan Earthquake of 2011 caused severe damage to the nonstructural walls of housing complexes designed/constructed in the existent earthquake resistance standards with reinforced concrete (RC structure), forcing many to give up their daily activities to live in evacuation shelters. With these events in hindsight, our division has been conducting research into RC structures in which people can continue to live in even after disaster strikes, by suppressing damages to the secondary walls, as stipulated in our issue: "Research regarding earthquake damage mitigation techniques for middle-to-low layer buildings in a giant earthquake (research period: fiscal year 2014 to 2016). Here, we will introduce the overview of the full-scale structural experiment implemented in 2014 of a partial frame RC structure with fiber reinforced concrete nonstructural walls.

### 2. Experiment overview

The experiment is shown in Photo 1. The test specimen is a full scale, partial frame, with a portion of the first floor corridor plane simulating a 1 layer, 1 span middle-to-low layer RC multiple dwelling. For pressurization, a load equivalent to the weight of the upper floor was applied using two vertical force actuators, while a horizontal pressure equivalent to the seismic force was applied using four pressurizing hydraulic jacks.

Photos 2 and 3 show the damage condition when the story deformation angle reached  $1/200\text{rad}$  and  $1/100\text{rad}$  respectively. At  $1/200\text{rad}$ , widening cracks in the wall (partial wall) between the window opening and door opening were found, although the same cracks were rarely found in other areas. As well, at  $1/100\text{rad}$ , widening cracks could be found on the corners of each opening, however, extensive damage like detached concrete could not be found. Furthermore, pressurization was finally conducted at  $1/50\text{rad}$ , however, the widening of cracks or detached concrete were likewise, not observed in other areas.

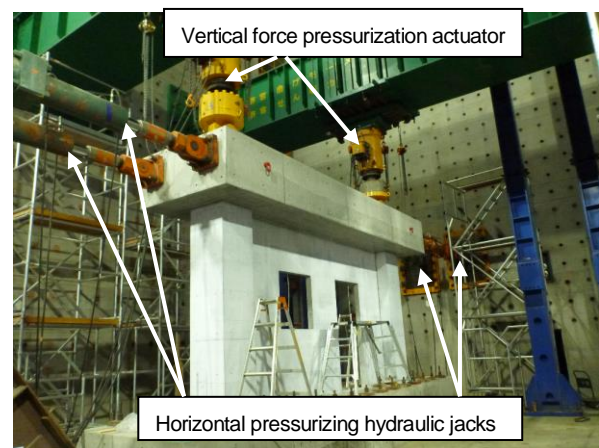


Photo 1: Test setup



Photo 2: Damage conditions at story deformation angle  $1/200\text{rad}$



Photo 3: Damage conditions at story deformation angle  $1/100\text{rad}$

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### 3. Conclusion

In the future, the detailed experiment data regarding damage suppression results and structural performance evaluation methods will be analyzed and collected as technical data.

(References)

1) NILIM resource No.674, Building Department Resource No.136 pp.5.2-4~5.2-5