Feasibility Experiments of Seismic Concrete Block Walls without Joint Mortar

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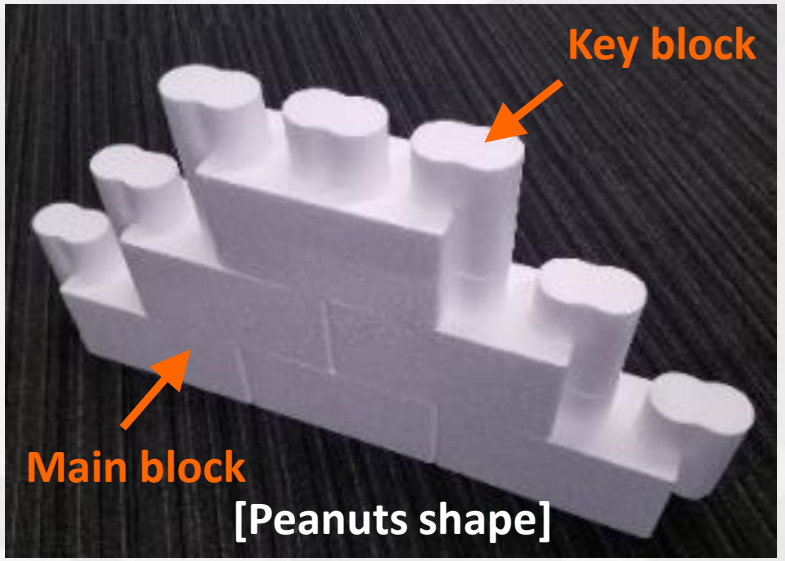
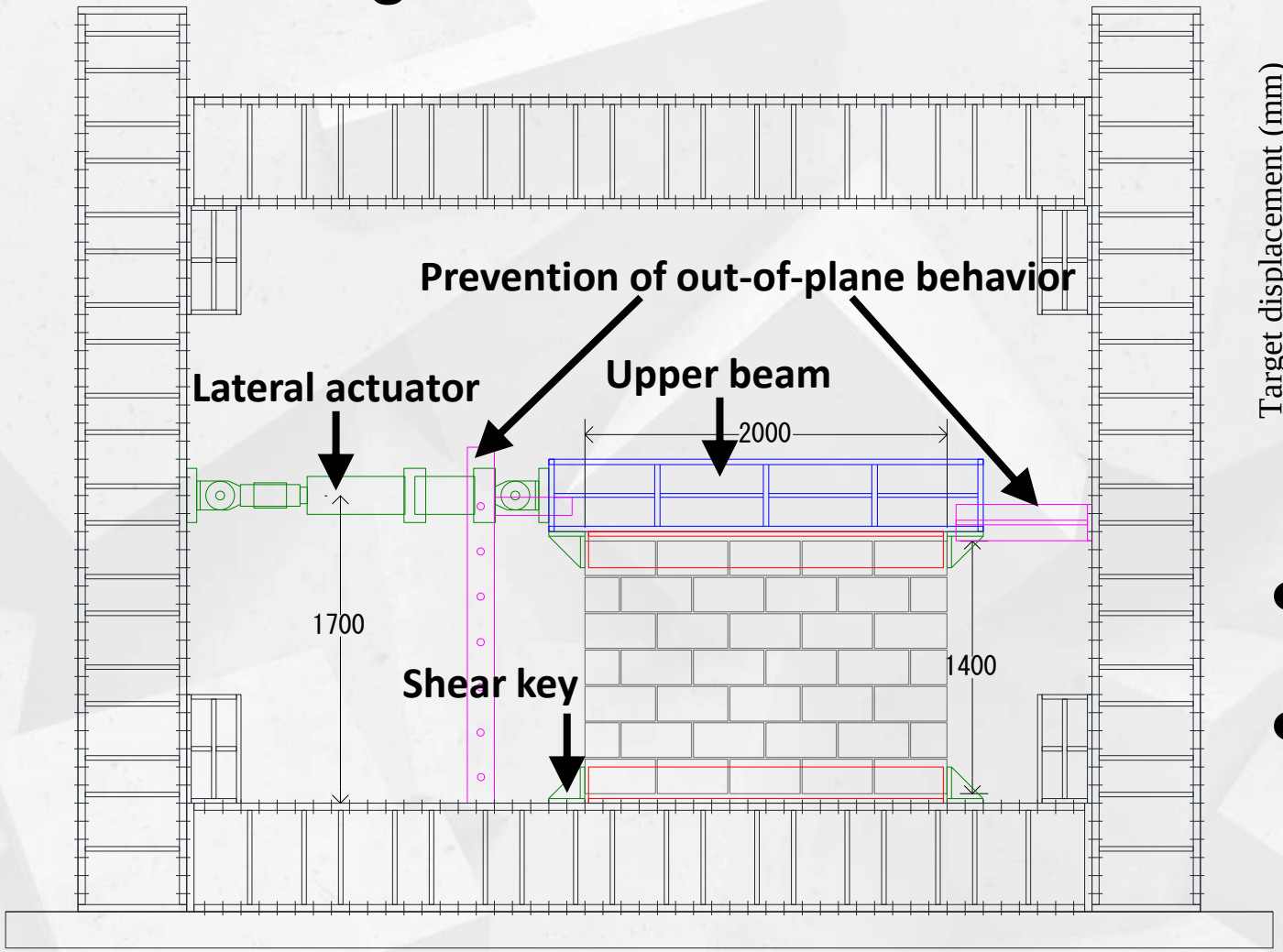
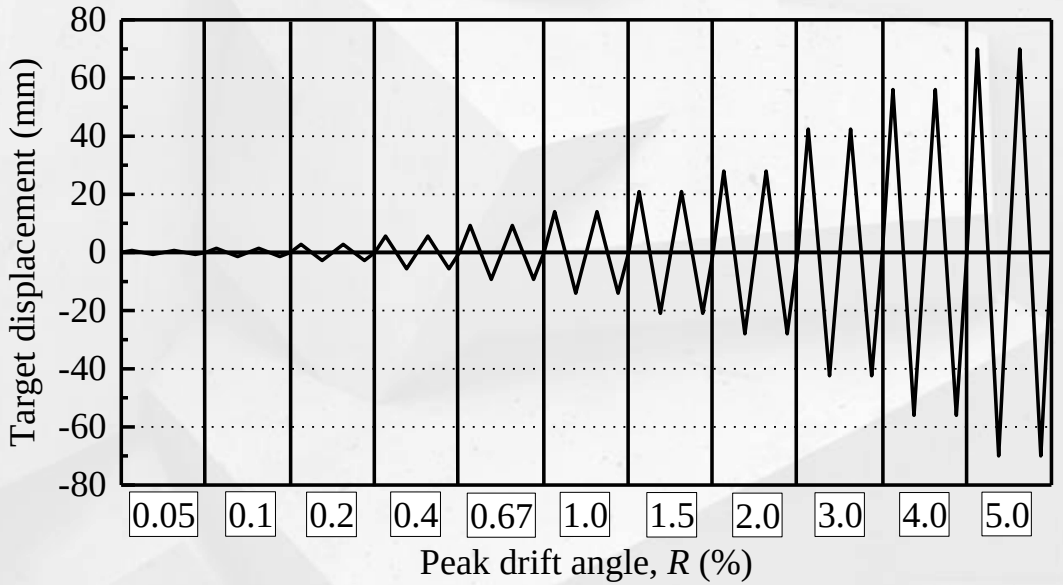
Objectives

- The authors developed 2 types of block systems consisting only of mail block and key block without joint mortar in consideration of seismic capacity and workability.
- 2 types of block systems have different key block shapes (peanuts / dumbbell).
- In this study, the proposed 2 types of concrete block walls (Specimen PS (peanut shape) and Specimen DS (dumbbell shape)) as well as a typical concrete block wall (Specimen CB) were experimentally investigated to evaluate the seismic capacity.
- In the tests, full-scale, 1-story specimens were tested under cyclic in-plane loading, and failure patterns and cracks were carefully observed.
- In this paper, the loading bearing capacity, energy dissipation capacity and reuse ration of block walls are discussed in detail.



Test Program

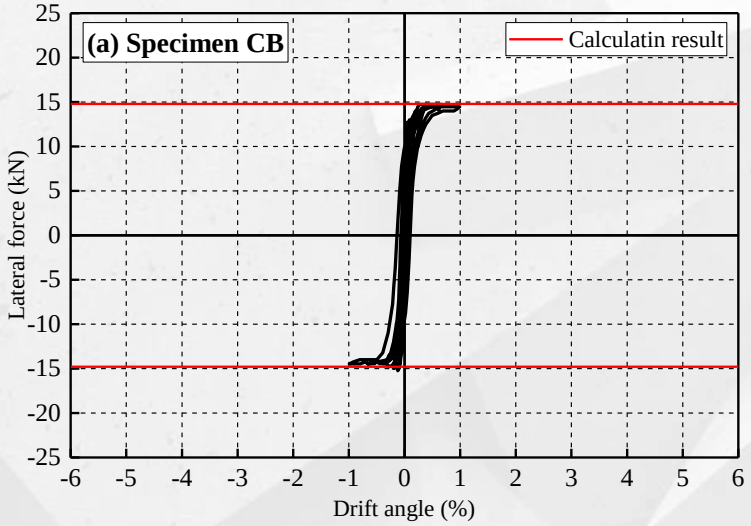


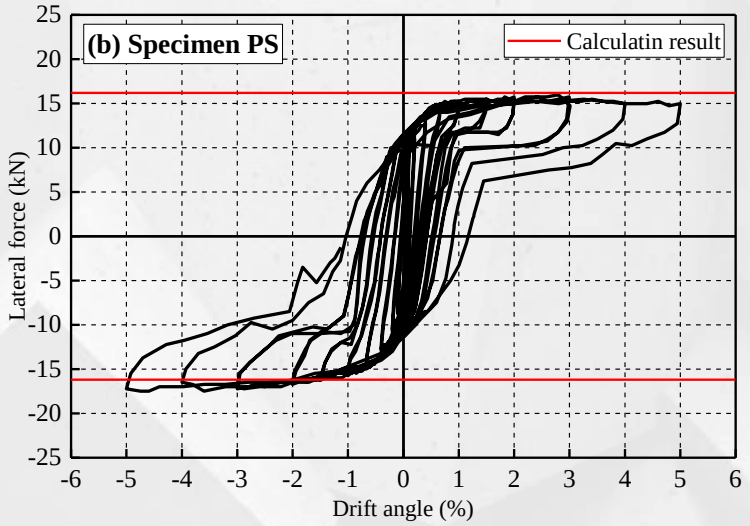


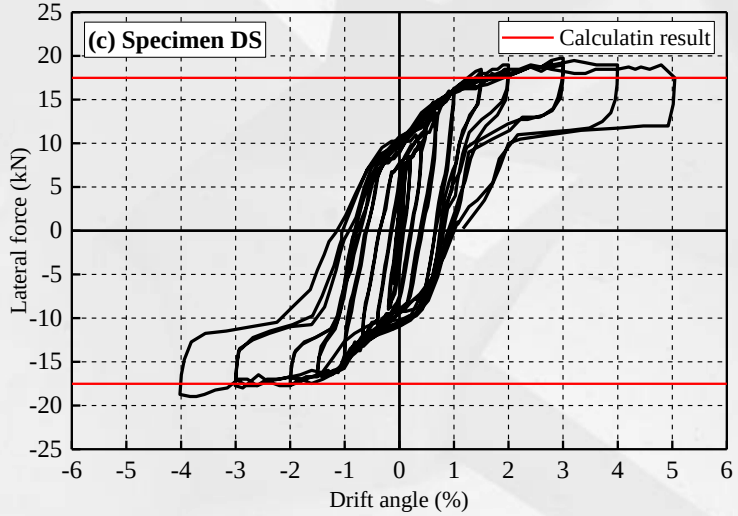
- Peak drift angles of 0.05, 0.1, 0.2, 0.4, 0.67, 1.0, 1.5, 2.0, 3.0, 4.0, 5.0% rad.
- 2 cycles for each peak drift

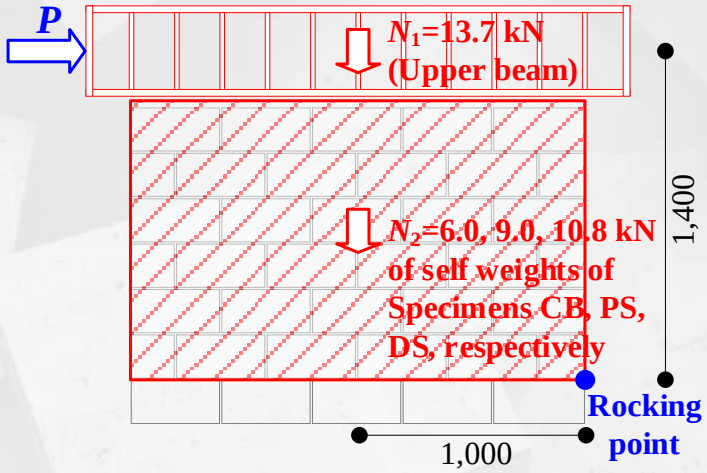
- Since the reference bldg. of this study is 1-story storage bldg., the axial load was considered as the weight of the upper beam (13.7 kN, axial stress, σ_0=0.04 N/mm^2).

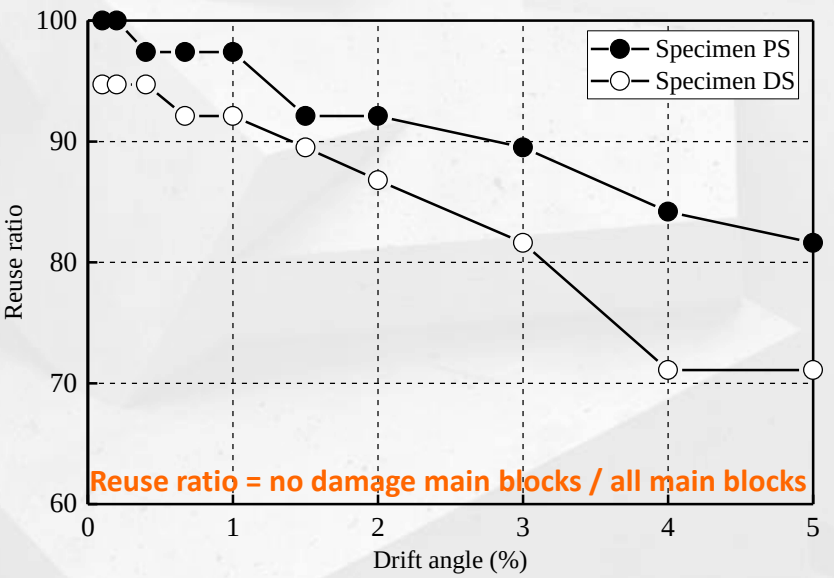
Experimental Results











- The typical concrete block and brick may not commonly reuse because of the using of the joint mortar. On the other hand, the proposed systems consisted of only main and key blocks without joint mortar can reuse.
- The proposed block systems can reuse more than 70% after R = 5.0% rad. This result imply that the proposed concrete block wall systems are economical and eco-friendly.

- The lateral loads of each specimen were calculated based on the rocking behavior.
- The calculated lateral loads show good agreement with the experimental results.

Concluding Remarks

This paper presented the in-plane loading test results of the two types of new concrete block walls as well as a typical block wall.

- The in-plane seismic performances of the proposed system were much higher than that of Specimen CB. The deformability of the proposed system has improved remarkably due to the interlocking mechanism.
- The calculated lateral loads based on the simple rocking mechanism agreed well with the experimental results.
- The energy dissipation capacities of the proposed systems considerably had higher values than that of Specimen CB, and the remarkable deterioration of the ratios of the proposed systems were not found until the final loading.
- The proposed system can reuse more than 70% after final loading. This result imply that the proposed concrete block wall systems are economical and eco-friendly.

In future researches, the out-of-plane shaking table tests and the numerical simulations will be carried out, respectively.