DEVELOPMENT OF BIDIRECTIONAL RAHMEN STRUCTURE
USING A WOOD BONDED COMPOSITE PANELS

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ABSTRACT: Author realize a 3-story office building using a bidirectional Rahmen structure using wood bonded composite panels. And we were confirmed by various tests its performance.

KEYWORDS: Bidirectional rahmen structure, Wood bonded composite panels, Various tests of structure performance

1 INTRODUCTION
In recent years, the proactive use of wood as a material in buildings has been pursued in Japan in order to realize a low carbon society, and in 2010, the Act for the Promotion of Use of Wood in Public Buildings etc. was enacted to encourage efforts to use wood in low-rise public buildings. Against this background, the author began to want to realize a bidirectional Rahmen structure using large section components with a hollow construction composed of a combination of small-scale materials such as laminated wood and wood bonded composite panels. Since that period coincided with the reconstruction of the author’s company’s building, the author decided to take on the challenge of developing a 3-story office building using new construction techniques.

2 OUTLINE OF BUILDING
A photo of the exterior of the building is shown in Figure 1, while Figure 2 shows floor plans and elevation plans for each floor. The building is a 3-story above-ground building with the 1st floor being a parking lot and the 2nd and 3rd floors made up of offices. It is a large building due to the wood construction, with the highest point being 16.8m and having a total floor area of 2,829m². The roof has solar power generation and a rooftop structure that is flat so that it can be used by people.

Figure 1: A photo of the exterior of the building

Figure 2: Floor plans and elevation plans for each floor

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columns are manufactured in advance at a factory, allowing for easy on-site construction since they can be joined to various other components using bolts. Beams with a long span were constructed on site by joining multiple beams.

4 EXPERIMENT

4.1 HORIZONTAL LOADING TEST

The maximum load for a 11M (1M = 910mm) Rahmen frame is 509kN, and the maximum load for a 5M Rahmen frame is 520kN, confirming that they have an extremely high load bearing ability.

4.2 VERTICAL LOADING TEST

The maximum load of 674kN and the curvature of L/1444 (= 6.3mm) when bearing a load for a long period demonstrated satisfactory performance.

4.3 TWO DIRECTIONS LOADING TEST

The maximum load of 894kN.

4.4 IMPULSE HAMMER TEST

The primary natural frequency of a Rahmen frame unit beam was 16.0Hz. When adjusted to take the rigidity of the floor and weight of the actual building into account, it was 12.6Hz. The primary natural frequency of the solid-body frame’s floor slab was 9.2Hz.

4.5 SOUND-PROOFING TEST

The actual building’s sound-proofing performance with light-weight floor impact sound insulation was L_{rL}-50. It was L_{rH}-65 with heavy floor impact sound insulation.

5 CONCLUSIONS

These results were confirmed by creating a bidirectional Rahmen structure using wood bonded composite panels and conducting various tests of its performance.