STUDY ON SINGLE SHEAR STRENGTH OF NAILED JOINTS SUBJECTED TO GRAIN DIRECTION

Kiyotaka Terui¹, Yoshimitsu Ohashi², Kohe Nomoto³, Osamu Sumioka⁴

ABSTRACT: To produce the equation for estimating the shear strength of the wooden horizontal diaphragm considering the influence of the fibrous direction of the beams and plywood on nailed Joints, were collected data make single shear tests of the nail joints. In the single-shear examination of the nail which made the fibrous direction of a beam or plywood the parameter, it was able to be shown clearly that the single shear capacity of a nail has a difference by a fibrous direction. It was possible to create a model of the multi-linear with the load-displacement relationship obtained in the experiment.

KEYWORDS: Single shear tests, Fibrous direction, Wooden horizontal diaphragm

1 INTRODUCTION

This study is intended to produce the estimate equation of the shear strength of wooden horizontal diaphragm using the single shear tests on nailed Joints considering the fibrous direction. Since the single shear tests on nailed Joints as a parameter to fibrous direction beam and plywood was performed in a series of studies, it reports.

2 SPECIMENS

Sliding direction of nail are the parallel direction, the right-angled direction, and the direction of 45 degrees for the fibrous direction of a beam and plywood. The parameters of the specimen in the single shear tests on nailed Joints are 19 patterns varying in a combination of sliding direction of nail and fibrous direction of plywood and fibrous direction of the beam in wooden horizontal diaphragm as shown in figure 1. The relations of the position of beam and plywood in the single shear tests on nailed Joints imitated the relations of the position beam and plywood of the floor posture. The distance of the nail and the edge of plywood in specimens is 15 mm. The beam of the specimen cut out 19 patterns from the same material in consideration of individual specificity of the quality of material. Moreover, plywood also cut out the specimen of 19 patterns from one piece of plywood.

Figure 1: The 19 patterns in the sliding direction of the nail

¹Kiyotaka Terui, Polus R & D Center of Life-Style Inc., SAITAMA, JAPAN. Email: 01452terui-sz@polus.co.jp
²Yoshimitsu Ohashi, Tokyo City University, TOKYO, JAPAN. Email: ohashi-y@tcu.ac.jp
³Kohe Nomoto, Polus R & D Center of Life-Style Inc., SAITAMA, JAPAN. Email: 04385nomoto-mf@polus.co.jp
⁴Osamu Sumioka, Polus R & D Center of Life-Style Inc., SAITAMA, JAPAN. Email: 03958sumioka-vj@polus.co.jp
3 THE METHOD OF AN EXPERIMENT

The method of an experiment is shown in Figure 2. Specimen of the experiment is the shape that the sliding direction of the nail turns to the direction of the load given with a testing machine. Specimens of the experiment fixed a beam to the table of the testing machine and connected plywood to the crosshead of the testing machine. Plywood is not fixed in the direction which is at a right angle to the load given with a testing machine.

![Test set-up](image)

**Figure 2: Test set-up**

4 THE RESULT OF THE EXPERIMENT

As for the result of the experiment, the difference in the fibrous direction of a beam and plywood showed that the performance of the Single Shear Tests on nailed Joints had a difference. In addition, it was revealed that some patterns could gather the experimental result of 19 patterns. The load-displacement relationship obtained from the experiment was able to model multi-linear as shown in figure 3.

![The load-displacement relationship of experimental result](image)

**The load-displacement relationship of experimental result**

![The load-displacement relationship of Multi-linear model](image)

**The load-displacement relationship of Multi-linear model**

**Figure 3: The load-displacement relationship of experimental result and Multi-linear model**

5 CONCLUSIONS

It could be modeled by the multi-linear performance of the shear of the nail joints by a combination of different fibrous direction of the beam and plywood. The estimate equation of the shear strength of wooden horizontal diaphragm is built from now on using a model of the multi-linear obtained.