SEISMIC PERFORMANCE OF WOODEN HOUSE WETTED BY RAINFALL OR SUBMERGING IN WATER

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ABSTRACT: The purpose of this study is to clear the influence of the seismic performance when the bearing wall with brace experienced wet processing. In this study, wet processing is performed of soaking and water splash. In addition, bearing wall with brace is dried in indoor condition or seal condition in order to discuss the difference of drying conditions. After finishing the wet processing and drying, the horizontal shear test of bearing wall with brace are carried out. From the test results, it is clear that seismic performance was reduced by the long drying period. In addition, the bearing wall with brace experienced wet processing shows different seismic performance by the drying condition and period.

KEYWORDS: Wooden house, Bearing wall with brace, Rainfall, Wall strength factor

1 INTRODUCTION

In the wooden house, the material, hardware, joint and structural member are often exposed to water splash by sudden rainfall during construction and transportation of the members and leak accident. In recent years, heavy rain exceeding the drainage capacity of city caused by typhoon and guerrilla rainstorm occurred. Furthermore, the many buildings were submerged by tsunami of Tohoku Region Pacific Coast Earthquake in 2011. The wooden house experienced submerge is discussed for the decline of seismic performance. In this study, after finishing the wet processing and drying, horizontal shear test of bearing wall with brace are carried out.

2 TEST SPECIMENS

Figure 1 shows the shape and size of test specimen. The materials of brace are LVL and hemlock. The materials of the sill, column, beam and studs are glulam made from Scots pine. The size of wooden frame is 1820 mm in width, 2730 mm in height.

3 WET PROCESSING AND DRYING CONDITION

Table 1 shows the list of test specimens. Two methods of wet processing are adopted in this study. The first one is soaking whole specimen in fresh water for 24 hours (see photo 1). The second wet processing is water splash by...
sprinkler for 3 hours (see photo 2). The water splash is assumed rainfall of 100mm/h. The drying conditions are set into two patterns, that is indoor condition and seal condition. Indoor condition means non-control condition of temperature and humidity in the room. The specimens on the seal condition are wrapped up by plastic sheet to prevent the evaporation of moisture. It is assumed to be inside condition of finishing materials. The humidity level is about 80 % in the plastic sheet.

<table>
<thead>
<tr>
<th>Table 1: List of test specimens</th>
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<tbody>
<tr>
<td>Material of brace</td>
</tr>
<tr>
<td>LVL</td>
</tr>
<tr>
<td>Hemloke</td>
</tr>
<tr>
<td>LVL</td>
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<tr>
<td>Hemloke</td>
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4 CHANGE OF MOISTURE CONTENT

Figure 2 shows the change of moisture content through the wet processing and drying condition. The moisture content is measured at three points of brace. Moisture content of both brace materials with LVL and hemlock are about 20 % before wet processing. After soaking for 24 hours, moisture content of LVL specimen raised to nearly 80 %. On the other hand, the moisture content of hemlock specimen raised to nearly 60 % after then. After 3 months, the moisture contents of specimen with both brace material that dried in the indoor condition recover to the same value before wet processing. Decrease of moisture content is small in seal condition. After water splash for 3 hour, Moisture content raised to nearly 50 %. After drying for two weeks, moisture content of specimen recover to the same value as before water splash.

5 SEISMIC PERFORMANCE

Figure 3 shows the wall strength factor of test specimens. The test specimen of LVL dried for 3 months after soaking are lower than control of LVL in wall strength factor. However, test specimen of hemlock dried for 3 months after soaking about the same wall strength factor as control of hemlock. The test specimen of LVL dried after water splash and control of LVL are about the same wall strength factor. It is reason that only surface of test specimens are contended water at water splash.

6 CONCLUSION

From the test results, irrespective of the drying conditions, seismic performance is recovered by long drying period.