Introduction

Lots of studies in wood frame shear wall (WFSW) research area focused on the performance of the single piece of wall. While, in the field, the wood frame shear walls always work as a component in the complete structural system, of which boundary conditions are different from that of the single piece of walls.

There were nine full-scale light-framed wood construction specimens tested to study the effects of the upper storey and the vertical load on the performance of the wood frame shear wall in the first storey, as well as to understand the performance of wood frame shear wall in the complete structure.

Test program

Test specimen

Nine symmetric specimens were divided into three groups according to different opening size in the wood frame shear wall in the first storey. In each group, the wood frame shear walls in the first storey were grouped into three types, namely, WFSW-A, WFSW-B, WFSW-C. All the test specimens are shown in Fig. 1.

Wall performance parameters

<table>
<thead>
<tr>
<th>Group</th>
<th>Specimen</th>
<th>Unit shear load (kN/m)</th>
<th>Yield deflection (mm)</th>
<th>Yield failure deflection (mm)</th>
<th>Failure deflection (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFSW-A</td>
<td>S11X</td>
<td>2.6</td>
<td>6.1</td>
<td>2.6</td>
<td>11.4</td>
</tr>
<tr>
<td>WFSW-B</td>
<td>S21X</td>
<td>2.5</td>
<td>6.1</td>
<td>2.6</td>
<td>11.4</td>
</tr>
<tr>
<td>WFSW-C</td>
<td>S31X</td>
<td>2.6</td>
<td>6.1</td>
<td>2.6</td>
<td>11.4</td>
</tr>
</tbody>
</table>

Results

Results showed that the effects of the upper storey with the vertical load on the performance of wood frame shear wall were to: (1) increase the elastic stiffness, (2) reduce the ultimate deflection and yield deflection, and (3) make the uplift of the studs at the end of walls and the boundary conditions small and uniform along the wall in the first storey. While the upper storey or the vertical load had little effect on the shear strength of wood frame shear wall. The test results indicated that in the lower storey the number of hold-downs can be reduced to some extent in seismic design.

Test setup

Test protocol and instrumentation

Fig. 4. Sketch of the test setup

Fig. 5. Photos of the specimens

Failure modes

Nail connection failure modes

Global hysteresis response

Fig. 6. Nail connection failure modes

Wall performance parameters

Table. 1. Uplift of studs (Unit: mm)

<table>
<thead>
<tr>
<th>Group</th>
<th>Specimen</th>
<th>Max. uplift/m/m under peak load</th>
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<th>Max. uplift/m/m under peak load</th>
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</tbody>
</table>

Conclusion


Dror, J., and Heine, C. 1995c. Sequential phased displacement tests of wood frame shear walls with corners. Prepared for the RAND Research Center, Inc by Virginia Polytechnic Institute and State University, Blacksburg, VA.


Literature cited

For further information

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