EFFECT OF COLLISION WITH RETAINING WALL ON BASE ISOLATED SUPERSTRUCTURE USING SHAKING TABLE

H. Fukui¹, H. Fujitani², Y. Mukai³, M. Ito⁴

¹Graduate Student, Graduated school of Engineering, Kobe University
²Professor, Graduated school of Engineering, Kobe University
³Associate Professor, Graduated school of Engineering, Kobe University
⁴Assistant Professor, Graduated school of Engineering, Kobe University

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Test Overview

<table>
<thead>
<tr>
<th>Floor</th>
<th>Mass (kg)</th>
<th>Story</th>
<th>Stiffness (N/mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>roof</td>
<td>504</td>
<td>Third story</td>
<td>125</td>
</tr>
<tr>
<td>3F</td>
<td>482</td>
<td>Second story</td>
<td>112</td>
</tr>
<tr>
<td>2F</td>
<td>478</td>
<td>First story</td>
<td>136</td>
</tr>
<tr>
<td>1F</td>
<td>738</td>
<td>Base-isolated story</td>
<td>11.0</td>
</tr>
</tbody>
</table>

Structural properties of testing model

<table>
<thead>
<tr>
<th>Young's modulus :E (MPa)</th>
<th>Hardness 50°</th>
<th>3.69</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hardness 70°</td>
<td>6.82</td>
</tr>
<tr>
<td></td>
<td>Hardness 85°</td>
<td>14.80</td>
</tr>
<tr>
<td></td>
<td>Steel</td>
<td>$2.05 	imes 10^5$</td>
</tr>
</tbody>
</table>

Input ground motions
- El Centro 1940_NS
- Takatori 1995_NS
- Hachinohe 1968_NS
Test Results - Maximum story shear force vs. Collision velocity -

Ex) (El Centro 100%; Collision; Hardness 70°)
Test Results - Maximum floor acceleration vs. Collision velocity -

Ex) Time history of floor acceleration on first floor. (El Centro 100%)
Comparison of Story shear force (Acc.-Disp.)

Ex) Time history of story shear force (El Centro 100%)

- Calculated by Acc.
- Calculated by Disp.

Without collision

3st

2st

1st
Conclusions

1) The relationship between the maximum story shear force and the collision velocity was confirmed to be mostly linear for all stories. The story shear forces did not have remarkable differences depending on the rigidity of the attachment members.

2) The relationship between the maximum floor acceleration and the collision velocity was confirmed to be mostly linear for all floors. The maximum floor accelerations changed depending on the differences in the rigidities of the retaining wall under the same collision velocity.

3) The story shear force was calculated in two methods (by acceleration and by spring deformation). Two story shear forces were good correspondence for the case without a collision. However, in the case with a collision, a difference between two story shear forces were observed because of an instantaneous increase in the floor accelerations.
Please come see my Poster!

Today Poster Session:

- **Time**: 5:15 – 7:00 pm
- **Room**: Pasadena (Exhibit Hall)
- **Poster location**: Number 024
Comparison of Story shear force (Acc.-Disp.)

Without collision

Ex) Time history of story shear force (El Centro 100%)

- 3story
- 2story
- 1story
- Base-isolated story

Calculated by Acc.
Calculated by Disp.