TRACK RECORD OF VIBRATION CONTROL DEVICE
<table>
<thead>
<tr>
<th>No.</th>
<th>Project</th>
<th>Vibration Control Device</th>
</tr>
</thead>
</table>
| 45  | Greenland Centre Sydney, Australia  
- Client: Probuild Construction  
- Outline  
  - Height: 235m  
  - Frequency: 0.153Hz (x-dir)  
    0.170 (y-dir)  
- Year: in progress  |  
- Type: TMD (1 set)  
- Control direction: Horizontal bi-dir.  
- Specification  
  - Rubber Bearing + Coil-Spring type  
  - Moving mass: 180tons  
  - Stroke: ±336mm  
- Conceptual & Detailed Design /  
  Manufacture / Installation Supervision /  
  Performance test / |
| 44  | Masan west harbor Bridge  
- Client: Suhyun Engineering  
- Outline  
  - Suspension bridge  
  - Length: 130m  
  - Frequency: 0.804Hz  
- Year: in progress  |  
- Type: TMD (4sets)  
- Control direction: Vertical  
- Specification  
  - Moving mass: 1.2ton (2 sets)+1.0ton (2 sets)  
  - Stroke: 3cm(vert)  
- Conceptual & Detailed Design /  
  Manufacture / Installation /  
  Performance test / |
| 43  | Haneda Bridge, Japan  
- Client: Hitachi Zosen  
- Outline  
  - Length: 594.7m (182+240+172.7)  
  - Frequency  
    0.563Hz(vert-dir)  
- Year: in progress  |  
- Type: TMD (20 sets)  
- Control direction: Vertical dir.  
- Specification  
  - Moving mass: 3.5ton (20 sets)  
  - Installation location: Steel box girder  
- Conceptual & Detailed Design /  
  Manufacture / Installation Supervision /  
  Performance test / |
<table>
<thead>
<tr>
<th>No.</th>
<th>Project</th>
<th>Vibration Control Device</th>
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<tbody>
<tr>
<td>42</td>
<td><strong>2nd Namhae Bridge (Hanger Cable)</strong></td>
<td>• Type: Stockbridge Damper&lt;br&gt;• Control direction: horizontal dir.&lt;br&gt;• Specification&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Moving mass: 4.62kg + 7.90 kg&lt;br&gt; - Messenger Cable: Φ-16mm&lt;br&gt; - Achieve damping ratio : 0.687%&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td></td>
<td><strong>Outline</strong></td>
<td>• Moving mass: 4.62kg + 7.90 kg&lt;br&gt; - Messenger Cable: Φ-16mm&lt;br&gt; - Achieve damping ratio : 0.687%&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td>- Suspension bridge&lt;br&gt; - Length: 990m (50+890+50)&lt;br&gt; - Cable Frequency: 1Hz ~ 40Hz&lt;br&gt; - Damping ratio: 0.01%~0.03%&lt;br&gt;</td>
<td>• Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Year: in progress&lt;br&gt; • Moving mass: 4.62kg + 7.90 kg&lt;br&gt; - Messenger Cable: Φ-16mm&lt;br&gt; - Achieve damping ratio : 0.687%&lt;br&gt;</td>
</tr>
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<td></td>
<td>• Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td>41</td>
<td><strong>Choansan Footbridge</strong></td>
<td>• Type: TMD (4sets)&lt;br&gt; • Control direction: Vertical&lt;br&gt; • Specification&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td><strong>Outline</strong></td>
<td>- Moving mass: 1.5ton (2 sets)+0.4ton (2 sets)&lt;br&gt; - Stroke: 3cm(vert)&lt;br&gt; • Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td></td>
<td>- Arch Bridge&lt;br&gt; - Length: 191m (45+80+40+30)&lt;br&gt; - Frequency&lt;br&gt;</td>
<td>• Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td></td>
<td>1.594Hz(1st Ver-dir)&lt;br&gt; 1.845Hz(2nd Ver-dir)&lt;br&gt; - Damping ratio: 0.51%&lt;br&gt;</td>
<td>• Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td></td>
<td>• Year: in progress&lt;br&gt; • Moving mass: 1.5ton (2 sets)+0.4ton (2 sets)&lt;br&gt;</td>
<td>• Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td></td>
<td>- Stroke: 3cm(vert)&lt;br&gt; • Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td><strong>Wangsibri Haengdang Footbridge</strong></td>
<td>• Type: TMD (2sets)&lt;br&gt; • Control direction: Vertical&lt;br&gt; • Specification&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td><strong>Outline</strong></td>
<td>- Moving mass: 0.7ton x2(vert)&lt;br&gt; - Stroke: 5cm(vert)&lt;br&gt; • Achieve damping ratio : 5.134%&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td>- Cable Stayed Bridge&lt;br&gt; - Length: 78m&lt;br&gt; - Frequency&lt;br&gt;</td>
<td>• Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td></td>
<td>1.482Hz(Ver-dir)&lt;br&gt; - Damping ratio: 0.346%&lt;br&gt; • Year: in progress&lt;br&gt;</td>
<td>• Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td>No.</td>
<td>Project</td>
<td>Vibration Control Device</td>
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</tr>
</tbody>
</table>
| 39  | Incheon International Airport Main Tower | - Type: AMD (2 sets)  
- Control direction: Horizontal bi-dir.  
- Specification:
  - Moving mass: 6.78ton(X), 9.23ton(Y)  
  - Stroke: ±350mm  
  - Optimal damping ratio: 15.0%  
- Achieve damping ratio: 13.24%(X), 13.65%(Y)  
- Replacement of Control unit / Performance test / |
| 38  | Pyeongtaek Bridge (Stay Cable) | - Type: Stockbridge Damper  
- Control direction: Vertical dir.  
- Specification:
  - High-frequency & Low-frequency Combined Type  
  - Messenger Cable: Φ-19mm  
  - Achieve damping ratio: 0.316%  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test / |
| 37  | Gonjiam Hwadam Forest Footbridge | - Type: TMD (3 sets)  
- Control direction: Vertical, Horizontal  
- Specification:
  - Moving mass: 0.4ton x2(hor), 0.3t(vert)  
  - Stroke: 0.587cm/0.779cm(hor), 0.1m(vert)  
  - Achieve damping ratio: 8.176%(Hor.), 5.84%(ver.)  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test / |
<table>
<thead>
<tr>
<th>No.</th>
<th>Project</th>
<th>Vibration Control Device</th>
</tr>
</thead>
</table>
| 36  | **New York Wheel, USA**  
- Client: Mammoet-Starneth  
- Outline  
  - Height: 192m  
  - Frequency  
    - 0.737Hz (x-dir)  
    - 0.278Hz (y-dir)  
- Year: In progress  
  |  
  - Type: Brace TMD(2ea)  
  - Control direction: horizontal bi-dir.  
  - Specification  
    - Moving mass: 32ton & 28ton  
    - Stroke: 50mm(x-dir) 270mm(y-dir)  
    - Optimal damping ratio: 6%  
  - Conceptual & Detailed Design /  
    Manufacture / Installation supervision /  
    Performance test / |
| 35  | **Taichung Bauger Building, Taiwan**  
- Client: CEC  
  (Continental Engineering Corporation)  
- Outline  
  - Height: 158.4m  
  - Frequency  
    - 0.237Hz (x-dir)  
    - 0.230Hz (y-dir)  
- Year: In progress  
  |  
  - Type: Pendulum type  
  - Control direction: horizontal dir.  
  - Specification  
    - Moving mass: 150ton  
    - Stroke: 0.6m(x-dir) 1.35m(y-dir)  
    - Optimal damping ratio: 12.3%  
  - Conceptual & Detailed Design /  
    Manufacture / Installation Supervision /  
    Performance test / |
| 34  | **Incheon International Airport 2nd Tower**  
- Client: Dongyang E&C  
- Outline  
  - Steel & concrete  
  - Height: 93.90m  
  - Frequency:  
    - 0.9560Hz (y-dir)  
    - 1.0231Hz (x-dir)  
  - Damping ratio: 0.6%  
  - Year: 2017  
  |  
  - Type: AMD (2 set)  
  - Control direction: Horizontal bi-dir.  
  - Specification  
    - Moving Mass: 10.4ton(x), 9.2ton(y) (2sets)  
    - Stroke: ±70mm  
    - Optimal damping ratio: 8.39%(x), 9.89%(y)  
  - Achieve damping ratio: 8.19%(x), 6.66%(y)  
  - Conceptual & Detailed Design /  
    Manufacture / Installation /  
    Performance test / |
<table>
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<th>No.</th>
<th>Project</th>
<th>Vibration Control Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td><strong>DUBAI I Ferris Wheel, UAE</strong></td>
<td>• Type: LEG TMD (4ea), Brace TMD (2ea)</td>
</tr>
<tr>
<td></td>
<td>• Client: Hyundai E&amp;C</td>
<td>• Control direction: horizontal dir. (X &amp; Y)</td>
</tr>
<tr>
<td></td>
<td>• Outline</td>
<td>• Specification</td>
</tr>
<tr>
<td></td>
<td>- 4 leg column + Wheel</td>
<td>- Moving mass: 4ton (4ea) &amp; 45ton (2ea)</td>
</tr>
<tr>
<td></td>
<td>- Height: 258m</td>
<td>- Installation location: Leg</td>
</tr>
<tr>
<td></td>
<td>- Diameter of wheel: 250m</td>
<td>- Optimal damping ratio: 10%</td>
</tr>
<tr>
<td></td>
<td>- World’s Highest Ferris Wheel</td>
<td>- Stroke: 250mm (45ton) / 300mm (4ton)</td>
</tr>
<tr>
<td></td>
<td>• Year: In progress</td>
<td>• Conceptual &amp; Detailed Design /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Manufacture / Installation /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Performance test /</td>
</tr>
</tbody>
</table>

| 32  | **Palyung Bridge (Hanger Cable)**                                     | • Type: Stockbridge Damper                                                              |
|     | • Client: Daelim Industries                                           | • Control direction: horizontal dir.                                                     |
|     | • Outline                                                             | • Specification                                                                         |
|     | - Suspension bridge                                                  | - Moving mass: 4.62kg + 7.90 kg                                                         |
|     | - Length: 1340m (310+850+180)                                        | - Messenger Cable: Ф- 16mm                                                               |
|     | - Cable Frequency: 1Hz ~ 40Hz                                        | • Achieve damping ratio : 0.695%                                                         |
|     | - Damping ratio: 0.01%~0.03%                                          | • Conceptual & Detailed Design /                                                         |
|     | • Year: 2016                                                          | • Manufacture / Installation /                                                          |
|     |                                                                      | • Performance test /                                                                    |

<p>| 31  | <strong>Cheonan Cheongsoo Footbridge</strong>                                      | • Type: TMD (1 set)                                                                     |
|     | • Client: Heunglim construction                                       | • Control direction: Vertical dir.                                                       |
|     | • Outline                                                             | • Specification                                                                         |
|     | - Cable Stayed bridge                                                | - Moving mass: 0.75ton (1 set)                                                          |
|     | - Length: 38.15m                                                     | - Stroke: ± 13mm                                                                        |
|     | - Frequency: 1.9296Hz (V)                                            | - Optimal damping ratio: 6.7%                                                           |
|     | - Damping ratio: 0.44%                                                | • Achieve damping ratio: 6.403%                                                         |
|     | • Year: 2015                                                          | • Conceptual &amp; Detailed Design /                                                         |
|     |                                                                      | • Manufacture / Installation /                                                          |
|     |                                                                      | • Performance test /                                                                    |</p>
<table>
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<tr>
<th>No.</th>
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<th>Vibration Control Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td><strong>Ulsan Bridge (Hanger Cable)</strong></td>
<td>Type: Stockbridge damper (120 sets)</td>
</tr>
<tr>
<td></td>
<td>• Client: Hyundai E&amp;C</td>
<td>Control direction: horizontal dir.</td>
</tr>
<tr>
<td></td>
<td>• Outline</td>
<td>Specification</td>
</tr>
<tr>
<td></td>
<td>- Suspension Bridge</td>
<td>- Moving mass: 4.62kg +7.90 kg</td>
</tr>
<tr>
<td></td>
<td>- Length : 1,800m</td>
<td>- Messenger Cable: Φ-16mm</td>
</tr>
<tr>
<td></td>
<td>- Cable Frequency: 1Hz ~ 40Hz</td>
<td>• Achieve damping ratio : 0.35%</td>
</tr>
<tr>
<td></td>
<td>- Damping ratio: 0.016%~0.04%</td>
<td>Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test</td>
</tr>
<tr>
<td></td>
<td>• Year: 2015</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td><strong>Sejong Government Office Footbridge</strong></td>
<td>Type: TMD (3 sets)</td>
</tr>
<tr>
<td></td>
<td>• Client: OK Consultant</td>
<td>Control direction: Vertical dir.</td>
</tr>
<tr>
<td></td>
<td>• Outline</td>
<td>Specification</td>
</tr>
<tr>
<td></td>
<td>- Single span+2span bridge</td>
<td>- Moving mass: 1.0ton (3 sets)</td>
</tr>
<tr>
<td></td>
<td>- Length : 163m</td>
<td>- Installation location: Under the deck</td>
</tr>
<tr>
<td></td>
<td>- Frequency : 2.07Hz</td>
<td>• Achieve damping ratio : 2.12%</td>
</tr>
<tr>
<td></td>
<td>- Damping ratio : 0.92%</td>
<td>Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test</td>
</tr>
<tr>
<td></td>
<td>• Year: 2014</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td><strong>Daehalang Kkochgelang Footbridge</strong></td>
<td>Type: TMD (4 sets)</td>
</tr>
<tr>
<td></td>
<td>• Client : Hyundai Steel</td>
<td>Control direction : Vertical dir.</td>
</tr>
<tr>
<td></td>
<td>• Outline</td>
<td>Specification</td>
</tr>
<tr>
<td></td>
<td>- Cable Stayed bridge</td>
<td>- moving mass : 1.5ton(2ea), 0.6ton(2ea)</td>
</tr>
<tr>
<td></td>
<td>- Length : 260m</td>
<td>- stroke : ±28mm</td>
</tr>
<tr>
<td></td>
<td>- Frequency : 1.9296Hz (V)</td>
<td>- optimal damping ratio : 6.8%</td>
</tr>
<tr>
<td></td>
<td>- Damping ratio : 0.28%</td>
<td>• Achieve damping ratio : 5.4%</td>
</tr>
<tr>
<td></td>
<td>• Year : 2013</td>
<td>Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test</td>
</tr>
<tr>
<td>No.</td>
<td>Project</td>
<td>Vibration Control Device</td>
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<td>-----</td>
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</tr>
</tbody>
</table>
| 27  | **Gangneung Dano Footbridge**  
  - Client: Gangneung City Hall  
  - Outline  
    - 3-span steel Bridge  
    - Length: 108m  
    - Frequency: 2.01Hz (1st V), 3.07Hz (2nd V)  
    - Damping ratio: 0.47%(1st), 0.77%(2nd)  
  - Year: 2013  
  - Type: TMD (3 sets)  
  - Control direction: Vertical dir.  
  - Specification  
    - Moving mass: 1.6ton (1ea), 0.3ton (2ea)  
    - Stroke: ±30mm  
  - Achieve damping ratio: 9.7%(1st V), 9.3%(2nd V)  
  - Conceptual & Detailed Design / Manufacture / Installation / Performance test / |  
| 26  | **Lashing Bridge on Maersk Ship**  
  - Client: DSME  
  - Outline  
    - Lashing Bridge  
    - Height: 8.5m  
    - Frequency: 6.0~8.0Hz  
    - Damping ratio: 0.2%  
  - Year: 2013  
  - Type: TMD (2 sets)  
  - Control direction: Horizontal dir.  
  - Specification  
    - Moving mass: 0.2ton (2 sets)  
    - Stroke: ±15mm  
    - Optimal damping ratio: 8.96%  
  - Achieve damping ratio: 6.81%  
  - Conceptual & Detailed Design / Manufacture / Installation / Performance test / |  
| 25  | **Gang-byun Techno Mart**  
  - Client: Prime Development Co., Ltd  
  - Outline  
    - Shopping Mall & Office  
    - Height: 187m(39-stories)  
    - Frequency: 0.19Hz(Y-Dir.), 2.7Hz(Z-Dir.)  
    - Damping ratio: 1.0% (Y-dir.), 0.3% (Z-dir.)  
  - Year: 2013  
  - Type: HMD (AMD+TMD, 1 sets)  
  - Control direction: Ver. & Hor. dir.  
  - Specification  
    - Moving mass: V.40t(TMD), H.50t(AMD)  
    - Stroke: ±10mm(TMD), ±600mm(AMD)  
    - Optimal damping ratio: 4.63%(TMD)  
  - Achieve damping ratio: 6.7%(x), 6.7%(z)  
  - Conceptual & Detailed Design / Manufacture / Installation / Performance test / |
<table>
<thead>
<tr>
<th>No.</th>
<th>Project</th>
<th>Vibration Control Device</th>
</tr>
</thead>
</table>
| 24  | Songdo 4th Bridge, Tower during Construction & In-service | - Type: TMD (2 sets)  
- Control direction: Horizontal dir.  
- Specification  
  - Moving mass: 6.0 ton (2 sets)  
  - Stroke: ±460mm  
  - Optimal damping ratio: 7.3% ~ 8.3%  
- Achieve damping ratio: 5.76%  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
| 23  | 2nd Jindo Bridge (In-Service Stage) | - Type: TMD (4 sets)  
- Control direction: Vertical dir.  
- Specification  
  - Moving mass: 3.25 ton (4 sets)  
  - Installation location: Steel box girder  
- Achieve damping ratio: 5.75%  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
| 22  | Paju Lotte Premium Outlets Footbridge | - Type: TMD (4 sets)  
- Control direction: Vertical dir.  
- Specification  
  - Moving mass: 0.75 ton (4 sets)  
  - Stroke: ±30mm  
  - Optimal damping ratio: 6.0%  
- Achieve damping ratio: 8.6%  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
<table>
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<tr>
<th>No.</th>
<th>Project</th>
<th>Vibration Control Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td><strong>BEXCO Footbridge</strong></td>
<td>- Type: TMD (2 sets)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Control direction: Vertical dir.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Specification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- moving mass: 1.3ton (2 sets)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- stroke: ±100mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- optimal damping ratio: 3.6%</td>
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<tr>
<td></td>
<td></td>
<td>- Achieve damping ratio: 3.05%</td>
</tr>
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<td>- Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td>20</td>
<td><strong>Ube Steel Stack, Japan</strong></td>
<td>- Type: TMD (2 sets)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Control direction: Horizontal bi-dir.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Specification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Moving mass: 0.24ton (2 sets)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Stroke: ±95mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Optimal damping ratio: 10.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Achieve damping ratio: 3.799%(X), 3.336%(Y)</td>
</tr>
<tr>
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<td></td>
<td>- Conceptual &amp; Detailed Design / Manufacture / Installation Supervision / Performance test /</td>
</tr>
<tr>
<td>19</td>
<td><strong>Ulleungdo Footbridge</strong></td>
<td>- Type: TMD (2 sets)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Control direction: Vertical dir.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Specification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Moving mass: 1.2ton (2 sets)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Stroke: ±30mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Optimal damping ratio: 14.2%</td>
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<tr>
<td></td>
<td></td>
<td>- Achieve damping ratio: 8.69%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Conceptual &amp; Detailed Design / Manufacture / Installation / Performance test /</td>
</tr>
<tr>
<td>No.</td>
<td>Project</td>
<td>Vibration Control Device</td>
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<td>-----------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 18  | **Dongchon Footbridge**       | • Client: Cheonggu E&C.  
• Outline  
- Cable stayed bridge  
- Length: 222m  
- Frequency: 1.63Hz (V)  
- Damping ratio: 0.4%  
• Year: 2011  
• Type: TMD (6 sets)  
• Control direction: Vertical dir.  
• Specification  
- Moving mass: 1.4ton(2ea), 0.4ton(4ea)  
- Stroke: ±30mm  
- Optimal damping ratio: 10.0%  
• Achieve damping ratio: 5.91%  
• Conceptual & Detailed Design /  
  Manufacture / Installation /  
  Performance test / |
| 17  | **Hyundai-steel Stock House** | • Client: Hyundai-steel  
• Outline  
- Long span slab  
- Frequency: 13.6~15.7Hz  
- Damping ratio: 0.3%  
• Year: 2011  
• Type: TMD (38 sets)  
• Control direction: Vertical dir.  
• Specification  
- Leaf spring & silicone damper  
- Moving mass: 0.06ton (38 sets)  
- Stroke: ±25mm  
- Optimal damping ratio: 4.0~6.0%  
• Achieve damping ratio: 2.51%  
• Conceptual & Detailed Design /  
  Manufacture / Installation / Performance test / |
| 16  | **Yeoido Setgang Footbridge** | • Client: Ilkyung E&C.  
• Outline  
- Cable stayed bridge  
- Length: 220m  
- Frequency: 0.94Hz(V), 1.11Hz(H)  
- Damping ratio: 0.6%  
• Year: 2011  
• Type: TMD (4 sets)  
• Control direction: Ver. & Horizontal  
• Specification  
- Moving mass: V:1.2ton(2ea), H:1.2ton(2ea)  
- Stroke: V:±70mm, H:110mm  
- Optimal damping ratio: 2.0%  
• Achieve damping ratio: 4.41%(V), 2.55%(H)  
• Conceptual & Detailed Design /  
  Manufacture / Installation /  
  Performance test / |
<table>
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<tr>
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</table>
| 15  | Pylon of Geoga Bridge | Type: TMD (3 sets)  
Control direction: Longitudinal dir.  
Specification  
- Pendulum type  
- Moving mass: 24.0ton (3 sets)  
- Stroke: ±3000mm  
- Optimal damping ratio: 2.23%  
Achieve damping ratio: 5.38%  
Conceptual & Detailed Design / Manufacture / Installation / Performance test |
|     | • Client: Deawoo E&C  
• Outline  
  - 3-pylon cable stayed bridge  
    (Construction stage)  
  - Height: 101.9m  
  - Frequency: 0.22~0.28Hz  
  - Damping ratio: 0.5%  
• Year: 2010 |
| 14  | POSCO E&C Head Office (A) | Type: TMD (1 set)  
Control direction: Horizontal bi-dir.  
Specification  
- Moving mass: 80.0ton  
- Stroke: ±300mm  
- Optimal damping ratio: 4.5%(X), 4.7%(Y)  
Achieve damping ratio: 4.58%(X), 8.49%(Y)  
Conceptual & Detailed Design / Manufacture / Installation / Performance test |
|     | • Client: POSCO E&C  
• Outline  
  - Height: 185m (39-stories)  
  - Frequency: 0.26Hz(X), 0.24Hz(Y)  
  - Damping ratio: 1.0%  
• Year: 2010 |
| 13  | POSCO E&C Head Office (B) | Type: TMD (1 set)  
Control direction: Horizontal bi-dir.  
Specification  
- Moving mass: 160.0ton  
- Stroke: ±250mm  
- Optimal damping ratio: 6.1%(X), 6.6%(Y)  
Achieve damping ratio: 3.60%(X), 4.94%(Y)  
Conceptual & Detailed Design / Manufacture / Installation / Performance test |
|     | • Client: POSCO E&C  
• Outline  
  - Height: 185m (39-stories)  
  - Frequency: 0.25Hz(X), 0.24Hz(Y)  
  - Damping ratio: 1.0%  
• Year: 2010 |
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</table>
| 12  | **Naksaeng Footbridge**  | - Type: TMD (2 sets)  
- Control direction: Vertical dir.  
- Specification  
  - Moving mass: 0.8ton (2 sets)  
  - Stroke: ±40mm  
  - Optimal damping ratio: 4.7%  
  - Achieve damping ratio: 5.4%  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
|     | Client: Lotte E&C        |                                                                                          |
|     | Outline                  |                                                                                          |
|     | - Cable stayed bridge    |                                                                                          |
|     | - Length: 54m            |                                                                                          |
|     | - Frequency: 1.52Hz(V)   |                                                                                          |
|     | - Damping ratio: 0.6%    |                                                                                          |
|     | - Year: 2009             |                                                                                          |
| 11  | **Alpensis Ski Jump Tower** | - Type:TMD (1set)  
- Control direction: Horizontal bi-dir.  
- Specification  
  - Moving mass: 25.0ton(X), 23.0ton(Y)  
  - Stroke: ±250mm  
  - Optimal damping ratio: 5.6%(X), 5.4%(Y)  
  - Achieve damping ratio: 3.43%(X), 3.43%(Y)  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
|     | Client: Taeyoung E&C     |                                                                                          |
|     | Outline                  |                                                                                          |
|     | - Height: 115m           |                                                                                          |
|     | - Frequency: 0.49Hz(X), 0.39Hz(Y) |                                                                                      |
|     | - Damping ratio: 2.0%    |                                                                                          |
|     | - Year: 2009             |                                                                                          |
| 10  | **Namsan Cable Car**     | - Type: TMD (2sets)  
- Control direction: Transverse  
- Specification (Pendulum Type)  
  - Moving mass: 170kg (2 sets)  
  - Stroke: 700mm  
  - Magnetic Damper  
  - Optimal damping ratio: 7.0%  
  - Achieve damping ratio: 6.564%  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
<p>|     | Client: Namsan Cable Car Way |                                                                                          |
|     | Outline                  |                                                                                          |
|     | - Cable Car              |                                                                                          |
|     | - Weight: 5,600kg        |                                                                                          |
|     | - Total length: 605m     |                                                                                          |
|     | - Frequency: 0.16~0.27Hz  |                                                                                          |
|     | - Damping ratio: 1.0%    |                                                                                          |
|     | - Year: 2009             |                                                                                          |</p>
<table>
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</table>
| 9   | Light Rail Transit, LRT | - Type: TMD (2 sets)  
- Control direction: Vertical dir.  
- Specification  
  - Moving mass: 40kg (2 sets)  
  - Stroke: ±5.0mm  
  - Optimal damping ratio: 7.0%  
- Achieve damping ratio: 2.1%  
- Conceptual & Detailed Design /  
  Manufacture / Installation /  
  Performance test / |
|     | Client: IHI corporation, Japan |  
- Outline  
  - Light Rail Transit  
  - Frequency: 8.0~10.0Hz  
  - Damping ratio: 1.0%(approx.)  
- Year: 2009 |
| 8   | Cheonan Footbridge | - Type: TMD (2 sets)  
- Control direction: Vertical dir.  
- Specification  
  - Moving mass: 0.6ton (2 sets)  
  - Stroke: ±50mm  
  - Optimal damping ratio: 5.0%  
- Achieve damping ratio: 6.985%  
- Conceptual & Detailed Design /  
  Manufacture / Installation /  
  Performance test / |
|     | Client: Human bridge |  
- Outline  
  - Suspension bridge  
  - Length: 63m  
  - Frequency: 2.8Hz(V)  
  - Damping ratio: 0.5%  
- Year: 2008 |
| 7   | Ulsan Lotte Hotel | - Type: AMD (2 sets)  
- Control direction: Horizontal bi-dir.  
- Specification  
  - Moving mass: 20.0ton(X), 10.0ton(Y)  
  - Stroke: ±600mm  
  - Optimal damping ratio: 20.6%(X), 13.9%(Y)  
- Achieve damping ratio: 12.8%(X), 7.5%(Y)  
- Conceptual & Detailed Design /  
  Manufacture / Installation / Performance test / |
|     | Client: IHI corporation, Japan |  
- Outline  
  - Hotel  
  - Height: 110m (24-stories)  
  - Frequency: 0.42Hz(X), 0.36Hz(Y)  
  - Damping ratio: 1.0%  
- Year: 2007 |
<table>
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</tr>
</thead>
</table>
| 6   | Whaseong Dongtan Footbridge | - Type: TMD (6 sets)  
- Control direction: Vertical & Horizontal  
- Specification  
  - Moving mass: 0.6ton (Ver., 4 sets)  
  - 0.6ton (Hor., 2 sets)  
  - Stroke: ±50mm  
  - Optimal damping ratio: 5.0%  
  - Achieve damping ratio: 4.31%(V), 2.50%(H)  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
|     |         | ● Client: KR  
● Outline  
  - Nielsen arch bridge  
  - Length: 87m  
  - Frequency: 2.50Hz(V), 1.57Hz(H)  
  - Damping ratio: 0.5%  
● Year: 2006 |
| 5   | Eunpa Footbridge | - Type: TMD (2 sets)  
- Control direction: Vertical dir.  
- Specification  
  - Moving mass: 0.65ton (2 sets)  
  - Stroke: ±40mm  
  - Optimal damping ratio: 5.0%  
  - Achieve damping ratio: 2.8%  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
|     |         | ● Client: Human bridge  
● Outline  
  - Suspension bridge  
  - Length: 110m  
  - Frequency: 1.77Hz  
  - Damping ratio: 0.5%  
● Year: 2006 |
| 4   | Busan Centumcity | - Type: TMD (3 sets)  
- Control dir: Horizontal dir.  
- Specification  
  - Moving mass: 100ton  
  - Stroke: ±300mm  
  - Optimal damping ratio: 6.0%  
  - Achieve damping ratio: 4.15%(X), 3.90%(Y)  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
|     |         | ● Client: POSCO E&C  
● Outline  
  - Residence building  
  - Weight: 33950ton  
  - Height: 121.7m  
  - Frequency: 0.52Hz(X), 0.47Hz(Y)  
  - Damping ratio: 1.0%  
● Year: 2004 |
<table>
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<tr>
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</tr>
</thead>
</table>
| 1   | Rima Building | - Type: TMD (1 set)  
- Control direction: Vertical dir.  
- Specification  
  - Moving mass: 200kg  
  - Stroke: ±50mm  
  - Optimal damping ratio: 4.0%  
  - Achieve damping ratio: 3.2%  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
| 2   | 2nd Jindo Bridge, Deck during Construction | - Type: TMD (2 sets)  
- Control direction: Horizontal dir.  
- Specification  
  - Moving mass: 12.0ton (2 sets)  
  - Stroke: ±1000mm  
  - Optimal damping ratio: 6.0%  
  - Achieve damping ratio: 5.55%  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |
| 3   | 2nd Jindo Bridge, Tower during Construction | - Type: Sliding Block (2 sets)  
- Control direction: Horizontal dir.  
- Specification  
  - Moving mass: 4.5ton (2 sets)  
  - Stroke: ±385mm  
  - Friction Coefficient: 0.3  
  - Achieve damping ratio: 3.6%  
- Conceptual & Detailed Design / Manufacture / Installation / Performance test |