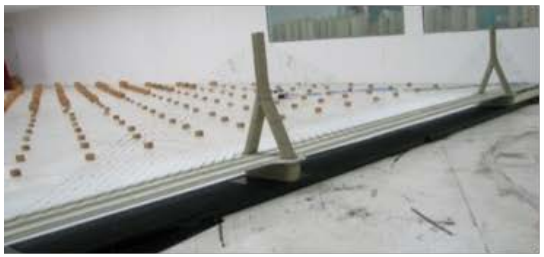
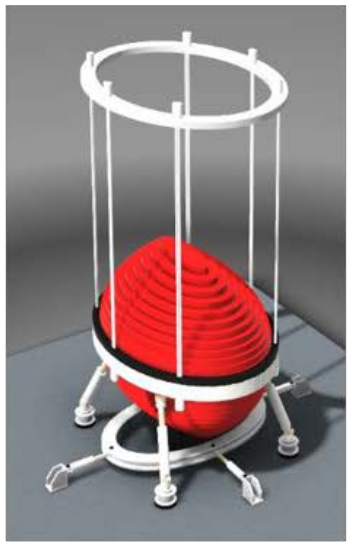
TE Solution
Total Engineering Solution
in Wind Engineering and Vibration Control

TRACK RECORD OF
VIBRATION CONTROL DEVICE










Project	Vibration Control Device

Taichung Bauger Building

▪ Client: CEC
(Continental Engineering Orporation)
▪ 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(xdir) 1.35m(y-dir)
- Optimal damping ratio : 12.3%

▪ Conceptual & Detailed Design /
/ Manufacture / Installation /
/ Performance test /

Incheon International Airport (2nd)

▪ Client : Dongyang E&C
▪ Outline
- Steel & concrete
- Height : 93.90m
- Frequency :
  0.9560Hz (y-dir) -1st
  1.0231Hz (x-dir) -2nd
- Damping ratio : 0.6%

▪ Year: In progress

▪ Type : HMD (2 set)
▪ Control direction : Horizontal x, y-dir.
▪ Specification
- Moving Mass :
  x-dir : 10.4ton + y-dir : 9.2ton (2sets)
- Stroke: ±70mm
- Optimal damping ratio: 8.39%(x), 9.89%(y)

▪ Conceptual & Detailed Design /
/ Manufacture / Installation /
/ Performance test /

DUBAI EYE

▪ Client : Hyundai E&C
▪ Outline
- 4 leg column+Wheel
- Height: 258m
- Diameter of wheel: 250m

▪ Year: In progress

▪ Type : LEG TMD (4ea),Brace TMD(2ea)
▪ Control direction : horizontal dir.(X&Y)
▪ Specification
- Moving mass: 4ton(4ea) & 45ton(2ea)
- Installation location: Leg
- Optimal damping ratio: 10%
- Stroke: 250mm (45ton) / 300mm(4ton)

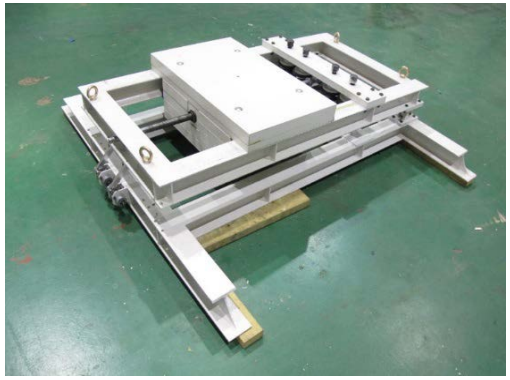
▪ Conceptual & Detailed Design /
/ Manufacture / Installation /
/ Performance test /

Project	Vibration Control Device

Cheonan Cheongsoo Footbridge

▪ Client: Heunglim construction
▪ Outline
- Cable Stayed bridge
- Length: 38.15m
- Frequency: 1.9296Hz (V)
- Damping ratio: 0.5%

▪ Year: 2015



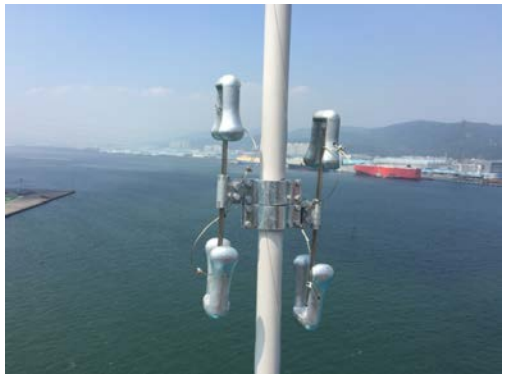
▪ Type: TMD (1 set)
▪ Control direction: Vertical dir.
▪ Specification
- Moving mass: 0.75ton(1 set)
- Stroke : ±13mm
- Optimal damping ratio: 6.7%

▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Ulsan Bridge

▪ Client: Hyundai E&C
▪ Outline
- Suspension Bridge
- Length : 1,800m
- Cable Frequency: 1Hz ~ 40Hz
- Damping ratio: 0.016%~0.04%

▪ Year: 2015



▪ Type: Stockbridge damper (120 sets)
▪ Control direction: horizontal dir.
▪ Specification
- Moving mass: 4.62kg +7.90 kg (1set)
- Messenger Cable: ¢-16mm

▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

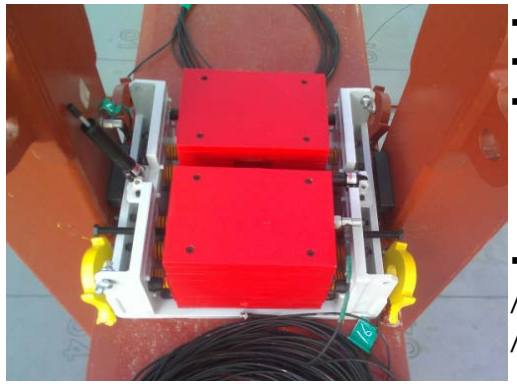
Sejong Connection Bridge

▪ Client: OK Consultant
▪ Outline
- Single span+2span bridge
- Length : 163m

▪ Year: 2014

▪ Type: TMD (3 sets)
▪ Control direction: Vertical dir.
▪ Specification
- Moving mass: 1.0ton (3 sets)
- Installation location: Under the deck

▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

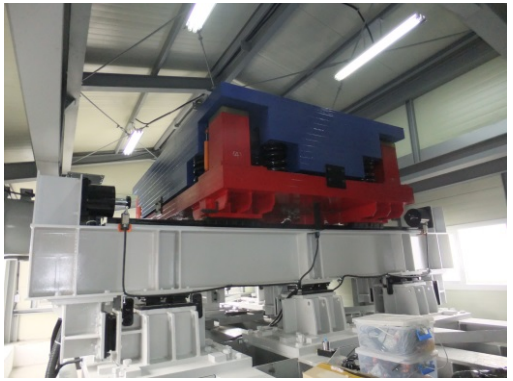
Project	Vibration Control Device
 **Baeksajang Habor Footbridge** ▪ Client : Hyundai ESI ▪ Outline - Cable Stayed bridge - Length : 260m - Frequency : 1.9296Hz (V) - Damping ratio : 0.5% ▪ Year : 2013	 ▪ Type : TMD (4 sets) ▪ Control direction : Vertical dir. ▪ Specification moving mass : 1.5ton (2 sets)+0.6ton (2 sets) - stroke : ±28mm - optimal damping ratio : 6.8% ▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /
 **Gangneung Dan-o 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 (1 set)+0.3ton (2 sets) - Stroke : ±30mm ▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /
 **Lashing Bridge on Maersk Ship** ▪ Client : DSME ▪ Outline - Lashing Bridge - Hight: 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% ▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Project	Vibration Control Device

Gang-byun Techno Mart

▪ Client: Prime Development Co., Ltd
▪ Outline
- Shoping 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



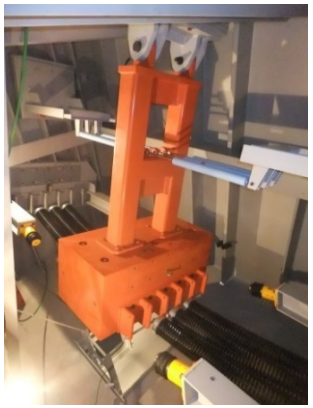
▪ Type: HMD (AMD+TMD,1 sets)
▪ Control direction: Ver. & Hor. dir.
▪ Specification
- Moving mass: 40t(TMD), 50t(AMD)
- Stroke: ±10mm(TMD), ±600mm(AMD)
- Optimal damping ratio: 4.63%(TMD)

▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Songdo 4th Bridge

▪ Client : GS E&C
▪ Outline
- Cable stayed bridge
- Length: 392m
- Frequency: 0.351Hz~0.645Hz (During Construction)
- Damping ratio: 0.4%

▪ Year: 2013



▪ 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%

▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

2nd Jindo Bridge

▪ Client: Hyundai E&C
▪ Outline
- Cable stayed bridge
- Length: 484m

▪ Year: 2012

▪ Type: TMD (4 sets)
▪ Control direction: Vertical dir.
▪ Specification
- Moving mass: 3.25ton (4 sets)
- Installation location: Steel box girder

▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Project	Vibration Control Device

Paju Lotte Outlets Footbridge

▪ Client: Lotte Shopping
▪ Outline
- 2-span steel bridge
- Length: 93m
- Frequency: 1.78Hz (V)
- Damping ratio: 0.76%

▪ Year: 2012

▪ Type: TMD (4 sets)
▪ Control direction: Vertical dir.
▪ Specification
- Moving mass: 0.75ton (4 sets)
- Stroke: ±30mm
- Optimal damping ratio: 6.0%

▪ Conceptual & Detailed Design /
/ Manufacture / Installation /
/ Performance test /

BEXCO Footbridge

▪ Client: Seung Hwa Plant
▪ Outline
- Cable stayed bridge
- Length: 82m
- Frequency: 1.60Hz (V)
- Damping ratio: 0.7%

▪ Year: 2012

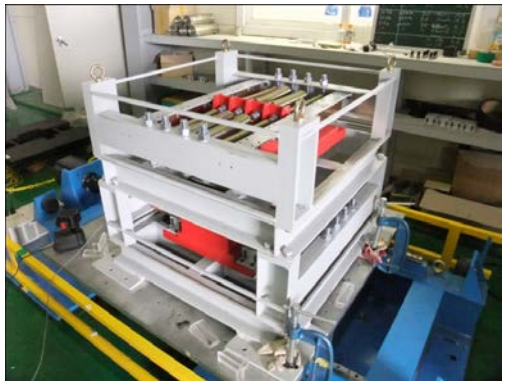
▪ Type : TMD (2 sets)
▪ Control direction : Vertical dir.
▪ Specification
- moving mass : 1.3ton (2 sets)
- stroke : ±100mm
- optimal damping ratio : 3.6%

▪ Conceptual & Detailed Design /
/ Manufacture / Installation /
/ Performance test /

Steel Stack

▪ Client: Hitachi Zosen (JAPAN)
▪ Outline
- Steel chimney
- Height: 50m
- Frequency: 1.567Hz(X,Y)
- Damping ratio: 1.27%(X), 1.02%(Y)

▪ Year: 2011



▪ Steel Stack
▪ Client : Hitachi Zosen (JAPAN)
▪ Outline
- Steel chimney
- Height: 50m
- Frequency: 1.567Hz(X,Y)
- Damping ratio: 1.27%(X) , 1.02%(Y)

▪ Year : 2011

Project	Vibration Control Device
 **Ulleungdo Footbridge** ▪ Client: New-millennium E&C ▪ Outline - Suspension bridge - Length: 140m - Frequency: 1.80Hz(V) - Damping ratio: 0.4% ▪ Year: 2011	 ▪ Type: TMD (2 sets) ▪ Control direction: Vertical dir. ▪ Specification - Moving mass: 1.2ton (2 sets) - Stroke: ±30mm - Optimal damping ratio: 14.2% ▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /
 **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 (2 sets), 0.4ton (4 sets) - Stroke: ±30mm - Optimal damping ratio: 10.0% ▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /
 **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% ▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Project	Vibration Control Device

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 (2 sets)
  H. 1.2ton (2 sets)
- Stroke: V :±70mm, H : 110mm
- Optimal damping ratio: 2.0%
▪ Conceptual & Detailed Design /
/ Manufacture / Installation /
/ Performance test /

Pylon of Geoga Bridge

▪ Client: Deawoo E&C
▪ Outline
- 3-pylon cable stayed bridge
  (Construction stage)
- Length : 676m
- Frequency : 0.22~0.28Hz
- Damping ratio : 0.5%
▪ Year: 2010

▪ Type: TMD (3 sets)
▪ Control direction: Longitudinal dir.
▪ Specification
- Pendulum type
- Moving mass: 24.0ton (3 sets)
- Stroke: ±3000mm
- Optimal damping ratio: 2.23%
▪ Conceptual & Detailed Design /
/ Manufacture / Installation /
/ Performance test /

POSCO E&C Head Office (A)

▪ Client: POSCO E&C
▪ Outline
- Height: 185m(39-stories)
- Frequency: 0.26Hz(X), 0.24Hz(Y)
- Damping ratio: 1.0%
▪ Year: 2010

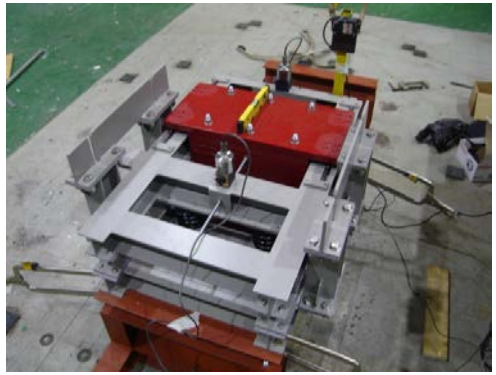
▪ Type: TMD (1 set)
▪ Control direction: Horizontal bi-dir.
▪ Specification
- Moving mass : 80.0ton
- Stroke : ±300mm
- Optimal damping ratio: 4.5%(X), 4.7%(Y)
▪ Conceptual & Detailed Design /
/ Manufacture / Installation /
/ Performance test /

Project	Vibration Control Device

POSCO E&C Head Office (B)
- Client : POSCO E&C
- Outline
  - Height: 185m(39-stories)
  - Frequency: 0.25Hz(X), 0.24Hz(Y)
  - Damping ratio: 1.0%
- Year: 2010

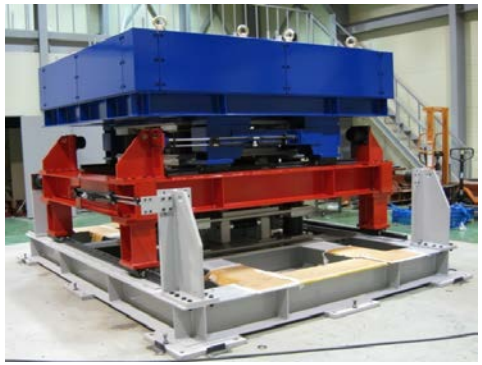
- Type: TMD (1 set)
- Control direction: Horizontal bi-dir.
- Specification
  - Moving mass : 160.0ton
  - Stroke : ±250mm
  - Optimal damping ratio : 6.1%(X), 6.6%(Y)
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Naksaeng Footbridge
- Client: Lotte E&C
- Outline
  - Cable stayed bridge
  - Length: 54m
  - Frequency: 1.52Hz(V)
  - Damping ratio: 0.6%
- Year: 2009



- Type: TMD (2 sets)
- Control direction: Vertical dir.
- Specification
  - Moving mass: 0.8ton (2 sets)
  - Stroke: ±40mm
  - Optimal damping ratio: 4.7%
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Alpensia Ski Jump Tower
- Client : Taeyoung E&C
- Outline
  - Height : 115m
  - Frequency : 0.49Hz(X), 0.39Hz(Y)
  - Damping ratio : 2.0%
- Year : 2009



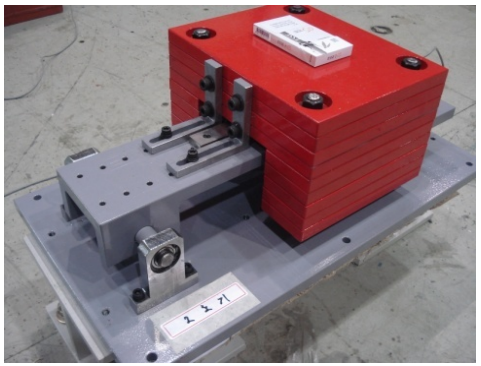
- Type : TMD (1set)
- Control direction : Horizontal bi-dir.
- Specification
  - Moving mass : 25.0ton(X), 23.0ton(Y)
  - Stroke : ±250mm
  - Optimal damping ratio : 5.6%(X), 5.4%(Y)
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Project	Vibration Control Device

Namsan Cable Car
- Client: Namsan Cable Car Way
- Outline
  - Cable Car
  - Weight: 5,600kg
  - Frequency: Variable
  - Damping ratio: 1.0%
- Year: 2009

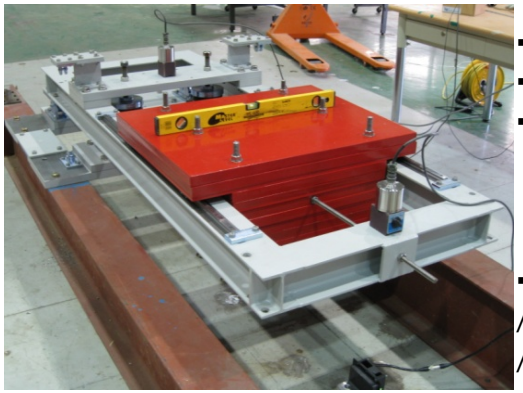
- Type: TMD (2sets)
- Control direction: Transverse
- Specification (Pendulum Type)
  - Moving mass : 170kg (2 sets)
  - Stroke : 700mm
  - Magnetic Damper
  - Optimal damping ratio : 7.0%
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Light Rail Transit, LRT
- Client: IHI Corporation
- Outline
  - Light Rail Transit
  - Frequency: 8.0~10.0Hz
  - Damping ratio: 0.5%(approx.)
- Year: 2009



- Type: TMD (2 sets)
- Control direction: Vertical dir.
- Specification
  - Moving mass: 40kg (2 sets)
  - Stroke: ±5.0mm
  - Optimal damping ratio: 7.0%
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Cheonan Footbridge
- Client: Human bridge
- Outline
  - Suspension bridge
  - Length: 63m
  - Frequency: 2.8Hz(V)
  - Damping ratio: 0.5%
- Year: 2008

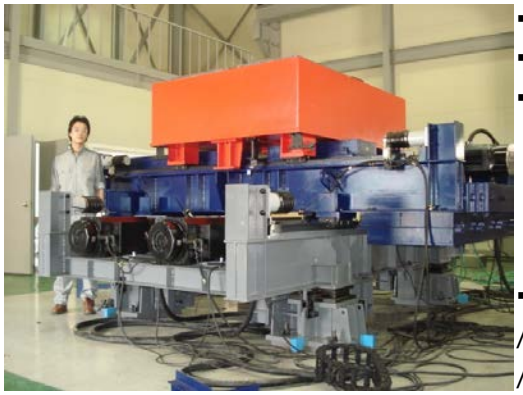


- Type: TMD (2 sets)
- Control direction: Vertical dir.
- Specification
  - Moving mass : 0.6ton (2 sets)
  - Stroke : ±50mm
  - Optimal damping ratio : 5.0%
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Project	Vibration Control Device

Ulsan Lotte Hotel

- Client: IHI corporation,
- Outline
  - Hotel
  - Height: 110m (24-stories)
  - Frequency: 0.42Hz(X), 0.36Hz(Y)
  - Damping ratio: 1.0%
- Year: 2007



- 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)
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

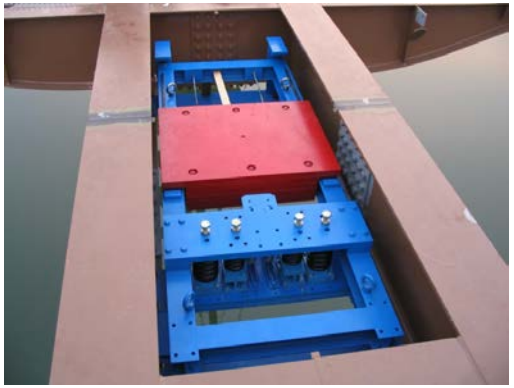
Whaseong Dongtan Footbridge

- Client: KR
- Outline
  - Nielsen arch bridge
  - Length: 87m
  - Frequency: 2.50Hz(V), 1.57Hz(H)
  - Damping ratio: 0.5%
- Year: 2006

- 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%
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Eunpa Footbridge

- Client: Human bridge
- Outline
  - Suspension bridge
  - Length: 110m
  - Frequency: 1.77Hz
  - Damping ratio: 0.5%
- Year: 2006



- Type: TMD (2 sets)
- Control direction: Vertical dir.
- Specification
  - Moving mass: 0.65ton (2 sets)
  - Stroke: ±40mm
  - Optimal damping ratio: 5.0%
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Project	Vibration Control Device

Busan Centumcity
- Client: POSCO E&C
- Outline
  - Residence building
  - Weight: 33950ton
  - Frequency: 0.52Hz(X), 0.47Hz(Y)
  - Damping ratio: 1.0%
- Year: 2004

- Type: TMD (3 sets)
- Control dir : Horizontal dir.
- Specification
  - Moving mass: 100ton
  - Stroke: ±300mm
- Optimal damping ratio: 6.0%
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

2nd Jindo Bridge
- Client: Hyundai E&C
- Outline
  - Construction stage
  - Cable stayed bridge
  - Length: 484m
  - Frequency: 0.44Hz
  - Damping ratio: 0.4%
- Year: 2003

- Type: TMD (2 sets)
- Control direction: Horizontal dir.
- Specification
  - Moving mass : 12.0ton (2 sets)
  - Stroke : ±1000mm
  - Optimal damping ratio : 6.0%
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test

Rima Building
- Client: Rima
- Outline
  - Slab vibration due to traffic load
  - Frequency: 10.5Hz(Z)
  - Damping ratio: 2.0%
- Year: 2001

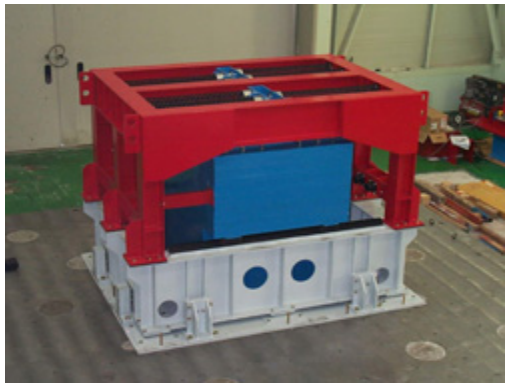
- Type: TMD (1 set)
- Control direction: Vertical dir.
- Specification
  - Moving mass : 200kg
  - Stroke : ±50mm
  - Optimal damping ratio : 4.0%
- Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Project	Vibration Control Device

Yangyang International Airport

▪ Client: Hanjin heavy industries
▪ Outline
- Airtraffic control tower
- Height: 80.1m
- Frequency: 0.39Hz(X), 0.66Hz(Y)
- Damping ratio: 1.0%

▪ Year: 2000



▪ Type: TMD (1 set)
▪ Control direction: Horizontal dir.
▪ Specification
- Moving mass: 15.0ton
- Stroke: ±300mm
- Optimal damping ratio: 5.0%

▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /

Incheon International Airport

▪ Client: Kumho E&C
▪ Outline
- Airtraffic control tower
- Height: 100.4m
- Frequency: 0.71Hz(X), 0.74Hz(Y)
- Damping ratio: 0.6%

▪ Year: 2000

▪ Type: HMD (2 sets)
▪ Control direction: Horizontal bi-dir.
▪ Specification
- Moving mass: 6.78ton(X), 9.23ton(Y)
- Stroke: ±350mm
- Optimal damping ratio: 15.0%

▪ Conceptual & Detailed Design / / Manufacture / Installation / / Performance test /