



HISISM

ANTISEISMIC DEVICES

Temburong Bridge
Brunei



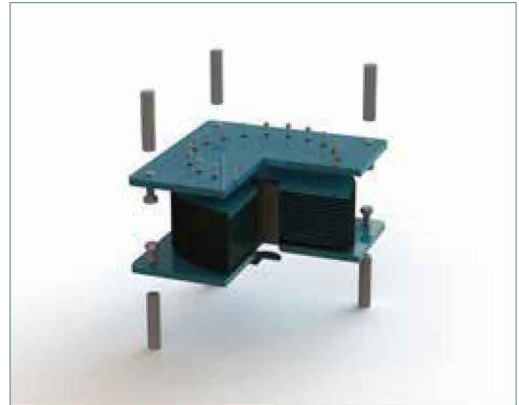
www.cecobearings.com | www.hirun.eu

Dependable Joining Technology



HILEAD Low Damping Rubber Bearings LDRB

They are similar to the HDRB but have an equivalent viscous damping
They may be used in low seismic areas or in combination with other kinds of rubber isolators, LRB or HDRB



Low damping rubber bearing

Sliders

Sliders are not base isolators as they have no damping and no re-centering capacity.

They may be combined with rubber isolators to reduce the stiffness of the base isolation system and therefore increase the natural period
They consist of free sliding bearings and may be pot, spherical or elastomeric bearings with sliding surfaces.

Sliders will not vary their height when the lateral displacement is applied and therefore:

- They cannot be combined with sliding pendulum isolators
- When combined with LRB and HDRB their supplementary deflection when the lateral displacement is applied shall be carefully computed. The structure shall be carefully verified taking into account the differential deflection of the sliders and the isolators.



Free sliding pot or spherical bearings may be used as sliders.



Example of linear iteration analysis for a HISLIDE isolator

The iteration may be performed with a very simple excel table

1. First step is to introduce the input values:

- Weight supported by the isolator
- Equivalent radius
- Dynamic friction
- Definition of the spectrum
- A tentative displacement

2. Second step is to calculate the other values (stiffness period, etc) using the mathematical model of the isolators

3. Third step is to input the obtained displacement in the second iteration

4. The procedure is completed when the input displacement is equal to the output

PENDULUM - ITERATION ANALYSIS - NOMINAL VALUE							
	Symbol	Formula	Unit	1	2	3	4
weight	V	input	kN	1000	1000	1000	1000
friction coefficient	μ	input		0,05	0,05	0,05	0,05
equivalent radius	R	input	mm	8000	8000	8000	8000
displacement guessed	D ₀	input	mm	400	389,6	384,9	382,7
stiffness	K _{eff}	$V \left(\frac{1}{R} + \frac{\mu}{D_0} \right)$	kN/mm	0,25	0,25	0,25	0,26
period	T _{eff}	$2\pi \sqrt{\frac{V}{K_{eff}g}}$	s	4,01	3,99	3,97	3,97
equivalent viscous damping	ξ	$\frac{2}{\pi} \left(\frac{\mu}{\mu + \frac{D_0}{R}} \right)$	%	31,8	32,2	32,4	32,5
damping coefficient	η	$\sqrt{\frac{10}{5 + \xi}}$		0,521	0,513	0,517	0,516
acceleration	A	$\frac{g\eta S_{D1}}{T_{eff}}$	m/s ²	0,956	0,956	0,957	0,957
displacement	D	$A \left(\frac{T_{eff}}{2\pi} \right)^2$	mm	389,6	384,9	382,7	381,6
horizontal load	H	$V \left(\frac{D}{R} + \mu \right)$	kN	99	98	98	98
Spectrum definition							
Reference acceleration	S _{D1}	g		0,750			



Standard

Normally HIRUN Sliding Pendulum Isolators are designed, manufactured and tested in accordance with EN 15129 and CE marked with supervision of the Notified Body ICECON that executes the regular audit visits as foreseen by the EN standard.

Quality Assurance

The whole production of CECO-HIRUN is subjected to a quality assurance program in accordance with ISO 9000 certified by CQC, member of the International Mutual Acknowledgment Body IQNET. In addition the production of the Sliding Pendulum Isolators is subjected to a specific quality assurance program in accordance with EN 15129 Annex ZA for the CE marking with the supervision of the Notified Body ICECON. (The relevant certificates are shown on the side)

Sliding Materials

CECO-HIRUN developed outstanding sliding materials:

- HI-3 mainly for use in spherical bearings
- HI-M and HI-H for use in sliding pendulum isolators.
- Here below a comparison table of the most commonly used sliding materials

For the sliding pendulum isolators a dynamic friction from 3 to 9%, according to the Engineers's requirements, can be granted



SLIDING MATERIAL PROPERTY	PTFE	HI-3	HI-M	HI-H
Compressive strength	90 MPa	180 MPa	270 MPa	180 MPa
Heat resistance (long term)	48°C	90°C	120°C	90°C
Heat resistance (short term)	80°C	120°C	180°C	180°C
Wear resistance	10,000 m	50,000 m	50,000 m	10,000 m
Static friction	<3%	<3%	<6%	<10%
Dynamic friction	<3%	<3%	2,5%	6 10%



Corrosion protection

The corrosion protection of structural steel is normally performed in accordance with EN ISO 12944.

The working life of the protective coating system on the bearing can be assumed to be fulfilled with a protective system designed for the durability "high" of more than 15 years in accordance with EN ISO 12944-5:2007, 5.5 for corrosivity category C5-I (I=industrial) for inland locations and C5-M (M=marine) for sea side locations.

Surfaces in contact with concrete need no corrosion protection, however a layer of 50 µm of the first pack is applied in order to prevent oxidation during the storage before the installation. A return of at least 50 mm is applied.

In alternative paint will conform to the Project specifications, as specified by the purchaser

Fire resistance

HISLIDE Isolators are fire resistant and don't require special precautions to protect them from the fire. After a fire event an inspection is recommended and, depending on the fire intensity, the sliding material may need to be replaced

Fixings

The HISLIDE Sliding Pendulum isolators are provided with fixings made with bolts or dowels according to the type of structure. The fixing are connected to the Isolator in such a way to allow the easy replacement if necessary.

Fuses

In case of use of the HISLIDE Isolators in railway bridges it is recommended the use of mechanical fuses in order to grant the fixity of the bridge under service condition. In case of a strong earthquake the fuses will be sheared of and the isolators can start their antiseismic function



References



Asan Cheonan Expressway
South Korea



Bursa Hospital
Turkey



Dintai Building
Taiwan



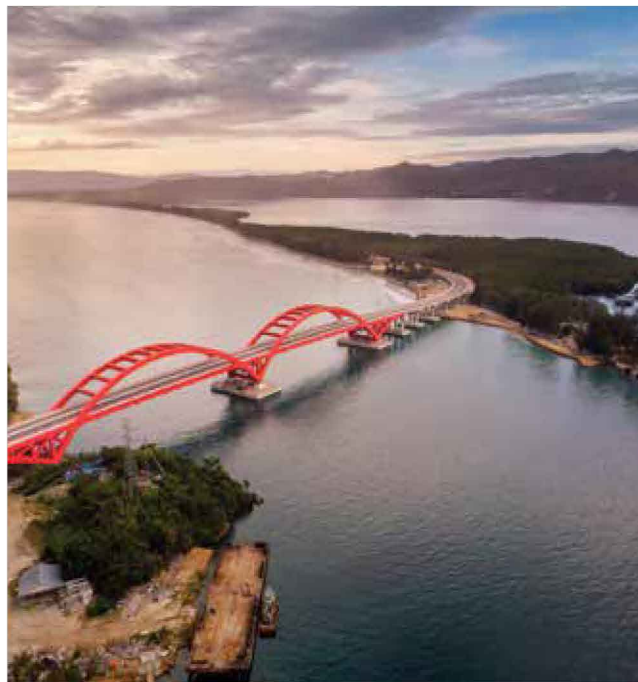
Green Museum
Taiwan



References



Cibubur LRT
Jakarta, Indonesia



Holtekamp bridge
Turkey



Kerch bridge
Russia, Crimea

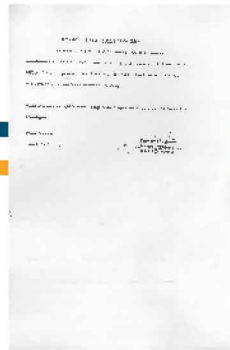
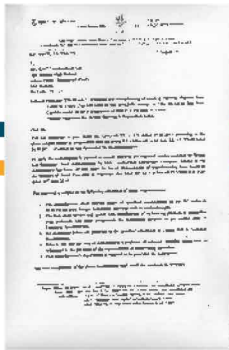
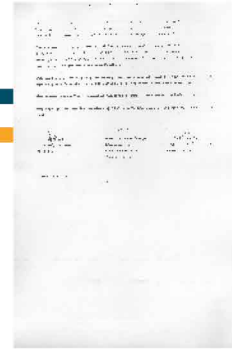
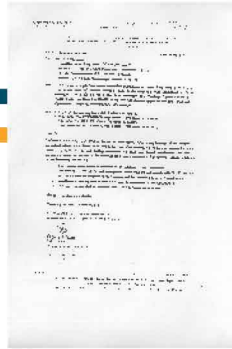
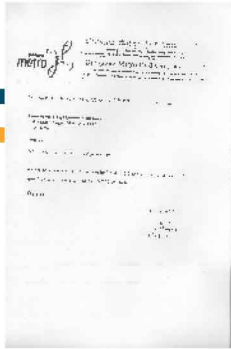


Casaclima
Rimini, Italy



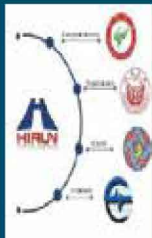
APPROVALS, APPRECIATIONS

CECO has long list of approvals, appreciation letters and satisfactory performance reports issued from various government agencies, many Indian & International consultants those who are working in India.



QUALITY CERTIFICATIONS

Hirun International and its partners cooperate with important international institutions in order to guarantee the test performances and the advanced research on materials and products



QUALITY

EUROPEAN CERTIFICATION - CE MARK



EUROPEAN CERTIFICATION - ETA

HIRUN INTERNATIONAL is actively working with its partner to obtain the European Technical Assessment for all its advanced products like special sliding materials, post tensioning kit, expansion joints

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