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Earthquake Protection for Buildings and Structures

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Maximum Safety and Reliability through Earthquake Protection

Spring Viscodamper¤ Combination

Numerous countries have to live with the constant threat of earthquakes. Not only are machines, technical equipment, buildings in danger of being damaged or destroyed, but life-essential facilities and human life itself are also at risk.

GERB has taken up the challenge of providing solutions that protect against such natural disasters. Engineering, project development, suitable devices and all necessary support can be supplied from a single-source.

Benefit from Experience of Many Decades

GERB has been supplying earthquake-proof, visco-elastic devices for heavy machinery of various kinds for decades. For example, appropriately designed elastic supports have been protecting turbo generators in both conventional and nuclear power plants in many countries against damage from earthquakes.

These ideas have been developed consequently, and nowadays efficient seismic protection strategies can be provided for machinery, technical equipment, buildings and many other kinds of structures.

Spring elements and dampers are effective against ground settlements, vibrations and structure borne noise and can successfully be used for earthquake protection purposes. During many years, it has been proven that machines, equipment and buildings with such devices have survived powerful earthquakes in many seismically prone areas of the world.

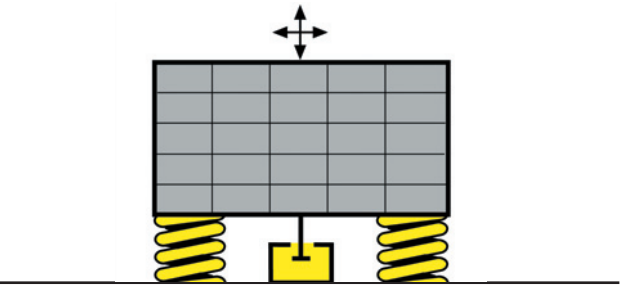
High Voltage Reactors with Earthquake Protection (California, USA)

Protecting Highly-Sensitive Facilities

GERB s fields of activities include providing solutions for reliable protection against earthquakes for conventional, nuclear and petrochemical facilities as well as high-voltage installations such as substation equipment and other fields. Natural earthquakes — with combined horizontal and vertical excitation — frequently produce very high stress and strain levels in structures as well as unacceptable accelerations. Systems comprising helical spring elements and Viscodampers have proven to be particularly suitable against these effects.

Spent Fuel Storage Tank with Earthquake Protection System

Private Buildings with GERB Base Control System
(Los Angeles, California)



Base Control System (BCS)

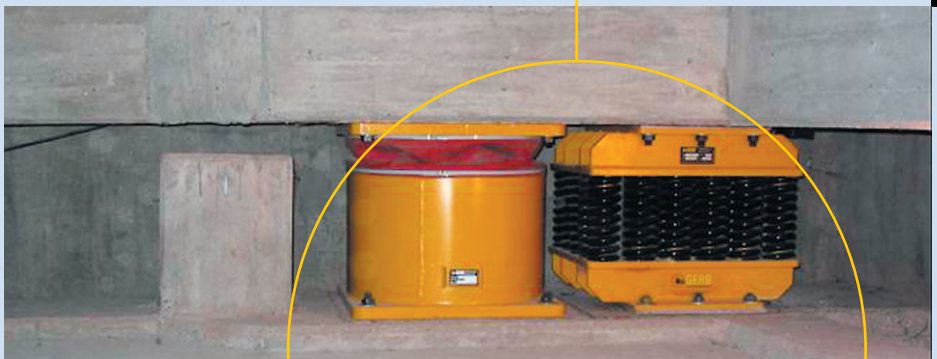
Building Protection Featuring the 'Base Control System'

GERB offers diverse solutions for the protection of buildings against earthquakes. The most effective is the Base Control System (BCS). Providing 3-dimensional elastic support for buildings this system not only offers protection against horizontal forces but shows all its efficiency against the combination of horizontal and vertical excitation (natural earthquakes). This protection is made possible through the utilisation of helical coils with large spring deflection characteristics and complementary Viscodampers that have been specially developed for this task.

The solution incorporates GERB's extensive experience gained from providing elastic building supports against soil-subsidence and vibration by underground rail and road traffic. First applications of the Base Control System have now been in use for more than 15 years — they have proved their efficiency, for instance, during the Northridge earthquake in 1994.

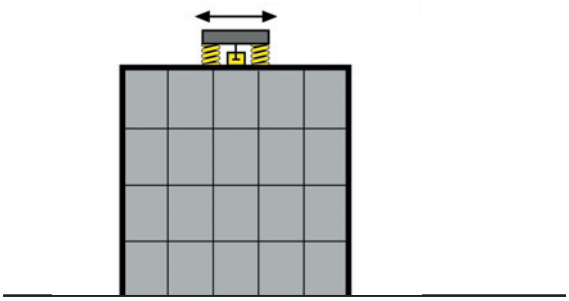
In addition to the protection of human lives the Base Control System provides the possibility to achieve defined performance levels of the building for potential earthquake scenarios. Prevention of damage and corresponding repair cost can also be a possible objective as well as the full functionality of the building after a major earthquake event.

Spring Supported Students Home
(Mendoza University, Argentinia)

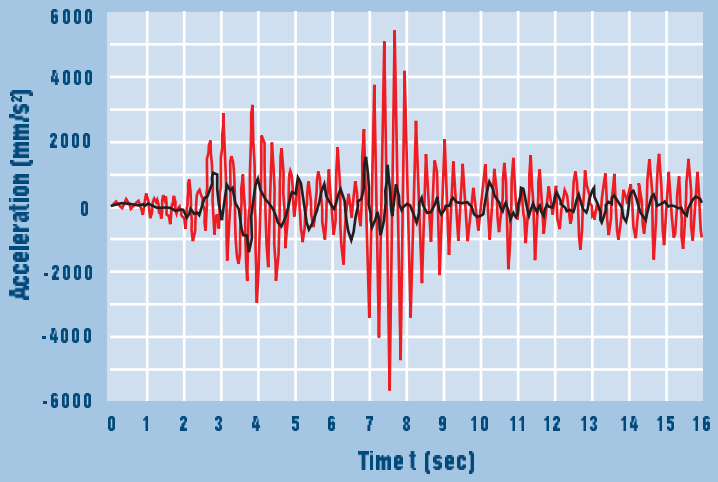


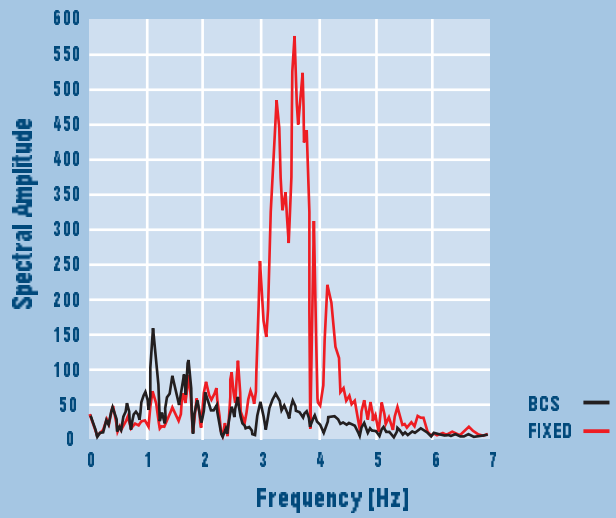
Spring Unit and Viscodamper¤

Shaking Table Test
(Skopje University, Macedonia)



Tuned Mass Control System (TMCS)



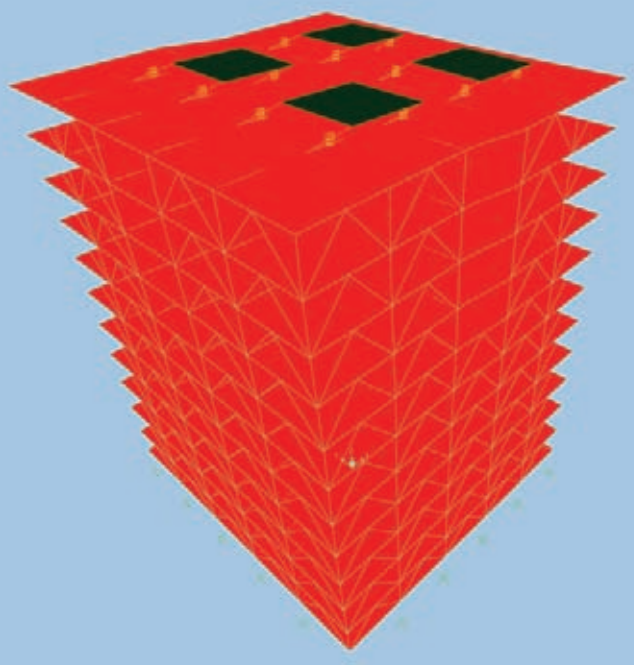


Tuned Mass Control Systems put Safety First

Tuned Mass Control Systems (TMCS) provide passively working earthquake protection. They absorb horizontal forces and are practically maintenance-free. Requiring no electrical power supply or any other form of drive or control mechanism they are immediately effective when an earthquake strikes. They are particularly easy to install in existing buildings — without interrupting the use of the building.

The development of seismically efficient TMCS is based on the vast experience from Tuned Mass Damper systems working against wind and men-induced vibration world-wide. International co-operations and acknowledged researchers in the field of seismic protection made it possible that today GERB can provide Tuned Mass Control Systems for many applications. Herewith, new buildings can be improved in their seismic resistance and the TMCS can also be used for the upgrade of the seismic performance in existing buildings.

In this context it is a very interesting possibility for sensitive buildings such as hospitals, office and residential buildings as well as industrial structures.



Seismic Retrofit (TMCS) of a Multistory Building

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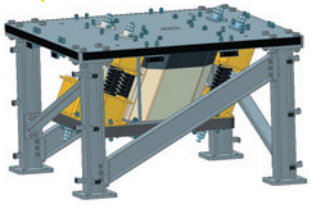
Earthquake Protection and Vibration Isolation in Seismically Prone Areas

Reference List (Excerpt)

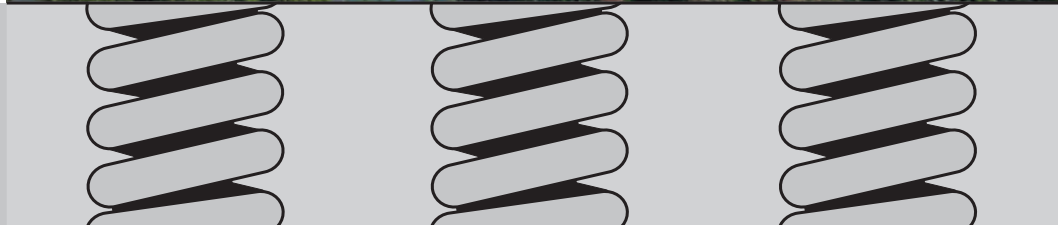
Country	Project	Structure
Argentinia	Students Building, Mendoza Rabotnitschesko Delo, Sofia Economedia, Sofia	Apartment Building MAN-Roland Printing Machine KBA Printing Machine
Chile	MTU	Diesel Engine Test Stand
China	HVOC Transmission Line Xi n Capacitor Works Tangshan Nokian Capacitors	AC Filter Capacitor Banks Capacitor Banks Waldrich Siegen Roll Grinder Capacitor Banks
Colombia	Barranquilla	2 Steam Turbines 71 MW
Dominican Republic	Monte Rio Union Fenosa	Caterpillar Motors MAN Diesel-Gensets
Germany	Enrichment Plant	Various Pumpsets
Greece	Concert Hall, Athens Meliti Achlada Megalopolis	Studio Room Alstom Coal Mill Steam Turbine Deck 300 MW
Honduras	Elcatex	Diesel-Gensets
India	Barh Power Plant	SteamTurbine Deck 500 MW
Indonesia	Medan	Alsthom Steam Turbines 65 MW
Italy	Toranto Tavazzano	Schiele Fans Steam Turbines 320 MW
Japan	Fuji Tecnica Kikuchi Press Toyota Motomachi	3-D Measuring Machine AIDA 2500 t Press Komatsu 2400 t Tandem Press
Korea	Nuclear Power Plant Lotti Jamsil Mando	Emergency Diesel Generator Niigata Diesel-Gensets Hydro Pulse Shaking Platforms
Mexico	VW Mexico Mexico-City	M ller-Weingarten Cross Bar Press MAN-Roland Printing Machine
New Zealand	Spezielektra	Air Core Reactor
Peru	Tintaya	Diesel-Gensets
Switzerland	NPP G sgen NPP Leibstadt	Spent Fuel Storage Tank Turbine Deck 900 MW
Taiwan	Hsinchu Lungmen Nuclear Plant QRDC Building China Times	Glas Fiber Draw Towers AVK Diesel Generator Sets Control Switchboards & Panels PDD for a Steel Roof Heidelberg Printing Press
Turkey	Coskun z, Bursa Seyit mer Power Plant Zonguldak Power Plant	20 Presses, 400, 800, 1200 tons Coal Mills Boiler Structure
USA	Lowe Residence, Los Angeles Sylmar Converter Station, California Los Angeles	Residential Buildings Air Core Reactors Steam Turbine
Venezuela	AEG-Telefunken Cadafe	Control Switchboards Steam Turbine Decks 400 MW

Roof Connection to
Prestressed Damping Device



Prestressed Damping Device (PDD)

Office Building with Prestressed Damping Device
(Taiwan)



GERB
worldwide

GERB engineers are pleased to offer you their support and advice on earthquake protection strategies. Contact us.

**Earthquake protection is not an off-the-shelf product.
GERB offers optimised solutions to meet your individual needs.**

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