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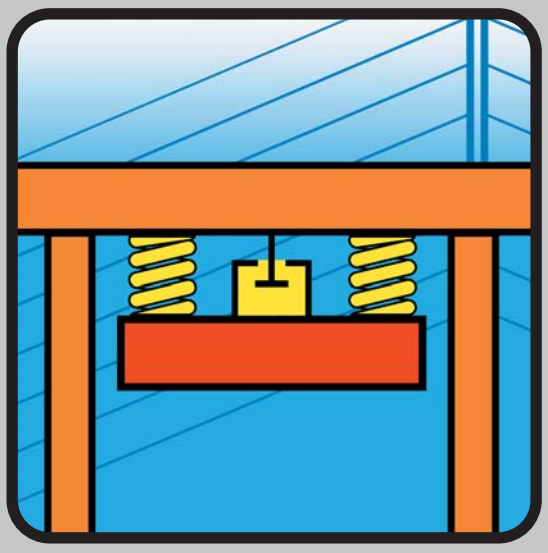


Vibration Protection for Structures, Buildings, Machinery and other Equipment with Tuned Mass Dampers

GERB
Vibration Control Systems

Vibration Protection for Structures, Buildings, Machinery and other Equipment with GERB Tuned Mass Dampers

Wide span structures such as bridges, stairs, and roofs, as well as tall, narrow structures such as chimneys, antennas, masts and buildings, can be easily excited to high vibration amplitudes in their first or higher eigenforms. Excitations can be caused by wind forces, pedestrian traffic, machinery or earthquakes. Natural frequencies and damping are typically low for these structures. With GERB tuned mass dampers (TMD), these vibrations can be easily reduced.

All GERB TMDs, both vertical or horizontal, have three main components:
Spring or pendulum – Oscillating Mass – Viscodamper® (viscous fluid damper).

Every TMD is exactly tuned to the main natural frequency of the structure.

Although TMDs have been well-known for a long time, it is still difficult to provide exact tuning and predefined system damping. Furthermore, the three components must not change their dynamic properties over time, even when exposed to variable weather conditions. GERB has worldwide success in designing and manufacturing TMDs with masses from 20 to 10,000 kg, and vibration frequencies from 40 to as low as 0.3 Hz.

To protect against vertical vibrations, GERB TMDs are equipped with helical compression springs and Viscodampers®. For horizontal and torsional vibrations, GERB supplies TMDs with leaf springs or pendulums, and Viscodampers®.

Vertical TMD

Millenium Bridge – London, GB

Horizontal TMD

There are generally three types of applications that often require the use of tuned mass dampers:

1. Tall, free-standing structures (bridges, pylons, chimneys, antennas and TV towers) may be excited by wind forces, with dangerous Eigenform amplitudes.

2. Smaller bridges, e.g. pedestrian bridges, and tribunes may be excited by vehicle or foot traffic. Although usually not dangerous to the structure itself, vibrations may become very unpleasant to people on the bridge or tribune.

3. Structures may have machine-induced vibrations. Vertical or horizontal TMDs are tuned to the disturbing frequency of the machine (e.g., excitation by unbalance forces).

In any case GERB tuned mass dampers help reduce vibrations. The TMD may be included in the original design of the structure, or may be installed later.

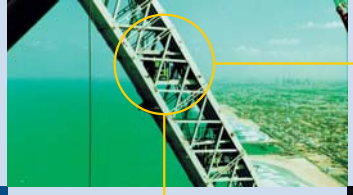
GERB tuned mass dampers are passive, and do not require an energy source. Other advantages include:

- Simple in design, ruggedly built, and maintenance-free,
- Highly effective, providing maximum reduction of vibration amplitudes,
- Able to tune on-site,
- Low price.

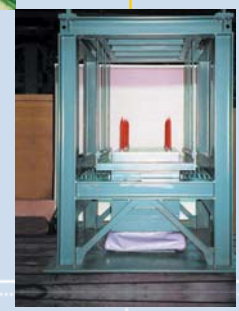
Vertical TMD

Schwedt Bridge – Berlin, Germany

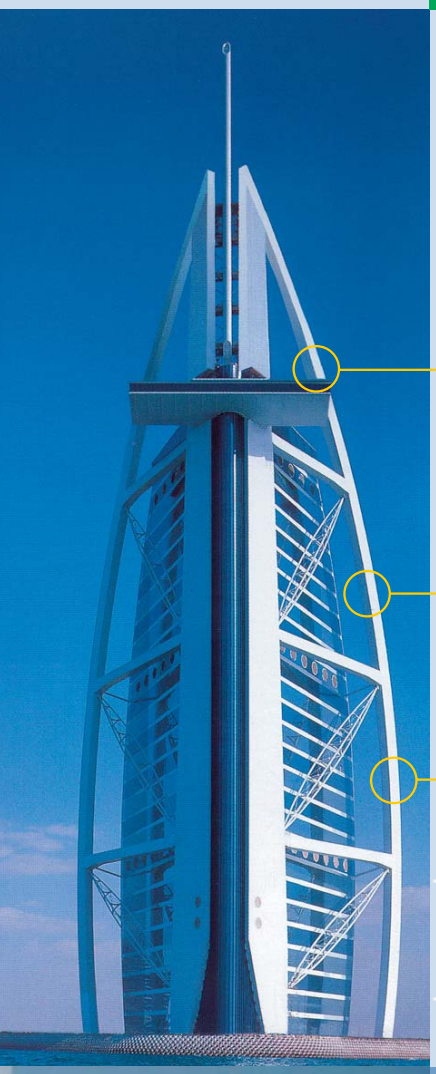
Fans in a Cooling Tower – Scholven, Germany

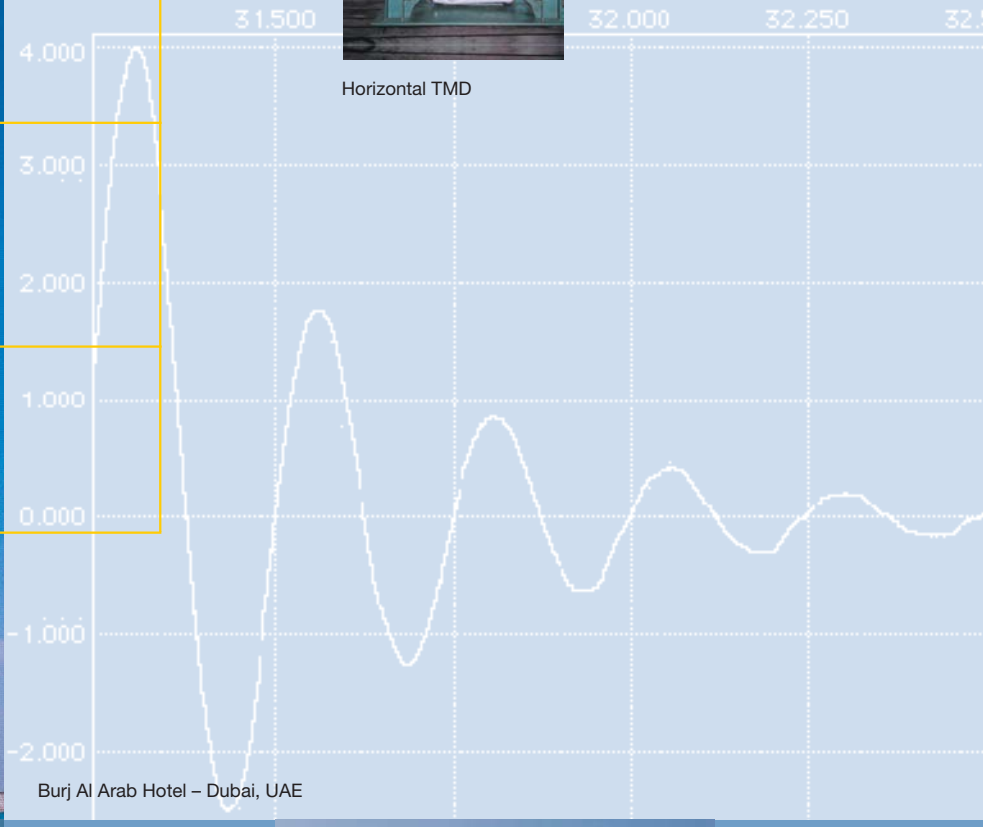


Building structure with TMDs



Horizontal TMD





Burj Al Arab Hotel – Dubai, UAE

Horizontal TMD

Emirates Towers – Dubai, UAE

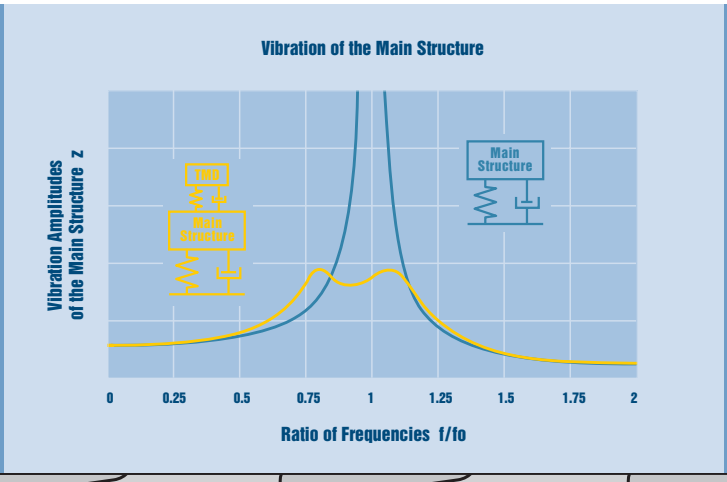
Horizontal TMD

GERB Vibration Control Systems

Tuned Mass Dampers
Reference List (Excerpt)

Country	Project	Tuned Mass [kg]	Frequency [Hz]	Type of TMD	Year
Brazil	REFAB 2, Stack	2 x 5,000	0.7	horizontal	2003
Denmark	Footbridge	3 x 200	4.1	vertical	1999
	Nykredit´s New Domicil, Floor	3 x 1,000	6.8	vertical	2001
France	Paris, Stade de France, Footbridge	3 x 2,050 – 2,800	1.8 – 2.1	vertical	1997
	La Hague, SGN, Stack	2 x 200	1.4	horizontal	1999
	Paris, Solferino Footbridge	14 x 1,900 – 2,500	0.8 – 2.2	horiz./vert.	2000
Germany	Hannover Exhibition Centre, Bridge	4 x 170	5.0	vertical	1984
	Berlin, Arc de 124.5°, Steel Scuplture	75	1.1	horizontal	1988
	Munich, BMW, Factory Floor	20 x 380	13.0	vertical	1988
	Solingen, Henckels Zwillingwerke, Factory Floor	6 x 400	14.0	vertical	1989
	Dorsten, Footbridge	2 x 1,700	1.9	vertical	1990
	Munich, Babcock, Steel Structure	2 x 200	12.0	vertical	1993
	Göttingen, Stack	1,100	0.7	horizontal	1994
	Regensburg, Siemens, Office Floor	11 x 160	7.5	vertical	1996
	Hamburg, Stack	780	0.7	horizontal	1996
	Karlsruhe, Building Structure	24 x 250 – 500	2.8 – 3.0	vertical	1997
	Scholven, Cooling Tower Fans	22 x 100	14.0	horizontal	1998
	Kassel, Footbridge	2,000	0.7	vertical	1998
	Berlin, Schwedter Str., Footbridge	4 x 900	1.9	vertical	1999
	Berlin, Reichstag, Spectator Balconies	18 x 700	4.5	vertical	1999
	Berlin, Bundeskanzleramt, Footbridge	6 x 1,500 – 2,200	1.7 – 3.3	vertical	2000
	MS Deutschland, Cruise Liner	4 x 200 – 10,000	3.4 – 13.5	horiz./vert.	2001
	Berlin, Britzer Damm, Footbridge	2 x 500	5.9	vertical	2001
	Freilassing, Footbridge	4 x 820	2.3	vertical	2002
	Marl, Conveyor	550	12.3	vertical	2003
	Dresden, Neue Terassen, Floor Slabs	8 x 5,000	2.4	vertical	2003
Great Britain	Inverness, Kessock Bridge	8 x 2,000	0.5	vertical	1989
	London, Millennium Dome, Steel Structure	3 x 600	2.4	vertical	1999
	London, Stakis Metropole, Hotel Building	7 x 14,500	4.4	vertical	2000
	London, Millennium Bridge	58 x 1,000 – 2,500	0.8 – 2.2	horiz./vert.	2001
	Coventry, Footbridge	3 x 670	1.0	vertical	2003
Iceland	Footbridge	4 x 350	2.6	vertical	1999
Italy	Barberino del Mugello, Footbridge	2 x 100	2.3	vertical	2002
	Sardinia, Sarlux, Cooling Tower Fan	24 x 700	11.0	horizontal	2000
Japan	Ube, Stack	300	3.1	horizontal	2000
Korea (South)	Seoul, Sun You Footbridge	4 x 1,500 – 1,650	0.8 – 2.0	horiz./vert.	2002
Norway	North Trondelag, Bridge	10,000	0.5	vertical	1989
	Mjasundet Bridge	6,000	0.6	vertical	1992
	Bulandet/Vaerlandet, 3 Bridges	5 x 5,000 – 10,000	0.8 – 2.0	vertical	2002
	Bergen, Gym Floor	2 x 2,000	3.8	vertical	2003
Poland	Wroclaw, Footbridge	3 x 450 – 500	1.2 – 1.5	vertical	2003
Switzerland	Rümlang, Footbridge	1,000	2.0	vertical	1992
Singapore	Singapore, Changi Airport, Footbridge	2 x 500	0.9	horizontal	2003
Thailand	Bangkok, Chao Phya Bridge	18 x 4,500	0.3 – 0.7	horiz./vert.	1985
	Bangkok, Stack	3,500	0.8	horizontal	1999
UAE	Dubai, Burj Al Arab, Steel Sceleton and Spire	11 x 5,000	0.8 – 2.0	horizontal	1997
	Dubai, Emirates Towers, Spire	6 x 1,200	0.9	horizontal	1999
	Dubai, 21st Century Tower, Spire	2 x 500	1.1	horizontal	2003

Chimney – Thailand (Ringdamper)



GERB
worldwide

We offer:

- Dynamic analysis of the structure
- On-site vibration measurement and assessment of bridges, buildings, machinery and other equipment
- Design of tuned mass dampers, tuned to the main structure
- Fabrication and testing of tuned mass dampers
- Installation and fine tuning of tuned mass dampers and final measurement and assessment.

For more information, please contact us.

ISO 9001 Certified Company

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