GERB

GERB Engineering

GERB Engineering – Profile

Management: Dr. Peter Nawrotzki, Stefan Gutberger

Scope of services

GERB Engineering GmbH was founded in 1974 with the aim of managing the civil engineering work undertaken within the GERB Group. Nowadays, our tasks involve almost all aspects of structural dynamics. Protecting people, buildings, equipment and machines against vibrations has become the most important aspect of our day-to-day work. The most frequent sources of vibrations relate to:

- Machines (e.g. for power generation or metal forming)
- Traffic (e.g. railways, pedestrians or street traffic)
- Nature (e.g. earthquakes and wind)

Vibration measurements and computer simulations are the typical tools that we use to determine the type and extent of either existing or expected vibration emissions.

If required, we are available to develop effective solutions for the reduction of vibrations in close co-operation with our customers.

GERB Engineering provides consultancy services for individual measures as well as the delivery of complete engineering concepts.

Consulting, planning and engineering concepts

GERB Engineering deals with problems regarding the structural analysis and structural dynamics involved in the operation of machines, plants, as well as in the construction of buildings, railway tracks and other structures. Our scope of services includes:

- Consulting on structural dynamic problems with highly qualified engineers
- Design planning and the development of proposed solutions
- Feasibility studies as well as provision of reports by experts
- Provision of documents for the approval procedure
- Preparation of planning documents for construction works
- Structural and stability analysis, the assessment of serviceability as well as fatigue analysis
- Computer simulation to assess dynamic behaviour
- In-depth analysis relating to structural behaviour due to seismic action
- Detailed construction manuals and the preparation of installation concepts
- Construction supervision
- Inspection of construction work
- Vibration measurement

Fields of activities:

Machine foundations for power plants or industrial facilities

Floating slab track systems for rail traffic

Tuned mass dampers

Seismic protection systems

Retrofitting of civil engineering structures

Press line, Mexico

Machine foundations – High-Tech requires an adequate basis

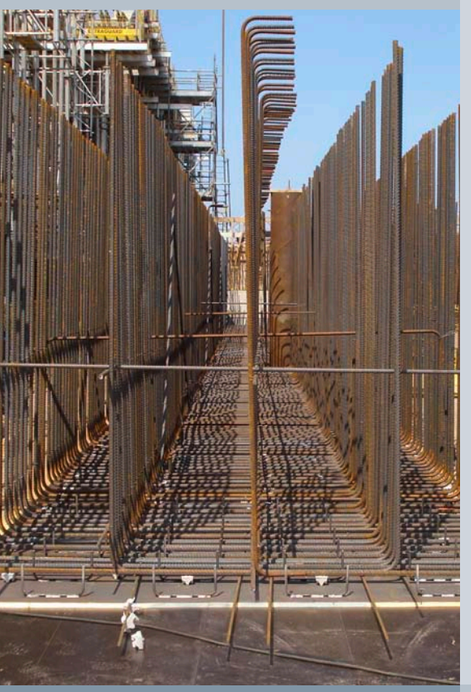
Machines with rotating or moving masses frequently require a separate foundation. This is to facilitate the load transfer into the ground, to increase the stiffness of the individual machine parts or as a means of energy dissipation. Typical examples of machines with rotating masses are turbines and fans. Reinforced concrete can be used in such applications in the form of a beam, plate, block or table foundation. In some cases steel frames can also be used as a supporting structure.

Machines for metal working often cause high impact forces. The vibration isolation of large forging presses takes place, for example, with the help of a reinforced concrete foundation block or a steel frame placed on GERB spring/Viscodamper® systems. These foundations are often arranged inside a foundation pit which creates additional space for further equipment. The pit is usually covered with a steel construction.

One aspect of GERB's expertise is the layout and design of foundations for heavy high precision tooling machines. Besides the necessary load transfer into the ground, a high level of precision for the proper machining operation is absolutely critical. Detailed knowledge of the ground is a prerequisite for the engineering.

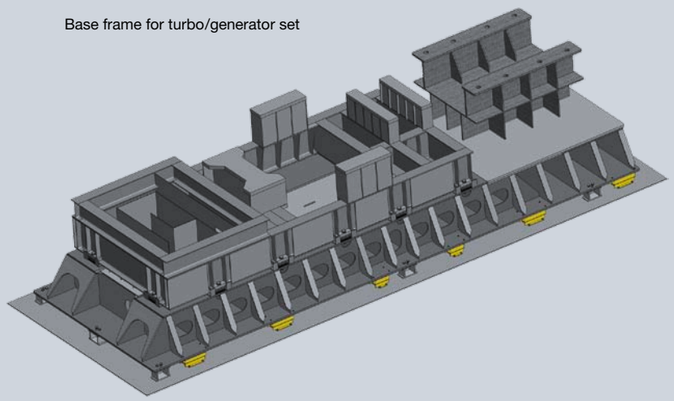
The design guidelines set out by the machine manufacturer must be strictly observed. To this end, the modern, computer-aided calculation methods we employ allow for demonstrating compliance with the permissible deformations up to the µm-range.

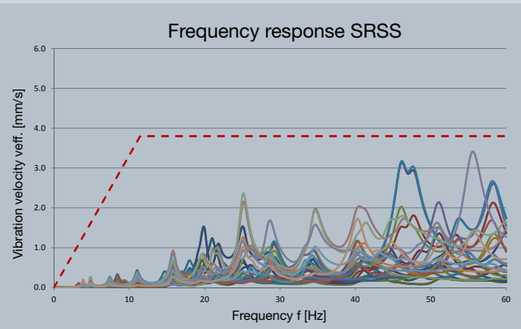
Pouring of concrete – Olkiluoto-3, Finland



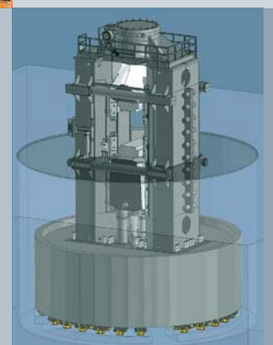
Construction of turbo/generator top mat – Rotterdam, Netherlands

Base frame for turbo/generator set





FEM – Analysis, turbo/generator foundation



Vibration isolation of a counterblow hammer, USA

Elbphilharmonie – Hamburg, Germany

Buildings and trackbeds – With us vibrations and structure-borne noise don’t stand a chance

Tramway – Basle, Switzerland

The decoupling of buildings from the surrounding area is practicable, such that the entire building or parts of it will be placed on spring elements. Under focus here is the protection of the building against damage by vibrations and structure-borne noise, as well as earthquake protection or precaution against possible subsidence.

During the design of such elastic decoupling close cooperation with acousticians and structural engineers is performed to develop a proper concept for the selection and arrangement of an adequate spring element system.

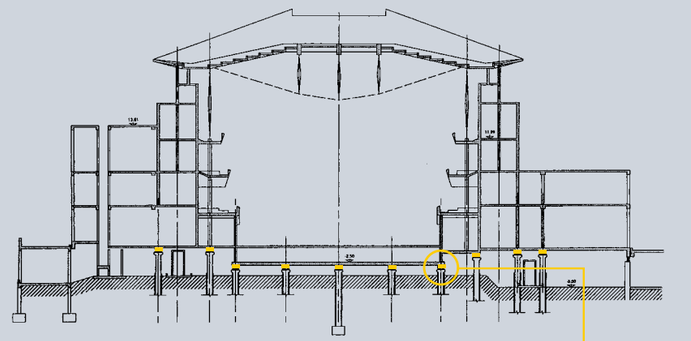
If required, static and dynamic analyses can be carried out to ensure both the stability and usability of the building.

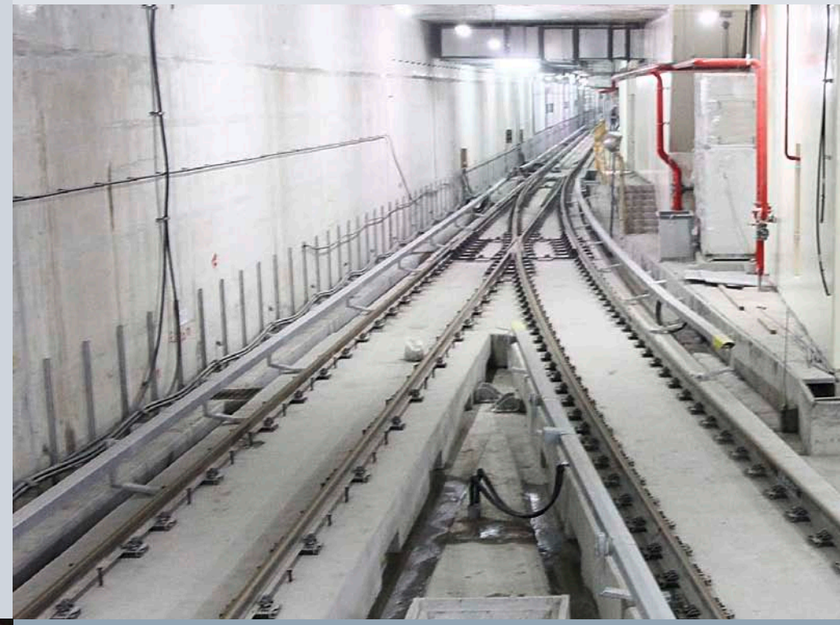
Vibration control is directly performed at the emission source through the use of mass-spring systems.
In the preliminary planning stages for these systems the selection and arrangement of the spring elements is defined. Through static and dynamic analyses, the behaviour of the entire structure is simulated, adjusted and optimized to meet the given requirements.

General arrangement and reinforcement drawings can be provided for floating trackbeds and other foundation systems. Further important issues in the design of mass-spring systems are clarifying of technical details including drainage, the form of the transitions, the stray current problem or a detailed consultation during construction.

Subway – Songshan, Taiwan

Helipad – St. Tropez, France

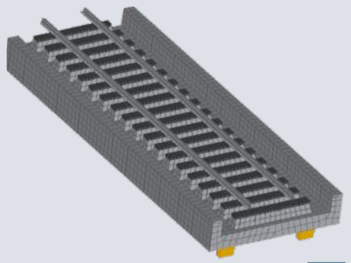




Eastern Art Center – Shanghai, China

Shanghai Concert Hall, China

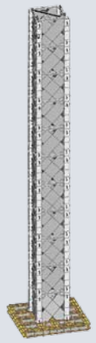
Cross Over – Songshan Station, Taiwan



Millennium Bridge – London, Great Britain

Tuned Mass Dampers – We know how to prevent unwanted movement

Stack with tuned mass damper

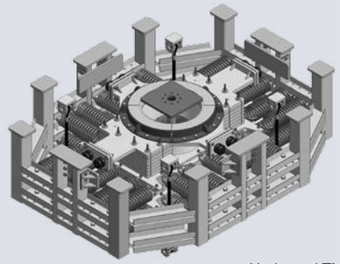


Estela de Luz, Mexico

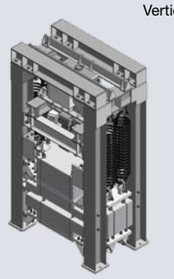
Long span or particularly slim structures are often susceptible to vibrations. Tuned Mass Dampers (TMDs) are used to reduce such vibrations caused by wind, traffic or earthquake. These TMDs consist of a relatively light mass which is elastically connected to the building and tuned to its natural frequency.

The proportion of the damping, provided, for example, by the GERB Viscodamper® system, is most important for the effectiveness of the TMDs.

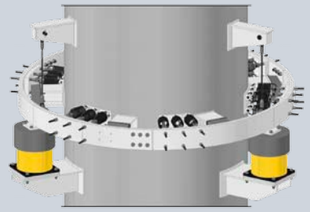
The layout of TMD-Systems is primarily based on empirical dimensions and the positive effect on the behaviour of the overall system can be numerically proven. Vibration monitoring is often carried out during the course of the project. Vibrationally vulnerable buildings include towers, masts, chimneys, bridges, skyscrapers and grandstands.



Horizontal TMD

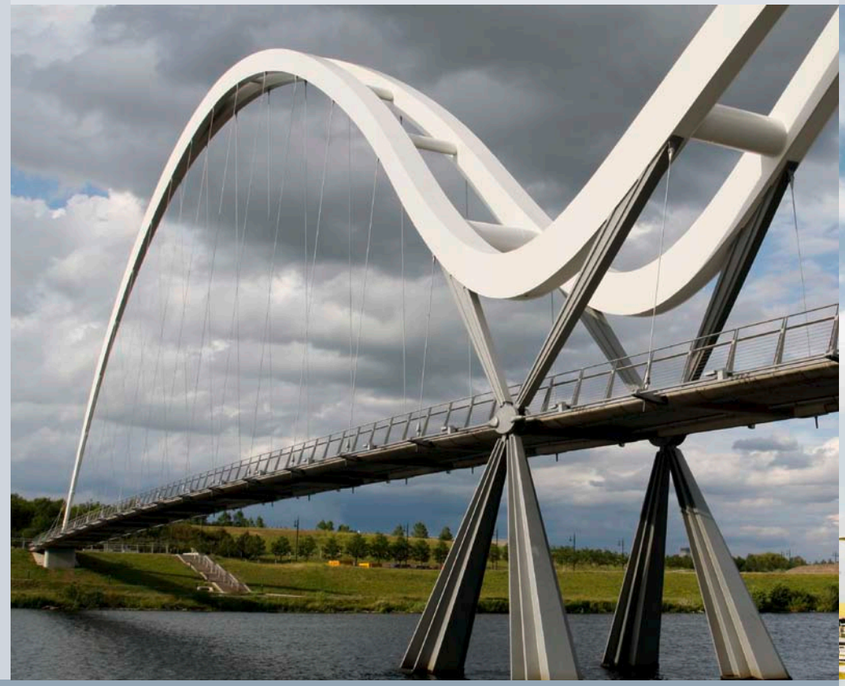


Vertical TMD



Typical structure of a stack TMD

Orbit Tower – Olympic ground, London

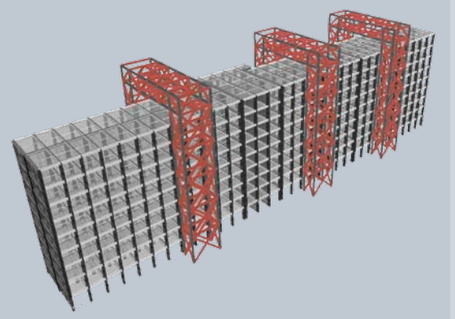


Infinity Bridge, Great Britain

Aspire Tower – Doha, Qatar

Grandstand – German Bundestag, Berlin

Hospital Slobozia, Romania



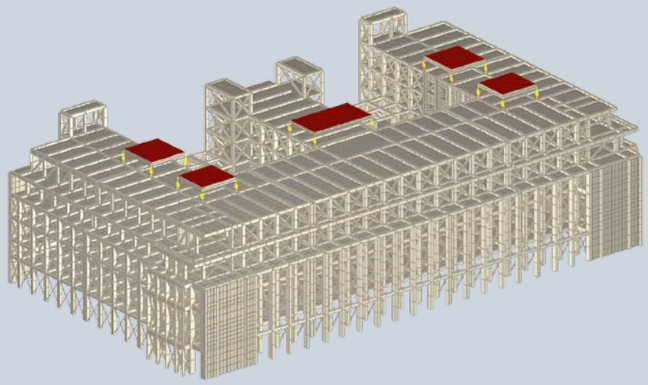
Earthquake protection – Forces of nature are predictable

GERB Spring Elements and Viscodamper® systems can be used to protect machines, plants and buildings against earthquakes. The structural stability of a building can be increased and potential damage can either be minimized or entirely avoided.

Especially in earthquake zones, the use of vibration-reducing constructions is important and useful in order to protect human lives and to minimize potential building damage.

Several mechanisms can be considered with a view to protecting buildings against earthquakes. A so-called “Base-Control-System” significantly reduces horizontal and vertical stresses on buildings. Moreover, this vertical “soft” support considerably reduces the restraint stresses in the building foundations.
The elastic uncoupling of complete floors and the use of TMDs at the top of buildings are further options for earth-quake protection.

Seat of government – Bucharest, Romania



Our team looking forward to providing advice

GERB worldwide

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