



Project References

Project References – Roof Structures



mageba



Project References

Introduction

mageba – your one-stop partner

The **Swiss company mageba** is one of the world's leading suppliers of **structural bearings, expansion joints** and other **high quality products and services** for the transport infrastructure and building construction sectors. In the last 10 years, mageba has also significantly expanded its range of products and services relating to **earthquake protection and structural monitoring**.

engineering connections® – since 1693

Whenever static and dynamic forces are transferred between structural elements, whenever forces interact with movements and rotations, whenever structural elements need to be protected against over-stress, whenever vibrations and noise need to be reduced: **mageba provides systems with its wide range of engineered products and services.**

Originating decades ago from the bridge industry, mageba has continuously extended its expertise in engineered connections to different types of structures. As a provider of high-quality structural support systems, mageba **supports owners, engineers, designers, architects and main contractors** from **planning stage to project completion.**

Infrastructure, Industrial structure and Building products



Structural bearings



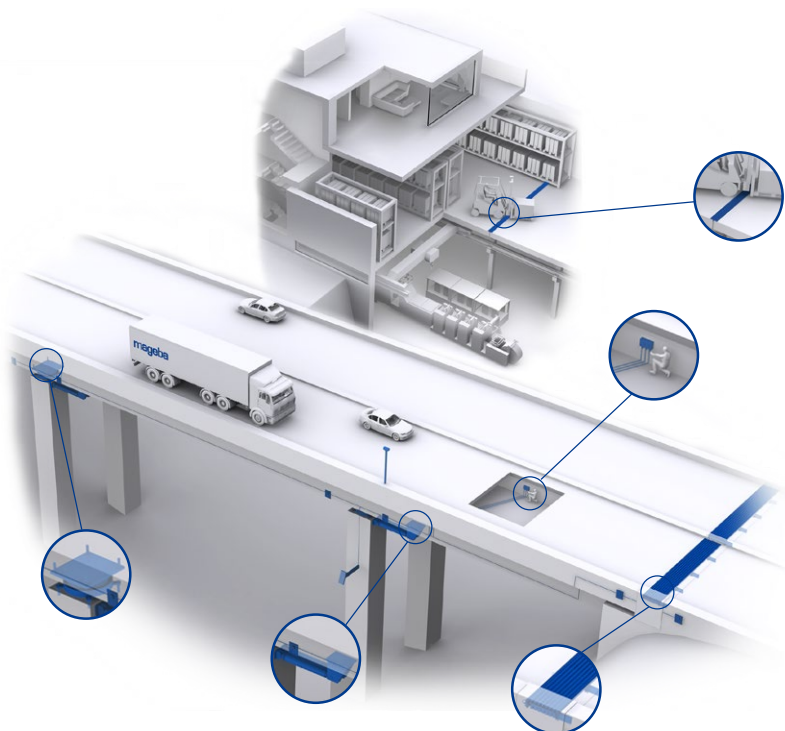
Expansion joints



Seismic devices



Structural monitoring



mageba's Systematic Quality Management and Technical Excellence:



The particular challenges presented by roof structures

Thanks to the great accomplishments of gifted architects and engineers, producing **exceptional structural designs**, the **importance of key components** in accommodating movements and rotations and resisting forces continues to increase.

Having supported a broad variety of **renowned and challenging projects worldwide** during the past five decades, mageba is your reliable partner in **ensuring your structure's safety and durability** – without any loss of its **architectural beauty**.

The following is a **brief overview of selected projects**, highlighting some of their **specific structural design challenges and developed solutions**.



Index

Project	Country	Installed	Products delivered	Page
Hazardous Waste Site	Switzerland	2006	LASTO®FLONBLOCK, LASTO®BLOCK	4
Dubai Sports Complex	United Arab Emirates	2008–2010	RESTON®SPHERICAL bearings	5
Grand Stade de Lille	France	2011	RESTON®SPHERICAL bearings	6
Oceania Business Plaza	Panama	2011	RESTON®SPHERICAL bearings	7
Kai Tak Cruise Terminal	Hong Kong	2012	RESTON®POT bearings, LASTO®BLOCK elastomeric bearings	8
Les Halles de Paris	France	2012	RESTON®SPHERICAL bearings	9
WIPO conference hall Geneva	Switzerland	2012	RESTON®SPHERICAL bearings	10
JTI Headquarters Geneva	Switzerland	2013	RESTON®SPHERICAL bearings	11
Kimbell Art Museum	USA	2013	RESTON®LINEAR rocker bearings	12
Zoo Elephant House Zurich	Switzerland	2013	ROBO®CONTROL permanent SHM system	13
Fondation Louis Vuitton	France	2013	RESTON®SPHERICAL bearings	14
Angouleme Multimedia Library	France	2014	RESTON®SA shock absorbers	15
Grand Stade des Lumières	France	2014	RESTON®SPHERICAL bearings	16
Oman Convention & Exhibition Centre	Oman	2014	RESTON®SPHERICAL bearings	17
Timsah Arena	Turkey	2013	RESTON®SPHERICAL bearings RESTON®PENDULUM Duplo seismic isolators	18
Singapore Sports Hub	Singapore	2014	RESTON®POT bearings	19
Tocumen Airport Access Road	Panama	2014	RESTON®POT HP (High Performance) bearings	20
Stavros Niarchos Center	Greece	2013–2015	RESTON®PENDULUM, RESTON®SA shock absorbers, RESTON®SP elastic spring devices, ROBO®CONTROL	21
Hotel Via Vallejo	Mexico	2014–2015	LASTO®LRB Lead Rubber bearings	22
Sky Building	Ecuador	2014–2015	LASTO®LRB Lead Rubber bearings	23
Eleftheria Square	Cyprus	2015	RESTON®POT bearings	24
Louvre Abu Dhabi	United Arab Emirates	2015	RESTON®PENDULUM seismic isolators	25
Al Habtoor City	United Arab Emirates	2015	RESTON®SPHERICAL bearings	26
Muscat International Airport	Oman	2012-2016	RESTON®POT, RESTON®SPHERICAL, TENSA®MODULAR, LASTO®FLONPAD , LASTO®FIONBLOCK	27



Hazardous Waste Site (Switzerland)



Project description

The Sondermülldeponie Kölliken Consortium was founded in the mid-1970s to create and operate a hazardous waste site. In total between 1978 and 1985, 300,000 m² or 475,000 tonnes of hazardous waste from a wide range of origins and compositions were deposited at the waste site.

In 1985, the waste site was closed and has been undergoing renovations since then. To complete the demolition, three airtight halls with an internal negative pressure (warehouse, manipulation hall and demolition hall) together with a rail connection had to be built. The complete demolition of the waste site is planned for 2017 with a deadline for the end of the monitoring phase in 2022.

mageba scope

mageba was commissioned to supply 164 bearings for this project, which were to reliably support the hall roof suspended on 28 arched girders.

The high-quality LASTO®FLONBLOCK tilting and sliding point bearings ensure a smooth load transmission into the load carrying structure; the LASTO®BLOCK distortion bearing acts as flexible, load-transmitting elements between the parts of the building sites to be connected free to move. Equipped with a sliding surface, which had to be fitted to the bottom for static reasons, they are especially suitable for the temporary support when moving large loads and for the incremental launching method. In addition, some bearings had to be designed with lift locks (Nd -420 kN).

Highlights & Facts

mageba products:

Typ: LASTO®FLONBLOCK, type KGa2360-Uplift as well as type KGe-1800 with fixing construction

LASTO®BLOCK type Nba-2360

Installed: 2006

Structure:

City: Kölliken
Country: Switzerland
Built: 2006
Type: Hazardous Waste Site
Owner: SMDK
Sondermülldeponie Kölliken

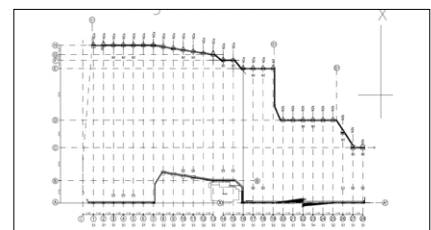
The hazardous waste site is located in canton Aargau, Switzerland's midland region



The bearing as a connecting element between the roof construction and concrete



The bearing location scheme, developed by mageba's headquarters in Bulach, Switzerland



Dubai Sports Complex (UAE)



Project description

The Dubai Sports Complex was conceived to create the world's best indoor international aquatic centre, matching the needs of the 2010 10th FINA World

Swimming Championships (25 m short course swimming), with the potential to host other international aquatic events such as the Asian Games Aquatics Event, the World Swimming Championships (all aquatic disciplines including 50 m swimming) and, potentially, a future Olympic Games.

The complex, with its 61 acres, sits on the edge of Dubailand and was developed at a cost in the region of Dh 1.1 billion.

mageba scope

The Dubai Sports Complex is equipped with 22 mageba RESTON®SPHERICAL bearings with high grading material ROBO®SLIDE (Vmax = 4,700 kN).

RESTON®SPHERICAL is a range of spherical bearings complying with the new European Standard EN 1337-7, now available with high-quality ROBO®SLIDE sliding material in accordance with European Technical Approval number ETA-8/0115.

ROBO®SLIDE is characterised by exceptional resistance to wear and bearing capacity well in excess of that offered by standard PTFE sliding material.

The flat sliding surface between the top of the bearing's calotte and a sliding plate accommodates longitudinal and transverse movements.

Guide bars and a restraining ring are used to transmit horizontal forces.

Highlights & Facts

mageba Products:

Type: 22 RESTON®SPHERICAL with ROBO®SLIDE
 Features: Vmax. 4700 kN

Structure:

City: Dubai
 Country: United Arab Emirates
 Built: 2008–2010

The Dubai Sports Complex is located in the city of Dubai



With a capacity of 15 000 spectators, the Dubai Sports Complex is capable of hosting Olympic swimming



ROBO®SLIDE disc on the calotte of a spherical bearing





Grand Stade de Lille (France)



Project description

The Grand Stade de Lille, formally known as the Stade Pierre-Mauroy, is a multi-use stadium in Lille, France. It opened in August 2012, and will be one of the venues of the 2016 UEFA European football championship finals.

The stadium is notable for several reasons:

- Half of its field can rise automatically above the other half to more optimally host music concerts and other shows
- It has a retractable roof
- It is recognised as a HQE (High Quality Environmental green building standard) building, with its solar panels and two windmills

mageba scope

To support the stadium's moveable roof, mageba supplied four large RESTON®SPHERICAL bearings. These were designed with a vertical load-carrying capacity of 31,500 kN each, and are of the guided sliding type, accommodating sliding movements of +/- 150 mm along one axis.

The bearings feature ROBO®SLIDE high-grade sliding material instead of the PTFE normally used in sliding bearings. ROBO®SLIDE offers much higher resistance to wear and abrasion than PTFE, and twice the strength. This means that a spherical bearing with ROBO®SLIDE can be designed to be much smaller than one with PTFE.

Highlights & facts

mageba Products:

- Type: RESTON®SPHERICAL bearings (31,500 kN)
- Features: ROBO®SLIDE high-grade sliding material
- Installation: 2011

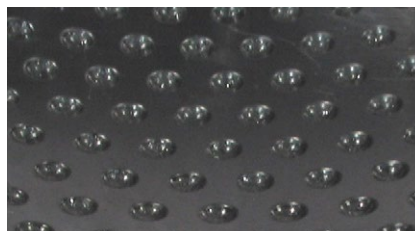
Structure:

- City: Lille
- Country: France
- Completed: 2012
- Type: Multi-use stadium
- Capacity: 50,000 spectators
- Roof weight: 72,000 kN

The stadium is located in the city of Lille in northern France



ROBO®SLIDE high-grade sliding material offers far higher strength and durability than PTFE



A RESTON®SPHERICAL bearing as fully fabricated, on a pallet for transport to site



Oceania Business Plaza (Panama)



Project description

Oceania Business Plaza is a perfect example of Ultra-Contemporary architectural design. A great tower with all the modern comfort and luxury located in downtown of Panama City. Belonging to one of the highest skyscrapers of the city, the Oceania Business Plaza constitutes an innovative structure within a group of buildings which have been erected on the latest economical boom. The complex Oceania Business Plaza is conformed by two towers which are connected by a 2-levels bridge at store 30. The highest skyscraper is 204 meters tall and 53 stories high. mageba's scope was the supply of bearings for supporting the bridge and allowing both structures move independently. Bringing into service is planned for end of 2011.

mageba scope

For this project mageba supplied 15 RESTON®SPHERICAL bearings types KA, KE and KF. Bearings were produced at mageba's 100% mageba-owned subsidiary mageba-Shanghai.

Design requirements demanded bearings which should be able to take max. vertical loads up to approx. 850 kN, min. vertical loads of 0 kN, horizontal loads of 1'332 kN and movements of 410 mm. The structure is supported by 15 bearings. The Bridge structure is fixed to one of the buildings through one fixed spherical bearing at each level. On all other positions, support is provided with respectively two KA and two KE bearings, allowing bridge's dilatation and buildings' movements due to wind and other external forces.

Highlights & Facts

mageba products:

Type: RESTON®SPHERICAL bearings
 Installed: 2011

Structure:

City: Panama City
 Country: Panama
 Built: 2011
 Structure: Building
 Type: Skyscraper
 Height: 207 m

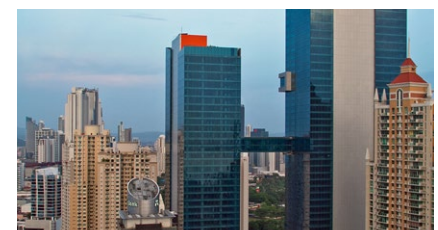
The Oceania Business Plaza located in downtown Panama City



Construction of the Plaza



The Oceania Business Plaza





Kai Tak Cruise Terminal (China)



Project description

The Kai Tak Cruise Terminal is built on the former site of the Kai Tak Airport in Hong Kong. The terminal has the capacity to berth two 360 m-long vessels. On peak days the Cruise Terminal can cater for up to 8,400 passengers and 1,200 crew members

The cruise terminal was designed by Foster + Partners and its roof spans over 70 m. Its multi-functional design allows the terminal to be converted into a venue for exhibitions and other events.

The total area of the Cruise Terminal is 52,000 m² and it also encompasses a rooftop garden which is open to the public.

mageba scope

A total of 1060 LASTO®BLOCK elastomeric bearings were used in the construction of the Kai Tak Cruise Terminal. All mageba elastomeric bearings installed in the Cruise Terminal are made from high-quality elastomer, reinforced by steel plates.

The RESTON®POT bearings used for this project have maximum load carrying capacity of $V_{max} = 3,800$ kN and ensure the controlled transfer of loads.

mageba RESTON®POT bearings are equipped with a special POM seal which is vulcanised directly into the bearing pad and hence improves the wear resistance of the bearing significantly.

Highlights & facts

mageba Products:

Type: RESTON®POT bearings, LASTO®BLOCK elastomeric bearings

Installation: 2012

Structure:

City: Hong Kong

Country: China

Completed: 2013

Type: Cruise Terminal

Area: 52,000 m²

Builder: Dragages Hong Kong

Location of the Kai Tak Cruise Terminal, Hong Kong



mageba LASTO®BLOCK elastomeric bearings, ready for delivery



The Kai Tak Cruise Terminal during construction



Les Halles de Paris (France)



Project description

Les Halles de Paris, located in the heart of the French capital, is the site of the city's traditional wholesale fresh food market, dating back to 1183. Following modernisation works in recent decades, it is now an important commercial and cultural centre, and has the city's most used rail station, serving 750,000 travellers on an average weekday.

In a development project in 2012, new buildings were constructed with a spectacular curvilinear canopy roof connecting them and covering the open-air central area between them. The canopy (La Canopée des Halles), in particular, is an architectural masterpiece and a fine feat of engineering.

mageba scope

To support the new canopy roof where it rests on the buildings at either side of the covered area, mageba supplied twelve large RESTON®SPHERICAL bearings. These were designed to carry loads of up to 55,900 kN (over half the weight of its Paris neighbour, the Eiffel Tower). All of the bearings are of the free sliding type (type KA), accommodating sliding movements in all directions. The bearings feature ROBO®SLIDE high-grade sliding material instead of the PTFE normally used in sliding bearings. This greatly increases the bearings' strength and also, due to ROBO®SLIDE's far superior resistance to wear and abrasion, their durability.

Highlights & facts

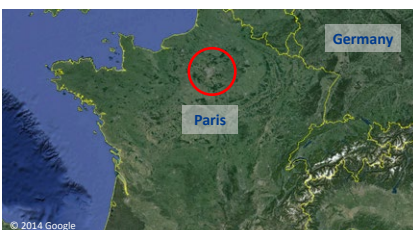
mageba products:

Product: RESTON®SPHERICAL bearings (up to 55 MN)
 Features: ROBO®SLIDE high-grade sliding material
 Installation: 2012

Structure:

City: Paris
 Country: France
 Completed: 2015
 Type: Canopy roof over plaza
 Contractor: VINCI
 Architects: Patrick Berger, Jacques Anziutti

Les Halles de Paris is located in the centre of the French capital



Application of grease to the upper sliding interface of a RESTON®SPHERICAL bearing



The 12 RESTON®SPHERICAL bearings support the great weight of the enormous canopy roof





WIPO conference hall Geneva (Switzerland)



Project description

The World Intellectual Property Organization (WIPO) has built a new conference building in the UN district of Geneva, Switzerland.

The structure is made of wood and steel and gives priority to sustainability, using local wood, natural light, hybrid ventilation combining natural mechanical means, and a cooling system drawing water from Lake Geneva, within a framework of the Geneva-Lake-Nations project.

Together with several new smaller meeting rooms in the main headquarters building (the Arpad Bogsch Building), the new conference hall will cater for increasing demand for multilateral and bilateral consultations associated with intergovernmental meetings at WIPO.

mageba scope

As the structure of the building poses challenges to its stabilisation, bearings that ensure the controlled transfer of forces between its superstructure and substructure.

mageba was chosen to provide six spherical bearings. These bearings facilitate the following major requirements:

- Transfer of higher horizontal loads than vertical loads (NSd,max = 11,600 kN / VxSd,max = 1,900 kN)
- Smooth rotation around three axis thanks to the concave/convex special design

Highlights & facts

mageba products:

Type: RESTON®SPHERICAL bearings types KF and KE
Features: NSd,max = 11,600 kN / VxSd,max = 1,900 kN
Installation: 2012

Structure:

City: Geneva
Country: Switzerland
Completed: 2014
Height: 40 m
Type: Steel / wood structure building
Owner: World Intellectual Property Organization (WIPO)
Contractor: Charpente Concept
Architect: Behnisch Architekten

The building is located in Geneva and was inaugurated in September 2014



A type KF spherical bearing, resisting horizontal forces in every direction, allowing no sliding movements



A RESTON®SPHERICAL bearing installed between the super- and substructure of the hall



JTI Headquarters Geneva (Switzerland)



Project description

The new headquarters of Japan Tobacco International (JTI) in Geneva is a steel structure building in sustainable design and surrounded by parkland. It is located in the Secheron district, which is an old industrial complex, close to the United Nations offices.

The structure of the building is built with a huge cantilever. Its opposing corners are elevated, which enables a central courtyard to provide unfettered views and allows pedestrians to pass through the site. A torsional tube structural system, which creates column free office space, provides maximum internal flexibility and future adaptability.

mageba scope

In order to meet the designer's unique requirements, mageba was chosen to provide spherical bearings that allow the structure to work. A very special requirement is that the bearings are made 100 % out of stainless steel and hence further increase the bearing's lifecycle.

mageba provided six spherical bearings that cover three major features:

- Transfer the vertical load of the structure up to 85,000 kN
- Transfer the horizontal load due to the cantilever structure up to 9,400 kN
- Allow smooth rotation around three axis thanks to the concave/convex special design

Highlights & facts

mageba products:

Type: RESTON®SPHERICAL bearings types KF and KE
 Features: 100 % stainless steel
 Installation: 2013

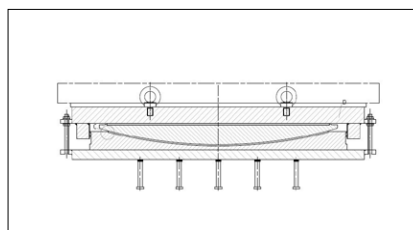
Structure:

City: Geneva
 Country: Switzerland
 Completed: 2015
 Height: 51 m
 Type: Steel structure building
 Owner: Japan Tobacco International (JTI)
 Contractor: Implenia Suisse AG
 Architect: Skidmore, Owings & Merrill LLP (SOM)

The building is located in Geneva and draws reference to Lake Geneva and the Alps



Technical details of a RESTON®SPHERICAL bearing of type KE, drawn in mageba's headquarters in Bulach



Installation of a RESTON®SPHERICAL bearing at the construction site in 2013





Kimbell Art Museum, Fort Worth (USA)



Project description

The Kimbell Art Museum in Fort Worth, Texas is a world-renowned building, and has won wide acclaim for its classic modern building since its opening in 1972. A second building, designed by world-renowned architect Renzo Piano and known as the Piano Pavillion, opened in 2013. The building design includes many striking features, including its roof, which spans gracefully above the large exhibit areas. To enhance the performance and aesthetic qualities the engineer and architect specified that the bearings, which support the roof and allow its movements, should be designed and positioned to be as discrete as possible.

mageba scope

In order to keep the bearings hidden from view, they had to be designed to be as small as possible. Considering the horizontal and vertical forces (including uplift forces of up to 330 kN) to be resisted by the bearings, and the movements that they would have to accommodate, RESTON®LINEAR rocker bearings were proposed. A total of 66 bearings, of types LGe and LGf, were required to safely transfer the loads and facilitate the design movements.

To ensure their quality and fitness for purpose, 10% of the bearings were tested in accordance with AASHTO rocker bearing testing specifications.

Highlights & facts

mageba products:

Type: RESTON®LINEAR rocker bearings
Features: All bearings designed to resist uplift forces
Installation: 2012

Structure:

City: Fort Worth, Texas
Country: USA
Completed: 2013
Type: Art museum building
Architect: Renzo Piano Building Workshop
Engineer: Guy Nordenson and Associates

The Kimbell Art Museum is located in Fort Worth, Texas

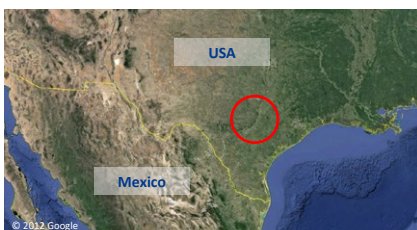


Illustration of a RESTON®LINEAR rocker bearing as designed for this project



Preparation of bearings for transport from the factory to the building construction site



Zoo Elephant House (Switzerland)



Project information

Zurich city's zoo has constructed a new park for its elephants, which opened in 2014. The 10,000 m² park includes a large housing unit consisting primarily of a wooden roof shell – the largest self-supporting wooden roof structure in Switzerland. A hot, humid environment will be maintained inside the structure, as prevailing in the natural habitat of the Indian elephant, whereas the outside shell needs to withstand the seasonally changing weather conditions of Switzerland.

Due to the roof's unusual design in terms of size, shape, and construction material, and the high humidity of the air underneath, it was decided to install a permanent automated monitoring system to provide continuous monitoring of the roof structure's anchorages and moisture levels.

mageba scope

mageba developed a monitoring plan for this demanding task. 24 humidity sensors, distributed over the entire roof surface, measure the moisture content of the roof's timber, and the anchor forces arising in the roof's foundations are also measured. The effect of humidity is correlated to the structure in terms of stress, creep, shrinkage and other deformations, with possible thrust/traction in the anchorage area.

The measured values are displayed in real time on the system's web interface. The system also includes an alarm feature, offering automatic notification of exceeding of pre-defined limits in any parameters.

Highlights & facts

mageba products:

Type:	ROBO®CONTROL permanent SHM system
Features:	Anchorage force sensors, air and structural temperature and humidity sensors
Installed:	2013

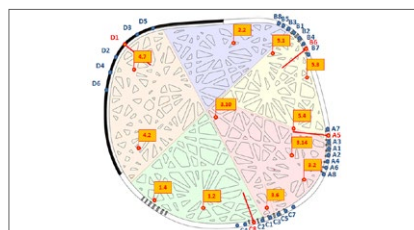
Structure:

City:	Zurich
Country:	Switzerland
Built:	2013
Type:	Wooden pavilion
Span:	110 m
Owner:	Zurich Zoo
Architect:	Markus Schietsch
Engineer:	Walt & Galmarini

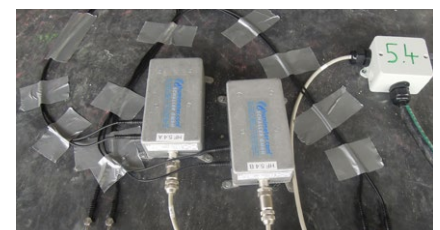
Zurich Zoo is located near Zurich city center



Layout of sensors on the wooden roof



Humidity sensors installed on the underside of the roof





Fondation Louis Vuitton (France)



Project description

The Louis Vuitton Foundation for Creation's art museum and cultural centre is to be opened in Paris in 2014.

It was designed by the Canadian-American Pritzker Prize-winning architect Frank Gehry, and has received architectural awards in both France and the United States.

The building's extraordinary roof takes the form of boat sails blown by the wind, with 3600 unique glass panels.

These panels were individually developed, using design software specially adapted for the aviation industry, to fit the shapes drawn by the architect.

mageba scope

mageba supplied spherical bearings to support the internal steel facade while allowing movements and rotations.

These RESTON®SPHERICAL bearings are designed to each carry vertical loads of 1400 kN and to permit sliding movements along one axis while resisting transverse forces.

Due to the building sequence of the roof's sail-like design, occasional uplift forces occurring during construction must also be resisted so the bearings feature uplift clamps.

The choice of this type of bearing, with mageba's special ROBO®SLIDE sliding material instead of PTFE, enabled the size of the bearings to be minimised – always desirable in architectural works.

Highlights & facts

mageba products:

Type: RESTON®SPHERICAL bearings
Features: Uplift clamps
Installation: 2013

Structure:

City: Paris
Country: France
Completed: 2014
Type: Art museum
Architect: Frank Gehry
Owner: Fondation Louis Vuitton / LVMH group

The building is located in Bois de Boulogne, the second largest public park in Paris



Schematic representation (exploded view) of a guided sliding RESTON®SPHERICAL bearing



Picture of the construction of the steel facade



Angouleme Multimedia Library (France)



Project description

The city of Angouleme in south-western France is home to an impressive new multimedia library, designed by the architect Françoise Raynaud.

The design of the building is based on the concept of an assembly kit game with five stacked boxes, each one corresponding to a different “universe”.

The first three are inspired by the words Imagine, Understand and Create. The fourth, devoted to entertainment, culture and relaxation, allows the media to be crossed and the worlds to be linked, while the last houses administrative and logistics functions.

Due to the building’s highly unconventional shape, it was particularly important to ensure the correct interaction between the structure’s various “building blocks”.

mageba scope

RESTON®SA shock absorbers were used at specific interfaces to secure particular blocks and control their relative movements. The shock absorbers were designed for seismic/dynamic loads of 51 kN each, with a longitudinal movement capacity of +/- 30 mm. They were equipped with spherical bearings at each end to accommodate minor transverse movements.

Due to the relative small loads, an innovative external channel was developed by mageba’s design engineers to ensure precise damping performance. After fabrication, the units were extensively tested in accordance with EN 15129, and the entire solution was certified with the CE label, by Politecnico de Milano.

Highlights & facts

mageba products:

Type: RESTON®SA shock absorbers
 Notable: Tested at Politecnico di Milano, Italy
 Installation: 2014

Structure:

City: Angouleme
 Country: France
 Completed: 2014
 Type: Library building
 Floor area: 5,600 square metres
 Architect: Françoise Raynaud (Loci Anima)

The library is located in south-western France, in the city of Angouleme



Two of the RESTON®SA shock absorbers, in a wooden crate for shipping to site



The dampers were tested at Politecnico di Milano, Italy in accordance with EN 15129





Grand Stade des Lumières (France)



Project description

The Stade des Lumières is 58,000-seat stadium that is being built in the city of Lyon in south-eastern France.

The stadium will be the new home of the football club Olympique Lyonnais, replacing its current stadium, Stade de Gerland, in 2015.

Among its first special uses will be as one of the venues for the staging of the 2016 UEFA European football championship, which is being hosted by France.

The stadium's most notable feature is its translucent roof, which, with its large surface area, must be constructed to resist the enormous uplift forces that can be generated by strong wind forces.

mageba scope

16 RESTON®SPHERICAL bearings play a key role in supporting the stadium's enormous roof, four at each side of the playing field.

These are designed to carry weight forces of up to 18,200 kN, and all are equipped with uplift clamps to enable them to resist uplift forces of up to 2000 kN that might arise on exceptional occasions due to strong winds.

All of the bearings are of the guided sliding type (type KE), allowing sliding movements of up to +/- 210 mm along one horizontal axis while resisting transverse forces of up to 3000 kN.

Worthy of particular note is the fact that the bearings were designed to be installed "upside down", with their long sliding plates connected to the large, robust sub-structure rather than to the roof.

Highlights & facts

mageba products:

Type: RESTON®SPHERICAL bearings
Features: Uplift protection, ROBO®SLIDE material, "upside down" design
Installation: 2014

Structure:

City: Lyon
Country: France
Completed: 2015
Type: Football stadium
Capacity: 58,000
Architect: Populous
Contractor: VINCI

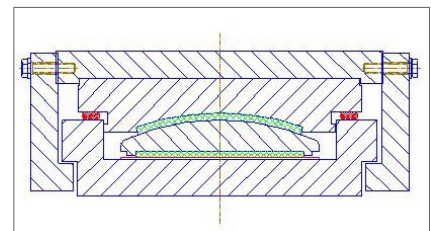
The stadium is the home of Olympique Lyonnais, the football team of the city of Lyon



Assembly of a typical RESTON®SPHERICAL bearing, with its calotte's flat surface on top



Contrary to most applications, the bearings are designed to be installed "upside down"



Oman Convention & Exhibition Centre



Project description

The new Oman Convention & Exhibition Centre, due for completion in 2016, is sure to be one of the finest facilities of its kind in the Middle East.

It is located just 10 minutes from the new Muscat International Airport, making access easy for international visitors. The centre will host international, regional and national conventions, exhibitions and business events.

Its many features include a tiered auditorium with seating for 3,200 people, and more than 22,000 square metres of exhibition space.

The venue is among the first to be built to meet the rigorous LEED certification by the U.S. Green Building Council.

mageba scope

16 RESTON®SPHERICAL bearings were used in the construction of this impressive building.

These were designed in accordance with a European Technical Approval (ETA 08/0115) to carry vertical loads of up to 19,800 kN, while accommodating horizontal sliding movements of up to +/- 105 mm.

The bearings were fabricated using weathering steel, and ROBO®SLIDE high-grade sliding material instead of the PTFE normally used in structural bearings, greatly increasing their durability and strength.

The high strength and thus smaller size of RESTON®SPHERICAL bearings with ROBO®SLIDE makes them a particularly attractive solution for architectural applications.

Highlights & facts

mageba products:

Type:	RESTON®SPHERICAL bearings
Features:	ROBO®SLIDE high-grade sliding material, weathering steel
Testing:	Politecnico di Milano
Installation:	2014

Structure:

City:	Muscat
Country:	Oman
Type:	Convention Centre
Designer:	Parsons
Contractor:	Khalid bin Ahmid

The centre is located in Hay al Ulfan, near the new Muscat International Airport, Oman.



RESTON®SPHERICAL bearings (fixed type on left, sliding on right) on pallets for shipping to site.



Installation of a large RESTON®SPHERICAL bearing with capacity of 19,800 kN.





Timsah Arena (Turkey)



Project description

The city of Bursa, the fourth most populous city in Turkey and formerly the capital of the Ottoman Empire during the fourteenth century, has a new football stadium – the Timsah Arena. The name, meaning Crocodile Arena, is derived from the local football team, Bursaspor, and was a strong influence in the stadium’s design. The structure’s most striking feature, its roof, resembles a crocodile curled around the ground, complete with open mouth. This spectacular roof covers all of the stadium’s 44,000 seats.

mageba scope

mageba supplied both bearings and seismic isolators to support the stadium’s roof and protect it during an earthquake. RESTON®SPHERICAL bearings of type KA 8.4 (with a vertical load capacity of 8400 kN), and RESTON®PENDULUM “Duplo” seismic isolators of type PD 7.3 (with a vertical capacity of 7300 kN) were supplied. The “Duplo”/PD isolators have two principal sliding surfaces, in contrast to the “Mono”/PM isolators which have only one. Test typing of the isolators was carried out at EUCENTRE, the European Centre for Training and Research in Earthquake Engineering, in Pavia, Italy.

Highlights & facts

mageba products:

Type: RESTON®SPHERICAL bearings and RESTON®PENDULUM Duplo seismic isolators

Installation: 2013

Structure:

City: Bursa

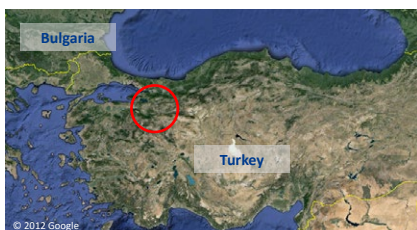
Country: Turkey

Completed: 2014

Type: Football stadium

Capacity: 44,000

The Timsah Arena is located close to the city of Bursa in western Turkey



Type testing of the RESTON®PENDULUM Duplo seismic isolators at EUCENTRE in Pavia, Italy



A RESTON®PENDULUM Duplo seismic isolator, ready for delivery to site (with dust skirt open)



Singapore Sports Hub (Singapore)



Project description

The Singapore Sports Hub is a sports complex on an area of 35 hectares and involves a new national stadium, multi-purpose indoor area, indoor aquatic centre, water sports centre, library, museum, commercial space and a sports promenade.

The Sports Hub is the world's largest sports facilities PPP project, and is Singapore's premier land and water sports centre. It has an innovative moving tier design which allows the stadium to be used for various sporting events.

The design of the stadium sets new standards for sustainable and green buildings, and is the first naturally ventilated sports complex in the world.

mageba scope

mageba designed and delivered customised RESTON®POT bearings with locker arms to fulfill the demanding needs of the project. Due to the three moving tiers in the national stadium, the bearings have to be able to automatically reset once the tiers are put back in their original position. The special locking arm bearings achieve a maximum free movement of 55 mm.

All the bearings were installed in February 2014, enabling the project to be completed in time for the 2014 Southeast Asia Games.

Highlights & facts

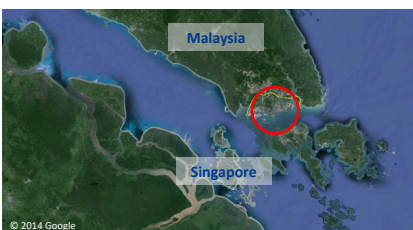
mageba products:

Type: RESTON®POT bearings
 Features: "Locking arm" design to reset position
 Installation: 2014

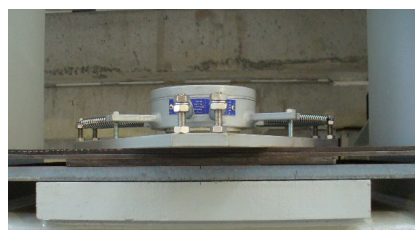
Structure:

City: Singapore
 Country: Singapore
 Type: Sports facility
 Area: 35 hectares
 Construction: 2011–2014
 Builder: Dragages Singapore

Location of the Sports Hub, Singapore



mageba locking arm bearing during installation



RESTON®POT bearing with special "locking arm" design, as fabricated





Tocumen Airport Access Road (Panama)



Project description

Panama City's Tocumen International Airport is currently being extended with the addition of a new terminal. Designed by Foster & Partners, it will increase floor space by over 800,000 square feet, with 20 new boarding gates, a duty free area, a new control tower and a third runway.

Access to the new terminal from the Corredor Sur highway that bypasses the airport is provided by a four-lane road, part of which is elevated. The non-continuous elevated structure of each carriageway is supported by ten piers, requiring a bearing solution.

mageba scope

To support the structures' decks, mageba supplied 80 RESTON®POT HP bearings with uplift resistance. These bearings are based on the standard RESTON®POT bearing which has been a most popular bearing in mageba's range for many years, having proven its worth in countless applications. The recently developed version of the bearing, with "HP" standing for "High Performance", represents a major advance in the bearing's technology. Durability is much increased, thanks to the use of improved materials, and the increased strength enabled the bearings to be made small enough to suit the main structure's design.

Highlights & facts

mageba products:

Type: RESTON®POT HP (high performance) bearings
Features: Uplift resistance
Installation: 2014

Structure:

City: Panama City
Country: Panama
Completed: 2014
Type: Airport access viaduct
Contractor: Construtora Norberto Odebrecht

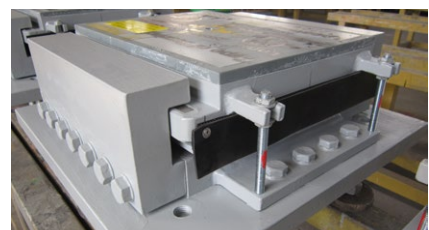
The new viaduct provides access to Tocumen International Airport, Panama City, Panama



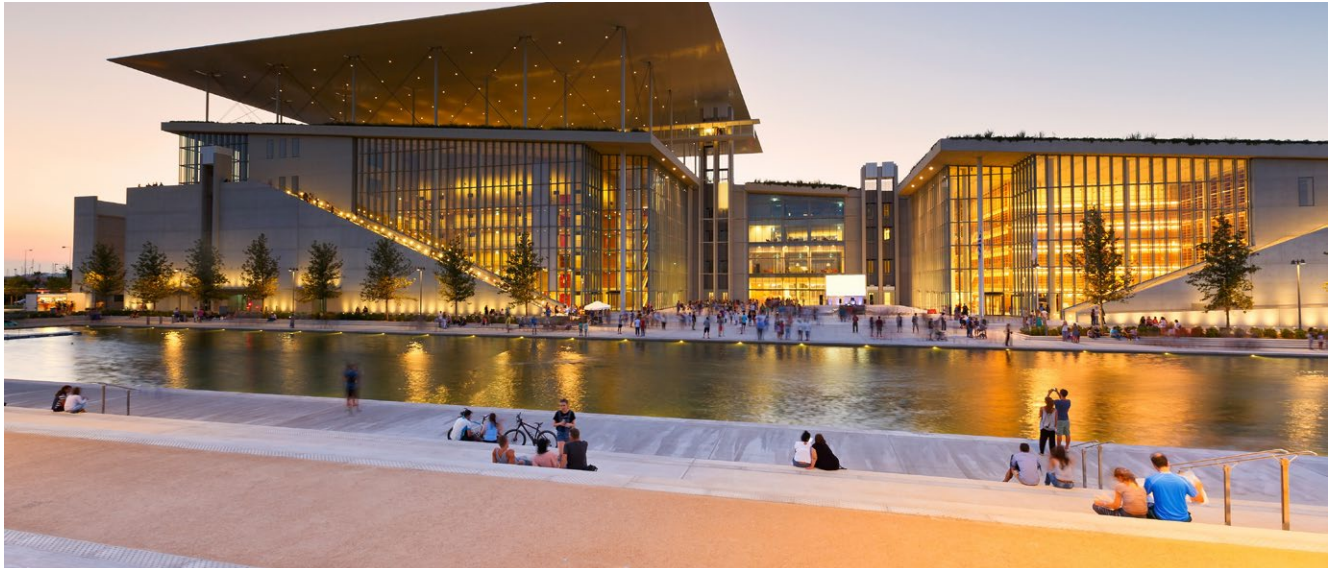
Exploded view of a typical RESTON®POT bearing, showing elastomeric pad at its core



A typical RESTON®POT bearing featuring uplift resisting clamps at sides, as fabricated



Stavros Niarchos Center (Greece)

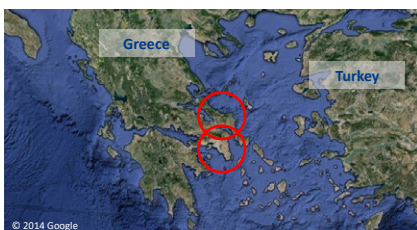


Project description

The Stavros Niarchos Foundation Cultural Center (SNFCC) in Athens is a multifunctional arts, education and recreation complex. It includes, within its 170,000 m² park, new state-of-the-art facilities for the National Library of Greece and the Greek National Opera.

The buildings were designed by Renzo Piano, the internationally acclaimed architect who achieved worldwide fame in the 1970s with the Centre Georges Pompidou in Paris. With a budget of €566 million, the SNFCC is one of the largest construction projects in recent Greek history.

The SNFCC is located 4.5 km south of the centre of Athens, Greece



mageba scope

In order to ensure that the building structure can withstand even a severe earthquake of the type Athens has known for thousands of years, the buildings of the National Library of Greece and the Greek National Opera are built on 323 RESTON®PENDULUM Curved Surface Sliders. The 323 seismic isolators allow dynamic movements of +/- 350 mm and carry loads of up to 70,000 kN per unit.

A solar collector roof canopy with an area of 10,000 m² is also equipped with 60 RESTON®SA shock absorbers and 120 RESTON®SP spring devices to resist the strong wind forces arising. All these devices regulate the connections to the 30 column heads that hold the roof, damping all vertical vibrations.

A ROBO®CONTROL structural health monitoring (SHM) system is also linked to all damper and spring devices.

The RESTON®PENDULUM isolators allow large movements and carry loads of up to 70,000 kN



Highlights & facts

mageba products:

Type: RESTON®PENDULUM Curved Surface Sliders
 RESTON®SA shock absorbers
 RESTON®SP elastic spring devices
 ROBO®CONTROL SHM

Installation: 2013–2015

Structure:

City: Athens
 Country: Greece
 Completed: 2016
 Type: Cultural centre
 Owner: Stavros Niarchos Foundation (to be donated to Greek state)
 Contractor: Impregilo-TERNA JV
 Designer: PENELIS SA / EXPEDITION / OMETE

Testing of one set of four RESTON®SA shock absorbers, arranged as used in roof canopy





Hotel Via Vallejo (Mexico)



Project description

This building will be housing two different Marriot hotels, the Courtyard and the Fairfield. The whole building will be constructed on top of a large new mall called Via Vallejo, located in the centre of Mexico City.

The 10-floor building will have been designed to not only withstand the effects of the severe earthquakes in Mexico City, but also to ensure the serviceability of the hotel during and after the seismic event. To do this, the engineers have chosen to use seismic isolation as a protective strategy.

mageba scope

To improve the seismic response of the building, the engineers in charge of the structural design performed complex dynamic analysis, which confirmed that the best strategy was to seismically isolate the hotel from the large mall. Therefore, it was decided that 18 mageba LASTO®LRB (Lead Rubber Bearings) will be supporting the entire hotel. These devices will isolate the structure, which is rather flexible, from the much stiffer mall's structure.

This strategy has been confirmed after extensive three-dimensional dynamic analysis of the structure seismic response.

Highlights & facts

mageba products:

Type: LASTO®LRB Lead Rubber Bearings (isolators)
Installation: 2014–2015

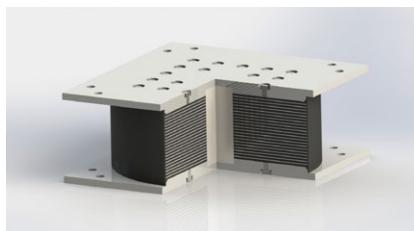
Structure:

City: Mexico City
Country: Mexico
Completed: 2014
Type: Gallegos Consultores
Contractor: SIESA

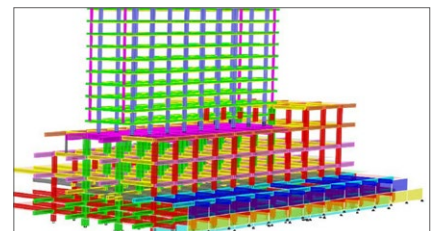
The structure is located in Mexico City, Mexico



3D-View of one of the LASTO®LRB (seismic isolators) to be installed in the building



Three-dimensional model of the hotel including the mageba LASTO®LRB supporting the hotel



Sky Building, Guayaquil (Ecuador)



Project description

The Sky Building in Guayaquil Ecuador will be part of a commercial complex called Aerocity located near the Guayaquil International Airport.

This 15-floor building consists of 4 parking levels and 11 office floors. Sky Building has been designed with the latest advances in terms of seismic protection by the leading structural engineering company in Ecuador. The structure has been conceived to withstand severe earthquake without suffering damages that could jeopardize the serviceability of the building at any time.

mageba scope

The seismic protection strategy chosen for this building is based on the seismic isolation principle. 64 mageba LASTO®LRB (Lead Rubber Bearings) will be installed on top of the parking levels in order to isolate the severe movement at the ground level, this will provide a comfortable movement on the structure, and most importantly the protection against any seismic damage during the earthquake.

There were considered three different types of seismic isolator for different loading conditions. Additionally, 44 sliders will also contribute with the isolation system.

Highlights & facts

mageba products:

Type: LASTO®LRB Lead Rubber Bearings (Isolators)
RESTON®SPHERICAL structural bearings (seismic sliders)

Installation: 2014-2015

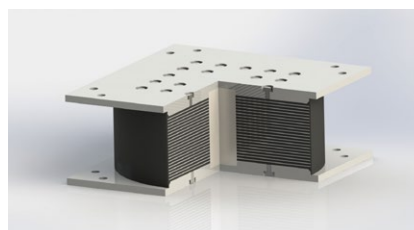
Structure:

City: Guayaquil
Country: Ecuador
Completed: 2014
Engineer: Consulsismica
Contractor: Construdipro S.A.

The building is located in Guayaquil, Ecuador



3D-View of one of the LASTO®LRB (seismic isolators) to be installed in the Sky Building

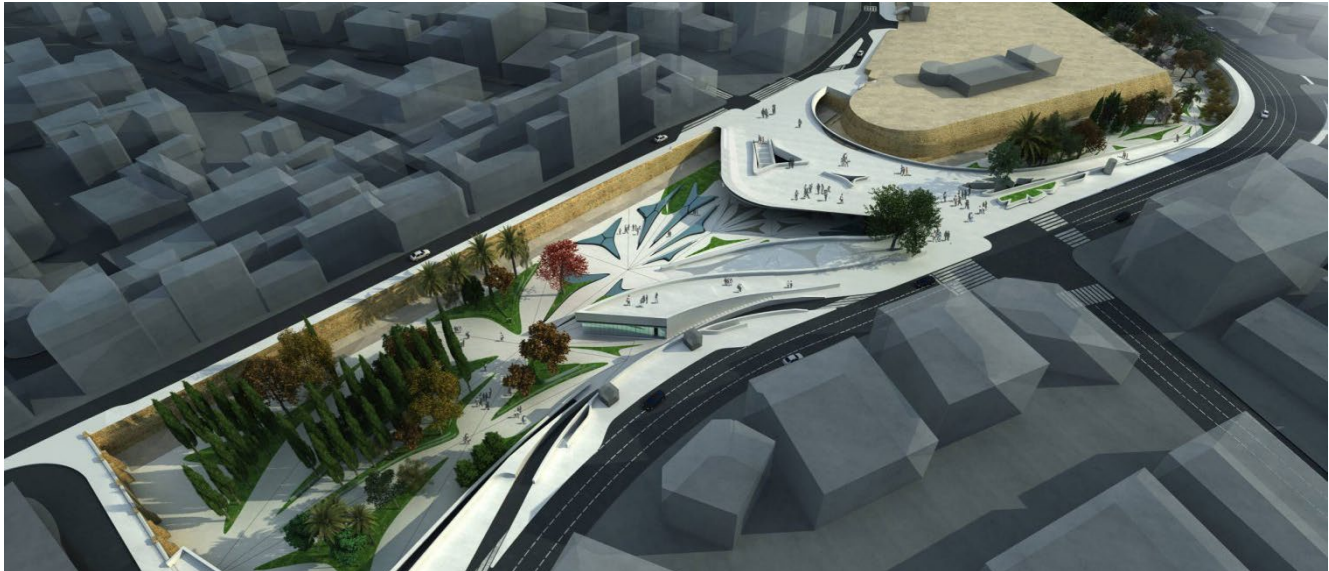


Full-Scale Sample LASTO®LRB prepared to be tested under actual seismic conditions in Italy





Eleftheria Square (Cyprus)



Project description

The Eleftheria Square in Cyprus' capital Nicosia constitutes a dramatic and historically significant 'architectural intervention' – an aspiration to reconnect the ancient city's massive fortified Venetian walls and moat with the modern city beyond – a bold vision of coherence and continuity which can become a catalyst to unify the last divided capital of Europe.

As the city expanded out of the medieval walls wooden bridges were constructed to facilitate transport. The original wooden bridge known as the Hajisavvas Opening was then replaced with a solid concrete one, which survives to date. In 2005 an architectural competition was announced to redesign the square. This was won by a group led by Zaha Hadid Architects.

mageba scope

mageba received an order of 19 RESTON®POT bearings as per EN1337 and CE-labelled. All bearings are multidirectional (free) and the maximum vertical load (ULS) is 11,207 kN. Friction was not considered for the transmission of the horizontal loads since Cyprus is a seismic area.

Due to the special geometry of the columns, space for the bearings was limited. In close cooperation with the structural engineer and the architect, mageba has worked out a proper solution that meets the requirements of this exceptional design.

Finally, and due to the fact that the bearings would be visible, the bearings had to be white coloured including the EPDM dusk skirts.

Highlights & facts

mageba products:

Type: RESTON®POT bearings
Features: EPDM dusk skirts, white coloured
Installation: 2015

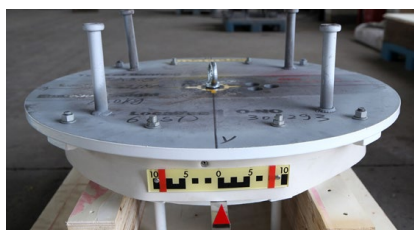
Structure:

City: Nicosia
Country: Cyprus
Type: Roof structure
Construction: 2005–TBC
Interior area: 7,175 m²
Open area: 35,300 m²
Architect: Zaha Hadid Architects
Engineer: Hyperstatic
Constructor: LOIS Builders Ltd
Owner: Nicosia Municipality

Nicosia is the capital and largest city on the island of Cyprus, as well as its main business centre



A pot bearing featuring white coloured dusk skirt, made of EPDM



The construction site in June 2015, showing the triangle-shaped columns with ellipsoid edges



Louvre Abu Dhabi (United Arab Emirates)



Louvre Abu Dhabi's exterior with Abu Dhabi's skyline (night)
© Louvre Abu Dhabi, Photography: Mohamed Som

Project description

The Louvre Abu Dhabi Museum, an affiliate of the renowned Louvre Museum in Paris, is located on the Saadiyat Island. In November 2017 the museum opened its doors to the public after ten years of planning and construction time. Designed by the French architect Jean Nouvel, the museum building is a fitting venue for the world-class art collections to be hosted in the years to come.

The building's most striking feature is its roof, a beautifully designed dome with a diameter of 180 m and a weight of approximately 8000 tonnes. The web-patterned dome allows the sun to filter through, much like rays of sunlight passing through palm branches in an oasis.

mageba scope

mageba supplied four large RESTON®PENDULUM bearings (type Mono) to support the museum's enormous roof. These bearings are designed to carry vertical loads of up to 33,000 kN each and to allow horizontal sliding movements of up to +/- 315 mm.

The contract to supply the bearings included a provision for full-scale testing to be carried out prior to the use of the bearings in the structure. This testing was successfully completed in 2014, at the SRMD testing facility of the University of California, San Diego – one of the world's foremost institutes for testing of this kind.

Highlights & facts

mageba products:

Type: RESTON®PENDULUM seismic isolators (type Mono) for loads of up to 33,000 kN

Testing: Caltrans SRMD, USA

Installation: 2015

Structure:

City: Abu Dhabi

Country: United Arab Emirates

Type: Art museum

Completed: 2017

Roof span: 180 m

Architect: Jean Nouvel

Engineer: Buro Happold

The museum was built in Abu Dhabi, the largest of the seven United Arab Emirates

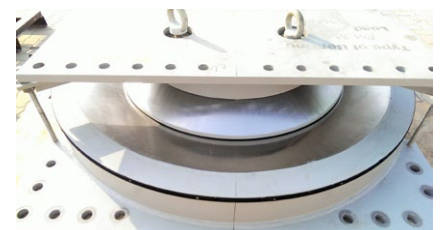


© 2012 Google

Testing of an isolator at the SRMD testing facility of the University of California, San Diego



A RESTON®PENDULUM bearing (type Mono) as fabricated, showing its spherical sliding surfaces





Al Habtoor City (UAE)



Project description

The enterprise Habtoor Leighton Group (HLG) secured a contract worth AED 1.45 billion (USD 395 million) for the construction of the Residential Towers project as part of the landmark AED 11 billion (USD 3 billion) „Al Habtoor City“ development in Dubai.

The Al Habtoor Residential Towers are a mixed-use development located immediately adjacent to the proposed Business Bay creek extension (Dubai Water Canal). It includes 2 x 75-storey residential towers, 1 x 52-storey residential towers, 7-storey podium including basement, ground floor and five floors of retail and parking.

The construction shall become the largest integrated hotel complex in the Middle East.

mageba scope

mageba delivered 16 RESTON®SPHERICAL bearings KF20 capable to bear 20,000 kN vertical load and 4 RESTON®SPHERICAL bearings KF24 with a vertical load capacity of 24,000 kN. These impressive vertical loads are necessitated due to a sophisticated steel truss roof structure which is directly embedded on mageba’s spherical bearings. Further to the high vertical loads, the bearings can resist horizontal loads of up to 5,300 kN and allow a certain rotation on the horizontal level in order to compensate the temperature born deformation and movements of the giant steel trusses.

In line with the high mageba standard, the bearings are equipped with ROBO®SLIDE, a high performance sliding material allowing a nearly friction free rotation of the bearings rotating surface.

Highlights & facts

mageba Products:

Type: 16 RESTON®SPHERICAL bearings type KF20 and 4 of type KF24

Installation: 2015

Structure:

City: Dubai

Country: UAE

Type: Steel truss roof

Completed: 2016

Owner: Al Habtoor Group

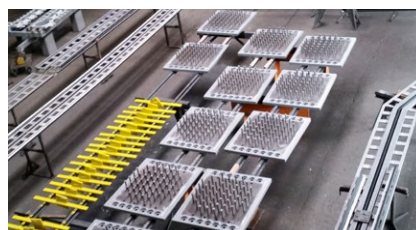
Constructor: Cleveland Bridge & Engineering

Designer: Khatib & Alami

The development is located in Dubai, on a prime location on Sheikh Zayed Road



The bearings have been produced in mageba’s production facilities and headquarters in Switzerland



The bearings finished, packed and tested are ready for shipment to Dubai



Muscat International Airport (Oman)



Project description

The new Muscat International Airport expansion will be completed in 2016 and has the capacity to handle 12 million passengers annually.

Further expansions planned in three subsequent phases will ultimately boost the airports' capacity to 24, 36 and 48 million passengers when the demand is required. The Total Gross Floor Area Terminal Building would be 335,000 m².

mageba scope

In order to assure safety in the Passengers Terminal Building (PTB) mageba delivered a variety of bearings and joints: In total 90 units of RESTON®POT bearings and 153 RESTON®SPHERICAL bearings for internal steel bridges, steel roofs as well as the tower and lift buildings. The 19 TENSA®MODULAR expansion joints with a

total length of 388 m will be installed in traffic forecourt bridges and in the traffic concourse (passenger arrival and departure).

mageba's supply for building products comprises:

772 units of high-quality point bearings LASTO®FLONPAD GP9, and 182 units of high-quality knuckle and sliding point bearings LASTO®FLONBLOCK, each made in Switzerland.

The process had challenges in terms of maximum available space below and above in several positions and also due to the fact that in other positions the bearings would be visible from the ground floor. mageba's input was hence extremely critical for the designing team because it had to adjust their details to the dimensions and heights of the bearings.

Highlights & facts

mageba products:

Type: 90 RESTON®POT bearings
135 RESTON®SPHERICAL bearings,
19 TENSA®MODULAR expansion joints,
772 LASTO®FLONPAD GP9 point bearings,
182 LASTO®FLONBLOCK sliding bearings

Installation: 2012–2016

Structure:

City: Muscat
Country: Oman
Type: Airport Center
Contractor: JV "Bechtel – ENKA"
Architect: Larsen A&CE
Client: OAMC (Oman Airports Management Company)

The Muscat airport is the largest one of the two international airports in Oman



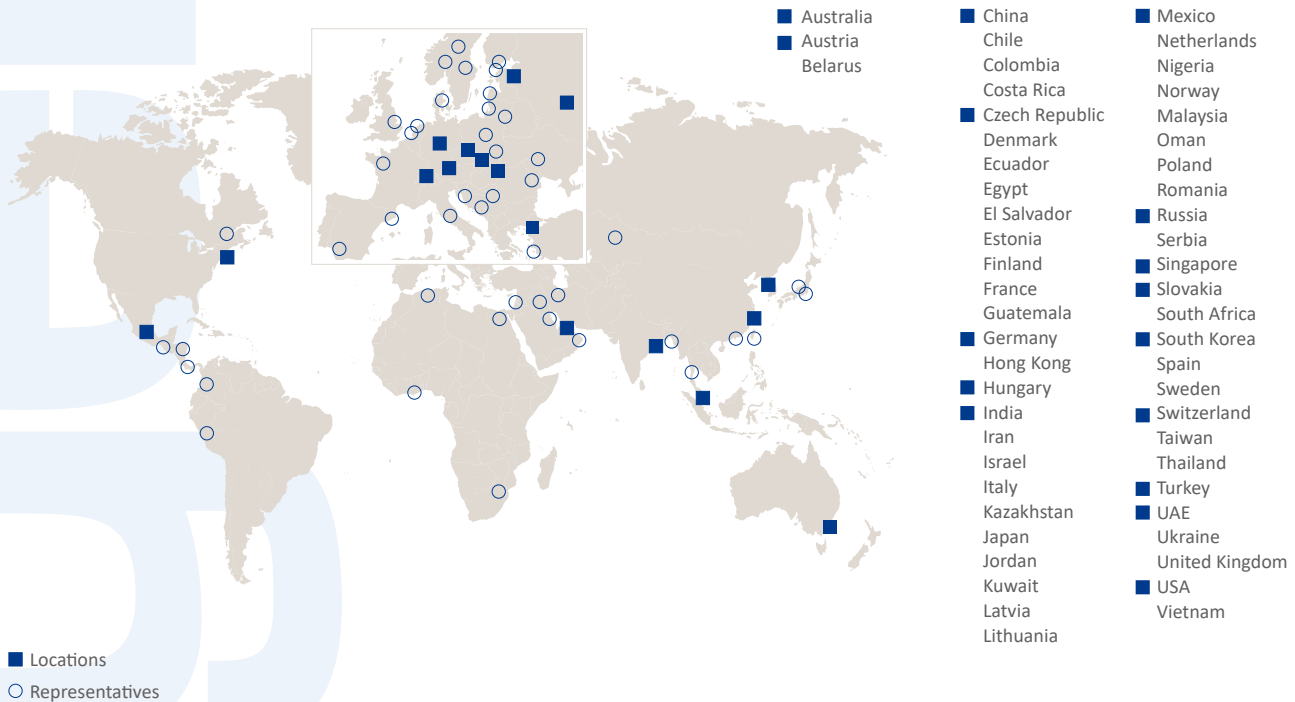
A spherical bearing supporting the steel roof of this impressive building



On-site check of a spherical bearing that features patented ROBO®SLIDE sliding material



engineering connections® – since 1963



- Australia
- Austria
- Belarus
- China
- Chile
- Colombia
- Costa Rica
- Czech Republic
- Denmark
- Ecuador
- Egypt
- El Salvador
- Estonia
- Finland
- France
- Guatemala
- Germany
- Hong Kong
- Hungary
- India
- Iran
- Israel
- Italy
- Kazakhstan
- Japan
- Jordan
- Kuwait
- Latvia
- Lithuania
- Mexico
- Netherlands
- Nigeria
- Norway
- Malaysia
- Oman
- Poland
- Romania
- Russia
- Serbia
- Singapore
- Slovakia
- South Africa
- South Korea
- Spain
- Sweden
- Switzerland
- Taiwan
- Thailand
- Turkey
- UAE
- Ukraine
- United Kingdom
- USA
- Vietnam

mageba headquarters



SWITZERLAND

mageba sa
Solistrasse 68
8180 Bülach
Tel. +41 44 872 40 50
info.ch@mageba-group.com

mageba-group.com

[LinkedIn](#) [YouTube](#)

Locations

AUSTRALIA

mageba (Australia) Pty Ltd
Eastern Creek, Sydney
Tel. +61 2 8188 5850
info.au@mageba-group.com

CZECH REPUBLIC

mageba CS s.r.o.
Brno
Tel. +420 541 233 042
info.cz@mageba-group.com

INDIA

mageba bridge products Pvt. Ltd.
Kolkata
Tel. +91 33 229 00 250
info@mageba.in

SINGAPORE

mageba (Singapore) PTE. LTD.
Singapore
Tel. +65 6977 7048
info.sg@mageba-group.com

TURKEY

mageba Yapı Sanayi ve Ticaret A.Ş.
Çayırova / Kocaeli
Tel. +90 262 658 23 80
info.tr@mageba-group.com

AUSTRIA

mageba gmbh
Wels
Tel. +43 7242 46991
info.at@mageba-group.com

GERMANY

mageba gmbh
Göttingen
Tel. +49 551 389 04 0
info.de@mageba-group.com

MEXICO

mageba Mexico - Tec. Est. S.A.
Querétaro
Tel. +52 442 388 6600
info.latam@mageba-group.com

SLOVAKIA

mageba Slovakia s.r.o.
Košice
Tel. +421 905 577 196
info.sk@mageba-group.com

UNITED ARAB EMIRATES

mageba sa (DMCC Branch)
Dubai
Tel. +971 4 561 3775
info.ae@mageba-group.com

CHINA

mageba (Shanghai) Co., Ltd.
Shanghai
Tel. +86 21 5740 7637
info.cn@mageba-group.com

GERMANY

mageba gmbh
Essen
Tel. +49 551 389 04 119
info.de@mageba-group.com

RUSSIA

mageba rus LLC
St. Petersburg
Tel. +7 495 967 93 20
info.ru@mageba-group.com

SOUTH KOREA

mageba (Korea) Co., Ltd.
Anyang
Tel. +82 31 389 2020
info.kr@mageba-group.com

USA

mageba North America Corp.
New York City
Tel. +1 212 644 3335
info.us@mageba-group.com

CHINA

mageba (Shengzhou) Co., Ltd.
Shengzhou
Tel. +86 21 5740 7637
info.cn@mageba-group.com

HUNGARY

mageba Hungary Kft.
Nyirtelek
Tel. +36 42 210 424
info.hu@mageba-group.com

RUSSIA

mageba rus LLC
Moscow
Tel. +7 495 967 93 20
info.ru@mageba-group.com

SWITZERLAND

mageba sa
Cugy
Tel. +41 21 731 07 10
info.ch@mageba-group.com

mageba
mageba-group.com