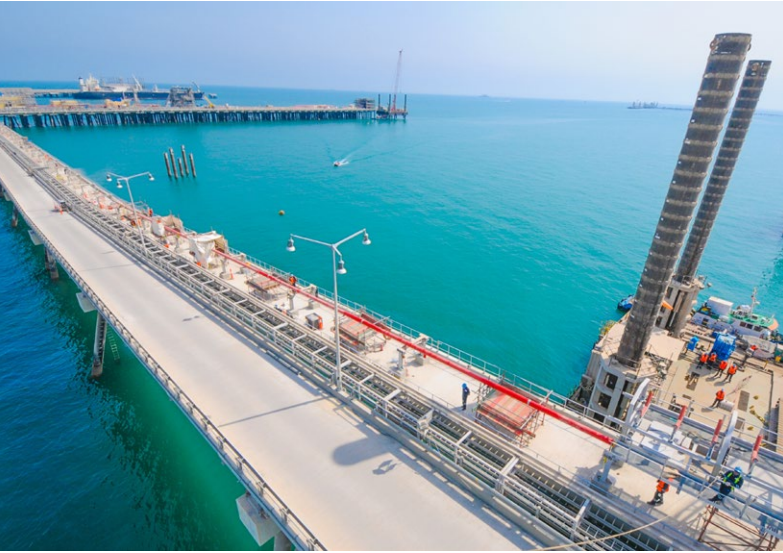




Project References

Project References – Ports and Wharfs





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



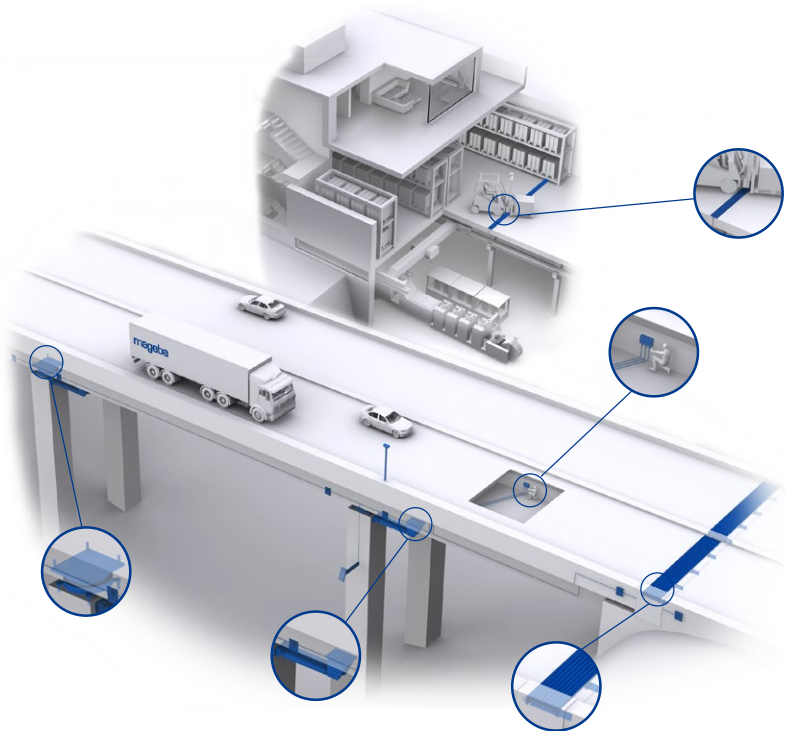
Expansion joints



Seismic devices



Structural monitoring



mageba's Systematic Quality

Management and Technical Excellence:



The particular challenges presented by ports and wharfs

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.**



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Cape Lambert Port A-Dolphin (Australia)



Project description

Rio Tinto owns an integrated portfolio of iron ore assets in the Pilbara region of Western Australia including 16 mines, 4 independent port terminals, a 1,700 km rail network and other related infrastructure.

One of its facilities is the Cape Lambert iron-ore port which is located about 1,250 km north of the Western Australian capital of Perth.

The Cape Lambert “A” wharf has been in operation since 1972, but its original 17 dolphins were either demolished or decommissioned in 1999. The existing and still operational dolphins were installed between 2001 and 2002.

During a recent structural integrity inspections of the entire system, structural defects were identified. With some of these defects reportedly reducing the structural capacity of the existing dolphins, the replacement of the deteriorated dolphins was proposed.

The wharf is located approx. 2.5 km northeast offshore of Cape Lambert at Port Walcott



mageba scope

For this project in total 36 RESTON® SPHERICAL bearings with uplift restraint were produced and installed.

The bearings were designed to perform in harsh environment, therefore their fabrication had to follow a strict quality control process.

In order to ensure that the quality of the steel used for the production of the bearings is the highest, at the procurement stage, each steel plate’s mechanical and chemical properties were tested in a third party ILAC accredited Lab to ensure their compliance to the AS3678 requirements.

In addition, mageba also commissioned the same lab to perform an ultrasonic testing on each steel plate to meet with AS 1710 – Level 2.

After their fabrication was completed, the bearings were tested to the designed load in mageba’s NATA accredited lab in Sydney as per MRWA Spec 861 & AS5100.4.

A bearing is prepared for testing in mageba’s NATA certified lab



Highlights & facts

mageba products:

Type:	RESTON®SPHERICAL bearings
Feature:	Uplift restraint
Installed:	2020

Structure:

City:	Port Walcott (WA)
Country:	Australia
Type:	Wharf
Owner:	Rio Tinto
Contractor:	Austral Construction Pty Ltd
Structural designer:	Aurecon

Installation of RESTON®SPHERICAL bearings on the superstructure manufactured in Shanghai



Port Arthur (USA)



Project description

The port of Port Arthur on Texas's gulf coast has seen a rapid growth in exports over the past years. In order to address this increased demand, the Port decided to enlarge its capacity by adding a new 183 m (600 ft) extension to the current facilities known as Berth 5.

The new extension will cost the port \$37 million, but it is needed to handle the increasing demand for diesel fuel produced locally and exported at the port. Imports are also being constrained by limited dock space, so this expansion will increase the ease with which imports can be off-loaded as well.

A further development is planned for 2022 to add Berth 6, which will increase the port's capacity even further with an additional 305 m (1,000 ft.) of dock space.

mageba scope

mageba supplied two 18 m (58 ft.) long overlapping plate expansion joints for the Berth 5 wharf extension.

The custom expansion joints built by mageba were design to accommodate the three sets of recessed rail system used by the port, with additional considerations for a future retrofit to add more rail capacity along the wharf.

After the designing process, the joints were produced and assembled in mageba's Shanghai facility and then shipped to site.

Highlights & Facts

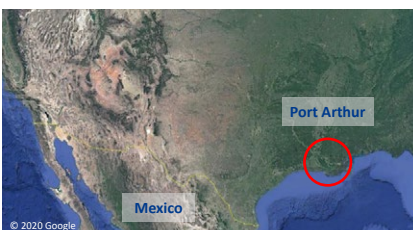
mageba Products:

Type: Overlapping plate expansion joints
Installation: 2020

Structure:

City: Port Arthur, TX
Country: United States
Type: Wharf
Completion: 2020
Owner: Port Arthur International Public Port
Contractor: Mason Construction
Engineer: Collins Engineers Inc.

The project is located in the city of Port Arthur in Texas



Joints in production



Joints after assembly in mageba's Shanghai facility





Colman Dock (USA)



Project description

Colman Dock, also called Pier 52, is an important ferry terminal in Seattle, Washington. The original pier is no longer in existence, but the terminal, now used by the Washington State Ferry system, is still called “Colman Dock”.

The Colman Dock project plans to replace the aging and seismically vulnerable components of pier in order to maintain ferry service in the future. The project will also address existing safety concerns related to conflicts between vehicles and pedestrian traffic as well as operational inefficiencies. The renovation works will be implemented as a multi-phased project.

mageba scope

mageba USA supplied four RESTON®DISC bearings; 2 × DF110 and 2 × DF70, with a ULS capacity of 165 and 110 kips respectively.

All bearings were designed to provide a SLS rotation capacity of 0.02 rad. The bearings had an unusually high horizontal load to vertical load ratio which required large shear pins and the welds to be designed for tension.

The bearings were designed with a bolted connection to the structure, allowing easier replicability for future maintenance purposes.

The bearings were tested in accordance with AASHTO LRFD.

Highlights & Facts

mageba Products:

Type: RESTON®DISC bearings
Installation: 2018

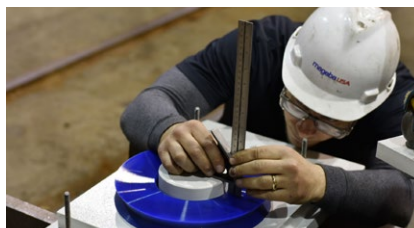
Structure:

City: Seattle, WA
Country: United States
Built: 2018
Type: Ferry terminal
Owner: Washington State DOT
Contractor: Jesse Engineering Co.

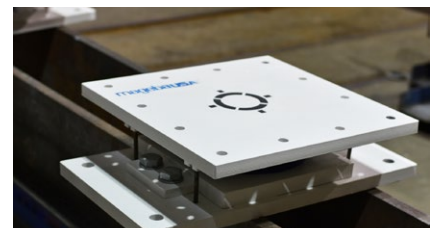
Colman Dock is located in Elliot Bay, Central Seattle



Manufacturing of a disc bearing



A RESTON®DISC bearing after assembly in the US factory



Costa Norte Power Plant (Panama)



© 2018 Flenco Fluid System

Project description

The Costa Norte Power Plant is located in Panama's Colón Province.

The plant – Panama's first LNG power plant – includes a 180,000 m³ liquid natural gas (LNG) storage tank, a re-gasification facility, a 381 MW net combined cycle gas-fired power plant and a 230 kW transmission line of length approximately 17 km connecting to the country's national interconnected system.

The cost is approximately USD 900 million, and it will supply roughly 3,000 GWh of electricity annually.

mageba scope

To support the steel beam that supports one of the plant's key natural gas pipelines, mageba supplied LASTO®FLONBLOCK elastomeric bearings.

This type of bearing was selected for its ability to carry high vertical loads while accommodating rotations and horizontal displacements, in both the longitudinal and transverse directions, with a minimum of friction.

The bearings were designed for vertical loads of approximately 270 kN. The elastomeric material is natural rubber with Shore A hardness of 60 +/- 5, which offers very high tensile strength and elasticity.

Highlights & Facts

mageba Products:

Type: LASTO®FLONBLOCK elastomeric bearings

Installation: 2017

Structure:

City: Colón

Country: Panama

Type: Power generation plant

Built: 2018

Owner: Panama Canal Authority

Contractor: BAM Iconsa JV

The new LNG power plant is located at the entrance of the Panama Canal



© 2018 Google

A LASTO®FLONBLOCK excluding the stainless steel sliding sheet



LASTO®FLONBLOCK bearing with a stainless steel sliding sheet





New Sulphur Jetty (Kuwait)



Project description

The capacity of the original sulphur handling plant located in the largest oil refining complex of Kuwait, Mina Al Ahmadi was increased from 2,431 tons/day to 5,000 tons/day.

To double the capacity of the plant, a major repair and expansion work was required.

The project was awarded to the South Korean Daelim Industrial on EPC basis. AFCONS Infrastructure Ltd, India as a sub-contractor of Daelim was responsible for the implementation of the project.

The project cost reached \$886 million, which included the construction of an approach trestle and a conveyor bridge amongst other things.

mageba scope

Having worked on many technically challenging projects with mageba, the sub-contractor, AFCONS Infrastructure Ltd. was confident that mageba would be the perfect partner for taking on the responsibility for designing and supplying the necessary bearing system.

LASTO®BLOCK elastomeric bearings with special attachments capable of transferring very large horizontal forces (in some cases, horizontal forces are greater than vertical loads) and accommodating uplift forces were designed in accordance with EN 1337-3 to meet the project requirements.

In total, 250 large sized LASTO®BLOCK bearings of type F2 were manufactured within a matter of just 16 weeks to meet the tight construction schedule. The smallest bearing weighs approximately 140 kg, while the largest one weighs about 1,890 kg.

Highlights & facts

mageba products:

Type: LASTO®BLOCK bearings
Installed: 2017

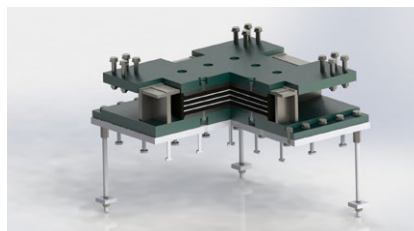
Structure:

City: Kuwait City
Country: Kuwait
Type: Approach Trestle and Conveyor
Completion: 2017
Owner: Kuwait National Petroleum Company
Contractor: AFCONS Infrastructure Ltd.

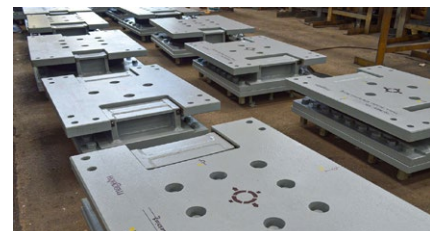
The project is situated 45 km from Kuwait City



3D view of an installed LASTO®BLOCK bearing of type F2



Elastomeric bearings with special attachments during the finishing works at the factory



JT4 Offshore Bridge (UAE)



Project description

The Jebel Ali Terminal 4, phase 1, is located to the operational Terminal 2, in the vicinity of a LNG import terminal and the shipping fairway to Jebel Ali.

To connect the terminal with the mainland a causeway will be constructed with an approximate total length of 2,240 m. This causeway will be split in two, the northern and southern causeway, by a 440 m long bridge. This is to ensure water circulation through the existing port. The causeways will consist of two rock structures containing reclamation fill with an approximate width of 35 m. The 440 m dual carriageway bridge will be a concrete gravity structure founded on rock foundations. The gravity piers significantly reduce the interface with buried gas line from the LNG facility.

mageba scope

mageba supplied a total of 264 elastomeric bearings that act as elastic connection between the elements of this offshore bridge.

Type B, the laminated bearing, is fully covered with elastomer, comprising only one steel reinforcing plate and can be positioned between the elements without anchoring.

Production according to American Standard AASHTO LRFD Section 14 and in-house testing was performed by mageba's ISO-certified production facility in Kolkata, India.

Highlights & facts

mageba products:

Types:	LASTO®BLOCK type B elastomeric bearings
Features:	According to American Standard AASHTO LRFD Section 14
Testing:	In-house testing of finished bearings by mageba India
Installation:	By general contractor BAM International LCC
Year:	2015

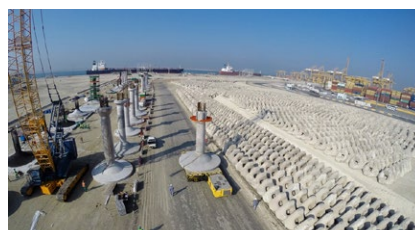
Structure:

Location:	Dubai
Completed:	2015
Type:	Offshore bridge
Length:	440 m
Contractor:	BAM International

The bridge is located close to Dubai International Airport and connects the terminal with the mainland



The piers on site ready for installation. The bearings are the connection elements to the bridge



The elastomeric bearings LASTO®BLOCK have been produced and tested by mageba India





Hay Point Port (Australia)



Project description

The Port of Hay Point in north-eastern Australia is one of the largest coal export ports in the world, serving the state of Queensland's strong coal mining industry.

It comprises two terminals, each of which has purpose-built rail in-loading facilities, onshore stockpile yards and offshore wharves.

The offshore wharves are serviced by conveyor systems, supported on jetties, which run out to sea and allow loading in deep water.

To enable the port to cater for growing demand, it had to be expanded with the addition of new wharves and associated infrastructure.

mageba scope

To provide bearing support for the new wharves and a number of other critical structures during the port's expansion project, mageba supplied a large number of elastomeric strip bearings.

These pre-drilled bearings, typically with a thickness of 25 mm and of elastomer of type 60 H in accordance with AS5100.4 Appendix B, had a total length of over 1.25 km.

By absorbing vibrations, the use of these bearings enables the supported heavy-duty structures to withstand the impacts and demanding loading conditions arising in this industrial facility.

Highlights & facts

mageba products:

Type:	Pre-drilled elastomeric strip bearings
Quantity:	1.25 km in length
Installation:	2013

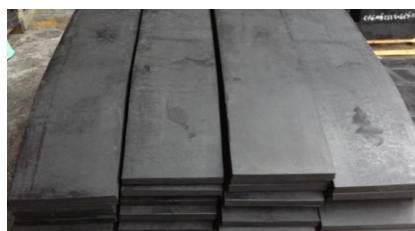
Structure:

City:	Hay Point
Country:	Australia
Built:	1971
Expansion:	2013
Type:	New wharves and associated structures
Contractor:	MDGS JV

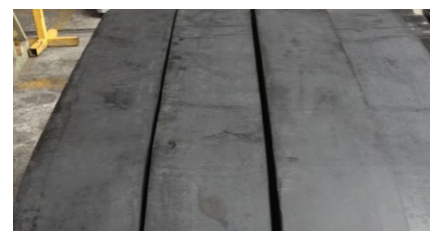
Hay Point Port is located in northeast Australia, on Queensland's east coast



Elastomeric bearing strips of thickness 25 mm, prior to drilling of 50 mm-diameter fixation holes



Construction of an offshore wharf, using mageba elastomeric strip bearings



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



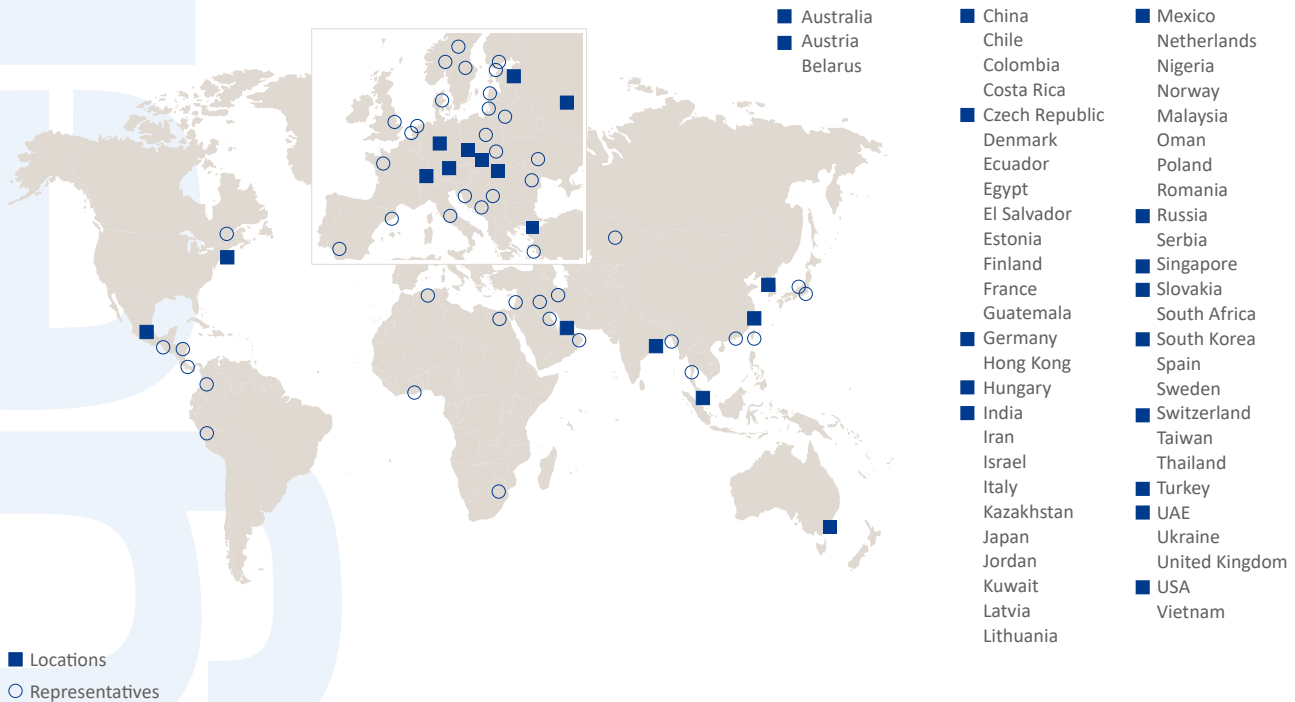
mageba LASTO®BLOCK elastomeric bearings, ready for delivery



The Kai Tak Cruise Terminal during construction



engineering connections® – since 1963



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- Hungary
- India
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- Kuwait
- Latvia
- Lithuania
- Mexico
- Netherlands
- Nigeria
- Norway
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