



ISOLDAMP GENERAL OVERVIEW

BRIDGE BEARINGS, JOINTS & SEISMIC PROTECTION DEVICES

ISOL
DAMP

The logo for ISOLDAMP features the word "ISOL" in a bold, blue, sans-serif font, and "DAMP" in a grey, sans-serif font below it. To the right of the text is a stylized graphic of a seismic waveform, consisting of a series of vertical lines of varying heights, resembling a seismogram.

INDEX

THE COMPANY

TYPE OF DEVICES

DEVICE DESIGN

PTFE SLIDING MATERIAL PERFORMANCE

SPECIAL SLIDING MATERIAL PERFORMANCE EVERSLIDE™

STANDARD CORROSION PROTECTION

REFERENCES & HIGHLIGHTS

The Company

ISOLDAMP SRL - ITALIAN ENGINEERING COMPANY BASED IN MILANO. The technical and production team of ISOLDAMP SRL is made up in Italy of **expert Structural Engineers and Technicians** with extensive and recognized design capacity **with more than 20 years of experience in the design, production and testing of seismic protection devices.**

*The company is capable of **designing and manufacturing structural bearings and seismic isolation devices** according to European, American, Peruvian, Chilean, Turkish standard and all other major international standards and regional Technical Approvals.*

Basing on its wide and deep knowledge of Client's need, ISOLDAMP is able to offer a unique support taking advantage of its important experience in the design of seismic devices and the most important production & testing network worldwide.

The Company

The main production plants are located in Italy and China. Follows in the next pages some pictures as example of production:



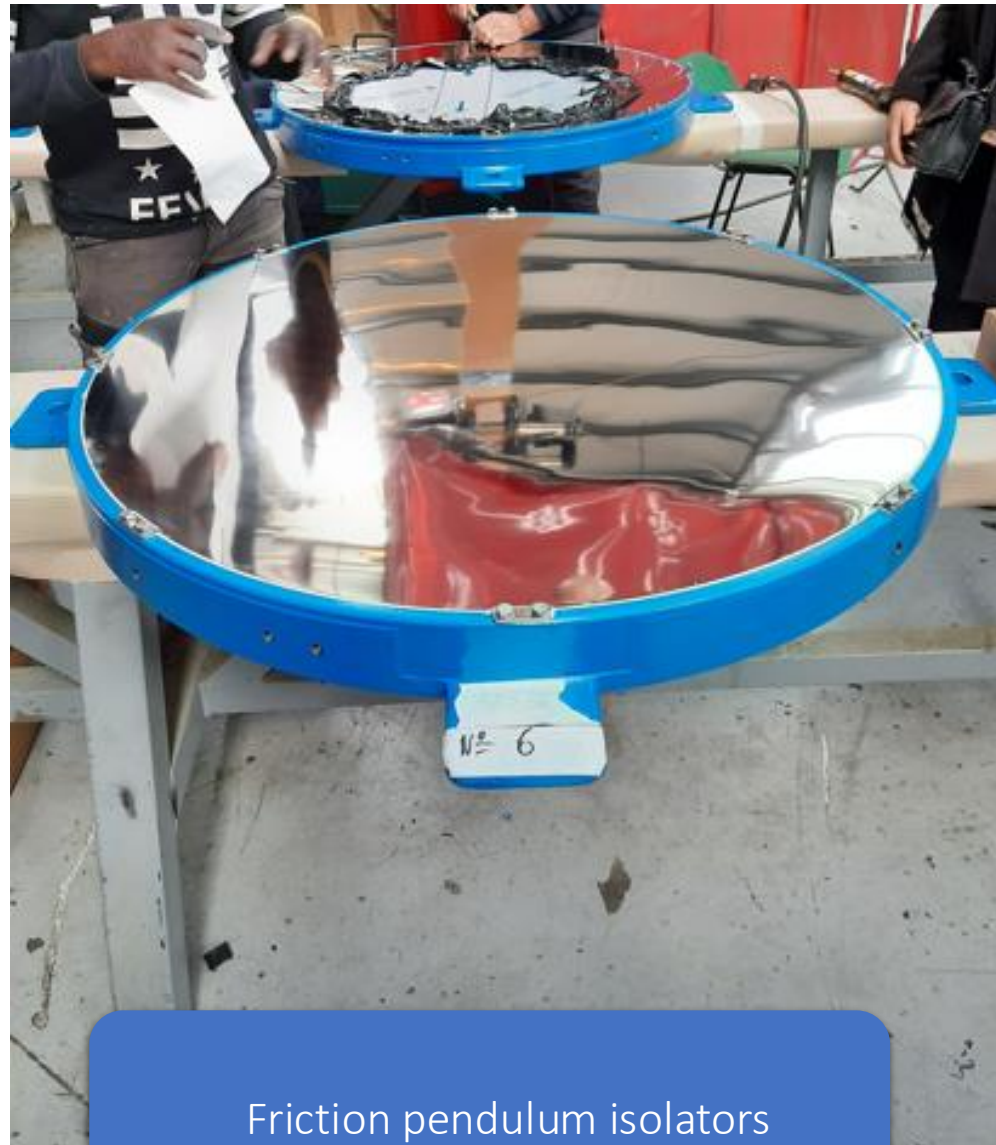
Friction pendulum isolators

The Company



Friction pendulum isolators

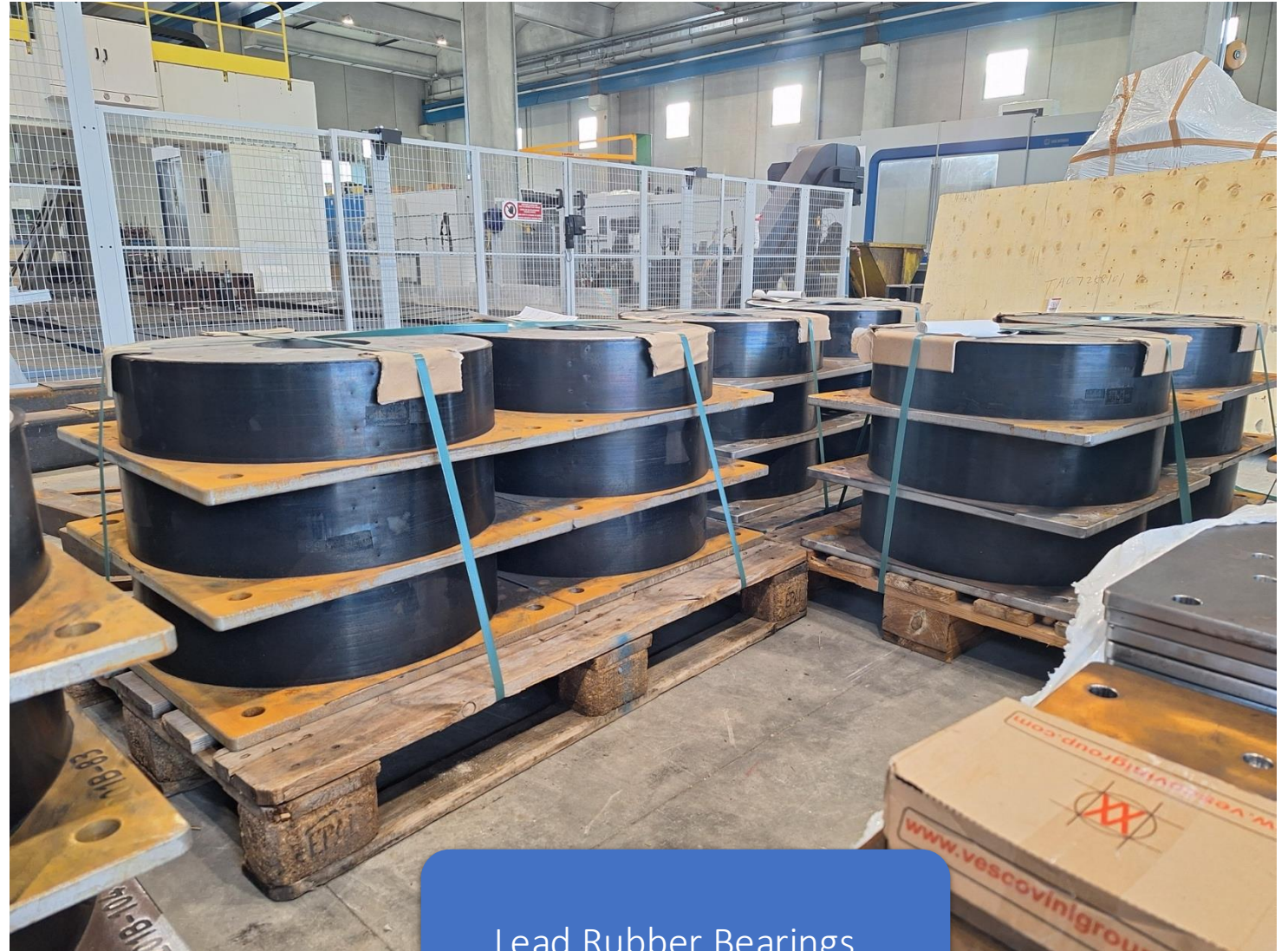
The Company



Friction pendulum isolators

The Company

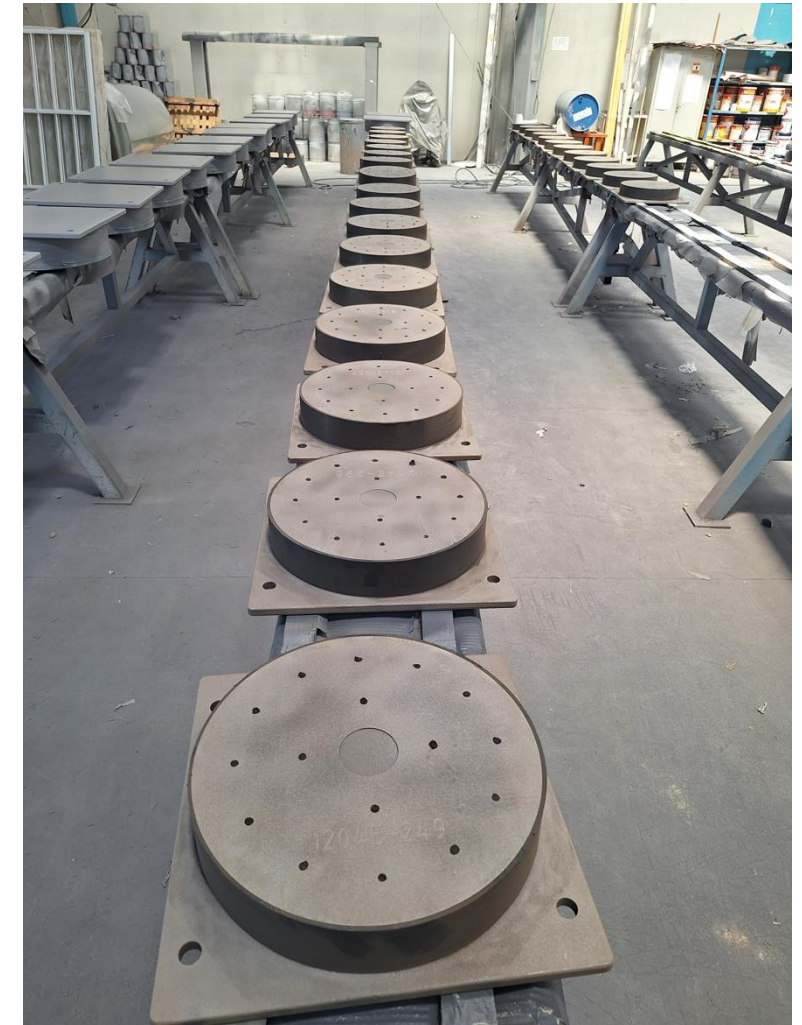
Follows in the next pages some pictures of the production of Lead low damping natural Rubber Bearings:



Lead Rubber Bearings

The Company

Detail of the lead with purity larger than 99.9% and detail of the corrosion protection application after sandblasting:



Lead Rubber Bearings

The Company

Packing of the painted and labelled devices during preparation for the delivery:



Lead Rubber Bearings

TYPE OF DEVICES

AVAILABLE **"CE" MARKED** PRODUCTS:

BEARINGS:

- ELASTOMERIC REINFORCED BEARINGS - EN1337-3
- SPHERICAL & CYLINDRICAL PTFE BEARINGS - EN1337-7
- SPHERICAL & CYLINDRICAL UHMWPE BEARINGS - EAD050004-01-0301
- STEEL POT BEARINGS - EN1337-5

SEISMIC ISOLATORS:

- HIGH & LOW DAMPING RUBBER BEARINGS - EN15129
- LEAD RUBBER BEARINGS - EN15129
- SINGLE & DOUBLE CURVED SURFACE SLIDER - FRICTION PENDULUM - EN15129

HYDRAULIC DEVICES:

- FLUID VISCOUS DAMPERS - EN15129
- SHOCK TRANSMISSION UNITS - EN15129

HYSTERETIC DEVICES:

- "C" SHAPED ELASTO PLASTIC DEVICES - EN15129 (DDD)

SINGLE GAP AND MULTI-MODULAR STEEL EXPANSION JOINTS

Follow in the next slides the main characteristics of the proposed devices:

TYPE OF DEVICES

ISOLATORS:

Isolators, as well as bearings do, are capable to support vertical loads, allow horizontal movements and rotations. Isolators are designed to protect the structures (building, bridges or else) from any damage in case of an earthquake ensuring the material and human content and the plain functionality after the seismic event. Isolators additional features, compared with bearings, are the following:

- **LOW HORIZONTAL STIFFNESS:** Isolators show a low horizontal stiffness allowing to bring the static (low) period to an “isolated” (larger) period measured in “seconds”. This means that in case of an earthquake the traditional non-isolated rigid structures vibrate for a very limited period and this transfers to the structure forces larger than the ones expected basing on the actual peak ground acceleration experienced by the considered site. This phenomenon is due to the specific mode of vibration of the structures which makes the acceleration to be amplified. The big force produces damages of the structure and sometimes results in the collapse of it or in the temporary or permanent impossibility to occupy it after the event. By supporting the entire structure over seismic isolators the period is brought to a larger one defined as “isolated period” (normally between 2 to 4 seconds) and this makes the structure to be subjected to a much lower force avoiding the larger part of the shear force to reach the superstructure damaging it.
- **DAMPING:** Isolators may be characterized by a “**low damping**” or may be capable to absorb part of the earthquake energy supplying an “**high damping**” thus providing an additional reduction of the force to which otherwise the structure would be subjected resulting in a lower displacement demand.

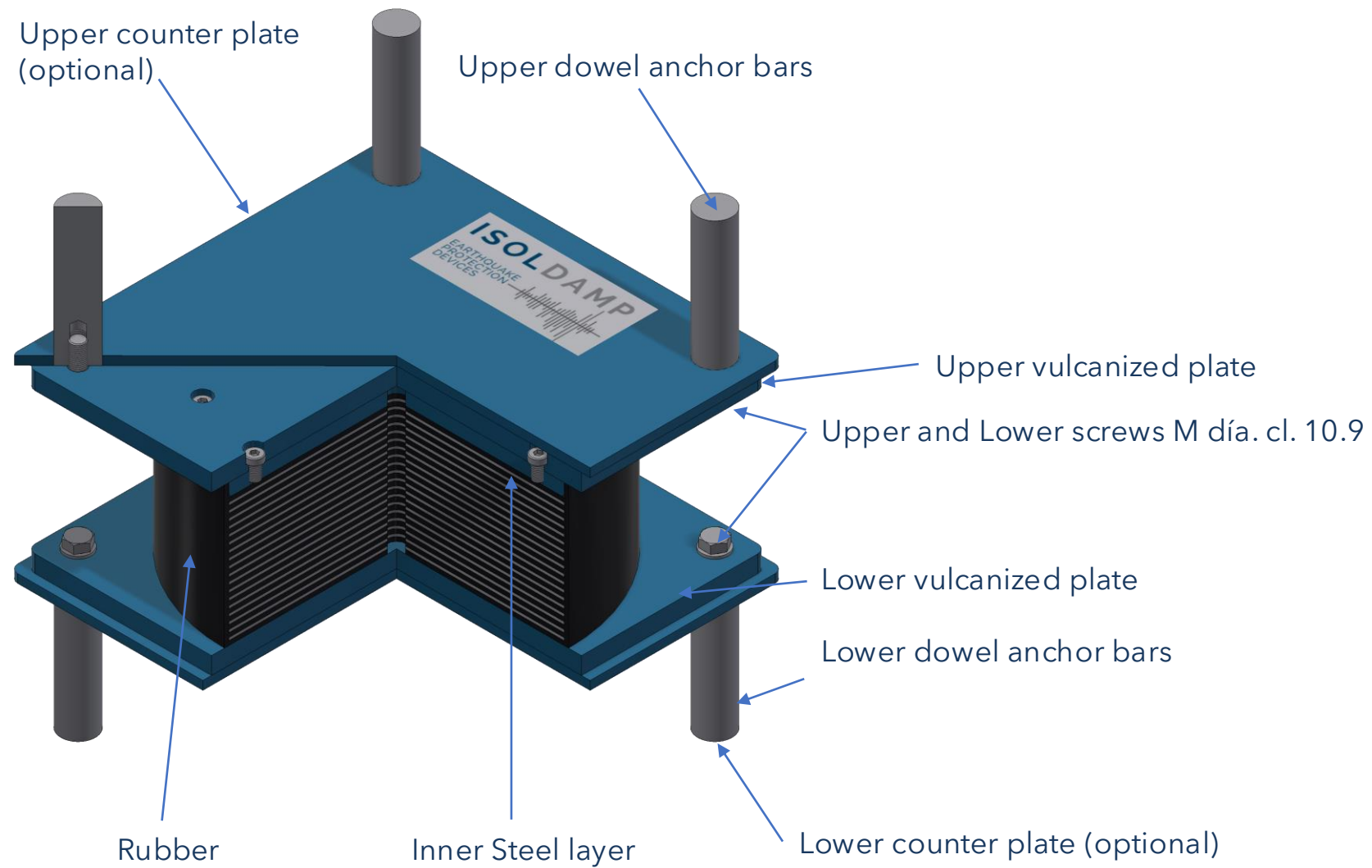
Seismic isolators

TYPE OF DEVICES

HDRBs devices are characterized by alternating layers of rubber and steel connected together by vulcanization. The steel layers provide the necessary vertical stiffness and resistance to carry safely the structure vertical loadings in any service or ultimate limit state combination while the rubber provides the necessary (low) horizontal stiffness which allows to decouple the movements and significantly lower the relative force transmitted from the ground to the superstructure. For the design of HDRBs isolators, a natural rubber with the suitable G modulus is used according to EN15129 with nominal damping at 100% shear strain ranging from 10% to 15%. HDRBs are designed in accordance with EN15129 standard (CE marked) or in alternative any other worldwide norm (American AASHTO, ASCE 7-22 or else) or technical specification. We are also able to offer rubber isolators characterized by a low damping ($\leq 6\%$ @ 100% shear deformation). In this case isolators are named **LDRBs** (low damping rubber bearings).

High Damping Rubber Bearings isolators type IDHDB
Low Damping Rubber Bearings isolators type IDLDRBS

TYPE OF DEVICES



High Damping Rubber Bearings isolators type IDHDB
Low Damping Rubber Bearings isolators type IDLDRBS

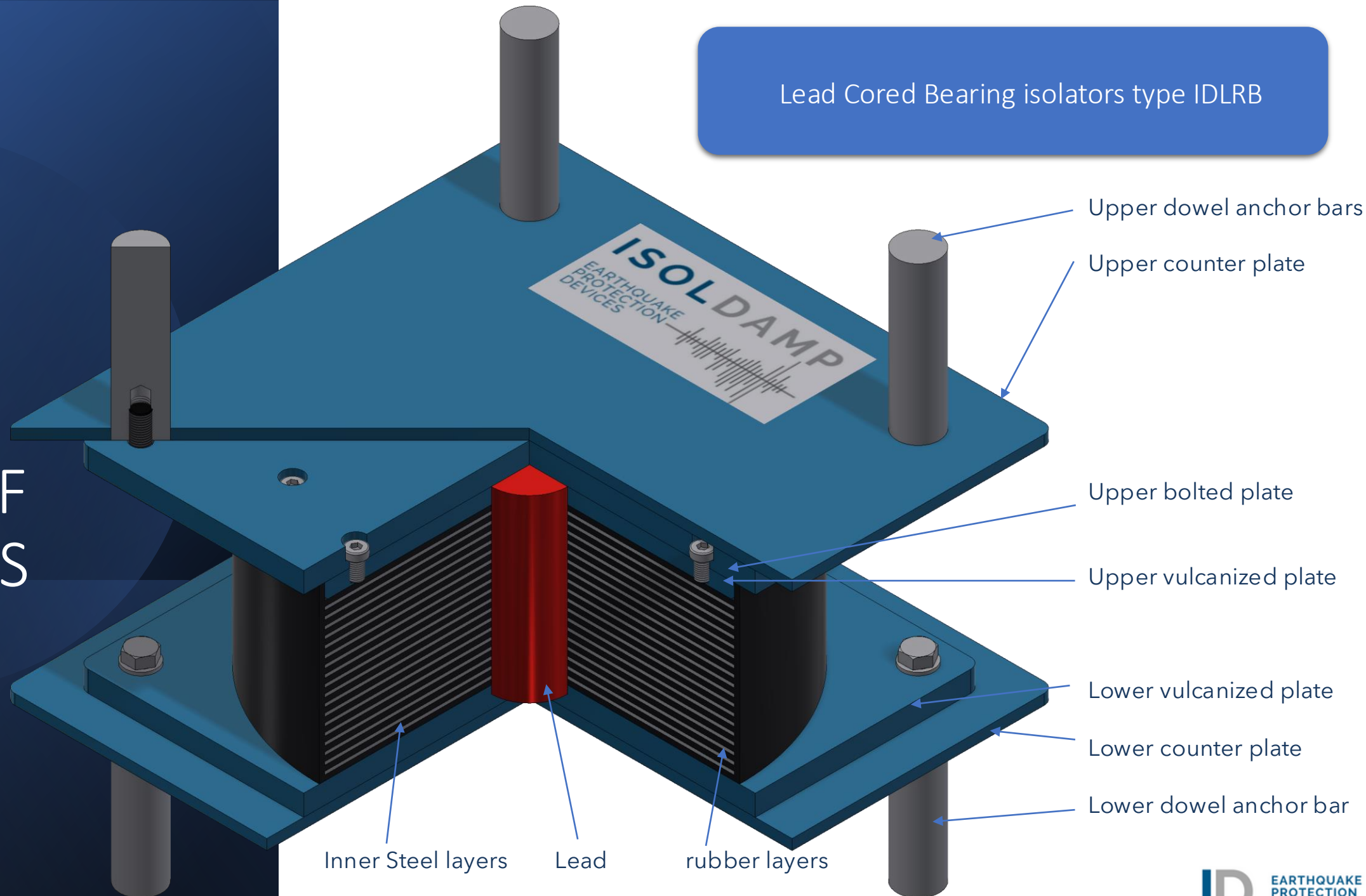
TYPE OF DEVICES

LRBs Lead Rubber Bearings isolators are characterized by alternating layers of rubber and steel connected together by vulcanization. The steel layers provide the necessary vertical stiffness while the rubber provides the necessary (low) horizontal stiffness which allows to decouple the movements and significantly lower the relative force transmitted. For the design of the following isolators, a natural rubber with the suitable G modulus is used according to EN15129. The devices are fitted by one or more lead cores symmetrical positioned with a purity larger than 99.9%. Thanks to the lead core/s LRBs show a bi-linear behavior which provides an important damping value up to more than 30%. After the seismic movement lead re-crystallize at room temperature recovering its pre- yielding characteristics. For the mentioned reason they are capable to overcome a large number of events along their design life (> 60 years). LRBs are designed in accordance with EN15129 standard (CE Marked) or in alternative any other worldwide norm (AASHTO, ASCE 7-22 or else) or technical specification. The LRBs are acting on the same two concepts earlier explained for isolators with the only difference that by the use of LRBs, thanks to the presence of the lead, Designers can profit of a larger amount of damping (up to more than 30% instead of maximum 10-15%) which increases the energy absorption thus limiting the expected displacement during an earthquake. For the said reason the selection of an HDRBs or an LRBs is made according to the seismicity of the area where the structure is built.

Lead Cored Bearing isolators type IDLRB

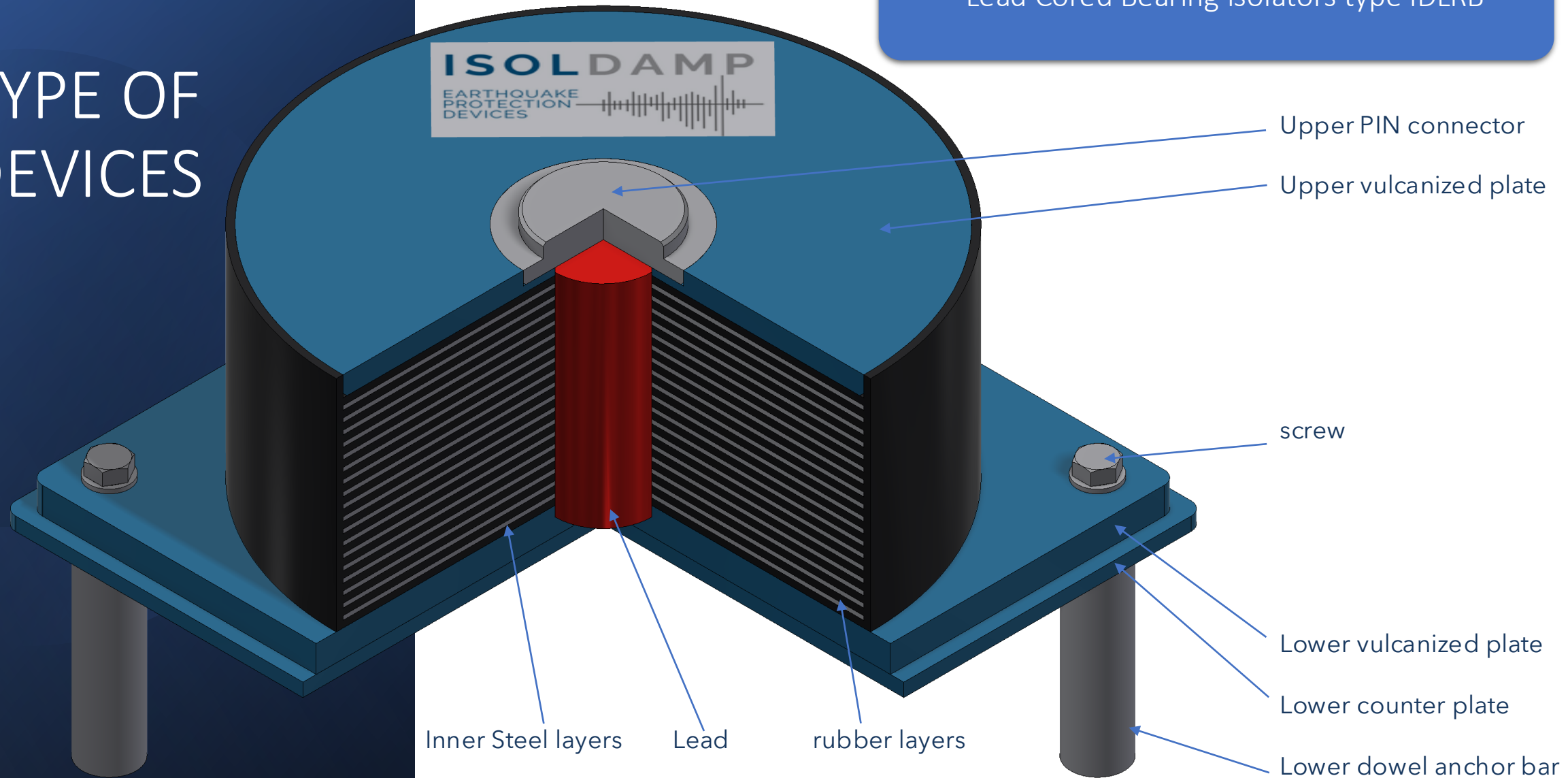
Lead Cored Bearing isolators type IDLRB

TYPE OF DEVICES



TYPE OF DEVICES

Lead Cored Bearing isolators type IDLRB

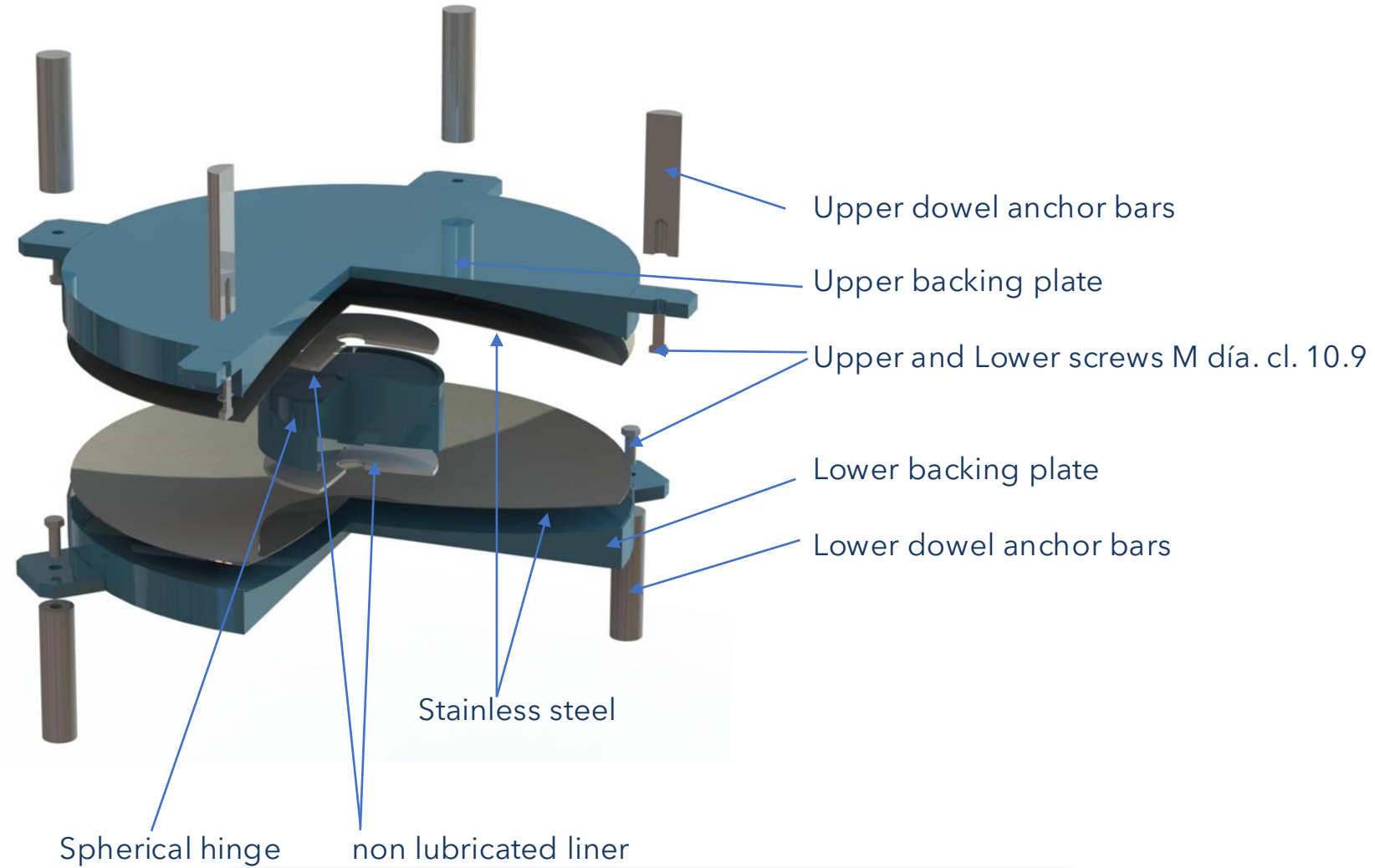


TYPE OF DEVICES

CURVED SURFACE SLIDERS also known as friction pendulum can be “single” or “double” surface. The working principle of the single or double surface is similar with the difference that double surface shows a more compact overall size as the design displacement is divided between two sliding concave plates. Double curved surface slider is the most common solution and it is made by two backing concave spherical plates with the same radius of curvature. Each one houses a stainless-steel mirror plate with the same radius of curvature of the backing plates. Between the two sliding plates a double convex spherical element is fitted by a special sliding liner material which produces the needed friction coefficient. Thanks to the cinematic mechanism, parallelism between the two sliding plates is granted in any displacement condition. The horizontal displacement is symmetrically shared between the two surfaces thus reducing the overall device size. The central double convex spherical hinge also allows for the structure rotation due to loading effects. Devices comply with EN 15129 (CE Marked) or in alternative any other worldwide norm (AASHTO, ASCE 7-22 or else) or technical specification. The purpose of the sliding pendulum is the one common to any kind of seismic isolator meaning to lower the horizontal stiffness and add energy dissipation to the system which is also the purpose of HDRBs and LRBs. The difference is how rubber / lead rubber isolators are reaching their targets compared with curved surface sliders. The first are capable to reach a low horizontal stiffness and cover the displacement thanks to the rubber G modulus (nominal 0.4 to 1.4 MPa) and its shear deformation while curved surface sliders are reaching the same targets thanks to the low and controlled friction generated between the sliding material and the stainless-steel mirror plate. In curved surface slider the displacement is reached by the liner material which slides over the mentioned mirror polished stainless-steel plate. The friction coefficient along with the curved surface contribution generate hysteretic cycles (force-displacement loops) which produces the damping requested by the design which helps in decrease and control the seismic displacement. Curved surface sliders are comparable anyway more to LRBs rather than to an HDRBs because the damping level reachable by a Pendulum is similar to the first.

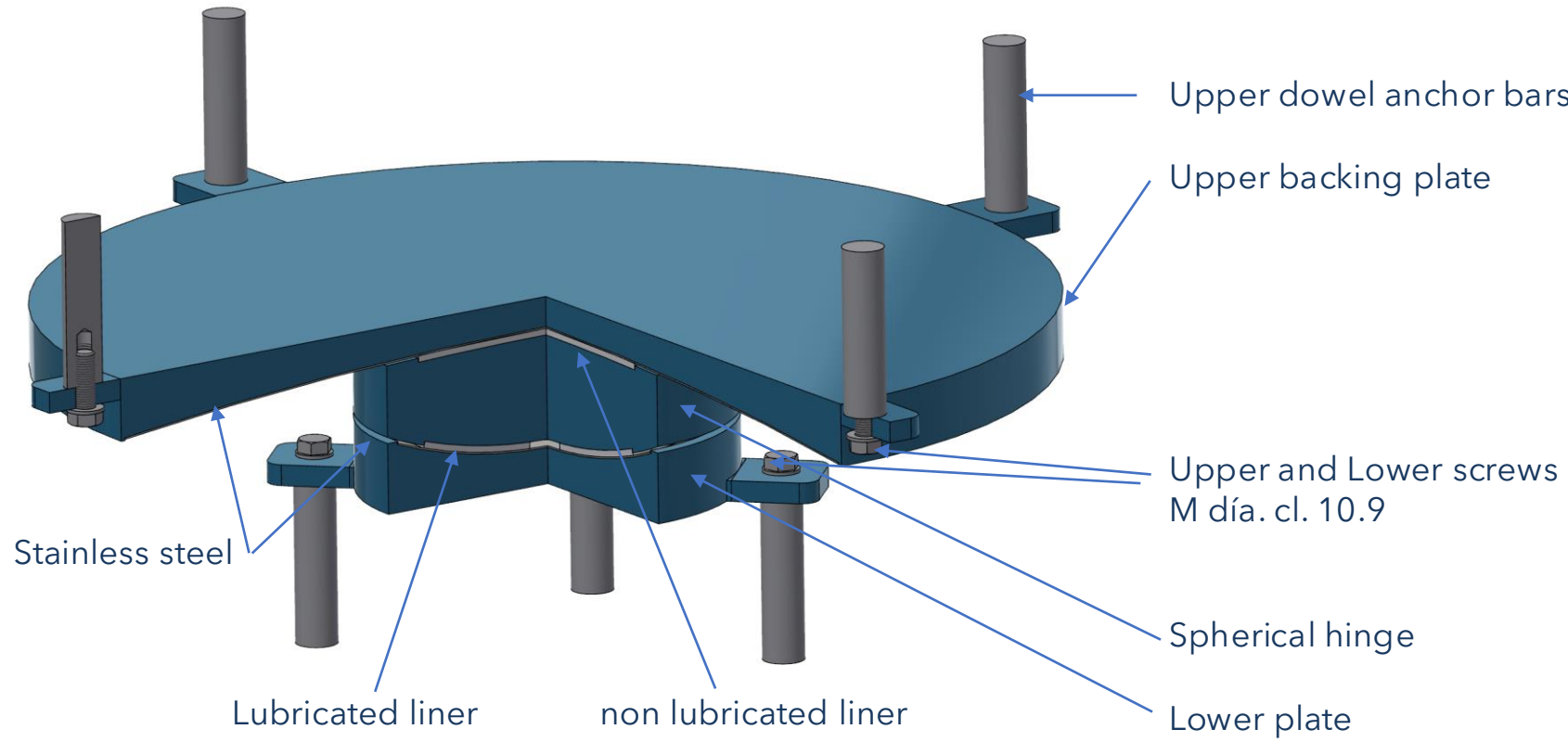
Double and single curved sliding
pendulum isolators

TYPE OF DEVICES



Double curved sliding pendulum isolators type IDFPD

TYPE OF DEVICES



Single curved sliding pendulum isolators type IDFPS

TYPE OF DEVICES

FLUID VISCOUS DAMPER (FVDs) are velocity-dependent and dissipative hydraulic devices. These devices enhance the structural response to dynamic actions, including those caused by earthquakes, by providing significant energy dissipation. In terms of construction, each device consists of a steel cylinder divided into two chambers by a piston. The chambers are filled with a silicone-based viscous fluid. When dynamic input is applied, relative motion occurs between the piston and the cylinder, causing the fluid to move from one chamber to the other through a hydraulic system. The system is designed in such a way that for slow motions (such as those induced by temperature fluctuations or shrinkage), a negligible restoring force is generated (less than 10% of the device's design capacity). This allows relative movement between the joints, preventing fatigue effects.

As the load speed increases, the reaction force generated by the device also increases, following the behavior described by the constitutive law:

$$F = C \cdot V^{\alpha}$$

Where:

- F = Force transmitted by the device (kN)
- C = Damping coefficient (kN/(mm/sec) $^{\alpha}$)
- V = Load velocity application rate (mm/sec)
- α = Coefficient that accounts for the damping properties of the device.

We are also able to design devices basing on other laws f.i. ($F = K_0 + k \cdot x + C \cdot V^{\alpha}$)

For fluid viscous dampers, the value of the α coefficient is typically ≤ 1 (often 0.15). Devices with a lower value of α are capable of ensuring higher energy dissipation thanks to the early activation which produces reaction in force already at relatively small velocities. FVDs have no vertical loading capacity and are normally used in pair in base isolators or as damping braces in buildings.

Hydraulic devices
Fluid Viscous Dampers type IDFVD

TYPE OF DEVICES

SHOCK TRANSMITTER DEVICES (STUs) are hydraulic, temporary connection devices designed to alter the behavior of a structure from static to dynamic conditions. These devices allow for slow relative movements between connected elements (typically, but not limited to, deck-to-pier, deck-to-deck, deck-to-abutment in bridges and slab-to-column, slab-to-slab in building connections) without generating significant restoring forces. In the presence of thermally induced or slowly applied movements, normally much lower than $V \leq 0,01$ mm/sec, they develop a reaction force always $\leq 10\%$ of the nominal design one unless differently specified by the Structural Engineer. However, they provide a stiff reaction when subjected to dynamic external inputs, such as those generated by seismic events or the braking of moving loads. The device response is symmetrical, offering the same behavior under both compression and tension.

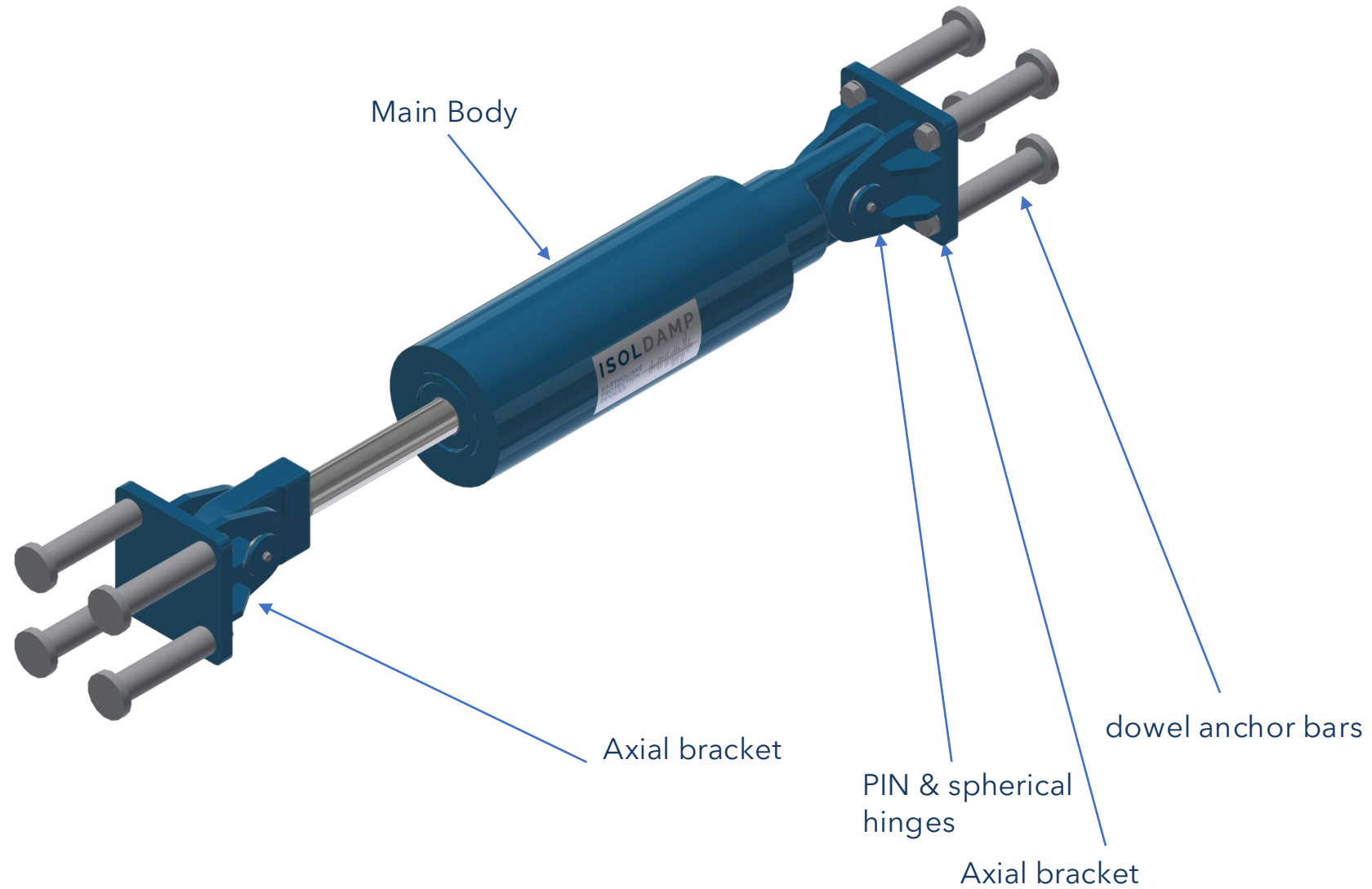
These devices consist of a cylinder, within which a piston moves. An hydraulic circuit is designed to enable the flow of a viscous fluid between two chambers. Unlike the FVD devices, which are capable of generating energy dissipation, in STUs the fluid is forced to pass through a specially calibrated orifice which provides, due its negligible capacity, a pseudo-rigid behavior of the device under dynamically applied loads.

STU devices are particularly beneficial when a structure needs to alter its static configuration during an earthquake or other dynamic events. In this way, while slow deformations are freely allowed, during a seismic event, these devices help distribute the forces generated by the earthquake across multiple locations in the structure, which are carefully selected by the structural engineer based on their location and resisting capacity.

IDSTU devices are also frequently used in buildings to connect different parts of the structure. This ensures a unified seismic response, reducing relative movements and, consequently, lowering the costs associated with expansion joints.

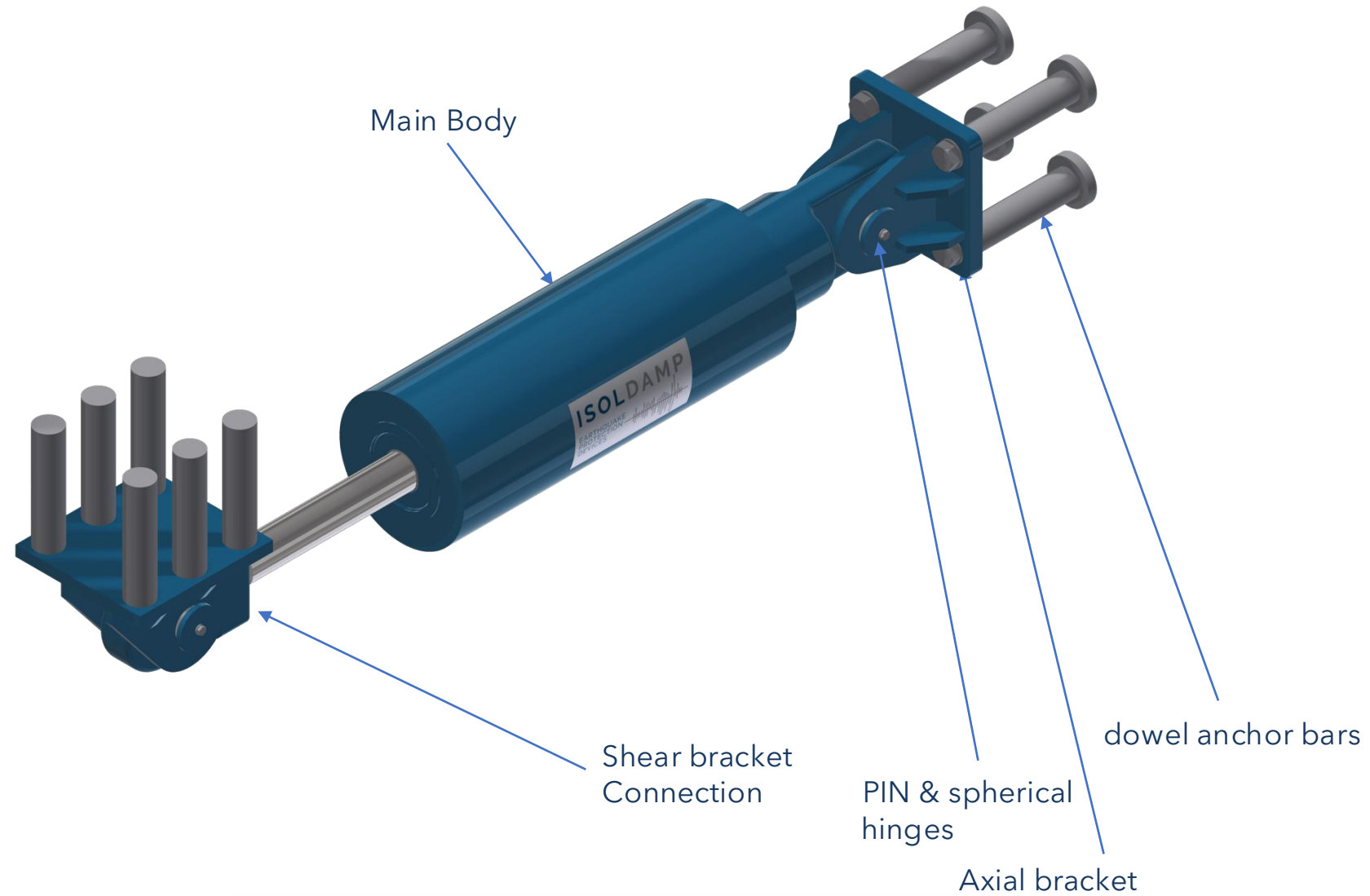
Hydraulic devices type IDSTU

TYPE OF DEVICES



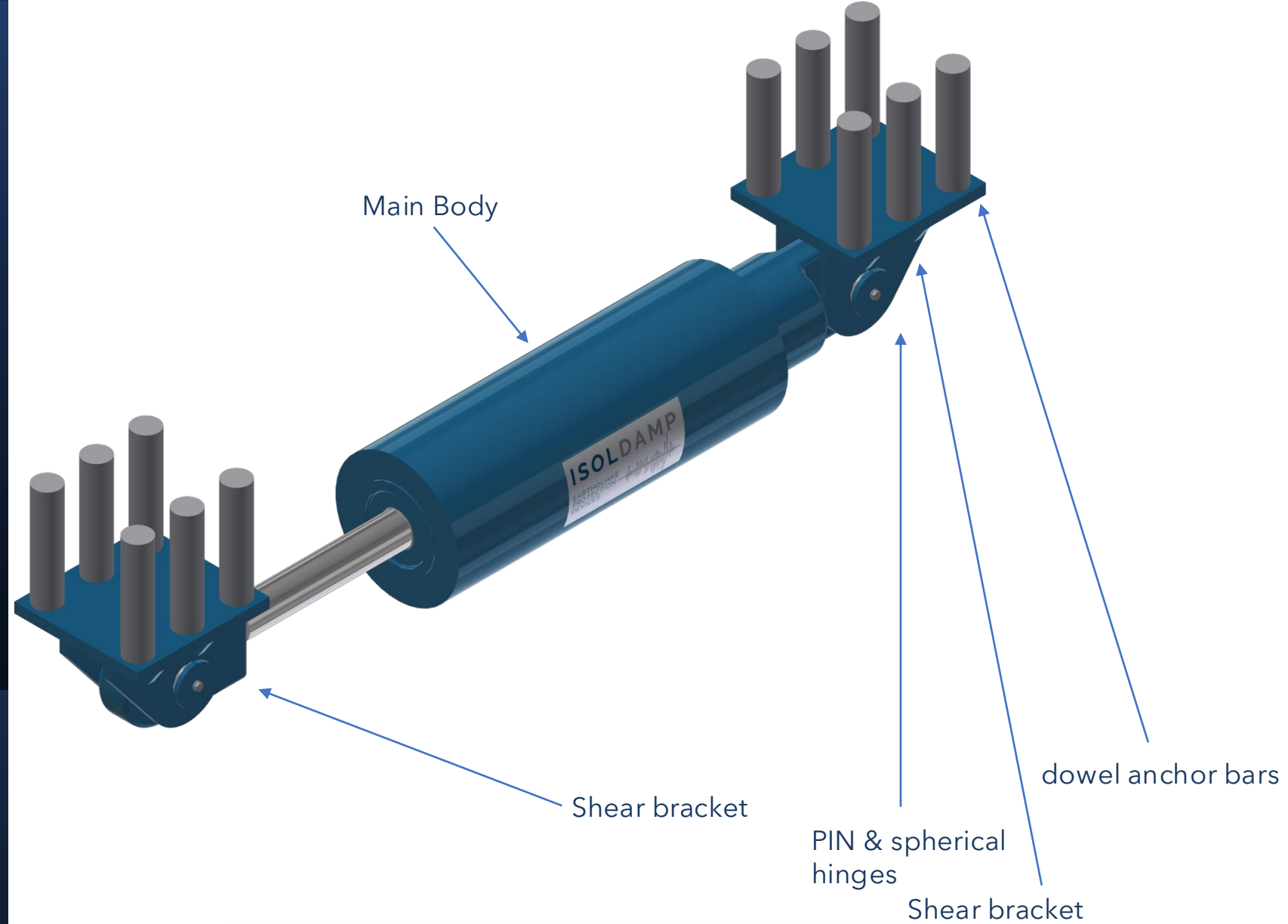
Hydraulic devices
Fluid Viscous Dampers and STUs
axial-axial installation

TYPE OF DEVICES



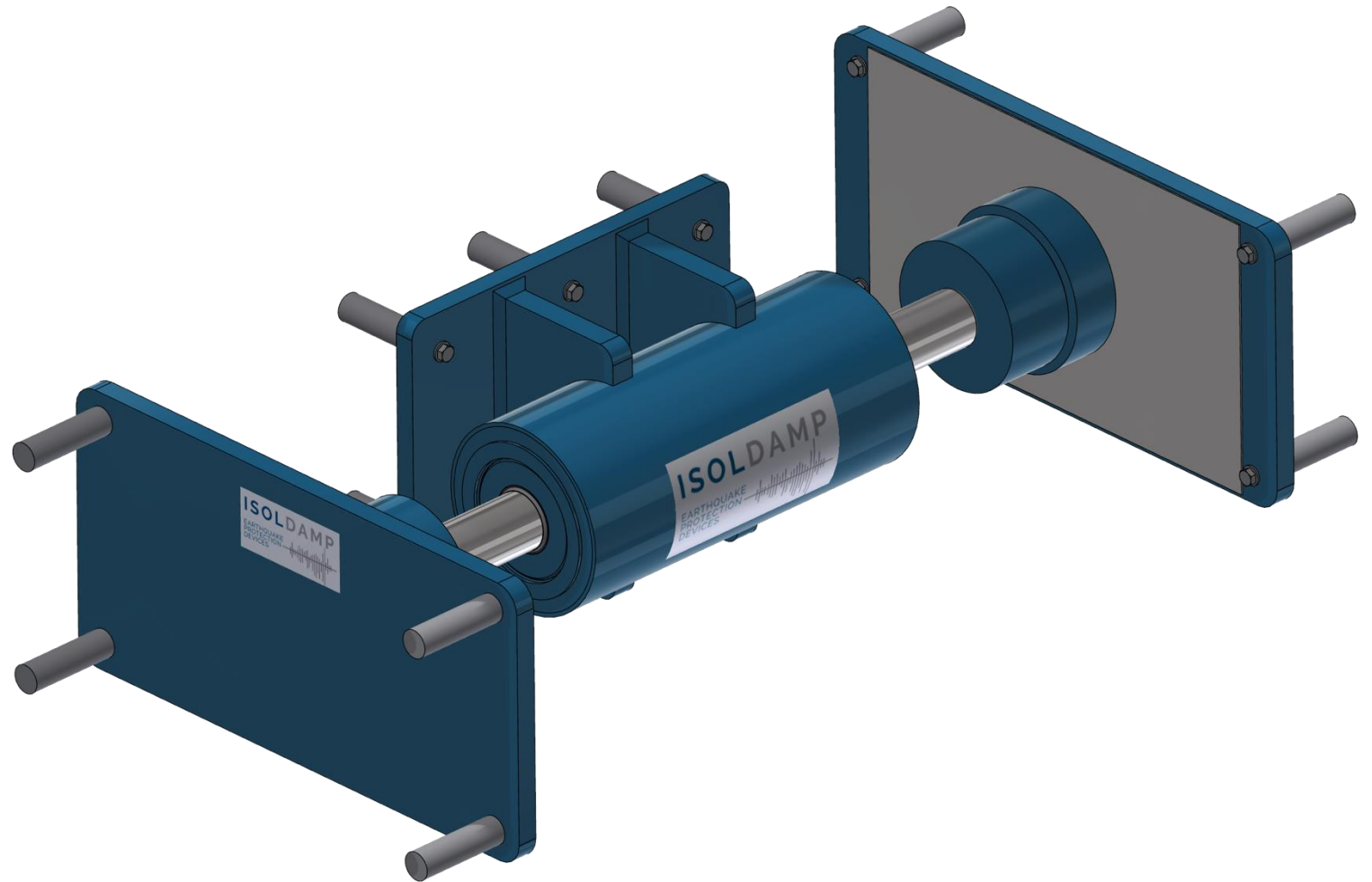
Hydraulic devices
Fluid Viscous Dampers and STUs
axial-shear installation

TYPE OF DEVICES



Hydraulic devices
Fluid Viscous Dampers and STUs
shear-shear installation

TYPE OF DEVICES



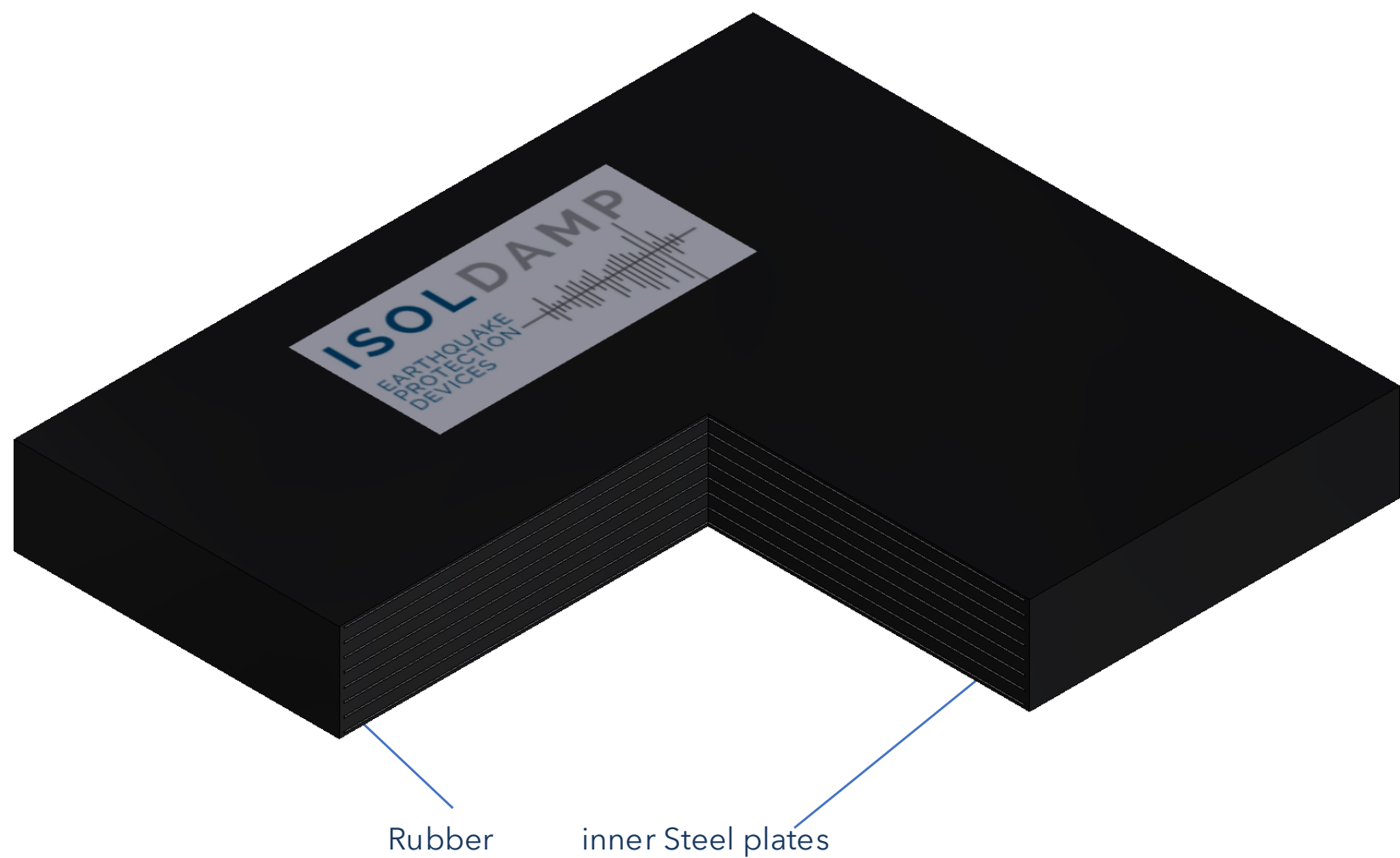
Hydraulic devices
Fluid Viscous Dampers and STUs
Special anchoring example

TYPE OF DEVICES

Elastomeric bearings designed according with EN1337-3 are structural devices designed to reproduce the static scheme foreseen by the Designer. The present applies to elastomeric bearings with or without complementary bearing devices to extend their field of use such as flat sliding elements covered by EN1337-2 or sliding surface described as used in bridge structures or any other structure with comparable support conditions. It applies to laminated bearings **TYPES B, C**, laminated sliding bearings types **E** and **D** or a combination of them in accordance with EN1337. We are able to design bearings in compliance with other standards as AASHTO, ASCE 7-22 or any other specification:

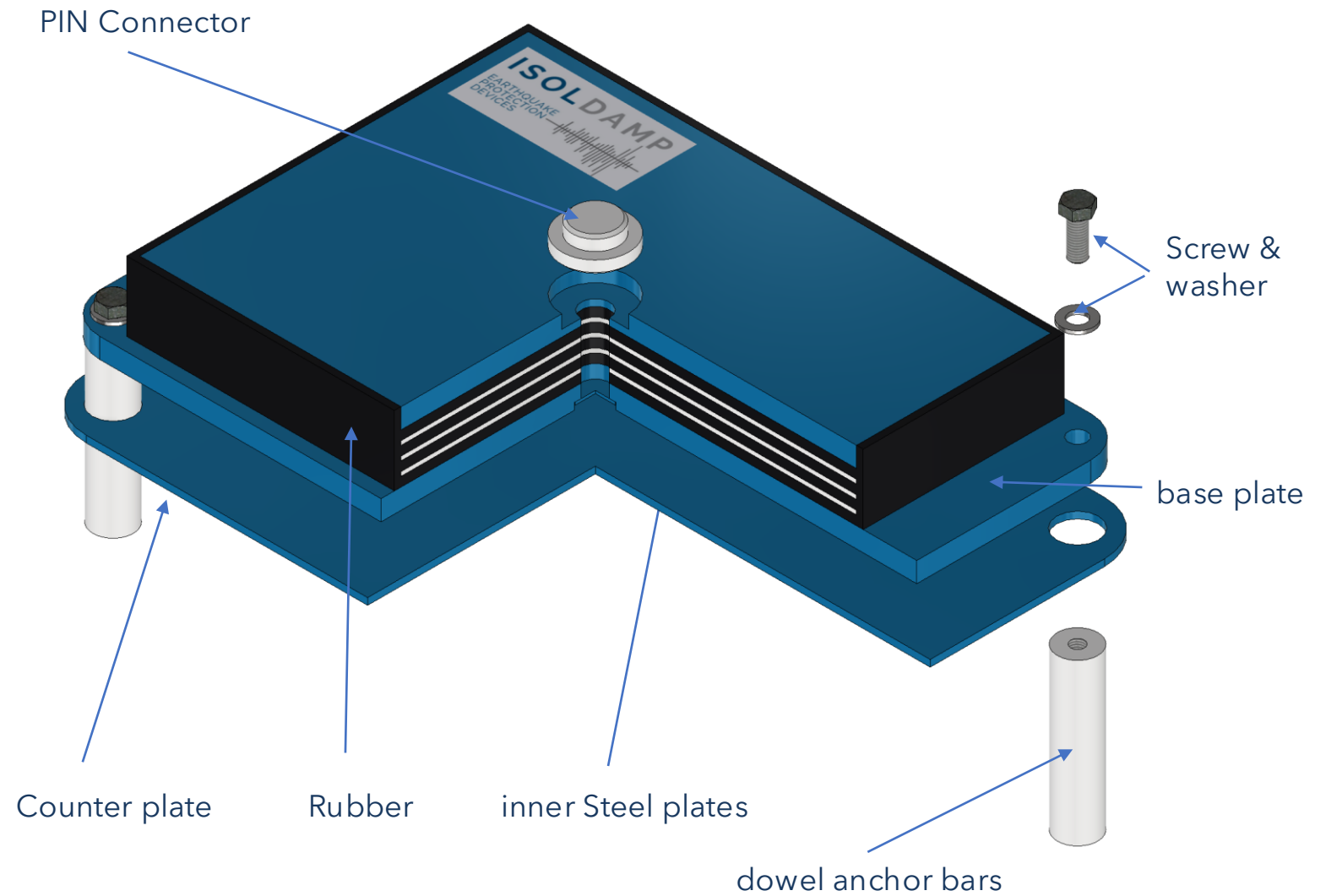
Elastomeric bearings type IDRUBBER

TYPE OF DEVICES



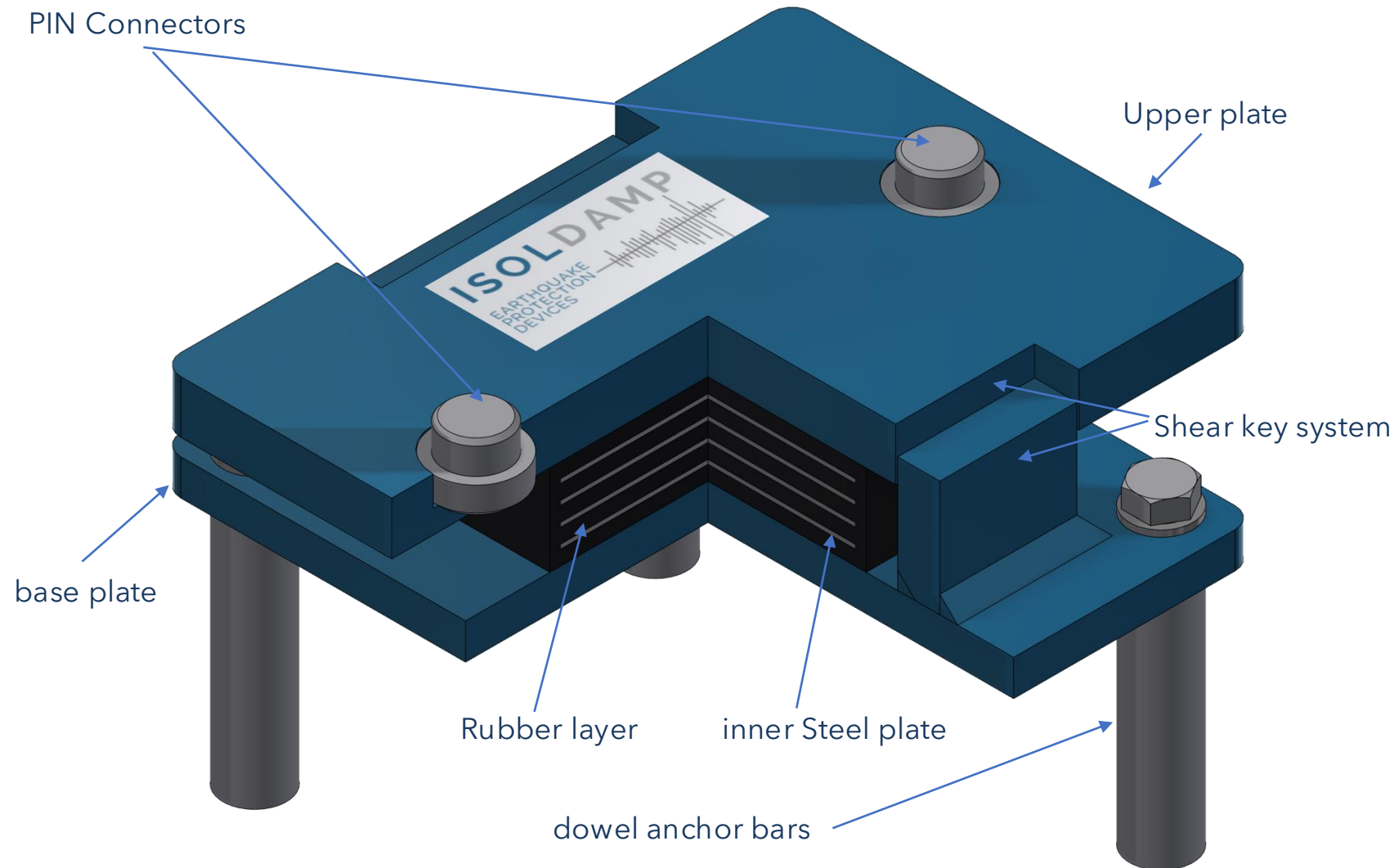
Elastomeric bearings type «B»

TYPE OF DEVICES



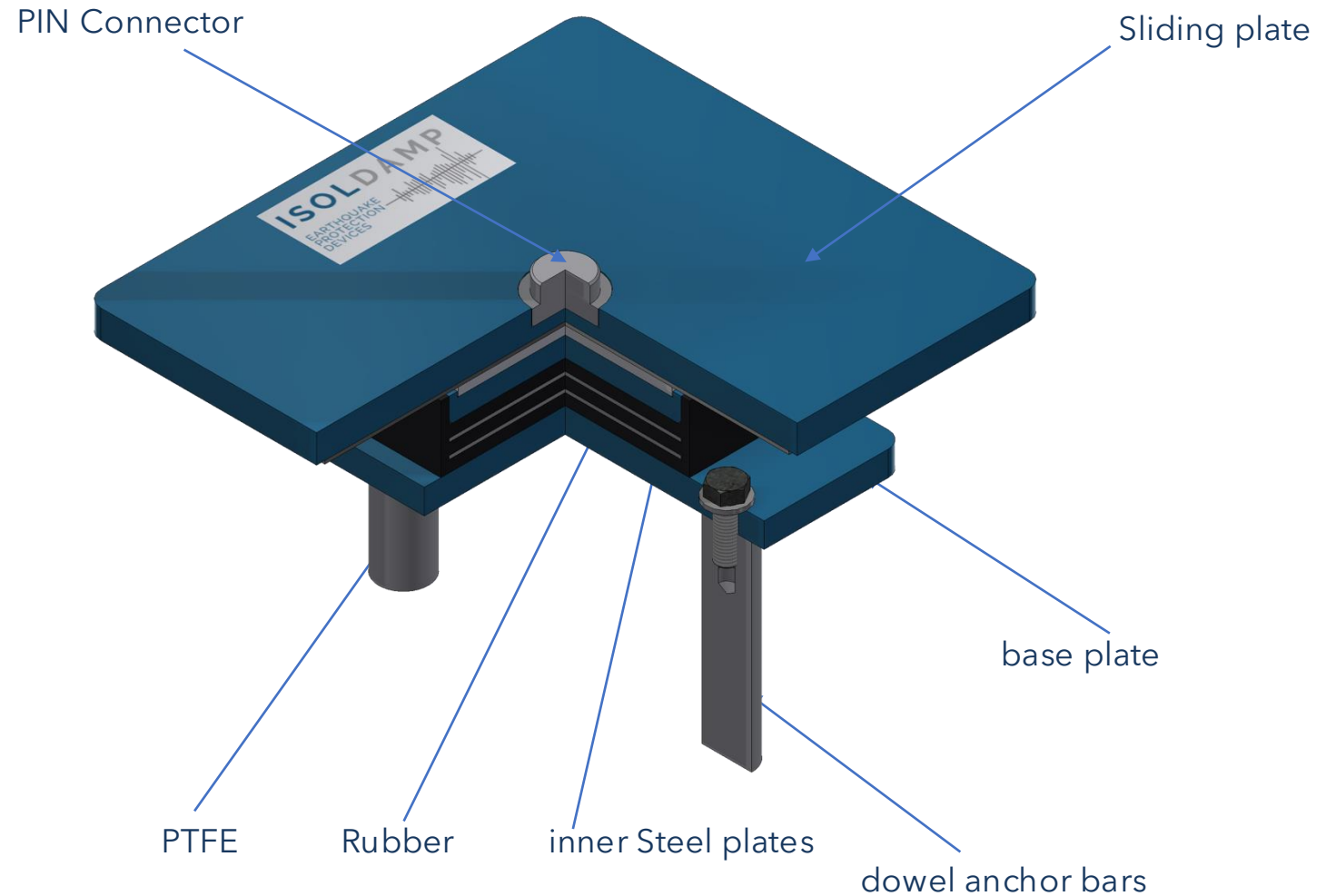
Elastomeric bearings type «C»

TYPE OF DEVICES



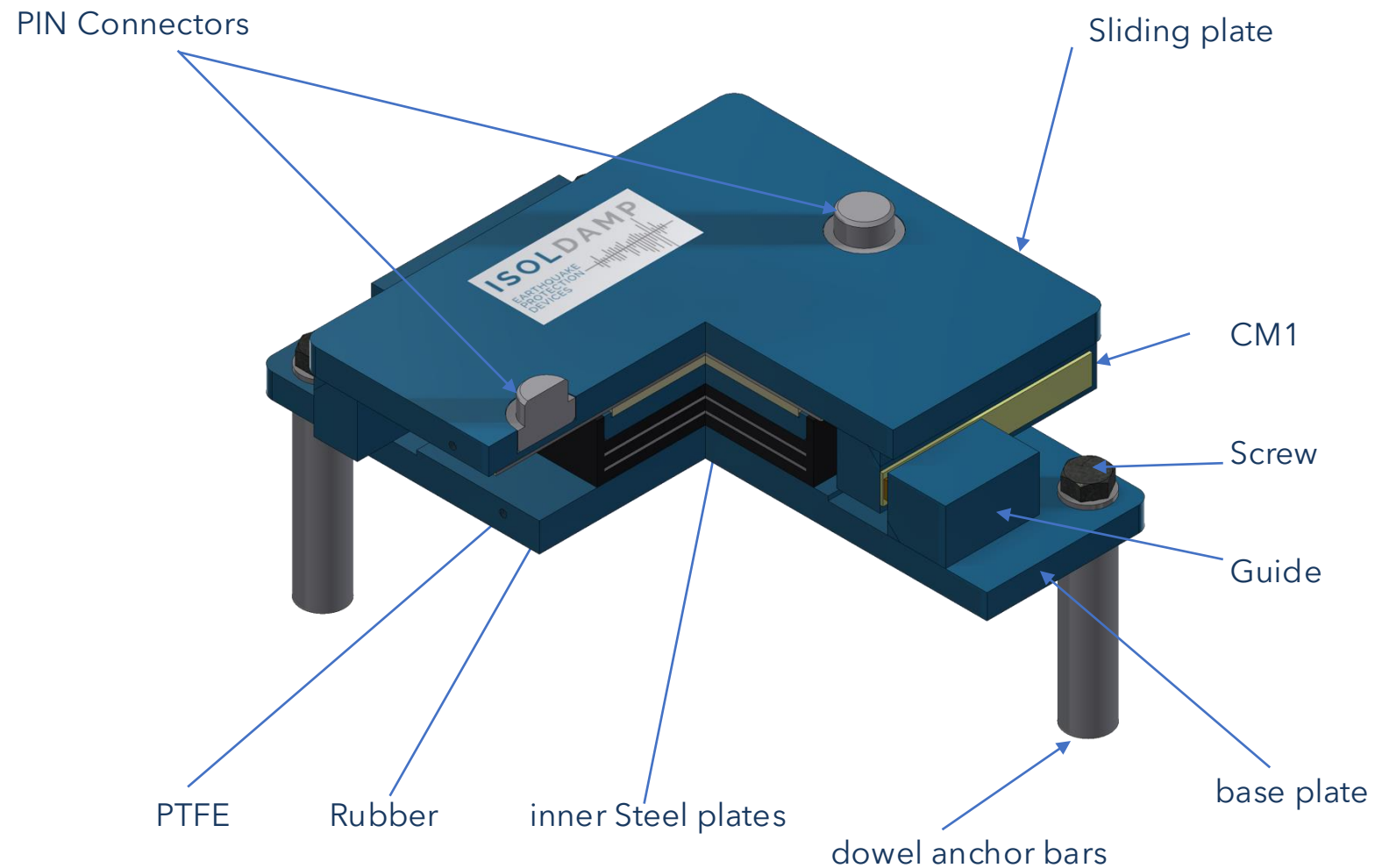
Elastomeric fixed bearings type «C»

TYPE OF DEVICES



Elastomeric free sliding bearings type «E»

TYPE OF DEVICES



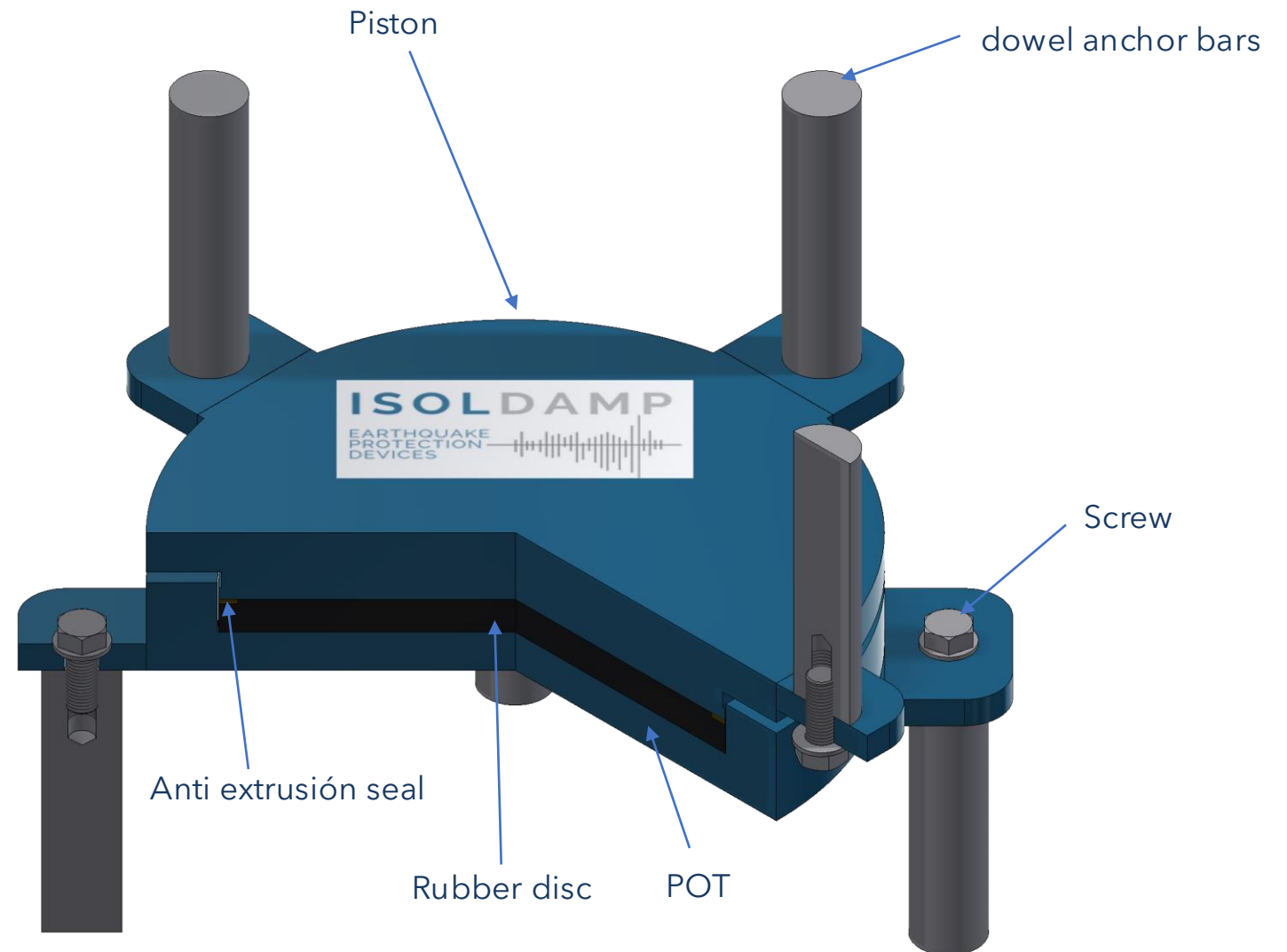
Elastomeric guided bearings type «E»

TYPE OF DEVICES

POT BEARINGS designed according with EN1337-5 are structural devices designed to reproduce the static scheme foreseen by the Designer. The present applies to pot bearings with or without complementary elements to extend their field of use such as flat sliding elements or guides in compliance with by EN1337-2 or sliding surface described as used in bridge structures or any other structure with comparable support conditions. We are able to design bearings in compliance with EN1337-5 and any other standards as AASHTO, ASCE 7-22 or any other specification:

POT bearings type IDPOT

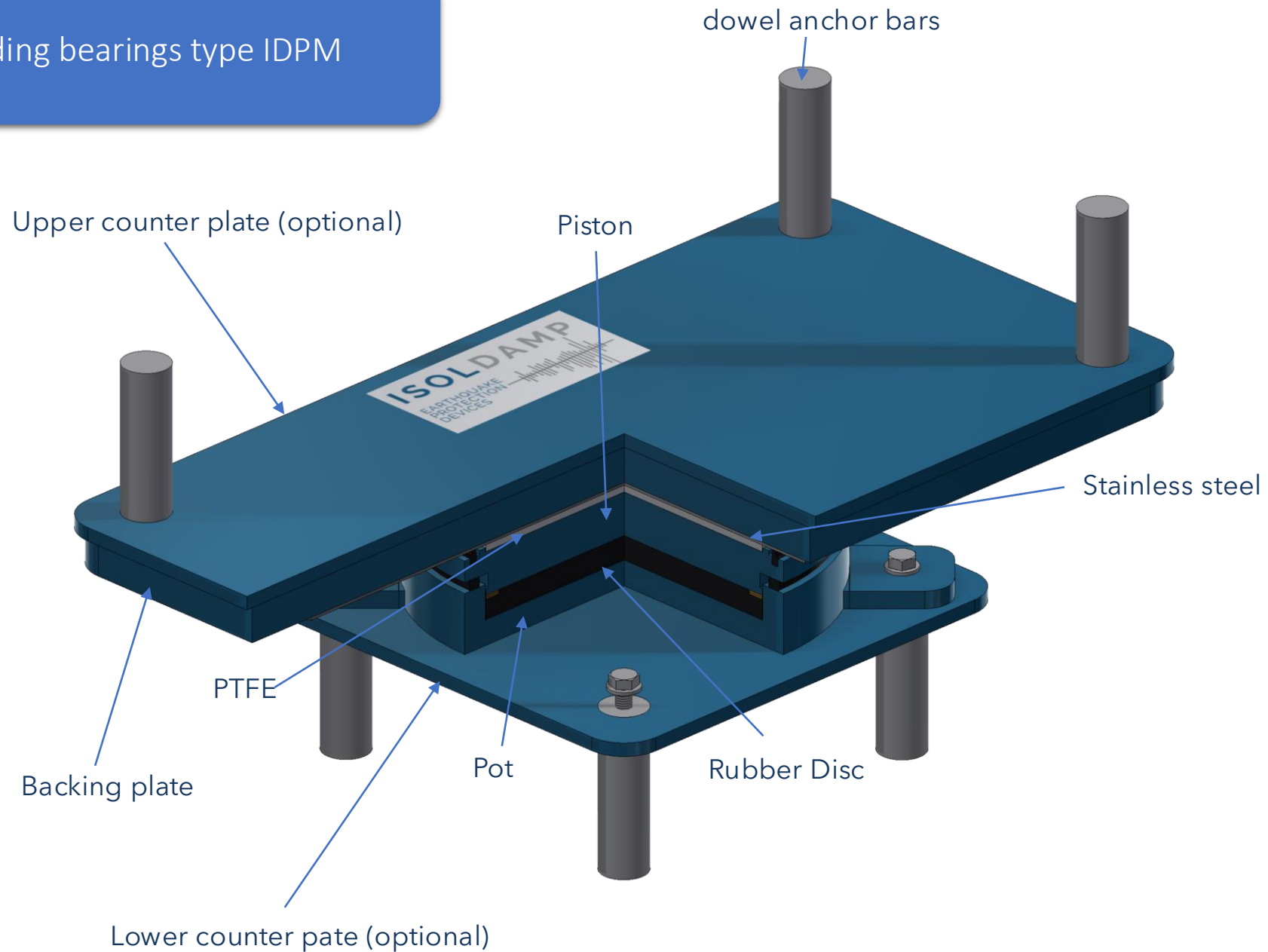
TYPE OF DEVICES



POT fixed bearings IDPF

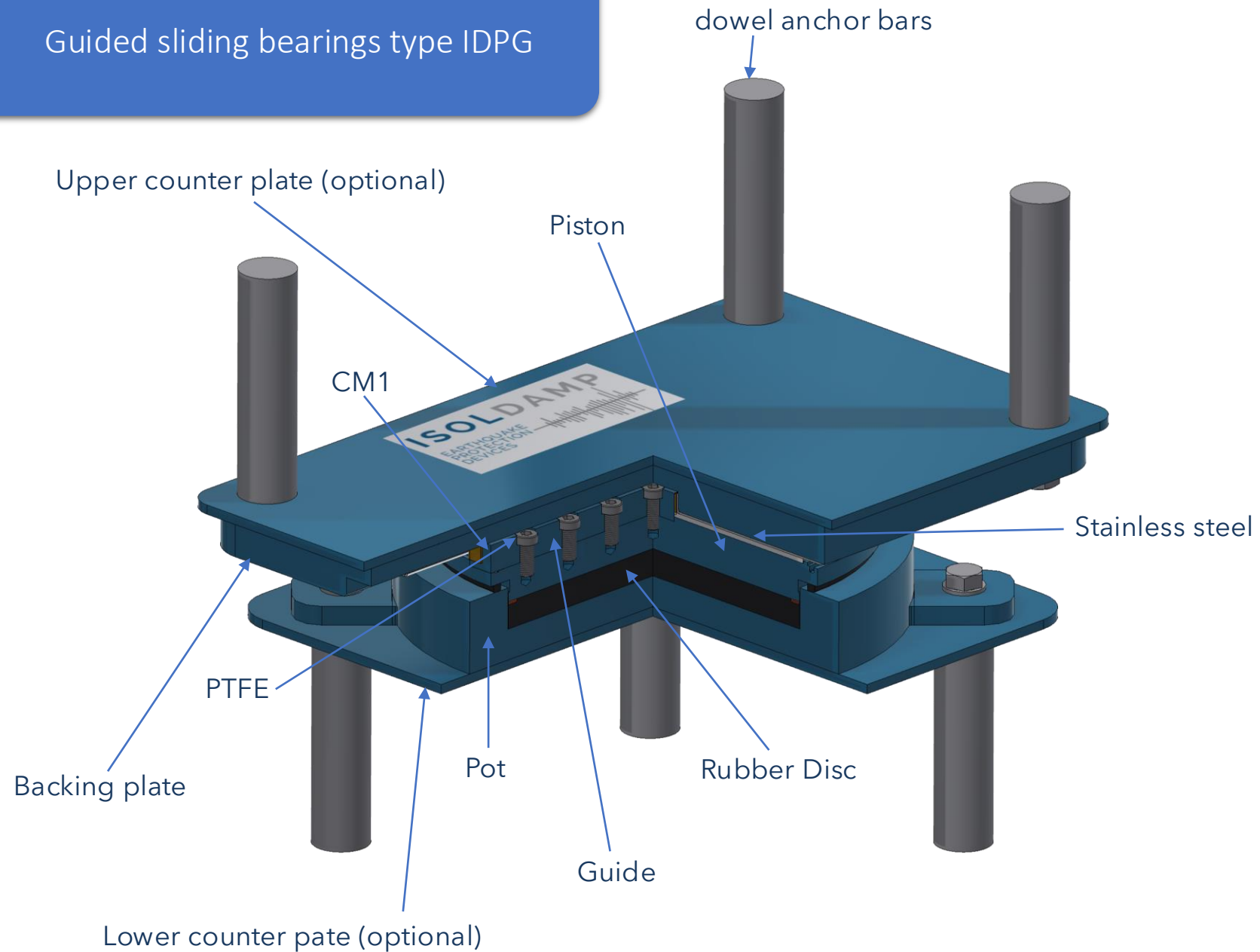
TYPE OF DEVICES

Free sliding bearings type IDPM



TYPE OF DEVICES

Guided sliding bearings type IDPG



TYPE OF DEVICES

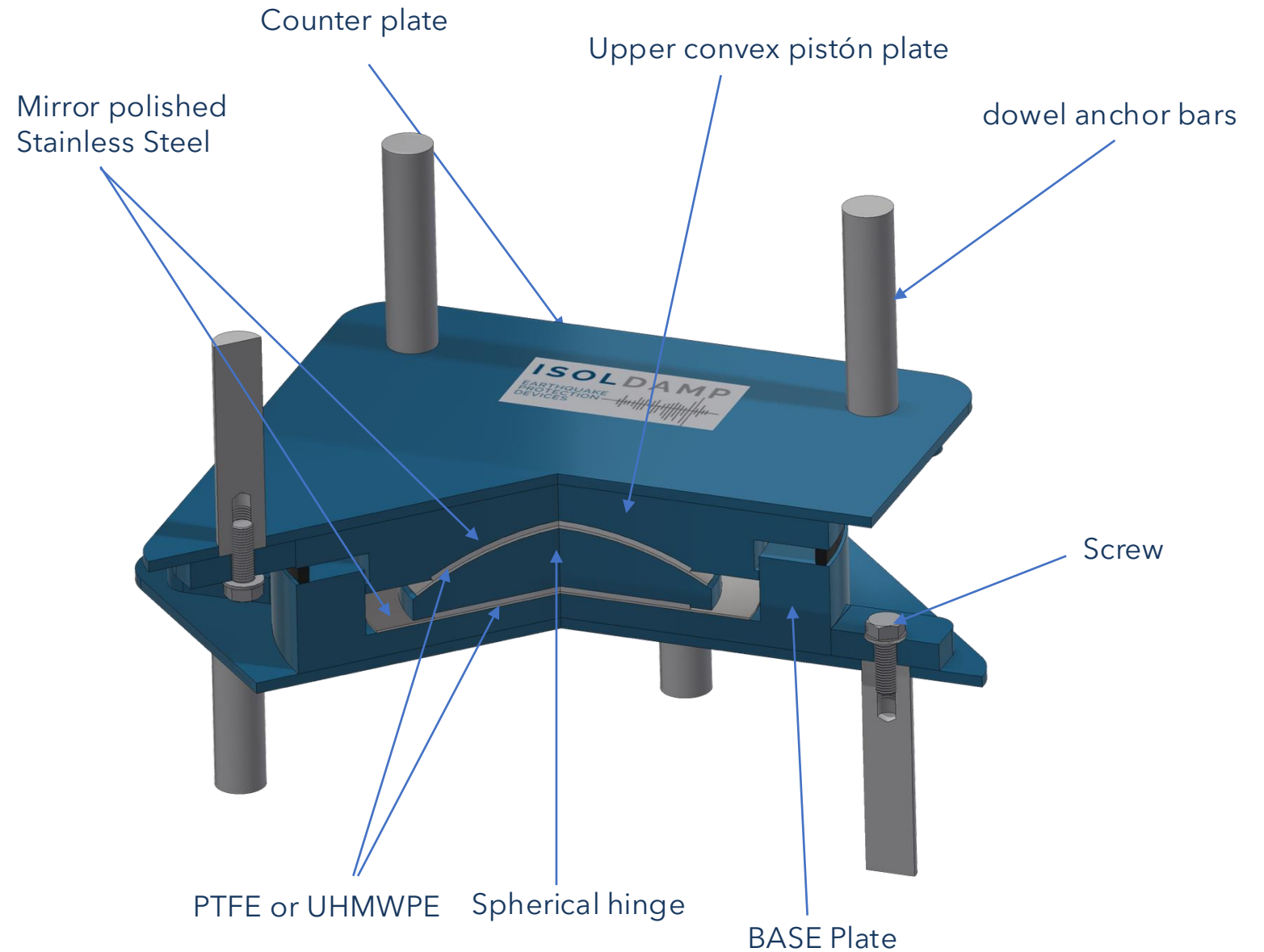
SPHERICAL BEARINGS designed according with EN1337-7 are structural devices designed to reproduce the static scheme foreseen by the Designer. The present applies to spherical bearings with or without complementary elements to extend their field of use such as flat sliding elements or guides in compliance with by EN1337-2 or sliding surface described as used in bridge structures or any other structure with comparable support conditions. We are able to design bearings in compliance with EN1337-7 and any other other standards as AASHTO, ASCE 7-22 or any other specification. We have fixed, guided sliding and free sliding spherical bearings. Follow data to require a quotation:

SPHERICAL BEARINGS					
DESCRIPTION		U.M.	FIXED	GUIDED	FREE SLIDING
Max vertical ULS load	V_{ULS}	[kN]	x	x	x
Max ULS longitudinal load.	$H_{MAX LONG. ULS}$	[kN]	x	x alt1	-
Max ULS transversal load.	$H_{MAX TRASV. ULS}$	[kN]	x	x alt2	-
Max ULS rotation	Rot. ULS	[rad]	x	x	x
Maximum ULS longitudinal displacement	Long. displacement	[mm]	-	x alt 2	x
Maximum ULS transversal displacement	Transv. Displacement	[mm]	-	x alt1	x
Maximum seismic vertical load	$N_{ED MAX.}$	[kN]	x	x	x
Minimum seismic vertical load	$N_{ED MIN.}$	[kN]	x	x	x
Quasi permanent load	N_{SD}	[kN]	-	-	-
Max seismic longitudinal load.	$H_{seism MAX LONG.}$	[kN]	x	x alt1	-
Max seismic transversal load.	$H_{seism MAX TRASV.}$	[kN]	x	x alt2	-
Maximum seismic rotation	Rot.	[rad]	x	x	x
Design basic earthquake displacement	d_{BD}	[mm]	-	-	-
Max amplified displacement*	D_{ED} / D_{MAX}	[mm]	x	x	x
Type of upper structure		[-]	STEEL / CONCRETE	STEEL / CONCRETE	STEEL / CONCRETE
Upper concrete resistance		Mpa	rck/fck	rck/fck	rck/fck
Type of upper anchoring system		[-]	PIN or SCREWS or SCREWS & ANCHOR BARS	PIN or SCREWS or SCREWS & ANCHOR BARS	PIN or SCREWS or SCREWS & ANCHOR BARS
Presence of upper counter plates		[-]	yes / no - wedge / flat	yes / no - wedge / flat	yes / no - wedge / flat
Type of lower structure		[-]	CONCRETE / STEEL	CONCRETE / STEEL	CONCRETE / STEEL
Lower concrete resistance		Mpa	rck/fck	rck/fck	rck/fck
Type of lower anchoring system		[-]	PIN or SCREWS or SCREWS & ANCHOR BARS	PIN or SCREWS or SCREWS & ANCHOR BARS	PIN or SCREWS or SCREWS & ANCHOR BARS
Presence of lower counter plates		[-]	yes / no - wedge / flat	yes / no - wedge / flat	yes / no - wedge / flat
Bearing plinth dimensions		[mm]	W x L x H	W x L x H	W x L x H

*including d_{BD} magnified (1.5 for bridges/1.2 for building), 100% of the irreversible movements, 50% of rheological movement

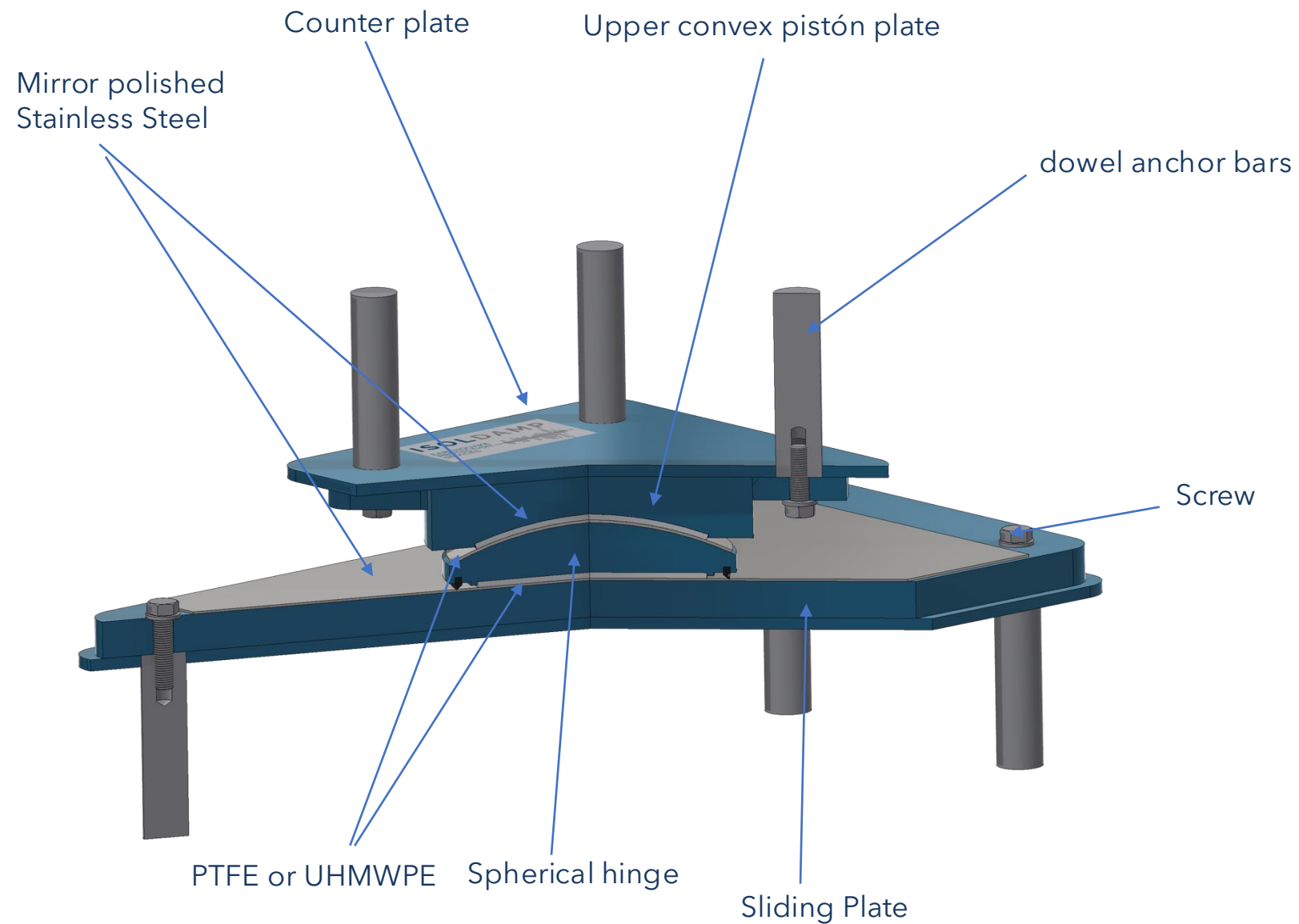
SPHERICAL bearings type IDS

TYPE OF DEVICES



SPHERICAL fixed bearings type IDSF

TYPE OF DEVICES



SPHERICAL Free sliding bearings type IDSM

Device Design

The design of the devices is normally made in accordance with the following standards:

EN 1337-7 Spherical & cylindrical PTFE bearings and UHMWPE acc. **with EAD050004-01-0301**

EN 1337-5 Pot Bearings

EN1337-3 Elastomeric bearings

EN15129 ANTI-SEISMIC DEVICES - EUROPEAN NORM

ASCE SEI 7 American Norm - Minimum Design Loads and Associated Criteria for Buildings and Other Structures

AASHTO GSSID American Norm - Guide Specification for Seismic isolation Design

NCh 2745 Chilean Norm

TBDY 2018 Turkish Norm

E031 Peruvian Norm

We are able to produce according with any kind of specification and standard

PTFE sliding Material Performance

Spherical and cylindrical bearing EN1337-2

1) Sliding materials is a fundamental component in spherical & cylindrical bearings.
PTFE acc. with **EN1337-2** guarantees a range of use between **-35°C to +45°C**

2) characteristic strength (nominal **90 MPa**)

3) **10.000 m** accumulated sliding path* resistance

NOTES:

*EN1337-2 requires a minimum accumulated sliding path of 10.000 meters for bridges and 1.000 meters for buildings.
The mentioned performance is reachable with standard virgin, dimpled and lubricated PTFE acc. with EN1337-2.

Special sliding Material Performance EVERSLIDE™

Spherical and cylindrical bearing with special sliding material made of UHMWPE

ETA according with EAD no. 050004-01-0301

1) Sliding materials is a fundamental component in spherical & cylindrical bearings. **EVERSLIDE™** guarantees a larger range of use between **-50°C to +80°C**

2) higher characteristic strength (nominal **180 MPa** with peak resistance for short term/seismic up to **240 MPa**)

3) **100.000 m** accumulated sliding path resistance

CONCLUSION:

EVERSLIDE™ has a characteristics nominal strength double compared with PTFE, a wider temperature of use and an accumulated sliding path resistance of the dimpled and lubricated liner which is 10 times the one of the PTFE and double compared the market benchmark of 50 km.

Standard Corrosion protection

Corrosion protection requirements: first maintenance > 25 years

The bearings have anti-corrosion protection, applied on all exposed surfaces, carried out according to ISO12944 class C5 VH (HIGH)

Corrosion protection consists of the following stages:

Sandblasting of surfaces according to ISO 8501 grade SA 2.5

Application of a 60 micron layer of zinc epoxy primer

Application of an intermediate layer of HIGH BUILDING epoxy paint with a thickness of 200 microns

Application of a finishing layer of 60 micron polyurethane paint

DFT (total dry film thickness) $\geq$ 320 microns.

ABSTRACT OF MAIN APPLICATION WORLDWIDE

Follow an abstract of references which includes an overview of a few important structures for which **ISOLDAMP** designed and/or produced/supplied its devices including **hospitals, clinics, health centers, hotels, high rise buildings, residential buildings, School/kinder gardens, University sporting halls, bridges & viaducts, (motorway viaducts and overpasses, train bridges, passenger bridges, stay cable bridges).**

References &
highlights

ABSTRACT OF HDRBS & DAMPERS - MAIN APPLICATION WORLDWIDE

References & highlight



Retrofit of San Giovanni Battista hospital- Foligno - Italia

References & highlight

MAIN APPLICATION WORLDWIDE

Mark	VERTICAL LAOD[kN]			Stroke[mm]	Rotatio n rad	NO.
	ULS (Static)	ULS (Seismic)	-	Seimic		
IDHDR-S 600X110	5500	3500		±250	0.003	381

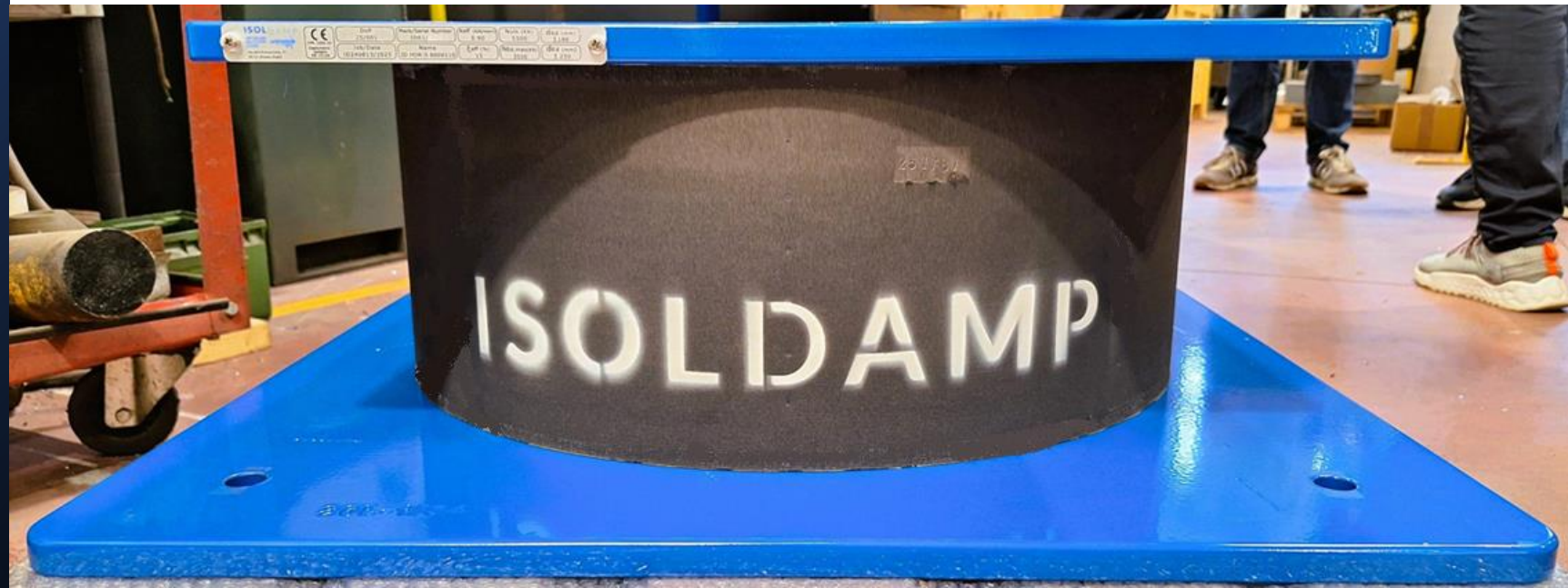
Mark	HORIZONTAL LAOD[kN]			Stroke[mm]	Rotatio n	NO.
	ULS (Static)	ULS (Seismic)	-	Seimic		
IDFVD 1000X500	-	1000		±250	3°	32

In Foligno Hospital **ISOLDAMP** supplied **HIGH DAMPING RUBBER BEARINGS** and **FLUID VISCOUS DAMPERS**. The project is very important as it represents **the largest European hospital ever isolated in retrofit approach (711 columns) keeping the activities open for workers and its patience.**

Retrofit of San Giovanni Battista hospital- Foligno - Italia

ABSTRACT OF HDRBS - MAIN APPLICATION WORLDWIDE

References & highlight



Retrofit of San Giovanni Battista hospital- Foligno - Italia

ABSTRACT OF HDRBS - MAIN APPLICATION WORLDWIDE

References & highlight



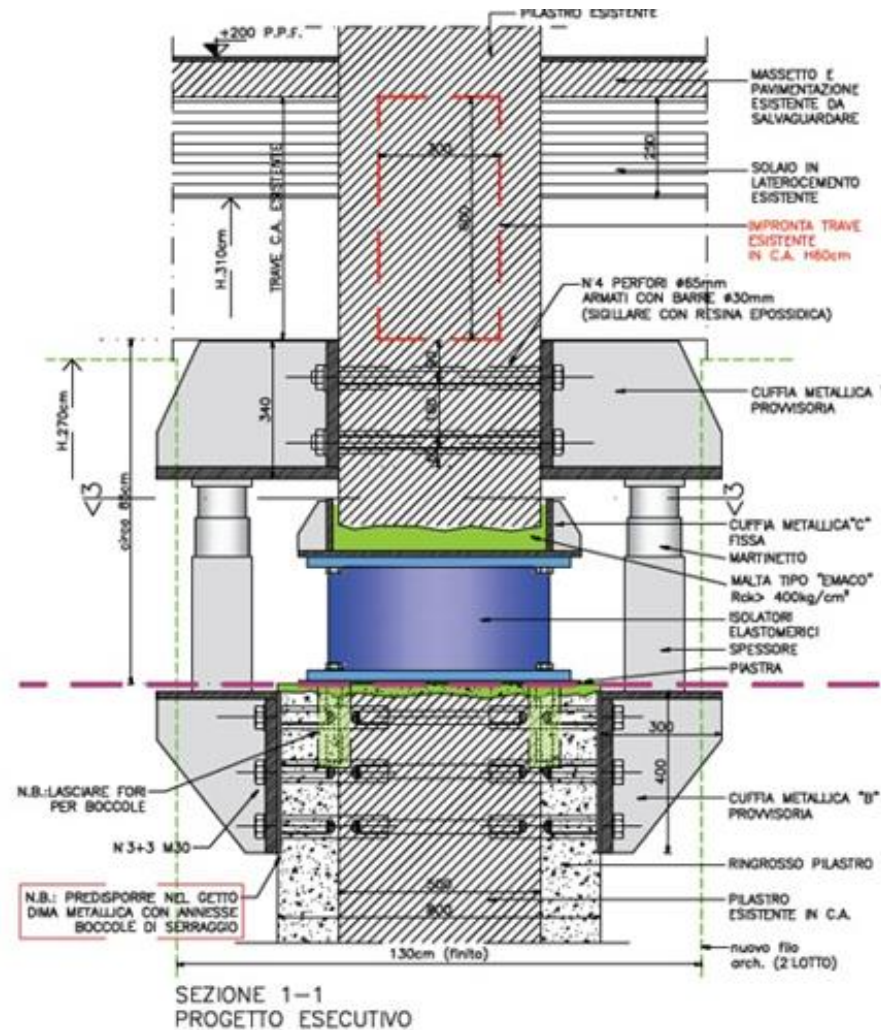
Above the detail of installation of isolators in retrofit. In particular one can see on the left that vertical loads are transferred temporarily through jacks. In the middle picture one sees the details of positioning of the injectable “plate jack” to transfer loads from jacks to the isolators and on the right side the result of the isolator’s installation.

Retrofit of San Giovanni Battista hospital- Foligno - Italia

References & highlight

ABSTRACT OF HDRBS - MAIN APPLICATION WORLDWIDE

On the left the detail of installation of isolators in retrofit.



Retrofit of San Giovanni Battista hospital- Foligno - Italia

References & highlight

ABSTRACT OF HDRBS and FVDs- MAIN APPLICATION WORLDWIDE

Detail of produced Viscous dampers ready to be delivered:



Retrofit of San Giovanni Battista hospital- Foligno - Italia

References & highlight



ABSTRACT OF HDRBS & FVDs MAIN APPLICATION WORLDWIDE

Detail of installed Viscous dampers and HDRBs.

Retrofit of San Giovanni Battista hospital- Foligno - Italia

References & highlight

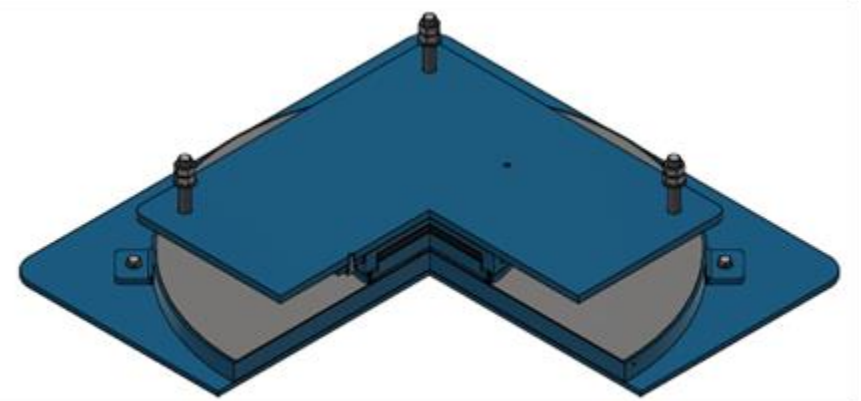
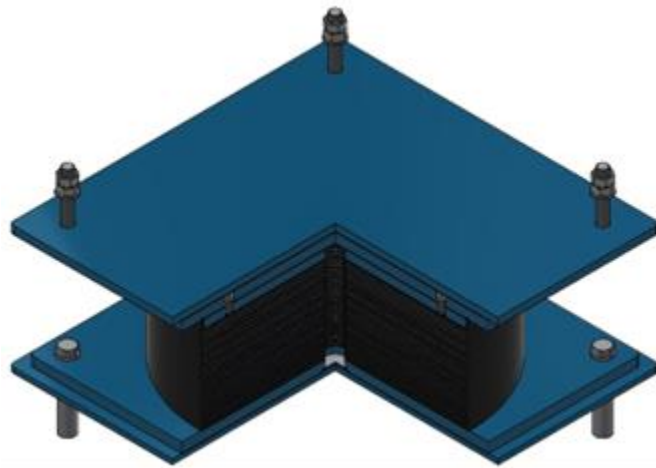


Lavori di restauro Teatro Comunale di
L'Aquila «Nazzareno De Angelis»
seismic retrofit

ABSTRACT OF HDRBS and POT BEARINGS- MAIN APPLICATION WORLDWIDE

Mark	Loads		Stiffness	Damping	Stroke			NO.
	Fz,d [kN]	N _{ED} [kN]	K _{eff} [kN/mm]	ε %	dbd [mm]	ded [mm]	D _{max} [mm]	
ID HDR-S 550x120	5129	2152	0.74	15	±215	±267	±300	12
ID PM 2000/±300	2000	-	-	-	-	±267	±300	8

References & highlight



Lavori di restauro Teatro Comunale di
L'Aquila «Nazzeno De Angelis»
seismic retrofit

ABSTRACT OF HDRBS and POT BEARINGS- MAIN APPLICATION WORLDWIDE

References & highlight



Lavori di restauro Teatro Comunale di
L'Aquila «Nazzareno De Angelis»
seismic retrofit – HDRBs

References & highlight



ABSTRACT OF HDRBS
and POT BEARINGS-
MAIN APPLICATION
WORLDWIDE

Lavori di restauro Teatro Comunale di
L'Aquila «Nazzareno De Angelis»
seismic retrofit – sliders

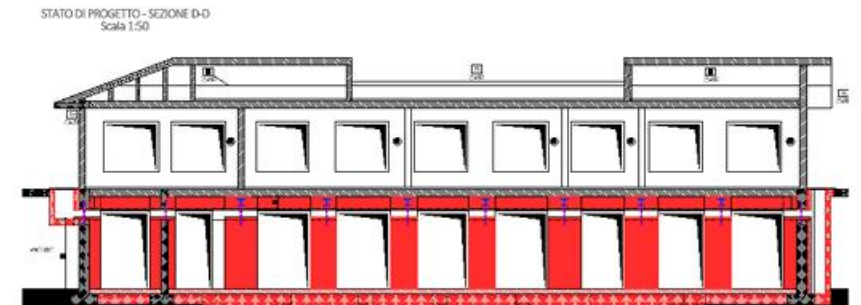
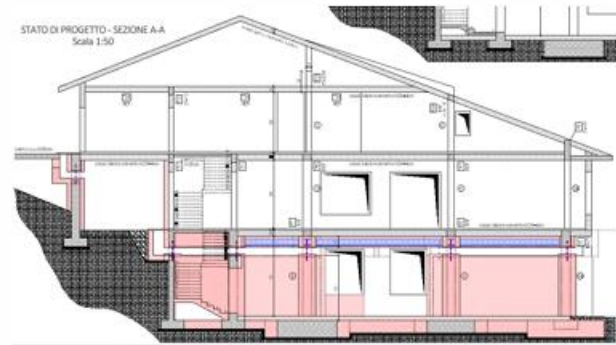
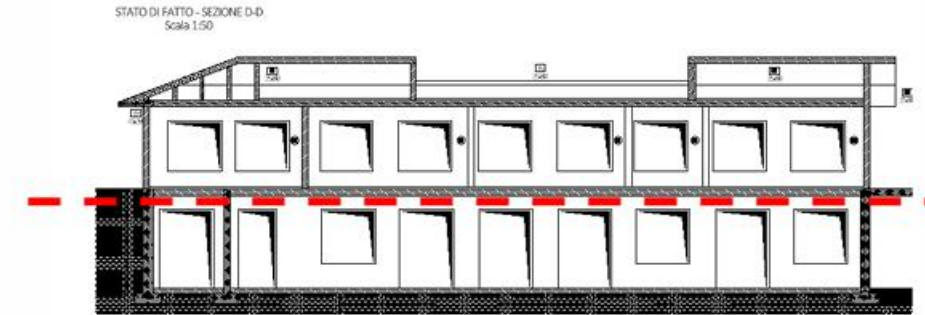
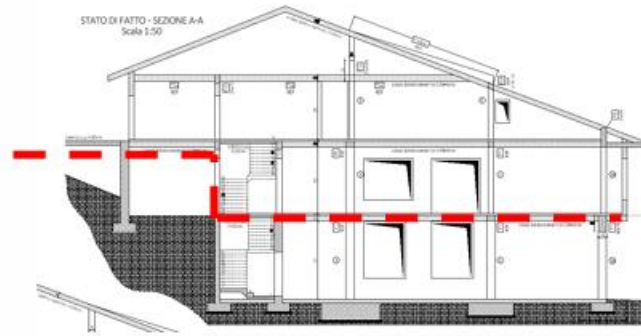
References & highlight



Retrofit con isolatori della scuola dell'infanzia Principe di Piemonte – Badia Calavena VR

ABSTRACT OF HDRBS & POT SLIDERS - MAIN APPLICATION WORLDWIDE

References & highlight



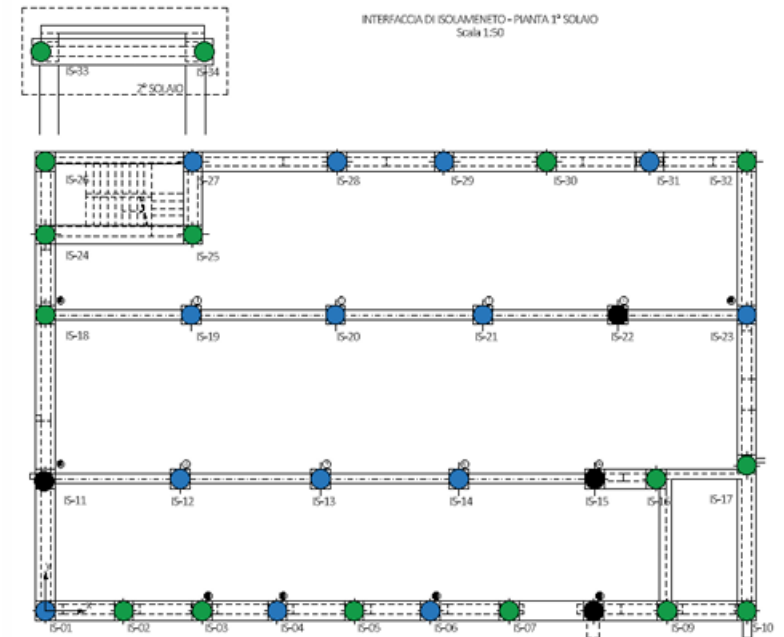
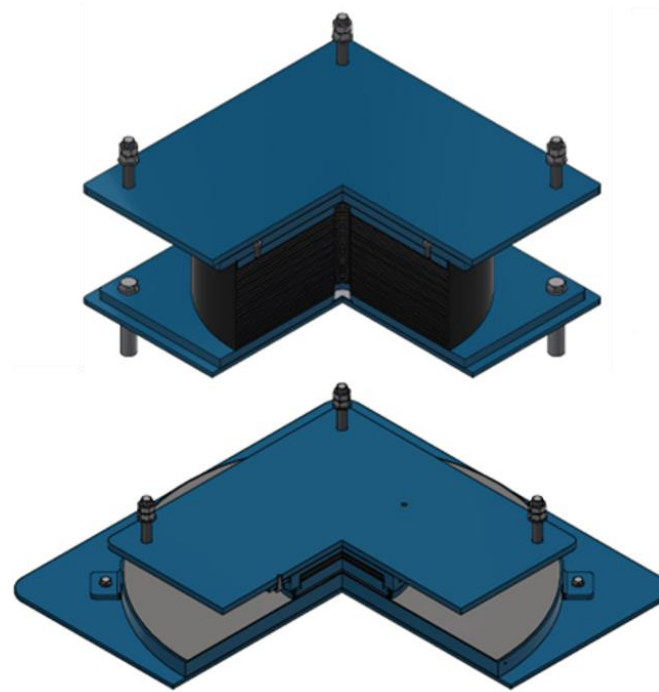
Creazione interfaccia di isolamento

Retrofit con isolatori della scuola dell'infanzia Principe di Piemonte – Badia Calavena VR

References & highlight

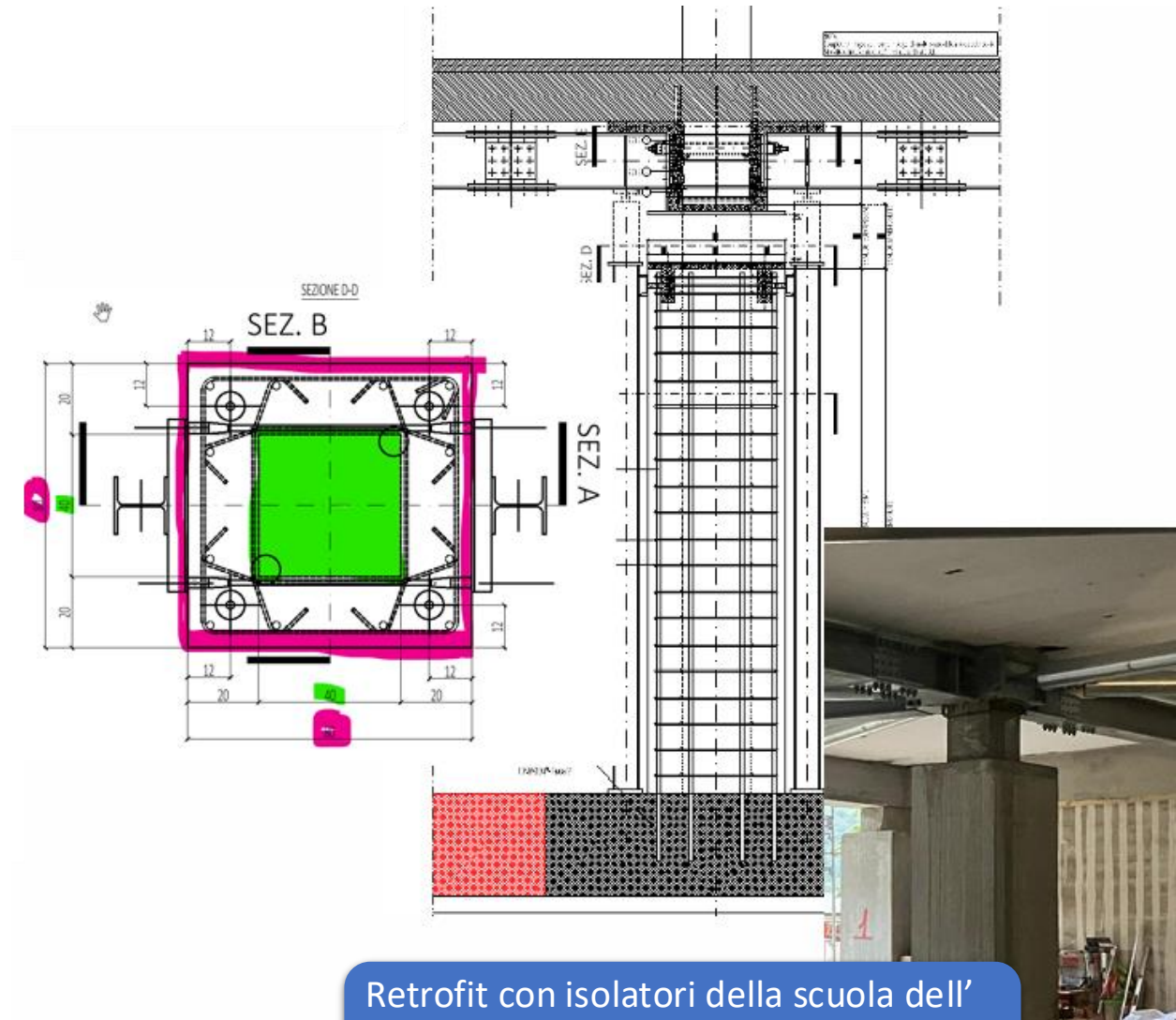
ABSTRACT OF HDRBS and POT BEARINGS- MAIN APPLICATION WORLDWIDE

Mark	Loads		Stiffness	Damping	Stroke			NO.
	F _{z,d} [kN]	N _{ED} [kN]	K _{eff} [kN/mm]	ε %	dbd [mm]	ded [mm]	D _{max} [mm]	
ID HDR-S 500x120	5129	2152	0.74	15	±215	±267	±300	12
ID PM 2000/±300	2000	-	-	-	-	±267	±300	8



Retrofit con isolatori della scuola dell'infanzia Principe di Piemonte – Badia Calavena VR

References & highlight



Retrofit con isolatori della scuola dell'infanzia Principe di Piemonte – Badia Calavena VR

ABSTRACT OF HDRBS and POT BEARINGS- MAIN APPLICATION WORLDWIDE

References & highlight



Retrofit con isolatori della scuola dell'infanzia Principe di Piemonte – Badia Calavena VR

References & highlight

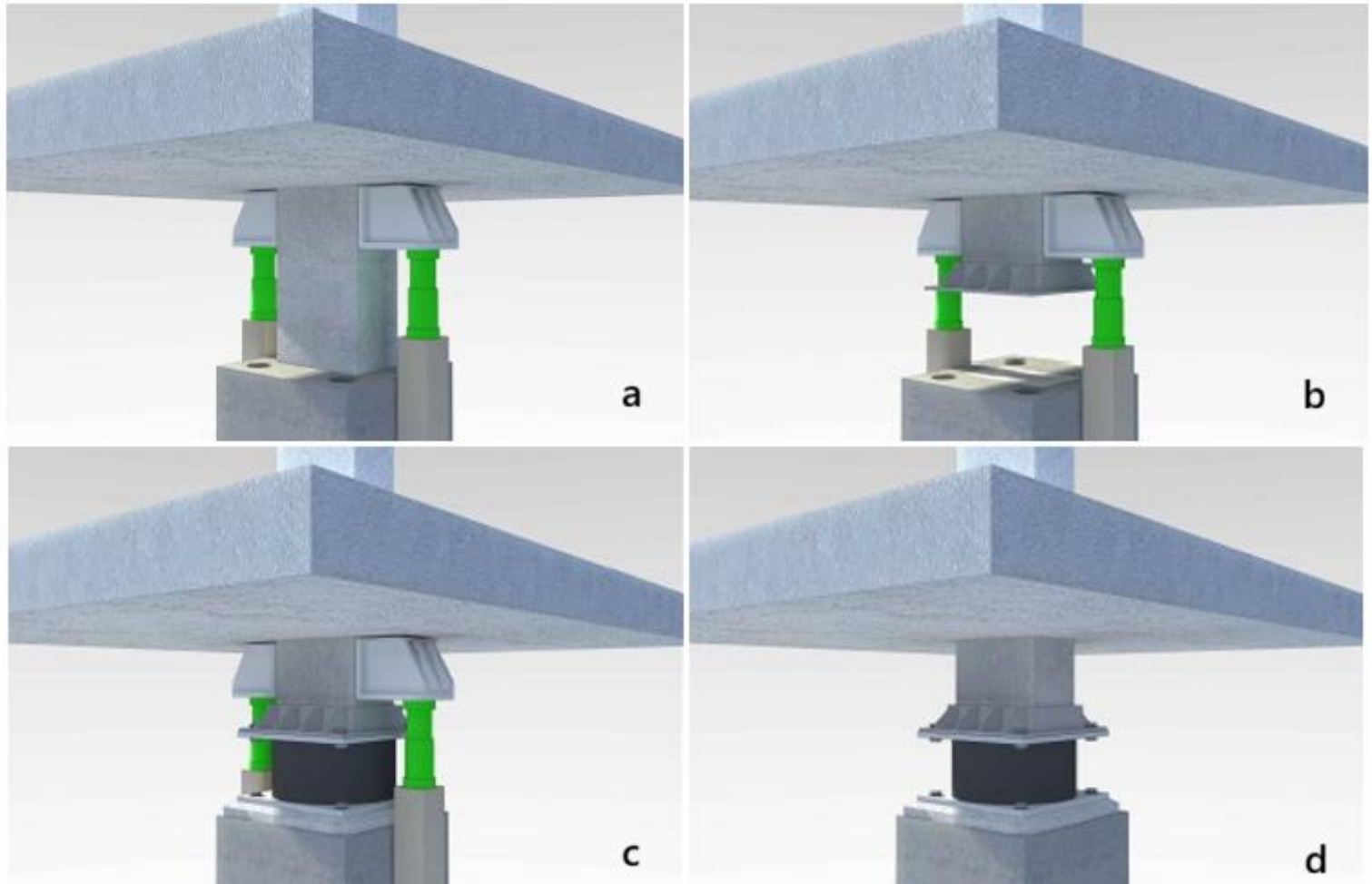
ABSTRACT OF HDRBS and POT BEARINGS- MAIN APPLICATION WORLDWIDE



Retrofit con isolatori della scuola dell'infanzia Principe di Piemonte – Badia Calavena VR

References & highlight

ABSTRACT OF HDRBS and POT BEARINGS- MAIN APPLICATION WORLDWIDE



Retrofit con isolatori della scuola dell'infanzia Principe di Piemonte – Badia Calavena VR

ABSTRACT OF HDRBS and POT BEARINGS- MAIN APPLICATION WORLDWIDE

References & highlight



Retrofit con isolatori della scuola dell'infanzia Principe di Piemonte – Badia Calavena VR

References & highlight

ABSTRACT OF HDRBS and POT BEARINGS- MAIN APPLICATION WORLDWIDE



Retrofit con isolatori della scuola dell'infanzia Principe di Piemonte – Badia Calavena VR

References & highlight

ABSTRACT OF HDRBS & POT BEARINGS- MAIN APPLICATION WORLDWIDE



Injectable plate jacks to allow the permanent load transfer from the temporary jacks to the seismic isolators.

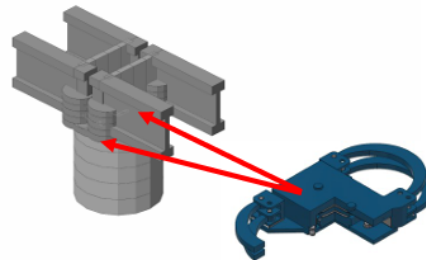
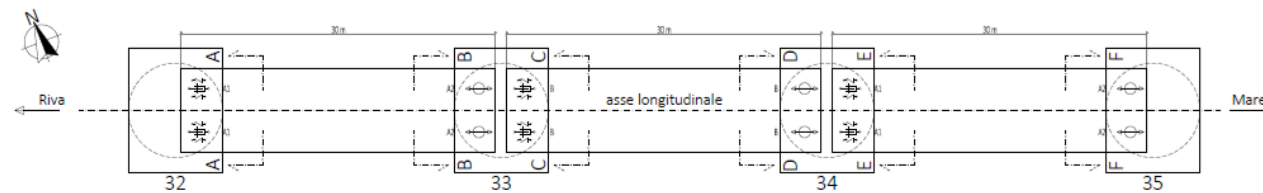


Retrofit con isolatori della scuola dell'infanzia Principe di Piemonte – Badia Calavena VR

References & highlight

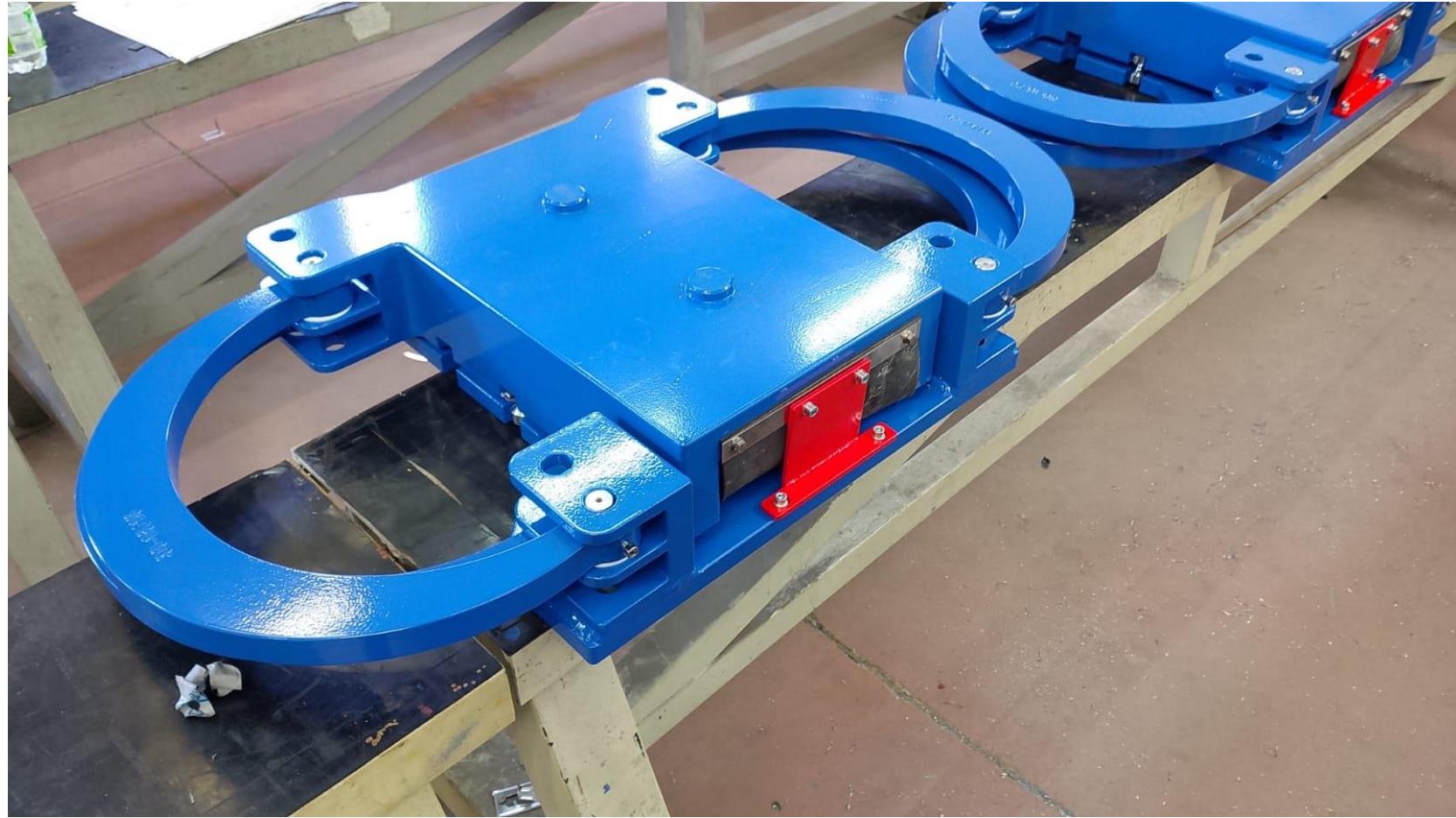


SCHEMA DISPOSITIVI SISMICI



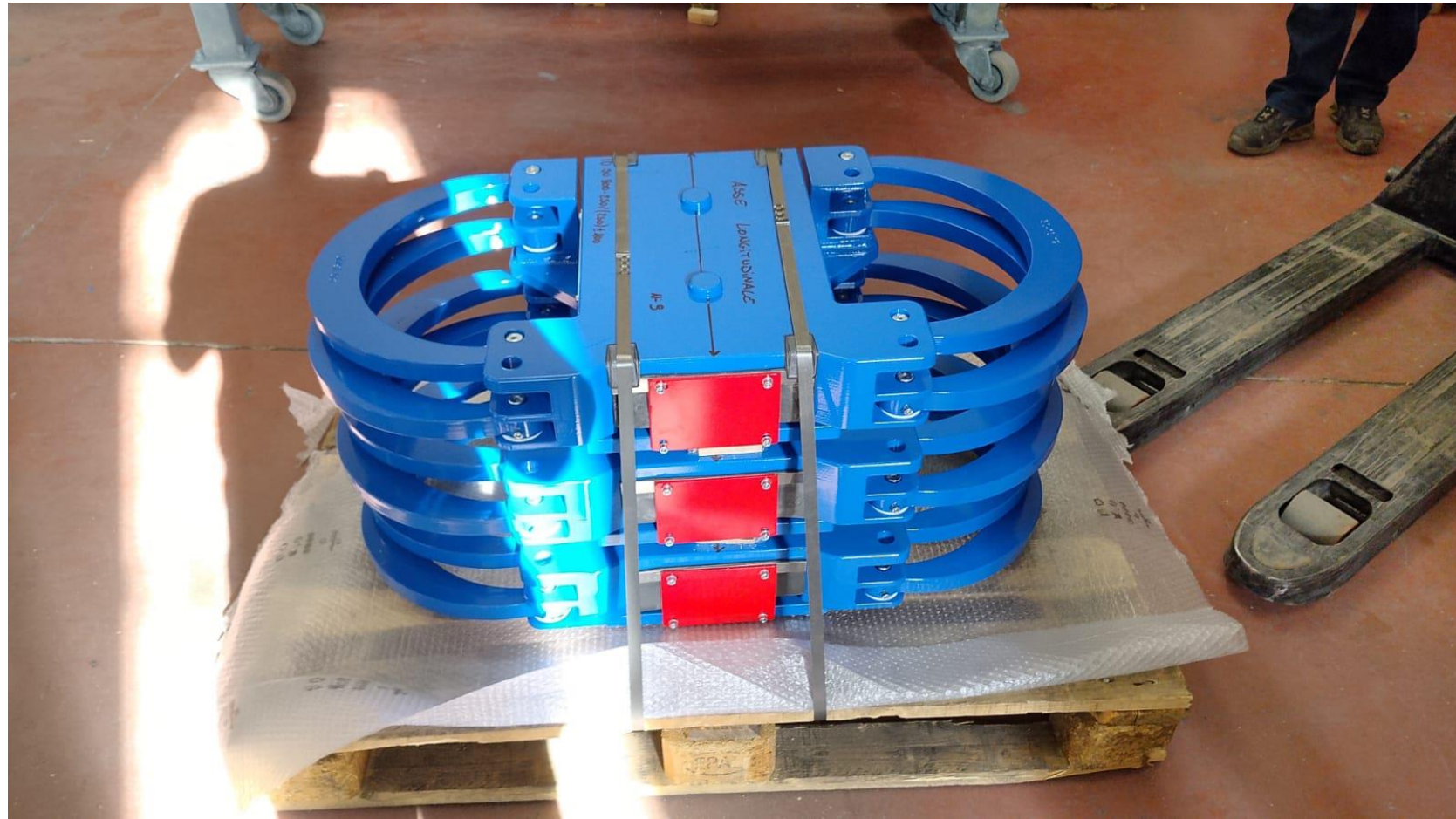
Retrofit del Pontile della raffineria
Sonatrach Augusta Sicily

References & highlight



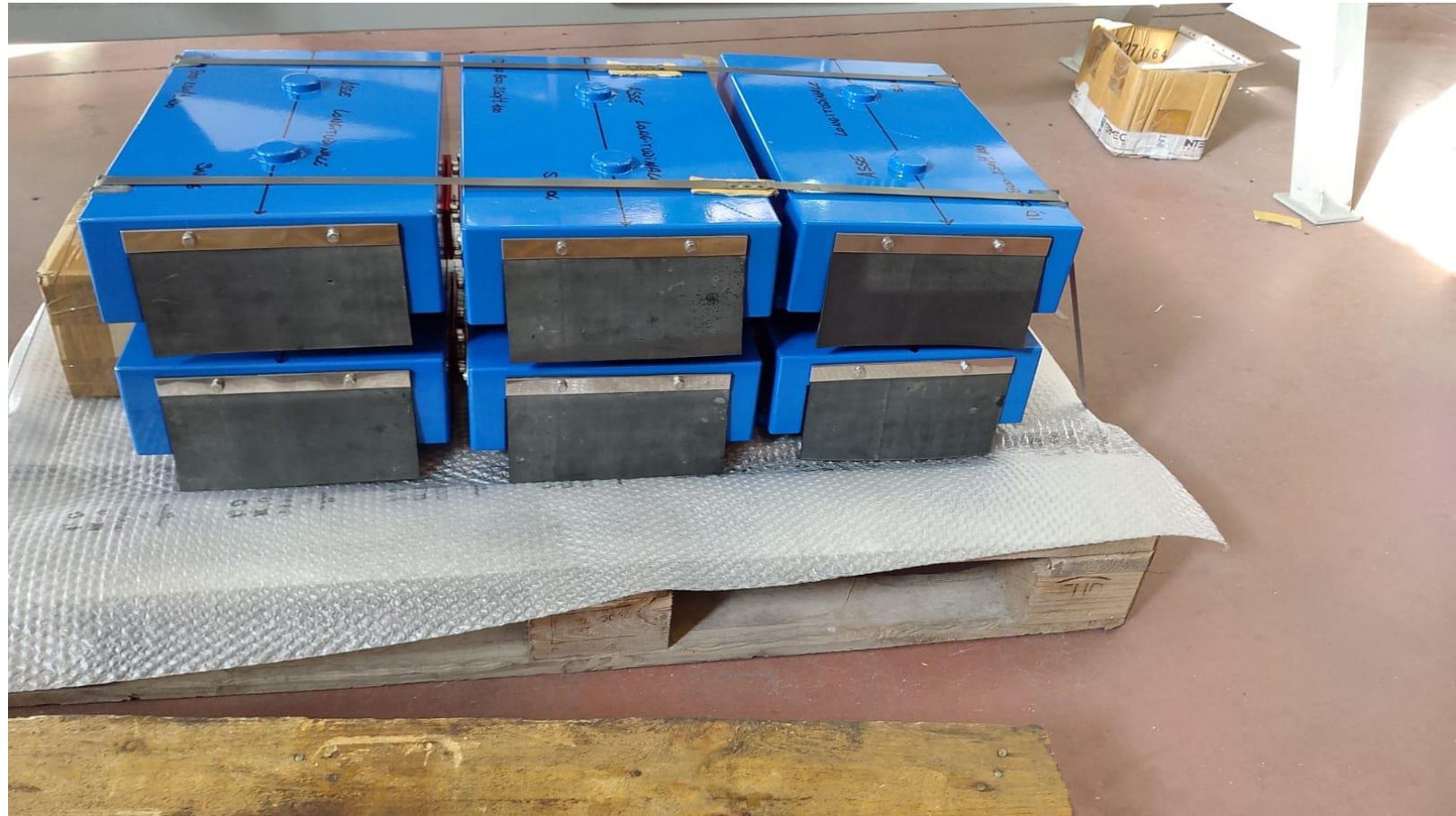
Refinery Sonatrach Italy – seismic isolated pier in retrofit approach

References & highlight



Refinery Sonatrach Italy – seismic isolated pier in retrofit approach

References & highlight



Refinery Sonatrach Italy – seismic isolated pier in retrofit approach

References & highlight

MAIN APPLICATION WORLDWIDE

Mark	VERTICAL LAOD[kN]			Stroke[mm]	Rotation	NO.
	-	ULS (Static)	NSD (KN)	DTM		
IDFPD 1900/280	-	4520	1900	±280	0.004	37
IDFPD 3450280	-	6050	3450	±280	0.004	32



Refinery Sonatrach Italy – seismic isolated pier in retrofit approach

ABSTRACT OF FLUID SLIDING PENDULUM SYSTEM - MAIN APPLICATION WORLDWIDE

References & highlight



Hospital Millenium Med Guayaquil - Campana

References & highlight

MAIN APPLICATION WORLDWIDE

Mark	VERTICAL LAOD[kN]			Stroke[mm]	Rotation	NO.
	-	ULS (Static)	NSD (KN)	DTM		
IDFPD 1900/280	-	4520	1900	±280	0.004	37
IDFPD 3450/280	-	6050	3450	±280	0.004	32
IDFPD 4500/280	-	7690	4500	±280	0.004	18
IDFPD 6150/280	-	9180	6150	±280	0.004	01

Hospital MilleniumMed Guayaquil - Campana

ABSTRACT OF FLUID SLIDING PENDULUM SYSTEM - MAIN APPLICATION WORLDWIDE

References & highlight



Hospital Millenium Med Guayaquil - Campana

ABSTRACT OF FLUID SLIDING PENDULUM SYSTEM - MAIN APPLICATION WORLDWIDE

References & highlight



Hospital Millenium Med Guayaquil - Campana

ABSTRACT OF FLUID SLIDING PENDULUM SYSTEM - MAIN APPLICATION WORLDWIDE

References & highlight



Hospital MilleniumMed Guayaquil - Campana

ABSTRACT OF FLUID SLIDING PENDULUM SYSTEM - MAIN APPLICATION WORLDWIDE

References & highlight



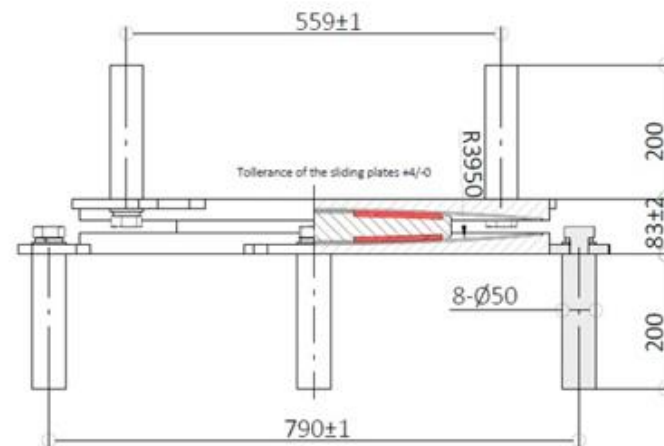
Hospital MilleniumMed Guayaquil - Campana

References & highlight

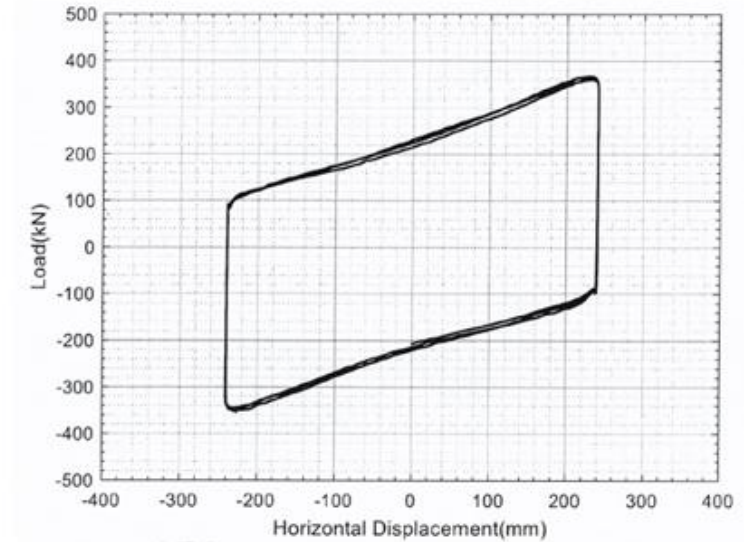
ABSTRACT OF FLUID SLIDING PENDULUM SYSTEM - MAIN APPLICATION WORLDWIDE



Specimen in the testing of bearing capacity



ID-03 / ID FPD 4500/±280



Hospital MilleniumMed Guayaquil - Campana

ABSTRACT OF LEAD RUBBER BEARINGS - MAIN APPLICATION WORLDWIDE

References & highlight



Puente Bio Bio Concepcion Chile – EFE Trenes de Chile



References & highlight

MAIN APPLICATION WORLDWIDE

Mark	VERTICAL LAOD[kN] / Horizontal stiffness			Stroke[mm]	Rotation	NO.
	ULS (Static)	ULS (Seismic weight)	Keff (kN/mm)	DTM		
IDLRB-N 1100X1100X479	14900	4668	4.05	±633	0.005	16
IDLRB-N 1100X1100X387	16910	4668	4.68	±588	0.005	45
IDLRB-N 1200X1200X478	22420	1650	4.93	±627	0.005	06

In BIO BIO Railway bridge **“prototype testing and FPC on 100% of the devices to be installed on site were tested dynamically in external laboratory”**. The project is very important as it represents the largest lead rubber isolators produced by **ISOLDAMP** in terms of rubber plan size and isolator’s height (1200x1200x508mm), displacement (± 633 mm) and horizontal nominal force (roughly 3.100 kN shear load). In addition the isolation is applied to a Railway Bridge with the strict control of **EFE TRENES DE CHILE (RAILWAY AUTHORITY)** the Owner of the structure.

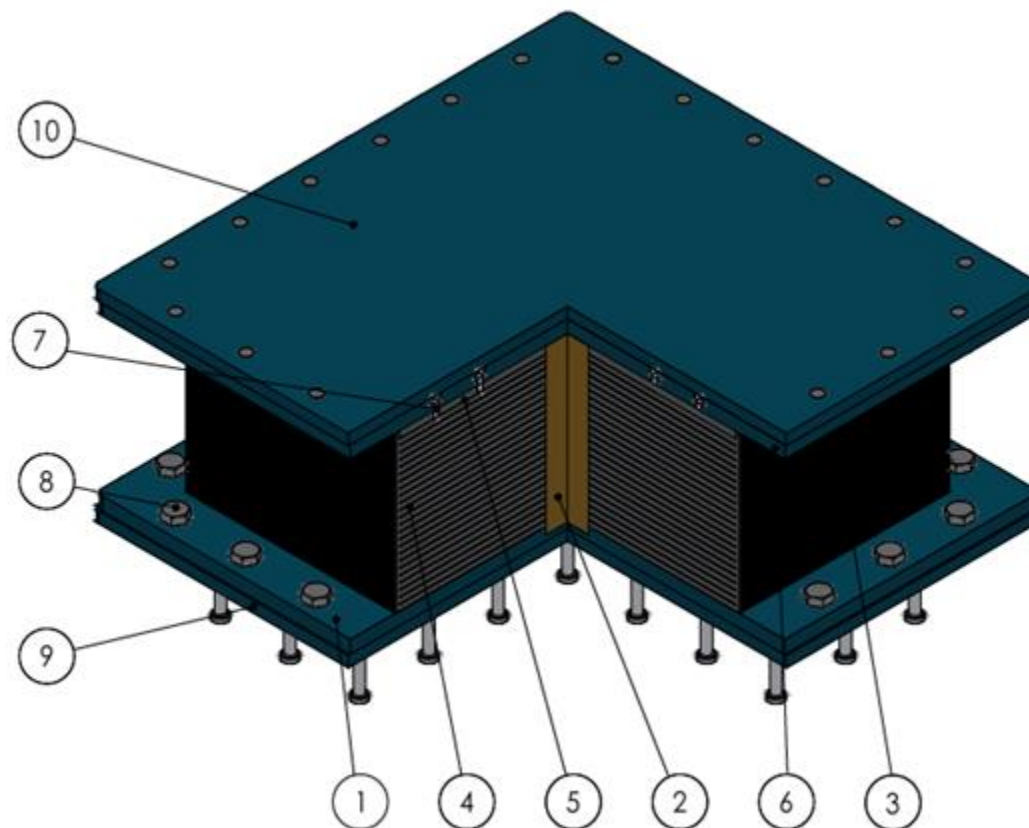


Puente Bio Bio Concepcion Chile – EFE Trenes de Chile



References & highlight

MAIN APPLICATION WORLDWIDE



10	Upper counter plate	EN 10025	S355 J2+N
9	Lower counter plate	EN 10025	S355 J2+N
8	Bolt	EN 898	cl. 8.8
7	Screw	EN 898	cl. 10.9
6	External Upper Plate	EN 10025	S355 J2+N
5	Internal Upper Plate	EN 10025	S355 J2+N
4	Reinforcement Steel Plate	EN 10025	S355 J2+N
3	Low damping rubber compound	EN 1337	(G=0.8 MPa)
2	Nucleo de plomo	EN 15129	Lead 99.9%
1	External Lower Plate	EN 10025	S355 J2+N

Puente Bio Bio Concepcion Chile – EFE Trenes de Chile

ABSTRACT OF LEAD CORED DEVICES - MAIN APPLICATION WORLDWIDE

References & highlight



Puente Bio Bio Concepcion Chile – EFE Trenes de Chile

ABSTRACT OF LEAD CORED DEVICES - MAIN APPLICATION WORLDWIDE

References & highlight



Puente Bio Bio Concepcion Chile – EFE Trenes de Chile

References & highlight

ABSTRACT OF SHOCK LEAD RUBBER BEARINGS - MAIN APPLICATION WORLDWIDE

Supply of **LEAD RUBBER BEARINGS** for the **A7 BUZAU FOCSANI** Motorway - **Romania**.



Lead Rubber bearings
Romania

ABSTRACT OF SHOCK LEAD RUBBER BEARINGS - MAIN APPLICATION WORLDWIDE

Supply of nr. **1360 LEAD RUBBER BEARINGS** for the **A7 BUZAU FOCSANI** Motorway - **Romania**.

References &
highlight



Lead Rubber bearings

References & highlight

ABSTRACT OF SHOCK LEAD RUBBER BEARINGS - MAIN APPLICATION WORLDWIDE

Supply of nr. **1360 LEAD RUBBER BEARINGS** for the **A7 BUZAU FOCSANI** Motorway - **Romania**.

Mark	Loads		Stiffness	Damping	Stroke		NO.
	F _{z,d} [kN]	N _{ED} [kN]	K _{eff} [kN/mm]	ε %	dbd [mm]	ded [mm]	
ID LRB-N 400x35	1500	600	3	25	±50	±85	688
ID LRB-N 550x78	4000	2200	3.1	25	±100	±191	16
ID LRB-N 550x60	1950	1200	3.75	25	±96	±150	16
ID LRB-N 550x80	3500	2200	3,84	30	±123	±191	640

Lead Rubber bearings
Romania

References & highlight



The main objective of the project was to maintain the OTP fluid-dynamic dampers positioned on the abutments of the two carriageways of the 765 meters long viaduct and serving as longitudinal restraints for the spans connected to them. These devices, installed in 90s were designed to have a pseudo-rigid behavior with respect to static forces, while exhibiting a hysteretic dissipative behavior in the event of a seismic event thanks to the presence of hydraulic components with a longitudinal displacement capacity of ± 200 mm.

Messina Palermo A20 Motorway – San Teodoro Viaduct Italy

References & highlight

ABSTRACT OF HYDRAULIC DEVICES, JOINTS, SPECIAL EQUIPMENT - MAIN APPLICATION WORLDWIDE

Between November 2022 and May 2023, inspections were carried out to assess the state of conservation of the current restraint system and the expansion joints. All the dampers, present on the abutments of both roads were in serious bad conditions. The dampers on abutment SP2 for the road towards Palermo has been found to be totally inoperative. Specifically, the bearings were at their limit of displacement, due to the deck shift towards the abutment. Follow an image of the situation:



Messina Palermo A20 Motorway – San Teodoro Viaduct Italy

References & highlight

ABSTRACT OF HYDRAULIC DEVICES, JOINTS, SPECIAL EQUIPMENT - MAIN APPLICATION WORLDWIDE

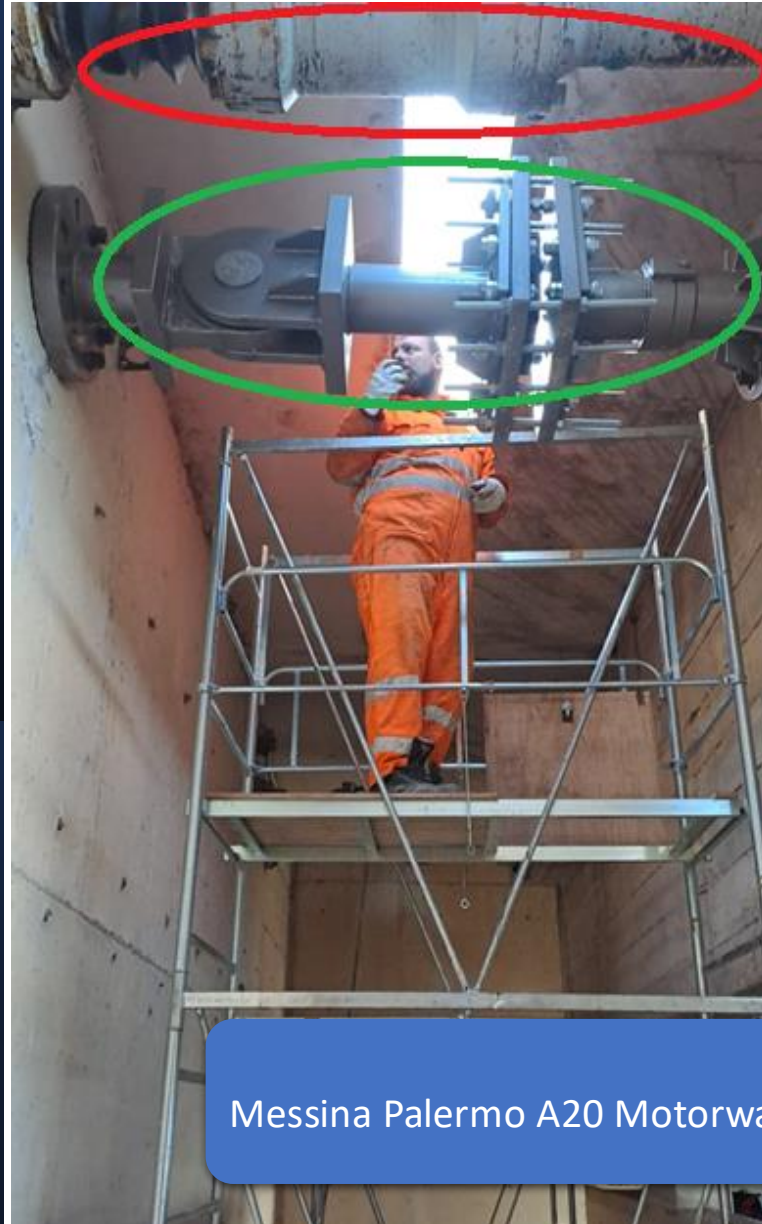
This maintenance project involved the removal of the current hydraulic isolators (OTPs) on all abutments for workshop maintenance to restore the devices to their initial design mechanical and fluid-dynamic characteristics. During transitional phases in which these devices were not present, temporary mechanical restraints were installed in their place. These restraints locked the deck in its actual position and preventing from free longitudinal movement. These temporary restraints were subjected to structural checks during this service and were sized with the maximum capacities calculated according to the NTC 2018 actions. Follow a picture of the temporary devices:



Messina Palermo A20 Motorway – San Teodoro Viaduct Italy

ABSTRACT OF HYDRAULIC DEVICES, JOINTS, SPECIAL EQUIPMENT - MAIN APPLICATION WORLDWIDE

References & highlight



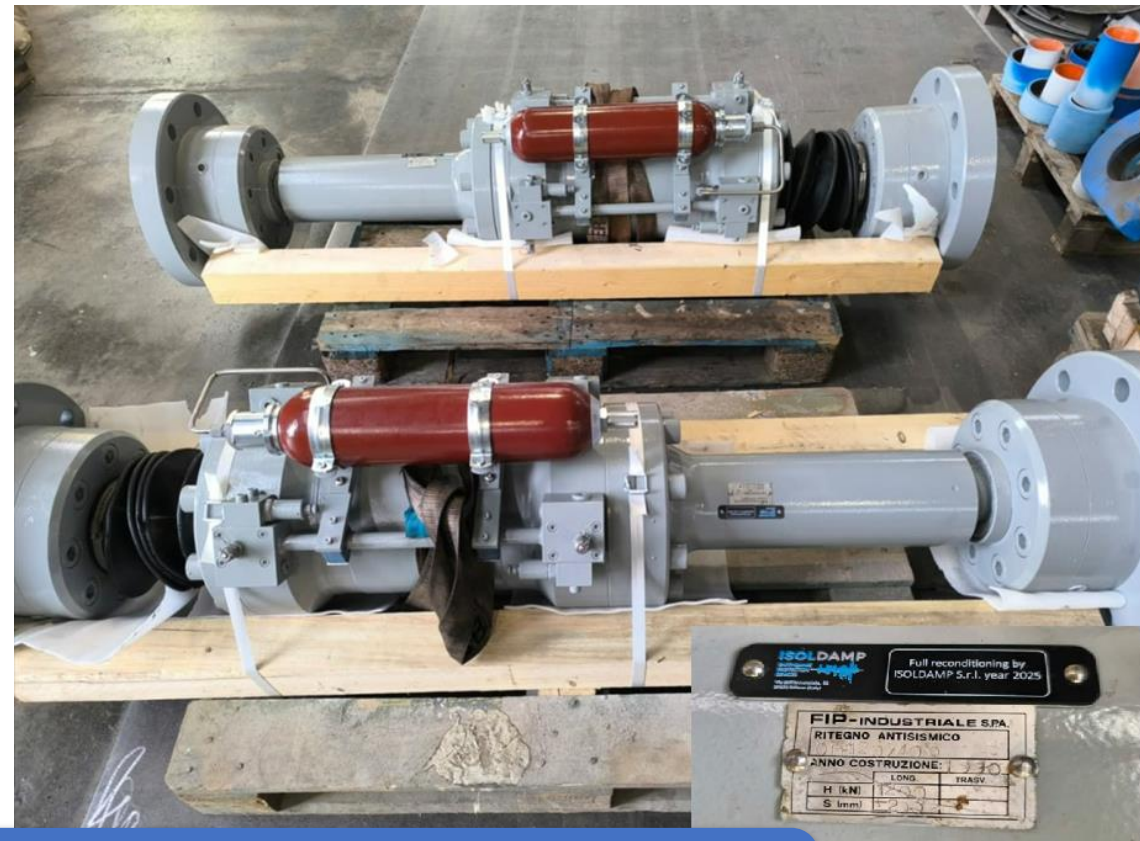
On the left detail of the removal of the original devices (red) and parallel installation of the temporary connection devices (green).

Messina Palermo A20 Motorway – San Teodoro Viaduct Italy

References & highlight

ABSTRACT OF HYDRAULIC DEVICES, JOINTS, SPECIAL EQUIPMENT - MAIN APPLICATION WORLDWIDE

The hydraulic devices were completely disassembled and sandblasted. Excessively damaged parts were replaced, as were all seals, tubing, silicone fluid, external accumulator, dust protection elements, connection screws. The devices were then reassembled and 100% quality-control tested dynamically before returning to the site to assure the needed behavior:



Messina Palermo A20 Motorway – San Teodoro Viaduct Italy

ABSTRACT OF HYDRAULIC DEVICES, JOINTS, SPECIAL EQUIPMENT - MAIN APPLICATION WORLDWIDE

References & highlight

On the left the devices before total maintenance.

On the right the devices after total radical maintenance realized by ISOLDAMP



Messina Palermo A20 Motorway – San Teodoro Viaduct Italy

References & highlight

ABSTRACT OF HYDRAULIC DEVICES, JOINTS, SPECIAL EQUIPMENT - MAIN APPLICATION WORLDWIDE

In order to displace the relevant part of the viaduct which had a length of more than 400 meters we supplied tailor made jacks capable to reach the needed 20 cm viaduct translation. A battery of nr. 4 jacks like the one in the picture was produced and the displacement operations were realized through a stressing pump servo controlled by a specific hardware and software. The viaduct displacement has been realized both in control of displacement and in control of force. The devices are also capable to work as **SHOCK TRANSMISSION UNITS**.

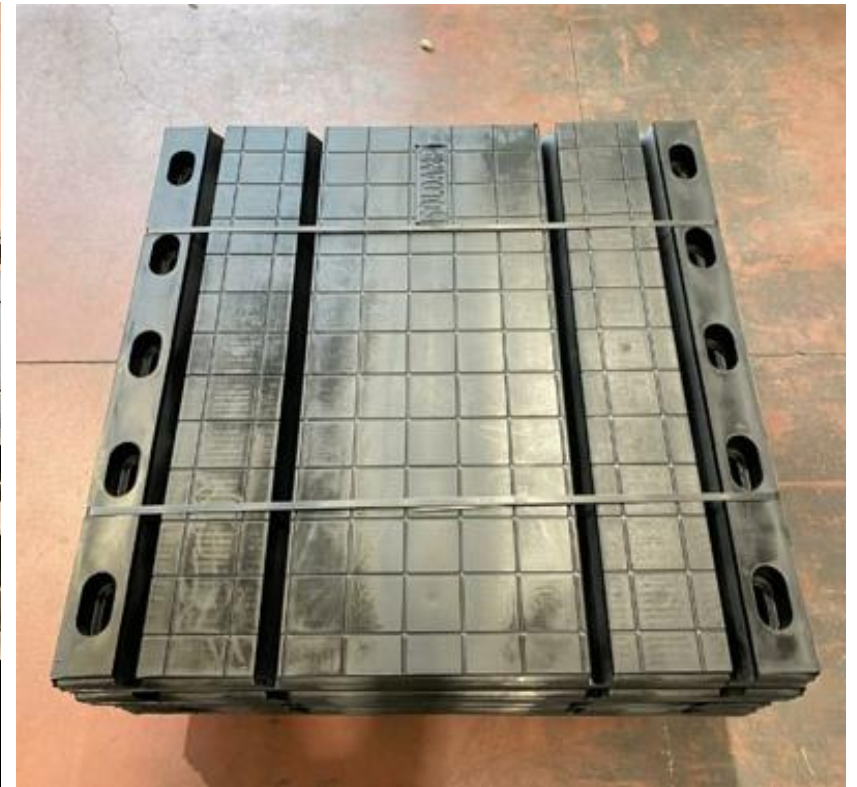


Messina Palermo A20 Motorway – San Teodoro Viaduct Italy

References & highlight

ABSTRACT OF HYDRAULIC DEVICES, JOINTS, SPECIAL EQUIPMENT - MAIN APPLICATION WORLDWIDE

Finally **ISOLDAMP** also supplied the very large seismic reinforced expansion joint to be installed at abutments type **IDMRJ 320/400** capable to cover seismic displacement up to ± 200 mm with no damages:



Messina Palermo A20 Motorway – San Teodoro Viaduct Italy

References & highlight

ABSTRACT OF FLUID VISCOUS DAMPERS - MAIN APPLICATION WORLDWIDE

Supply of Fluid Viscous dampers for the **seismic retrofit of CUS sport hall belonging to the University of Ferrara Italy:**



Fluid viscous dampers
Italy

ABSTRACT OF FLUID VISCOUS DAMPERS - MAIN APPLICATION WORLDWIDE

Follow the picture of the sporting hall:

References &
highlight



Fluid viscous dampers
Italy

ABSTRACT OF FLUID VISCOUS DAMPERS - MAIN APPLICATION WORLDWIDE

Follow the picture of the sporting hall FVDs devices and related pins:

References &
highlight

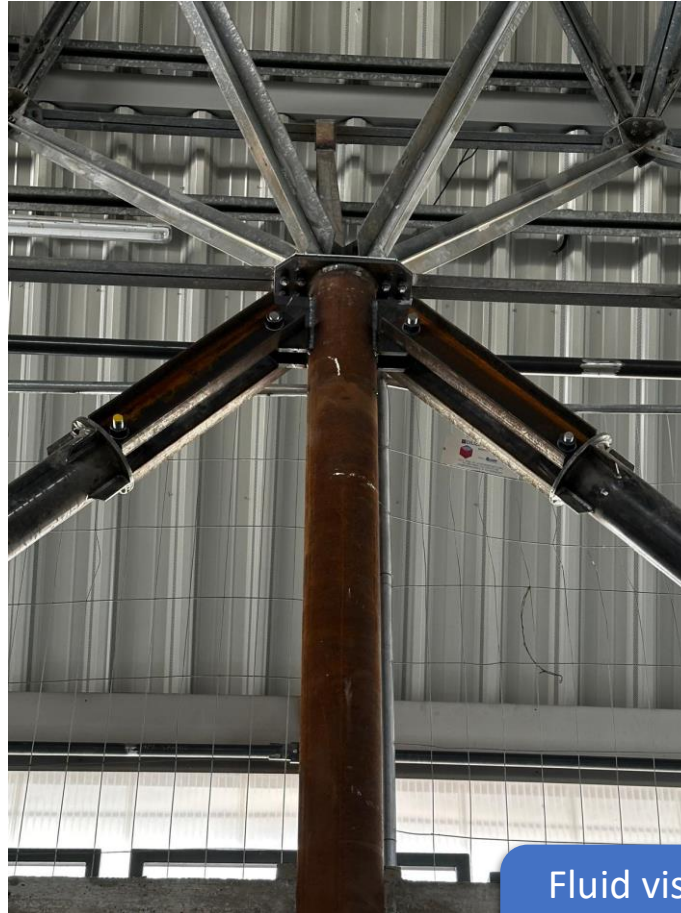


Fluid viscous dampers
Italy

References & highlight

ABSTRACT OF FLUID VISCOUS DAMPERS - MAIN APPLICATION WORLDWIDE

Follow details of installation executed under the guidance on site by ISOLDAMP:



Fluid viscous dampers
Italy

References & highlight



ABSTRACT OF SHOCK TRANSMISSION UNITS - MAIN APPLICATION WORLDWIDE

Supply of SHOCK TRANSMISSION UNITS for the **Stay Cable Bridge in Galati Romania.**

Shock transmission units
Romania

References & highlight

ID EARTHQUAKE
PROTECTION
DEVICES

References & highlight

ABSTRACT OF SHOCK TRANSMISSION UNITS - MAIN APPLICATION WORLDWIDE

Painting of **SHOCK TRANSMISSION UNITS** for the **Stay Cable Bridge in Galati Romania.**



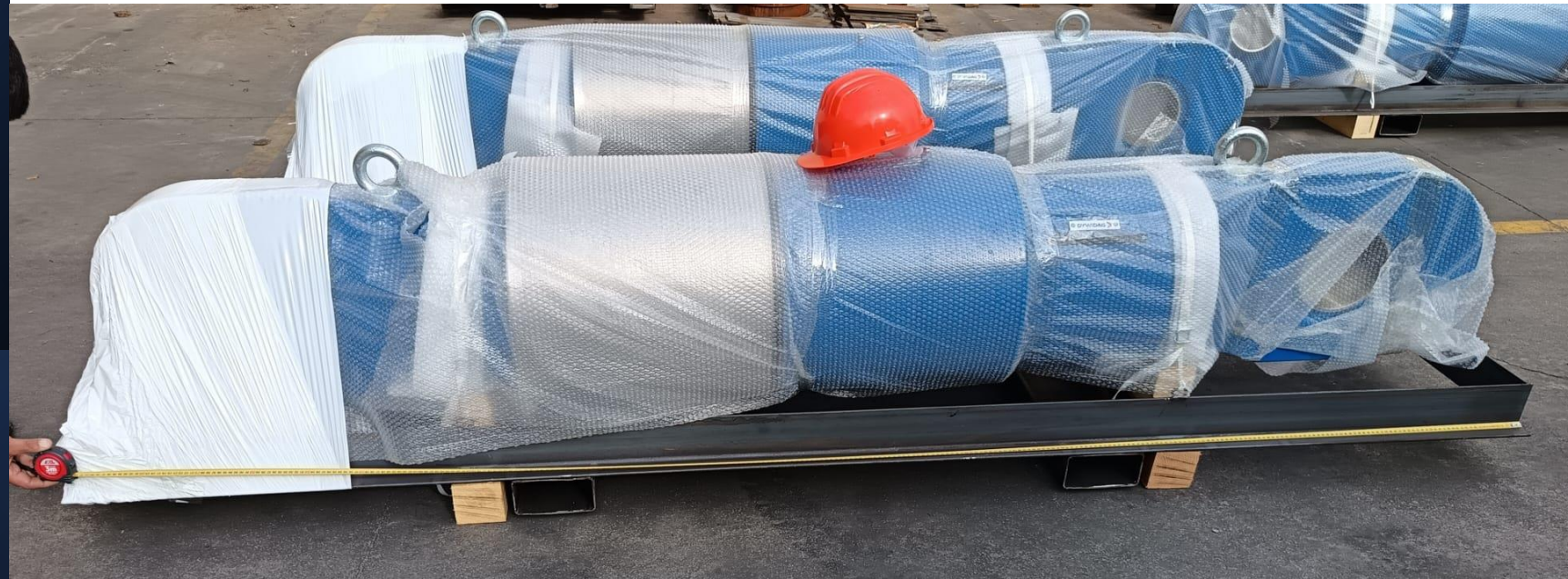
Shock transmission units
Romania

References & highlight

ABSTRACT OF SHOCK TRANSMISSION UNITS - MAIN APPLICATION WORLDWIDE

Supply of **SHOCK TRANSMISSION UNITS** for the **Stay Cable Bridge in Galati Romania.**

Mark	DESIGN AXIAL LAOD [kN]	Max amplified DESIGN AXIAL LAOD* [kN]	max displacement capacity [mm]	NO.
IDSTU 4200/±150	4200	6300	±150	16



Shock transmission units
Romania

References & highlight



Shock transmission units
Romania

ABSTRACT OF SHOCK
TRANSMISSION UNITS -
MAIN APPLICATION
WORLDWIDE

Supply of **SHOCK
TRANSMISSION UNITS**
for the **Stay Cable**
Bridge in Galati
Romania.

References & highlight

ABSTRACT OF SHOCK TRANSMISSION UNITS - MAIN APPLICATION WORLDWIDE

Prototype test of **SHOCK TRANSMISSION UNITS** for the **Stay Cable Bridge in Galati Romania.**

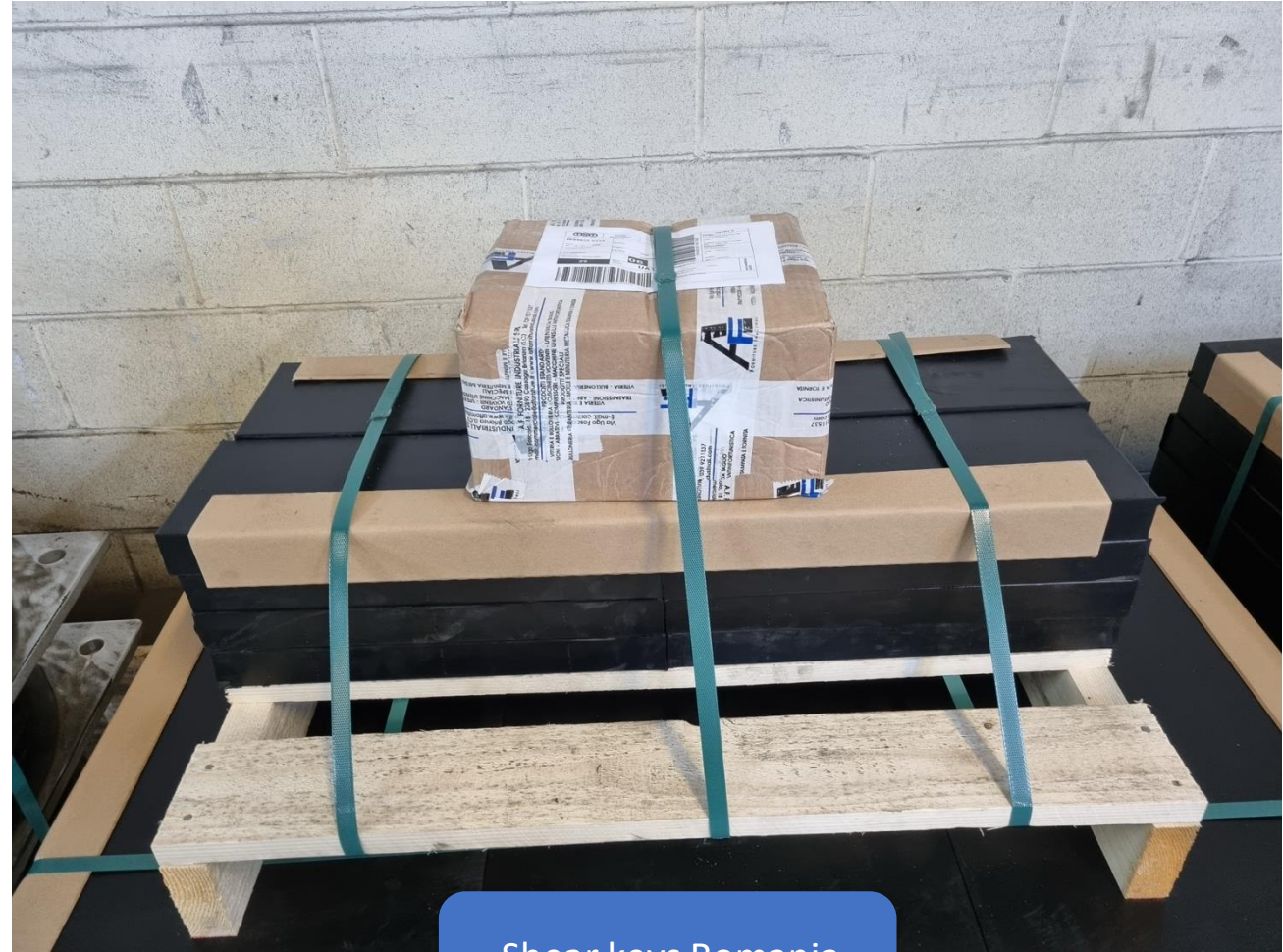


Shock transmission units
Romania

References & highlight

ABSTRACT OF SHOCK TRANSMISSION UNITS - MAIN APPLICATION WORLDWIDE

Detail of the **SHEAR KEYS** to restrain laterally the deck of for the **Stay Cable Bridge in Galati Romania.**

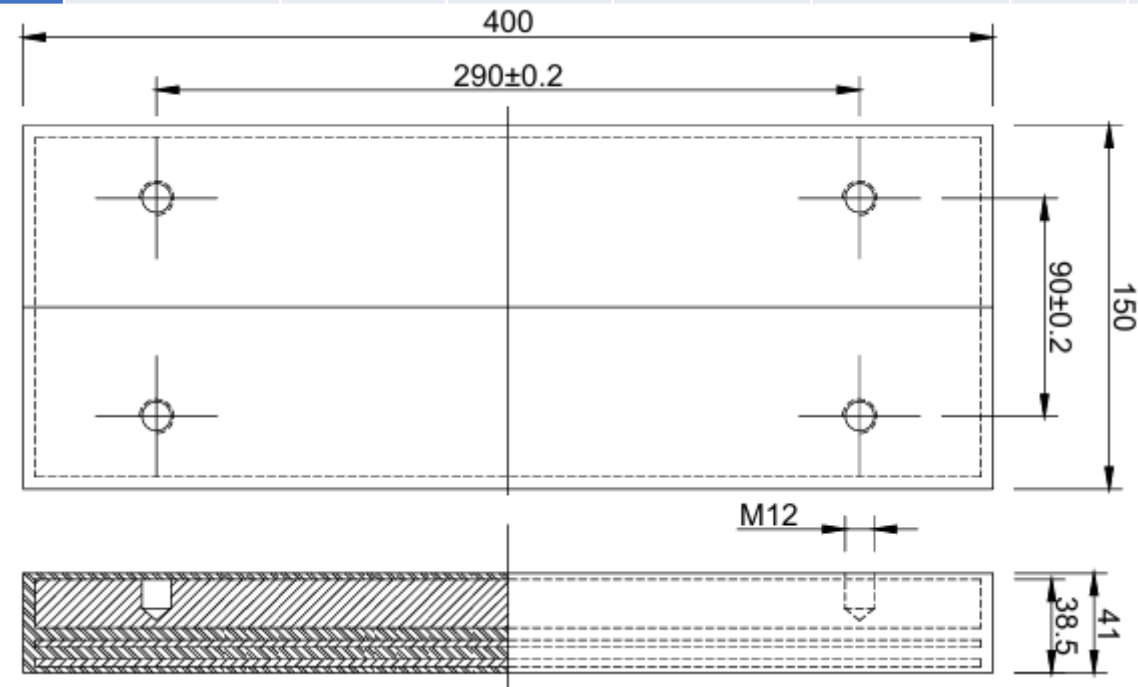


Shear keys Romania

ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

Follow loads and characteristics of the devices:

	Mark	VERTICAL LAOD[kN] / Horizontal stiffness			Stroke[mm]	Rotati on	NO.
		ULS (Static)	ULS (Seismic weight)	Keff (kN/mm)	DULS		
	IDRB 150X400X38.5	2360	-	-	-	-	16



Shear keys Romania

References & highlight

References & highlight

ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE



Humanitas PROTON Passengers bridge

ISOLDAMP designed and produced the elastomeric PTFE guided and free sliding bearings for the passenger bridge connecting an existing wing of **HUMANITAS HOSPITAL IN MILANO** to the new one guesting Proton therapy building center. It is an advanced form of radiation therapy that uses protons instead of X-rays, allowing the radiation dose to be focused while sparing surrounding healthy tissue, thus reducing side effects.

References & highlight

ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

ISOLDAMP designed and produced the elastomeric bearings for the new passenger bridge over the **Railway station in Chivasso**. The devices are **characterized by dielectric compound as requested by Italian Authority** and were tested in real time testing at Politecnico of Milano under the surveillance of **RFI (Rete Ferroviaria Italiana)** final Owner of the bridge:



Passenger Bridge over Chivasso Railway station

ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

Follow the devices before delivery to the site:



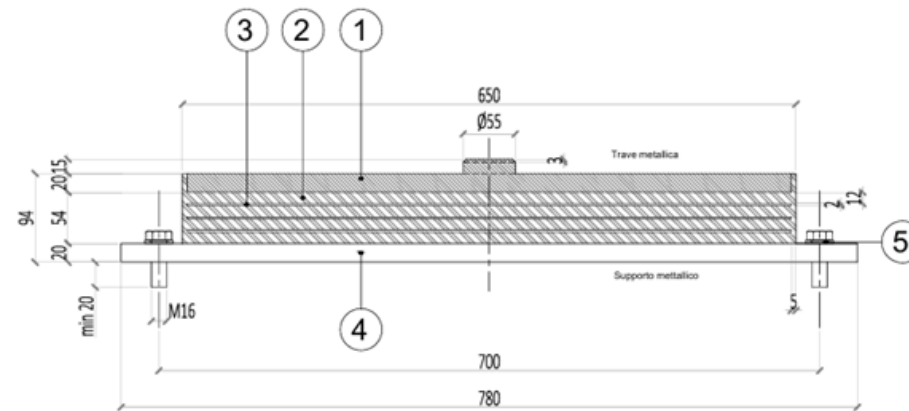
References &
highlight

Passenger Bridge over Chivasso Railway station

ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

Follow the devices loads and characteristics:

Mark	VERTICAL LAOD[kN] / Horizontal stiffness			Stroke[mm]	Rotatio n	NO.
	ULS (Static)	ULS (Seismic weight)	Keff (kN/mm)	DULS		
IDRBC 650X350X48	3000	-	4.27	±40	0.01	4



05	4	Vite e Rosetta	Class 10.9	EN 898-1	-
04	1	Piastra inferiore vulcanizzata	S355J2+N	EN 10025	Protezione Anticorrosiva
03	3	Lamiere di rinforzo	S355JR	EN 10025	Nota 1
02	4	Elastomero	Gomma naturale G=0.9 MPa	EN 1337-3	Dielettrica omologata RFI
01	1	Piastra superiore vulcanizzata	S355J2+N	EN 10025	Protezione Anticorrosiva + Nota 2
ITEM	QTY	DESCRIPTION	MATERIAL	STANDARD	NOTE

Passenger Bridge over Chivasso Railway station

References &
highlight

ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

References & highlight



Bristol Hotel Stresa Italy

References & highlight



ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

Follow the devices loads and characteristics:

Mark	VERTICAL LAOD[kN] / Horizontal stiffness			Stroke[mm]	Rotatio n	NO.
	ULS (Static)	ULS (Seismic weight)	Keff (kN/mm)	DULS		
IDRBC 150X150X21	250	-	0.96	±20.7	0.003	95

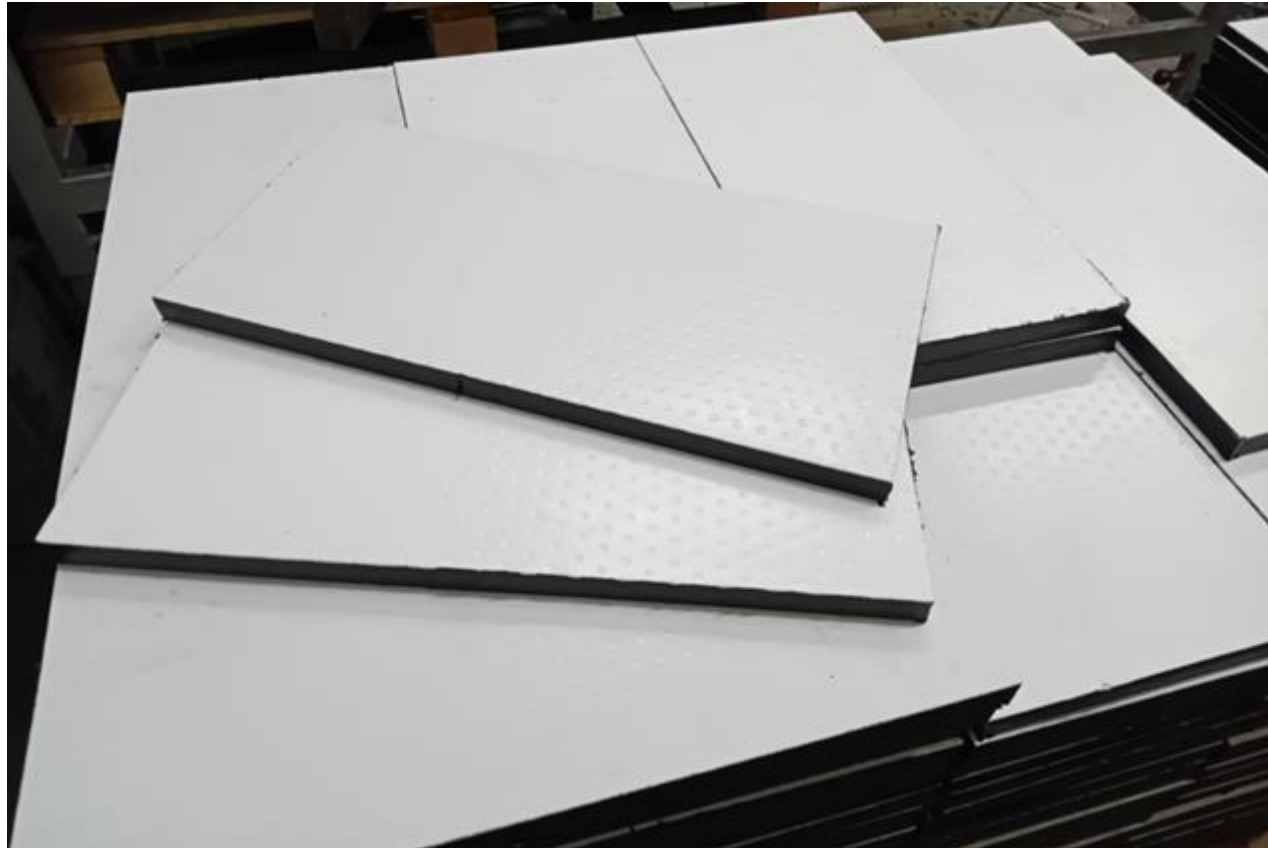
References &
highlight

Bristol Hotel Stresa Italy

References & highlight

ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

The following bearings have a very small thickness and are equipped by vulcanized, dimpled and lubricated virgin PTFE to allow the **"bridge launching activities"**.



Launching pads Israel

ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

Follow the devices loads and characteristics:

Mark	VERTICAL LAOD[kN] / Horizontal stiffness			Stroke[mm]	Rotation	NO.
	ULS (Static)	ULS (Seismic weight)	Keff (kN/mm)	DULS		
IDRBD 250X500X21.5	2650	-	-	-	0.005	150
IDRBD 250X500X17.5	2650	-	-	-	0.005	150

References & highlight

Launching pads Israel

References & highlight



ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

The following CE-marked bearings, in compliance with EN 1337-3, are fitted with virgin vulcanized PTFE, featuring a dimpled and lubricated surface, and a stainless-steel-clad support plate to allow free sliding movements.

Sliding elastomeric bearings for
Motorway R444 ISRAEL

References & highlight

ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

Follow image of the sliding plate of the devices made by a mirror-polished stainless-steel element TIG welded to a S335J2+N construction steel backing plate:



Sliding elastomeric bearings for
Motorway R444 ISRAEL

ABSTRACT OF ELASTOMERIC BEARINGS - MAIN APPLICATION WORLDWIDE

Follow loads and characteristics of the devices:

Mark	VERTICAL LAOD[kN] AND DISPLACEMENT [mm]				Rotation	NO.
	ULS max (Static)	ULS min (static)	Displacement (short term)	Displacement (long term)		
IDRBD 200X250X41 (56)	950	115	±65	±21	0.005	69

References &
highlight

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ABSTRACT OF EXPANSION JOINT - MAIN APPLICATION WORLDWIDE

CE-marked single gap (and multi modular) expansion joints.

References &
highlight



Expansion joint production



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