Company History

Year	Date	Event
1980		
1981		
1982		
1983		
1984	Sep. 26	Unison Co., Ltd established
1987	Jul. 01	Unison Research & Development Center established
1993	Nov. 24	Registered in KOSDAQ (Korea Securities Dealers Automated Quotation)
1994	Dec. 13	**Obtained ISO9001 (KSA - QA, all items)**
1996	Nov. 25	Obtained EM mark (Elastomeric Bearing & Seismic Resistance Bearing for high-speed railway)
1997	Apr. 25	Obtained NA, NPT STAMP certificates (ASME : American Society of Mechanical Engineers)
	Aug. 27	Certified for KEPIC-MN (Nuclear Machine) Quality Assurance (KEA : Korea Electric Association)
1999	Oct. 19	Obtained EM mark for 'Lead Rubber Bearing (LRB)' (Ministry of Commerce, Industry & Energy)
2001	May. 16	Completed Cheonan General Factory
2005	Mar. 29	UNISON E&C Co., Ltd established
2006	Nov. 21	**Obtained ISO14001 (KSA, all items)**
2007	Jun. 18	Acquired patent for 'Elastomeric Bridge Bearing Which Can Be Easily Taken Maintenance'
2009	Oct. 01	UNISON hi-Tech was spun off from UNISON as a wholly owned subsidiary Established UNISON Research and Development Center
2011	Apr. 25	**UNISON** e **Tech Co., Ltd** established
2012	Sep.	Constructed Cheonan 3 & 4 Complex Factory
2013	Mar.	**Obtained CE certificate for POT Bearing**
2014	Jan. 06	SEB performance authentication from the Small and Medium Business Administration
2015	Jan.	**Obtained CE certificate for Elastomeric Bearing**

Company Profile

We, **UNISON e Tech** is one of the leading construction and plant manufacturers in Korea with the 27years of experiences since 1984.

With the slogan "**UTMOST EXPERT TECHNOLOGY** " as the company motto,
We will continue to make stable growth by our passion and obtaining technology
in order to achieve global competence and stable management.

GROSS AREA	98,106 ㎡
UNDER ROOF FACTORY	18,726 ㎡
HEAD OFFICE	53, Wookakgogil, Soosin-myeon, Dongnam-gu, Cheonan si, Korea
CONTACT POINT	• HEAD OFFICE ┃ Tel +82 41 620 3333 • HOMEPAGE ┃ www.uet.co.kr • SEOUL OFFICE (Construction Business Part) Tel +82 2 528 8778, E-mail choigj@uet.co.kr

1 Head office
2 R&D center
3 Experiment room
4 Cutting shop
5 Machining shop
6 Expansion Joint shop
7 Shop blasting shop
8 Rubber & Painting shop
9 Warehouse
10 Warehouse
11 Packing shop
12 Assembly shop
13 Assembly shop
14 Test & Welding shop
15 Modal testing tower

UTMOST EXPERT TECHNOLOGY

UTMOST EXPERT TECHNOLOGY to support and improve future world

Bridge Bearing

Contents

Definition

UNISON eTECH elastomeric bearings are fabricated by natural rubber or neoprene. Designed and sized to meet the needs of your structure, these bearings are rigid enough to transmit the necessary loads and flexible enough to permit the rotation and movement required by the structure. They can also be used for vibration and earthquake motion control applications.

Product Features

A laminated elastomeric bearing is an elastomeric rubber block reinforced with steel plates vulcanized when built. This bearing is the connection between a structure and its support, and should make the following possible through elastic deformation:

01 Transmission of normal forces;
02 Horizontal movements;
03 Rotation of the structure in any direction;
04 Transmission of horizontal forces, within defined limits.

It may also be provided with a sliding plane for withstanding large movements of the structure and also having a one or two horizontal movement locking systems.

UNISON eTECH's Laminated Elastomeric bearings are designed, manufactured and tested in accordance with the requirements of a wide range of international standards which **AASHTO-LRFD, BS 5400, EN 1337-3, KS F 4420** etc.
Every single component is mechanically worked and assembled by fully qualified and trained workers at the UNISOIN eTECH's factory under strict **KS Q ISO 9001 : 2009/ISO 9001:2008, KS I ISO 14001:2009/ISO 14001:2004** quality control standards

Type B

Type B elastomeric bearings are enclosed on all sides with rubber (NR/CR) and are used between concrete or steel construction components. This type of bearings can simply be positioned between the structural components.

Type C

Type C rubber bearings is the uniform type rubber bearings which reinforced steel plates and top/bottom plates and rubber pad are fixed with connection bolts, sliding or roll-over is not caused, so it guarantees the performance improvement and safety.

Quality of the materials

01. NATURAL RUBBER(NR) COMPOUND : AASHTO M251

Properties	Testing standard	Specification
Shore A hardness	ASTM D2240	60 ± 5
Tensile strength MPa, min	ASTM D412	15.5
Ultimate elongation, min %		400
Change in Durometer hardness, maximum point (168 at 70°C)		±10
Change in tensile strength, maximum % (168 at 70°C)	ASTM D573	-25
Change in Ultimate elongation, maximum % (168 at 70°C)		-25
Compression set (22hr at 70°C)	ASTM D395 Method B	≤ 25
OZONE 50pphm, 40±2°C, 100hr, Elongation 20%	D1149	No Cracking

02. NEOPRENE RUBBER(CR) COMPOUND : AASHTO M251

Properties	Testing standard	Specification
Shore A hardness	ASTM D2240	60 ± 5
Tensile strength MPa, min	ASTM D412	15.5
Ultimate elongation, min %		350
Change in Durometer hardness, maximum point (70hr, at 100)		±15
Change in tensile strength, maximum % (70hr at 100)	ASTM D573	-15
Change in Ultimate elongation, maximum % (70hr at 100)		-40
Compression set (22hr at 100°C)	ASTM D395 Method B	≤ 35
OZONE 50pphm 40±2°C, 38°C, 100hr, Elongation 20%	D1149	No Cracking

03. INTERNAL STEEL LAMINATES

The internal steel laminates for the elastomeric bearing pad shall comply with the Appropriate standard given A36

Quality of the materials

01. NATURAL RUBBER(NR) COMPOUND : BS5400

Properties		Testing standard	Specification
Hardness (Shore A)		BS 903, Part-A26	60±5
Tensile strength (MPa)		BS 903, Part-A2	15.5 Min.
Elongation Break (%)		BS 903, Part-A2	400 Min.
Heat Ageing, 168hr at 70°C	Change in Hardness, points	BS 903, Part-A19 BS 903, Part-A26 BS 903, Part-A2 BS 903, Part-A2	±10 Max.
	Change in Tensile Strength, %		-15 Max.
	Change in Elongation, %		-20 Max.
Compression Set (24hr at 70°C)		BS 903, Part-A6	30% Max.
Low Temperature Brittleness, Impact Brittleness		BS 903, Part-A25	≤ -25°C
Ozone Resistance (25pphm, 30°C, 96hr, Elongation 20%)		BS 903, Part-A43	No cracks

02. NEOPRENE RUBBER(CR) COMPOUND : BS5400

Properties		Testing standard	Specification
Hardness (Shore A)		BS 903, Part A26	60±5
Tensile strength (MPa)		BS 903, Part-A2	15.5 Min.
Elongation Break (%)		BS 903, Part-A2	350 Min.
Heat Ageing, 72hr at 100°C	Change in Hardness, points	BS 903, Part-A19 BS 903, Part-A26 BS 903, Part-A2 BS 903, Part-A2	±15 Max.
	Change in Tensile Strength, %		-15 Max.
	Change in Elongation, %		-40 Max.
Compression Set (22hr at 100°C)		BS 903, Part-A6	35% Max.
Low Temperature Brittleness, Impact Brittleness		BS 903, Part A25	≤ -25°C
Ozone Resistance (25pphm, 30°C, 96hr, Elongation 20%)		BS 903, Part - A43	No cracks

03. INTERNAL STEEL LAMINATES

The internal steel laminates for the elastomeric bearing pad shall comply with the Appropriate standard given BS 5400

Elastomeric Bearing Dimension

ELASTOMERIC BEARING AASHTO : G = 1.08MPa 11.0kgf/cm² TYPE - B

Applied load(kN)	PAD Dimension W*L*T(mm)	Elastic rubber layer		Horizontal load(kN)		Displacement(mm)	
		Number of elastomeric layers	Effective elastomer thickness	SLS (50%)	ULS (150%)	SLS (50%)	ULS (150%)
500	210 X 300 X 77	6	48			24	72
	210 X 300 X 88	7	56			28	84
	210 X 300 X 99	8	64			32	96
	210 X 300 X 110	9	72			36	108
	210 X 300 X 121	10	80	34.0	102.1	40	120
	210 X 300 X 132	11	88			44	132
	210 X 300 X 143	12	96			48	144
	210 X 300 X 154	13	104			52	156
	210 X 300 X 165	14	112			56	168
750	220 X 400 X 77	6	48			24	72
	220 X 400 X 88	7	56			28	84
	220 X 400 X 99	8	64			32	96
	220 X 400 X 110	9	72			36	108
	220 X 400 X 121	10	80	47.5	142.6	40	120
	220 X 400 X 132	11	88			44	132
	220 X 400 X 143	12	96			48	144
	220 X 400 X 154	13	104			52	156
	220 X 400 X 165	14	112			56	168
1000	290 X 400 X 80	4	48			24	72
	290 X 400 X 96	5	60			30	90
	290 X 400 X 112	6	72			36	108
	290 X 400 X 128	7	84	62.6	187.9	42	126
	290 X 400 X 144	8	96			48	144
	290 X 400 X 160	9	108			54	162
	290 X 400 X 176	10	120			60	180
1350	330 X 450 X 96	5	60			30	90
	330 X 450 X 112	6	72			36	108
	330 X 450 X 128	7	84	80.2	240.6	42	126
	330 X 450 X 144	8	96			48	144
	330 X 450 X 160	9	108			54	162
	330 X 450 X 176	10	120			60	180
1750	350 X 550 X 112	6	72			36	108
	350 X 550 X 128	7	84			42	126
	350 X 550 X 144	8	96			48	144
	350 X 550 X 160	9	108	104.0	311.9	54	162
	350 X 550 X 176	10	120			60	180
	350 X 550 X 192	11	132			66	198
	350 X 550 X 208	12	144			72	216
2000	400 X 550 X 144	8	96			48	144
	400 X 550 X 160	9	108			54	162
	400 X 550 X 176	10	120	118.8	356.4	60	180
	400 X 550 X 192	11	132			66	198
	400 X 550 X 208	12	144			72	216
2500	450 X 600 X 116	5	80			40	120
	450 X 600 X 136	6	96			48	144
	450 X 600 X 156	7	112	145.8	437.4	56	168
	450 X 600 X 176	8	128			64	192
	450 X 600 X 196	9	144			72	216
	450 X 600 X 216	10	160			80	240
3000	450 X 700 X 126	5	80			40	120
	450 X 700 X 147	6	96			48	144
	450 X 700 X 168	7	112	170.1	510.3	56	168
	450 X 700 X 189	8	128			64	192
	450 X 700 X 210	9	144			72	216

* For special designs, please contact our Engineering Department.

Pot Bearing

Definition

UNISON *e***TECH** POT bearings are designed and manufactured according to well-known international standards as BS5400, AASHTO or EN1337-5.

These bearings are suitable for high loads, displacements and rotations.

They are conformed by an elastomeric pad placed into a metallic pot, so as by means of a piston it is confined, bearing pressures near 30 N/mm2 and rotations up to 0,03 rad, depending on the design standard. Combined with other sliding elements, movement capacity can be provided in one or both directions.

Standard **UNISON** *e***TECH** POT bearings are totally detachable, which makes it easy to dismantle in case that any element must be replaced.

However, based on the structure where bearings will be installed, they can be designed to achieve the best performance. **UNISON** *e***TECH** POT bearings are split into three main types consist of fixed, guided and free.

Product Features

Rotation
All bearings can rotate at least 0.01 radians about any horizontal axis.

Movement
Total increments of movement 50mm total can be supplied. The top plate dimensions and the top fixing centers should be increased accordingly International-standards

CE Marking
UNISON *e***TECH** pot bearings designed in accordance with standard EN 1337-5.
UNISON *e***TECH** also designs and manufactures bearings according to other applicable well known and widely used technical specifications such as AASHTO or BS.

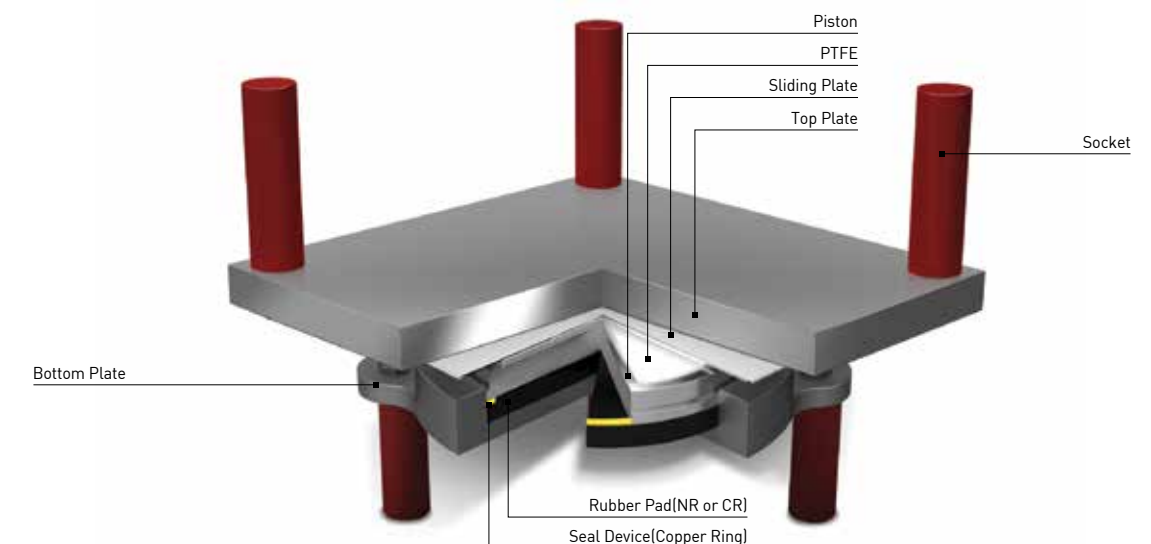| Fixed	Guided	Free
Fixed bearing use to support vertical load and transmit all horizontal loads to substructure, provides multi-rotational capability and prevents movement in all directions.	Guided sliding bearing use to support vertical load and transmit either longitudinal or Transverse horizontal load to substructure, provide multi-rotational capability and allow movement in one direction while resisting movement in perpendicular direction.	Free sliding bearing use to support vertical loads, provide multi-rotational capability and allows movement in all directions

POT Mechanism Details

Piston
PTFE
Sliding Plate
Top Plate
Socket
Bottom Plate
Rubber Pad(NR or CR)
Seal Device(Copper Ring)

Piston & Rubber Pad
POT bearing delivers the loads through thick Piston and Rubber plate. Thus, vertical loads will be distributed uniformly, and piston can rotate of min. 0.01 radian on the horizontal axis.
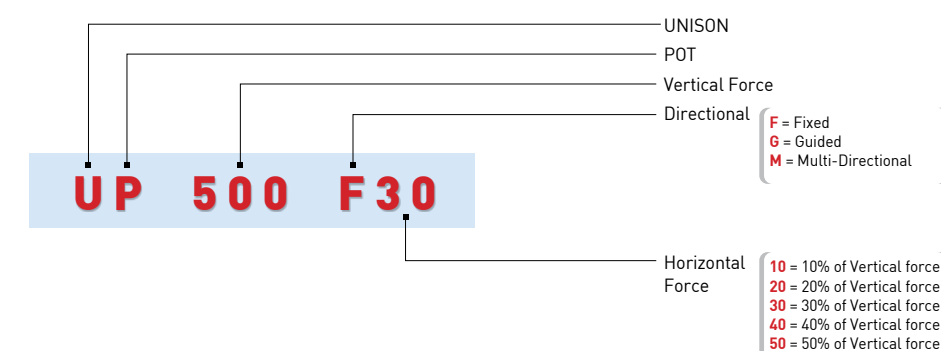
PTFE & Sliding Plate
Absorbs displacements at normal times, and reduces frictions during earthquake. With lubricating reactions by special grease between sliding plate(mirror surface stainless steel) and PTFE sliding performance is achieved, and horizontal force from one directional pot to the top plate will be delivered to the piston and bottom plate by guide of piston.
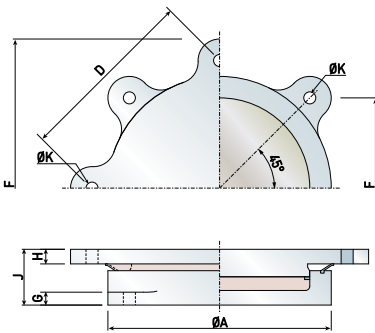
Top & Bottom Plate
Protects the main body of bearing and limits the movement

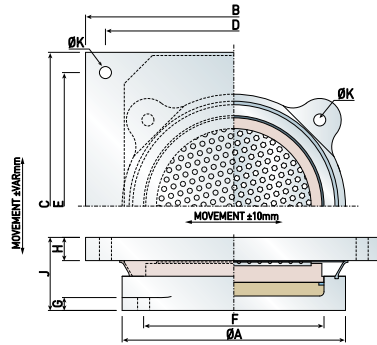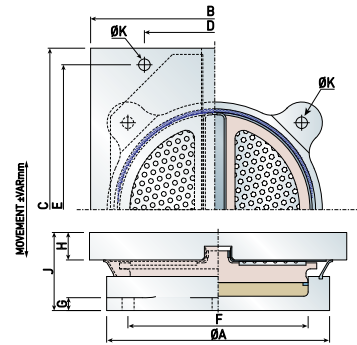### Classifications of POT Bearing are as follows

UNISON
POT
Vertical Force
Directional

F = Fixed
G = Guided
M = Multi-Directional

U P   5 0 0   F 3 0

Horizontal Force

10 = 10% of Vertical force
20 = 20% of Vertical force
30 = 30% of Vertical force
40 = 40% of Vertical force
50 = 50% of Vertical force

Pot Bearing

Fixed POT Bearing	Free POT Bearing	Guided POT Bearing

Fixed

Model	Vertical Load (kN)	Horizontal Force (kN)		Rotation (rad.)	Dimension (mm)							Weight (kgf)
		SLS	ULS		A	D	F	G	H	J	K	
UP 500	500	50	70	0.015	190	160	160	17	18	59	14	12
F20		100	140	0.015	200	170	170	17	18	59	14	13
F30		150	200	0.014	210	180	180	20	22	64	18	18
F40		200	260	0.014	220	190	190	20	20	67	18	20
F50		250	330	0.018	260	220	220	20	24	71	22	28
UP 750	750	70	100	0.013	220	180	180	17	18	59	14	16
F20		150	200	0.015	240	200	200	20	22	68	18	24
F30		230	300	0.018	250	210	200	20	20	67	18	25
F40		300	390	0.018	260	220	220	20	22	69	22	29
F50		380	490	0.02	320	270	270	25	25	78	26	49
UP1000	1000	100	130	0.01	260	210	210	20	17	64	14	23
F20		200	260	0.019	280	230	230	20	20	67	18	30
F30		300	390	0.02	290	240	240	20	23	75	22	37
F40		400	520	0.02	300	260	250	25	26	78	26	44
F50		500	650	0.015	330	280	280	30	34	87	32	62
UP5000	5000	460	600	0.01	570	430	420	20	21	105	14	170
F20		920	1200	0.01	600	490	480	40	42	131	38	269
F30		1500	1950	0.015	640	520	520	45	48	154	44	371
F40		2000	2600	0.015	660	550	550	50	54	160	50	429
F50		2500	3250	0.015	730	620	620	60	60	167	58	555
UP30000	10000	840	1090	0.012	800	600	600	25	29	145	22	461
F20		1680	2180	0.012	830	660	660	45	45	166	44	619
F30		3000	3900	0.016	890	730	730	60	61	209	58	965
F40*		4000	5200	0.016	930	760	760	60	64	218	58	1097
F50*		5000	6500	0.014	1040	850	840	65	69	218	66	1368

* For special designs, please contact our Engineering Department.
Note) UNISON e-TECH produce up to 52000kN of pot bearing.

Free

Model	Vertical Load (kN)	Rotation (rad.)	Displacement (mm)		Dimension (mm)										Weight (kgf)
			Longitudal	Transverse	A	B	C	D	E	F	G	H	J	K	
UP500M	500	0.015	±50	±10	180	250	310	190	270	150	20	22	70	14	20
UP750M	750	0.015	±50	±10	220	280	340	220	300	170	20	22	75	14	28
UP1000M	1000	0.014	±50	±10	260	320	370	250	330	200	25	27	85	14	42
UP5000M	5000	0.014	±50	±10	570	590	680	530	640	410	50	37	126	14	244
UP5500M	5500	0.018	±50	±10	600	620	710	560	670	430	50	37	136	14	284
UP6000M	6000	0.013	±50	±10	620	640	730	580	690	450	20	37	136	14	302
UP10000M	10000	0.01	±50	±10	800	800	910	740	850	600	60	42	160	22	572

* For special designs, please contact our Engineering Department.
Note) UNISON e-TECH produce up to 52000kN of pot bearing.

Guided

Model	Vertical Load (kN)	Horizontal Force (kN)		Rotation (rad.)	Displacement (mm)	Dimension (mm)										Weight (kgf)
		SLS	ULS			A	B	C	D	E	F	G	H	J	K	
UP 500	500	50	70	0.015	±50	190	240	340	120	300	160	17	32	86	14	30
G20		100	140	0.015		200	250	360	130	320	170	17	32	86	14	33
G30		150	200	0.014		210	280	400	130	350	180	20	32	96	18	44
G40		200	260	0.014		220	300	410	150	360	180	20	37	112	18	58
G50		250	330	0.018		260	320	450	160	390	220	20	37	105	22	66
UP 750	750	70	100	0.013	±50	220	260	370	140	330	180	17	32	86	14	37
G20		150	200	0.015		240	280	390	150	340	200	20	32	90	18	44
G30		230	300	0.018		250	310	430	150	380	200	20	37	106	18	61
G40		300	390	0.018		260	330	470	170	410	220	20	42	119	22	83
G50		380	490	0.02		300	360	530	170	460	250	25	42	121	26	101
UP1000	1000	100	130	0.01	±50	260	300	390	170	350	210	20	32	91	14	47
G20		200	260	0.019		280	320	410	180	360	230	20	37	98	18	60
G30		300	390	0.02		290	340	480	180	420	240	20	42	113	22	84
G40		400	520	0.02		300	360	530	170	460	250	25	42	120	26	101
G50		500	650	0.015		330	390	590	180	510	280	30	47	127	32	132
UP5000	5000	460	600	0.01	±50	570	610	680	380	640	420	20	37	129	14	252
G20		920	1200	0.01		600	640	780	350	680	480	40	52	148	38	372
G30		1500	1950	0.015		640	680	920	370	810	520	45	64	185	44	565
G40		2000	2600	0.015		660	700	970	380	850	550	50	79	220	50	739
G50		2500	3250	0.015		730	770	1090	420	950	620	60	84	227	58	951
UP10000	10000	840	1090	0.012	±50	800	840	910	540	850	600	25	42	166	22	607
G20		1680	2180	0.012		830	870	970	510	860	660	45	57	186	44	807
G30		3000	3900	0.016		890	930	1210	530	1070	730	60	84	247	58	1403
G40*		4000	5200	0.016		930	970	1190	590	1050	760	60	99	291	58	1735
G50*		5000	6500	0.014		1040	1080	1340	640	1180	840	65	114	304	66	2311

* For special designs, please contact our Engineering Department.
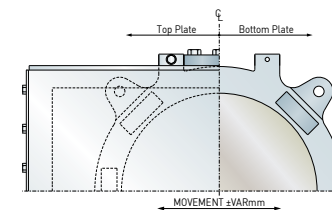Note) UNISON e-TECH produce up to 52000kN of pot bearing.

I.L.M POT Bearing

Incremental Launching Method(I.L.M) is a combination of the in-site construction and the precast construction. Structure system is changing by construction steps. Because Superstructure is pressed out of cantilever type of construction. Each construction step need revision of structure system on stress condition.
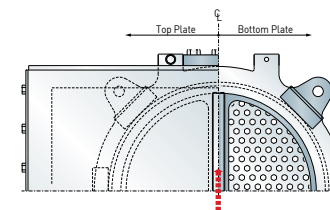
At the beginning of I.L.M, Single segment length is 6~10m, but these days, length is 20~30m for reducing the duration. So It's very important to irremovableness of the bearing during pressing out the segment by the end of the segment.

UNISON eTECH develops and supply I.L.M POT for pressing out the end of the segment until final abutment.
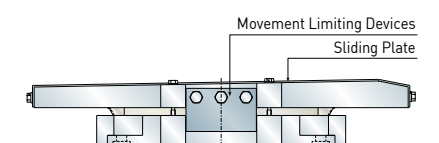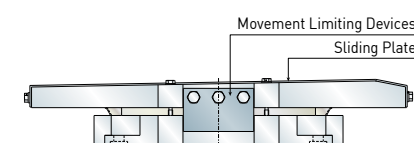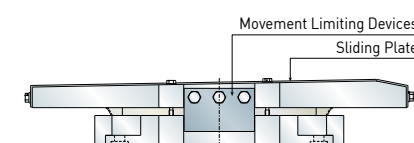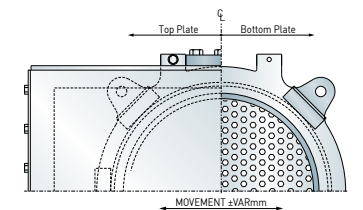
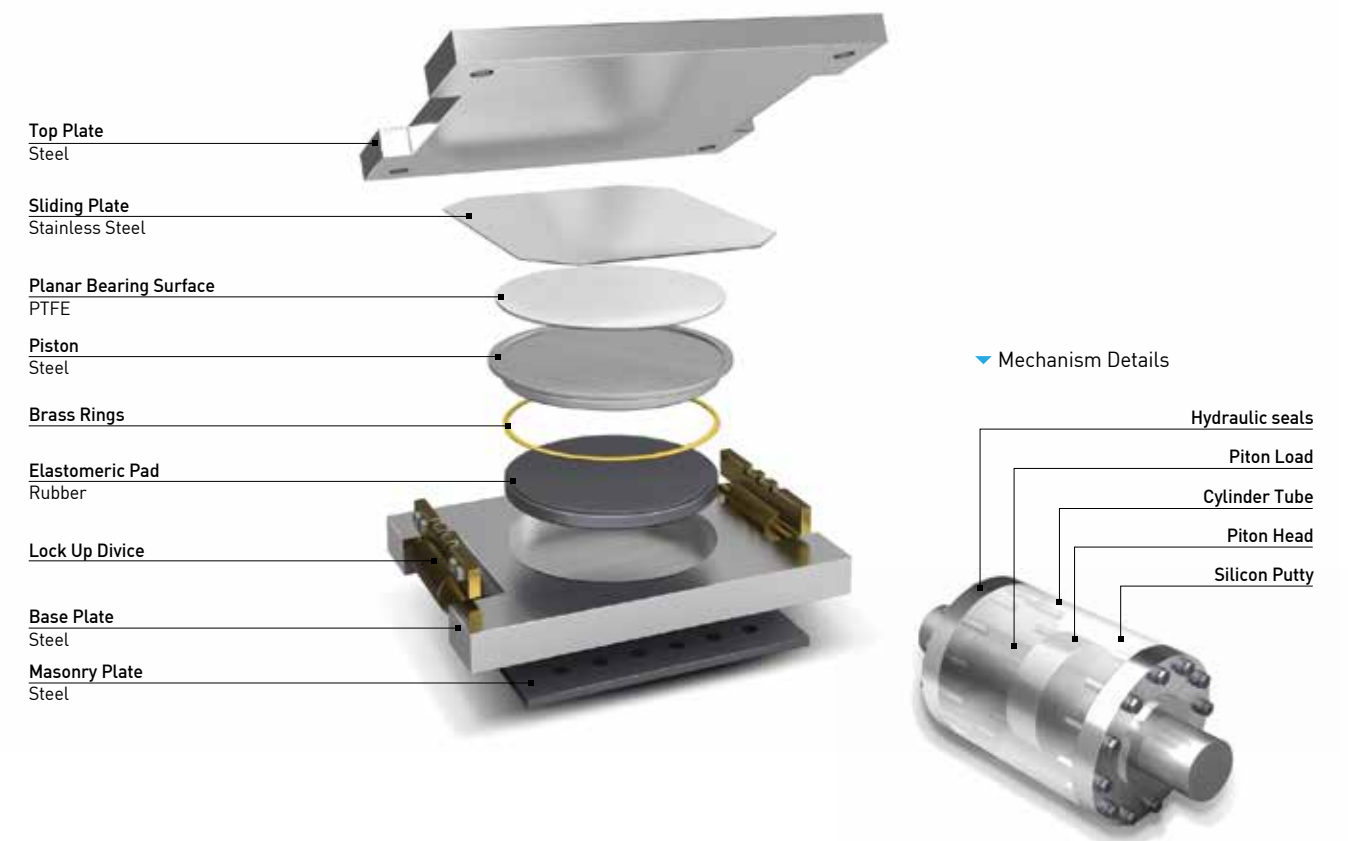| Fixed I.L.M POT Bearing	Guided I.L.M POT Bearing	Free I.L.M POT Bearing

Seismic Pot Bearing(SPB)

Definition

A device that integrates impact load dispersion unit(LUD) into bridge seat unit. At normal times, it safely delivers load and strain of superstructure to substructure and, at the time of application of excessive horizontal force like earthquake or sudden braking of railway vehicles, LUD operates to safely disperse the excessive horizontal force to each bridge seat.

Product Features

• Pot bearing completely controls vertical load.
• Transportation at normal times is the same as pot bearing.
• LUD operates to play a role of fixed end when impact load (earthquake, sudden braking) is applied.
• Suitable for small & medium size bridges
• Detail designs, please contact our Engineering Department.

SPB Mechanism Details

Top Plate
Steel

Sliding Plate
Stainless Steel

Planar Bearing Surface
PTFE

Piston
Steel

Brass Rings

Elastomeric Pad
Rubber

Lock Up Divice

Base Plate
Steel

Masonry Plate
Steel

▼ Mechanism Details

Hydraulic seals
Piton Load
Cylinder Tube
Piton Head
Silicon Putty

Design

Elastomer
The average maximum bearing pressure applied on the confined elastomer at serviceability limit states ranges from 25 MPa to 46 MPa, depending on the design code.

PTFE
The coefficient of friction between the polished stainless steel sheet and the confined PTFE disc at design load is less than 0.03.

DU guide strips
DU guide strips are designed for a maximum pressure of 120 MPa/200 Mpa.(At permanent and variable horizontal loads.)

Rotation
Standard bearings are designed for a minimum rotation of 0.01 radian

Movement
Standard bearings are designed for a minimum movement capacity of ±10mm. Additional movement of the structure must be added to the dimensions of the sliding plate.

Lock Up Device(LUD)

Definition

A device that integrates impact load dispersion unit(LUD) into bridge seat unit. At normal times, it safely delivers load and strain of superstructure to substructure and, at the time of application of excessive horizontal force like earthquake or sudden braking of railway vehicles, LUD operates to safely disperse the excessive horizontal force to each bridge seat.
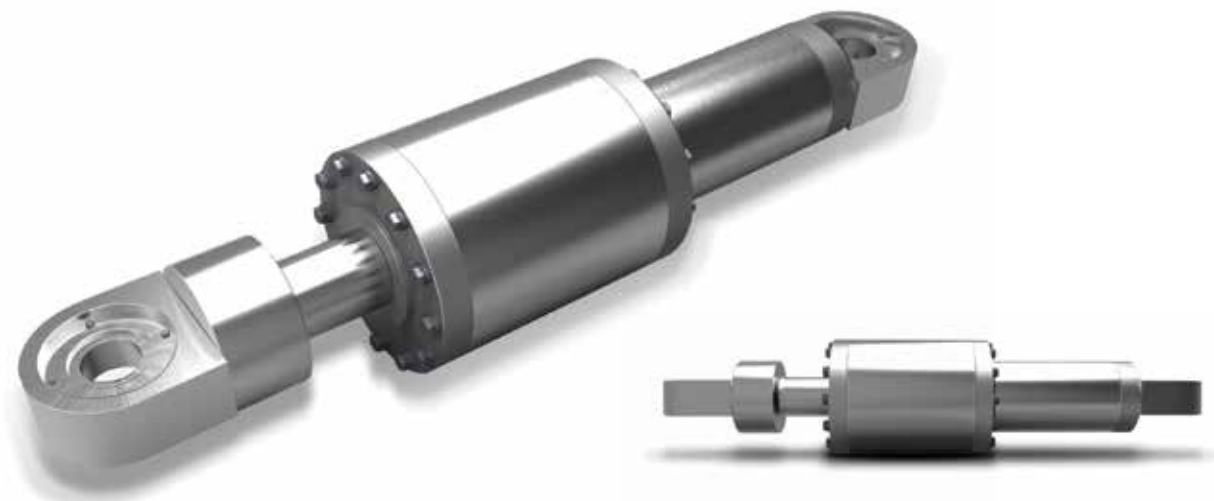
Product Features

A Lock-Up Device is a sample device which provides the engineer a method of temporarily creating a fixed connection, when desirable, which would remain as a movable connecting during normal operation remain as a movable connection.

It is simple, maintenance-free and comparatively inexpensive design which doesn't involve no valves, springs, compensating devices, and by pass channels pressure limiters.

It is particularly relevant in meeting the challenges of designing new earthquake-resistant bridges and in the strengthening of existing structures by inducing beneficial load-sharing in a bridge's substructure.

This unit is connected to either side of adjoining structure or between elements or structures. Upon a sudden shock(dynamic) load the device locks up and transmits the load through the structure.

In effect the device creates a rigid link within a fraction of a second when the sudden load is applied, affording the possibility of sharing the load throughout the structure.

LUD Mechanism Details

Cylinder, Chamber1, Piston Head, Piston Rod, Chamber2, Fixing end Clevis, Moving end Clevis
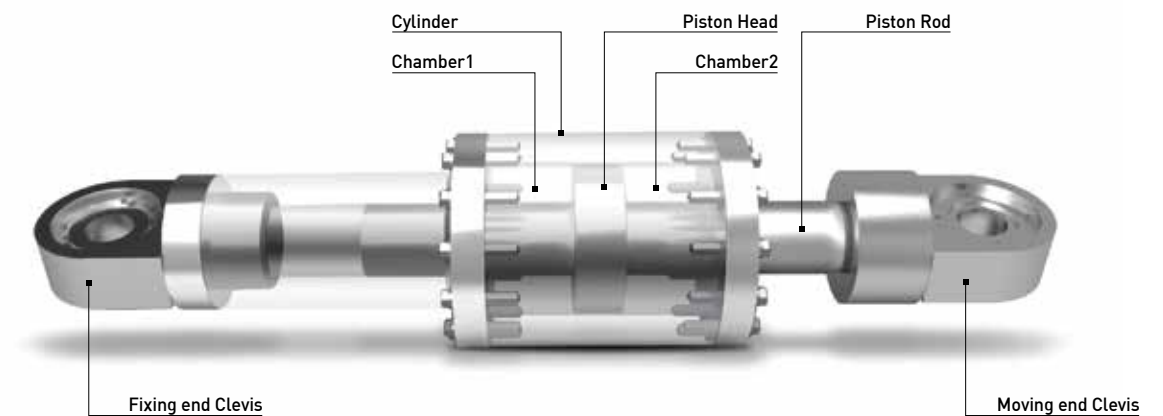
Piston Rod
This component is subjected to the compressive and tensile stress due to the external loads. So, it's checked that the compressible and tensile stress of the section are enough to transmit the Earthquake load.

Piston Head
The capacity of the piston head's thread is checked as followed

Cylinder
It is a thin-walled cylinder that the resistance capacity of the tangential stress in cylinder wall and the tensile stress in the section of the cylinder is estimated.

Moving End Clevis
The resistance capacity of the Moving End Clevis(MEC) to the applied load shall be checked on the shear stress of the threads and the connected part to the pin, and the tensile stress of the MEC's cap.

Fixing End Clevis
The resistance capacity of the Fixing End Flange(FEF) and Clevis(FEC) of the applied load shall be checked on the tensile stresses of the FEF's and the FEC's section.

Lock Up Device(LUD)

Silicon putty

The outer shape of LUD is identical with general hydraulic cylinder which is composed of cylinder, piston and inner filler but the inner filler of LUD is a special material (Silicon Putty) which is transformed by impact load (from fluid to elastic solid) and allows the low velocity displacement (under 0.01mm/sec) from temperature gradient of superstructure, creep and shrinkage with small reaction (smaller than 20% of nominal load) and restrains the movement by instant lock of Lock Up Device in case of impact load like earthquake.

▼ UNISON E TECH Lock Up Device

Hydraulic Seals   Silicon Putty
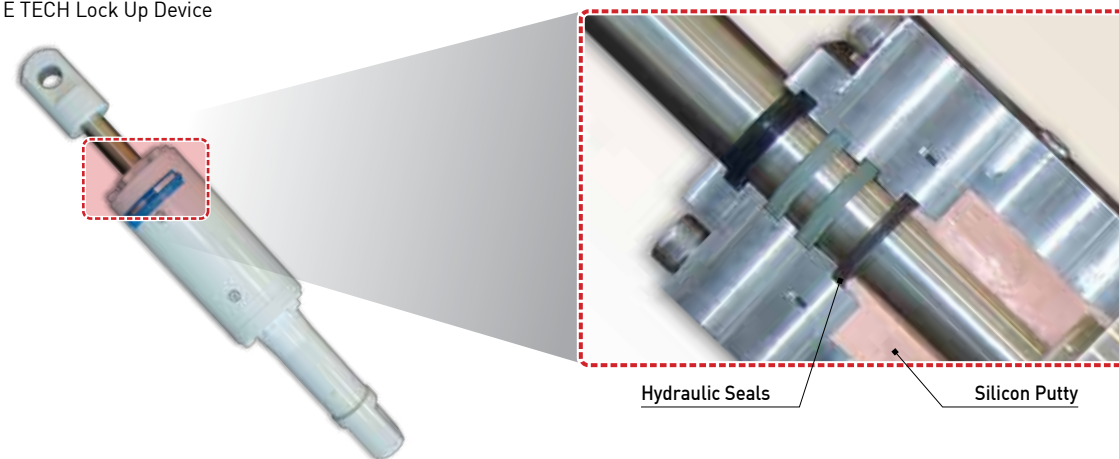
Design criteria

In order to design an the LUD, it is necessary to know the following:

• Rate of expansion and contraction during normal operation
• Total stroke(mm, in.) of the transmission rod through full range of
  normal movement
• Ultimate design force to be transmitted through the LUD
• Geometry of the surrounding application
• Design code that is applicable
• Preference in corrosion protection

LUD Applications

▼ Single span bridge

L   L   L   L

A   B   C ...   D   E

Fixed Bearing   Lock Up Device   Sliding Bearing
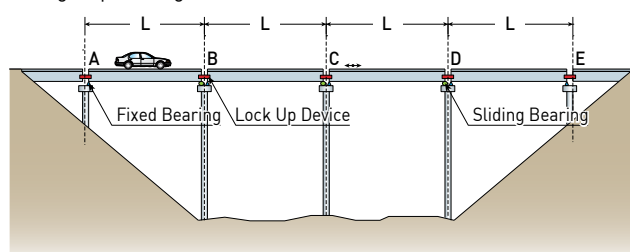
▼ Continuous girder bridge

Lock Up Device Fixed Bearing   Sliding Bearing
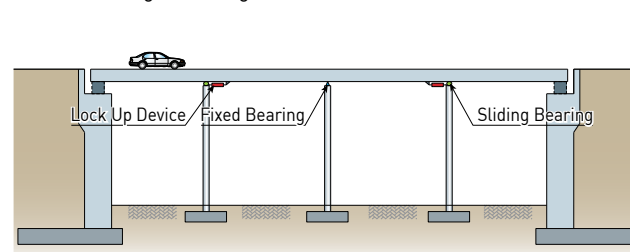
Testing

▲ Movement test

In service state, Lock-Up Device accommodates the movement from thermal load, creep and shrinkage, and in earthquake state, instant lock of Lock-Up Device leads to deformation of hysteretic bearing and dissipates the earthquake load to deformation and heat energy.
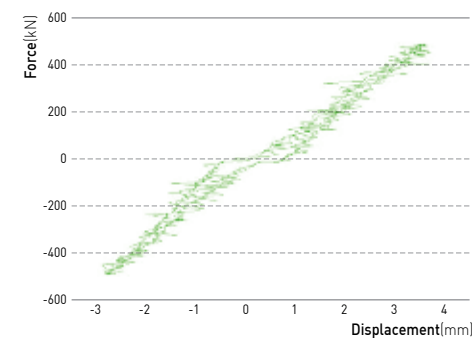
**Fast movement test**
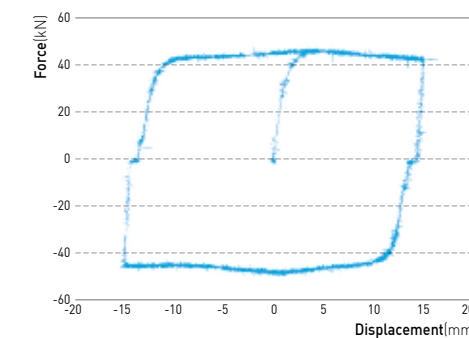
Slow movement test
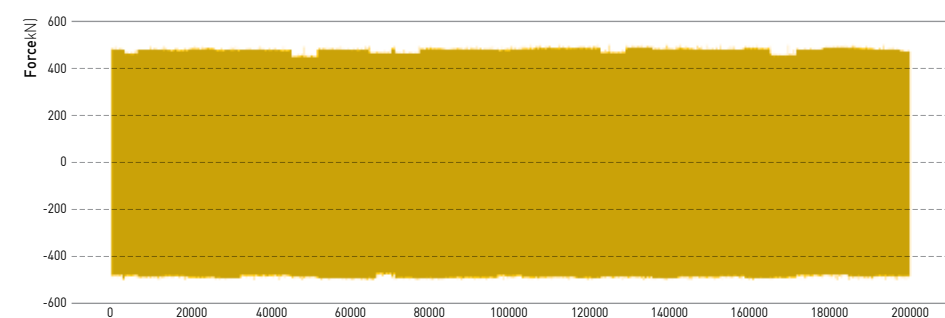
200,000 Cycles Full load test

Spherical Elastomeric Bearing(SEB)
Vibration Reduction Spherical Bearing

Definition

The SEB has cylindrical shape, which can help to carry more horizontal loads with high flexibility in rotational direction. The SEB consists of two parts which have hemispherical shapes on one face each. The curvature of hemispherical surface can be adjusted in the manufacturing stage, and also different curvatures can be made in different directions. The hemispherical surfaces allow the greater amount of multi axis rotation than plate surface. It has been observed that the rubber material usage can induce the restoring capacity for rotation of bearing. Therefore, laminated elastomer has a tendency to restore to initial state, when the spherical bearing is rotated or tilted.
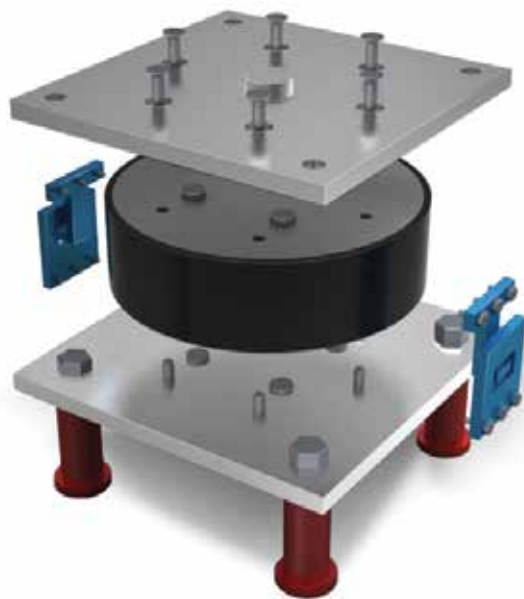
Product Features

Easy Design and Analysis
• Simple structure analysis is available.
• Outstaning allwable rotation angle (over 0.05rad).

Easy Maintenance
•Simple mechanism and high resistance to corrosion compared to conventional
  steel spherical bearing
• Additional steel guide is unnecessary for restraining the horizontal loads
• Anchor bolt connection for easy maintenances
• Fatigue/cyclic load resistance abilities is higher than conventional bearing
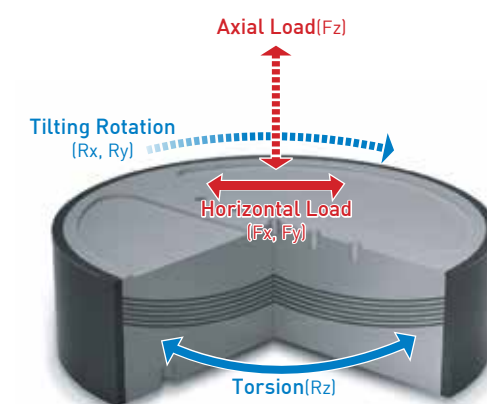
Bridge Vibration Reducing
• Laminated rubber layer provides vibration reduction induced from bridge deck
• Extra damping capacity provides improved seismic capacity for structure

Mechanism Details

Slide Plate & PTFE
One & All dir.

Shear Connection

Direction Guide

Upper Plate

Side Block
•Uplift Restraining
•Excessive Horizontal
  movement Limit

Lower Plate

Anchor

Spherical Elastomeric Bearing
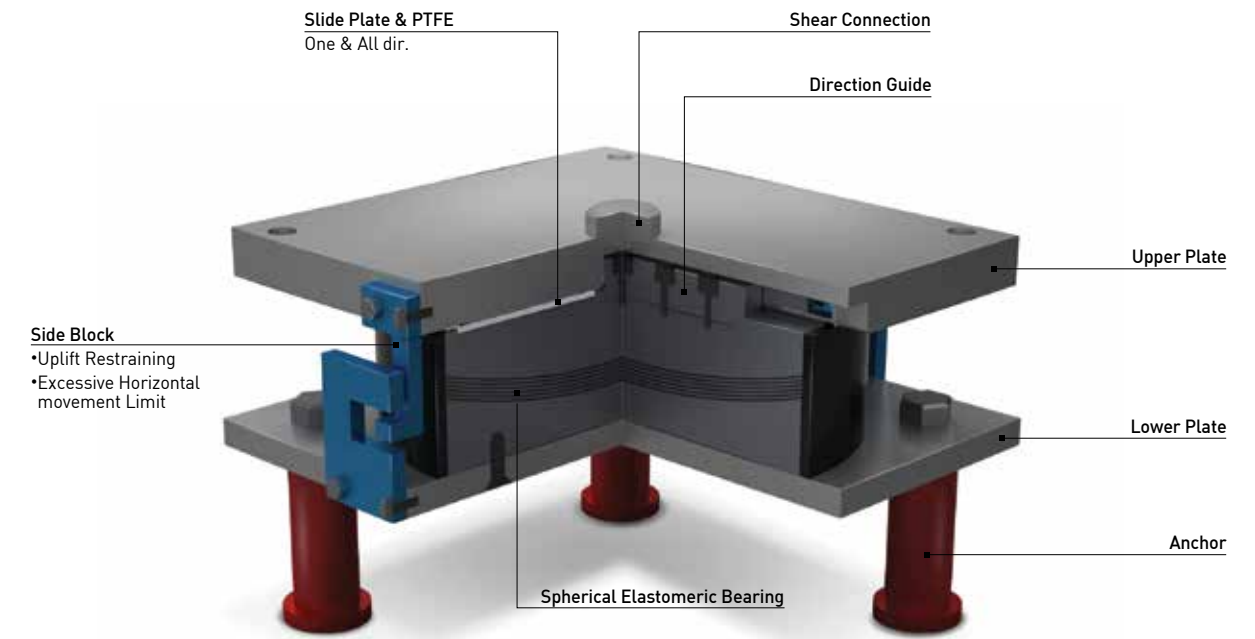
Vibration Reduction Spherical Bearing

• Excellent absorption of the noise and vibration according
  to the railway movement

• Withstanding the braking load by high horizontal stiffness

• Large-rotation capacity(over 0.05rad) is guaranteed.

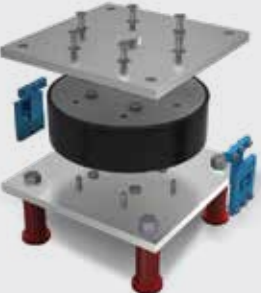• The uplift movement restraining devices are provided.

Axial Load(Fz)

Tilting Rotation
(Rx, Ry)

Horizontal Load
(Fx, Fy)

Torsion(Rz)

Spherical Elastomeric Bearing(SEB)
Vibration Reduction Spherical Bearing

Bearing Types

Fixed

- Suitable for any bridge type and superstructure
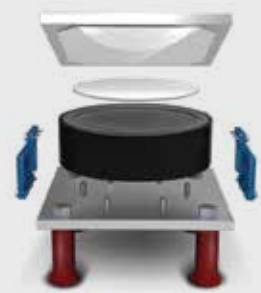- Horizontal stiffness can be altered by rubber layer shape factor design

Guided

- Transfer large one-direction horizontal load
- Simple mechanism and low height
- Easy repair and replacement, economical maintenance
- Large rotational capacity
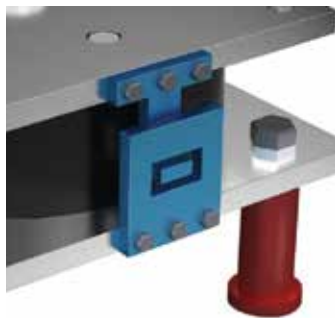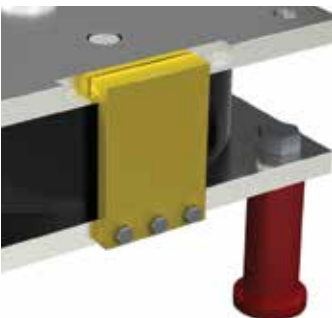- Uplift restraining devices applied

Free

- PTFE sliding plate installs for permitting all-direction movements
- Uplift restraining devices applied

Uplift Restraining Device

- Rotational motion is available by applying the advanced uplift device.
- Conventional Uplift restraining devices can be applied.

▲ Advanced Uplift Restraining Device

▲ Conventional Uplift Restraining Device

Testing

Real-scale vibration reducing TEST – Hysteresis (vs Spherical Steel Bearing)

REAL LOAD TEST

Classifica	Spherical Elastomeric Bearing				Spherical Steel Bearing			
Radian	0 rad		0.03rad		0 rad		0.03rad	
Frequency [Hz]	1 Hz	2 Hz	1 Hz	2 Hz	1 Hz	2 Hz	1 Hz	2 Hz
Max. displacement	0.43 mm	0.4mm	0.54mm	0.5mm	0.39mm	0.37mm	0.24mm	0.23mm
Damping ratio	9.70%	10.70%	7.50%	10%	6.10%	6.50%	4.10%	4.20%

Practical Application (Yun-Dong Bridge)

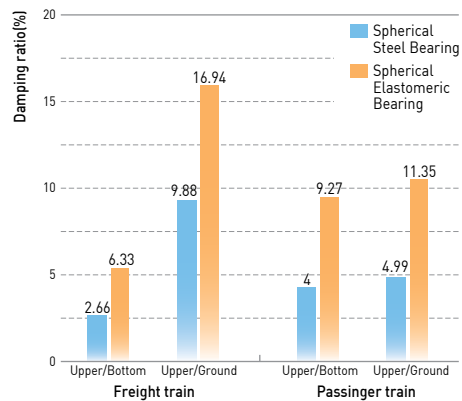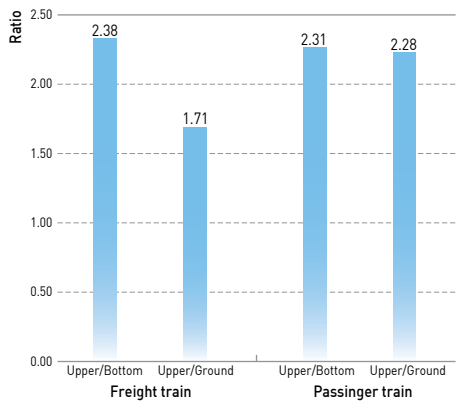▲ Work-Site Picture

▲ Work-Site Picture

Test Results

Acceleration damping characteristics

SEB/SSB Acceleration damping characteristics

Polyurethane Disc Bearing(PDB)

Definition

Disc Bearings have seen extensive use on railroad bridges as well as highway bridges. Railroad engineers favor the Disc Bearing due to the cushioning effect and durability of the polyurethane rotational element which is designed to handle the excessive live loads typical on railroads.
Disc Bearings meet the extensive requirements of railroad industry guidelines.

Product Features

Simple Structures

• Vertical load and rotation of the restraint device that does not require a separate disc is a simple form to accommodate.

Easy to maintain

• A simple visual inspection of damage in the form of a structure that is easy to identify.

Stability

• Evenly distribute the load of the loading Polyurethane Disc can have the flexibility to have a load carrying structure.
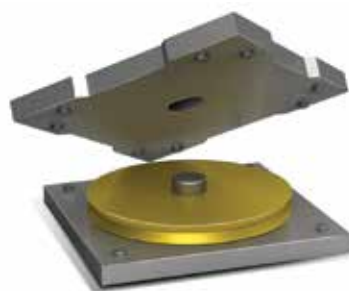
Advantages of Polyurethane Disc

• Design-temperature : -70°C ~ 120°C
• Percentage of live load can be applied to a large railway bridge.
• Excellent resistance to sea water.

Applicability
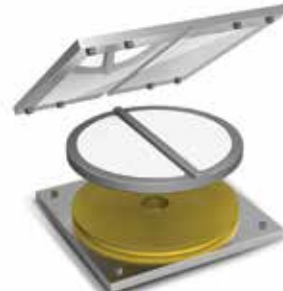
• Rotation capacity : 0.03rad
• Shear Keys is easy to design horizontal load resistance.
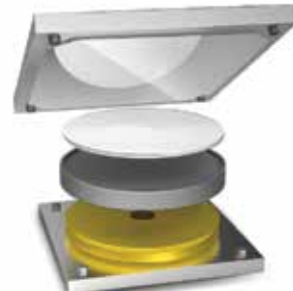• Allowable bearing stress capacity is 35MPa.

Fixed	Guided	Free

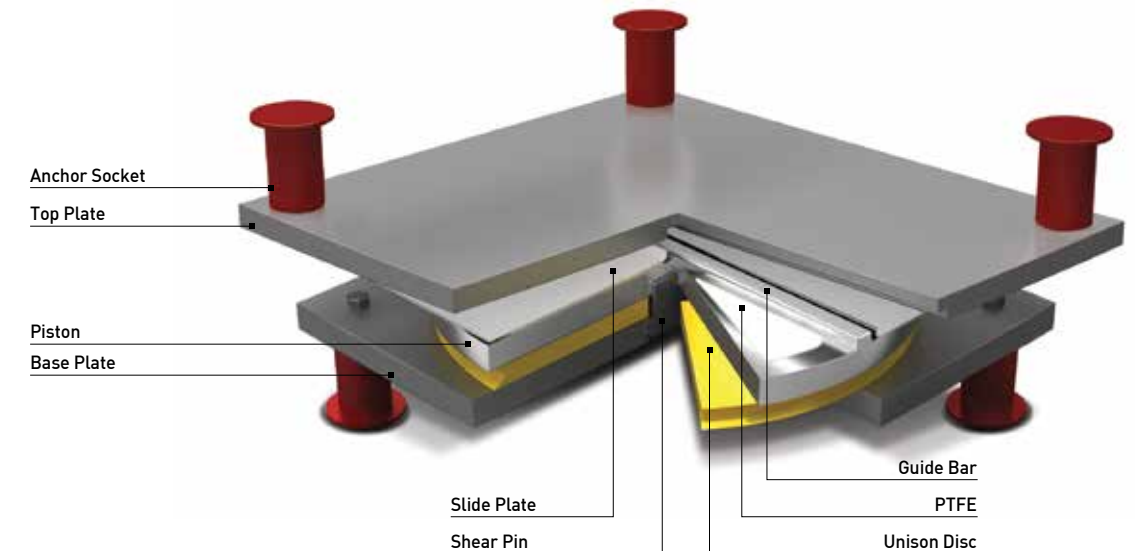Fixed bearings allow rotation in any direction and prevent lateral displacement.

Unidirectional bearings allow rotation in any directional and displacement in a single direction.

Multidirectional bearings allow rotation and displacement in any direction.

Mechanism Details

Anchor Socket
Top Plate
Piston
Base Plate
Slide Plate
Shear Pin
Guide Bar
PTFE
Unison Disc

PTFE

Its friction coefficient of 0.03 to 0.10 indicates sliding capability enough for accommodating movement quantity according to temperature expansion of bridge superstructures. This is capability shown in most of bearing supports using fluoro resin plate and stainless plate.

Guide Bar

This is a device limiting moving direction of bridge superstructures, i.e., operation in bridge axis direction or operation in direction perpendicular to bridge axis. Steel materials to it is applied.

Polyurethane Disc

A device supporting bridge superstructure load and accommodating rotative strain. Allowable bearing stress is 35MPa, about 2.5 times larger than that of general elastomeric bearing for bridges. Also, it keeps good endurance period based on its strong resistance against various environmental influence like chemical materials, corrosion and ozone. Most of polyurethane discs is similar to common term of bridge and so there is almost no repair or replacement of bridge bearing support. The size of bearing can be smaller than POT bearing.

Shear Pin

A device that delivers load of horizontal direction, a pin of high strength special material. Inserted into middle plate of disc support in screw bolt type, it reinforced convenience and structural stability at the time of maintenance and replacement of bearing support. Section is so decided as to sufficiently resist shearing force considered at the time of disc support design and the same section resists shearing for all directions.
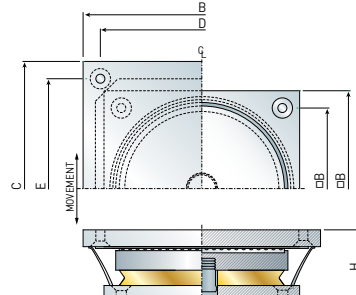
Polyurethane Disc Bearing(PDB)

Fixed
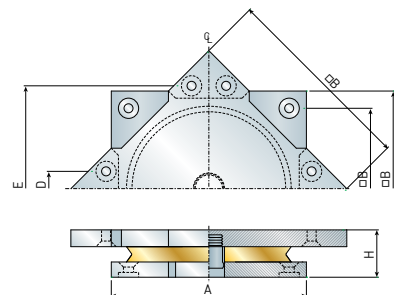
Guided
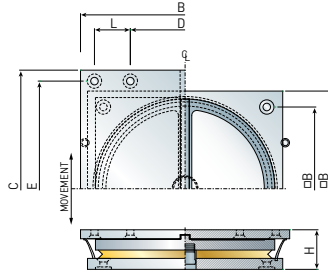
Free

Fixed

Type	Vertical Load (kN)	Horizontal Load (kN)		Rotation (rad.)	Dimension (mm)						Weight (kgf)
		SLS	ULS		A	B	D	E	F	H	
UFD 500 F20	500	60	100	0.02	210	210	30	215	160	48	20
UFD 750 F20	750	90	150	0.02	240	240	35	250	180	49	26
UFD 1000 F20	1000	120	200	0.02	270	270	40	280	200	56	33
UFD 1350 F20	1350	160	270	0.02	300	310	40	320	230	64	46
UFD 1500 F20	1500	180	300	0.02	310	320	50	330	240	65	51
UFD 2000 F20	2000	240	400	0.02	350	360	50	370	270	71	68
UFD 22500 F20	22500	2700	4500	0.02	1200	1240	180	1295	960	193	1841
UFD 25000 F20	25000	3000	5000	0.02	1260	1300	190	1355	980	213	2170
UFD 30000 F20	30000	3600	6000	0.02	1360	1400	200	1470	1100	236	2810

Guided

Type	Vertical Load (kN)	Horizontal Load (kN)		Rotation (rad.)	Displacement (mm)	Dimension (mm)								Weight (kgf)
		SLS	ULS			A	B	C	D	E	F	L	H	
UGD 500 G30	500	90	150	0.02	±50	240	300	380	140	340	180	50	83	47
UGD 750 G30	750	140	230	0.02	±50	260	330	420	175	380	200	50	94	64
UGD 1000 G30	1000	180	300	0.02	±50	305	370	460	170	410	240	60	100	84
UGD 1350 G30	1350	250	410	0.02	±50	320	390	490	200	440	250	60	110	106
UGD 1500 G30	1500	270	450	0.02	±50	350	410	530	170	470	270	80	117	130
UGD 2000 G30	2000	360	600	0.02	±50	390	460	580	170	510	300	100	127	170
UGD 9000 G30	9000	1620	2700	0.02	±50	780	850	1030	340	900	600	170	227	1053
UGD 9500 G30	9500	1710	2850	0.02	±50	790	860	1070	350	930	610	160	229	1124
UGD 10000 G30	10000	1800	3000	0.02	±50	800	880	1050	380	920	630	155	235	1159

* For special designs, please contact our Engineering Department.

Free

Type	Vertical Load (kN)	Rotation (rad.)	Displacement		Dimension (mm)							Weight (kgf)
			Longi.	Trans.	A	B	C	D	E	F	H	
UMD 500 M	500	0.02	±50	±10	220	280	310	230	260	170	71	29
UMD 750 M	750	0.02	±50	±10	245	305	335	250	280	190	72	34
UMD 1000 M	1000	0.02	±50	±10	260	325	355	275	300	210	73	38
UMD 1350 M	1350	0.02	±50	±10	290	360	390	300	335	230	76	47
UMD 1500 M	1500	0.02	±50	±10	310	370	400	310	345	250	76	51
UMD 2000 M	2000	0.02	±50	±10	350	410	440	350	380	280	81	69
UMD 26000 M	26000	0.02	±50	±10	1220	1320	1450	1120	1310	1020	219	1946
UMD 28000 M	28000	0.02	±50	±10	1280	1360	1570	1140	1400	1070	224	2172
UMD 30000 M	30000	0.02	±50	±10	1330	1420	1620	1200	1450	1120	241	2544

Test

VERTICAL LOAD TEST

Classification Spec.	Load (kN)	Displacement (Max) (mm)	Displacement (Residual) (mm)	Standard of Permission (mm)	Result
8,000kN	8,000kN	2.31	0.18	3.5	O.K
10,000kN	10,000kN	2.39	0.28	4	O.K
16,000kN	16,000kN	2.01	0.2	4.8	O.K
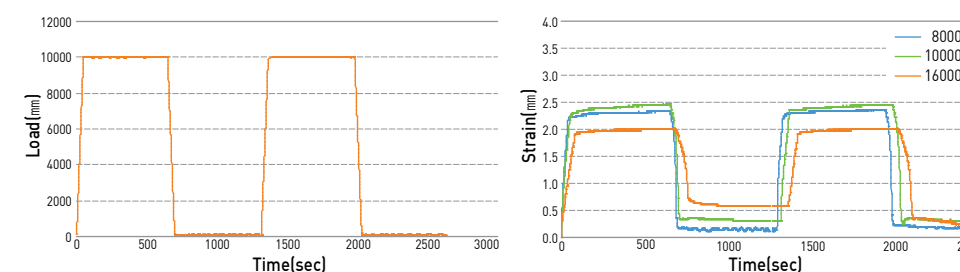
Load – Time

Strain – Time

CREEP TEST

Classification Spec.	Creep (mm)		Standard of Permission (mm)	Creep of Permission (mm)	Result
	MAX	Δcreep			
8,000kN	2.453	0.194	3.5	2.8	O.K
10,000kN	2.531	0.216	4	3.2	O.K
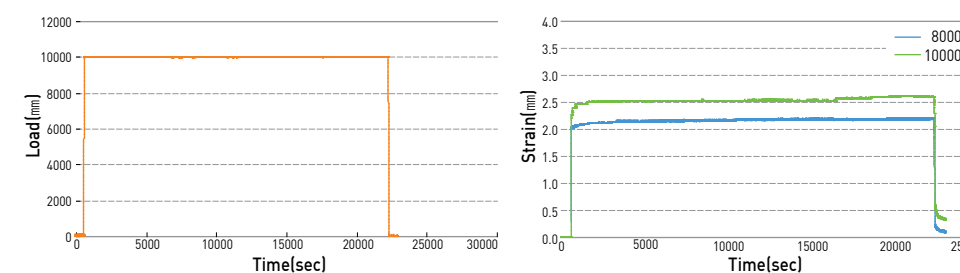
Load – Time

Strain – Time
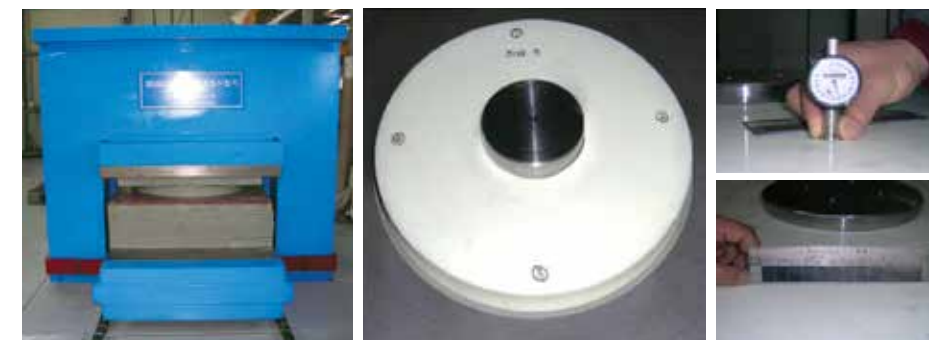
▲ Vertical Test Machine(30,000kN)   ▲ Specimen(10,000kN)   ▲ Inspection

Lead Rubber Bearing(LRB)

Definition

Lead Rubber Bearing absorbs earthquake energies with Lead Core to reduce the damage, and it is displaced by long term loads and be resisted against short term loads, to maintenance is not necessary.

▲ Circular Type

▲ Rectangular Type

Product Features

Lead Rubber Bearing(LRB) is rubber bearing - made up of alternate layers of steel laminate and hot - vulcanized rubber - with a cilindrical central lead core.

Thanks to the high energy dissipation capacity, it is possible to reduce the horizontal displacement, in comparison with that of an isolation system with the same equivalent stiffness but lower energy dissipation capacity.

LRB is designed for maximum displacement, from 70%(at ordinary times) of product's height, 200%(at earthquake times) of product's height.

Nonlinear feature of pier and LRB

Concrete Pier

LRB
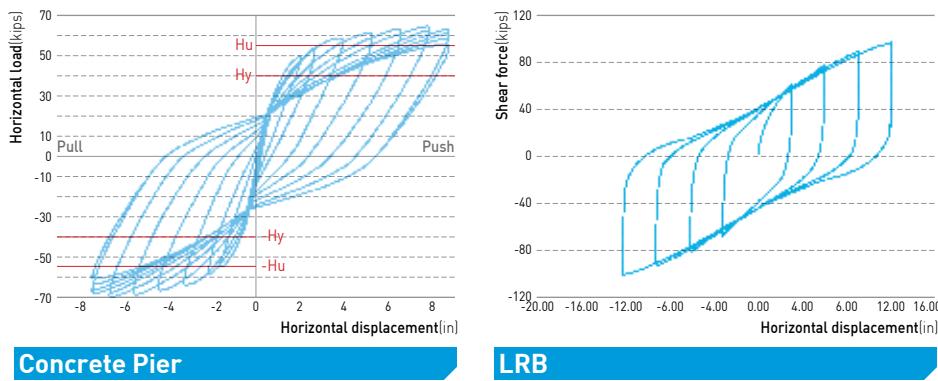
Lead Rubber Bearing Details

▲ Circular Type

▲ Rectangular Type
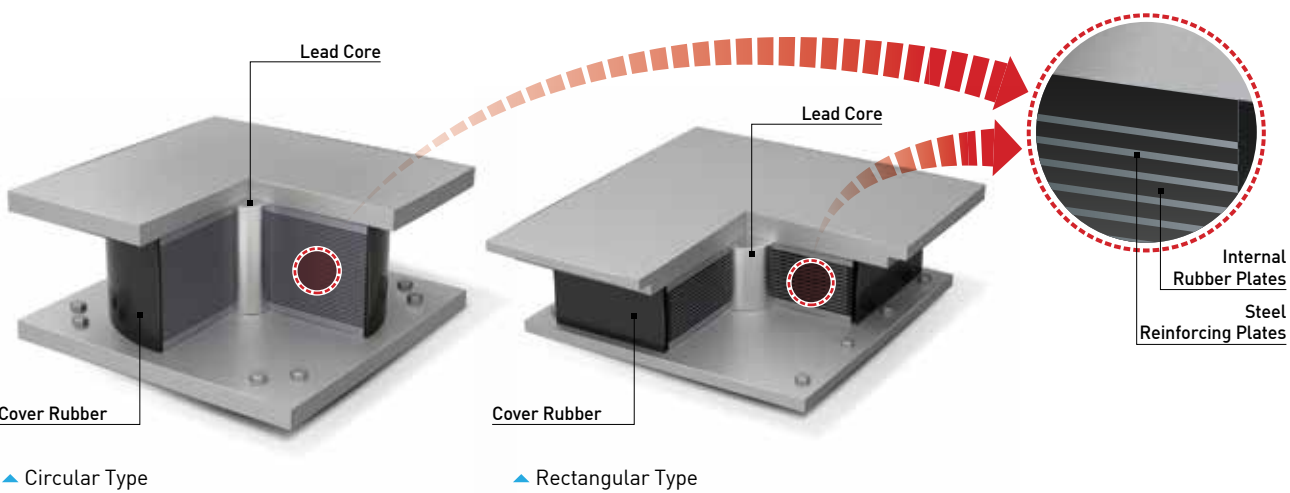
Lead Core

The excellent damping characteristics and durability of the used high purity lead by many varied testing methods.

Steel Reinforcing Plates and Internal Rubber Layers

The durability of natural rubber has been proven by various kinds of testing for tensile strength, rigidity, creep, aging and fatigue.

Cover Rubber

LRB is protected from harmful things by cover rubber.

PHYSICAL PROPERTIES OF RUBBER

Test Item		Unit	Rubber	
Hardness		Hs	55 ± 5	
Shear Elastic Modulus Factor G		MPa	0.7±0.1	0.7±0.1
Splitting Tensile Elongation		%	≥550	
Tensile Strength		MPa	≥15	
Aging Durability	25% Elongation Variation Rate	%	≥-25(70°Cx70h)	
	Elongation Rate	%	≥-25(70°C x 70h)	
Permanent Deformation by Compression		%	≤25(70°C x 22h)	
Ozone Aging		-	No Cracks (25pphm, 20%, 38°C x 48h)	
Cold Durability		-	≤-40	
Peel Strength Of Rubber from Metal		KN/m	≥6.9	

ELEMENTS OF LEAD

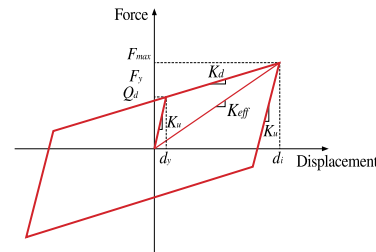| Element	Pb	Ag	Cu	As	Sb+Sn	Zn	Fe	Bi
Standard	99.99	≤0.002	≤0.002	≤0.002	≤0.005	≤0.002	≤0.002	≤0.002

Lead Rubber Bearing(LRB)

Standard Diagram of
Spherical Lead Rubber Bearing for Bridge
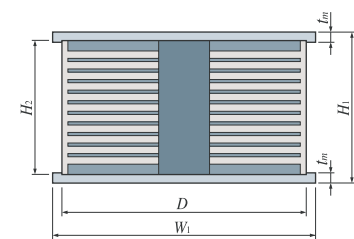
▲ LRB Section View

▲ Force Displacement Hysteresis Curve

D : LRB Diameter
W_1 : Width of steel plate for connecting
H_1 : Total Height of LRB
H_2 : Height of LRB
Q_d : Characteristic force
F_y : Yield force
F_{max} : Maximum strength
K_v : Vertical stiffness
K_u : Elastic stiffness
K_d : Post-elastic stiffness
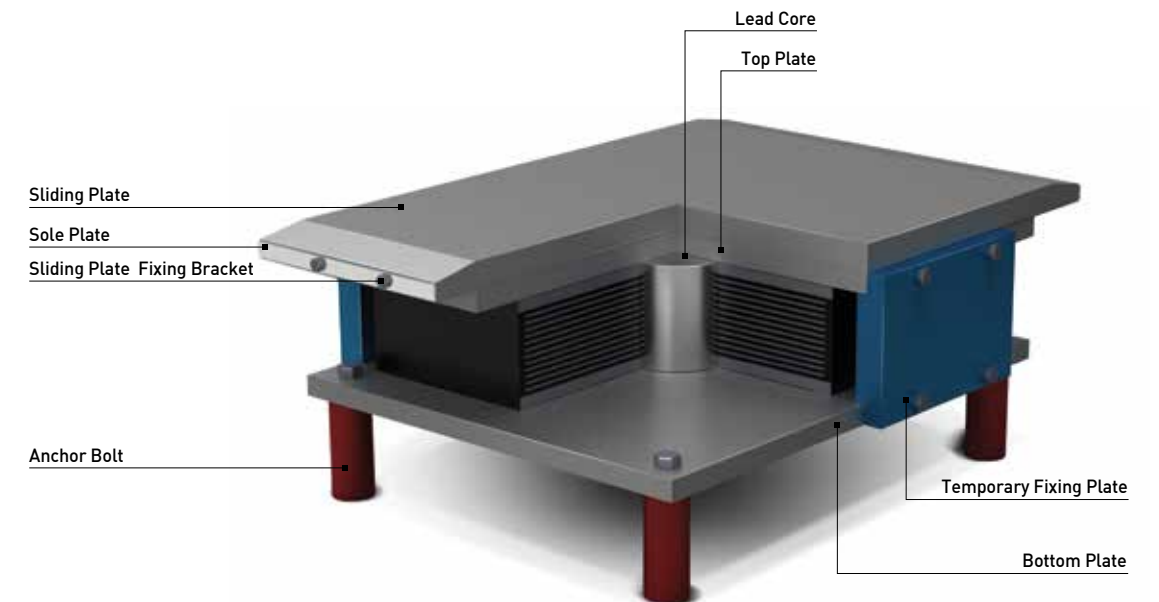K_{eff} : Valid stiffness
t_m : Cover Plate

Design Specification of
Lead Rubber Bearing for Bridge

Total load [kN]	Yield ratio [%]	Product code	Constant displacement [mm]	Dimension (mm)					Bolt		Property (earthquake displacement = 60mm)					Product weight [kgf]
				D	W_1	t_m	H_1	H_2	Diameter	Quantity	Q_d [kN]	K_U [kN/m]	K_d [kN/m]	K_v [kN/m]	K_{eff} [kN/m]	
3000	3	LRB300-L3-T10	100	650	730	40	287	217	30	8	64	17,452	2,030	11,653	3,089	624
		LRB300-L3-T15	150	650	730	40	367	297	30	8	64	11,635	1,353	7,769	2,412	718
		LRB300-L3-T20	200	650	730	40	447	377	30	8	64	8,726	1,015	5,826	2,074	812
	5	LRB300-L5-T10	100	650	730	40	287	217	30	8	107	20,000	1,992	11,653	3,780	631
		LRB300-L5-T15	150	650	730	40	367	297	30	8	107	13,333	1,328	7,769	3,117	729
		LRB300-L5-T20	200	650	730	40	447	377	30	8	107	10,000	996	5,826	2,785	827
	7	LRB300-L7-T10	100	650	730	40	287	217	30	8	143	21,985	1,960	11,653	4,342	638
		LRB300-L7-T15	150	650	730	40	367	297	30	8	143	14,657	1,307	7,769	3,688	738
		LRB300-L7-T20	200	650	730	40	447	377	30	8	143	10,993	980	5,826	3,362	839
4000	3	LRB400-L3-T10	100	750	830	40	287	217	30	8	91	23,964	2,746	21,383	4,270	824
		LRB400-L3-T15	150	750	830	40	367	297	30	8	91	15,976	1,830	14,255	3,355	951
		LRB400-L3-T20	200	750	830	40	447	377	30	8	91	11,982	1,373	10,691	2,897	1,078
	5	LRB400-L5-T10	100	750	830	40	287	217	30	8	143	26,952	2,700	21,383	5,082	833
		LRB400-L5-T15	150	750	830	40	367	297	30	8	143	17,968	1,800	14,255	4,182	965
		LRB400-L5-T20	200	750	830	40	447	377	30	8	143	13,476	1,350	10,691	3,732	1,096
	7	LRB400-L7-T10	100	750	830	40	287	217	30	8	206	30,449	2,645	21,383	6,074	844
		LRB400-L7-T15	150	750	830	40	367	297	30	8	206	20,299	1,763	14,255	5,193	981
		LRB400-L7-T20	200	750	830	40	447	377	30	8	206	15,225	1,322	10,691	4,752	1,118
5000	3	LRB500-L3-T10	100	800	880	40	280	210	30	8	107	27,067	3,082	19,115	4,871	903
		LRB500-L3-T15	150	800	880	40	352	282	30	8	107	18,406	2,096	12,998	3,885	1,025
		LRB500-L3-T20	200	800	880	40	433	363	30	8	107	13,534	1,541	9,558	3,330	1,162
	5	LRB500-L5-T10	100	800	880	40	280	210	30	8	184	31,375	3,016	19,115	6,075	916
		LRB500-L5-T15	150	800	880	40	352	282	30	8	184	21,335	2,051	12,998	5,110	1,044
		LRB500-L5-T20	200	800	880	40	433	363	30	8	184	15,688	1,508	9,558	4,567	1,188
	7	LRB500-L7-T10	100	800	880	40	300	230	36	8	254	35,170	2,955	19,115	7,189	999
		LRB400-L7-T15	150	800	880	40	372	302	36	8	254	23,916	2,009	12,998	6,243	1,133
		LRB400-L7-T20	200	800	880	40	453	283	36	8	254	17,585	1,478	9,558	5,712	1,283
12000	3	LRB1200-L3-T10	100	1,250	1,330	40	290	220	36	12	254	66,264	7,677	67,744	11,911	2,223
		LRB1200-L3-T15	150	1,250	1,330	40	356	286	36	12	254	45,338	5,253	46,351	9,487	2,471
		LRB1200-L3-T20	200	1,250	1,330	40	422	352	36	12	254	34,457	3,992	35,227	8,226	2,720
	5	LRB1200-L5-T10	100	1,250	1,330	40	302	232	36	12	429	76,050	7,529	67,744	14,684	2,364
		LRB1200-L5-T15	150	1,250	1,330	40	374	304	36	12	429	52,034	5,151	46,351	12,307	2,683
		LRB1200-L5-T20	200	1,250	1,330	40	446	376	36	12	429	39,546	3,915	35,227	11,070	3,001
	7	LRB1200-L7-T10	100	1,250	1,330	40	314	244	36	16	572	83,670	7,408	67,744	16,934	2,502
		LRB1200-L7-T15	150	1,250	1,330	40	392	322	36	16	572	57,248	5,069	46,351	14,595	2,889
		LRB1200-L7-T20	200	1,250	1,330	40	470	400	36	16	572	43,508	3,852	35,227	13,379	3,275

* For special designs, please contact our Engineering Department.

I.L.M Lead Rubber Bearing

Lead Core
Top Plate
Sliding Plate
Sole Plate
Sliding Plate Fixing Bracket
Anchor Bolt
Temporary Fixing Plate
Bottom Plate

Incremental Launching Method(I.L.M) is a combination of the in-site construction and the precast construction.
Structure system is changing by construction steps. Because Superstructure is pressed out of cantilever type of construction. Each construction step need revision of structure system on stress condition.

At the beginning of I.L.M, Single segment length is 6~10m, but these days, length is 20~30m for reducing the duration. So It's very important to irremovableness of the bearing during pressing out the segment by the end of the segment.
UNISON eTECH develops and supply I.L.M LRB for pressing out the end of the segment until final abutment.
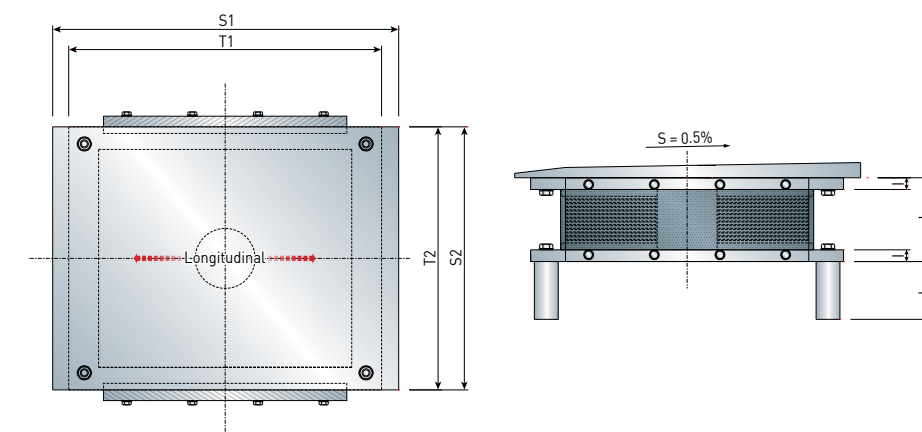
Energy Dissipation System(EDS)

Definition

The Energy Dissipation System (EDS) is a state of the art isolation bearing system designed to minimize forces and displacements experienced by structures during earthquake. The basic components of the EDS are a sliding multirotational bearing assembly with damping and a maintenance free device called the mass energy regulator (MER).
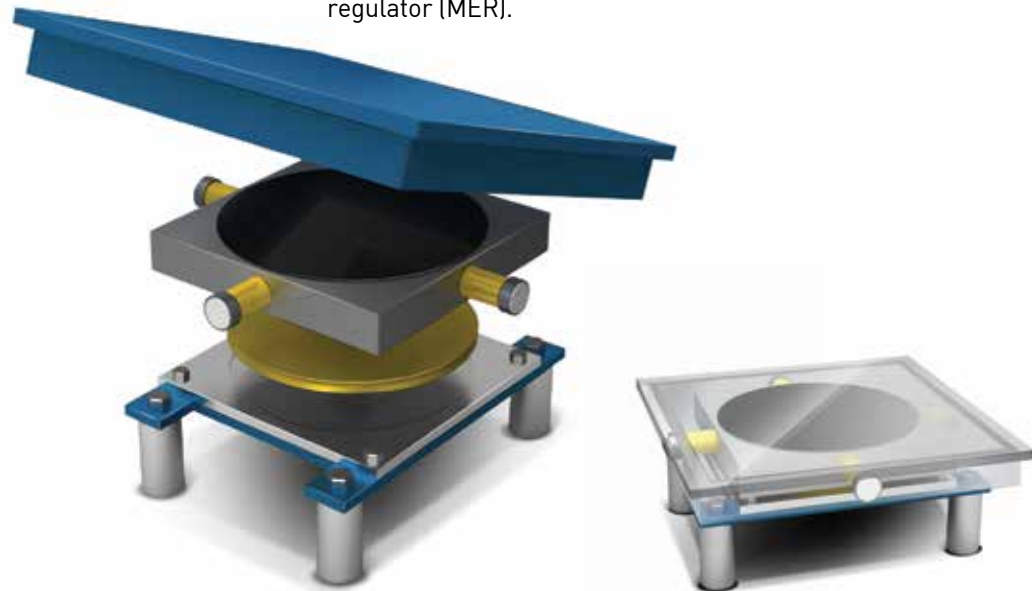
Product Features

Cost Effective
The simplicity of the EDS and the use of readily available engineering materials results in a low cost isolation system. In addition the use of the EDS in a structure design can actually reduce the overall cost by reducing forces and is placements.

Maintenance Free
The EDS is designed to restore the structure to its original pre-quake position. No costly jacking of the structure or replacement of fuses is required. Performance is unaffected by long term cycling. So EDS does not need to be replaced after seismic events.
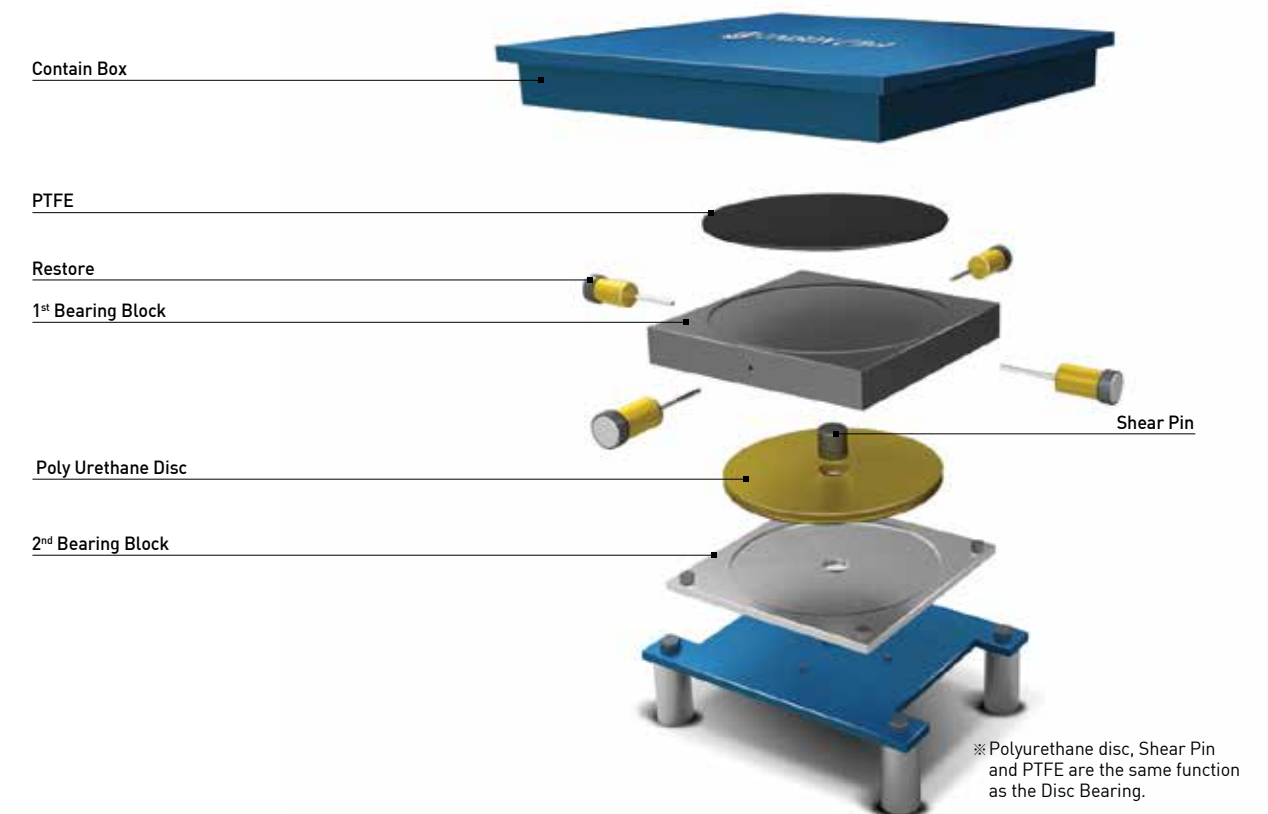
Multidirectional Protection
Because the EDS employs the use of multi-rotational and multidirectional bearings, protection from earthquakes is provided regardless of the direction or orientation of seismic forces.

Simple Installation
The total EDS can be confined within the sole and masonry plates. This means that during installation of the bearings, no additional component connections are required.

Mechanism Details

Contain Box

PTFE

Restore

1st Bearing Block

Shear Pin

Poly Urethane Disc

2nd Bearing Block

※Polyurethane disc, Shear Pin and PTFE are the same function as the Disc Bearing.

Contain Box
Protects the main body of bearing

1st Bearing Block
Fixed restoring spring and shear pin

Shear Pin
Resists horizontal forces and delivers horizontal loads

2nd Bearing Block
Facilitates the replacement and maintenance of polyurethane disc

PTFE
Absorbs displacements at normal times, and reduces frictions during earthquake

Restoring Spring
Resists horizontal forces, and restores during earthquake

Polyurethane Disc
Supports the upper bridge loads, and accepts rotational distortions

Shear Key
Resists horizontal forces delivers horizontal loads

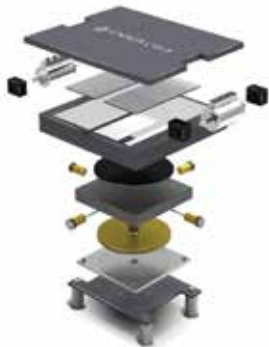# Energy Dissipation System(EDS)

Mechanism Details

EDS

The EDS Bearing is designed to withstand the forces and displacements incurred during and earthquake.
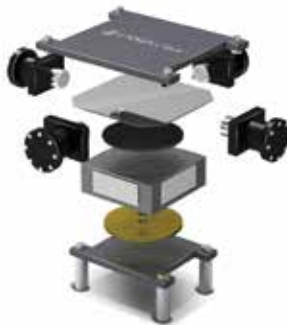

OMEDS

OMEDS is behavior for the temperature in one direction as you remove the tops of the Restore Bearing can reduce the size.

EDS Plus (with LUD)

EDS plus exceptional performance and functionality of the EDS in a long span bridge can be fully exert a dual suspension structure system is to introduce the product.
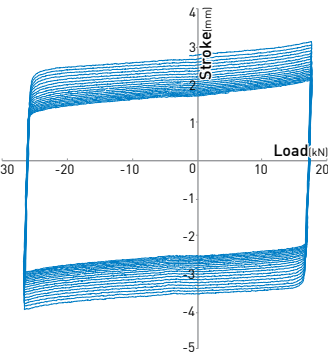

EDS Light

EDS light exceptional performance and functionality of the EDS in a long span bridge can be fully exert a dual suspension structure system is to introduce the product.
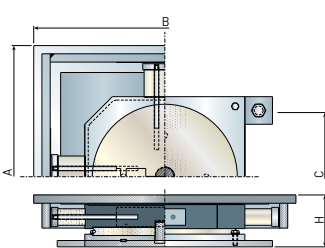
Test

The Energy Dissipation System has undergone extensive prototype and shake table testing at **UNISON e TECH** R&D Center. Tests include individual component testing as well as full scale cycle testing in accordance with AASHTO Guide Specifications for Seismic Isolation Design.
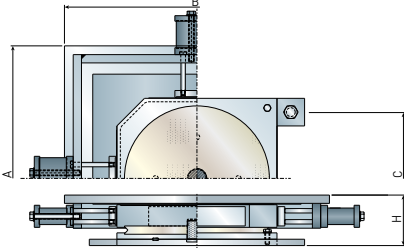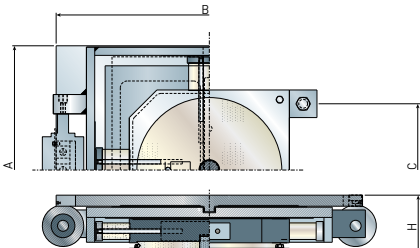

▲ EDS Shear Test

EDS	EDS Light	EDS Plus

EDS & OMEDS Dimension

Model	Vertical Load (kN)	Horizontal Load (kN)	Earthquake Displacement (mm)	Rotation	Bearing Body Dimension(mm)			
					A	B	C	H
EDS 50	500	50	50	0.02	480	480	170	150
EDS 100	1000	100	50	0.02	555	555	230	160
EDS 200	2000	200	50	0.02	660	660	320	200
EDS 300	3000	300	50	0.02	755	755	400	210
EDS 400	4000	400	50	0.02	805	805	450	220
EDS 500	5000	500	50	0.02	870	870	500	230
EDS 600	6000	600	50	0.02	925	925	550	230
EDS 700	7000	700	50	0.02	975	975	590	260
EDS 2800	28000	2800	50	0.02	1630	1630	1170	350
EDS 3000	30000	3000	50	0.02	1690	1690	1220	355

EDS Light Dimension

Model	Vertical Load (kN)	Horizontal Load (kN)	Earthquake Displacement (mm)	Rotation	Bearing Body Dimension(mm)			
					A	B	C	H
EDS Light 50	500	50	50	0.02	350	350	170	149
EDS Light 100	1000	100	50	0.02	415	415	230	160
EDS Light 200	2000	200	50	0.02	510	510	320	200
EDS Light 300	3000	300	50	0.02	595	595	400	205
EDS Light 400	4000	400	50	0.02	645	645	450	216
EDS Light 500	5000	500	50	0.02	700	700	500	227
EDS Light 600	6000	600	50	0.02	750	750	550	227
EDS Light 700	7000	700	50	0.02	790	790	590	253
EDS Light 2800	28000	2800	50	0.02	1395	1395	1170	347
EDS Light 3000	30000	3000	50	0.02	1445	1445	1220	352

EDS Plus Dimension

Model	Vertical Load (kN)	Horizontal Load (kN)	Earthquake Displacement (mm)	Rotation	Bearing Body Dimension(mm)				LUD
					A	B	C	H	D
EDS Plus 50	500	50	50	0.02	480	560	170	149	60
EDS Plus 100	1000	100	50	0.02	555	665	230	160	80
EDS Plus 200	2000	200	50	0.02	660	795	320	200	95
EDS Plus 300	3000	300	50	0.02	755	905	400	205	110
EDS Plus 400	4000	400	50	0.02	805	965	450	216	120
EDS Plus 500	5000	500	50	0.02	870	1050	500	227	130
EDS Plus 600	6000	600	50	0.02	925	1120	550	227	140
EDS Plus 700	7000	700	50	0.02	975	1185	590	253	150
EDS Plus 2800	28000	2800	50	0.02	1630	2010	1170	347	270
EDS Plus 3000	30000	3000	50	0.02	1690	2095	1220	352	290

* For special designs, please contact our Engineering Department.

Expansion Joint

Finger Expansion Joint

Definition

The finger joint consists in general of thick steel finger plates which are bolted to a steel edge profile using conventional anchoring. The compact and simple system is assembled from few components and therefore suffers relatively little wear and tear, resulting in lower initial and maintenance costs.
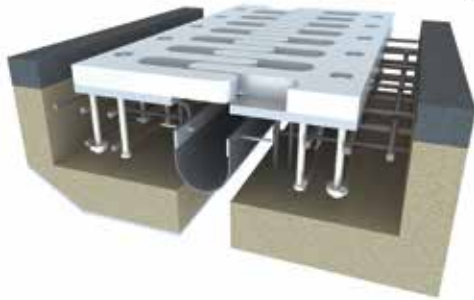
Product Features

Simple structure and failure of expansion joint is less and Long life span with using durable material. Because finger has continuous to the vehicle transporting direction, influence of impact is less.

It can be applied to all bridge types, in case of bridge which longitudinal expansion is large like curved bridge, fingers may interrupt each other, so review on this is required. Because vehicle is contacted with finger plate, impact and noise is reduced and driving performance is excellent.

Additional water proof sheet or Evazote is required. Water proof is excellent but durability is reduced . In case of cantilever sheet water proof, regular cleaning is required.

Fast maintenance is possible with individual fabrication and construction. Only part of traffic is blocked when replacing it. And easy to handle.

SPECIFICATION

type	maximum allowance expansion	a	b	blockout		bolt	f			element length	weight (kgf/m)
				c	d		minimum	standard	maximum		
UCF-50 S	50	127.5	222.5	300	250	M16	25	50	75	1,242	110
UCF-80 S	80	132.5	247.5	300	250	M16	40	80	120	1,242	117
UCF-100 S	100	160.0	295.0	350	250	M16	50	100	150	1,312	302
UCF-120 S	120	147.5	312.5	350	250	M16	60	120	180	1,312	305
UCF-150 S	150	155.0	350.0	350	250	M20	75	150	225	1,312	357
UCF-200 S	200	152.5	397.5	380	320	M20	100	200	300	1,312	418
UCF-250 S	250	150.0	445.0	400	320	M20	125	250	375	1,312	479
UCF-300 S	300	157.5	502.5	430	330	M22	150	300	450	1,312	561
UCF-350 S	350	149.5	554.5	455	340	M22	175	350	525	1,312	643
UCF-400 S	400	195.0	650.0	485	340	M24	200	400	600	1,312	789
UCF-450 S	450	207.5	712.5	505	350	M24	225	450	675	1,312	910
UCF-500 S	500	210.0	765.0	525	350	M24	250	500	750	1,312	1,014
UCF-550 S	550	215.0	820.0	550	350	M24	275	550	825	1,312	1,076
UCF-600 S	600	210.0	865.0	570	350	M24	300	600	900	1,312	1,169

## Finger Expansion Joint Details

Asphalt Concerte Pavement
Stud Bolt
Rubber Sheet
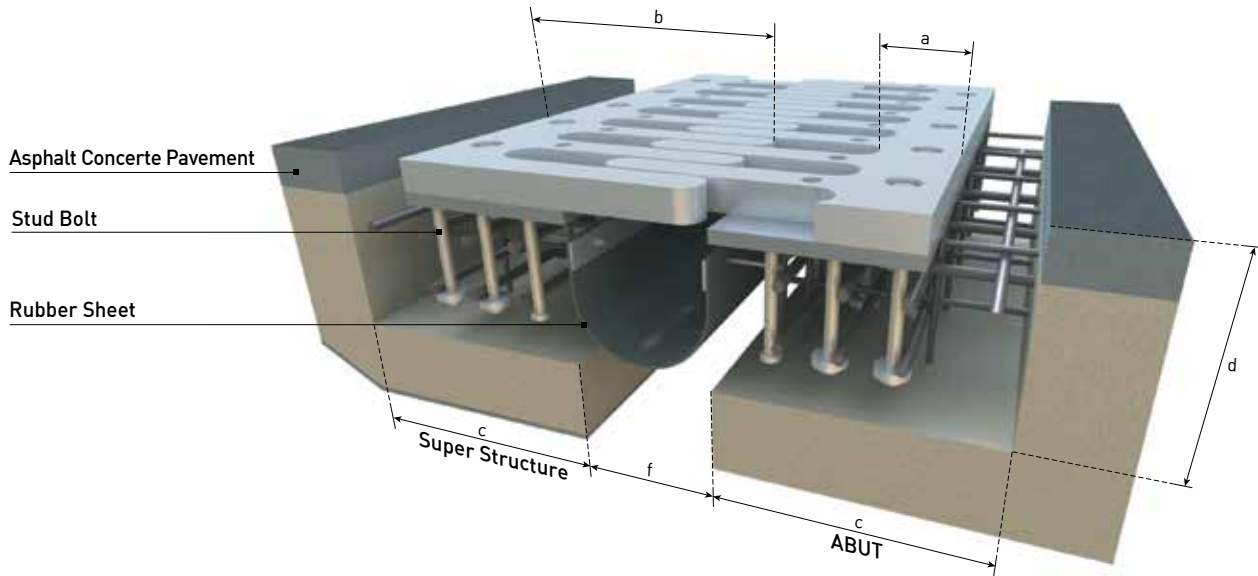
Rubber Sheet

This is water proof sheet. By using synthetic rubber, anti-ozone, weathering and durability is excellent.

- It has excellent durability with inserting Tire Code
- It can expand on each direction adapts to with membrane movement of sheet
- It has perfect water proof, anti-ozone and weathering ability
- It is easy to maintenance and economical

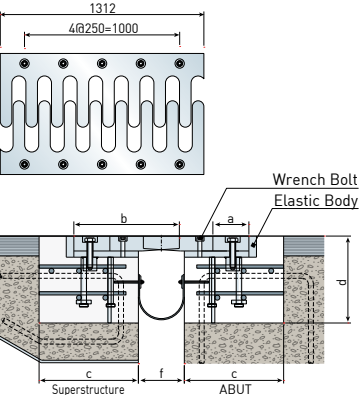Neoprene
Tire Code Thread (Grid)
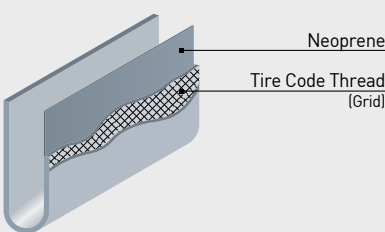
EvazoteWater Proof

Perfect water proof with sealing of structure spaces. Free movements to all directions such as 60% compression, 30% tension deformation, 120% length direction shear deformation and 100% vertical direction shear deformation.
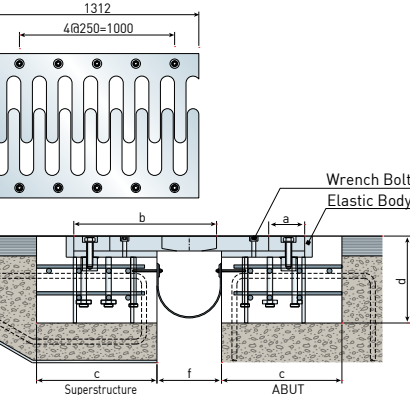

UCF-50~80 S
UCF-100~350 S
UCF-400~600 S
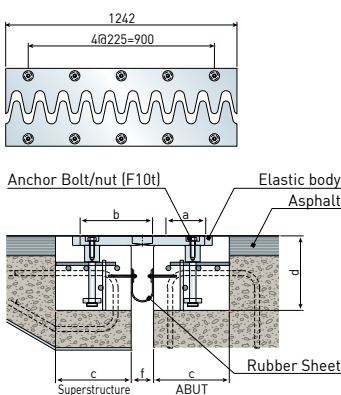
Soundproof Wall

Soundproof Wall

Definition

Soundproof walls are all products reducing the sound pressure with respect to a specified sound source and receptor.

Soundproof walls are to be made by considering the sound absorbing coefficient, transmission loss of sound, insertion loss of sound etc. Depending on used material, soundproof walls are separated by sound absorption type and sound reflection type

01: Sound Absorption Type

Soundproof walls are all products reducing the sound pressure with respect to a specified sound source and receptor.
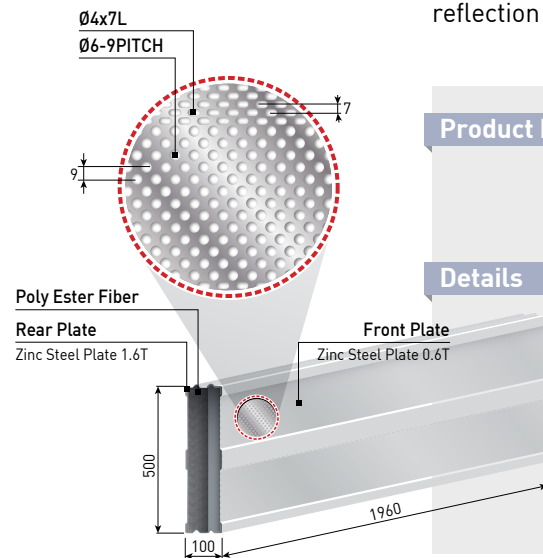
Soundproof walls are to be made by considering the sound absorbing coefficient, transmission loss of sound, insertion loss of sound etc. Depending on used material, soundproof walls are separated by sound absorption type and sound reflection type

Ø4x7L
Ø6-9PITCH

7

9

Poly Ester Fiber
Rear Plate
Zinc Steel Plate 1.6T

Front Plate
Zinc Steel Plate 0.6T

500

100   1960

Product Features	It have grade 1 performance of NRC and offer fine view by a variety of colors and design. It prevent light reflection and corrosion by coating powder at front & rear plate. It is easy to maintain and inspect and improve satisfaction of residents.

Details	Product Size

Product Size
- Length : 1,960~3,960 mm, Width : 500 mm, Thickness : 100 mm

Absorbing Material
- Polyester(32-60K), t=40~66mm (Repellent treated)
- Polyester(over 100K), t=10~30mm (Repellent treated)

Front Plate & Rear Plate
- Front Plate : Zinc steel plate, t=0.6~0.8mm
- Rear Plate : Zinc steel plate, t=1.6mm

02: Sound Reflection Type (Transparent)

This type is blocking out noise by sound reflection. It is very useful for securing a clear view. Soundproof panel is made up a main body and separating frame. So It is easy to change panels.

1970

Using PMMA or laminated glass

1000

95
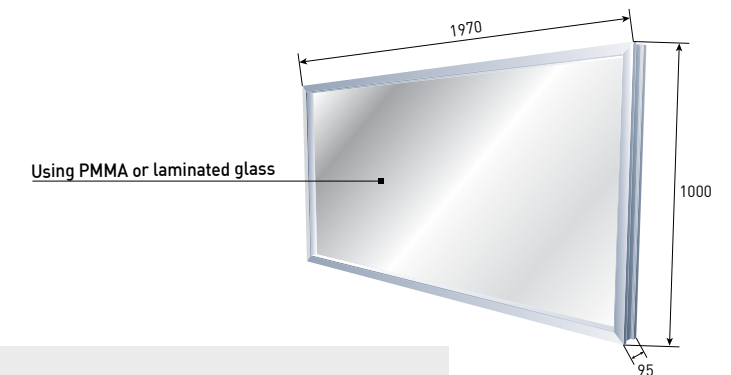
Product Features	If the transparent plate is damaged. It is possible to replace the transparent plate by release frame. Easy to maintain and easy to clean. So satisfaction with Residents is very high.
	Mixed use : sound absorption type and reflection type, It is possible to upgrade aesthetic view and sound absorption performance.

Details	Product Size

Product Size
- Length : 1,960~3,960 mm, Width : 500~1,000 mm,
  Thickness : 60~95 mm.

Transparent Sheet
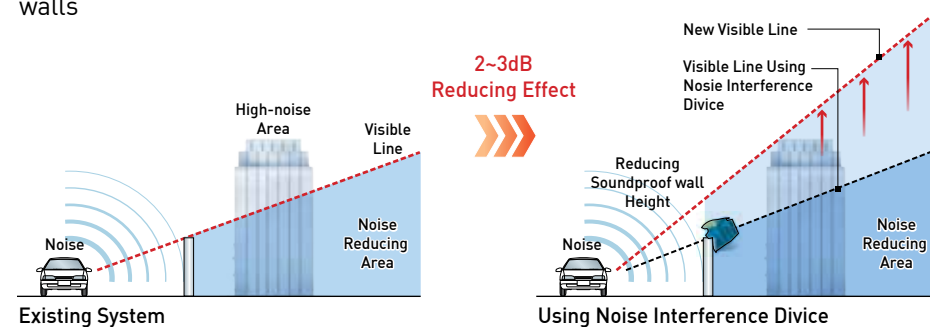- Laminated glass or Poly methyl methacrylate.

Frame
- Aluminum alloy.

Soundproof Wall

03 : Noise Interference Device

It is very effective against the high noise-making area which is hard to reduce the noise. It is possible to control noise by installation at the upper part of soundproof walls

Direct Noise

Direct Noise + Tuning Noise = Noise Reducing Area

Diffracted Sound

Absorbing Material

Tuning Noise

Diffracted Sound Reducing Area

Noise

High-noise Area

Visible Line

Noise

Noise Reducing Area

Existing System

2~3dB Reducing Effect

New Visible Line

Visible Line Using Nosie Interference Divice

Reducing Soundproof wall Height

Noise

Noise Reducing Area

**Using Noise Interference Divice**

Product Features

It is controlled noise using interference principal and diffraction characteristic. Noise passing interference device conflict with noise passing upper soundproof wall for reducing noise.
It can gain the same soundproof effect as the existing soundproof wall even when the soundproof wall is designed by 2~3m lowered.
It is economical because of reducing a footing /support size.
It can be harmonized with surrounding environment with its various colors.

Applicable Fields

- High noise-making area which is hard to reduce the noise with the simple soundproof facility

- Noise-making areas restricted to height

- High bridge or structure (road or railway)

04 : Soundproof Tunnel

When noise areas are is high-rise buildings or can't install soundproof wall, must be regarded as the soundproof tunnel installation.
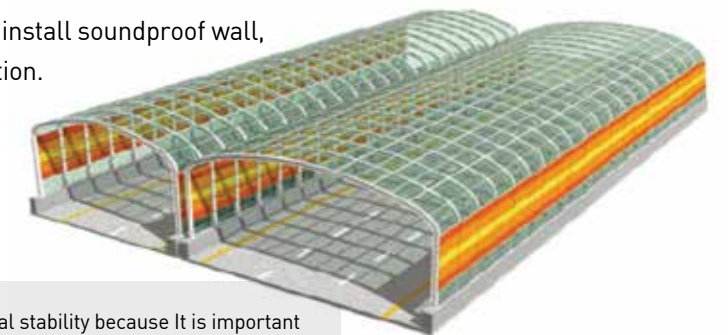
Product Features

We need to examine about structural stability because It is important permanent structure.
We provide total service from Analysis noise reduction to Construction for economical and excellent soundproof tunnel.
When soundproof tunnel is installed on the bridge, need to consider to additional load and expansion joint.

Design Process

01 Analysis Noise Reduction

02 Analysis Structural Design

03 Landscape Design

04 Construction
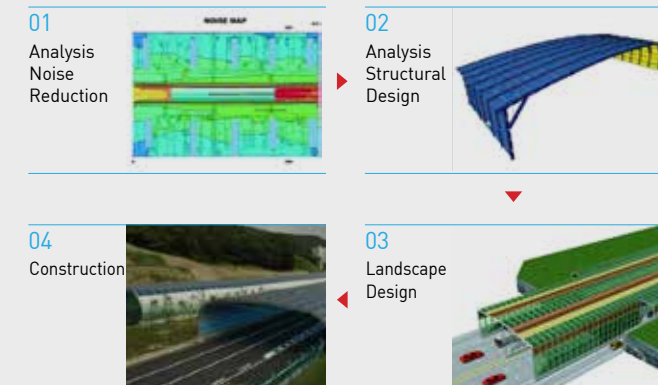
Production Process & Test Equipment List

UTMOST EXPERT
TECHNOLOGY

We have various analysis tools for our product performance and quality assurance.
And we confirm our product functional condition by our performance test equipment before released products.
We have system from product development to product construction.

Production Process(LRB)

| 01. Mensuration | 02. Rubber-sheet Rolling | 03. Rubber-sheet Cutting | 04. Plate Rolling | 05. Built-up | 06. Molding | 07. Insert Lead-Plug | 08. LRB |

Test Equipment

2000kN Test Machine

	Load	Stroke	Speed
Ver.	2,000kN	±100mm	±100mm/sec
Hor.	500kN	±200mm	±200mm/sec

30,000kN Test Machine

	Load	Stroke	Speed
Ver.	30,000kN	±200 mm	±100mm/sec
Hor.	5,000kN	±1000mm	±20mm/sec

Thermal Chamber

Maximum Capacity	
Control Range	-30 ℃ ~ +70 ℃
Size	5′4′3.7 m3

Fatigue Test Machine

Max Ver.load	2000kN
Max Ver.displacement	200mm
Max Speed	50mm/sec

Creep Test Machine

Cylinders	1,000 kN / 50mm
Hydraulic Jackie	7,000kN/㎠/ 2000cc
Pressure sensor	7,000kN/㎠

Modal Testing Tower

Specification

Story : 5 floor
Height : 30m (= 5 @ 6m)
Dimension : 6m X 6m

Application

Research on the vibration control method of high ise building caused by various loads
(wind or seismic load)

Excitation :
unbalance or linear motor on 4th floor

Test of vibration control devices :
TMD, AMD, HMD, Bracing damper, MR damper etc.