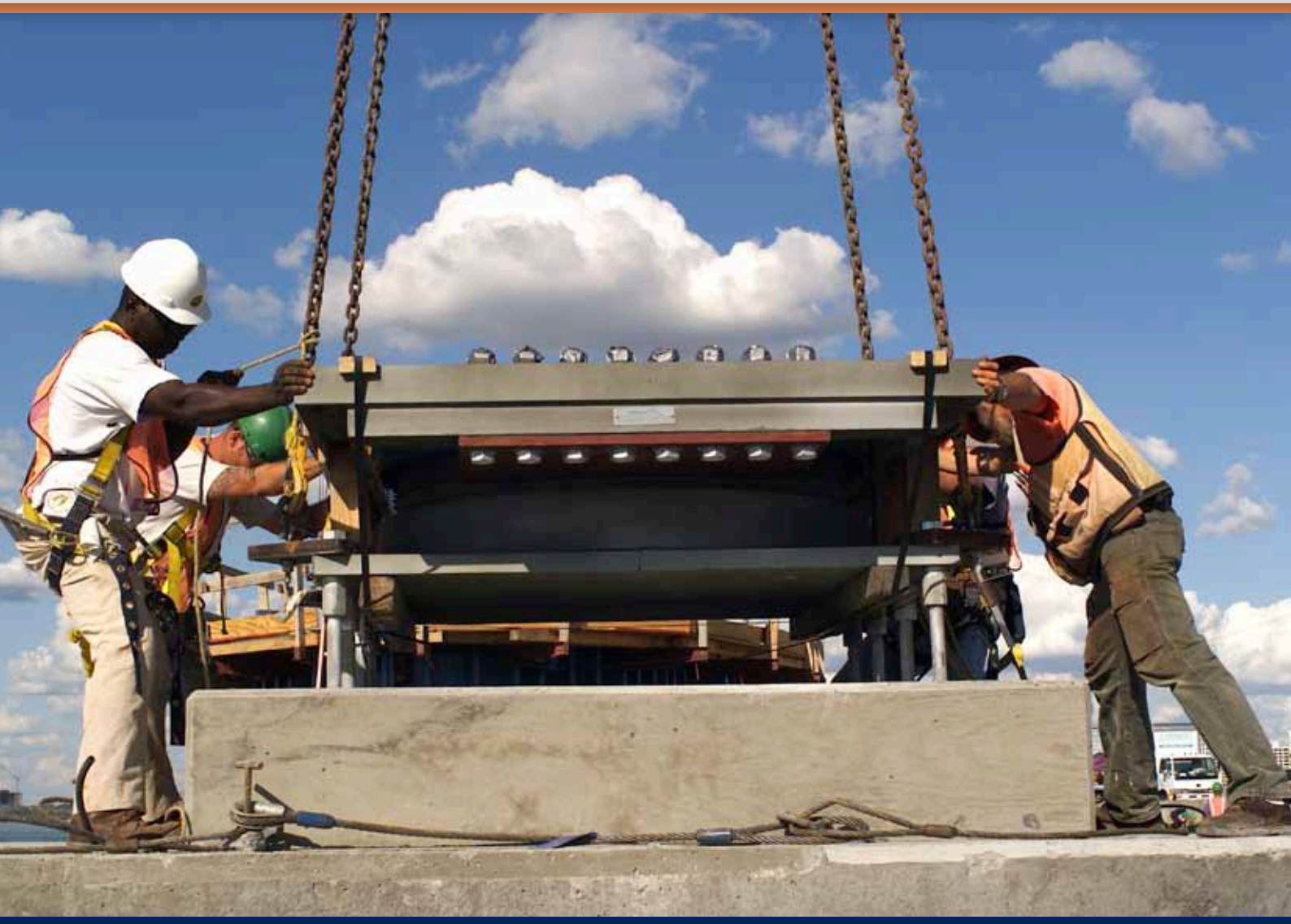
TechStar
INCORPORATED



Bearing Systems

INTRODUCTION

OBJECTIVE OF THIS CATALOGUE

This catalogue presents current information on pot bearings by D.S. TechStar, Inc. The objective of this catalogue is to guide the designer, site engineer, and contractor in all matters relating to the selection and installation of pot-type bridge bearings.

PRINCIPLES OF A POT BEARING

Pot-type bridge bearings – fixed or sliding – can accommodate rotations of up to 0.040 radians in any direction and can be designed to accommodate any horizontal load or displacement.

A pot bearing consists of a shallow/hollow steel cylinder, or pot, with an elastomeric disc, slightly shorter than the steel cylinder, fitted snugly inside. A steel disc, or piston, fits inside the steel cylinder and bears on the elastomeric disc. Flat brass sealing rings are used to contain the elastomer inside the pot. The elastomer behaves like a viscous fluid flowing within the pot as rotation occurs.

BEARING INSTRUMENTATION – SMART BEARINGS

All TechStar Bearings can be equipped with Health Monitoring instrumentation to accurately measure performance data in real time (via an internet connection). With TechStar's 'Smart' Bearing concept, data such as vertical load, rotation and translation can be constantly measured and viewed online or tied into an overall structure's monitoring system. This information gives an overview of the bearings' performance while functioning on the structure. For more information about bearing instrumentation, please contact us today at engineering@techstar-inc.com.

DESIGN AND DETAILING

The advanced design of D.S. TechStar pot bearings is based on the latest developments in bearing engineering and is accomplished with the help of finite element analysis. D.S. TechStar pot bearings can be designed in accordance with AASHTO Allowable Stress Design, Load Reduction Factor Design (LRFD), BS 5400, DIN standards, or to the Japanese Code (JIS).

The detailing of the shop drawings for D.S. TechStar pot bearings is performed on a modern Computer Aided Drawing (CAD) system that enables the adaptation of pot bearings to fit almost any combination of loads, movements, and rotations. Special dimensional conditions can also be satisfied.

STANDARD POT BEARINGS AND INDIVIDUAL DESIGN

The following catalogue pages show standard pot bearings to the proposed CEN Code. These pot bearings are only a fraction of the wide range of bearings that D.S. TechStar can produce. If full design data is provided, D.S. TechStar will design and optimize every pot bearing individually. Contact our Engineering Department for specialized designs.

TYPES OF POT BEARING

TA SERIES (FREE SLIDING)
This type is movable in all directions but cannot accommodate horizontal forces.

TF SERIES (FIXED)
This type is immovable and can accommodate horizontal forces from any direction.

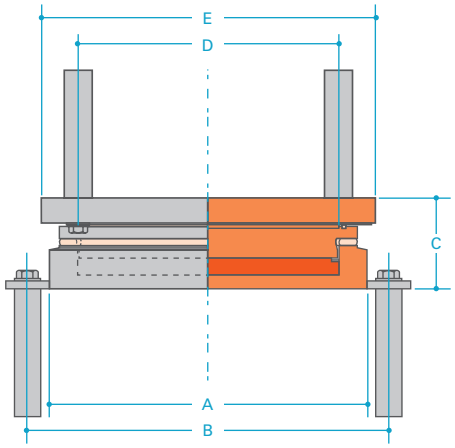
TC SERIES (CENTER GUIDED SLIDING)
This type is movable in one direction only and can accommodate horizontal forces perpendicular to this direction.

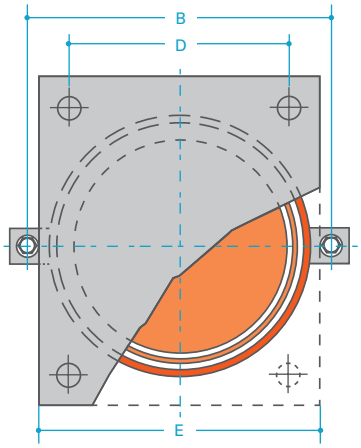
MOVEMENT
The dimensions shown in the following tables of this catalogue allow for a sliding movement of 100 mm. Variations in total movement require that the top sliding plate be adjusted accordingly.

ROTATION
The dimensions shown in the following tables represent pot bearings designed with a rotational capacity of 0.015 radians. Larger rotations of up to 0.040 radians are possible but require revised bearing heights as compared to the following tables. Accordingly, rotations of 0.010 radians will result in dimensions less than the following tables indicate.

TA SERIES (FREE SLIDING)

TECHNICAL DATA





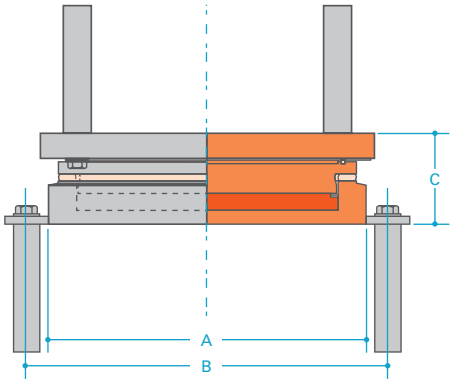
Capacity (Tons)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
50	230	290	85	240	250
100	300	360	89	270	320
150	350	410	98	290	370
200	370	430	105	330	390
250	420	480	107	350	450
300	460	520	111	370	480
350	500	560	115	410	520
400	530	590	120	430	550
450	560	620	123	450	580
500	600	660	128	480	620
600	640	700	132	530	660
700	690	750	137	580	710
800	740	800	139	630	760
900	780	840	142	650	800
1000	820	880	145	680	840
1200	900	960	150	730	920
1400	980	1040	153	800	1000
1600	1060	1120	160	950	1080
1800	1140	1200	170	1010	1160
2000	1220	1280	180	1060	1240
2200	1260	1320	190	1110	1280
2400	1300	1360	196	1160	1320
2600	1340	1420	200	1210	1360
2800	1400	1460	207	1260	1420
3000	1460	1540	213	1320	1480
3500	1520	1580	228	1380	1540
4000	1620	1680	242	1440	1640
4500	1720	1780	256	1500	1740
5000	1820	1880	264	1560	1840

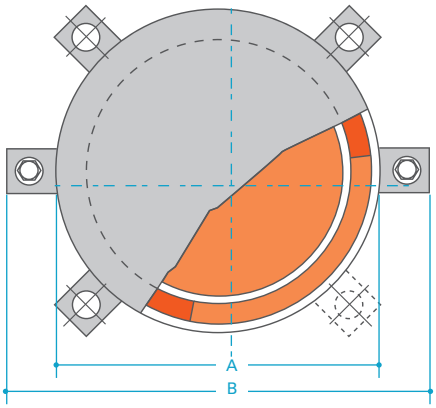
Horizontal force = 15%
Rotation = .015 radians
Anchors = socket + bolts

Movement will affect length of slide plate
Sole & masonry plates can be added to design

TF SERIES (FIXED)

TECHNICAL DATA





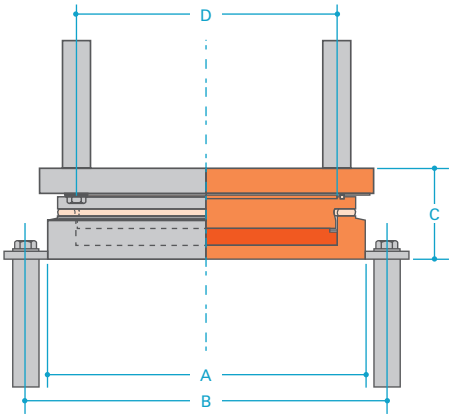
Capacity (Tons)	A (mm)	B (mm)	C (mm)
50	230	290	56
100	300	360	64
150	350	410	72
200	370	430	76
250	420	500	80
300	460	540	87
350	500	580	89
400	530	610	92
450	560	640	97
500	600	680	99
600	640	720	102
700	690	770	110
800	740	820	115
900	780	860	122
1000	820	900	126
1200	900	980	135
1400	980	1060	148
1600	1060	1140	156
1800	1140	1220	160
2000	1220	1300	171
2200	1260	1340	181
2400	1300	1380	195
2600	1340	1440	200
2800	1400	1500	215
3000	1460	1560	225
3500	1520	1620	235
4000	1620	1720	245
4500	1720	1820	262
5000	1820	1920	270

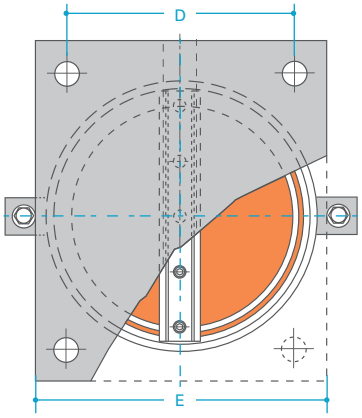
Horizontal force = 15%
Rotation = .015 radians
Anchors = socket + bolts

Movement will affect length of slide plate
Sole & masonry plates can be added to design

TC SERIES (CENTER GUIDED SLIDING)

TECHNICAL DATA



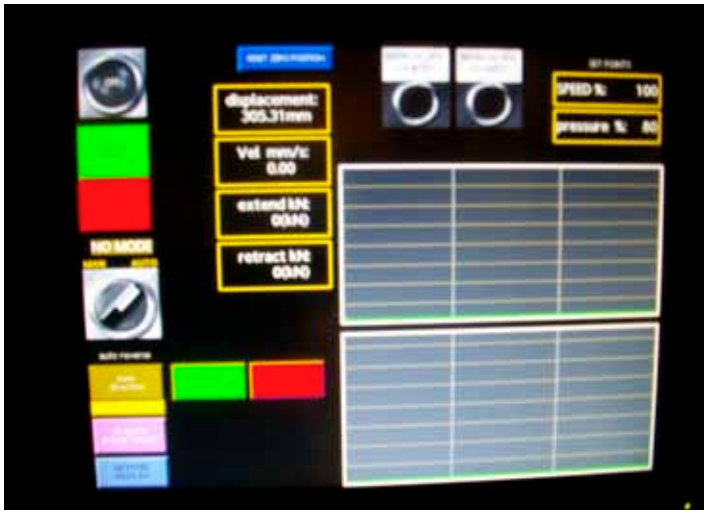


Capacity (Tons)	A (mm)	B (mm)	C (mm)	D (mm)
50	230	290	87	240
100	300	360	93	270
150	350	410	100	290
200	370	430	107	330
250	420	500	115	350
300	460	540	122	370
350	500	580	127	410
400	530	610	132	430
450	560	640	135	450
500	600	680	137	480
600	640	720	140	530
700	690	770	145	580
800	740	820	147	630
900	780	860	152	650
1000	820	900	156	680
1200	900	980	163	730
1400	980	1060	172	800
1600	1060	1140	182	950
1800	1140	1220	188	1010
2000	1220	1300	200	1060
2200	1260	1340	210	1110
2400	1300	1380	218	1160
2600	1340	1440	225	1210
2800	1400	1500	231	1260
3000	1460	1560	235	1320
3500	1520	1620	242	1380
4000	1620	1720	258	1440
4500	1720	1820	268	1500
5000	1820	1920	282	1560

Horizontal force = 15%
Rotation = .015 radians
Anchors = socket + bolts

Movement will affect length of slide plate
Sole & masonry plates can be added to design

TESTING CAPABILITIES



Largest structural bearing/dynamic STU testing facility in the USA.

TechStar's load testing capability is the largest structural bearing/dynamic STU testing facility in the USA. Statically, the testing frame has a vertical load capacity of 6 million pounds (28,000 kN). The hydraulic controls of the testing frame allow it to be dialed down for testing of small loads such as 100 kips. The horizontal capacity is 1.9 million pounds with a travel/stroke range of 15 inches (380 mm) with the same dial down capacity for light load testing. TechStar's auxillary STU testing hydraulic controls provide the same "in-triplet" mounted horizontal rams a dynamic capacity of 1.9 million pounds at 6.5-7.0 mm/second velocity in both tension and compression. The structural frame is rated above 2 million pounds. This is the largest dynamic load testing capability within the USA except for Caltran's lab in San Diego. The TechStar facility is the only lab available on short notice for full dynamic testing with outside independent supervision.

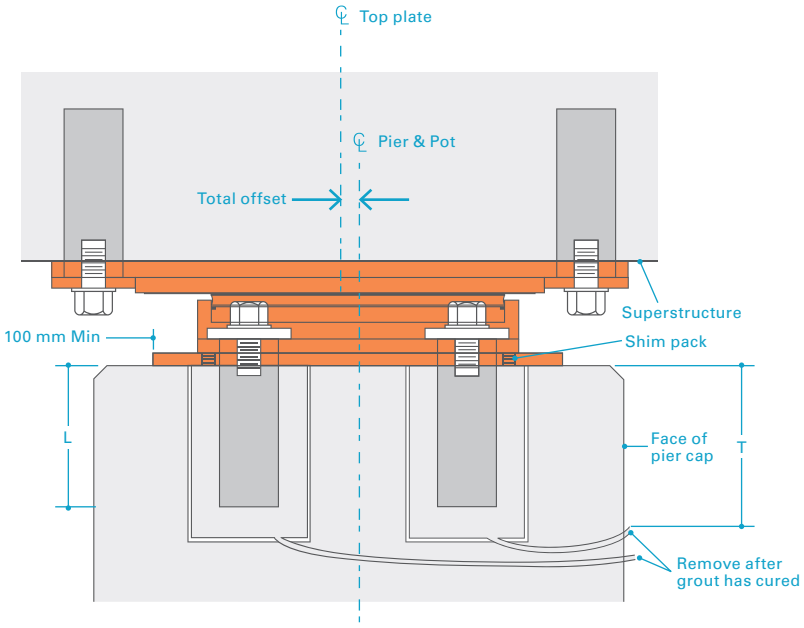
TechStar has tested bearings up to 7 million pounds vertical load for State DOTs and has tested STUs for projects including for the government of South Korea.

STANDARD FIXINGS

INSTALLATION

A pedestal is formed which will support the pot bearing. Pipes are cast into the pedestal and form the anchor recesses, and permit placing of the reinforcing steel. The bearing is placed in the proper position, and the surrounding area is grouted with non-shrink grout. Plastic pipes permit the release of air.

This type of anchorage is slightly more expensive than stud anchors attached to the masonry plate, but the ease of installation by avoiding the interference problem associated with the stud anchors and reinforcing steel makes this type of anchorage cost effective. (See Figure 1)



Bolt	Socket		Pipe	
	Ø D	L	Ø ID	T
19	51	229	152	305
25	76	305	152	356
38	102	381	152	432
50	152	457	229	508
64	152	457	229	508

Figure 1 – Detail of Bearing anchorages and installation components

DISC BEARINGS

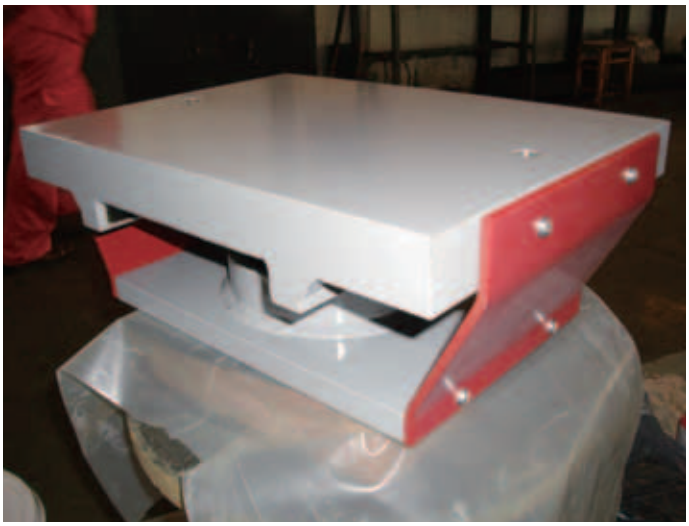
More Durable Alternative To The Standard Pot Bearing

The TechStar 'Disc Bearing' solution offers a lower profile (vertical height) than typical Pot Bearings. Even with the lower profile, Disc Bearings can provide the same load capacity and movement as Pot Bearings provide. Another advantage that Disc Bearings has over Pot Bearings, is not relying on rubber seals to retain the elastomer, therefore offering the potential for greater service life. In the United States and all over the world, Bridge Builders are using Disc Bearings more and more.

The sun is always shining on a TechStar Disc Bearing Project. TechStar disc bearings can be found in the States of Arizona, Florida, Illinois, Louisiana, New York, Ohio, Oregon, and Rhode Island. They can also be found in countries such as Qatar, Bangkok and India. TechStar manufactures Disc Bearings in their facilities in the USA, Canada, Taiwan, Thailand, China and India. There is no project too big or too small for TechStar to handle.

Physical Property Requirements for Disc Bearing Elastomer

Physical Properties	ASTM Test Method	Requirements (Min)
Hardness, Shore D	D-2240	62 ±2
Tensile strength, min psi	D-412	5000 (34.5) (min mPa)
Ultimate elongation, min %	D-412	220
100% modulus, min psi	D-412	2000 (13.8) (min mPa)
200% modulus, min psi	D-412	3700 (25.5) (min mPa)
Aged physicals after 70 hours		
@ 100°C (212°F)	D-573	–
Hardness change, max	–	±2
Tensile strength change, max %	–	+15, -0
Elongation change, max %		+20, -0
Tear Strength, min lb/in	D-624	110
Compression set, 22 hours @ 70°C (158°F), Method B, % max	D-395	40
Low temperature brittleness @ -40°C (-40°F), Procedure B	D-746	No failure



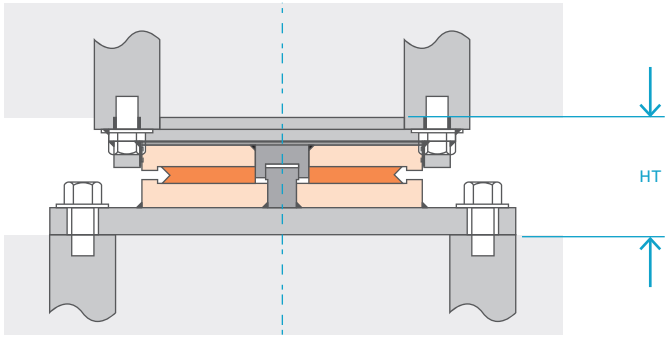


Figure 2 – Section Thru Disc Bearing (looking up station)

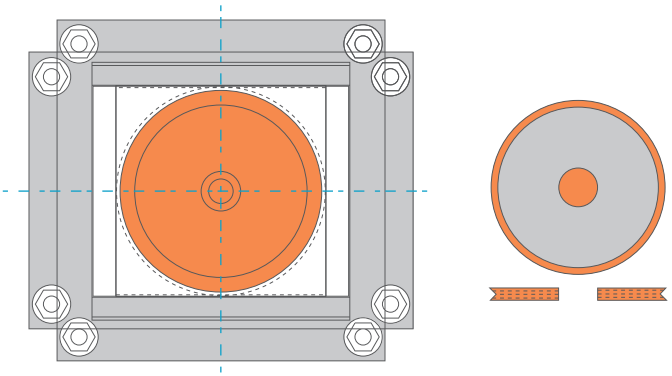
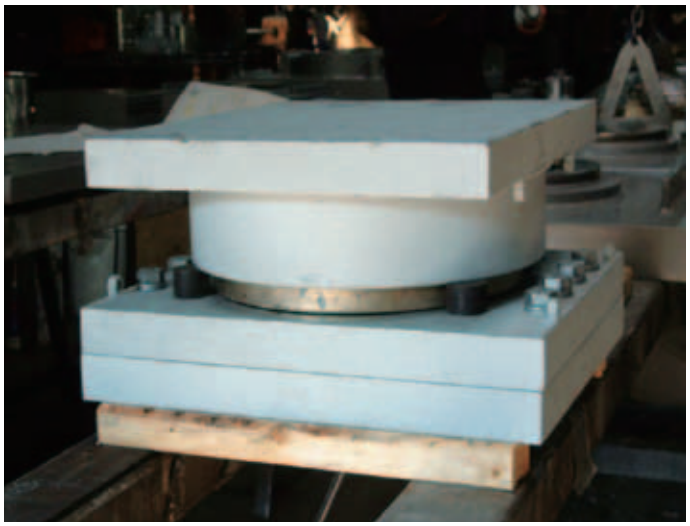


Figure 3 – Detail of Polyurethane Disc

SHPHERICAL BEARINGS

TechStar Spherical Bearings For High Vertical, Horizontal Loads

Spherical Bearings are designed for very high vertical, horizontal and lateral loads and where large rotational structural displacements need to be accommodated. The bearings are grouped into three categories: fixed bearing (restriction of all movement in planar axis); guided bearing (restriction of movement in one direction in planar axis); multi-directional bearing (allows movement in all planes and axes). All three types can be designed to accommodate uplift loads, often required during construction or during the life of the structure.
The bearings are designed to be quickly and easily replaced because of the structural fastening and attachment strategy TechStar deploys. Structural rotation is accommodated by a system of convex and concave plates which are, in turn, mounted onto a flat sliding surface which allows horizontal displacements whilst the curved bearings rotate about their center of radius. (See Figure 4 and 5)



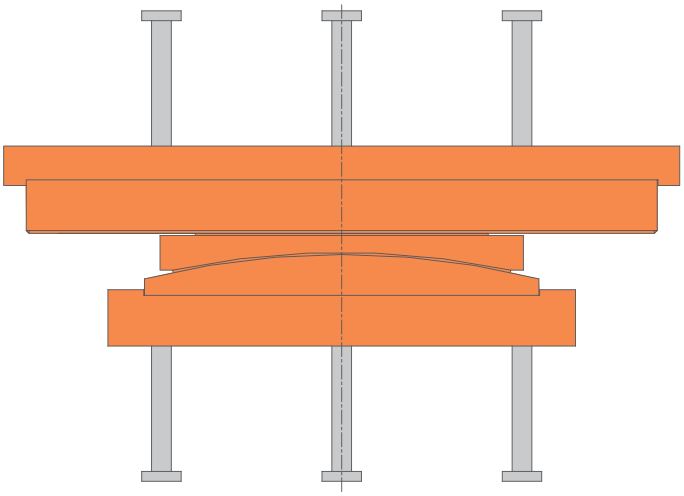


Figure 4 – Section Thru Spherical Bearing (looking up station)

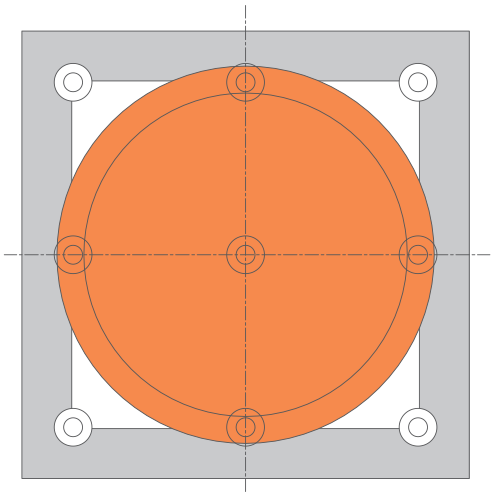
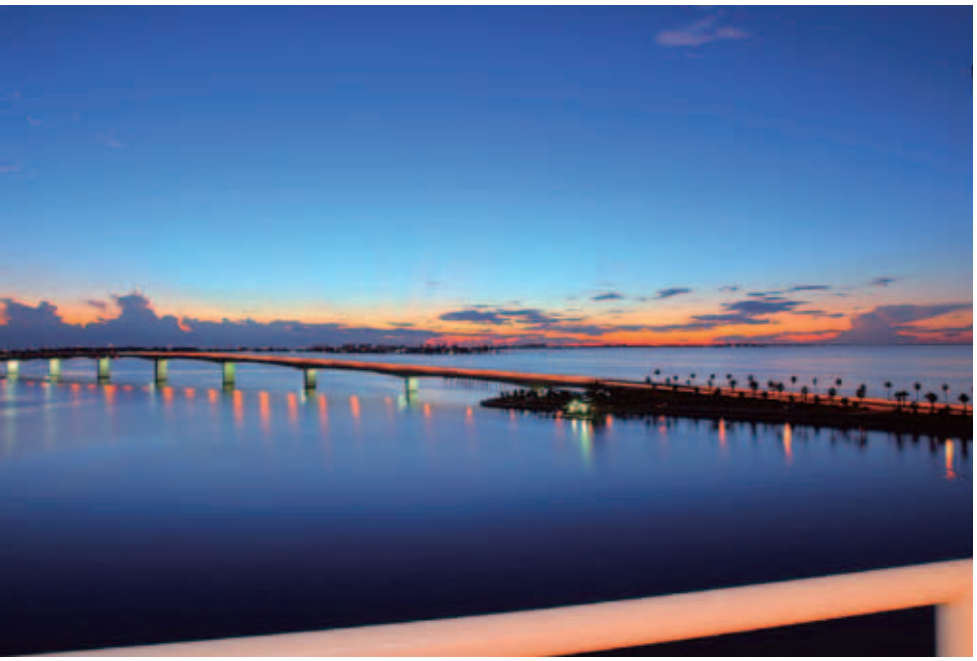
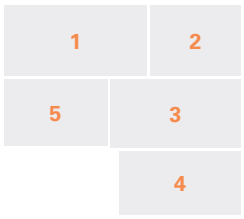


Figure 5 – Detail of Sliding Plate

NOTABLE PROJECTS



1 Ringling Bridge, Florida, USA
2 Avenida de las Americas, Ecuador
3 New Doha Airport Hanger, Doha, Qatar
4 Screwtail Bridge, Arizona, USA
5 Oakland Bay Bridge, California, USA



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