CORE-PAD Kawakin PAD BEARING

CORE-PAD bearings are designed in accordance with Japanese and AASHTO standards.

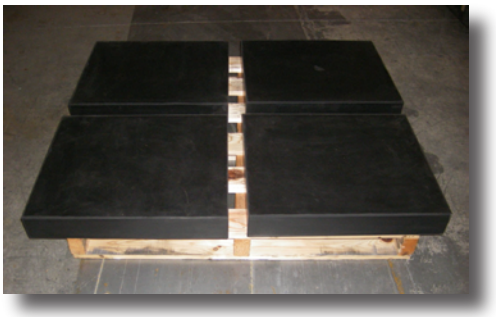
Kawakin has made more than 200 achievements of pad-type bearings in and outside Japan!!

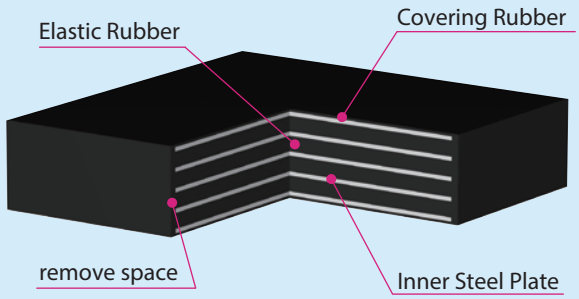
Application range

Suitable for a wide range of bridges including single-span concrete girders

Function

- Supports vertical loads
- Accommodates horizontal movement and rotation





High Quality

- Perfect vulcanization of steel plates to the rubber
- Quality control by rigorous material and performance test
- Advanced durability demonstrated by compressive fatigue test, shear fatigue test, and compressive rotating fatigue test

High Durability

Inner steel plates fully enclosed in the rubber to ensure high corrosion resistance

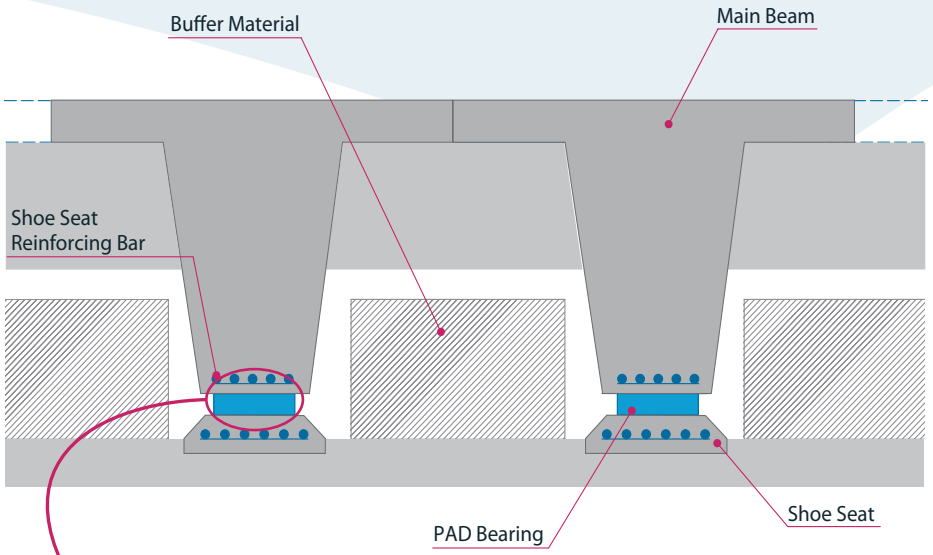
Low cost and Size Line-up

- A broad line-up for supporting low to high vertical loads
- Vertical load capacity up to 5,000 kN

The Kawakin' s elastomeric bearing, CORE-PAD, consists of vulcanized rubber with layers of inner steel plates. The rubber pad withstands vertical loads (dead load, live load and so on) by deflecting, and accommodates the displacement due to support movements and temperature variations by deforming. High durability and safety are achieved by special material development and total inspection with large load-testing machines capable of reproducing actual bridge behavior. We perform accurate quality control through our long experience.

Installation

Super T girder Application Example

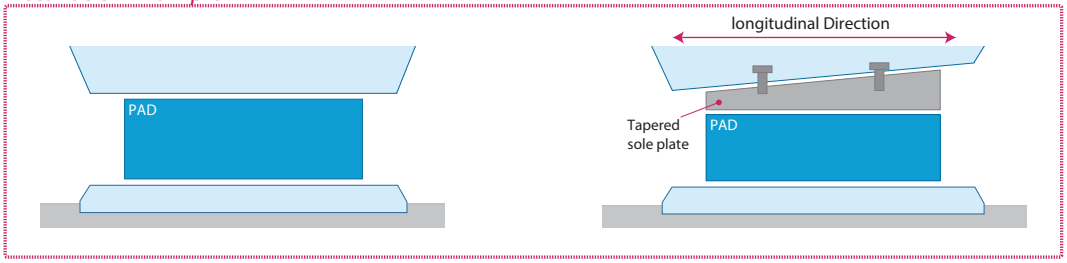


Standard Bearing Installation

Installation Example-1

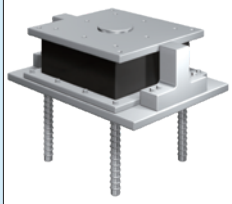
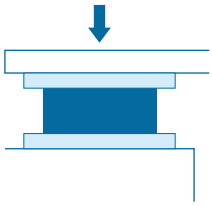
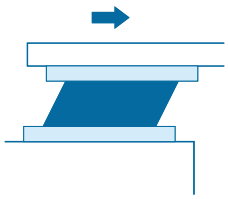
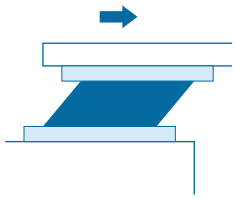
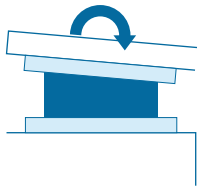
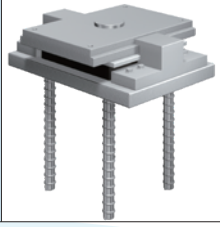
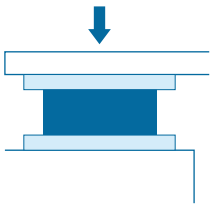
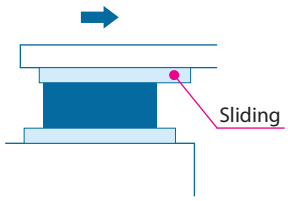
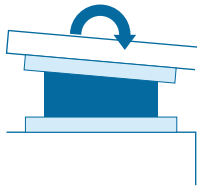
Installation Example-2

Installation Example

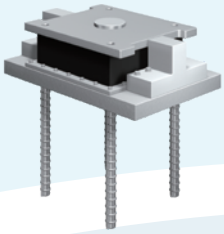


Application

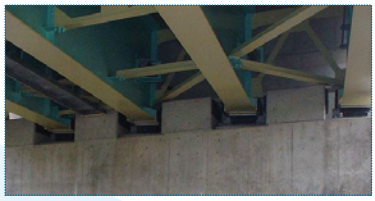
The application examples of CORE-PADs are given below. CORE-PADs are applicable to Movable/Fixed bearings and sliding bearings, depending on design requirement. The sliding type is suitable for long bridges with large displacement

		Vertical	Horizontal		Rotation
			Temperature change	Earthquakes	
MF Type					
Sliding Type					

MOVABLE & FIXED TYPE BEARING

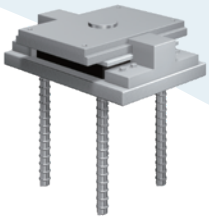


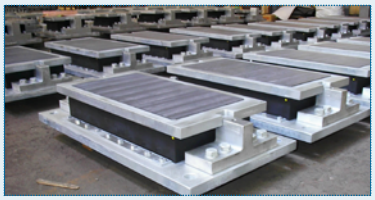
Finished Product



Installation Example

SLIDING RUBBER BEARING



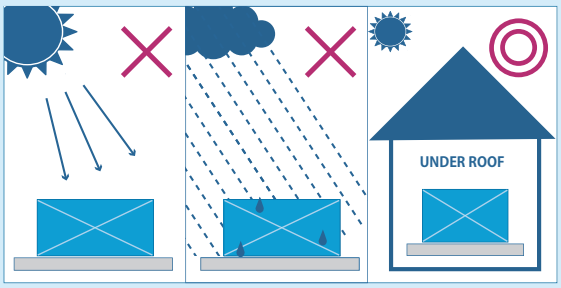


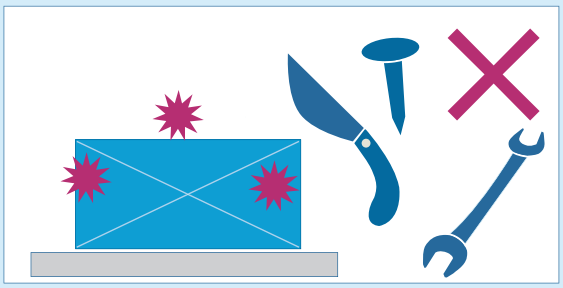
Finished Product

Installation Example

STORAGE

- Avoid exposure to direct sunlight or rain (Keep under roof with good ventilation)
- Care should be taken during shipping (No damage shall be caused by edged tools)





Kawakin Core-Tech Co., Ltd.

Head Office : 2-2-7, Kawaguchi, Kawaguchi-city, Saitama, 332-0015, JAPAN
TEL: +81-48-259-1117 FAX: +81-48-259-1137
Email: info@kawakinkk.co.jp
Branch/Plant : Ibaraki / Tokyo / Osaka / Sendai / Sapporo / Vietnam

Tomorrow's Technology, Today.
Kawakin Holdings Group
Issued 05/2022
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CORE-PAD Kawakin PAD BEARING

Issued 05/2022

MATERIAL

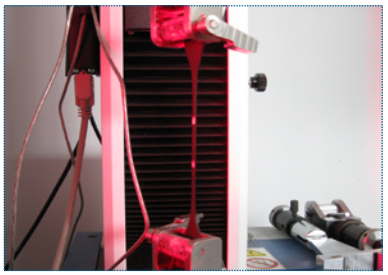
We offer materials suited to different regions around the world. The specifications given below are an example in accordance with AASHTO that are used for the Southeast and South Asian nations. CORE-PADs can also conform to BS and JIS. You have a choice of CR (Chloroprene Rubber) with high weather resistance or NR (Natural Rubber) with high elongation as raw material and a variety of hardness according to design requirements.

	Item	ASTM /Test Condition	Requirement		Unit G8	Unit G7
Hardness	Hardness	D2240	50±5	point	57	51
Tensile test	Tensile Strength	D412	2500	psi	-	-
			17.2	MPa	18.8	19.5
	Ultimate elongation		400	%	560	670
Heat Resistance	Change in hardness	D573 70hr×69.9℃	±15	point	2	2
	Change in tension		-15	%	-3	-2
	Change in elongation		-40	%	-11	-8
Compression Set	Compressive strain	D395 22hr×69.9℃	35	%	22	18
Ozone	Visual inspection	D1149 100pphm, 20%strain, 37.7℃±1℃, 48hr	No cracks		OK	OK
Adhesion	Adhesion strength	D429, B	7	N/mm	14	13
Low Temperature Test	Brittleness at -40℃	D746, B	No Failure		OK	OK

Examples of CORE-PAD specifications

QUALITY CONTROL - Material Control

Quality is not judged by only appearance. Quality control should be made carefully to ensure quality of bearings. CORE-PADs have gone though various tests conforming to AASHTO and ISO. We have confidence that our high quality will satisfy the most stringent performance requirements.



Tensile test

(1) Physical test

Skilled engineers in our test laboratory make strict evaluations of basic characteristics of rubber material such as hardness, tensile strength, elongation at break, aging characteristics, compression set, and water resistance day after day to ensure stable and high material quality. Only rubber materials that show stable performances will be on manufacturing lines.

Ozone crack testing machine

(2) Ozone crack test

The occurrence of ozone cracks on the rubber surfaces due to ozone attack have been reported all over the world. Elastomeric bearings should be necessarily ozone-resistant. We perform verification tests for ozone cracks according to the major specifications and under strict conditions than those specifications, and we developed high-quality ozone-resistant materials.

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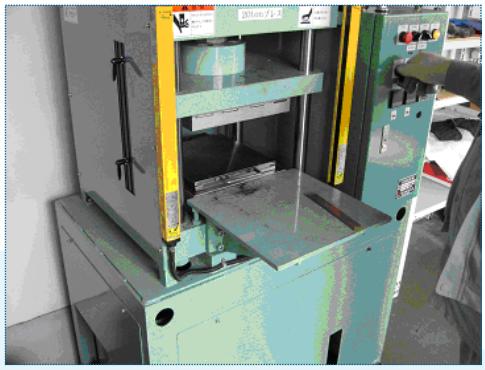
2-2-7 Kawaguchi, Kawaguchi, Saitama 332-0015 JAPAN | Tel. +81 48 259 1117 | Fax. +81-48-259-1137 | www.kawakinct.co.jp | Email: info@kawakinkk.co.jp

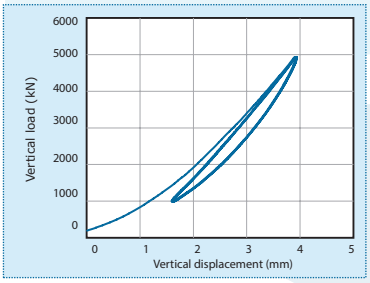
CORE-PAD Kawakin PAD BEARING

The test results of vertical stiffness and horizontal stiffness for a total of 245 natural rubber bearings are given below. As it can be seen, 95 percent (Confidence Intervals) of all the measurement data are within a range of ±40% of the design values for vertical stiffness and within ±10% for horizontal stiffness. Conclusively, Kawakin can produce high quality bearings.



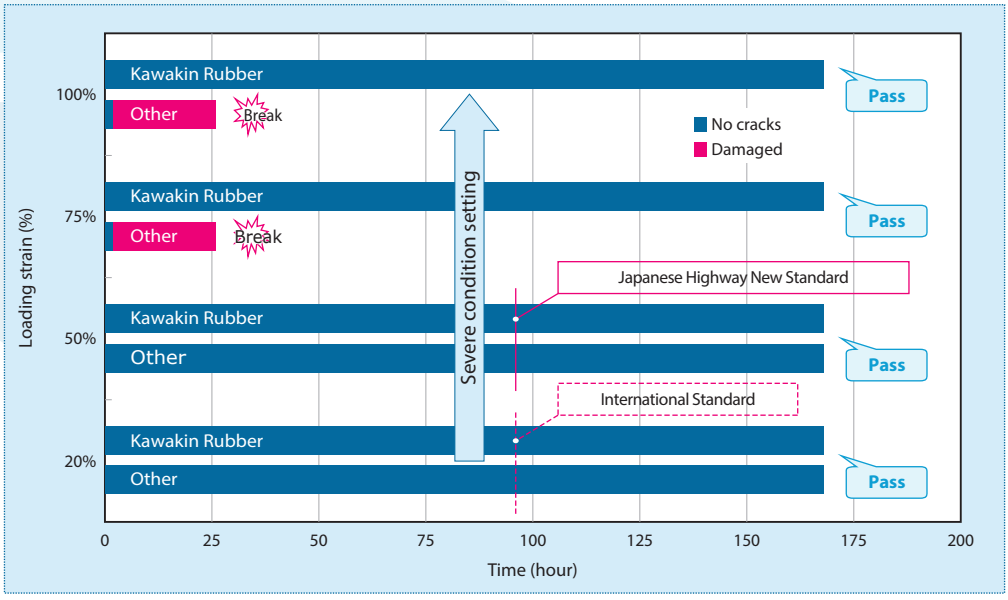
Sheet press machine

Ozone resistance test



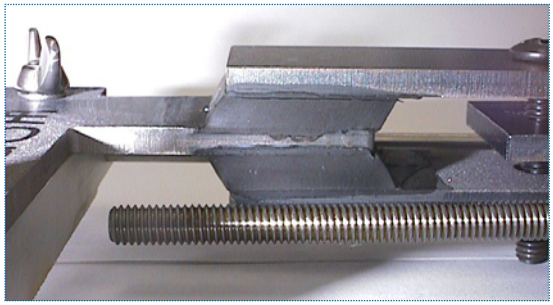
Test results of vertical stiffness

Dunbell test piece



Test results of ozone resistance

Kawakin' s long-term experience and manufacturing capabilities is the guarantee of rubber material. The figures above represent the results of ozone resistance tests for two types of rubber materials according to International Standard (ISO 22762-2). Both of the test pieces satisfy the minimum standard values required in the Standards. Kawakin' s test piece kept sound even under the stricter conditions while the other test piece did not.



Double Shear Test

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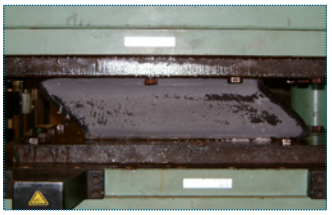
CORE-PAD Kawakin PAD BEARING

QUALITY CONTROL - Performance Test

Elastomeric bearings are expected to have specific compressive stiffness and horizontal stiffness by design. Performance tests with full-scaled models are necessary to ensure the above performance. Kawakin has some large bi-axial load testing machines in and outside Japan. We carry out performance tests using them under various assumed environmental conditions so that our knowledge of quality control widens. We do our best everyday to ensure the best performances, making use of our findings.

2400ton Bi-Axial Test Machine



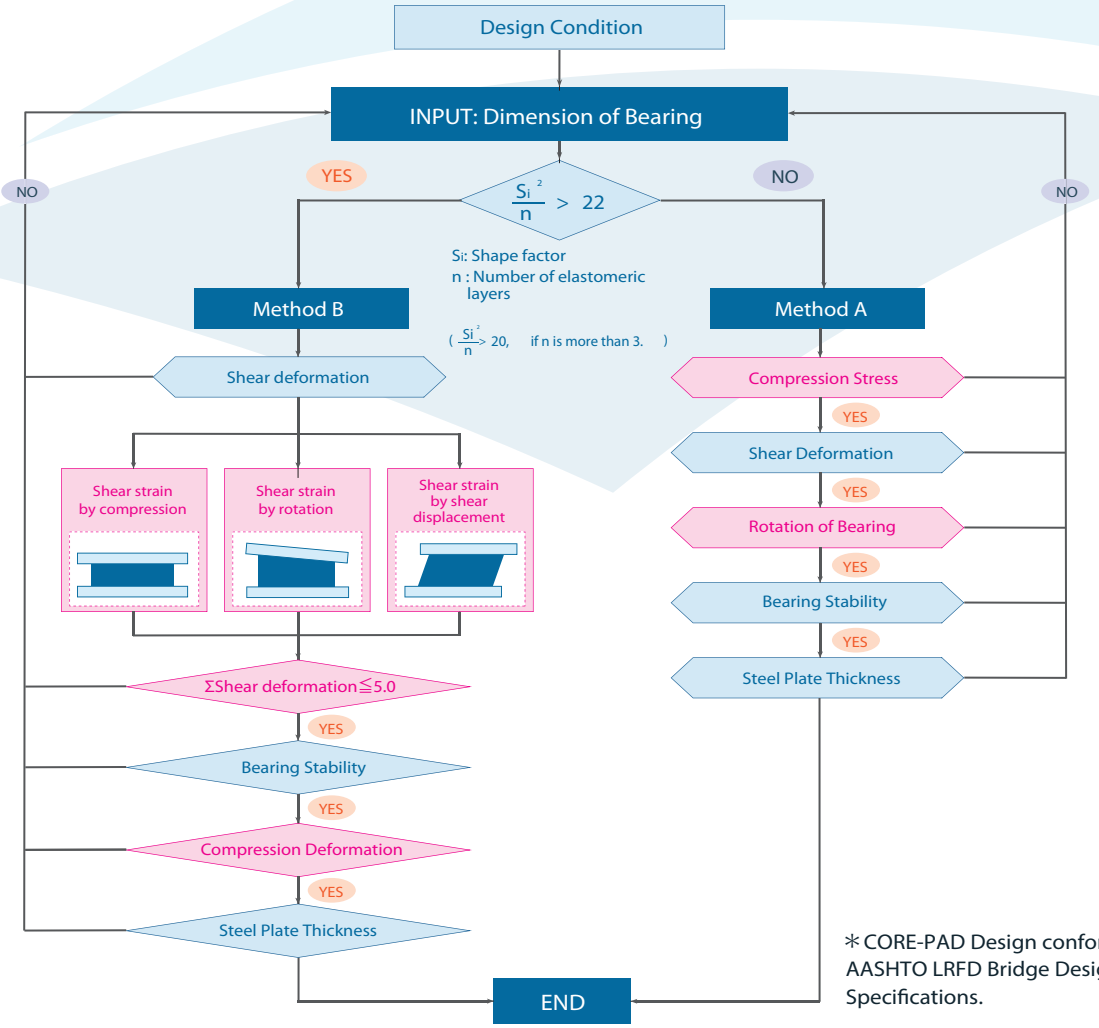
Temperature Dependency Test

Vertical Loading Performance Test

1000ton Bi-Axial Test Machine at Kawakin Core-Tech Vietnam

DESIGN METHOD

CORE-PAD Design Flow Chart



＊CORE-PAD Design conforms to the AASHTO LRFD Bridge Design Specifications.

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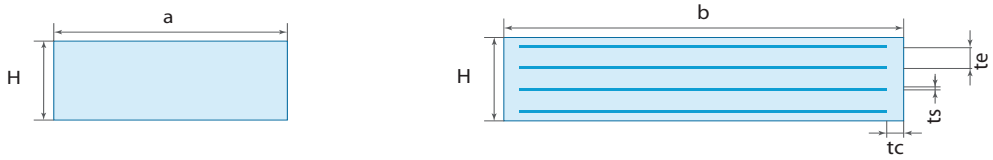
CORE-PAD *Kawakin PAD BEARING*

STANDARD DIMENSIONS



Elastomeric laminated bearing profile

Rmax: Total Vertical Load (kN)
Rmin: Minimum Vertical Load (kN)
ΔL: Longitudinal Movement (mm)
θs, st: Rotation Angle about the Transverse axis due to Static Load (rad)
a : Longitudinal Dimension (mm)
b : Transverse Dimension (mm)

H: Bearing Height (mm)
te: Thickness per Rubber Layer (mm)
n: Number of Rubber Layers
tc: Thickness of Side Cover Rubber (mm)
ts: Thickness per Inner Steel Plate (mm)
W: Bearing Weight (kg)

Rmax	Rmin	Δ L	θs,st	a	b	H	te	n	tc	ts	Weight
200	140	10	0.005	190	240	34	7	3	10	2.3	4.1
200	140	20	0.005	190	290	56	10	4	10	2.3	7.0
300	210	10	0.005	190	290	34	7	3	10	2.3	5.0
300	210	20	0.005	190	390	56	10	4	10	2.3	9.5
400	280	20	0.005	240	340	56	10	4	10	2.3	10.6
400	280	30	0.005	290	390	76	15	4	10	2.3	17.4
500	350	20	0.005	240	390	56	10	4	10	2.3	12.2
500	350	30	0.005	290	440	76	15	4	10	2.3	19.6
750	525	20	0.005	290	440	56	10	4	10	2.3	16.8
750	525	30	0.005	340	490	76	15	4	10	2.3	25.8
1000	700	20	0.005	240	390	65	5	8	10	2.3	18.2
1000	700	30	0.005	340	590	76	15	4	10	2.3	31.2
1250	875	30	0.005	390	540	76	15	4	10	2.3	32.8
1250	875	40	0.005	390	590	98	16	5	10	2.3	45.0
1500	1050	30	0.005	290	440	94	5	12	10	2.3	36.3
1500	1050	40	0.005	440	590	105	16	5	10	2.3	63.6
1750	1225	30	0.005	340	440	94	5	12	10	2.3	42.9
1750	1225	40	0.005	390	390	130	5	16	10	2.3	64.4
2000	1400	30	0.005	390	440	89	6	10	10	2.3	43.7
2000	1400	40	0.005	390	440	130	5	16	10	2.3	73.0
2250	1575	30	0.005	440	440	89	8	8	10	2.3	43.9
2250	1575	40	0.005	440	440	129	6	14	10	2.3	77.1
3000	2100	30	0.005	490	490	80	10	6	10	2.3	45.6
3000	2100	50	0.005	540	840	129	20	5	10	3.2	137.8
3250	2275	30	0.005	490	540	78	12	5	10	2.3	45.9
3250	2275	50	0.005	490	540	153	7	15	10	2.3	117.0
3500	2450	30	0.005	540	540	85	12	5	10	2.3	65.1
3500	2450	50	0.005	540	540	153	7	15	10	2.3	129.3
3750	2625	30	0.005	540	540	85	12	5	10	2.3	65.1
3750	2625	50	0.005	540	590	147	8	13	10	2.3	130.4
4000	2800	40	0.005	540	590	111	10	8	10	2.3	94.7
4000	2800	60	0.005	540	640	168	8	15	10	2.3	159.7
4250	2975	40	0.005	540	640	111	10	8	10	2.3	102.9
4250	2975	60	0.005	590	590	168	8	15	10	2.3	160.9
4500	3150	40	0.005	590	590	119	10	8	10	2.3	122.2
4500	3150	60	0.005	640	640	181	8	15	10	2.3	231.0
4750	3325	40	0.005	640	640	116	14	6	10	3.2	126.6
4750	3325	60	0.005	640	640	184	9	14	10	2.3	224.0
5000	3500	40	0.005	640	640	116	14	6	10	3.2	126.6
5000	3500	60	0.005	640	640	184	9	14	10	2.3	224.0

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2-2-7 Kawaguchi, Kawaguchi, Saitama 332-0015 JAPAN | Tel. +81-48-259-1117 | Fax. +81-48-259-1137 | www.kawakinct.co.jp | Email: info@kawakinkk.co.jp

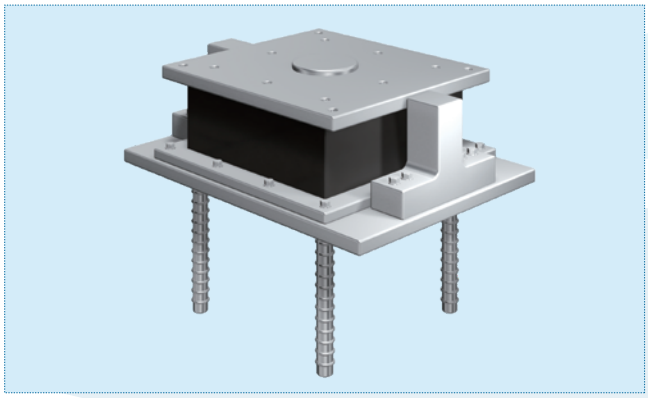
Rubber Bearing with External Load Plates

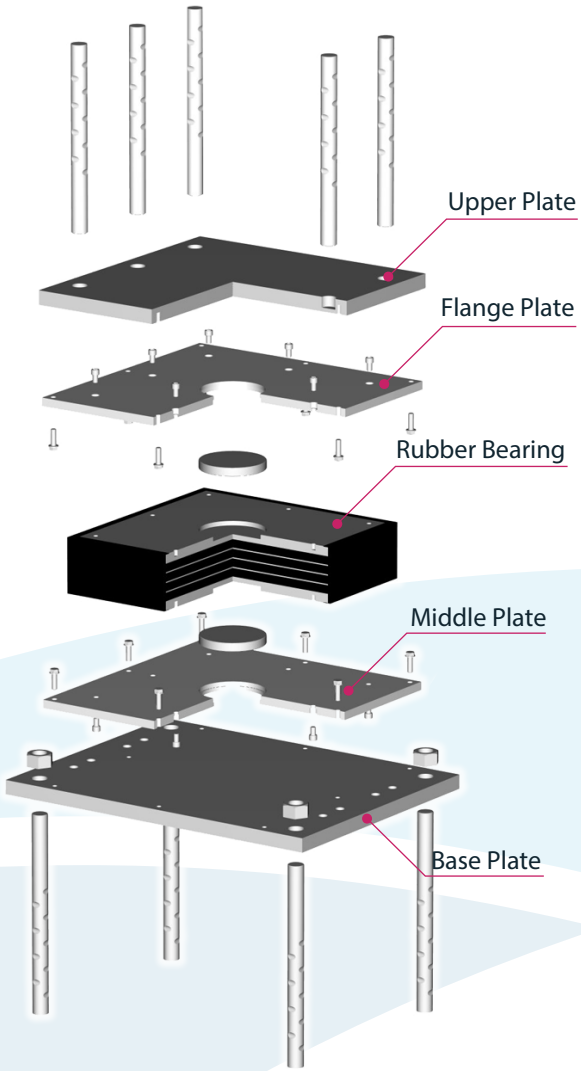
Application range
Suitable for a variety of bridges

Function
- Supports vertical loads
- Distributes horizontal inertia force

High Quality
Accurate quality control by rigorous performance

Size Line-up
- A broad line-up of distributing bearings for supporting low to high vertical loads
- High vertical load capacity upto 20,000kN



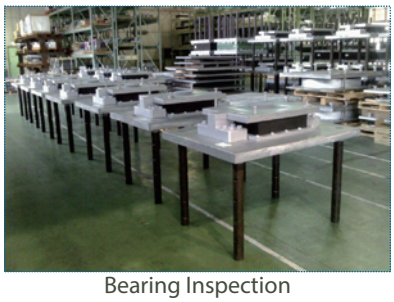


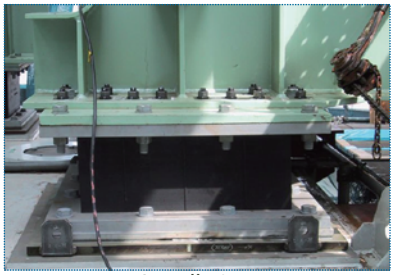
The rubber bearing deforms in shear and supports vertical load with its laminated structure. It distributes horizontal inertia force occurring at multiple supports of a bridge during earthquake or temperature changes .

Application Examples


Press Machine


Bearing Inspection

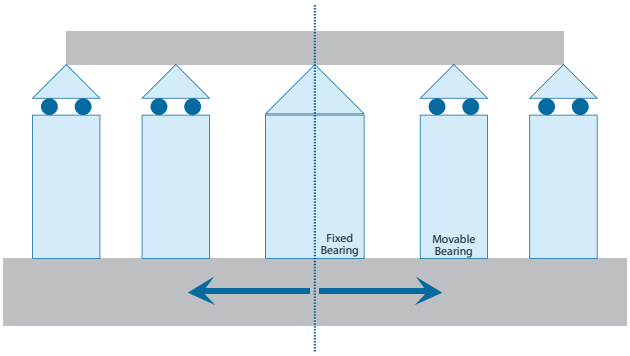

Bearing Inspection


Installation

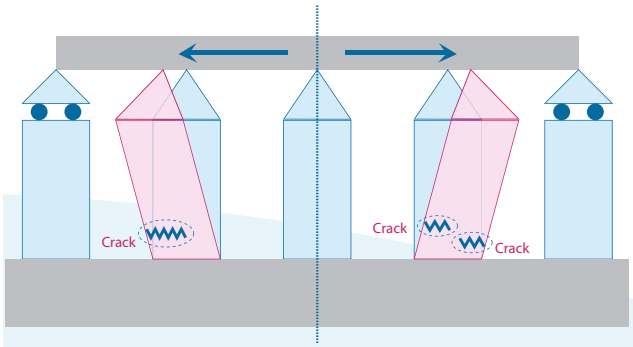

Application for PC/RC Bridge


Application for Steel Bridge

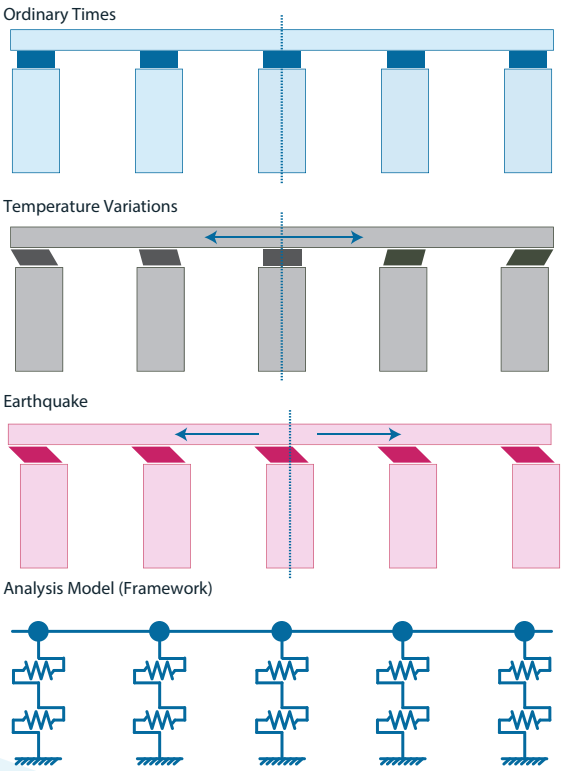
Structure



Anti-seismic system for a bridge with one fixed support



Movement of a bridge with multiple fixed supports during an earthquake



Schematic diagram of elastic supports method

Performance test

Performance test for horizontal inertia force distribution system

	Performance Verification	Designation	Type of Test
Vertical Force	・Ordinary ・Wind load ・Small-middle Earthquake	Maximum compressive stress Buckling stability Bond strength between the inner steel plates and rubber layers	Vertical loading test Dimension measurement Adhesion test
	Large Earthquake	Buckling stability Bond strength between the inner steel plates and rubber layers	Dimension measurement Adhesion test
Horizontal Force	・Ordinary ・Wind load ・Small-middle Earthquake	Shear stiffness	Shear stiffness test
	Large Earthquake	Shear stiffness	Shear stiffness test Dimension measurement
Displacement	Ordinary	Amount of movement Shear strain	Shear stiffness test
	Large Earthquake	Amount of movement Shear strain	Dimension measurement Shear stiffness test
	Rotational Displacement by Traffic Load	Rotational capacity	Vertical loading test
Fatigue durablity	Ordinary	Compressive stress Local shear strain	Vertical loading test Breaking elongation of rubber
		Bond strength between the inner steel plates and rubber layers Aging	Adhesion test Ozone deterioration test

Kawakin Core-Tech Co., Ltd.

Head Office : 2-2-7, Kawaguchi, Kawaguchi-city, Saitama, 332-0015, JAPAN
TEL: +81-48-259-1117 FAX: +81-48-259-1137
Email: info@kawakinkk.co.jp
Branch/Plant : Ibaraki / Tokyo / Osaka / Sendai / Sapporo / Vietnam

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