GUCHEN® ELASTOMERIG BEARINGS

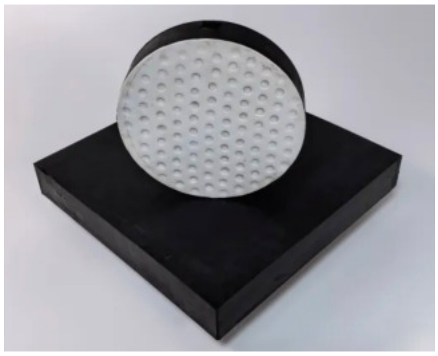
Engineered for Movement. Built for Longevity.

Hebei Guchen Engineering Rubber Co., Ltd.

COMPANY PROFILE

Guchen Bridge Systems is a premier manufacturer and Leading Global Supplier of Elastomeric Bearings. Operating from our advanced production facilities in Hebei, China, we engineer durability and reliability into every product, ensuring the safety and longevity of critical infrastructure projects worldwide.

For over 15 years, we have combined precision engineering with rigorous quality control to deliver solutions that stand up to the most demanding conditions—from heavy traffic loads and extreme weather to seismic events. Our commitment is not just to meet expectations but to exceed them, providing unparalleled value and support at every stage of your project.



Why Partner With Guchen?

Engineering Excellence: Our in-house team of experienced engineers utilizes state-of-the-art design and finite element analysis (FEA) to create joints that perform flawlessly under specified movement ranges and dynamic loads. We offer custom-designed solutions tailored to your project's unique requirements.

Uncompromising Quality: From the selection of high-grade, corrosion-resistant steels and advanced, weather-proof elastomers to our meticulous manufacturing processes, every step is controlled to ensure superior product life. Our products comply with major international standards, including EN, AASHTO, and DIN.

Proven Global Performance: Our elastomeric bearings have been specified and installed for over 30 projects worldwide, encompassing a wide range of structures including right-angle, curved, skewed bridges, and those with cylindrical piers. This global experience equips us with a deep understanding of the diverse challenges faced by engineers and contractors.

Total Project Support: We are more than just a supplier; we are your partner. We provide comprehensive technical documentation, detailed installation guidance, and responsive after-sales support to ensure seamless integration and optimal performance of our systems.

Our Commitment

At Guchen Bridge Systems, our mission is to empower engineers and builders with reliable, innovative, and cost-effective elastomeric bearings that ensure the structural integrity and safety of bridges for decades to come.

Let us help you build smarter, safer, and longer-lasting.

CERTIFICATIONS & COMPLIANCE


营业执照
(副 本)
名 称 河北古晨工程橡胶有限公司
登 记 机 关


开户许可证
经审核，河北古晨工程橡胶有限公司 符合开户条件，准予
开立基本存款账户。
法定代表人（单位负责人）
开户银行
账 号


证 书
CERTIFICATE
河北古晨工程橡胶有限公司
贵单位在全国3.15诚信企业推广活动中，产品质量、售后服务及企业形象，经审核入选为《国家3.15诚信企业》。
国家3.15诚信企业
STATE 3.15 GOOD FAITH ENTERPRISES
中国名牌产品培育委员会
中国品牌调查统计中心


企业信用等级证书
ENTERPRISE CREDIT RATING CERTIFICATE
河北古晨工程橡胶有限公司
AAA级
AAA CERTIFICATE
中国名牌产品培育委员会
中国品牌调查统计中心


证 书
CERTIFICATE
河北古晨工程橡胶有限公司
中国名牌产品培育委员会
中国品牌调查统计中心


ZTC
中 泰 认 证
质量管理体系认证证书
河北古晨工程橡胶有限公司
GB/T 19001-2016 idt ISO 9001:2015
中泰联合认证有限公司


ZTC
中 泰 认 证
环境管理体系认证证书
河北古晨工程橡胶有限公司
GB/T 24001-2016 idt ISO 14001:2015
中泰联合认证有限公司


ZTC
中 泰 认 证
职业健康安全管理体系认证证书
河北古晨工程橡胶有限公司
GB/T 45001-2020 idt ISO 45001:2018
中泰联合认证有限公司


实用新型专利证书
实用新型名称：钢结构球铰支座
发 明 人：连鹏飞
专利权人：河北古晨工程橡胶有限公司
局长
申长雨


型式检验报
检验报告
报告编号：A34915F202208020
产品名称：球型钢支座
委托单位：中冶天工集团有限公司
检验类别：委托检验
国家工程橡胶产品质量检验检测中心（河北）
恒为检验检测认证（河北）集团有限公司

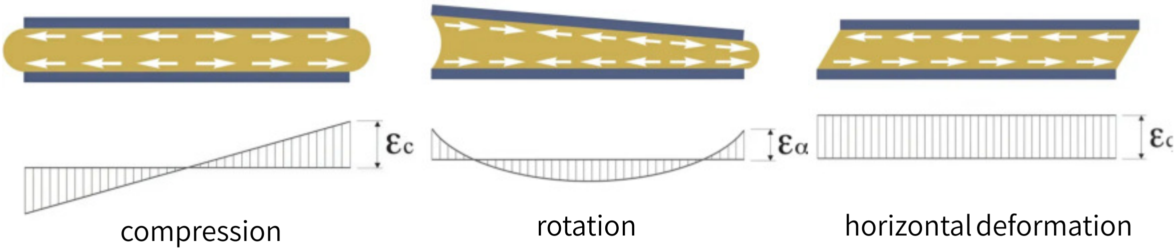

建筑摩擦摆隔震支座
检 测 报 告
工程名称：FPS-II-3500-300-4.4 型式检验
样品名称：建筑摩擦摆隔震支座
委托单位：河北古晨工程橡胶有限公司
检测日期：2024 年 01 月 15 日~2024 年 03 月 15 日
报告总页数：共 17 页
委托编号：ZHA2-F119-2024000050
报告编号：ZHA2-B119-2024000102
武汉中和工程技术有限公司

Elastomeric Bearings

APPLIGATIONS

Behaviour

Each elemental layer, subject to stresses and movements, deflects as shown in the three diagrams below:



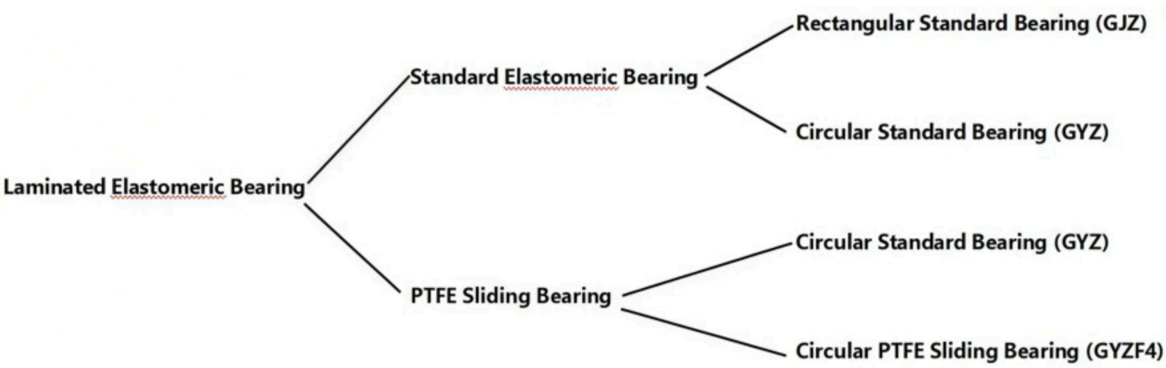
The laminated elastomeric bearing is manufactured by vulcanizing and bonding multiple layers of rubber sheets with thin steel plates. It possesses sufficient vertical stiffness to reliably transfer the reactions from the superstructure to the substructure. The bearing exhibits excellent elasticity to accommodate beam-end rotations, along with significant shear deformation capacity to accommodate horizontal movements of the superstructure.

Use

Laminated elastomeric bearings are not only excellent in technical performance but also offer outstanding advantages including simple construction, cost-effectiveness, and easy maintenance & replacement. Furthermore, their capabilities in shock absorption, vibration isolation, and low structural height make them a popular and widely adopted solution in the bridge industry.

Classification and Designation

(1) Laminated elastomeric bearings are classified by structural type as follows:

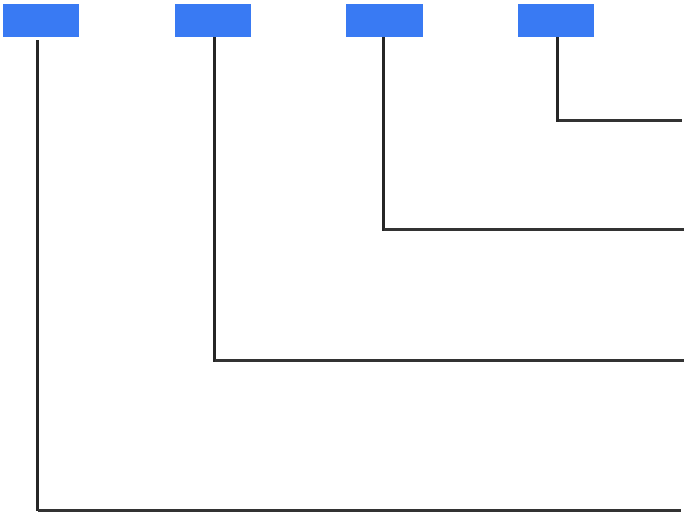


(2) Classification by Elastomer Type and Service Temperature:

A: Normal Temperature Type: Manufactured using Chloroprene Rubber (CR), suitable for a temperature range of -25°C to +60°C.

B: Cold Resistance Type: Manufactured using Natural Rubber (NR), suitable for a temperature range of -40°C to +60°C.

(3) Bearing Designation System:



Elastomer Type (Chloroprene Rubber (CR), Natural Rubber (NR)

Plan Dimensions (Rectangular: La x Lb xt-mm; Circular, d xt-mm)

Type Code (F4 indicates a PTFE sliding bearing: no code indicates a standard bearing)

Product Code (G)Z denotes rectangular highway bridge bearing; GyZ denotes circular highway bridae bearing)

Standard Elastomeric Bearing

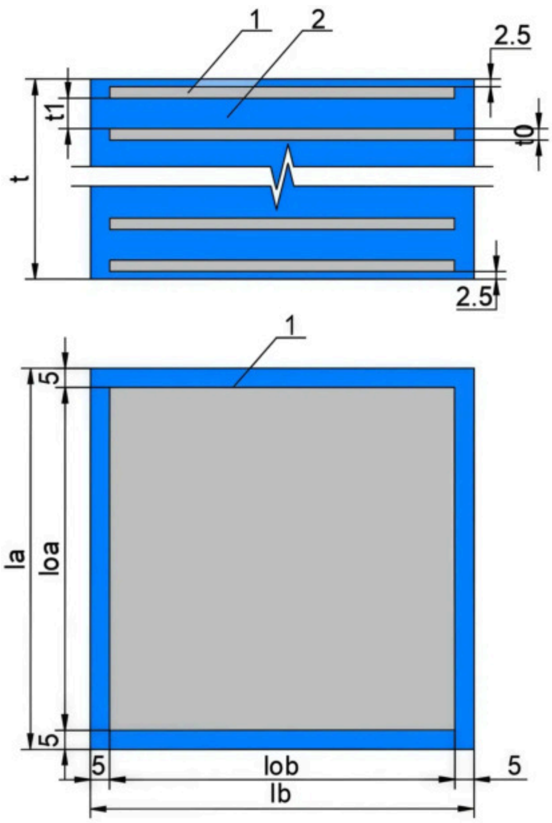


Figure 1. Structure of a Rectangular Laminated Elastomeric Bearing (Unit: mm) | 1 - Steel Reinforcement Layer; 2 - Elastomer Layer

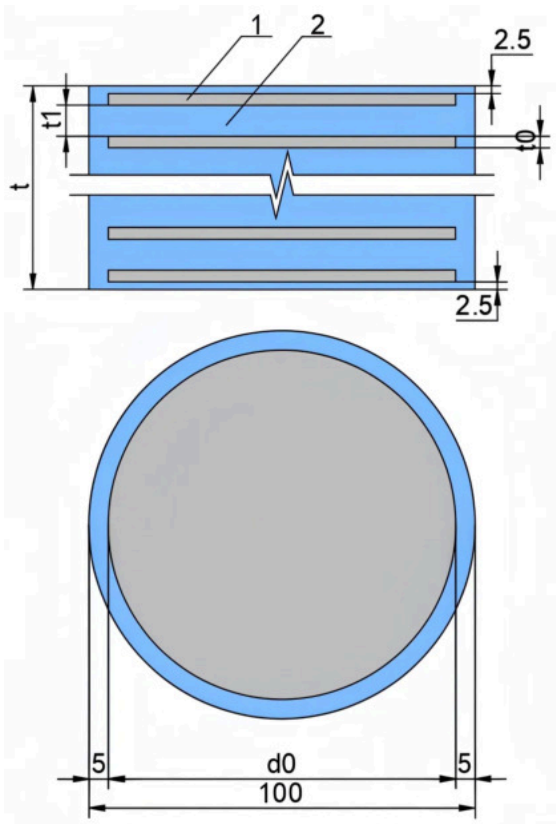


Figure 2. Structure of a Circular Laminated Elastomeric Bearing (Unit: mm) | 1 - Steel Reinforcement Layer; 2 - Elastomer Layer

(1) The structural diagrams for standard elastomeric bearings are shown in Figures 1 and 2 below.

(2) The designations for standard elastomeric bearings are GJZ for rectangular and GYZ for circular. The product series and specifications are listed in Table 1. The meanings of the symbols in the table are as follows:

La × Lb or d: Plan dimensions or diameter;Rck:Maximum bearing capacity;S:Shape factor;t: Total thickness of the bearing;Δl1: Maximum displacement without considering braking force;Δl2: Maximum displacement considering braking force;te: Total thickness of rubber layers;tanθ: Allowable rotation tangent value;RGK:Minimum bearing pressure for anti-sliding;t0:Thickness of the intermediate rubber layer;Thickness of the intermediate rubber layer.

Table 1 Selection Parameters for GJZ and GYZ Elastomeric Bearing Specification Series

NO.	$l_a \times l_b$(或d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_1 (mm)	Δl_2 (mm)	t_e (mm)	tan θ (The unit of θ is rad)			R_{GK}(kN)			t_1 (mm)	t_0 (mm)
								Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region		
1	100×150	101	5.48	21	5.0	7.0	15	0.0107	0.0090	0.0074	35	42	53	5	2
				28	7.5	10.5	20	0.0160	0.0135	0.0111	(53)	(63)	(79)		
2	100×200	137	6.11	21	5.0	7.0	15	0.0087	0.0074	0.0061	47	56	70	5	2
				28	7.5	10.5	20	0.0131	0.0111	0.0091	(70)	(84)	(105)		
3	d150	154	7.00	21	5.0	7.0	15	0.0057	0.0050	–				5	2
				28	7.5	10.5	20	0.0085	0.0073	0.0060	41	49	62		
				35	10.0	14.0	25	0.0114	0.0097	0.0080	(62)	(74)	(93)		
				42	12.5	17.5	30	0.0143	0.0122	0.0101					
4	150×150	196	7.00	21	5.0	7.0	15	0.0057	0.0050	–				5	2
				28	7.5	10.5	20	0.0085	0.0073	0.0060	53	63	79		
				35	10.0	14.0	25	0.0114	0.0097	0.0080	(79)	(95)	(118)		
				42	12.5	17.5	30	0.0143	0.0122	0.0101					
5	150×200	266	8.06	21	5.0	7.0	15	0.0050	–	–				5	2
				28	7.5	10.5	20	0.0067	0.0057	0.0050	70	84	105		
				35	10.0	14.0	25	0.0089	0.0077	0.0064	(105)	(126)	(158)		
				42	12.5	17.5	30	0.0112	0.0096	0.0080					
6	150×250	336	8.84	28	7.5	10.5	20	0.0057	0.0050	–	88	105	131	5	2
				35	10.0	14.0	25	0.0077	0.0066	0.0050	(131)	(158)	(197)		
				42	12.5	17.5	30	0.0096	0.0083	0.0069					
7	150×300	406	9.44	28	7.5	10.5	20	0.0052	0.0050	–	105	126	158	5	2
				35	10.0	14.0	25	0.0069	0.0060	0.0050	(158)	(189)	(236)		
				42	12.5	17.5	30	0.0086	0.0074	0.0063					
8	d200	284	9.50	35	10.0	14.0	25	0.0051	–	–				5	2
				42	12.5	17.5	30	0.0064	0.0055	0.0050	73	88	110		
				49	15.0	21.0	35	0.0077	0.0066	0.0056	(110)	(132)	(165)		
				56	17.5	24.5	40	0.0089	0.0077	0.0065					

NO.	$l_a \times l_b$(或d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_1 (mm)	Δl_2 (mm)	t_e (mm)	tan θ (The unit of θ is rad)			R_{GK}(kN)			t_1 (mm)	t_0 (mm)
								Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region		
9	200 × 200	361	9.50	35	10.0	14.0	25	0.0051	–	–	93 (140)	112 (168)	140 (210)	5	2
				42	12.5	17.5	30	0.0064	0.0055	0.0050					
				49	15.0	21.0	35	0.0077	0.0066	0.0056					
				56	17.5	24.5	40	0.0089	0.0077	0.0065					
10	200 × 250	456	10.60	42	12.5	17.5	30	0.0054	0.0050	–	117 (175)	140 (210)	175 (263)	5	2
				49	15.0	21.0	35	0.0064	0.0056	0.0050					
				56	17.5	24.5	40	0.0075	0.0066	0.0056					
11	200 × 300	551	7.17	30	8.0	11.2	21	0.0066	0.0056	0.0050	140 (210)	168 (252)	210 (315)	8	3
				41	12.0	16.8	29	0.0098	0.0084	0.0070					
				52	16.0	22.4	37	0.0131	0.0112	0.0093					
12	200 × 350	646	7.62	30	8.0	11.2	21	0.0059	0.0051	–	163 (245)	196 (294)	245 (368)	8	3
				41	12.0	16.8	29	0.0089	0.0076	0.0063					
				52	16.0	22.4	37	0.0118	0.0101	0.0084					
13	200 × 400	741	7.98	30	8.0	11.2	21	0.0055	0.0050	–	187 (280)	224 (336)	280 (368)	8	3
				41	12.0	16.8	29	0.0082	0.0070	0.0059					
				52	16.0	22.4	37	0.0109	0.0093	0.0078					
14	d250	452	7.50	41	12.0	16.8	29	0.0073	0.0062	0.0052	115 (172)	137 (206)	172 (258)	8	3
				52	16.0	22.4	37	0.0097	0.0083	0.0069					
				63	20.0	28.0	45	0.0121	0.0104	0.0086					
				74	24.0	33.6	53	0.0146	0.0124	0.0103					
15	250 × 250	576	7.50	41	12.0	16.8	29	0.0073	0.0062	0.0052	146 (219)	175 (263)	219 (328)	8	3
				52	16.0	22.4	37	0.0097	0.0083	0.0069					
				63	20.0	28.0	45	0.0121	0.0104	0.0086					
				74	24.0	33.6	53	0.0146	0.0124	0.0103					
16	250 × 300	696	8.21	41	12.0	16.8	29	0.0062	0.0054	0.0050	175 (263)	210 (315)	263 (394)	8	3
				52	16.0	22.4	37	0.0083	0.0071	0.0060					
				63	20.0	28.0	45	0.0104	0.0089	0.0075					
				74	24.0	33.6	53	0.0125	0.0107	0.0090					
17	250 × 350	816	8.79	41	12.0	16.8	29	0.0056	0.0050	–	204 (306)	245 (368)	205 (459)	8	3
				52	16.0	22.4	37	0.0074	0.0064	0.0054					
				63	20.0	28.0	45	0.0093	0.0080	0.0067					
				74	24.0	33.6	53	0.0111	0.0096	0.0081					
18	250 × 400	936	9.29	41	12.0	16.8	29	0.0051	–	–	233 (350)	280 (420)	350 (525)	8	3
				52	16.0	22.4	37	0.0068	0.0059	0.0050					
				63	20.0	28.0	45	0.0085	0.0073	0.0062					
				74	24.0	33.6	53	0.0102	0.0088	0.0074					
19	250 × 450	1056	9.71	41	12.0	16.8	29	0.0050	–	–	263 (394)	315 (473)	394 (591)	8	3
				52	16.0	22.4	37	0.0063	0.0055	0.0050					
				63	20.0	28.0	45	0.0079	0.0068	0.0058					
				74	24.0	33.6	53	0.0095	0.0082	0.0069					
20	250 × 500	1176	10.07	41	12.0	16.8	29	0.0050	–	–	292 (438)	350 (525)	438 (656)	8	3
				52	16.0	22.4	37	0.0060	0.0052	–					
				63	20.0	28.0	45	0.0074	0.0065	0.0055					
				74	24.0	33.6	53	0.0089	0.0078	0.0066					
21	d300	661	9.06	52	16.0	22.4	37	0.0059	0.0051	–	165 (247)	198 (297)	247 (371)	8	3
				63	20.0	28.0	45	0.0074	0.0063	0.0053					
				74	24.0	33.6	53	0.0088	0.0076	0.0064					
				85	28.0	39.2	61	0.0103	0.0089	0.0075					

NO.	$l_a \times l_b$(或d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_1 (mm)	Δl_2 (mm)	t_e (mm)	tan θ (The unit of θ is rad)			R_{GK}(kN)			t_1 (mm)	t_0 (mm)
								Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region		
22	300 × 300	841	9.06	52	16.0	22.4	37	0.0059	0.0051	–	210 (315)	252 (378)	315 (473)	8	3
				63	20.0	28.0	45	0.0074	0.0063	0.0053					
				74	24.0	33.6	53	0.0088	0.0076	0.0064					
				85	28.0	39.2	61	0.0103	0.0089	0.0075					
23	300 × 350	986	9.78	52	16.0	22.4	37	0.0052	0.0050	–	245 (368)	294 (441)	368 (551)	8	3
				63	20.0	28.0	45	0.0065	0.0056	0.0050					
				74	24.0	33.6	53	0.0078	0.0068	0.0057					
				85	28.0	39.2	61	0.0091	0.0079	0.0067					
24	300 × 400	1131	10.40	52	16.0	22.4	37	0.0050	–	–	280 (420)	336 (504)	420 (630)	8	3
				63	20.0	28.0	45	0.0059	0.0051	–					
				74	24.0	33.6	53	0.0071	0.0062	0.0053					
				85	28.0	39.2	61	0.0083	0.0072	0.0061					
25	300 × 450	1276	10.92	63	20.0	28.0	45	0.0055	0.0050	–	315 (473)	378 (567)	473 (709)	8	3
				74	24.0	33.6	53	0.0066	0.0057	0.0050					
				85	28.0	39.2	61	0.0077	0.0067	0.0057					
26	300 × 500	1421	8.28	54	16.5	23.1	38	0.0070	0.0061	0.0051	350 (525)	420 (630)	525 (788)	11	4
				69	22.0	30.8	49	0.0094	0.0081	0.0068					
				84	27.5	38.5	60	0.0117	0.0101	0.0084					
27	300 × 550	1566	8.58	54	16.5	23.1	38	0.0066	0.0057	0.0050	385 (578)	462 (693)	578 (866)	11	4
				69	22.0	30.8	49	0.0088	0.0076	0.0064					
				84	27.5	38.5	60	0.0110	0.0095	0.0080					
28	300 × 600	1171	8.84	54	16.5	23.1	38	0.0063	0.0054	0.0050	420 (630)	504 (756)	630 (945)	11	4
				69	22.0	30.8	49	0.0084	0.0073	0.0061					
				84	27.5	38.5	60	0.0105	0.0091	0.0076					
29	d350	908	10.63	63	20.0	28.0	45	0.0050	–	–	224 (337)	269 (404)	337 (505)	8	3
				74	24.0	33.6	53	0.0059	0.0051	–					
				85	28.0	39.2	61	0.0068	0.0060	0.0051					
				96	32.0	44.8	69	0.0078	0.0068	0.0058					
30	350 × 350	1156	10.63	63	20.0	28.0	45	0.0059	–	–	286 (429)	343 (515)	429 (643)	8	3
				74	24.0	33.6	53	0.0059	0.0051	–					
				85	28.0	39.2	61	0.0068	0.0060	0.0051					
				96	32.0	44.8	69	0.0078	0.0068	0.0068					
31	350 × 400	1326	8.26	54	16.5	23.1	38	0.0061	0.0052	–	327 (490)	392 (588)	490 (735)	11	4
				69	22.0	30.8	49	0.0081	0.0069	0.0058					
				84	27.5	38.5	60	0.0101	0.0087	0.0073					
				99	33.0	46.2	71	0.0121	0.0104	0.0087					
32	350 × 450	1496	8.72	54	16.5	23.1	38	0.0055	0.0050	–	368 (551)	441 (662)	551 (827)	11	4
				69	22.0	30.8	49	0.0074	0.0064	0.0053					
				84	27.5	38.5	60	0.0092	0.0079	0.0067					
				99	33.0	46.2	71	0.0111	0.0095	0.0080					
33	350 × 500	1666	9.12	54	16.5	23.1	38	0.0051	–	–	408 (613)	490 (735)	613 (919)	11	4
				69	22.0	30.8	49	0.0069	0.0059	0.0050					
				84	27.5	38.5	60	0.0086	0.0074	0.0062					
				99	33.0	46.2	71	0.0103	0.0089	0.0075					
34	350 × 550	1836	9.48	54	16.5	23.1	38	0.0050	–	–	449 (674)	539 (809)	674 (1011)	11	4
				69	22.0	30.8	49	0.0064	0.0056	0.0050					
				84	27.5	38.5	60	0.0081	0.0070	0.0059					
				99	33.0	46.2	71	0.0097	0.0084	0.0071					
35	350 × 600	2006	9.80	54	16.5	23.1	38	0.0050	–	–	490 (735)	588 (882)	735 (1103)	11	4
				69	22.0	30.8	49	0.0061	0.0053	0.0050					
				84	27.5	38.5	60	0.0076	0.0066	0.0056					
				99	33.0	46.2	71	0.0092	0.0079	0.0067					
36	d400	1195	8.86	54	16.5	23.1	38	0.0050	–	–	293 (440)	352 (528)	440 (660)	11	4
				69	22.0	30.8	49	0.0063	0.0054	0.0050					
				84	27.5	38.5	60	0.0079	0.0068	0.0057					
				99	33.0	46.2	71	0.0094	0.0081	0.0068					

NO.	$l_a \times l_b$(或d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_1 (mm)	Δl_2 (mm)	t_e (mm)	tan θ (The unit of θ is rad)			R_{GK}(kN)			t_1 (mm)	t_0 (mm)
								Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region		
39	400×450	1911	9.87	69	22.0	30.8	49	0.0053	0.0050	–	467 (700)	560 (840)	700 (1050)	11	4
				84	27.5	38.5	60	0.0066	0.0057	0.0050					
				99	33.0	46.2	71	0.0079	0.0069	0.0058					
				114	38.5	53.9	82	0.0092	0.0080	0.0068					
40	400×550	2 106	10.29	69	22.0	30.8	49	0.0050	–	–	513 (770)	616 (924)	770 (1155)	11	4
				84	27.5	38.5	60	0.0062	0.0054	0.0050					
				99	33.0	46.2	71	0.0074	0.0065	0.0055					
41	400×600	2 301	10.67	69	22.0	30.8	49	0.0050	–	–	560 (840)	672 (1008)	840 (1260)	11	4
				84	27.5	38.5	60	0.0058	0.0051	–					
				99	33.0	46.2	71	0.0070	0.0061	0.0052					
42	400×650	2 490	11.02	69	22.0	30.8	49	0.0050	–	–	607 (910)	728 (1092)	910 (1365)	11	4
				84	27.5	38.5	60	0.0056	0.0050	–					
				99	33.0	46.2	71	0.0067	0.0058	0.0050					
43	d450	1 521	10.00	69	22.0	30.8	49	0.0050	–	–	371 (557)	445 (668)	557 (835)	11	4
				84	27.5	38.5	60	0.0057	0.0050	–					
				99	33.0	46.2	71	0.0069	0.0060	0.0051					
				114	38.5	53.9	82	0.0080	0.0070	0.0059					
44	450×450	1 936	10.00	69	22.0	30.8	49	0.0050	–	–	473 (709)	567 (851)	709 (1063)	11	4
				84	27.5	38.5	60	0.0057	0.0050	–					
				99	33.0	46.2	71	0.0069	0.0060	0.0051					
				114	38.5	53.9	82	0.0080	0.0070	0.0059					
45	450×500	2 156	10.54	84	27.5	38.5	60	0.0053	0.0050	–	525 (788)	630 (945)	788 (1181)	11	4
				99	33.0	46.2	71	0.0064	0.0055	0.0050					
				114	38.5	53.9	82	0.0074	0.0065	0.0055					
46	450×550	2 376	11.02	84	27.5	38.5	60	0.0050	–	–	578 (866)	693 (1040)	866 (1299)	11	4
				99	33.0	46.2	71	0.0059	0.0052	–					
				114	38.5	53.9	82	0.0069	0.0061	0.0052					
47	450×600	2 596	8.40	70	22.5	31.5	50	0.0062	0.0054	0.0050	630 (945)	756 (1134)	945 (1418)	15	5
				90	30.0	42.0	65	0.0083	0.0072	0.0060					
				110	37.5	52.5	80	0.0104	0.0090	0.0075					
48	450×650	2 816	8.69	70	22.5	31.5	50	0.0059	0.0051	–	683 (1024)	819 (1229)	1024 (1536)	15	5
				90	30.0	42.0	65	0.0079	0.0068	0.0057					
				110	37.5	52.5	80	0.0098	0.0085	0.0071					
49	d500	1 886	8.17	70	22.5	31.5	50	0.0059	0.0051	–	458 (687)	550 (825)	687 (1031)	15	5
				90	30.0	42.0	65	0.0079	0.0067	0.0056					
				110	37.5	52.5	80	0.0098	0.0084	0.0070					
				130	45.0	63.0	95	0.0118	0.0101	0.0085					

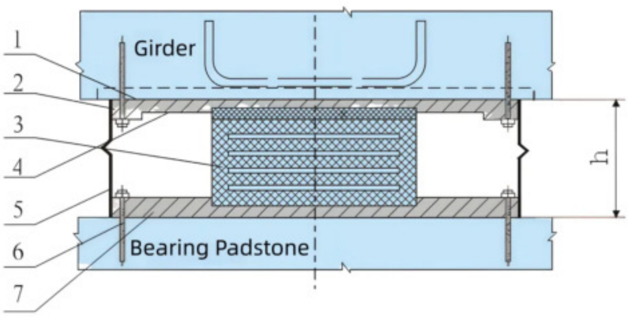
NO.	$l_a \times l_b$(或d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_1 (mm)	Δl_2 (mm)	t_e (mm)	tan θ (The unit of θ is rad)			R_{GK}(kN)			t_1 (mm)	t_0 (mm)
								Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region		
50	500 × 500	2 401	8.17	70	22.5	31.5	50	0.0059	0.0051	–	583 (875)	700 (1050)	875 (1313)	15	5
				90	30.0	42.0	65	0.0079	0.0067	0.0056					
				110	37.5	52.5	80	0.0098	0.0084	0.0070					
				130	45.0	63.0	95	0.0118	0.0101	0.0085					
51	500 × 550	2 646	8.56	70	22.5	31.5	50	0.0054	0.0050	–	642 (963)	770 (1155)	963 (1444)	15	5
				90	30.0	42.0	65	0.0073	0.0063	0.0052					
				110	37.5	52.5	80	0.0091	0.0078	0.0066					
				130	45.0	63.0	95	0.0109	0.0094	0.0079					
52	500 × 600	2 891	8.92	70	22.5	31.5	50	0.0051	–	–	700 (1050)	840 (1260)	1050 (1575)	15	5
				90	30.0	42.0	65	0.0068	0.0059	0.0050					
				110	37.5	52.5	80	0.0085	0.0073	0.0062					
				130	45.0	63.0	95	0.0102	0.0088	0.0077					
53	500 × 650	3 136	9.25	70	22.5	31.5	50	0.0050	–	–	758 (1138)	910 (1365)	1138 (1706)	15	5
				90	30.0	42.0	65	0.0064	0.0055	0.0050					
				110	37.5	52.5	80	0.0080	0.0069	0.0058					
				130	45.0	63.0	95	0.0096	0.0083	0.0070					
54	500 × 700	3 381	9.55	70	22.5	31.5	50	0.0050	–	–	817 (1225)	980 (1470)	1225 (1838)	15	5
				90	30.0	42.0	65	0.0061	0.0053	–					
				110	37.5	52.5	80	0.0076	0.0066	0.0056					
				130	45.0	63.0	95	0.0091	0.0079	0.0067					
55	d550	2 290	9.00	90	30.0	42.0	65	0.0061	0.0052	–	554 (832)	665 (998)	832 (1247)	15	5
				110	37.5	52.5	80	0.0076	0.0066	0.0055					
				130	45.0	63.0	95	0.0091	0.0079	0.0066					
				150	52.5	73.5	110	0.0106	0.0092	0.0077					
56	550 × 550	2 916	9.0	90	30.0	42.0	65	0.0061	0.0052	–	706 (1059)	847 (1271)	1059 (1588)	15	5
				110	37.5	52.5	80	0.0076	0.0066	0.0055					
				130	45.0	63.0	95	0.0091	0.0079	0.0066					
				150	52.5	73.5	110	0.0106	0.0092	0.0077					
57	550 × 600	3 186	9.40	90	30.0	42.0	65	0.0057	0.0050	–	770 (1155)	924 (1386)	1155 (1733)	15	5
				110	37.5	52.5	80	0.0071	0.0061	0.0052					
				130	45.0	63.0	95	0.0085	0.0073	0.0062					
				150	52.5	73.5	110	0.0109	0.0086	0.0072					
58	550 × 650	3 456	9.76	90	30.0	42.0	65	0.0053	0.0050	–	834 (1 251)	1 001 (1 502)	1 251 (1 877)	15	5
				110	37.5	52.5	80	0.0067	0.0058	0.0050					
				130	45.0	63.0	95	0.0080	0.0069	0.0059					
				150	52.5	73.5	110	0.0093	0.0081	0.0069					

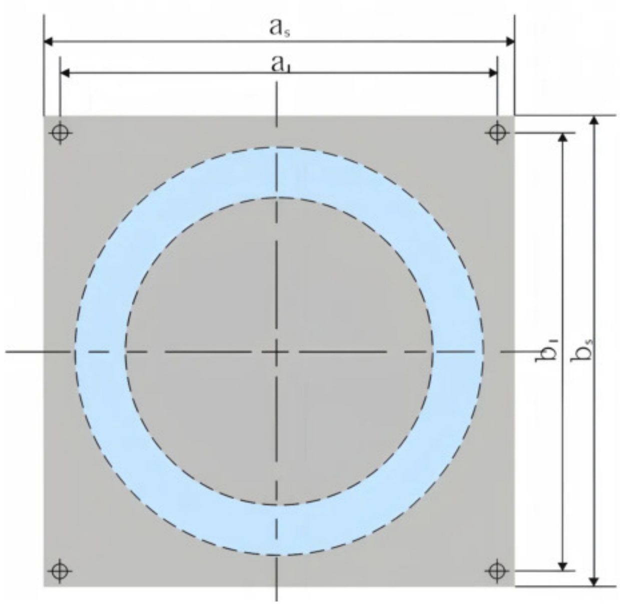
NO.	$l_a \times l_b$(或d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_1 (mm)	Δl_2 (mm)	t_e (mm)	tan θ (The unit of θ is rad)			R_{Gk}(kN)			t_1 (mm)	t_0 (mm)
								Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region		
59	d600	2 734	9.83	90	30.0	42.0	65	0.0050	–	–	660 (990)	792 (1 188)	990 (1 484)	15	5
				110	37.5	52.5	80	0.0060	0.0052	–					
				130	45.0	63.0	95	0.0072	0.0063	0.0053					
				150	52.5	73.5	110	0.0085	0.0073	0.0062					
60	600 × 600	3 481	9.83	90	30.0	42.0	65	0.0050	–	–	840 (1 260)	1 008 (1 512)	1 260 (1 890)	15	5
				110	37.5	52.5	80	0.0060	0.0052	–					
				130	45.0	63.0	95	0.0072	0.0063	0.0053					
				150	52.5	73.5	110	0.0085	0.0073	0.0062					
61	600 × 650	3 776	10.23	90	30.0	42.0	65	0.0050	–	–	910 (1 365)	1 092 (1 638)	1 365 (2 048)	15	5
				110	37.5	52.5	80	0.0057	0.0050	–					
				130	45.0	63.0	95	0.0068	0.0059	0.0050					
				150	52.5	73.5	110	0.0079	0.0069	0.0059					
62	600 × 700	4 071	10.60	110	37.5	52.5	80	0.0054	0.0050	–	980 (1 470)	1 176 (1 764)	1 470 (2 205)	15	5
				130	45.0	63.0	95	0.0064	0.0056	0.0050					
				150	52.5	73.5	110	0.0075	0.0066	0.0056					
63	600 × 750	4 366	10.94	110	37.5	52.5	80	0.0051	0.0050	–	1 050 (1 575)	1 260 (1 890)	1 575 (2 363)	15	5
				130	45.0	63.0	95	0.0061	0.0054	0.0050					
				150	52.5	73.5	110	0.0072	0.0063	0.0054					
64	d650	3 217	10.67	110	37.5	52.5	80	0.0050	–	–	774 (1 161)	929 (1 394)	1 161 (1 742)	15	5
				130	45.0	63.0	95	0.0059	0.0051	–					
				150	52.5	73.5	110	0.0069	0.0060	0.0051					
				170	60.0	84.0	125	0.0078	0.0068	0.0059					
65	650 × 650	4 096	10.67	110	37.5	52.5	80	0.0050	–	–	986 (1 479)	1 183 (1 775)	1 479 (2 218)	15	5
				130	45.0	63.0	95	0.0059	0.0051	–					
				150	52.5	73.5	110	0.0069	0.0060	0.0051					
				170	60.0	84.0	125	0.0079	0.0068	0.0059					
66	650 × 700	4 416	9.20	102	36.0	50.4	77	0.0060	0.0052	–	1 062 (1 593)	1 274 (1 911)	1 593 (2 389)	18	5
				125	45.0	63.0	95	0.0074	0.0064	0.0054					
				148	54.0	75.6	113	0.0089	0.0077	0.0065					
				171	63.0	88.2	131	0.0104	0.0090	0.0076					
67	650 × 750	4 736	9.53	102	36.0	50.4	77	0.0056	0.0050	–	1 138 (1 706)	1 365 (2 048)	1 706 (2 559)	18	5
				125	45.0	63.0	95	0.0070	0.0061	0.0051					
				148	54.0	75.6	113	0.0084	0.0073	0.0062					
				171	63.0	88.2	131	0.0099	0.0085	0.0072					

NO.	$l_a \times l_b$(或d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_1 (mm)	Δl_2 (mm)	t_e (mm)	tan θ (The unit of θ is rad)			R_{GK}(kN)			t_1 (mm)	t_0 (mm)
								Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region		
68	d700	3 739	9.58	102	36.0	50.4	77	0.0052	0.0050	–	898 (1 347)	1 078 (1 616)	1 347 (2 020)	18	5
				125	45.0	63.0	95	0.0065	0.0056	0.0050					
				148	54.0	75.6	113	0.0078	0.0067	0.0057					
				171	63.0	88.2	131	0.0091	0.0079	0.0066					
69	700 × 700	4 761	9.58	102	36.0	50.4	77	0.0052	0.0050	–	1 143 (1 715)	1 372 (2 058)	1 715 (2 573)	18	5
				125	45.0	63.0	95	0.0065	0.0056	0.0050					
				148	54.0	75.6	113	0.0078	0.0067	0.0057					
				171	63.0	88.2	131	0.0091	0.0079	0.0066					
70	d750	4 301	10.28	125	45.0	63.0	95	0.0054	0.0050	–	1 031 (1 546)	1 237 (1 856)	1 546 (2 319)	18	18
				148	54.0	75.6	113	0.0065	0.0056	0.0050					
				171	63.0	88.2	131	0.0076	0.0066	0.0056					
				194	72.0	100.8	149	0.0086	0.0075	0.0064					
71	d800	4 902	10.97	125	45.0	63.0	95	0.0050	–	–	1 173 (1 759)	1 407 (2 111)	1 759 (2 639)	18	5
				148	54.0	75.6	113	0.0055	0.0050	–					
				171	63.0	88.2	131	0.0064	0.0056	0.0050					
				194	72.0	100.8	149	0.0073	0.0064	0.0055					

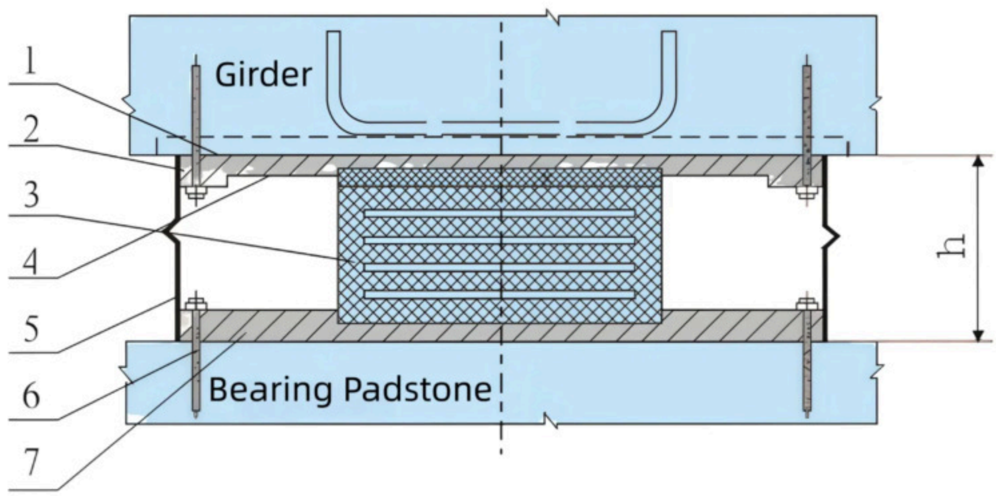
GYZF4 Structural Schematic

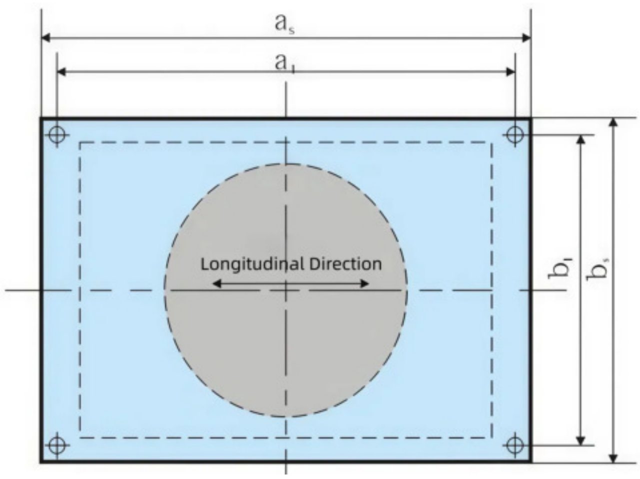
It is manufactured by bonding a specified thickness of polytetrafluoroethylene (PTFE) plate to the top surface of the GYZ series bearing. In addition to retaining all the features of the GYZ series, it utilizes the low friction coefficient between the PTFE plate and the stainless steel plate embedded in the girder bottom. This allows the superstructure's horizontal displacement to exceed the shear deformation limit of the bearing itself, meeting the large displacement requirements of certain bridges.





1– Top Bearing Plate
2– Galvanized Screw
3– GYZF4 Circular Bearing
4– Stainless Steel Plate
5– Dust Guard
6– Anchor Bolt
7– Bottom Bearing Plate
h– Bearing Assembled Height, mm
a_1、b_1– Anchor Bolt Hole Spacing (Top/ Bottom Plate), mm
a_s、b_s– Top/Bottom Plate Dimensions, mm
δ – Bearing Thickness, mm





1– Top Bearing Plate
2– Galvanized Screw
3– GYZF4 Circular Bearing
4– Stainless Steel Plate
5– Dust Guard
6– Anchor Bolt
7– Bottom Bearing Plate
h– Bearing Assembled Height, mm
a_1、b_1– Anchor Bolt Hole Spacing (Top/ Bottom Plate), mm
a_s、b_s– Top/Bottom Plate Dimensions, mm
δ – Bearing Thickness, mm

Table 2 Selection Parameters for GJZF4 and GYZF4 Elastomeric Bearing Specification Series

NO.	$l_a \times l_b$ (d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_3 (mm)		Δl_4 (mm)		t_e (mm)	tan θ (The unit of θ is rad)			R_{ck}(kN)			t_1 (mm)	t_0 (mm)	t (mm)
					Longitudinal Direction	Transverse Direction	Longitudinal Direction	Transverse Direction		Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region			
1	100 × 150	101	5.48	23	±30	±20	±30	±3	15	0.0107	0.0090	0.0074	53	63	79	5	2	2
				30					20	0.0106	0.0135	0.0111						
2	100 × 200	137	6.11	23	±30	±20	±30	±3	15	0.0087	0.0074	0.0061	70	84	105	5	2	2
				30					20	0.0131	0.0111	0.0091						
3	d150	154	7.00	23	±30	±20	±30	±3	15	0.0057	0.0050	–	62	74	93	5	2	2
				30					20	0.0085	0.0073	0.0060						
				37					25	0.0114	0.0097	0.0080						
				44					30	0.0143	0.0122	0.0101						
4	150 × 150	196	7.00	23	±30	±20	±30	±3	15	0.0057	0.0050	–	79	95	118	5	2	2
				30					20	0.0085	0.0073	0.0060						
				37					25	0.0114	0.0097	0.0080						
				44					30	0.0143	0.0122	0.0101						
5	150 × 200	266	8.06	23	±30	±20	±30	±3	15	0.0050	–	–	105	126	158	5	2	2
				30					20	0.0067	0.0057	0.0050						
				37					25	0.0089	0.0077	0.0064						
				44					30	0.0112	0.0096	0.0080						
6	150 × 250	336	8.84	30	±30	±20	±30	±3	20	0.0057	0.0050	–	131	158	197	5	2	2
				37					25	0.0077	0.0066	0.0055						
				44					30	0.0096	0.0083	0.0069						
7	150 × 300	406	9.44	30	±30	±20	±30	±3	20	0.0052	0.0050	–	158	189	236	5	2	2
				37					25	0.0069	0.0060	0.0050						
				44					30	0.0086	0.0074	0.0063						
8	d200	284	9.50	37	±30	±20	±30	±3	25	0.0051	–	–	110	132	165	5	2	2
				44					30	0.0064	0.0055	0.0050						
				51					35	0.0077	0.0066	0.0056						
				58					40	0.0089	0.0077	0.0065						
9	200 × 200	361	9.50	37	±30	±20	±30	±3	25	0.0051	–	–	140	168	210	5	2	2
				44					30	0.0064	0.0055	0.0050						
				51					35	0.0077	0.0066	0.0056						
				58					40	0.0089	0.0077	0.0065						
10	200 × 250	456	10.60	44	±30	±20	±30	±3	30	0.0054	0.0050	–	175	210	263	5	2	2
				51					35	0.0064	0.0056	0.0050						
				58					40	0.0075	0.0066	0.0056						
11	200 × 300	551	7.17	32	±30	±20	±30	±3	21	0.0066	0.0056	0.0050	210	252	315	8	3	2
				43					29	0.0098	0.0084	0.0070						
				54					37	0.0131	0.0112	0.0093						
12	200 × 350	646	7.62	32	±30	±20	±30	±3	21	0.0059	0.0051	–	245	294	368	8	3	2
				43					29	0.0089	0.0076	0.0063						
				54					37	0.0118	0.0101	0.0084						
13	200 × 400	741	7.98	32	±30	±20	±30	±3	21	0.0055	0.0050	–	280	336	420	8	3	2
				43					29	0.0082	0.0070	0.0059						
				54					37	0.0109	0.0093	0.0078						
14	d250	452	7.50	43	±60	±30	±60	±3	29	0.0073	0.0062	0.0052	172	206	258	8	3	2
				54					37	0.0097	0.0083	0.0069						
				65					45	0.0121	0.0104	0.0086						
				76					53	0.0146	0.0124	0.0103						
15	250 × 250	576	7.50	43	±50	±20	±50	±3	29	0.0073	0.0062	0.0052	219	263	328	8	3	2
				54					37	0.0097	0.0083	0.0069						
				65					45	0.0121	0.0104	0.0086						
				76					53	0.0146	0.0124	0.0103						

NO.	$l_a \times l_b$ (d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_3 (mm) Longitudinal Direction	Δl_3 (mm) Transverse Direction	Δl_4 (mm) Longitudinal Direction	Δl_4 (mm) Transverse Direction	t_e (mm)	tan θ (The unit of θ is rad) Moderate Temperature Region	tan θ Cold Region	tan θ Severe Cold Region	R_{CK}(kN) Moderate Temperature Region	R_{CK}(kN) Cold Region	R_{CK}(kN) Severe Cold Region	t_1 (mm)	t_0 (mm)	t (mm)
16	250 × 300	696	8.21	43	± 50	± 20	± 50	± 3	29	0.0062	0.0054	0.0050	263	315	394	8	3	2
				54					37	0.0083	0.0071	0.0060						
				65					45	0.0104	0.0089	0.0075						
				76					53	0.0125	0.0107	0.0090						
17	250 × 350	816	8.79	43	± 50	± 20	± 50	± 3	29	0.0056	0.0050	–	306	368	459	8	3	2
				54					37	0.0074	0.0064	0.0054						
				65					45	0.0093	0.0080	0.0067						
				76					53	0.0111	0.0096	0.0081						
18	250 × 400	936	9.29	43	± 50	± 20	± 50	± 3	29	0.0051	–	–	350	420	525	8	3	2
				54					37	0.0068	0.0059	0.0050						
				65					45	0.0085	0.0073	0.0062						
				76					53	0.0102	0.0088	0.0074						
19	250 × 450	1056	9.71	43	± 50	± 20	± 50	± 3	29	0.0050	–	–	394	473	591	8	3	2
				54					37	0.0063	0.0055	0.0050						
				65					45	0.0079	0.0068	0.0058						
				76					53	0.0095	0.0082	0.0069						
20	250 × 500	1176	10.07	43	± 50	± 20	± 50	± 3	29	0.0050	–	–	438	525	656	8	3	2
				54					37	0.0060	0.0052	–						
				65					45	0.0074	0.0065	0.0055						
				76					53	0.0089	0.0078	0.0066						
21	d300	661	9.06	54	± 60	± 30	± 60	± 3	37	0.0059	0.0051	–	247	297	371	8	3	2
				65					45	0.0074	0.0063	0.0053						
				76					53	0.0088	0.0076	0.0064						
				87					61	0.0103	0.0089	0.0075						
22	300 × 300	841	9.06	54	± 70	± 30	± 70	± 3	37	0.0059	0.0051	–	315	378	473	8	3	2
				65					45	0.0074	0.0063	0.0053						
				76					53	0.0088	0.0076	0.0064						
				87					61	0.0103	0.0089	0.0075						
23	300 × 350	986	9.78	54	± 70	± 30	± 70	± 3	37	0.0052	0.0050	–	368	441	551	8	3	2
				65					45	0.0065	0.0056	0.0050						
				76					53	0.0078	0.0068	0.0057						
				87					61	0.0091	0.0079	0.0067						
24	300 × 400	1 131	10.40	54	± 70	± 30	± 70	± 3	37	0.0050	–	–	420	504	630	8	3	2
				65					45	0.0059	0.0051	–						
				76					53	0.0071	0.0062	0.0053						
				87					61	0.0083	0.0072	0.0061						

NO.	$l_a \times l_b$ (d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_3 (mm)		Δl_4 (mm)		t_e (mm)	tan θ (The unit of θ is rad)			R_{ck}(kN)			t_1 (mm)	t_0 (mm)	t_f (mm)
					Longitudinal Direction	Transverse Direction	Longitudinal Direction	Transverse Direction		Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region			
25	300 × 450	1 276	10.92	65	± 70	± 30	± 70	± 3	45	0.0055	0.0050	–	473	567	709	8	3	2
				76					53	0.0066	0.0057	0.0050						
				87					61	0.0077	0.0067	0.0057						
26	300 × 500	1 421	8.28	56	± 70	± 30	± 70	± 3	38	0.0070	0.0061	0.0051	525	630	788	11	4	2
				71					49	0.0094	0.0081	0.0068						
				86					60	0.0117	0.0101	0.0084						
27	300 × 550	1 566	8.58	57	± 70	± 30	± 70	± 3	38	0.0066	0.0057	0.0050	578	693	866	11	4	3
				72					49	0.0088	0.0076	0.0064						
				87					60	0.0110	0.0095	0.0080						
28	300 × 600	1 711	8.84	57	± 70	± 30	± 70	± 3	38	0.0063	0.0054	0.0050	630	756	945	11	4	3
				72					49	0.0084	0.0073	0.0061						
				87					60	0.0105	0.0091	0.0076						
29	d350	908	10.63	65	± 90	± 40	± 90	± 3	45	0.0050	–	–	337	404	505	8	3	2
				76					53	0.0059	0.0051	–						
				87					61	0.0068	0.0060	0.0051						
				98					69	0.0078	0.0068	0.0058						
30	350 × 350	1 156	10.63	65	± 90	± 40	± 90	± 3	45	0.0050	–	–	429	515	643	8	3	2
				76					53	0.0059	0.0051	–						
				87					61	0.0068	0.0060	0.0051						
				98					69	0.0078	0.0068	0.0058						
31	350 × 400	1 326	8.26	56	± 90	± 40	± 90	± 3	38	0.0061	0.0052	–	490	588	735	11	4	2
				71					49	0.0081	0.0069	0.0058						
				86					60	0.0101	0.0087	0.0073						
				101					71	0.0121	0.0104	0.0087						
32	350 × 450	1496	8.72	56	± 90	± 40	± 90	± 3	38	0.0055	0.0050	–	551	662	827	11	4	2
				71					49	0.0074	0.0064	0.0053						
				86					60	0.0092	0.0079	0.0067						
				101					71	0.0111	0.0095	0.0080						
33	350 × 500	1666	9.12	56	± 90	± 40	± 90	± 3	38	0.0051	–	–	613	735	919	11	4	2
				71					49	0.0069	0.0069	0.0050						
				86					60	0.0086	0.0074	0.0062						
				101					71	0.0103	0.0089	0.0075						
34	350 × 550	1836	9.48	57	± 90	± 40	± 90	± 3	38	0.0050	–	–	674	809	1 011	11	4	3
				72					49	0.0064	0.0056	0.0050						
				87					60	0.0081	0.0070	0.0059						
				102					71	0.0097	0.0084	0.0071						

NO.	$l_a \times l_b$(d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_3 (mm)		Δl_4 (mm)		t_e (mm)	tan θ (The unit of θ is rad)			R_{ck}(kN)			t_1 (mm)	t_0 (mm)	t (mm)
					Longitudinal Direction	Transverse Direction	Longitudinal Direction	Transverse Direction		Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region			
35	350×600	2006	9.80	57	±90	±40	±90	±3	38	0.0050	–	–	735	882	1 103	11	4	3
				72					49	0.0061	0.0053	0.0050						
				87					60	0.0076	0.0066	0.0056						
				102					71	0.0092	0.0079	0.0067						
36	d400	1195	8.86	56	±90	±40	±90	±3	38	0.0050	–	–	440	528	660	11	4	2
				71					49	0.0063	0.0054	0.0050						
				86					60	0.0079	0.0068	0.0057						
				101					71	0.0094	0.0081	0.0068						
37	400×400	1521	8.86	56	±90	±40	±90	±3	38	0.0050	–	–	560	672	840	11	4	2
				71					49	0.0063	0.0054	0.0050						
				86					60	0.0079	0.0068	0.0057						
				101					71	0.0094	0.0081	0.0068						
38	400×450	1716	9.40	71	±90	±40	±90	±3	49	0.0057	0.0050	–	630	756	945	11	4	2
				86					60	0.0071	0.0062	0.0052						
				101					71	0.0086	0.0074	0.0063						
				116					82	0.0100	0.0086	0.0073						
39	400×500	1911	9.87	71	±90	±40	±90	±3	49	0.0053	0.0050	–	700	840	1 050	11	4	2
				86					60	0.0066	0.0057	0.0050						
				101					71	0.0079	0.0069	0.0058						
				116					82	0.0092	0.0080	0.0068						
40	400 × 550	2106	10.29	72	±90	±40	± 90	±3	49	0.0050	–	–	770	924	1 155	11	4	3
				87					60	0.0062	0.0054	0.0050						
				102					71	0.0074	0.0065	0.0055						
41	400 × 600	2301	10.67	72	±90	±40	± 90	±3	49	0.0050	–	–	840	1 008	1 260	11	4	3
				87					60	0.0058	0.0051	–						
				102					71	0.0070	0.0061	0.0052						
42	400 × 650	2490	11.02	72	±90	±40	± 90	±3	49	0.0050	–	–	910	1 092	1 365	11	4	3
				87					60	0.0056	0.0050	–						
				102					71	0.0067	0.0058	0.0050						
43	d450	1521	10.00	71	± 110	±40	± 110	±3	49	0.0050	–	–	557	668	835	11	4	2
				86					60	0.0057	0.0050	–						
				101					71	0.0069	0.0060	0.0051						
				116					82	0.0080	0.0070	0.0059						
44	450 × 450	1936	10.00	71	± 110	±40	± 110	±3	49	0.0050	–	–	709	851	1 063	11	4	2
				86					60	0.0057	0.0050	–						
				101					71	0.0069	0.0060	0.0051						
				116					82	0.0080	0.0070	0.0059						

NO.	$l_a \times l_b$ (d) (mm)	R_{cx} (kN)	S	t (mm)	Δl_3 (mm)		Δl_4 (mm)		t_s (mm)	tan θ (The unit of θ is rad)			R_{ck} (kN)			t_1 (mm)	t_0 (mm)	t (mm)
					Longitudinal Direction	Transverse Direction	Longitudinal Direction	Transverse Direction		Moderate Temperature Region	Cold Region	Severe Cold Region	Moderate Temperature Region	Cold Region	Severe Cold Region			
45	450 × 500	2156	10.54	86	± 110	± 40	± 110	± 3	60	0.0053	0.0050	–	788	945	1 181	11	4	2
				101					71	0.0064	0.0055	0.0050						
				116					82	0.0074	0.0065	0.0055						
46	450 × 550	2376	11.02	87	± 110	± 40	± 110	± 3	60	0.0050	–	–	866	1 040	1 299	11	4	3
				102					71	0.0059	0.0052	–						
				117					82	0.0069	0.0061	0.0052						
47	450 × 600	2596	8.40	73	± 110	± 40	± 110	± 3	50	0.0062	0.0054	0.0050	945	1 134	1 418	15	5	3
				93					65	0.0083	0.0072	0.0060						
				113					80	0.0104	0.0090	0.0075						
48	450 × 650	2816	8.69	73	± 110	± 40	± 110	± 3	50	0.0059	0.0051	–	1024	1 229	1 536	15	5	3
				93					65	0.0079	0.0068	0.0057						
				113					80	0.0098	0.0085	0.0071						
49	d500	1886	8.17	72	± 110	± 40	± 110	± 3	50	0.0059	0.0051	–	687	825	1 031	15	5	2
				92					65	0.0079	0.0067	0.0056						
				112					80	0.0098	0.0084	0.0070						
				132					95	0.0118	0.0101	0.0085						
50	500 × 500	2 401	8.17	72	± 130	± 40	± 130	± 3	50	0.0059	0.0051	–	875	1 050	1 313	15	5	2
				92					65	0.0079	0.0067	0.0056						
				112					80	0.0098	0.0084	0.0070						
				132					95	0.0118	0.0101	0.0085						
51	500 × 550	2 646	8.56	73	± 130	± 40	± 130	± 3	50	0.0054	0.0050	–	963	1 155	1 444	15	5	3
				93					65	0.0073	0.0063	0.0052						
				113					80	0.0091	0.0078	0.0066						
				133					95	0.0109	0.0094	0.0079						
52	500 × 600	2 891	8.92	73	± 130	± 40	± 130	± 3	50	0.0051	–	–	1 050	1 260	1 575	15	5	3
				93					65	0.0068	0.0059	0.0050						
				113					80	0.0085	0.0073	0.0062						
				133					95	0.0102	0.0088	0.0077						
53	500 × 650	3 136	9.25	73	± 130	± 40	± 130	± 3	50	0.0050	–	–	1 138	1 365	1 706	15	5	3
				93					65	0.0064	0.0055	0.0050						
				113					80	0.0080	0.0069	0.0058						
				133					95	0.0096	0.0083	0.0070						
54	500 × 700	3 381	9.55	73	± 130	± 40	± 130	± 3	50	0.0050	–	–	1 225	1 470	1 838	15	5	3
				93					65	0.0061	0.0053	–						
				113					80	0.0076	0.0066	0.0056						
				133					95	0.0091	0.0079	0.0067						

NO.	$l_a \times l_b$ (d) (mm)	R_{cx} (kN)	S	t (mm)	Δl_3 (mm) Longitudinal Direction	Δl_3 (mm) Transverse Direction	Δl_4 (mm) Longitudinal Direction	Δl_4 (mm) Transverse Direction	t_e (mm)	tan θ (The unit of θ is rad) Moderate Temperature Region	tan θ Cold Region	tan θ Severe Cold Region	R_{ck} (kN) Moderate Temperature Region	R_{ck} (kN) Cold Region	R_{ck} (kN) Severe Cold Region	t_1 (mm)	t_0 (mm)	t (mm)
55	d550	2 290	9.00	93	± 130	± 40	± 130	± 3	65	0.0061	0.0052	–	832	998	1 247	15	5	3
				113					80	0.0076	0.0066	0.0055						
				133					95	0.0091	0.0079	0.0066						
				153					110	0.0106	0.0092	0.0077						
56	550 × 550	2 916	9.00	93	± 130	± 40	± 130	± 3	65	0.0061	0.0052	–	1 059	1 271	1 588	15	5	3
				113					80	0.0076	0.0066	0.0055						
				133					95	0.0091	0.0079	0.0066						
				153					110	0.0106	0.0092	0.0077						
57	550 × 600	3 186	9.40	93	± 130	± 40	± 130	± 3	65	0.0057	0.0050	–	1 155	1386	1733	15	5	3
				113					80	0.0071	0.0061	0.0052						
				133					95	0.0085	0.0073	0.0062						
				153					110	0.0109	0.0086	0.0072						
58	550 × 650	3 456	9.76	93	± 130	±40	± 130	± 3	65	0.0053	0.0050	–	1251	1 502	1 877	15	5	3
				113					80	0.0067	0.0058	0.0050						
				133					95	0.0080	0.0069	0.0059						
				153					110	0.0093	0.0081	0.0069						
59	d600	2 734	9.83	93	± 130	±40	± 130	± 3	65	0.0050	–	–	990	1 188	1 484	15	5	3
				113					80	0.0060	0.0052	–						
				133					95	0.0072	0.0063	0.0053						
				153					110	0.0085	0.0073	0.0062						
60	600 × 600	3 481	9.83	93	± 130	±40	± 130	± 3	65	0.0050	–	–	1 260	1 512	1 890	15	5	3
				113					80	0.0060	0.0052	–						
				133					95	0.0072	0.0063	0.0053						
				153					110	0.0085	0.0073	0.0062						
61	600 × 650	3 776	10.23	93	± 130	±40	± 130	± 3	65	0.0050	–	–	1 365	1 638	2 048	15	5	3
				113					80	0.0057	0.0050	–						
				133					95	0.0068	0.0059	0.0050						
				153					110	0.0079	0.0069	0.0059						
62	600 × 700	4 071	10.60	113	± 150	±40	± 150	± 3	80	0.0054	0.0050	–	1 470	1 764	2 205	15	5	3
				133					95	0.0064	0.0056	0.0050						
				153					110	0.0075	0.0066	0.0056						
63	600 × 750	4 366	10.94	113	± 150	±40	± 150	± 3	80	0.0051	0.0050	–	1 575	1 890	2 363	15	5	3
				133					95	0.0061	0.0054	0.0050						
				153					110	0.0072	0.0063	0.0054						
64	d650	3 217	10.67	113	± 150	±40	± 150	± 3	80	0.0050	–	–	1 161	1 394	1 742	15	5	3
				133					95	0.0059	0.0051	–						
				153					110	0.0069	0.0060	0.0051						
				173					125	0.0078	0.0068	0.0059						

NO.	$l_a \times l_b$ (d) (mm)	R_{ck} (kN)	S	t (mm)	Δl_3 (mm) Longitudinal Direction	Δl_3 (mm) Transverse Direction	Δl_4 (mm) Longitudinal Direction	Δl_4 (mm) Transverse Direction	t_s (mm)	tan θ (The unit of θ is rad) Moderate Temperature Region	tan θ Cold Region	tan θ Severe Cold Region	R_{ck}(kN) Moderate Temperature Region	R_{ck}(kN) Cold Region	R_{ck}(kN) Severe Cold Region	t_1 (mm)	t_0 (mm)	t (mm)
65	650 × 650	4 096	10.67	113	± 150	±40	± 150	± 3	80	0.0050	–	–	1 479	1 775	2 218	15	5	3
				133					95	0.0059	0.0051	–						
				153					110	0.0069	0.0060	0.0051						
				173					125	0.0078	0.0068	0.0059						
66	650 × 700	4 416	9.20	105	± 150	±40	± 150	± 3	77	0.0060	0.0052	–	1 593	1 911	2 389	18	5	3
				128					95	0.0074	0.0064	0.0054						
				151					113	0.0089	0.0077	0.0065						
				174					131	0.0104	0.0090	0.0076						
67	650 × 750	4 736	9.53	105	± 150	± 40	± 150	± 3	77	0.0056	0.0050	–	1 706	2 048	2 559	18	5	3
				128					95	0.0070	0.0061	0.0051						
				151					113	0.0084	0.0073	0.0062						
				174					131	0.0099	0.0085	0.0072						
68	d700	3 739	9.58	105	± 150	± 40	± 150	± 3	77	0.0052	0.0050	–	1 347	1 616	2 020	18	5	3
				128					95	0.0065	0.0056	0.0050						
				151					113	0.0078	0.0067	0.0057						
				174					131	0.0091	0.0079	0.0066						
69	700 × 700	4 761	9.58	105	± 150	± 40	± 150	± 3	77	0.0052	0.0050	–	1 715	2 058	2 573	18	5	3
				128					95	0.0065	0.0056	0.0050						
				151					113	0.0078	0.0067	0.0057						
				174					131	0.0091	0.0079	0.0066						
70	d750	4 301	10.28	128	± 180	± 40	± 180	± 3	95	0.0054	0.0050	–	1 546	1 856	2 319	18	5	3
				151					113	0.0065	0.0056	0.0050						
				174					131	0.0076	0.0066	0.0056						
				197					149	0.0086	0.0075	0.0064						
71	d800	4 902	10.97	128	± 180	± 40	± 180	± 3	95	0.0050	–	–	1 759	2 111	2 639	18	5	3
				151					113	0.0055	0.0050	–						
				174					131	0.0064	0.0056	0.0050						
				197					149	0.0073	0.0064	0.0055						

Note 1: The values in the "Minimum Bearing Capacity for Anti-sliding" column are applicable for contact between the bearing and steel, and are based on conditions excluding vehicular braking forces. When braking forces are to be considered, calculations must be performed separately.

Note 2: The allowable rotation tangent values are calculated for rotation about the bearing's short side axis. Calculation must be performed separately for rotation about the long side axis.

Table 3 Main Accessory Dimensions for GJZF4 and GYZF4 Specification Series Bearings (Unit: mm)

No.	Bearing Plan Dimensions la×lb (or d)	Main Accessory Dimensions									
		Multi-directional Bearing				Unidirectional Bearing				Anchor Bolt Specification ⌀×l	Bearing Assembled Height h
		Top/Bottom Steel Plate Dimensions		Anchor Bolt Spacing		Top/Bottom Steel Plate Dimensions		Anchor Bolt Spacing			
		a_1	b_1	a_2	b_2	a_1	b_1	a_2	b_2		
1	100×150	270	290	220	240	270	240	220	190	M16×160	37+t
2	100×200	270	340	220	290	270	290	220	240	M16×160	37+t
3	d150	280	290	230	220	280	240	230	170	M16×160	37+t
4	150×150	320	290	270	240	320	240	270	190	M16×160	37+t
5	150×200	320	340	270	290	320	290	270	240	M16×160	37+t
6	150×250	320	390	270	340	320	340	270	290	M16×160	37+t
7	150×300	320	440	270	390	320	390	270	340	M16×160	37+t
8	d200	330	340	280	270	330	290	280	220	M16×160	37+t
9	200×200	370	340	320	290	370	290	320	240	M16×160	37+t
10	200×250	370	390	320	340	370	340	320	290	M16×160	37+t
11	200×300	370	440	320	390	370	390	320	340	M16×160	37+t
12	200×350	370	490	320	440	370	440	320	390	M16×160	37+t
13	200×400	370	540	320	490	370	490	320	440	M16×160	37+t
14	d250	440	410	390	340	440	340	390	270	M16×160	37+t
15	250×250	460	390	410	340	460	340	410	290	M18×180	37+t
16	250×300	460	440	410	390	460	390	410	340	M18×180	37+t
17	250×350	460	490	410	440	460	440	410	390	M18×180	37+t
18	250×400	460	540	410	490	460	490	410	440	M18×180	37+t
19	250×450	460	590	410	540	460	540	410	490	M18×180	37+t
20	250×500	460	640	410	590	460	590	410	540	M18×180	37+t
21	d300	490	460	440	390	490	390	440	320	M16×160	37+t
22	300×300	550	460	500	410	550	390	500	340	M22×220	37+t
23	300×350	550	510	500	460	550	440	500	390	M22×220	37+t
24	300×400	550	560	500	510	550	490	500	440	M22×220	37+t
25	300×450	550	610	500	560	550	540	500	490	M22×220	37+t
26	300×500	550	660	500	610	550	590	500	540	M22×220	37+t
27	300×550	550	710	500	660	550	640	500	590	M22×220	38+t
28	300×600	550	760	500	710	550	690	500	640	M22×220	38+t
29	d350	600	530	500	460	600	440	500	370	M18×180	37+t
30	350×350	640	530	590	480	640	440	590	390	M22×220	37+t
31	350×400	640	580	590	530	640	490	590	440	M22×220	37+t
32	350×450	640	630	590	580	640	540	590	490	M22×220	37+t
33	350×500	640	680	590	630	640	590	590	540	M22×220	37+t
34	350×550	640	730	590	680	640	640	590	590	M22×220	38+t
35	350×600	640	780	590	730	640	690	590	640	M22×220	38+t
36	d400	650	580	600	510	650	490	600	420	M18×180	37+t
37	400×400	690	580	640	530	690	490	640	440	M22×220	37+t

No.	Bearing Plan Dimensions laxlb (or d)	Main Accessory Dimensions									
		Multi-directional Bearing				Unidirectional Bearing				Anchor Bolt Specification ∅xl	Bearing Assembled Height h
		Top/Bottom Steel Plate Dimensions		Anchor Bolt Spacing		Top/Bottom Steel Plate Dimensions		Anchor Bolt Spacing			
		a_1	b_1	a_2	b_2	a_1	b_1	a_2	b_2		
38	400 × 450	690	630	640	580	690	540	640	490	M22 × 220	37+t
39	400 × 500	690	680	640	630	690	590	640	540	M22 × 220	37+t
40	400 × 550	720	750	660	680	720	660	660	590	M24 × 240	53+t
41	400 × 600	720	800	660	730	720	710	660	640	M24 × 240	53+t
42	400 × 650	720	850	660	780	720	760	660	690	M24 × 240	53+t
43	d450	740	630	690	560	740	540	690	470	M22 × 220	37+t
44	450 × 450	810	650	750	580	810	560	750	490	M22 × 220	52+t
45	450 × 500	810	700	750	630	810	610	750	540	M24 × 240	52+t
46	450 × 550	810	750	750	680	810	660	750	590	M24 × 240	53+t
47	450 × 600	810	800	750	730	810	710	750	640	M24 × 240	53+t
48	450 × 650	810	850	750	780	810	760	750	690	M24 × 240	53+t
49	d500	790	680	740	610	790	590	740	520	M22 × 220	37+t
50	500 × 500	900	700	840	630	900	610	840	540	M24 × 240	52+t
51	500 × 550	900	750	840	680	900	660	840	590	M24 × 240	53+t
52	500 × 600	900	800	840	730	900	710	840	640	M24 × 240	53+t
53	500 × 650	900	850	840	780	900	760	840	690	M28 × 280	53+t
54	500 × 700	900	900	840	830	900	810	840	740	M28 × 280	53+t
55	d550	880	750	820	680	880	660	820	590	M24 × 240	53+t
56	550 × 550	950	750	890	680	950	660	890	590	M28 × 280	53+t
57	550 × 600	950	800	890	730	950	710	890	640	M28 × 280	53+t
58	550 × 650	950	850	890	780	950	760	890	690	M28 × 280	53+t
59	d600	930	800	870	730	930	710	870	640	M24 × 240	53+t
60	600 × 600	1 000	800	940	730	1 000	710	940	640	M28 × 280	53+t
61	600 × 650	1 000	850	940	780	1 000	760	940	690	M28 × 280	53+t
62	600 × 700	1 040	920	980	830	1 040	810	980	740	M30 × 300	53+t
63	600 × 750	1 040	950	980	880	1 040	860	980	790	M30 × 300	53+t
64	d650	1 020	850	960	780	1 020	760	960	690	M28 × 280	53+t
65	650 × 650	1 090	850	1 030	780	1 090	760	1 030	690	M30 × 300	53+t
66	650 × 700	1 090	900	1 030	830	1 090	810	1 030	740	M30 × 300	53+t
67	650 × 750	1 090	950	1 030	880	1 090	860	1 030	790	M30 × 300	53+t
68	d700	1 070	900	1 010	830	1 070	810	1 010	740	M28 × 280	53+t
69	700 × 700	1 140	900	1 080	830	1 140	810	1 080	740	M30 × 300	53+t
70	d750	1 180	950	1 120	880	1 180	860	1 120	790	M30 × 300	53+t
71	d800	1 230	1 000	1 170	930	1 230	910	1 170	840	M30 × 300	53+t

Selection of Elastomeric Bearings

1. When selecting elastomeric bearings, the maximum bearing capacity shall match the support reaction force at the bridge bearing points, with an allowable tolerance of ±10%.

2. For curved, sloped, skewed, or wide bridges, circular elastomeric bearings are recommended. Spherical crown bearings or sloped bearings should not be used in highway bridge projects.

3. When the bridge longitudinal slope is not greater than 1%, the elastomeric bearings can be installed directly on the piers or abutments. However, the required thickness to account for the influence of the longitudinal slope must be considered. When the longitudinal slope exceeds 1%, leveling measures such as embedded steel plates, concrete capping blocks, or other methods shall be used to adjust the girder bottom to ensure the bearings are installed horizontally.
4. PTFE sliding plate elastomeric bearings shall be installed horizontally. The PTFE sliding plate must not be placed on the bottom face of the bearing. Likewise, the stainless steel plate in contact with the PTFE sliding plate must not be installed on the bridge pier or abutment bedding stone.

Installation and Maintenance of Elastomeric Bearings

Elastomeric bearings are located at the critical connection point between the superstructure and substructure of a bridge. Their reliability directly impacts the safety and durability of the entire bridge structure. Therefore, in addition to ensuring proper design selection and that manufacturing quality complies with technical standards, correct construction and installation are the critical factors for the successful application of elastomeric bearings.

I. Setting of Bearing Padstones

To ensure the construction quality of elastomeric bearings and facilitate their installation, adjustment, inspection, and future replacement, the setting of bearing padstones at the top of piers and abutments is essential. This requirement applies regardless of the construction method (cast-in-place or precast girders) and regardless of the type of elastomeric bearing used (Figures 1-1, 1-2, 1-3).

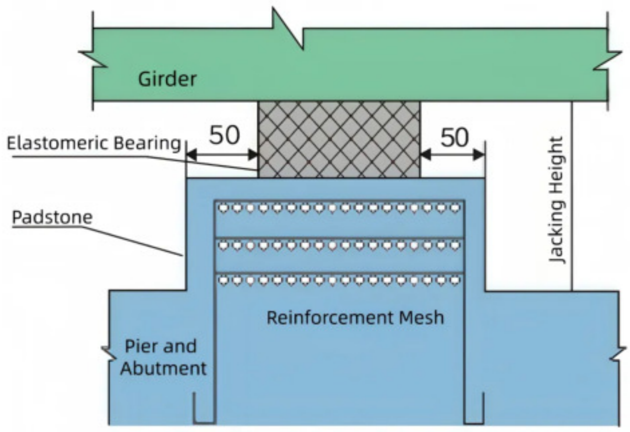


Figure 1-1 Schematic Diagram of Bearing Padstone (Unit: mm)

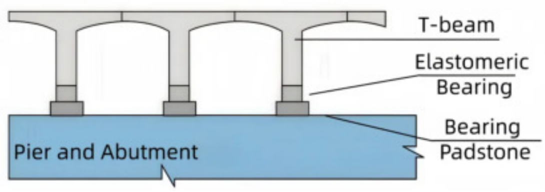


Figure 1-2 Bearing Padstone Arrangement for T-Beams

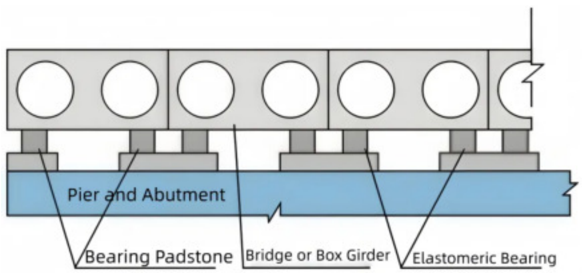


Figure 1-3 Bearing Padstone Arrangement for Slab Girders and Box Girders

1. The plan dimensions of the bearing padstone should be adequate to support the loads from the superstructure. Generally, the length and width should be about 10 cm larger than those of the elastomeric bearing. The height of the padstone should be greater than 6 cm to ensure sufficient vertical space between the girder bottom and the pier/abutment top for placing jacks (or flat jacks) to facilitate future bearing replacement.

2. The bearing padstone should contain a reinforcement mesh, with the vertical reinforcement connected to the reinforcement within the pier or abutment. The cement grade used for casting the padstone should not be lower than C25. The top surface of the padstone concrete should be precisely leveled using a straightedge, ensuring it is flat but not smooth.

3. The elevation of the bearing padstone top surface must be highly accurate and consistent. This is particularly critical when two bearings are installed at one end of a girder, where the levelness error between the top surfaces of these two padstones must be strictly controlled. The top surfaces of all two or four padstones supporting the same girder must lie in the same plane to prevent eccentric compression, initial shear deformation, and uneven stress distribution.

II. Installation of Standard Elastomeric Bearings

1. Installation for Cast-in-Place Girders

Installing bearings for cast-in-place girders is relatively straightforward. The construction sequence is as follows:

1.1. First, remove loose sand and debris from the top surface of the pier and abutment padstones. The surface must be clean, level, and free of oil contamination. If the elevation difference between padstones is excessive, it can be adjusted using cement mortar.

1.2. Mark the centerline of the bearing position on the support padstones according to the design drawings. Simultaneously, mark cross-shaped centerlines on the elastomeric bearing itself. Place the elastomeric bearing on the padstone, ensuring the bearing's centerline aligns precisely with the design position centerline on the pier/abutment for accurate placement.

1.3. All two or four bearings supporting the same girder must be on the same plane. To facilitate leveling, a layer of cement mortar can be spread between the bearing and the padstone before concrete placement, allowing the bearing to settle and level itself under the weight of the girder.

1.4. Before casting the concrete girder, a support steel plate slightly larger than the bearing plan area must be placed on top of the elastomeric bearing. Anchor bars welded to this steel plate will connect it to the girder. This support steel plate (commonly referred to as the "girder bottom embedded steel plate") is treated as part of the formwork for the cast-in-place girder and is cast into the concrete. To prevent grout leakage, fill the peripheral gap between the support steel plate and the formwork with softwood boards. These wooden boards are removed during formwork stripping. Following this method ensures full and uniform contact between the bearing, the girder bottom steel plate, and the padstone top surface (Figures 2-1a, 2-1b).

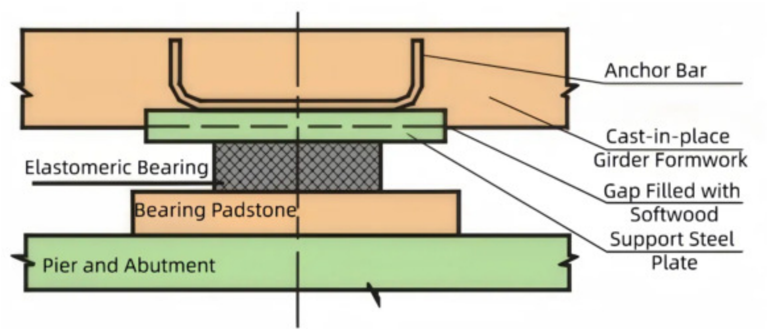


Figure 2-1a Schematic Diagram of Bearing Construction for Cast-in-Place Girders

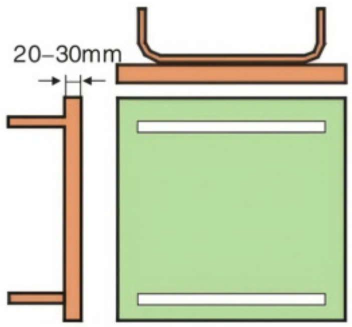


Figure 2-1b Schematic Diagram of Support Steel Plate for Cast-in-Place Girders

2. Installation of Bearings for Precast Girders

The key to successfully installing elastomeric bearings for precast girders lies in ensuring the girder bottom surface and the padstone top surface are as level and parallel as possible. This guarantees full and uniform contact with both the top and bottom surfaces of the bearing, preventing eccentric compression, gaps, and uneven bearing. The construction sequence is as follows:

2.1. First, prepare the support padstones correctly.

2.2. The bottom surface of the precast girder that contacts the bearing must be level and flat. Any honeycombed areas or surface inclination should be grouted and leveled using cement mortar beforehand.

2.3. Correct Positioning of the Elastomeric Bearing.

Position the elastomeric bearing on the pier/abutment padstone according to the design centerline. When lowering the girder into place, the main axis of a T-beam must align with the bearing centerline. For slab girders and box girders, the longitudinal axis should run parallel to the bearing centerline. To ensure accurate placement, when installing the first span of a bridge or box girder, mark cross-shaped centerlines on the girder bottom corresponding to the two bearing positions, and mark vertical lines on the girder's end face indicating the bearing centerlines. During placement, these marks must align with the corresponding centerlines on the pier/abutment (Figure 2-2). Subsequent spans should use the first span as a reference for girder placement.

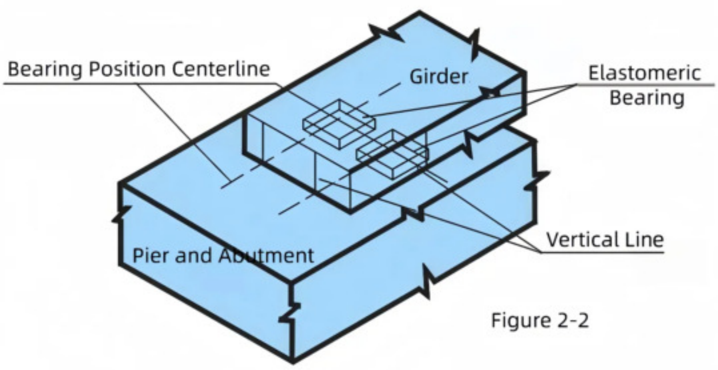


Figure 2-2

2.4 When lowering the girder into place, the operation must be smooth and controlled to prevent eccentric compression or initial shear deformation of the bearings.

2.5 When installing bearings for T-beams, if the bearing is wider than the bottom of the T-beam rib, a reinforced concrete block or thick steel plate slightly larger than the bearing must be placed between the bearing and the girder bottom as a transition. This prevents local overloading and stress concentration in the elastomeric bearing. This reinforced concrete block or steel plate should be bonded to the girder bottom using epoxy resin mortar.

2.6 After the girder is placed and the elastomeric bearings are installed, the bearing top surface should generally be level, with a maximum inclination not exceeding 5 minutes of arc.

3. Adjustment of Elastomeric Bearings After Installation

If any of the following conditions are observed after bearing installation, adjustments should be made promptly:
a. Individual bearings are not in contact (empty), resulting in uneven load distribution.
b. Bearings exhibit significant initial shear deformation.
c. Bearings are subjected to severe eccentric compression, leading to localized high stress, abnormal bulging at the sides, and localized lack of contact.

The standard adjustment method involves jacking up the end of the girder, applying a layer of cement mortar (or epoxy resin mortar) to the top and/or bottom surfaces of the affected bearing(s), and then slowly lowering the girder back into place. Under the girder's weight, the top and bottom surfaces of the bearing will become parallel and achieve full contact with both the girder bottom and the padstone top surface. Simultaneously, ensure all bearings at both ends of the same girder are coplanar. The longitudinal inclination of the girder should be controlled such that no significant initial shear deformation occurs in the bearings.

4. Precautions for Installing Standard Elastomeric Bearings

4.1 Rectangular bearings should be installed with their short side parallel to the bridge longitudinal direction to facilitate beam-end rotation. If installation with the long side parallel to the longitudinal direction is necessary, verification through rotation calculation is mandatory.

4.2 Circular elastomeric bearings are isotropic. Directionality need not be considered during installation; simply align the center of the bearing with the design center point.

4.3 When using standard elastomeric bearings, a fixed end and an expansion (free) end are typically designated. When bearings of the same height are used, the horizontal displacement of the superstructure is accommodated by the shear deformation of the bearings at both ends of the same girder, each bearing contributing roughly half. Alternatively, a thinner elastomeric bearing can be used as the fixed bearing.

4.4 Installation of elastomeric bearings is optimal during seasons with temperatures close to the annual average (e.g., spring and autumn). If installation must occur at extreme high or low temperatures, two methods were historically proposed to avoid excessive shear deformation: firstly, jacking the girder and re-centering the bearings when the average annual temperature occurs; secondly, pre-displacing the bearings during installation based on calculated values for the installation temperature. The first method might be feasible for railway bridges but is often impractical for highway bridges. The second method requires sophisticated on-site techniques and is difficult to control accurately. A simpler alternative is available: if installation at the average annual temperature is not anticipated, the design can specify a slightly increased bearing height. This allows the maximum superstructure displacement, even when installed at extreme temperatures, to be accommodated within the shear deformation capacity of the taller bearing. This enables installation at any temperature, keeps the maximum shear strain within allowable limits, and avoids the need for complex special construction procedures.

5. Dealing with Longitudinal or Combined Gradients in the Girder

When the girder has a longitudinal or combined gradient, the following methods can be employed:

5.1 A wedge-shaped steel plate can be installed between the girder bottom and the bearing, or the top surface of the bearing padstone (or the girder bottom surface) can be cast to a slope (see figure below). This method is suitable for bridge gradients not exceeding 1%.

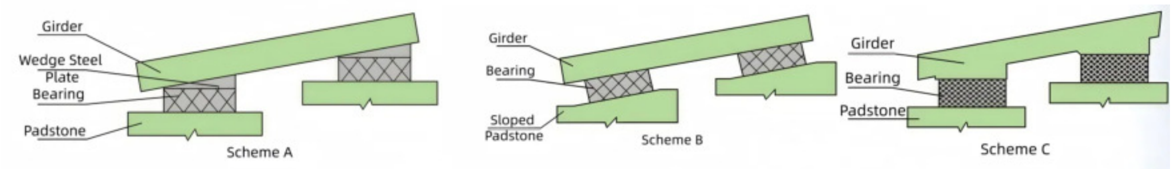


Figure 2-3

5.2 Use of Sloped Bearings (Suitable for bridge gradients ⩾ 1%)

The use of sloped elastomeric bearings for bridges with longitudinal or combined gradients was proposed early on by the French company CIPEC and has been widely adopted. This concept is extensively elaborated in the book "Elastomeric Bearings" published by the Highway Planning and Design Institute of the Chinese Ministry of Communications in July 1988. As the application range of sloped bearings continues to expand, China's engineering community has progressively standardized its nomenclature and the methods for specifying its baseline dimensions.

III. Installation of PTFE Sliding Elastomeric Bearings

1. Structure and Connection of PTFE Sliding Elastomeric Bearings

The overall structure of PTFE sliding elastomeric bearings is classified into two types: "Enclosed Type" and "Simple Type". The enclosed type should be selected for urban bridges and areas with strong UV radiation, severe air pollution, and dust. The simple type can be used in other scenarios.

1.1 Simple Type (Structure see Figure 3-1)
1.2 Enclosed Type (Structure see Figure 3-2)

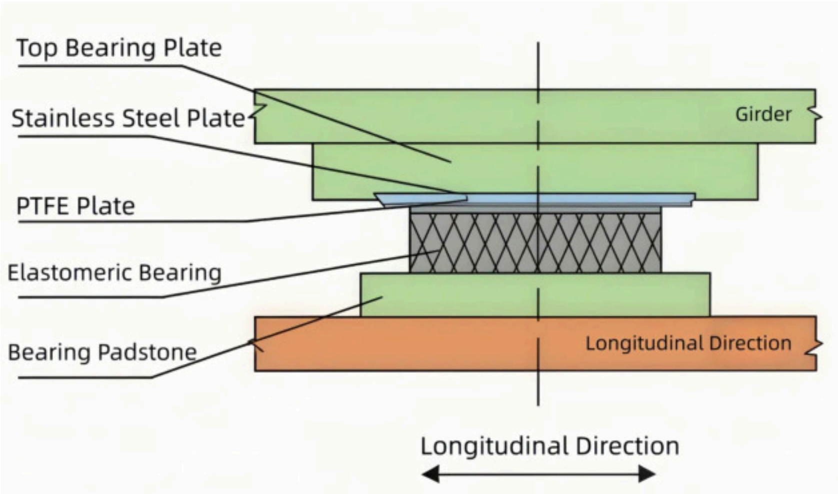


Figure 3-1

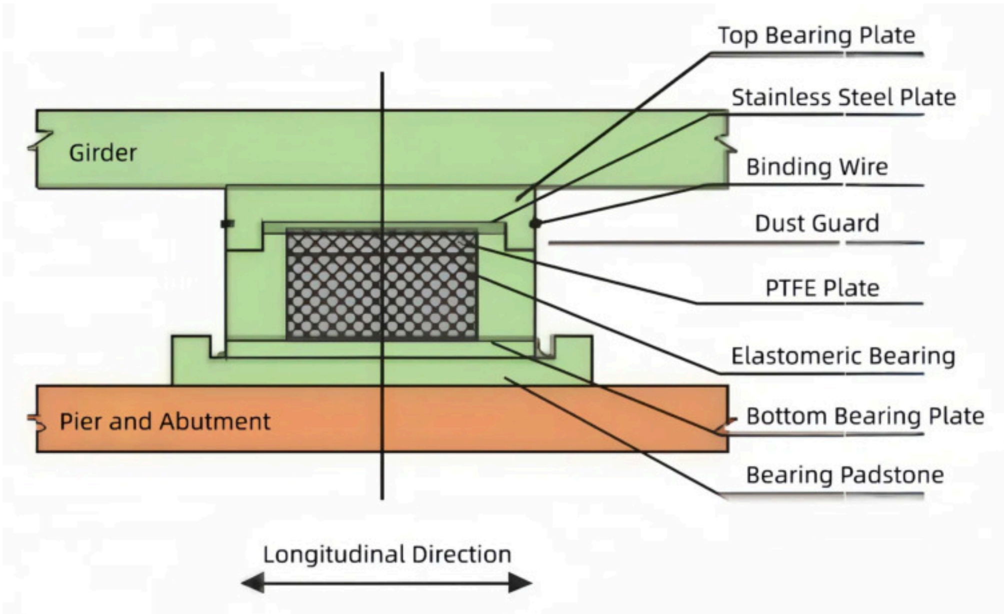


Figure 3-2

1.3 Connection of the Upper and Lower Steel Plates of PTFE Sliding Elastomeric Bearings to the Bridge Structure

1.3.1 Connection of the Lower Steel Plate for Enclosed PTFE Sliding Elastomeric Bearings

For the enclosed type, the connection of the lower steel plate can be achieved by:
Pre-forming a corresponding recess in the pier's support padstone. During girder erection, the lower steel plate is then bonded into this recess using epoxy resin mortar.
Alternatively, anchor bolts can be pre-embedded in the support padstone, and the lower steel plate is secured to these bolts during girder erection.

1.3.2 Connection of the Upper Steel Plate for PTFE Sliding Elastomeric Bearings

For Cast-in-place Girders: The upper steel plate can be welded with anchor bars and cast integrally with the girder, forming a connection as shown in Figure 3-3.
For Precast Girders: The upper steel plate is bonded to the girder bottom using epoxy resin mortar or connected via anchor bolts.

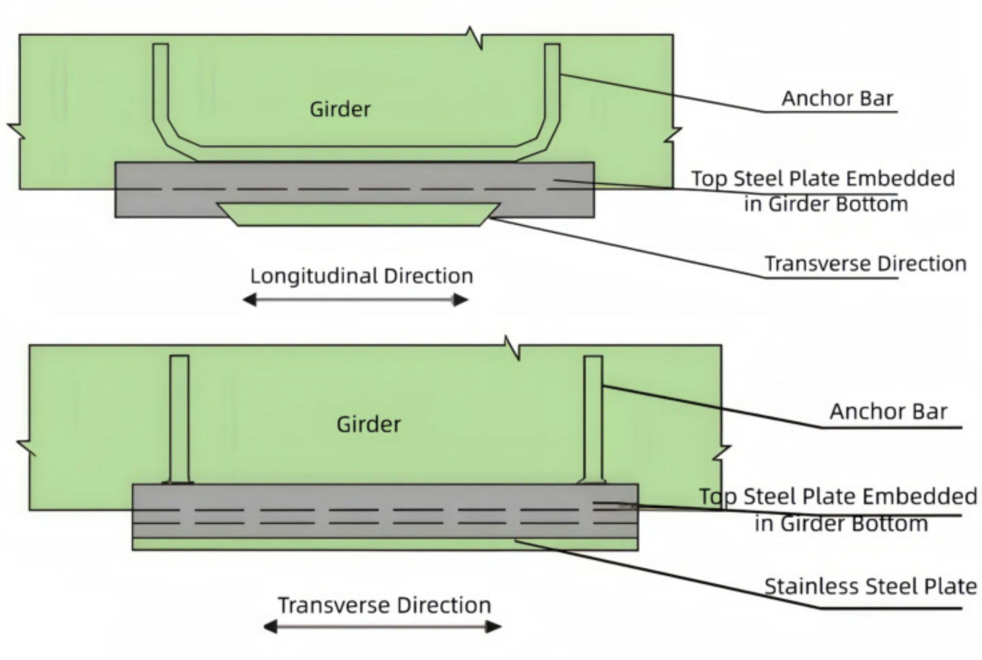


Figure 3-3

2. Installation and Precautions for PTFE Sliding Elastomeric Bearings:

The installation method for PTFE sliding elastomeric bearings is generally the same as for standard elastomeric bearings. However, the following points require attention:

2.1 When PTFE sliding bearings are used as expansion (movable) bearings, they must be used in conjunction with standard elastomeric bearings (serving as fixed bearings).

2.2 During installation, the PTFE sliding bearing must be positioned accurately according to the design support center. The steel plate on the girder bottom and the top surface of the support padstone (or the lower steel plate) should be as parallel and level as possible, ensuring full and uniform contact with both the top and bottom surfaces of the bearing. All bearings for the same girder must lie in the same plane to avoid eccentric compression, uneven bearing, or localized lack of contact.

2.3 If issues are identified after installation requiring adjustment, the girder end can be jacked up. A layer of epoxy resin mortar can be applied between the bottom surface of the PTFE bearing and the support padstone (or lower steel plate) for leveling and adjustment.

2.4 The lubricant reservoir dimples on the PTFE surface must be filled with a non-volatile lubricant, such as "5201 Silicone Grease," during installation to reduce the friction coefficient.

2.5 The stainless steel surface in contact with the PTFE plate must be free from damage or scoring, as this could increase the friction coefficient and damage the PTFE plate.

2.6 When lowering the girder, to prevent longitudinal and transverse sliding between the girder and the bearing, wooden triangular blocks should be placed against both sides of the girder for positioning. These blocks are removed after the girder placement is fully completed. (See Figure 3-4)

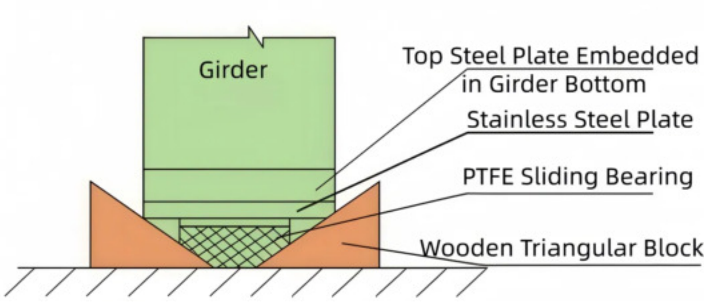
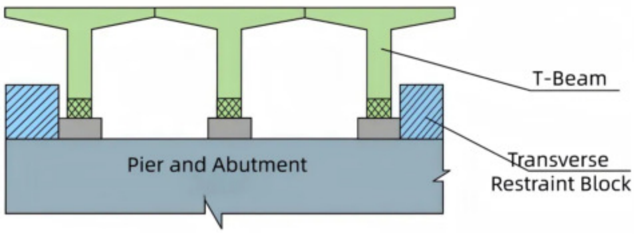
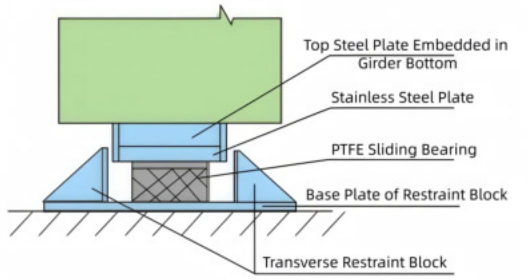


Figure 3-4

2.7 To prevent transverse sliding of the superstructure, anti-skid restraint blocks can be installed at the ends of the bearings or the superstructure (See Figures 3-5a and 3-5b).

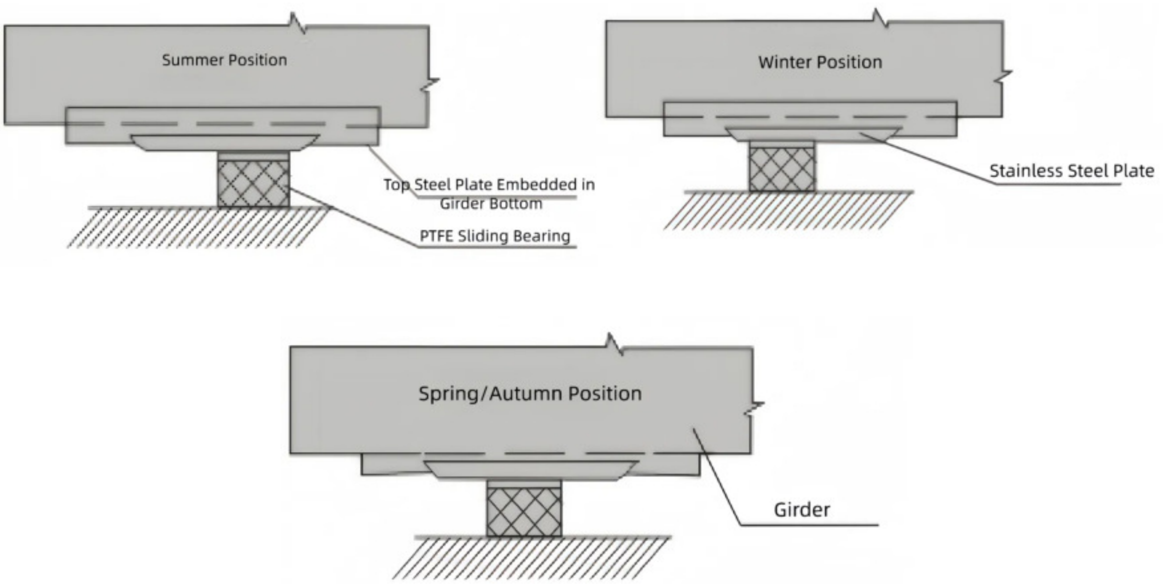


Figures 3-5a



Figures 3-5b

2.8 The relative position between the bearing and the stainless steel plate must be determined based on the installation temperature (see Figure 3-6). If the stainless steel plate has suff icient length, the bearing can be positioned relative to the center of the stainless steel plate according to the standard spring/autumn positioning, regardless of the season.



(IV) Bearing Maintenance:

1. Elastomeric bearings should undergo regular maintenance and inspection. Any issues identified must be promptly repaired or addressed.

2. The following items should be checked for both standard elastomeric bearings and PTFE sliding bearings:
(1) Check for any bearing sliding or uplift (loss of contact).
(2) Check if the shear displacement is excessive (the shear angle should not exceed 35°).
(3) Check for excessive compression deformation.
(4) Check for aging of the rubber protective layer, such as cracking or hardening. Record the location, width, and length of any cracks.
(5) Check that the bulging of the rubber layers between the steel reinforcement plates is uniform and normal.
(6) For PTFE sliding bearings, inspect the PTFE sheet on the top of the bearing for integrity and any delamination. Also, check if the bearing has slid beyond the edges of the stainless steel plate on the supporting surface.

3. All parts of the bearing must be kept intact and clean. Remove debris and obstructions around the bearings promptly. In winter, remove snow and ice to ensure proper bearing function. Regularly clean away stagnant water and ensure drainage from piers and abutment caps is clear. Prevent bearings from contacting oils or greases; clean any residual oil from girder bottoms, piers, and abutment caps. This helps prevent rubber deterioration and loss of function.

4. Adjust the bearings if uneven bearing pressure at the girder supports, uplift, or excessive compression deformation is observed.

5. Replace elastomeric bearings promptly if excessive shear deformation, significant aging, cracking, or other damage occurs.

6. For PTFE sliding bearings, if sand or dirt is found between the PTFE plate and the stainless steel plate, or if the silicone grease has dried out, clean the surfaces immediately and replenish with new silicone grease.

References for Installation and Construction of Elastomeric Bearings

1. Ministry of Communications, Highway Planning and Design Institute, JT/GQS 018-84, "Elastomeric Bearings and Expansion Joints".

2. Ministry of Communications, Highway Planning and Design Institute, JT/GQS 024-83, "Fabricated Prestressed Concrete Simply-Supported Girders".

3. Ministry of Railways (1984), "Detailed Rules for Installation, Maintenance and Repair of Elastomeric Bearings".

4. "Highways" Magazine, China, Issue 4, 1980, "Design and Construction of Bridge Bearings"

5.Ministry of Communications, Highway Planning and Design Institute (1988), "Elastomeric Bearings"

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