

<http://www.dongilinc.com>



Marine Products

Rubber Fender | Accessories | Other Products



Dongil R&C Co., Ltd. was established in July, 1995. The company has been specialized in the design and development processes of rubber fender and other rubber products.

Since then, our company has studied, developed and manufactured general industrial products together with other rubber products for construction and civil engineering, industrial field. We strongly believe that it is our duty to make a contribution to the development of rubber products. With accumulated knowledge and technologies, we focus on the execution of various projects. We are trying our best to provide our customers with the best-quality products and services.

- 2016. 03** Registered for manufacture of ship components and building of other ships
- 2016. 03** Applied for patent of Improved rubber dam
- 2016. 03** Acquired certification for R&D Institute
- 2014. 07** Established the 2nd factory in Yoosan Industrial Complex
- 2012. 12** Designated for Development project(The navy - development of Murena skirt)
- 2009. 10** Acquired certification for Clean workplace
- 2009. 08** Acquired certification for Oil fence model
- 2009. 05** Acquired certification for innovative SMEs(INNO-BIZ)
- 2009. 02** Obtained patent for dual webbed type oil fence
- 2009. 02** Acquired certification for R&D section
- 2008. 06** Merged Seojin Industrial Co., Ltd. (increased capital to 1,675 million Won)
- 2008. 05** Acquired utility model for Rubber packing for container to transport nuclear waste
- 2005. 07** Acquired certification for ISO 9001
- 2005. 05** Acquired certification for KS M 6709(Rubber fender)
- 2003. 11** Changed company name to Dongil R&C Co., Ltd. as a corporation
- 2003. 07** Expanded plant for thermal and nuclear power plant
- 2003. 03** Moved to Eogok Regional Industrial Complex in Yangsan
- 2001. 05** Established rail, bridge division
- 1999. 04** Technical cooperation with Mont Co., Ltd. in Japan (Rubber packing)
- 1997. 10** Expanded plant for Rubber fender
- 1995. 07** Founded Seojin Industrial Co., Ltd.

Company Profile

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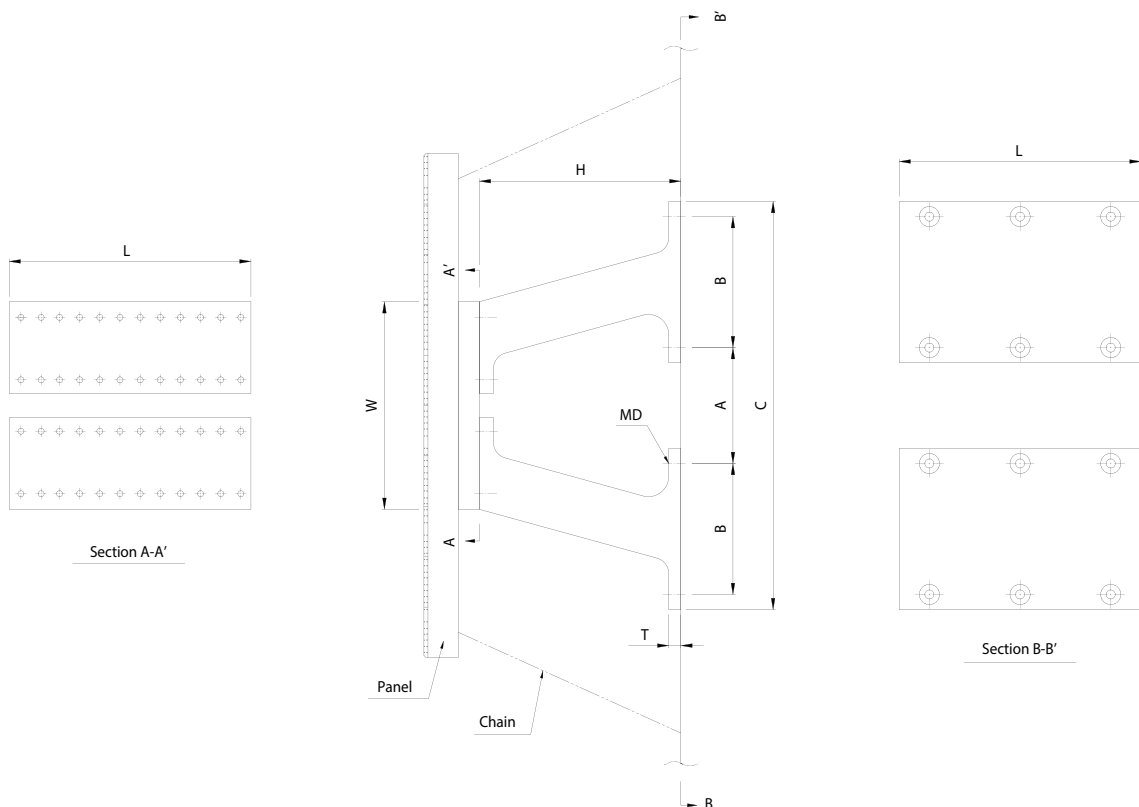
TTV Fender



It is used worldwide for large vessels where there's excessive difference between the rise and fall of the tide.

TTV Fender has a large surface contact area which will absorb much energy but will provide a low hull pressure so that the vessel may not be damaged during berthing operations.

Drawing & Dimension

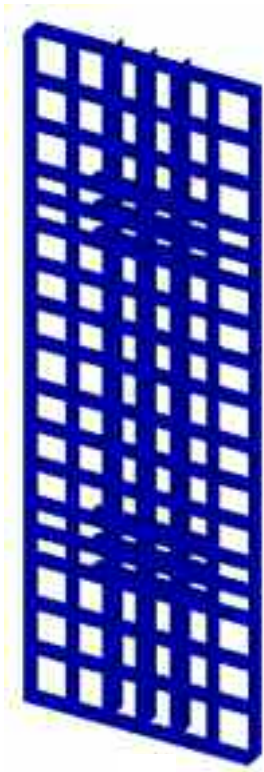


(Unit: mm)

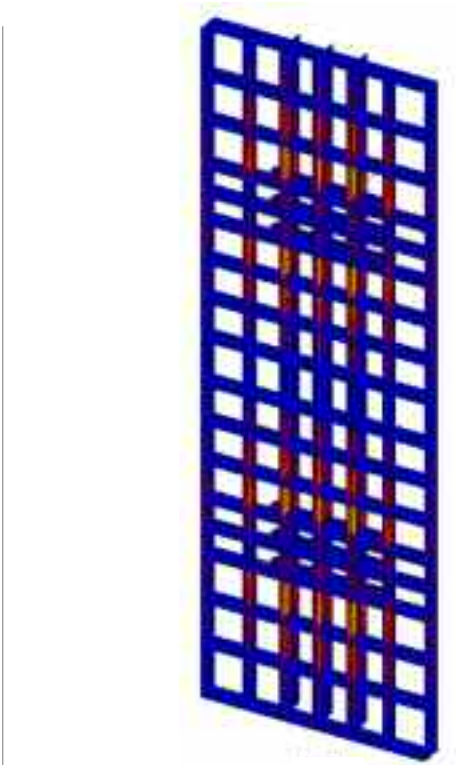
Dimension Height	MD (WD")	A	B	C	T	W
600H	M48 (2)	375	450	1435	50	600
800H	M64 (2 1/2)	480	585	1850	65	800
1000H	M64 (2 1/2)	605	685	2175	70	1000
1300H	M76 (3)	745	880	2735	95	1300
1600H	M76 (3)	800	1100	3300	100	1600
1800H	M76 (3)	900	1200	3600	110	1800
2000H	M76 (3)	1150	1300	4050	125	2000
2250H	M76 (3)	1560	1500	4860	140	2500
2500H	M76 (3)	1560	1500	4860	140	2500

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

Modeling & Program Analysis

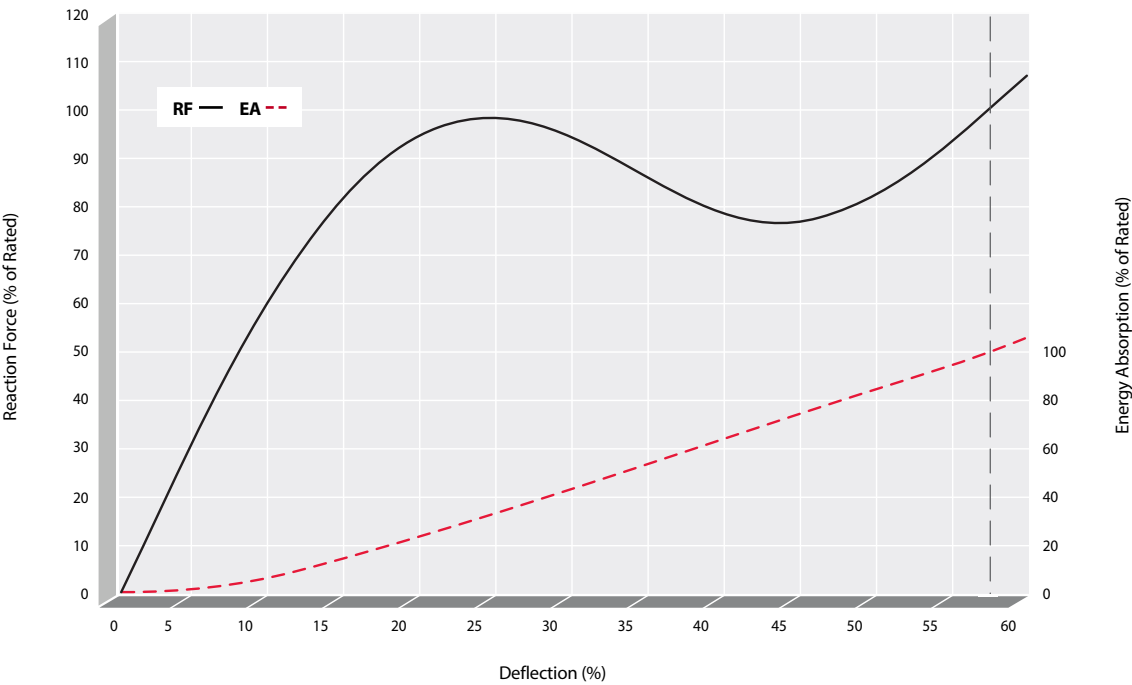


Modeling



Analysis

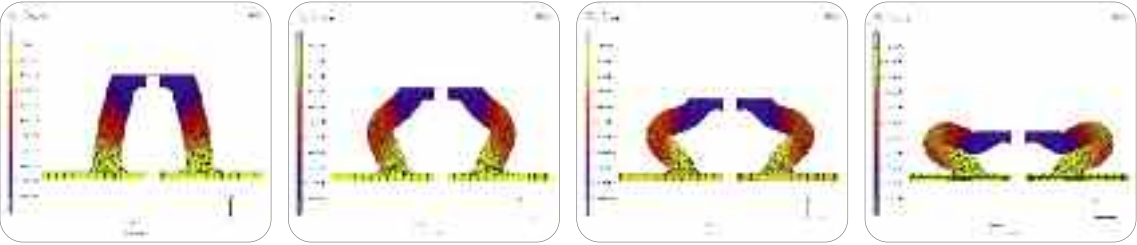
Performance Curve & Table



(Unit: mm)

Size		600H	800H	1000H	1300H	1600H	1800H	2000H	2250H	2500H
Performance										
R S	RF(ton)	65.0	86.7	108.5	141.0	173.5	196.8	216.9	251.4	274.5
	EA(ton-m)	17.7	31.3	49.0	82.9	125.5	167.0	196.0	248.6	309.2
R H	RF(ton)	56.9	75.9	94.9	123.4	151.8	172.2	189.8	220	240.2
	EA(ton-m)	15.5	27.4	42.9	72.5	109.8	146.1	171.5	217.5	270.5
R M	RF(ton)	43.8	58.4	73	94.9	116.8	132.3	146	165.3	181.3
	EA(ton-m)	11.9	21.1	33	55.8	84.5	112.4	132	160.2	205.2
R L	RF(ton)	30.7	40.9	51.1	66.4	81.8	92.6	102.2	119.2	128.6
	EA(ton-m)	8.3	14.8	23.1	39.1	59.2	78.6	92.4	121.4	141.5

- Deflection: 57.5% - Tolerance: 10% - RF: Reaction Force - EA: Energy Absorption - Length: 1000mm
We can manufacture various fender performance grade, please consult DRC to get more performance grade information.



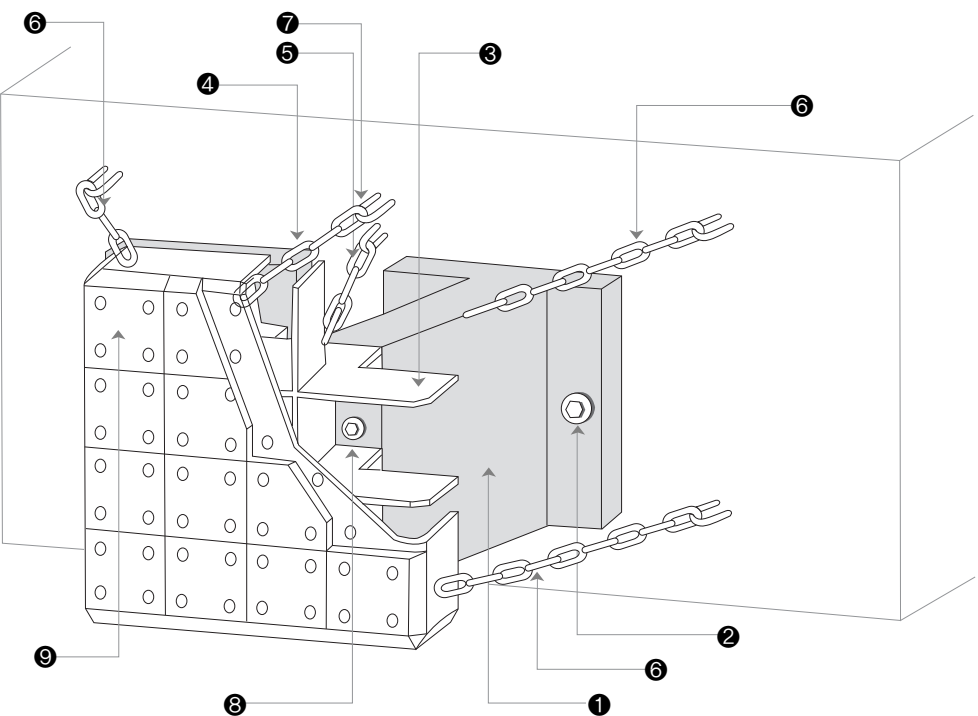
PIANC FACTOR

Temperature Factor		Angular Factor		Velocity Factor	
Temperature(℃)	Factor	Angle(°)	Factor	Time(s)	Factor
-30	1.181	0	1.000	1	1.081
-20	1.144	3	0.971	2	1.008
-10	1.113	5	0.938	3	1.004
0	1.085	8	0.902	4	1.003
10	1.052	10	0.863	5	1.002
23	1.000	15	0.841	6	1.001
30	0.981	20	0.754	8	1.000
40	0.964			10	1.000
50	0.941				

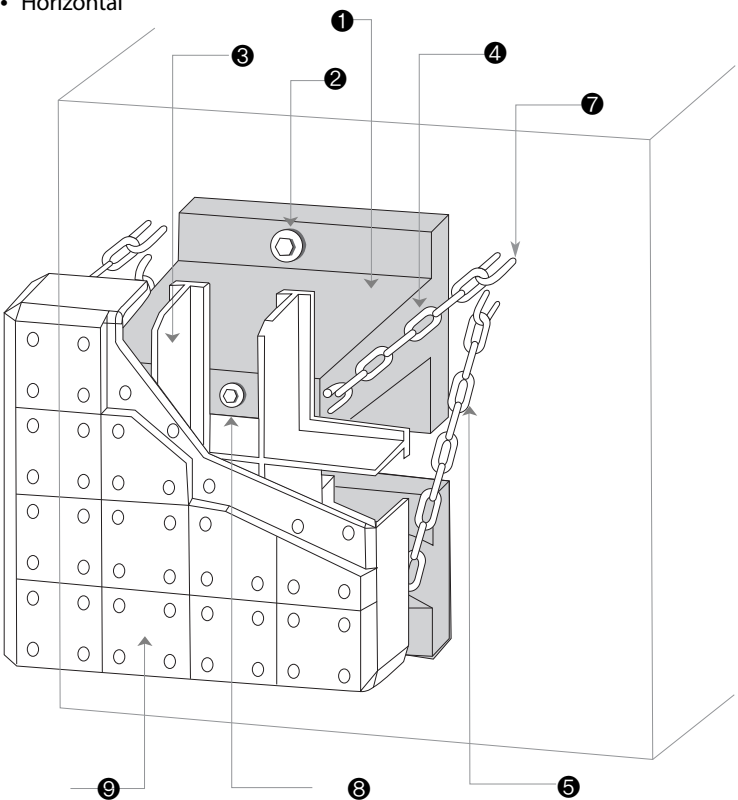


Assembly of TTV Fender

• Vertical Installation



• Horizontal



No.	Major Items for an Assembly
1	Fender Body
2	Anchor (Resin, I, J type)
3	Protector Panel
4	Horizontal Chain
5	Suspension Chain
6	Shear Chain
7	U-Anchor
8	Head Bolt
9	Resin Pad



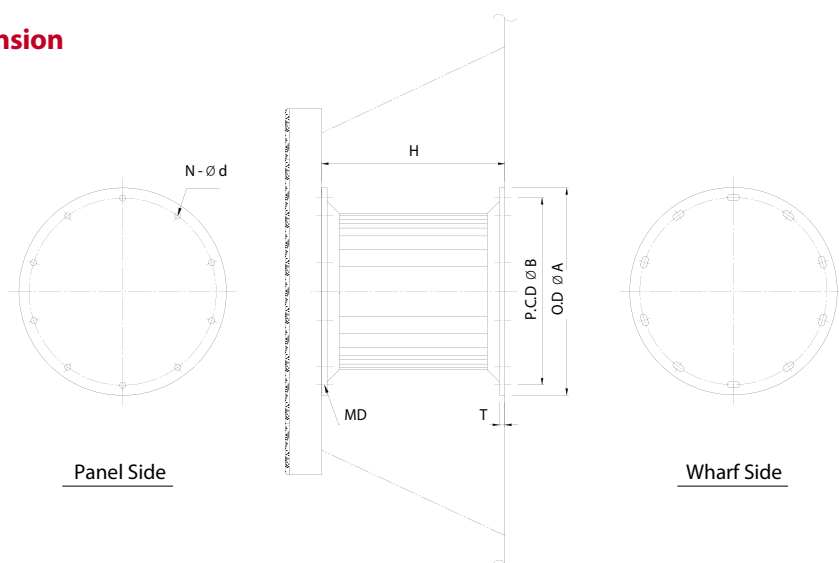
DR(Reel,Cell) Fender

DR type Fender is a cylindrical elastomeric section with steel mounting plates permanently bonded to the main column during vulcanization. Under axial loading, the contoured profile of the cylinder buckles radially. This controlled, multi-directional dispersion of energy combines the high absorptive efficiency of the buckling column with the strength-extending characteristics of a stable geometric shape-high energy absorption and low reaction force as distinguished features.

In addition, DR Fenders can be fitted with frontal frames to obtain wide contact area with the vessel, reducing pressure against the vessel hulls as much as required.



Drawing & Dimension

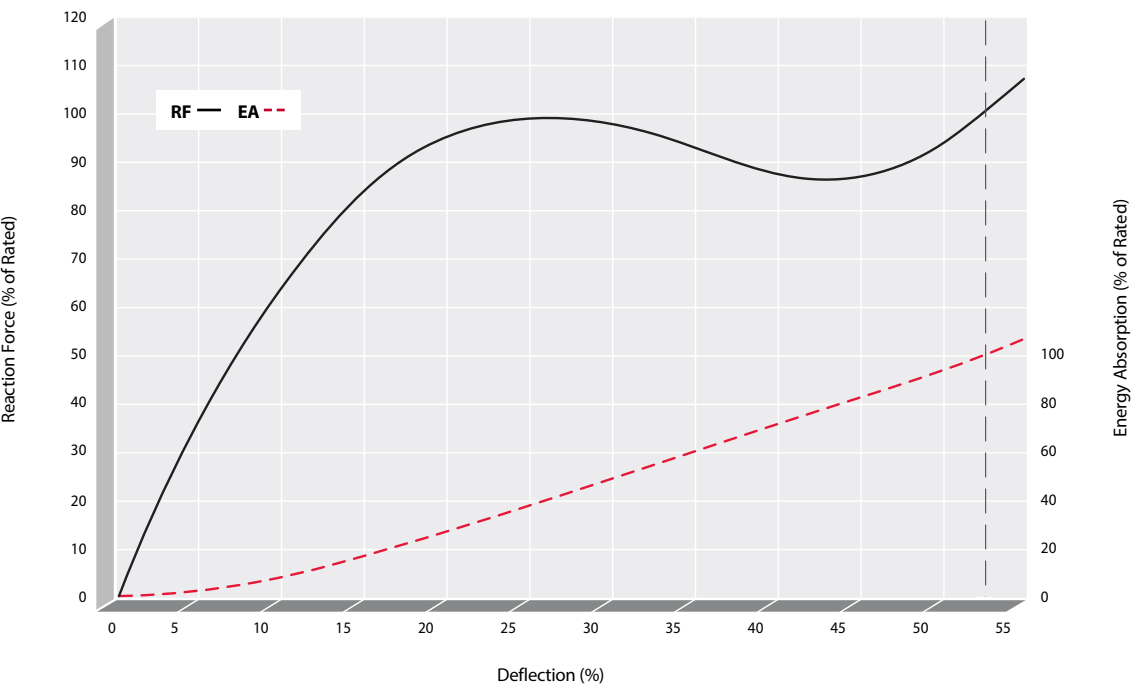


(Unit: mm)

Dimensions	MD (WD")	T	O.D	P.C.D	N	Ø d
Height						
500H	M24 (1)	25	650	550	4	32
650H	M27 (1 1/8)	25	870	730	4	39
800H	M30 (1 1/4)	30	1050	900	6	40
1000H	M36 (1 1/2)	35	1300	1100	6	47
1200H	M42 (1 3/4)	40	1550	1350	6	53
1400H	M48 (2)	42	1800	1600	6	61
1600H	M48 (2)	45	2000	1800	8	61
1700H	M56 (2 1/4)	50	2100	1900	8	66
2000H	M64 (2 1/2)	50	2450	2250	8	74
2250H	M64 (2 1/2)	65	2750	2500	10	74
2500H	M64 (2 1/2)	70	2950	2700	10	74

We can manufacture various fender performance grade. Please consult DRC to get more performance grade information.

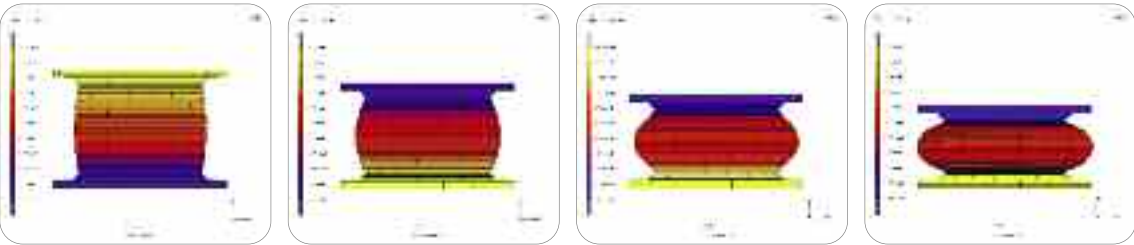
Performance Curve & Table



(Unit: mm)

Size		500H	650H	800H	1000H	1200H	1400H	1600H	1700H	2000H	2250H	2500H
Performance												
R S	RF(ton)	21.6	35.1	55.0	87.8	126.4	172.0	222.3	253.9	351.0	493.7	610.7
	EA(ton-m)	4.1	9.4	17.0	38.6	70.2	108.8	158.0	189.5	308.9	489.1	670.4
R H	RF(ton)	18.5	30	47	75	108	147	190	217	300	422	522
	EA(ton-m)	3.5	8	14.5	33	60	93	135	162	264	418	573
R M	RF(ton)	14.5	24	36	58	82	112	148	167	231	325	401
	EA(ton-m)	2.7	7	11	25.5	47	74	104	125	203	321	441
R L	RF(ton)	8.8	16.1	21.5	35	52	73	91	103	142	212	263
	EA(ton-m)	1.6	3.6	6.8	15.5	22	36	64	77	125	210	288

-Deflection: 52.5% -Tolerance:10% -RF:Reaction Force -EA:Energy Absorption
We can manufacture various fender performance grade. please consult DRC to get more performance grade information.



Marine Products • DR (Reel) Fender

PIANC FACTOR

Temperature Factor		Angular Factor		Velocity Factor	
Temperature(℃)	Factor	Angle(°)	Factor	Time(s)	Factor
-30	1.181	0	1.000	1	1.007
-20	1.144	3	0.977	2	1.003
-10	1.113	5	0.953	3	1.002
0	1.085	8	0.909	4	1.001
10	1.052	10	0.882	5	1.000
23	1.000	15	0.808	6	1.000
30	0.981	20	0.654	8	1.000
40	0.964			10	1.000
50	0.941				



- Table of Major Accessories

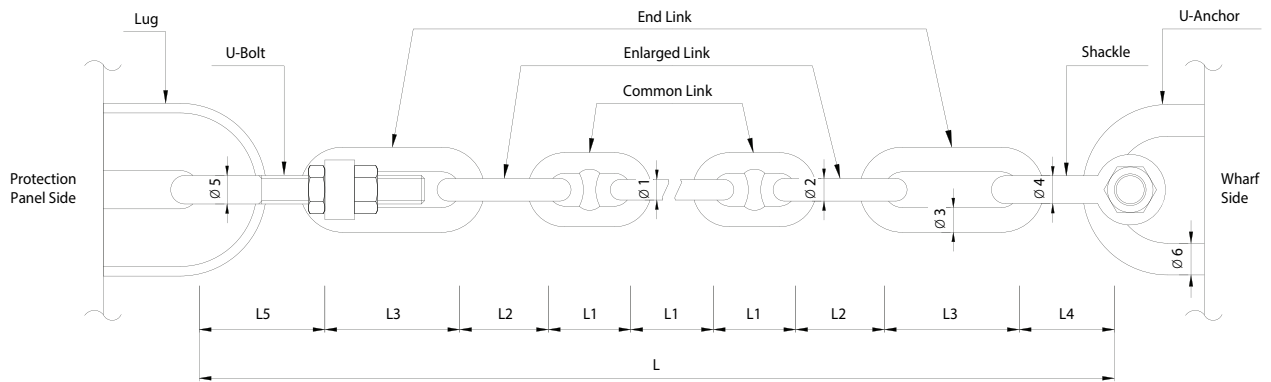
No.	Parts	Purpose
1	Fender	Absorption of ship berthing energy
2	Anchor & Anchor Bolt	Fixing the fender to a dolphin, a pier, or a wharf
3	Protector Panel	Protecting the hull of the vessel
4	Resin Pad	Reducing the friction coefficient & protecting the hull of the vessel
5	Horizontal Chain	Hold the panel to keep it vertical
6	Suspension Chain	Hold the weight of the protector panel
7	Shear Chain	Restraining the shearing deflection of the fender system in case of accident
8	U-Anchor	Holds chains to the concrete structure
9	Head Bolt	Holds the protector panel to the fender body

- Materials & Standards

No.	Accessories	Parts	Material	Corresponding Standard
1	Anchor (Resin, J, I type)	Anchor Bolt	Stainless Steel	KS D 3503
		Pin Washer	Rolled Steel	KS D 3706
2	Protector Panel With Relative Parts	Protector Panel Bolt / Nut / Washer	Rolled Steel (Zn-Galvanized)	KS D 3503
3	Fender Top	Resin-Pad	HDPE UHMW	
4	Chain	Horizontal Chain Shear Chain Suspension Chain	Steel Bars for Chain Rolled Steel	KS D 3546
5	U-Anchor	U-Anchor	Rolled Steel (Zn-Galvanized) Stainless Steel	KS D 3503 KS D 3706



• Chain Construction



Item	Diameter	Length	Remarkd
Common Link	Ø 1	L1 = Ø 1X4.0	Zn - Galvanized
Enlarged Link	Ø 2 = Ø 1X1.1	L2 = Ø 1X4.3	
End Link	Ø 3 = Ø 1X1.2	L3 = Ø 1X4.35	
Shackle	Ø 4 = Ø 1X1.3	L4 = Ø 1X5.5	
U-Bolt	Ø 5 = Ø 1X1.3	L5 = Variable	
U-Anchor	Ø 6 = Ø 1X1.5	L6 = Variable	

• Proof Load

Normal Dia.(mm)	Class 1		Class 2		Class 3		Min. Weight per 1m.Chain(kg)
	Breaking test load(ton)	Proof test load(ton)	Breaking test load(ton)	Proof test load(ton)	Breaking test load(ton)	Proof test load(ton)	
12.5	-	-	9.40	6.72	-	-	3.422
14.0	8.40	5.88	11.77	8.40	-	-	4.292
16.0	10.94	7.66	15.31	10.94	-	-	5.606
17.5	13.04	9.13	18.26	13.04	-	-	6.707
19.0	15.34	10.74	21.47	15.34	-	-	7.906
20.5	17.80	12.47	24.93	17.80	-	-	9.203
22.0	20.44	14.31	28.62	20.44	-	-	10.600
24.0	24.24	16.97	33.93	24.24	-	-	12.610
26.0	28.34	19.84	39.67	28.34	-	-	14.800
28.0	32.74	22.92	45.84	32.74	-	-	17.170
30.0	37.45	26.20	52.40	37.45	-	-	19.710
32.0	42.45	29.70	59.40	42.45	-	-	22.430
34.0	47.70	33.40	66.80	47.70	-	-	25.320
36.0	53.30	37.30	74.60	53.30	-	-	28.380
38.0	59.15	41.40	82.80	59.15	-	-	31.620
40.0	65.28	45.70	91.40	65.28	130.55	91.40	35.040
42.0	71.70	50.20	100.35	71.70	143.40	100.35	38.630
44.0	78.35	54.85	109.70	78.35	156.75	109.70	42.400

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DHR(CONE) Fender

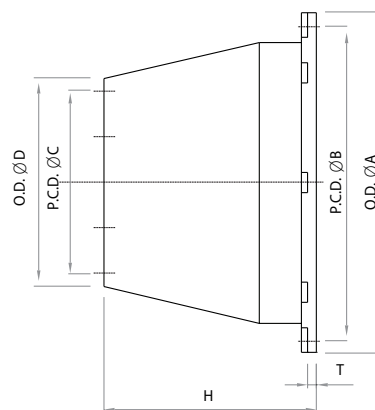
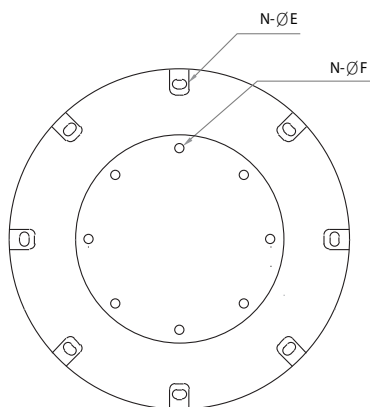


Dong-il Hyper Reel (DHR) fender is the latest model of "reel (or cell) type" fender.

It has excellent energy absorption capacity with low reaction force.

The conical shape is more stable and robust under axial, shear and angular loading than traditional system fender. It is ideal for berths where large berthing angles and heavy impacts.

Drawing & Dimension

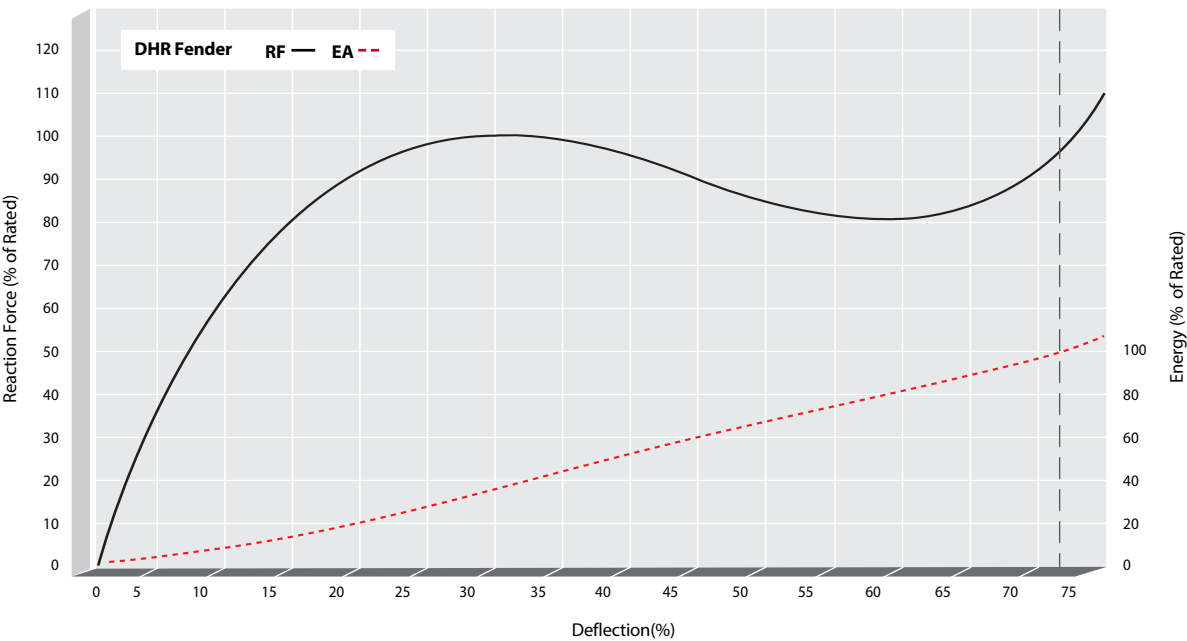


(Unit : mm)

Dimension Height	MD (WD")	O.D ØA	P.C.D ØB	P.C.D ØC	O.D ØD	N-ØE (Hole)	N-ØE (Bolt)	T
600H	M24 (1)	960	875	515	590	4-30	4-M24	30
800H	M30 (1 1/4)	1280	1165	685	785	6-38	6-M30	35
900H	M30 (1 1/4)	1440	1313	770	885	6-38	6-M30	35
1000H	M36 (1 1/2)	1600	1460	885	980	6-44	6-M36	35
1150H	M42 (1 3/4)	1850	1550	990	1130	6-50	6-M42	40
1200H	M42 (1 3/4)	1920	1750	1025	1175	8-50	8-M42	40
1300H	M48 (2)	2080	1900	1100	1275	8-60	8-M48	40
1400H	M48 (2)	2240	2040	1195	1370	8-60	8-M48	50
1600H	M48 (2)	2560	2335	1365	1570	8-60	8-M48	60
1800H	M56 (2 1/4)	2880	2625	1540	1765	10-70	10-M56	60
2000H	M56 (2 1/4)	3200	2920	1710	1955	10-70	10-M56	90

Performance Curve & Intermediate Deflection Table

- Performance Curve



(Unit: mm)

Size		600H	800H	900H	1000H	1150H	1200H	1300H	1400H	1600H	1800H	2000H
Performance												
RS	RF(ton)	45.6	81	102	126	166	182	213	247	322	409	500
	EA(ton-m)	14.5	34.2	48.8	66.5	101	115	145	182	275	390	533
RH	RF(ton)	40.3	71.6	90.4	111	147	161	188	218	285	360	442
	EA(ton-m)	12.8	30.3	43.2	59	89	102	128	162	242	345	472
RM	RF(ton)	35	62.2	78.7	96.7	127	139	163	189	247	311	383
	EA(ton-m)	11	26.4	37.6	51	77.8	88	111	141	209	299	411
RL	RF(ton)	24.3	43.3	55	67	88	96	107	131	172	216	265
	EA(ton-m)	7.7	18.3	26.5	35.5	54	62	78	98	146	209	284

-Rated Deflection : 72%, Maximum Deflection : 75%
RF : Reaction Force (tonf), EA : Energy Absorption (tonf-m), Performance Tolerance : ± 10%
All Reaction Force (RF) , Energy Absorption (EA) values are at 72% Rated Deflection
We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

PIANC FACTOR

Temperature Factor		Angular Factor		Velocity Factor	
Temperature(℃)	Factor	Angle(°)	Factor	Time(s)	Factor
-30	1.181	0	1.000	1	1.048
-20	1.144	3	1.000	2	1.020
-10	1.113	5	1.000	3	1.014
0	1.085	8	0.990	4	1.008
10	1.052	10	0.975	5	1.000
23	1.000	15	0.942	6	1.000
30	0.981	20	0.898	8	1.000
40	0.964			10	1.000
50	0.941				

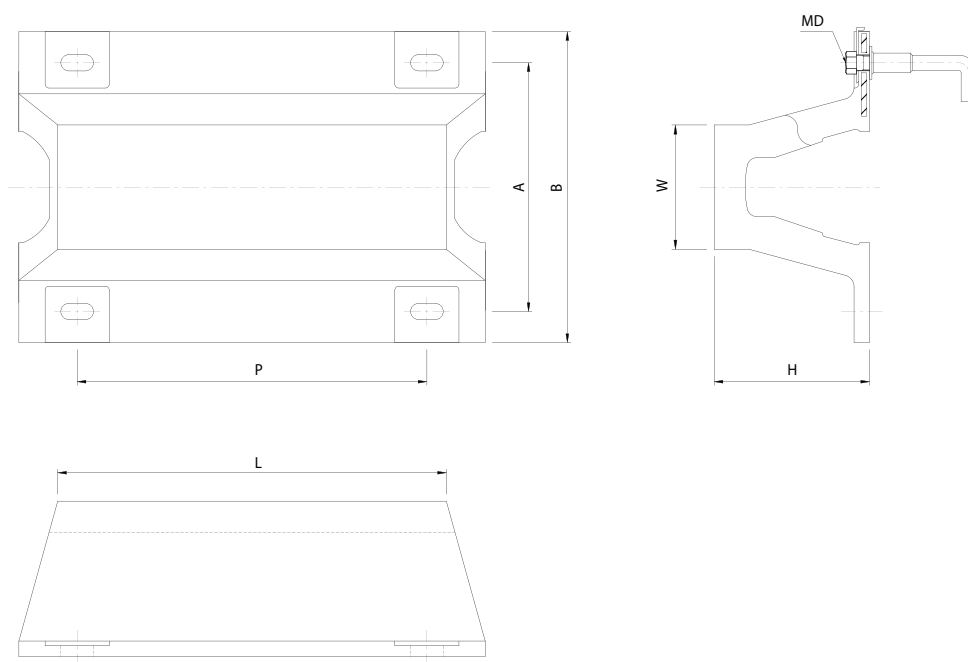


SV Fender



Super V-type fender has high energy absorption performance than other V-type fenders. It can be used with protection panel.

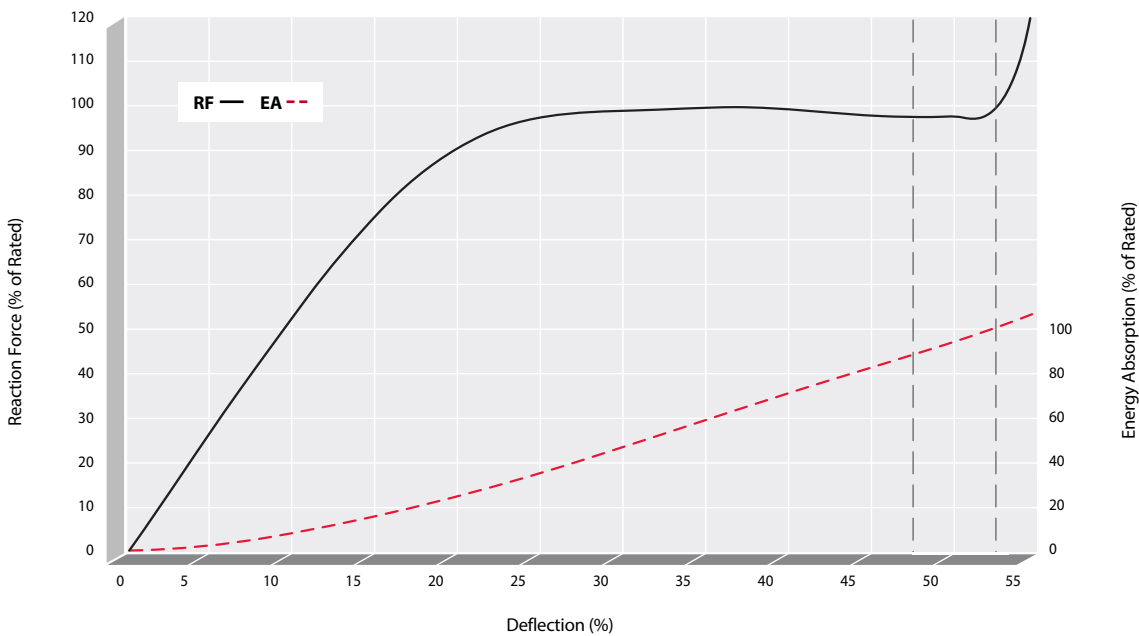
Drawing & Dimension



(Unit: mm)

Dimensions Height	MD (WD")	A	B	W	P					
					1000L	1500L	2000L	2500L	3000L	3500L
250H	M24 (1)	500	400	200	900	700	630	800	725	680
300H	M30 (1 1/4)	600	480	290	900	700	630	800	725	680
400H	M36 (1 1/2)	800	640	320	900	700	630	800	725	680
500H	M36 (1 1/2)	1000	800	400	900	700	630	800	725	680
600H	M42 (1 3/4)	1200	960	480	900	700	630	800	-	-
800H	M48 (2)	1500	1300	640	900	700	630	800	-	-
1000H	M48 (2)	1800	1550	800	900	700	630	800	-	-

Performance Curve & Table



Fender

(Unit: mm)

Size		250H	300H	400H	500H	600H	800H	1000H
Performance								
RS	RF(ton)	26.9	32.3	43.1	53.9	64.7	86.2	108.0
	EA(ton-m)	2.8	4.1	7.2	11.3	16.3	29.0	45.2
RH	RF(ton)	20.7	24.9	33.2	41.5	49.8	66.3	82.9
	EA(ton-m)	2.2	3.1	5.6	8.7	12.5	22.3	34.8
RM	RF(ton)	17.3	20.7	26.6	34.6	41.5	55.3	69.1
	EA(ton-m)	1.8	2.6	4.6	7.3	10.4	18.6	29.0
RL	RF(ton)	13.8	16.6	22.1	27.6	33.2	44.2	55.3
	EA(ton-m)	1.5	2.1	3.7	5.8	8.4	14.8	23.2

- Deflection: 52.5% - Tolerance: ±10% - RF: Reaction Force - EA: Energy Absorption - Length: 1000mm

Fender + Protection Panel

(Unit: mm)

Size		250H	300H	400H	500H	600H	800H	1000H
Performance								
RS	RF(ton)	26.9	32.3	43.1	53.9	64.6	86.1	108.0
	EA(ton-m)	2.5	3.6	6.4	10.0	14.5	25.7	40.1
RH	RF(ton)	20.7	24.9	33.2	41.5	49.7	66.3	82.9
	EA(ton-m)	1.9	2.8	4.9	7.7	11.1	19.7	30.9
RM	RF(ton)	17.3	20.7	27.6	34.6	41.5	55.2	69.1
	EA(ton-m)	1.6	2.3	4.1	6.4	9.3	16.5	25.7
RL	RF(ton)	13.8	16.6	22.1	27.6	33.2	44.1	55.2
	EA(ton-m)	1.3	1.8	3.3	5.1	7.4	13.1	20.6

- Deflection: 47.5% - Tolerance: ±10% - RF: Reaction Force - EA: Energy Absorption - Length: 1000mm

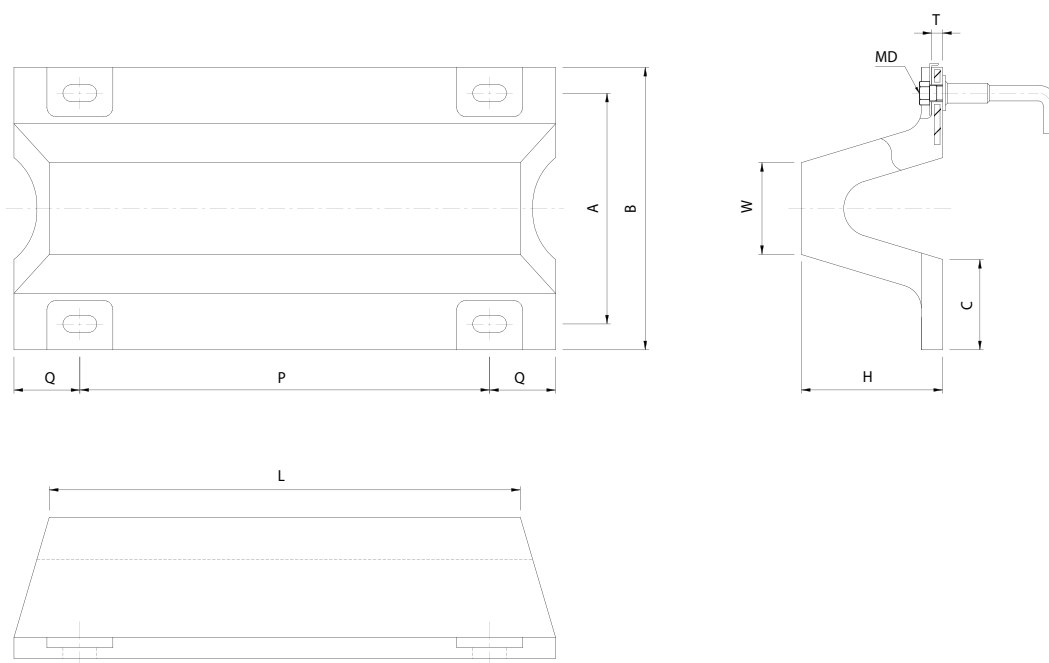


OV Fender



OV Fender is easy to install and it is used to protect the large scale quays.

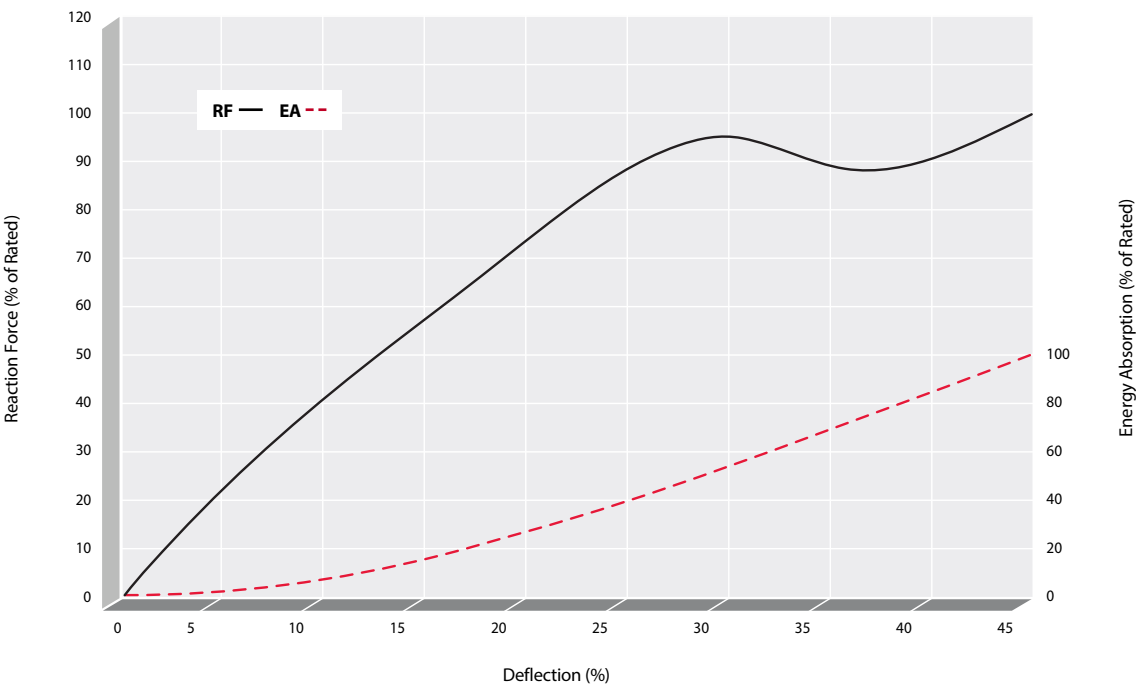
Drawing & Dimension



(Unit: mm)

Dimensions Height	MD (WD")	A	B	C	T	W	1000L		1500L		2000L		2500L		3000L		3500L	
							P	Q	P	Q	P	Q	P	Q	P	Q	P	Q
150H	M22 (7/8)	240	300	96	17	97.5	855	110	675X2	112.5	620X3	107.5	785X3	110	715X4	107.5	671X5	110
200H	M24 (1)	320	400	128	17	130	860	120	680X2	120	620X3	120	785X3	122.5	715X4	120	672X5	120
250H	M27 (1 1/8)	410	500	160	22	162.5	865	130	680X2	132.5	620X3	132.5	790X3	127.5	715X4	132.5	673X5	130
300H	M30 (1 1/4)	490	600	192	23	195	870	140	685X2	140	625X3	137.5	790X3	140	715X4	145	674X5	140
400H	M36 (1 1/2)	670	800	256	31	260	900	150	700X2	150	635X3	147.5	800X3	150	725X4	150	680X5	150
500H	M42 (1 3/4)	840	1000	320	34	330	930	160	715X2	160	645X3	157.5	810X3	160	730X4	165	686X5	160
600H	M48 (2)	1010	1200	384	40	395	960	170	730X2	170	655X3	167.5	820X3	170	740X4	170	692X5	170
800H	M64 (2 1/2)	1340	1600	512	43	525	1040	180	770X2	180	680X3	180	845X3	182.5	760X4	180	704X5	180
1000H	M64 (2 1/2)	1680	2000	640	49	655	1100	200	800X2	200	700X3	200	865X3	202.5	775X4	200	900X4	200

Performance Curve & Table



(Unit: mm)

Size		150H	200H	250H	300H	400H	500H	600H	800H	1000H
Performance										
RS	RF(ton)	12.8	17.1	21.4	25.7	34.2	42.8	51.3	68.4	85.5
	EA(ton-m)	0.7	1.1	1.8	2.6	4.7	7.2	10.4	18.5	29.0
RH	RF(ton)	11.3	15.0	18.8	22.5	30.0	37.5	45.0	60.0	75.0
	EA(ton-m)	0.6	1.0	1.6	2.3	4.1	6.3	9.1	16.2	25.4
RM	RF(ton)	8.4	11.5	14.0	17.0	22.5	28.0	34.0	45.0	56.0
	EA(ton-m)	0.4	0.8	1.2	1.7	3.0	4.8	6.8	12.1	19.0
RL	RF(ton)	5.6	7.5	9.4	11.5	15.0	19.0	22.5	30.0	37.5
	EA(ton-m)	0.3	0.5	0.9	1.1	2.0	3.2	4.6	8.1	13.7

- Deflection: 45% - Tolerance: ± 10% - RF: Reaction Force - EA: Energy Absorption - Length:1000mm
We can manufacture various fender performance grade. please consult DRC to get more performance grade information.



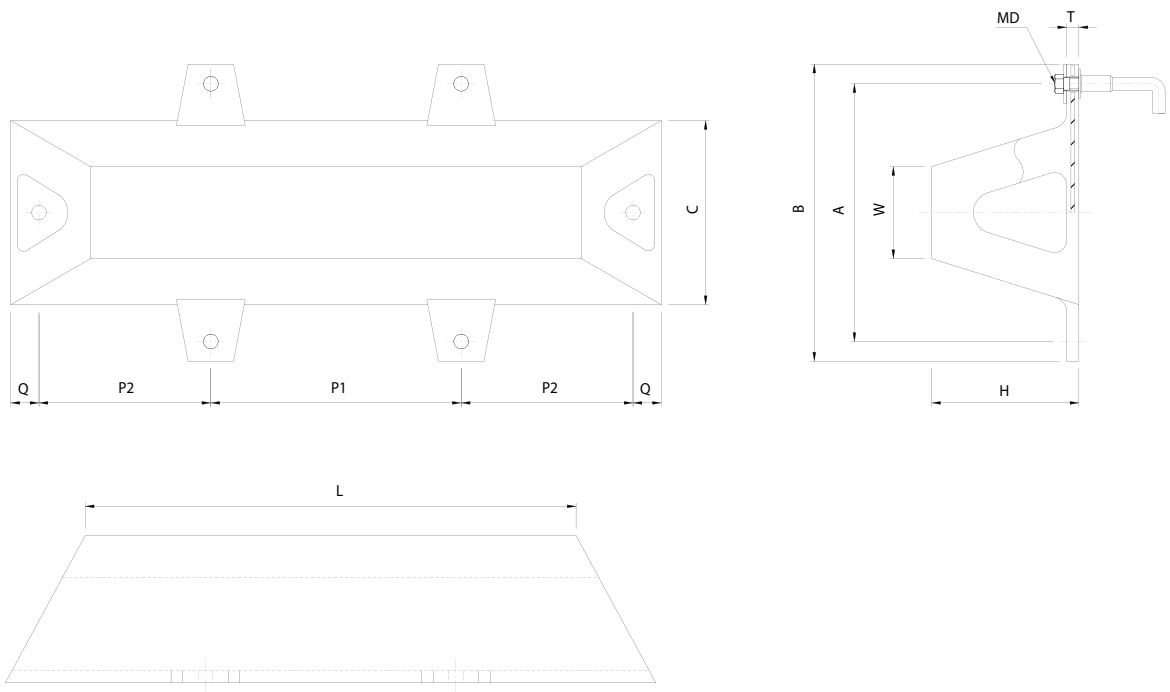


CV Fender



CV Fender provides the stabilized performance and easy installation, maintenance properties. It has a high energy absorption ability and gives low reaction force.

Drawing & Dimension



(Unit: mm)

Dimensions Height	MD (WD")	A	B	C	T	W
200H	M24 (1)	350	445	250	25	125
300H	M30 (1 1/4)	530	645	375	35	188
400H	M36 (1 1/2)	710	840	500	40	250
500H	M42 (1 3/4)	860	1000	625	40	315
600H	M48 (2)	1050	1210	750	50	375
800H	M62 (2 1/2)	1350	1550	1000	60	500
1000H	M62 (2 1/2)	1600	1800	1250	65	625

We can manufacture various fender performance grade, please consult DRC to get more performance grade information.

(Unit: mm)

Dimensions	1000L		1500L		2000L			2500L			3000L			3500L		
	P2	Q	P2	Q	P1	P2	Q	P1	P2	Q	P1	P2	Q	P1	P2	Q
200H	555	70	805	70	900	605	70	900	855	70	900X2	655	70	900X2	905	70
300H	600	75	850	75	1000	600	75	1000	850	75	1000X2	600	75	1000X2	850	75
400H	640	85	890	85	1200	540	85	1200	790	85	1200X2	440	85	1200X2	690	85
500H	675	100	925	100	1000	675	100	1000	925	100	1000X2	675	100	1000X2	925	100
600H	710	115	960	115	1020	700	115	1020	950	115	1020X2	690	115	1020X2	940	115
800H	670	130	920	130	1050	645	130	1050	895	130	1050X2	620	130	1050X2	870	130
1000H	700	150	950	150	1200	600	150	1200	850	150	1200X2	500	150	1200X2	750	150

We can manufacture various fender performance grade, please consult DRC to get more performance grade information.

Performance Table

(Unit: mm)

Size		200H		300H		400H		500H		600H		800H		1000H	
Performance															
RS	RF(ton)	17.1		25.7		34.2		42.8		51.3		68.4		85.5	
	EA(ton-m)	1.1		2.6		4.7		7.2		10.4		18.5		29.0	
RH	RF(ton)	15.0		22.5		30.0		37.5		45.0		60.0		75.0	
	EA(ton-m)	1.0		2.3		4.1		6.3		9.1		16.2		25.4	
RM	RF(ton)	11.5		17.0		22.5		28.0		34.0		45.0		56.0	
	EA(ton-m)	0.8		1.7		3.0		4.8		6.8		12.1		19.0	
RL	RF(ton)	7.5		11.5		15.0		19.0		22.5		30.0		37.5	
	EA(ton-m)	0.5		1.1		2.0		3.2		4.6		8.1		13.7	

-Deflection: 45% -Tolerance: ± 10% - RF: Reaction Force - EA: Energy Absorption -Length:1000mm

We can manufacture various fender performance grade, please consult DRC to get more performance grade information.

Face Color Type



Pad Coupling Type



All Color Type



*

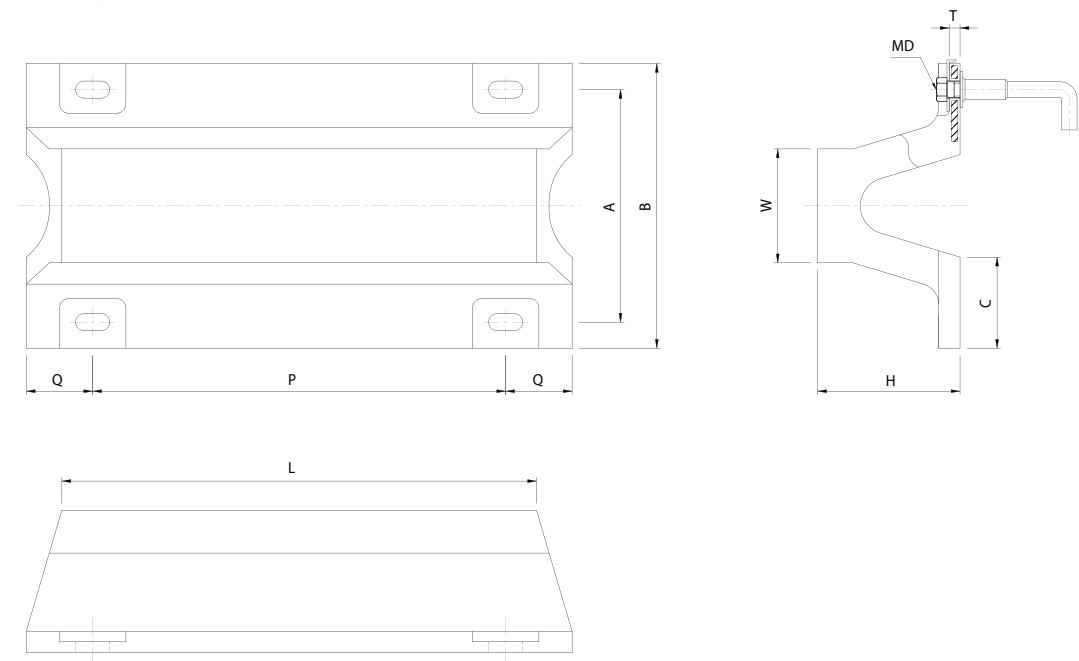
TV Fender



TV Fender is designed to increase the energy absorption ability about 15%, compared with the other types of fender with same size and rubber grade. The compression capacity increases from 45% up to 52.5% through the most suitable design. TV Fender is easy to install and replace as the specification of the anchor bolt for TV Fender is same as DOV Fender's bolt.



Drawing & Dimension



(Unit: mm)

Dimension Height	MD (WD")	A	B	C	T	W	1000L		1500L		2000L		2500L		3000L	
							P	Q	P	Q	P	Q	P	Q	P	Q
150H	M22 (7/8)	240	300	96	17	120	855	110	675X2	112.5	620X3	107.5	785X3	110	715X4	107.5
200H	M24 (1)	320	400	128	17	160	860	120	680X2	120	620X3	120	785X3	122.5	715X4	120
250H	M27 (1 1/8)	410	500	160	22	200	865	130	680X2	132.5	620X3	132.5	790X3	127.5	715X4	132.5
300H	M30 (1 1/4)	490	600	192	23	240	870	140	685X2	140	625X3	137.5	790X3	140	715X4	145
400H	M36 (1 1/2)	670	800	256	31	320	900	150	700X2	150	635X3	147.5	800X3	150	725X4	150
500H	M42 (1 3/4)	840	1000	320	34	400	930	160	715X2	160	645X3	157.5	810X3	160	730X4	165
600H	M48 (2)	1010	1200	384	40	480	960	170	730X2	170	655X3	167.5	820X3	170	740X4	170
800H	M64 (2 1/2)	1340	1600	512	43	640	1040	180	770X2	180	680X3	180	845X3	182.5	760X4	180
1000H	M64 (2 1/2)	1680	2000	640	49	800	1100	200	800X2	200	700X3	200	865X3	202.5	775X4	200

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

Performance Table

(Unit: mm)

Size		150H	200H	250H	300H	400H	500H	600H	800H	1000H
Performance										
RS	RF(ton)	16.5	21.0	27.0	33.0	43.5	54.0	64.5	87.0	108.0
	EA(ton-m)	0.9	1.65	2.7	3.9	6.9	10.8	15.6	27.7	43.5
RH	RF(ton)	12.0	17.0	21.0	25.0	33.0	42.0	50.0	66.0	83.0
	EA(ton-m)	0.7	1.3	2.1	3.0	5.3	8.3	12.0	21.4	33.4
RM	RF(ton)	11.0	14.0	18.0	22.0	29.0	36.0	43.0	58.0	72.0
	EA(ton-m)	0.6	1.1	1.8	2.6	4.6	7.2	10.4	18.5	29.0
RL	RF(ton)	9.0	12.0	15.0	17.0	23.0	29.0	35.0	46.0	58.0
	EA(ton-m)	0.5	0.9	1.4	2.1	3.7	5.8	8.3	14.8	23.1

- RF:Reaction(ton) -EA:Energy Absorption(ton-m) -Tolerance: ± 10% -Deflection:52.5% -Length:1000mm

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

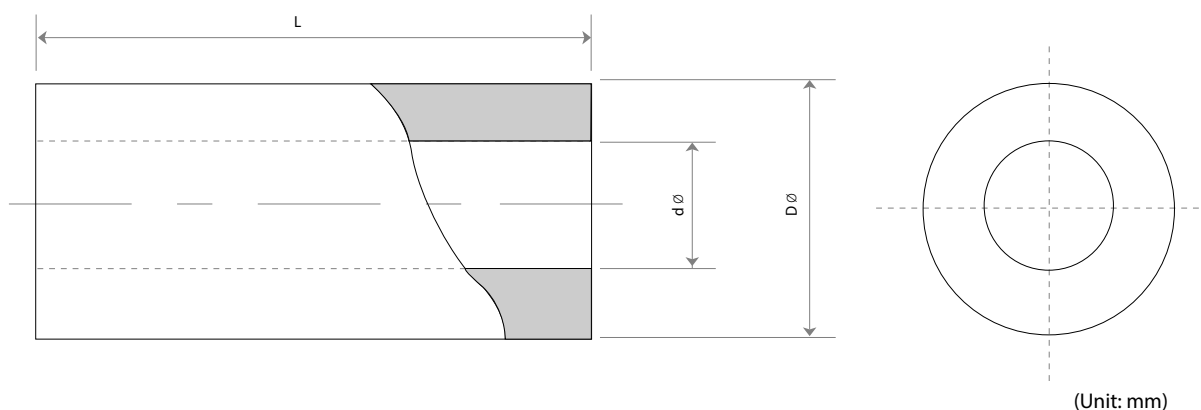


CY(Cylindrical) Fender



CY Fender is a simple hollow cylinder which is generally mounted on the small scale of the quays for the small and medium vessels. It gives a small hull pressure to the vessel by taking large deformation when the vessel comes alongside the quay.

Drawing & Dimension



(Unit: mm)

Size	Cy150Ø × 75Ø	Cy200Ø × 100Ø	Cy300Ø × 150Ø	Cy400Ø × 200Ø	Cy500Ø × 250Ø	Cy600Ø × 300Ø	Cy800Ø × 400Ø	Cy1000Ø × 500Ø	Cy1200Ø × 600Ø	Cy1400Ø × 700Ø	Cy1600Ø × 800Ø
D Ø	150	200	300	400	500	600	800	1000	1200	1400	1600
d Ø	75	100	150	200	250	300	400	500	600	700	800

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

• Cylindrical Fender Performance Table

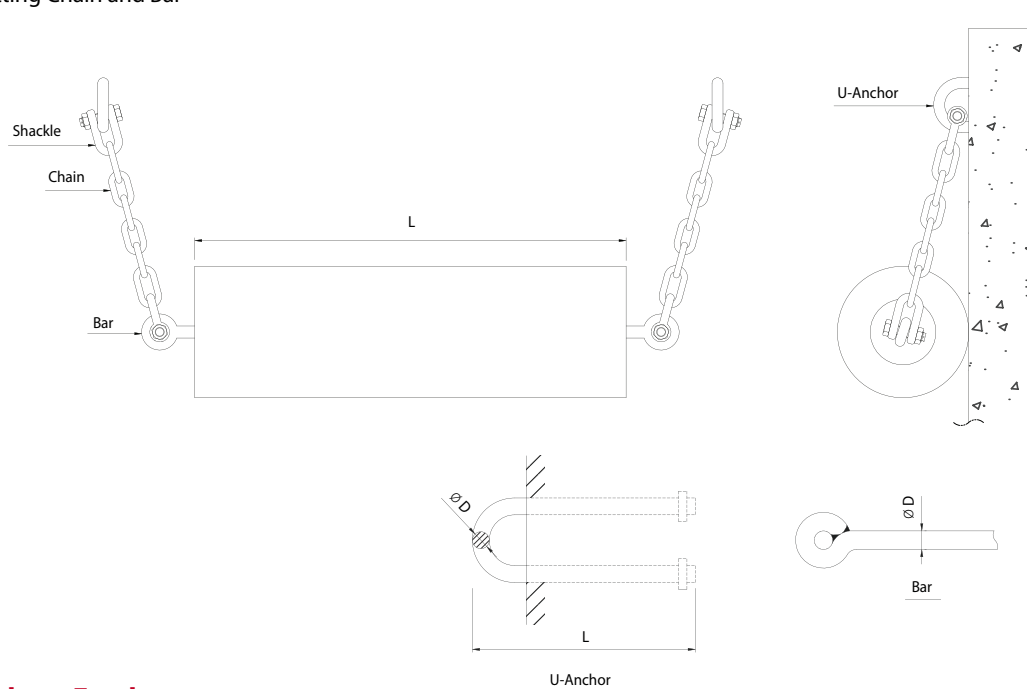
(Unit: mm)

Size		150Ø × 75Ø	200Ø × 100Ø	300Ø × 150Ø	400Ø × 200Ø	500Ø × 250Ø	600Ø × 300Ø	800Ø × 400Ø	1000Ø × 500Ø	1200Ø × 600Ø	1400Ø × 700Ø	1600Ø × 800Ø
Performance												
RH	RF(ton)	7.50	10.00	15.00	20.00	25.00	30.00	40.00	50.00	60.00	70.00	80.00
	EA(ton-m)	0.22	0.40	0.90	1.60	2.50	3.60	6.40	10.00	14.40	19.60	25.60
RM	RF(ton)	6.00	7.70	12.00	16.00	12.00	23.00	30.00	38.00	46.00	54.00	61.00
	EA(ton-m)	0.18	0.32	0.73	1.30	2.00	2.90	5.20	3.20	11.70	15.90	20.80
RL	RF(ton)	4.10	5.40	8.00	11.00	13.00	16.00	21.00	26.00	32.00	37.00	42.00
	EA(ton-m)	0.12	0.21	0.48	0.84	1.32	1.90	3.40	5.30	7.60	10.40	13.50

- RF:Reaction(ton) -EA:Energy Absorption(ton-m) -Tolerance: ± 10% -Deflection:50% -Length:1000mm

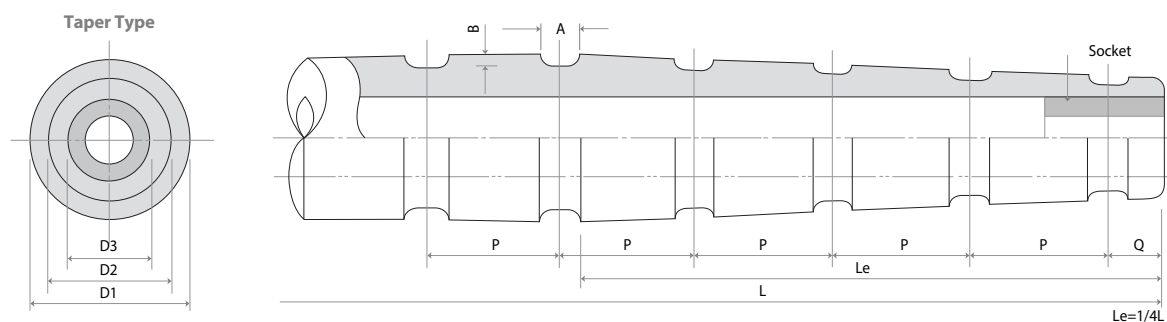
We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

- Fitting Chain and Bar



Tugboat Fender

- Type A(straight) for use of bow and stern



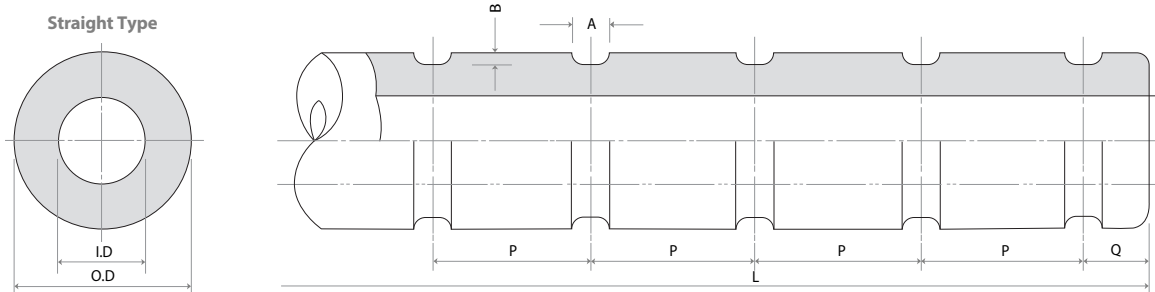
(Unit: mm)

Size	ø 200×100	ø 250×125	ø 300×150	ø 350×175	ø 400×200	ø 500×250	ø 600×300	ø 700×350	ø 800×400
D1	200	250	300	350	400	500	600	700	800
D2	150	190	225	260	300	375	450	525	600
D3	100	125	150	175	200	250	300	350	400
A	50	50	50	70	70	70	85	85	85
B	15	15	15	20	20	30	30	40	40
P	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900
Q	150	150	200	200	200	250	250	300	300
O . D	152	152	202	202	202	252	303	354	404
Socket I . D	75	75	75	100	100	100	150	150	150
Length	150	200	225	250	300	350	400	400	400

- Maximum Length available is 20m

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

- Type B(straight) for use of boardside



(Unit: mm)

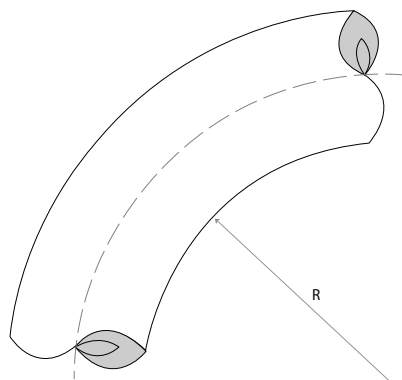
Size	100 Ø × 50 Ø	150 Ø × 75 Ø	200 Ø × 100 Ø	250 Ø × 125 Ø	300 Ø × 150 Ø	350 Ø × 175 Ø	400 Ø × 200 Ø	500 Ø × 250 Ø	600 Ø × 300 Ø	700 Ø × 350 Ø
O . D	100	150	200	250	300	350	400	500	600	700
I . D	50	75	100	125	150	175	200	250	300	350
A	30	30	50	50	50	70	70	70	85	85
B	10	10	15	15	15	20	20	30	30	40
P	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900	600 ~ 900
Q	100	100	150	150	200	200	200	250	250	300

- Maximum Length available is 20m

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

O.D.(mm)	Permissible bending radius (R) (mm)
800	1600
600	1200
500	1000
400	800
300	600
200	400

We can manufacture various fender performance grade.
please consult DRC to get more performance grade information.



(Unit: mm)

I.D. of fender	O.D. of socket	I.D. of socket	Lenght of socket
200	202	100	300
250	252	100	350
300	299	150	400
350	354	150	400
400	404	150	400

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

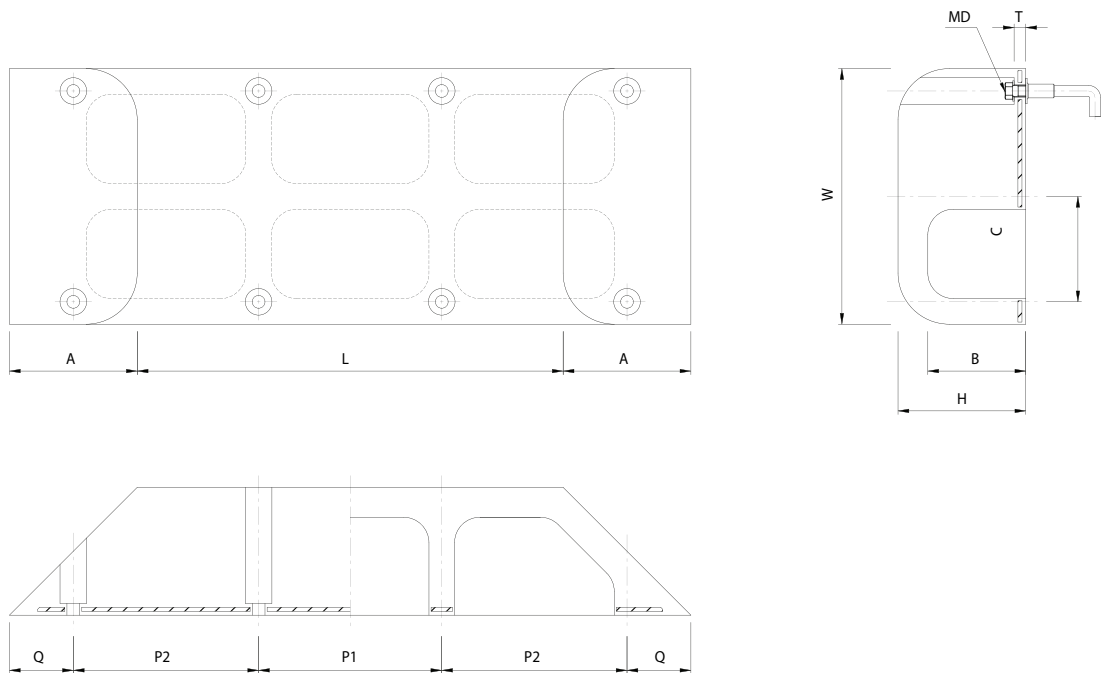


BP Fender



BP Fender is an energy absorption device which has been modified from the car bumper. It has lower face pressure than the conventional OV Fender as BP Fender has large contact surface.

Drawing & Dimension



(Unit: mm)

Dimension Height	MD (WD")	A	B	C	T	Q	W	1000L		1500L		2000L		2500L		3000L	
								P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
150H	M24 (1)	150	110	107.5	25	75	300	-	575	-	825	710	720	880	885	785X2	790
200H	M30 (1 1/4)	200	150	145	25	100	400	-	600	-	850	730	735	900	900	800X2	800
250H	M30 (1 1/4)	250	190	190	30	125	500	-	625	-	875	750	750	910	920	810X2	815
300H	M36 (1 1/2)	300	230	235	35	150	600	-	650	-	900	760	770	930	935	825X2	825
400H	M36 (1 1/2)	400	310	320	40	200	800	-	700	-	950	800	800	960	970	850X2	850
500H	M42 (1 3/4)	500	380	410	50	250	1000	-	750	-	1000	830	835	1000	1000	875X2	875
600H	M48 (2)	600	460	495	55	300	1200	-	800	-	1050	860	870	1030	1035	900X2	900
800H	M64 (2 1/2)	800	620	670	60	400	1600	-	900	-	1150	930	935	1100	1100	950X2	950
1000H	M64 (2 1/2)	1000	780	850	65	500	2000	-	1000	-	1250	1000	1000	1160	1170	1000X2	1000
1300H	M76 (3)	1300	1020	1125	70	650	2600	-	1150	-	1400	1100	1100	1260	1270	1075X2	1075

We can manufacture various fender performance grade, please consult DRC to get more performance grade information.



Performance Table

(Unit: mm)

Size		150H	200H	250H	300H	400H	500H	600H	800H	1000H	1300H
Performance											
Def 45%	RF(ton)	12.8	17	21.3	25.5	34	42.5	51	68	85	110.5
	EA(ton-m)	0.64	1.13	1.77	2.54	4.52	7	10.2	18.1	28.2	47.7

- RF:Reaction(ton) -EA:Energy Absorption(ton-m) -Tolerance: $\pm 10\%$ -Deflection:50% -Length:1000mm

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.



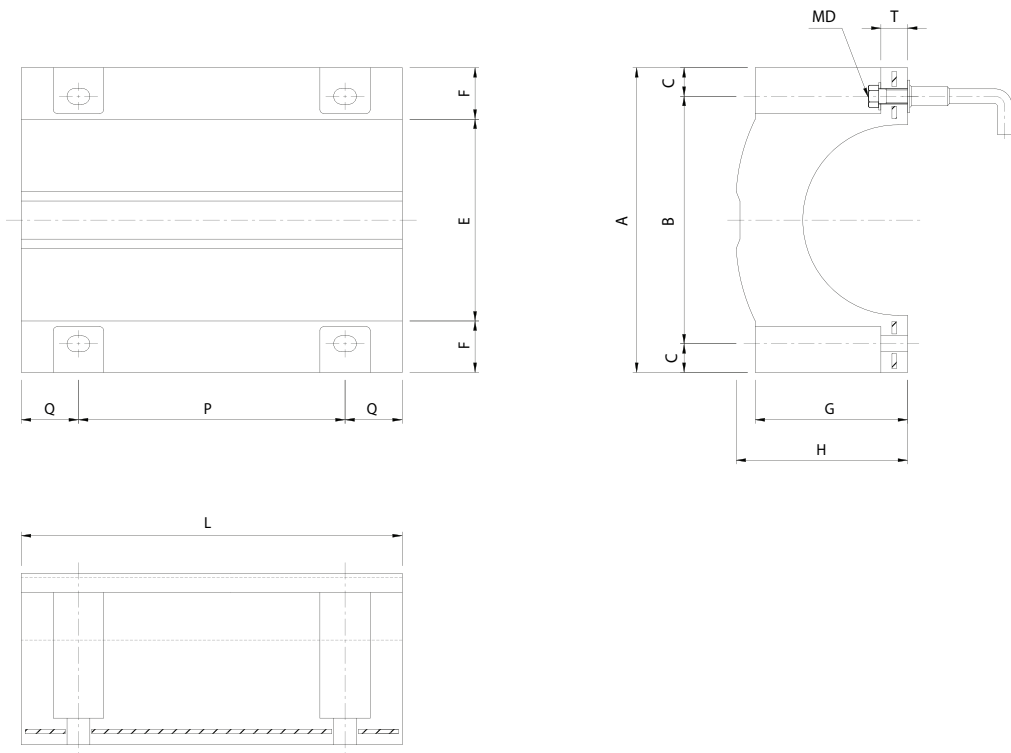
Bridge Fender



DRB Fender is the buffering material to use for protecting the bridge and the ship, and is developed to install at the pier of the bridge to introduce the solidity of BP type and the versatility of DOV type.

- 1) Manufacture for being practicable to install at the round or plane pier.
- 2) Easiness to absorb the shock by reserving the contact surface as much as possible.
- 3) Reserving the contact surface by installing the anchor bolt inside FENDER.
- 4) Design to give a visual attention to the running ship by using the luminous paper or the yellow paint on the contact part. And usable the Solar LED panel (refer to page. 52)

Drawing & Dimension



(Unit: mm)

Dimension Height	MD (WD")	A	B	C	E	F	G	T	1000L		1500L		2000L		2500L	
									P	Q	P	Q	P	Q	P	Q
250H	M24 (1")	445	360	42.5	275	85	225	40	800	100	650x2	100	600x3	100	760x3	110
450H	M36 (1 1/2")	800	650	75	530	135	400	70	700	150	600x2	150	560x3	160	740x3	140

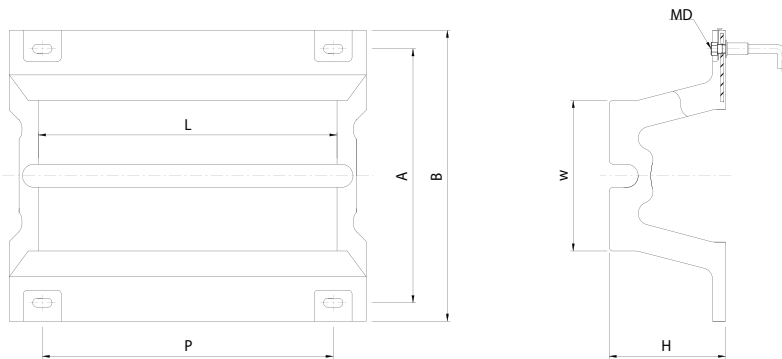
We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

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SM Fender



Drawing & Dimension



(Unit: mm)

Dimensions Height	MD (WD")	A	B	W	P					
					1000L	1500L	2000L	2500L	3000L	3500L
250H	M27 (1 1/8)	535	625	330	865	680x2	620x3	790x3	715x4	673x5
300H	M30 (1 1/4)	640	750	396	870	685x2	625x3	790x3	715x4	674x5
400H	M36 (1 1/2)	870	1000	528	900	700x2	630x3	800x3	725x4	680x5
500H	M42 (1 3/4)	1090	1250	660	930	715x2	645x3	810x3	730x4	686x5
600H	M42 (1 3/4)	1310	1500	776	960	730x2	655x3	820x3	740x4	692x5
800H	M64 (2 1/2)	1740	2000	1035	1040	770x2	680x3	845x3	760x4	704x5
1000H	M64 (2 1/2)	2180	2480	1294	1100	800x2	700x3	865x3	775x4	900x5

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

Performance Table

(Unit: mm)

Size		250H	300H	400H	500H	600H	800H	1000H
Performance								
RS	RF(ton)	43.0	42.2	56.1	70.2	84.4	112.5	140.6
	EA(ton-m)	3.4	4.0	7.1	11.2	16.1	28.5	42.4
RH	RF(ton)	30.7	37	49.2	61.6	74	98.7	123.3
	EA(ton-m)	2.4	3.5	6.2	9.8	14.1	25	37.2
RM	RF(ton)	24.9	30	40	50	60	80	100
	EA(ton-m)	2	2.9	5.1	8.1	11.7	20.8	32.5
RL	RF(ton)	21.2	25.5	34	42.5	51	68	85
	EA(ton-m)	1.7	2.5	4.4	6.9	10	17.7	27.7

-Deflection 55%, -Tolerance: $\pm 10\%$ -RF:Reaction Force -EA:Energy Absorption -Length:1000mm

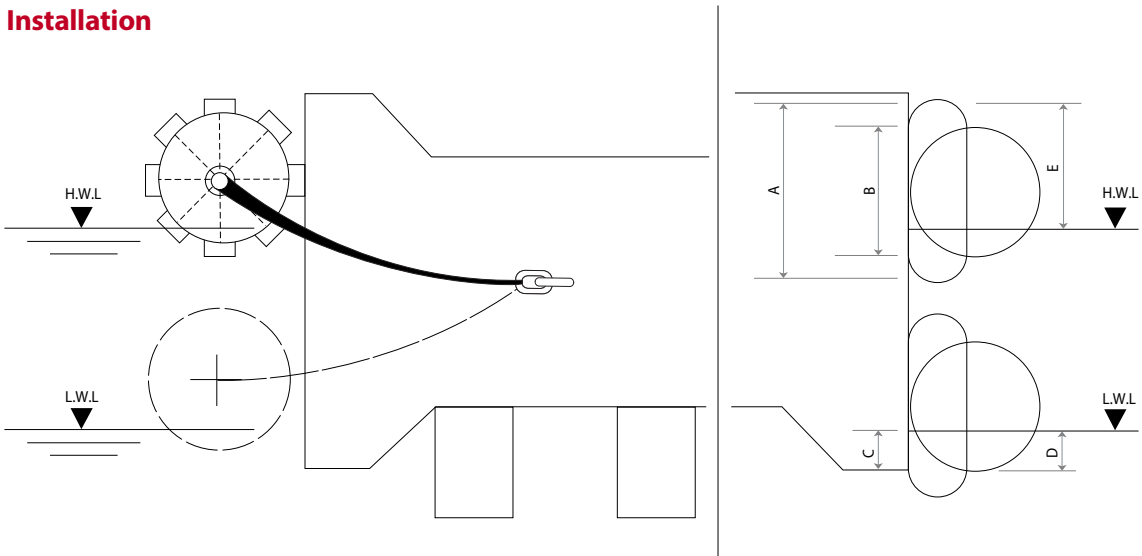
We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

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Air(Pneumatic) Fender



Installation



(Unit: mm)

Size	A	B	C	D	E
1000 Ø x1500L	1340	940	460	410	760
1200 Ø x2000L	1610	1130	410	380	1025
1500 Ø x2500L	2020	1420	440	410	1350
2000 Ø x3500L	2690	1890	490	460	1885
2500 Ø x4000L	3360	2360	520	500	2430
3300 Ø x6500L	4430	3110	580	580	3285

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

Performance Table

• Air Fender Performance Table

(Unit: mm)

Diameter	300		500		800		1000		1200		1350
Length	500	600	800	1000	1200	1500	1500	2000	1800	2000	2500
Initial Inner Pressure of 0.3kg/cm ²											
RF(ton)	2.0	2.4	5.4	6.8	13.0	17.0	20.0	27.0	30.0	33.0	45.0
EA(ton-m)	0.1	0.1	0.4	0.5	1.6	2.0	3.2	4.2	5.5	6.0	10.1
Initial Inner Pressure of 0.5kg/cm ²											
RF(ton)	2.3	2.4	6.0	7.5	14.4	19.0	22.6	30.1	32.6	36.1	50.6
EA(ton-m)	0.13	0.15	0.58	0.73	2.20	2.80	4.1	5.5	7.1	7.9	12.7
Initial Inner Pressure of 0.8kg/cm ²											
RF(ton)	3.0	3.6	8.0	10.0	19.1	24.0	28.6	38.1	41.2	45.8	64.4
EA(ton-m)	0.1	0.2	0.7	0.9	2.8	3.5	5.3	7.1	9.2	10.3	16.3

We can manufacture various fender performance grade, please consult DRC to get more performance grade information.

(Unit: mm)

Diameter	1500		2000			2500		3000	3300			4500	
Length	2500	3000	3000	3500	6000	4000	5500	5000	4500	6500	10600	7000	9000
Initial Inner Pressure of 0.3kg/cm ²													
RF(ton)	51.0	60.0	81.4	95.0	162.9	130.0	178.8	200.0	208.0	300.0	485.0	419.0	540.0
EA(ton-m)	12.0	14.0	24.0	28.0	48.0	50.0	68.8	100.0	104.0	150.0	242.0	302.0	388.0
Initial Inner Pressure of 0.5kg/cm ²													
RF(ton)	56.5	67.1	90.0	105.0	180.0	151.0	207.6	225.0	224.0	353.0	527.0	475.0	612.0
EA(ton-m)	15.5	18.6	33.0	38.5	66.0	68.8	94.6	125.0	135.0	195.0	318.0	389.0	505.0
Initial Inner Pressure of 0.8kg/cm ²													
RF(ton)	71.1	85.3	114.4	134.0	229.0	190.0	261.0	284.0	282.0	407.0	663.0	598.0	769.0
EA(ton-m)	20.0	24.0	43.0	50.1	85.9	88.9	122.0	160.0	174.0	252.0	411.0	504.0	648.0

-RF: Reaction force (ton) -EA: Energy Absorption (ton-m) -Tolerance: ± 10%, -Deflection: 60%

We can manufacture various fender performance grade, please consult DRC to get more performance grade information.



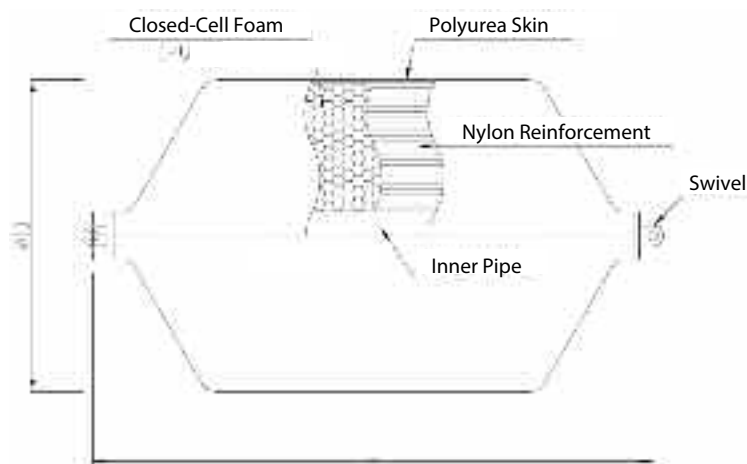
Foam Filled Fender



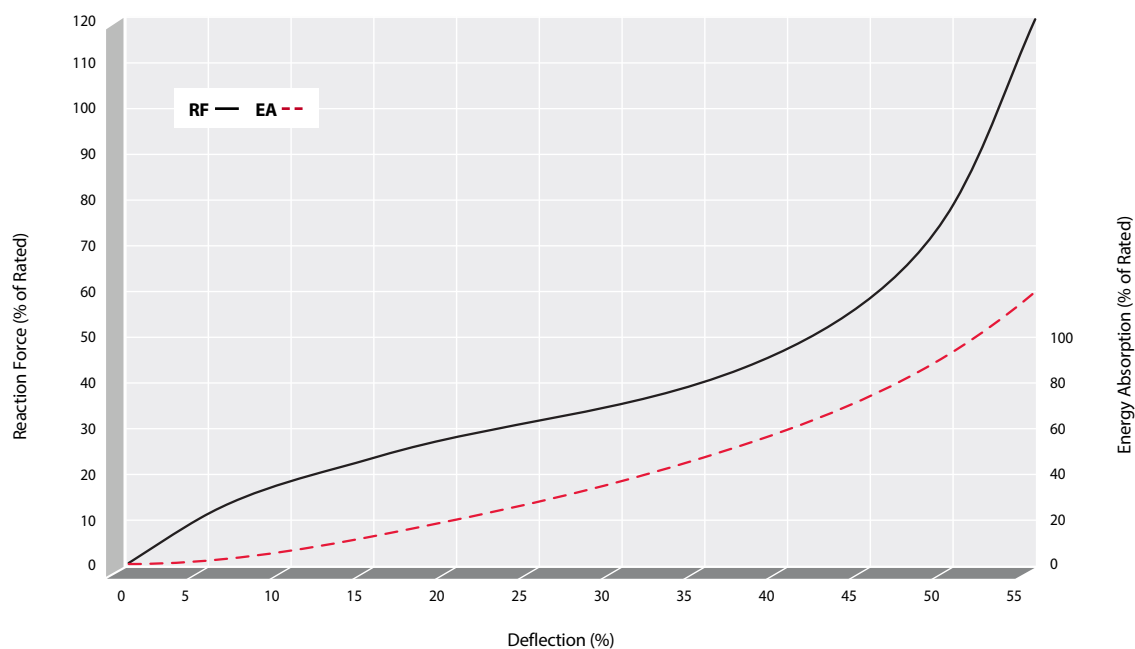
Foam Filled Fender consist of closed cell polyethylene foam core, reinforced polyurethane elastomer, and swivel tension chain member. Foam Filled Fender is unsinkable with their closed cell polyethylene foam core.

Foam Filled Fender is very easy to install and never sink or blow out.

Drawing



Performance Curve



Deflection(%)	0	5	10	15	20	25	30	35	40	45	50	55
EA(%)	0	1.3	4.8	9.7	18	22.5	30.2	38.9	49.1	61.4	77.1	100
RF(%)	0	9.7	15.4	19.7	23.5	26.2	29.5	35	39.8	48.9	65.1	100

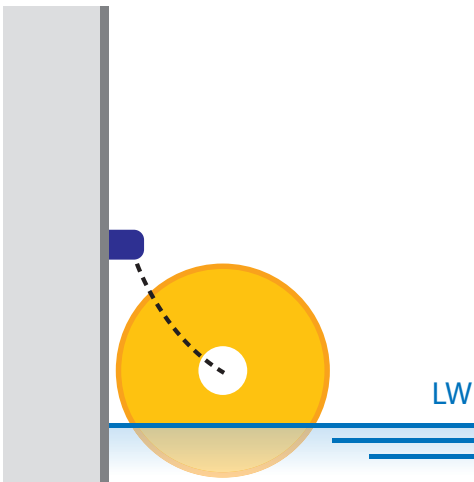
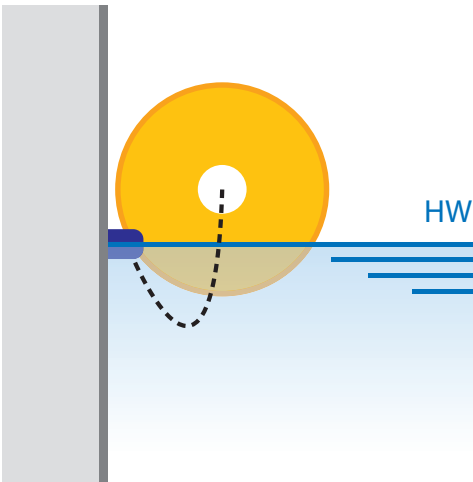
Performance Table

SIZE		STANDARD		HIGH		EXTRA HIGH		SUPER HIGH	
DIA (mm)	LENGTH (mm)	Reaction Force (ton)	Energy Absorption (ton-m)	Reaction Force (ton)	Energy Absorption (ton-m)	Reaction Force (ton)	Energy Absorption (ton-m)	Reaction Force (ton)	Energy Absorption (ton-m)
300	600	2.3	0.19	3.0	0.24	4.4	0.36	6.0	0.49
500	1000	6.5	0.87	8.4	1.13	12.3	1.65	16.8	2.26
700	1500	13.6	2.55	17.6	3.32	25.8	4.85	35.3	6.63
1000	1500	19.4	5.21	25.2	6.77	36.8	9.89	50.4	13.54
1200	2000	31.0	10.00	40.3	13.00	58.9	18.99	80.6	25.99
1350	2500	43.6	15.81	56.7	20.56	82.9	30.04	113.4	41.11
1500	2500	48.4	19.52	63.0	25.38	92.0	37.09	126.0	50.76
1700	3000	65.9	30.09	85.6	39.12	125.2	57.17	171.3	78.23
2000	3500	90.4	48.59	117.6	63.17	171.8	92.33	235.2	126.34
2400	3700	114.8	73.96	149.2	96.15	218.1	140.53	298.4	192.30
2500	4500	145.4	97.58	189.0	126.85	276.3	185.40	378.1	253.70
3000	5000	193.7	156.25	251.8	203.12	368.0	296.87	503.5	406.25
3300	6500	277.4	245.42	360.7	319.05	527.1	466.30	721.3	638.09
3500	5500	248.5	233.62	323.0	303.71	472.1	443.88	646.0	607.42

Performance Tolerance : ±15%
All Reaction force, Energy absorption values are at 55% Deflection.
We can manufacture virtually any size, please consult DRC for details.

Mooring applications

Foam filled fenders must be installed onto a solid structure or reaction panel. Indicative layout is given below.

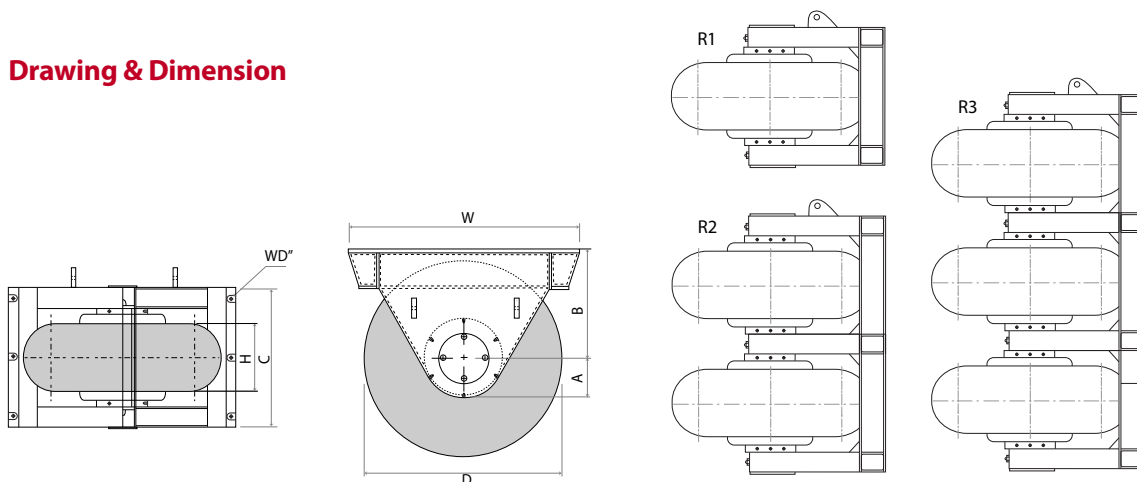




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Roller Fender

Drawing & Dimension



Roller Fender Dimension

(Unit: mm)

Type Size	WD''	Roller Fender		Frame					
		D	H	A	B	W	C(R1)	C(R2)	C(R3)
R600	7/8	600	200	110	320	695	420	770	1120
R750	7/8	750	250	140	400	870	510	935	1360
R900	1	900	300	165	480	1040	610	1120	1630
R1200	1 1/8	1200	400	220	640	1380	820	1500	2180
R1500	1 1/4	1500	500	275	800	1740	1010	1850	2690
R1800	1 1/2	1800	600	330	960	2080	1210	2215	3220
R2100	1 3/4	2100	700	385	1155	2440	1410	2590	3770
R2400	2	2400	800	440	1280	2770	1610	2950	4290
R2700	2 1/4	2700	900	495	1440	3130	1810	3300	4790
R3000	2 1/2	3000	1000	550	1600	3480	2010	3660	5310

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

Performance Table

Roller Fender Performance Table

(Unit: mm)

Size		R600	R750	R900	R1200	R1500	R1800	R2100	R2400	R2700	R3000
Deflection(mm)		125	157	185	260	325	390	455	510	578	640
Performance											
R1	RF(ton)	7.00	11.00	15.00	27.00	43.00	62.00	84.00	110.00	139.00	171.00
	EA(ton-m)	0.25	0.49	0.84	2.00	3.91	6.75	10.70	16.00	22.80	31.20
R2	RF(ton)	14.00	22.00	30.00	54.00	86.00	124.00	168.00	220.00	278.00	342.00
	EA(ton-m)	0.50	0.98	1.68	4.00	7.82	13.50	21.40	32.00	45.60	62.40
R3	RF(ton)	21.00	33.00	45.00	81.00	129.00	186.00	252.00	330.00	417.00	513.00
	EA(ton-m)	0.75	1.47	2.52	6.00	11.73	20.20	32.10	48.00	68.40	93.60

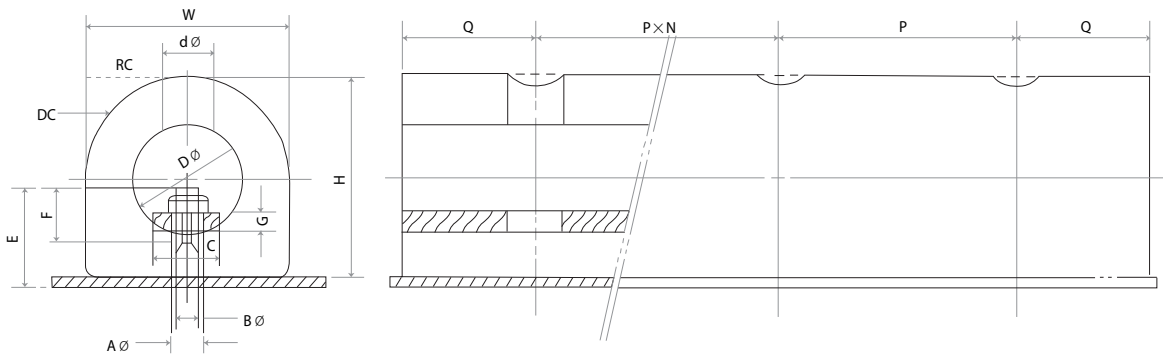
-RF: Reaction Force(ton) -EA: Energy Absorption(ton-m) -Tolerance: $\pm 10\%$

We can manufacture various fender performance grade. please consult DRC to get more performance grade information.

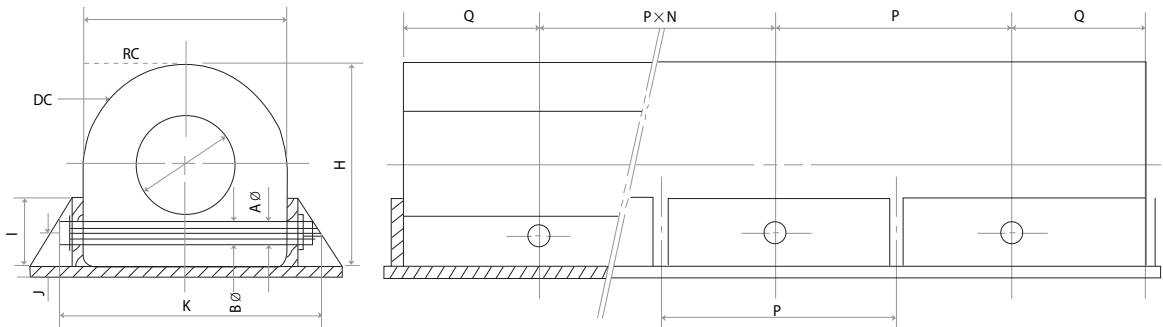
D-Type Rubber Fender

Standard Size and Specification

- Type A(Vertical fitting bolt method)



- Type B(Cross fitting bolt method)



(Unit: mm)

Fender Size	W	H	A	B	C	D	d	E	F	G	I	J	K	P	Q
150WH	150	150	22	19	50	75	60	80	40	16	60	26	220		
200WH	200	200	25	22	65	100	65	95	50	19	75	35	280	250	150
250WH	250	250	28	25	80	125	70	112	60	22	100	43	350	~	~
300WH	300	300	32	28	90	150	80	132	70	25	125	52	400	350	200
400WH	400	400	36	32	100	200	90	180	80	28	150	70	520		
500WH	500	500	42	38	120	250	100	210	90	32	175	88	640		

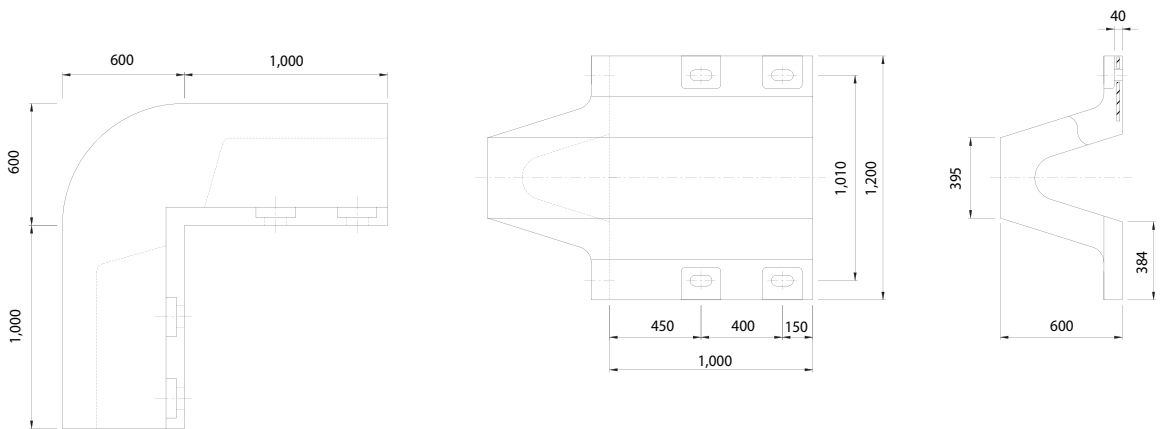
We can manufacture various fender performance grade. please consult DRC to get more performance grade information.



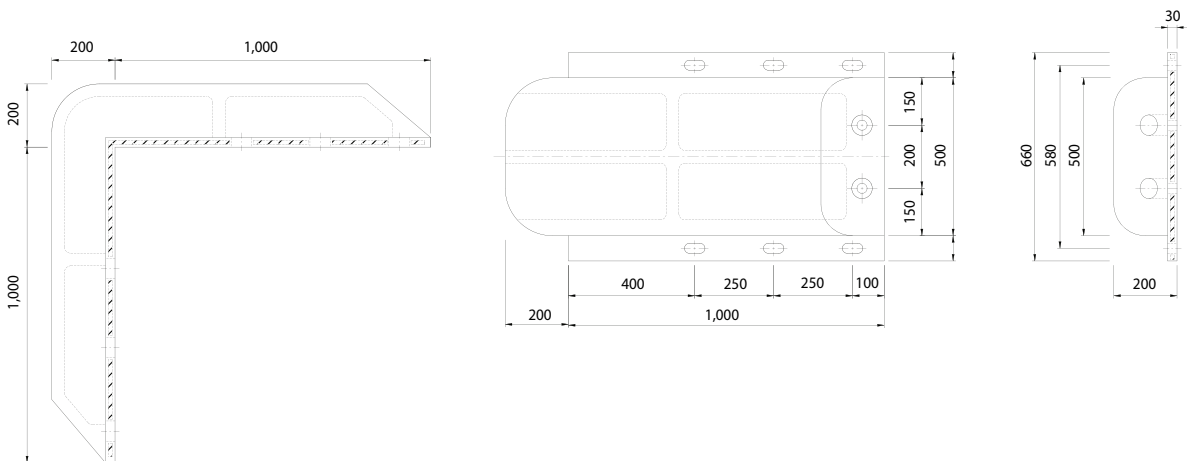
Corner type Fender

Fender for the use of Corner

DOV Coner Fender



BP CONER FENDER



W type fender



Bp Corner



Dov Corner



DCY Corner



Fender Maintenance

Lifetime

Lifetime of Fender varies with the frequency of berth, the tide and the type of ship, but its stiffness changes sharply after 5~7 years because of exposure of sunshine, ozone, fatigue load and the others. This means that absorption power decreases and repulsive power increases, which are the basic functions of Fender.

Maintenance

Regular maintenance extends the lifetime of Fender and makes a ship berth safely. Every Fender needs the inspection more than two or three times a year and the ways of maintenance are as follows.

- General Type(V type, BP type, etc.)

Tightening the anchor bolt after checking looseness every two or three a year

Adhesive treatment to the film peeled by abrasion

- System Fender(TTV, DR)

Possible to replace the rubber and ACC'y part according to a condition

- Pad type : Checking abrasion every two or three a year, Tightening the fitting bolt, Need to replace in case of protrusion of the fitting bolt

- Anchor bolt type : Tightening after checking looseness every two or three a year

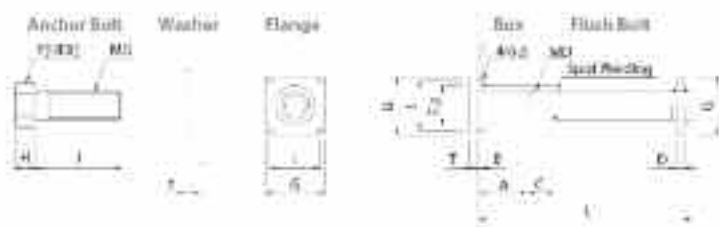
- Chain type : Tightening after checking looseness of U bolt, Reinforcement after checking the coating status(Spray)

- Panel : Checking the overall drooping status, Reinforcement after checking the coating status(Epoxy touch up)



Accessories

I-Type Anchor Bolt / J-Type Anchor Bolt



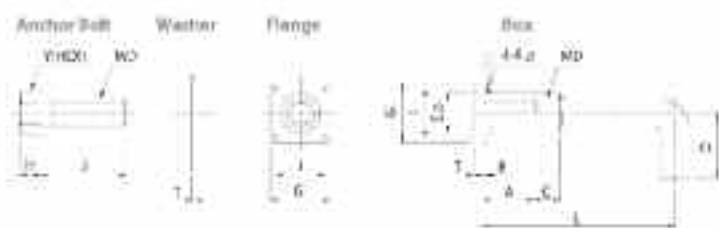
Parts	Material
Anchor Bolt, Flange, Flush Bolt	Rolled Steel or Equivalent
Bolt	Stainless Steel or Equivalent

I-Type Anchor Bolt Dimension

(Unit: mm)

MD (WD*)	Anchor Bolt				Flange, Box, Flush Bolt							
	H	Y	Z	I	A	B	C	D	ΔE	G	I	L
M22 (7/8)	15	35	30	H+Z	50	6	25	6	28	65	50	165
M24 (1)	18	41	35		55	6	25	6	35	70	55	175
M27 (1 1/8)	20	46	37		60	6	30	9	35	75	60	200
M30 (1 1/4)	22	50	40		65	6	30	9	42	75	60	225
M36 (1 1/2)	27	58	45		70	6	35	9	50	85	70	270
M42 (1 3/4)	32	67	50		75	6	40	12	60	90	75	325
M48 (2)	36	77	60		85	6	45	12	65	120	95	360
M56 (2 1/4)	40	83	70		90	6	55	16	70	125	100	435
M64 (2 1/2)	45	95	75		100	6	60	16	80	130	105	475
M76 (3)	55	110	80		120	6	75	19	90	155	120	550

T: Fender Rubber Thickness J: Round Up to nearest 5mm L: Thickness of Washer



Parts	Material
Anchor Bolt, Flange, Flush Bolt	Rolled Steel or Equivalent
Bolt	Stainless Steel or Equivalent

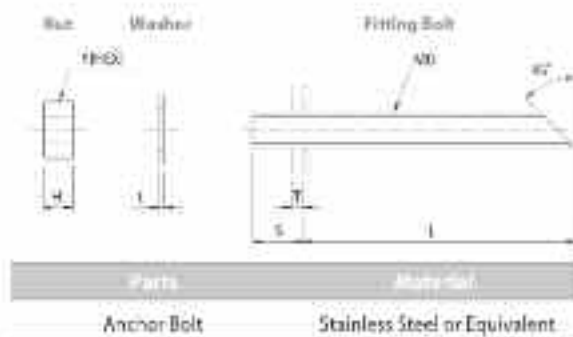
J-Type Anchor Bolt Dimension

(Unit: mm)

MD (WD*)	Anchor Bolt				Flange, Box, Flush Bolt							
	H	Y	Z	I	A	B	C	D	ΔE	G	I	L
M22 (7/8)	15	35	30	H+Z	50	6	25	50	28	65	50	175
M24 (1)	18	41	35		55	6	25	50	35	70	55	185
M27 (1 1/8)	20	46	37		60	6	30	75	35	75	60	210
M30 (1 1/4)	22	50	40		65	6	30	85	42	75	60	230
M36 (1 1/2)	27	58	45		70	6	35	100	50	85	70	255
M42 (1 3/4)	32	67	50		75	6	40	100	60	90	75	290
M48 (2)	36	77	60		85	6	45	120	65	120	95	325
M50 (2 1/2)	40	95	75		100	6	60	160	90	130	105	375

T: Fender Rubber Thickness J: Round Up to nearest 5mm L: Thickness of Washer

Chemical Anchor A



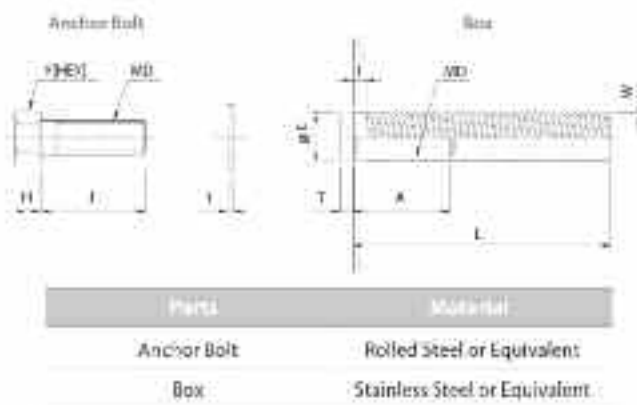
• Stud Type Anchor Bolt Dimension

(Unit: mm)

MØ (W/D)	Nut			Anchor Bolt	
	H	Y	Z	L	Ø
M22 (7/8)	18	35	8	145	H+T+Z
M24 (1)	20	41	10	175	
M27 (1 1/8)	22	46	10	210	
M30 (1 1/4)	25	50	11	210	
M36 (1 1/2)	30	58	12	250	
M42 (1 3/4)	33	67	13	320	
M48 (2)	40	77	15	320	
M56 (2 1/4)	45	85	18	400	
M64 (2 1/2)	50	95	20	450	
M76 (3)	62	110	20	550	

T: Fender Rubber Thickness t: Thickness of Washer

Chemical Anchor B



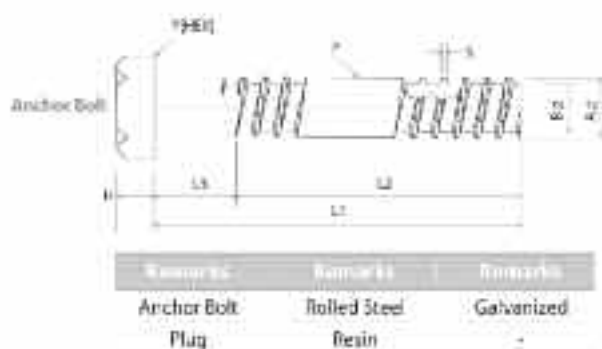
• Chemical Anchor Dimension

(Unit: mm)

MØ (W/D)	Anchor Bolt				Box				
	H	Y	Z	t	A	L	F	Ø	W
M22 (7/8)	18	35	30	t+T+Z	100	15	32	200	2
M24 (1)	18	41	35		100	15	35	250	2
M27 (1 1/8)	20	46	37		100	15	40	250	2
M30 (1 1/4)	22	50	40		100	15	45	250	2
M36 (1 1/2)	27	58	45		120	15	55	350	2.5
M42 (1 3/4)	32	67	50		120	15	60	400	2.5
M48 (2)	36	77	60		120	15	65	450	2.5
M56 (2 1/4)	45	95	75		120	15	80	450	2.5

T: Fender Rubber Thickness L: Round Up to Nearest 5mm t: Thickness of Washer

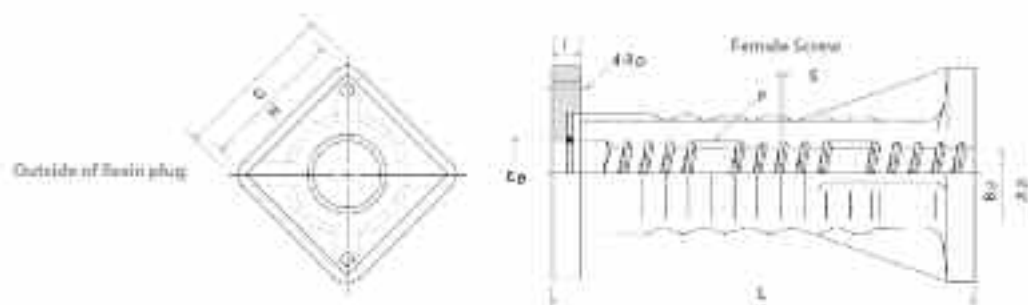
Resin Type Anchor Bolt / Resin Plug



• Resin Type Anchor Bolt Dimension

(Unit: mm)

WD ¹	H	Y	L1	L2	L3	L4	B1	B2	A	Pitch (mm)
3/4	13	32	160	105	55	19	14	2.0	2 3/4	
1	18	41	210	145	65	25	18	2.0	2 1/2	
1 1/4	22	50	270	185	85	32	24	2.5	2	
1 1/2	27	58	330	235	95	38	30	2.5	2	
1 3/4	32	67	330	235	95	44	35	3.0	1 3/4	
2	36	77	395	265	130	50	40	3.5	1 1/2	
2 1/2	45	95	410	275	135	65	53	4.0	1 1/4	
3	55	110	440	305	135	76	62	4.5	1	



• Resin Plug Dimension

(Unit: mm)

WD ¹	Outside of Plug Body					Female Screw			
	E ₂	G	H	I	L	A ₂	B ₂	S	Pitch (mm)
3/4	27.0	60	55	25	150	21	16	3	2 3/4
1	35.5	63	75	25	200	26	19	3	2 1/2
1 1/4	42.5	100	80	30	250	32	25	3	2
1 1/2	50.0	120	110	30	300	40	31	3.5	2
1 3/4	57.0	120	110	30	300	46	36	3.5	1 3/4
2	63.0	160	150	30	360	51	41.5	4	1 1/2
2 1/2	78.0	160	150	30	360	68	54.5	4.5	1 1/4
3	88.0	180	170	30	400	79	64	5	1

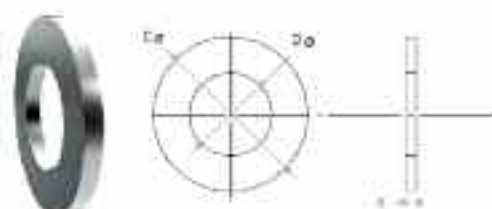
L-Type Washer / Round Washer



• L-Type Washer Dimension

(Unit: mm)

STD (WSP)	L	W	Ø	T	Ø	T	Ø	Feeder Size
M12 (2/8)	68	25	23	32	59.5	10	10	150H
M24 (1)	74	29	33	42	79.5	10	14	200H
M27 (1 1/8)	88	34	42	48	94.5	10	16	250H
M30 (1 1/4)	100	37	47	58	109.5	10	19	300H
M36 (1 1/2)	119	43	52	68	126	10	22	400H
M42 (1 3/4)	127	49	56	83	145	10	25	500H
M48 (2)	139	56	61	98	165	10	28	600H
M64 (2 1/2)	196	70	100	134	242	10	32	800H
	215	70	100	165	282	10	36	1000H



• Round Washer Dimension

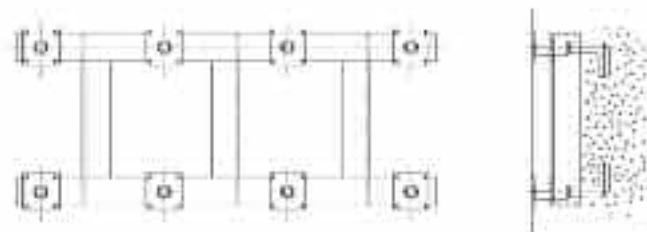
(Unit: mm)

STD (WSP)	General			TTV, DCP		
	C	Ø	T	C	Ø	T
M20 (3/4)	-	-	-	80	24	6
M22 (7/8)	44	26	5	-	-	-
M24 (1)	52	28	5	90	28	6
M27 (1 1/8)	58	31	5	-	-	-
M30 (1 1/4)	62	35	5	90	35	6
M36 (1 1/2)	72	41	8	130	41	9
M42 (1 3/4)	82	47	8	140	47	9
M48 (2)	95	54	8	160	54	12
M64 (2 1/2)	115	70	10	180	70	12
M76 (3)	135	82	10	180	82	12

Chain & U-Anchor



Template



Standard Size of Vessel and Berthing Energy



• Passenger

Tonnage	Length	Width	Depth	Draft	Displ.	Additional	Virtual	Estimated Effective Berth Energy		
G.T.	L	B	D	d	W*	W*	W*	Approaching Velocity (M/sec.)		
(tons)	(m)	(m)	(m)	(m)	(tons)	(tons)	(tons)	v=0.15	v=0.25	v=0.25
500	50	8.2	4.5	4.0	500	600	1,100	0.28	0.63	1.12
1,000	65	10.0	5.3	4.5	1,000	1,000	2,000	0.51	1.15	2.04
2,000	82	12.0	6.4	5.2	2,000	1,800	3,800	0.87	2.18	3.88
3,000	95	13.5	7.3	5.7	3,000	2,500	5,500	1.40	3.16	5.61
4,000	105	14.8	8.0	6.3	4,000	3,400	7,400	1.89	4.25	7.55
5,000	113	15.8	8.8	6.8	5,000	4,200	9,200	2.35	5.20	9.39
6,000	121	16.7	9.5	7.2	6,000	5,100	11,100	2.83	6.37	11.33
7,000	127	17.5	10.2	7.6	7,000	5,900	12,900	3.29	7.40	13.16
8,000	135	18.2	10.8	8.0	8,000	7,000	15,000	3.83	8.61	15.31
10,000	145	19.2	12.0	8.5	10,000	8,500	18,500	4.72	10.62	18.88
15,000	165	21.5	13.0	8.8	15,000	10,300	25,300	6.45	14.52	25.82
20,000	180	23.0	13.8	9.0	20,000	11,800	31,800	8.11	18.25	32.45
30,000	210	26.5	15.5	9.5	30,000	15,300	45,300	11.56	26.00	46.22
50,000	245	30.5	18.0	10.5	50,000	21,800	71,800	18.32	41.21	73.26
80,000	290	36.0	21.0	11.7	80,000	32,100	112,100	28.60	64.34	114.39



• Freighter

Tonnage	Length	Width	Depth	Draft	Displ.	Additional	Virtual	Estimated Effective Berth Energy		
G.W.T.	L	B	D	d	W*	W*	W*	Approaching Velocity (M/sec.)		
(tons)	(m)	(m)	(m)	(m)	(tons)	(tons)	(tons)	v=0.15	v=0.25	v=0.25
700	52	8.3	3.8	3.6	900	500	1,400	0.36	0.80	1.43
1,000	68	9.3	4.4	4.1	1,300	800	2,100	0.54	1.21	2.14
2,000	77	11.5	5.8	5.1	2,700	1,600	4,300	1.10	2.47	4.39
3,000	90	13.1	6.8	5.7	4,000	2,300	6,300	1.61	3.62	6.43
4,000	100	14.3	7.7	6.3	5,300	3,200	8,500	2.17	4.88	8.67
5,000	109	15.3	8.4	6.7	6,700	4,000	10,700	2.73	6.14	10.92
6,000	117	16.2	9.0	7.1	8,000	4,800	12,800	3.27	7.35	13.06
7,000	124	17.0	9.6	7.5	9,300	5,600	14,900	3.80	8.55	15.20
8,000	130	17.7	10.1	7.8	10,700	6,400	17,100	4.36	9.82	17.45
9,000	136	18.4	10.6	8.1	12,000	7,200	19,400	4.95	11.14	19.80
10,000	142	19.0	11.1	8.3	13,300	7,900	21,200	5.41	12.17	21.63
12,000	152	20.1	11.9	8.8	16,000	9,500	25,500	6.51	14.64	26.02
15,000	165	21.6	13.0	9.5	20,000	12,000	32,000	8.16	18.37	32.65
17,000	173	22.4	13.7	9.8	22,700	13,400	36,100	9.21	20.72	36.84
20,000	184	23.6	14.6	10.3	26,700	15,800	42,500	10.84	24.39	43.37

Conversion: Meter =3.281 Feet

Metric Tonn =2,205 Kips

Metric Tonn/Meter (T-M) =7.251 Feet-Kips



• Tanker

Trimage	Length	Width	Depth	Draft	Displ.	Additional	Virtual	Estimated Effective Birth Energy		
Displ.	L	B	D	d	W	W	W	Approaching Velocity (m/sec)		
(tons)	(m)	(m)	(m)	(m)	(tons)	(tons)	(tons)	+0.10	+0.15	+0.20
300	37	7.0	3.3	3.0	400	300	700	0.18	0.40	0.71
500	43	7.8	3.8	3.5	700	400	1,100	0.28	0.63	1.12
700	54	7.9	4.0	3.8	900	600	1,500	0.38	0.86	1.53
1,000	61	8.9	4.3	4.2	1,300	800	2,100	0.54	1.21	2.14
2,000	76	11.2	5.7	5.1	2,700	1,600	4,300	1.10	2.47	4.39
3,000	87	12.8	6.3	5.7	4,000	2,300	6,300	1.61	3.62	6.48
4,000	96	14.0	7.2	6.2	5,300	3,000	8,300	2.12	4.76	8.47
5,000	103	15.1	7.8	6.3	6,700	3,500	10,200	2.60	5.83	10.41
6,000	110	16.0	8.2	6.9	8,000	4,200	12,200	3.11	7.00	12.45
7,000	116	16.8	8.7	7.2	9,500	5,000	14,500	3.60	8.78	15.61
20,000	164	23.7	12.3	9.5	26,700	12,000	38,700	9.87	22.21	39.49
25,000	176	25.5	13.3	10.1	33,300	14,500	47,800	12.19	27.44	48.78
30,000	187	27.1	14.1	10.6	40,000	17,000	57,000	14.54	32.72	58.16
35,000	197	28.5	14.8	11.3	46,700	19,000	65,700	16.91	38.05	67.65
40,000	206	29.7	15.5	11.5	53,300	22,000	75,300	19.21	43.22	76.84
50,000	232	32.0	16.7	12.2	66,700	26,700	93,400	23.83	53.61	95.31
60,000	236	34.0	17.8	12.8	80,000	31,300	111,300	28.39	63.88	113.57
70,000	248	35.7	18.7	13.4	93,300	36,000	129,300	32.98	74.22	131.94
80,000	260	37.3	19.6	13.8	106,700	40,600	147,300	37.58	84.55	150.30
100,000	280	40.1	21.1	14.8	133,300	49,600	182,900	46.66	104.98	186.53
120,000	297	42.6	22.4	15.5	160,000	57,700	217,700	55.54	124.96	222.14
150,000	320	45.8	24.1	16.5	200,000	70,400	270,400	68.98	155.20	275.92
200,000	326	49.8	25.2	17.7	272,000	82,200	354,200	90.35	203.30	361.42
250,000	338	51.8	26.7	20.6	333,300	115,400	448,700	114.46	257.54	457.85
264,000	337	54.5	27.0	20.8	353,000	117,900	470,900	120.13	270.25	480.51
276,000	337	53.3	32.0	22.0	368,000	131,900	499,900	127.52	286.89	510.10
312,000	346	53.3	32.0	24.1	406,000	162,500	567,500	144.77	325.69	579.08
326,000	345	53.3	32.0	24.8	421,600	171,600	593,200	151.09	341.70	607.55
372,000	347	54.5	35.0	27.0	494,700	204,500	699,200	178.37	401.27	713.46
477,000	379	62.0	36.0	28.0	634,400	240,200	874,600	223.11	501.93	892.44

Conversions: Meter = 3.281 Feet

Metric Tons = 2,205 Kips

Metric Ton Meter (T-M) = 7.231 Feet-Kips



• Bulk Carrier

Tonnage	Length	Width	Depth	Draft	Displ.	Additional	Virtual	Estimated Effective Berth Energy		
DWT	L	B	D	d	W	W	W	Approaching Vesselty (m/s, m/s)		
(ton)	(m)	(m)	(m)	(m)	(ton)	(ton)	(ton)	v=0.10	v=0.15	v=0.25
1,000	61	8.9	4.8	4.3	1,300	900	2,200	0.56	1.26	2.24
2,000	77	11.1	6.0	5.1	2,700	1,600	4,300	1.10	2.47	4.39
3,000	88	12.7	6.8	5.7	4,000	2,300	5,300	1.61	3.62	6.43
4,000	96	13.9	7.5	6.1	5,300	2,900	8,200	2.09	4.71	8.37
5,000	104	14.9	8.1	6.5	6,700	3,600	10,300	2.63	5.91	10.51
15,000	149	21.3	11.5	8.6	20,000	8,900	28,900	7.37	16.59	29.48
20,000	164	23.4	12.7	9.2	26,700	11,200	37,900	9.67	21.75	38.67
25,000	176	25.1	13.6	9.8	35,300	15,700	47,000	11.99	26.95	47.96
30,000	187	26.6	14.4	10.3	43,000	16,000	56,000	14.29	32.14	57.14
40,000	206	29.2	15.9	11.0	58,300	20,200	73,500	18.75	42.19	75.00
50,000	227	31.4	17.1	11.7	66,700	24,600	91,300	23.29	52.40	91.16
60,000	235	33.3	18.1	12.3	80,000	28,700	108,700	27.78	62.39	110.92
70,000	248	35.0	19.0	12.8	95,300	32,900	126,200	32.19	72.44	138.77
80,000	259	36.6	19.9	13.2	106,700	36,500	143,200	36.55	82.19	146.12
100,000	278	39.3	21.4	14.0	133,300	44,100	177,400	45.26	101.82	181.02
150,000	300	45.0	25.0	16.0	200,000	61,900	261,900	66.51	150.30	267.24
200,000	315	50.0	28.0	18.0	266,700	82,100	348,800	88.98	200.18	355.92
250,000	330	53.5	30.0	20.5	333,300	111,600	444,900	113.49	255.33	453.98
312,000	346	53.5	32.0	24.0	416,000	160,400	576,400	147.04	330.78	588.16

Conversion: Meter =3.281 Feet

Metric Tonn = 2,205 Kips

Metric Tonn-Meter (T.M) =7,231 Feet-Sqft





• Container

Tonnage		Length	Width	Depth	Draft	Displ.	Additional	Vertical	Estimated Effective Beam Energy		
G.T.	D.W.T.	L	B	D	d	W	W'	W''	Approaching Velocity (m/sec.)		
(tons)	(tons)	(m)	(m)	(m)	(m)	(tons)	(tons)	(tons)	0-0.10	0-0.15	0-0.30
	15,000	187.5	25.0	13.5	9.5	20,700	13,300	34,000	8.67	19.52	34.70
16,240	19,855	187.0	26.0	15.5	10.5	22,700	16,669	39,369	10.04	22.59	40.17
17,194	16,977	208.8	23.8	14.3	9.2	26,200	14,289	40,489	10.32	23.23	41.31
21,057	20,400	196.0	27.6	16.6	10.5	27,200	17,471	44,671	11.39	25.64	45.56
23,600	23,650	212.5	30.0	16.3	10.5	31,500	18,942	50,442	12.89	28.95	51.47
40,000	26,100	242.0	32.2	19.6	10.5	34,800	21,572	56,372	14.38	32.85	57.52
50,922	27,203	218.5	31.2	18.9	11.2	36,262	22,161	58,423	14.90	33.53	59.61
	30,400	274.0	31.5	23.5	9.1	40,534	18,345	58,879	15.02	33.79	60.06
51,500	28,900	249.0	32.2	24.0	11.0	38,500	23,969	62,469	15.93	35.85	63.74
54,500	33,600	252.0	32.2	24.4	11.0	40,500	24,654	65,154	16.62	37.39	66.48
	35,480	268.0	32.1	19.5	9.1	47,300	17,944	65,244	16.64	37.41	66.57
30,497	30,191	239.2	31.8	21.6	11.6	40,244	26,019	66,263	16.90	38.03	67.61
30,073	33,179	259.8	32.3	24.3	12.0	44,227	30,248	71,475	18.99	42.71	75.99
54,435	40,000	268.8	32.3	24.3	11.0	53,320	26,293	79,613	20.30	45.69	81.23
51,159	35,952	261.0	32.2	24.0	12.0	58,058	30,540	86,598	22.60	50.85	90.40
51,623	36,924	269.0	32.2	24.4	12.0	59,029	31,476	90,505	23.08	51.94	92.35
57,000	49,700	289.5	32.3	24.6	11.0	66,250	28,323	94,573	24.12	54.26	96.50
58,437	42,446	289.6	32.2	24.3	12.0	68,545	33,813	102,358	26.11	58.75	104.44
58,487	47,442	289.6	32.2	24.6	13.0	73,642	39,736	113,378	28.90	65.07	115.69
	50,000	290.0	32.3	24.7	11.0	68,200	28,200	96,400	24.59	55.33	98.37
60,000	307.8	34.1	26.2	11.6		82,000	33,320	115,320	29.42	66.19	117.67

Conversions: Meter = 3.281 Feet

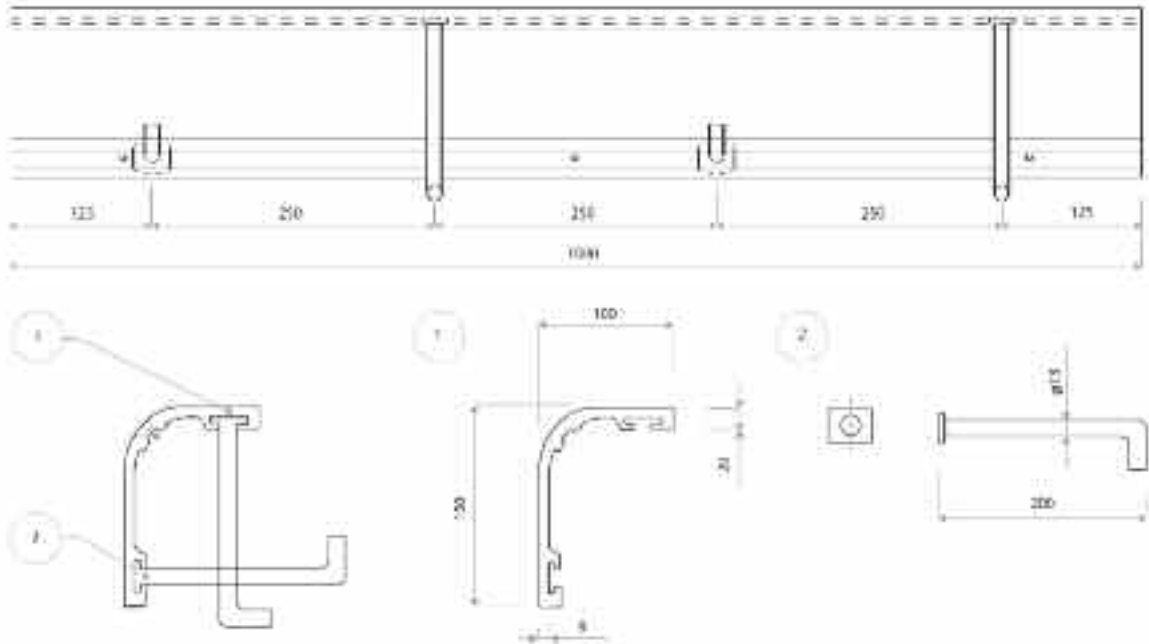
Metric Tons = 2,205 Kips

Metric Ton-Meter (T-M) = 7,231 Feet-Kips



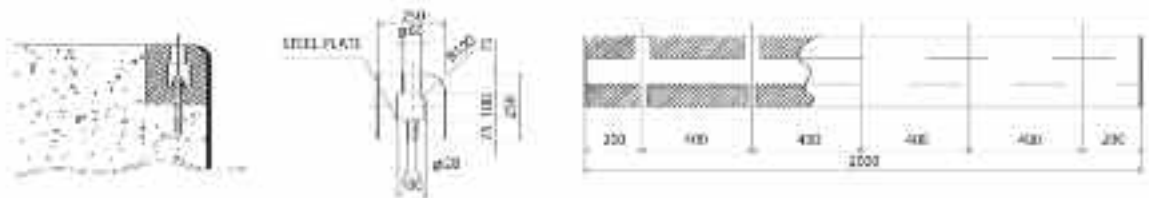
Other Products

FC Corner Protection

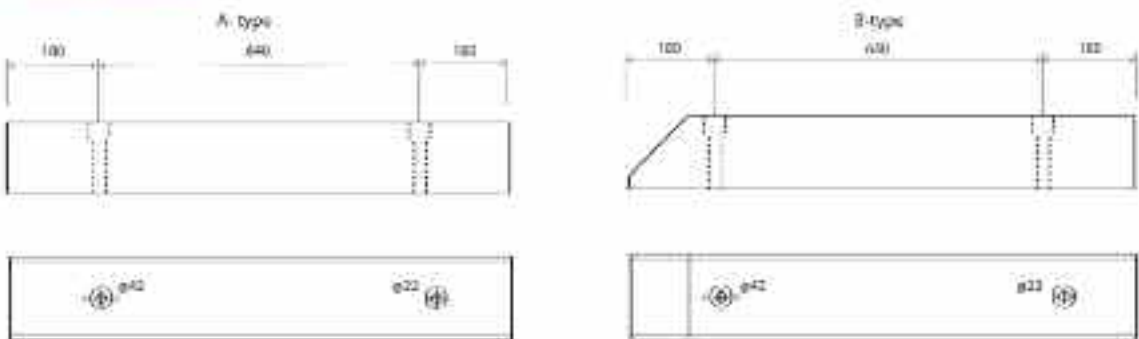


Rubber Corner Protection

- (250H.W × 2000L) - 5Hole



FC Car Stopper



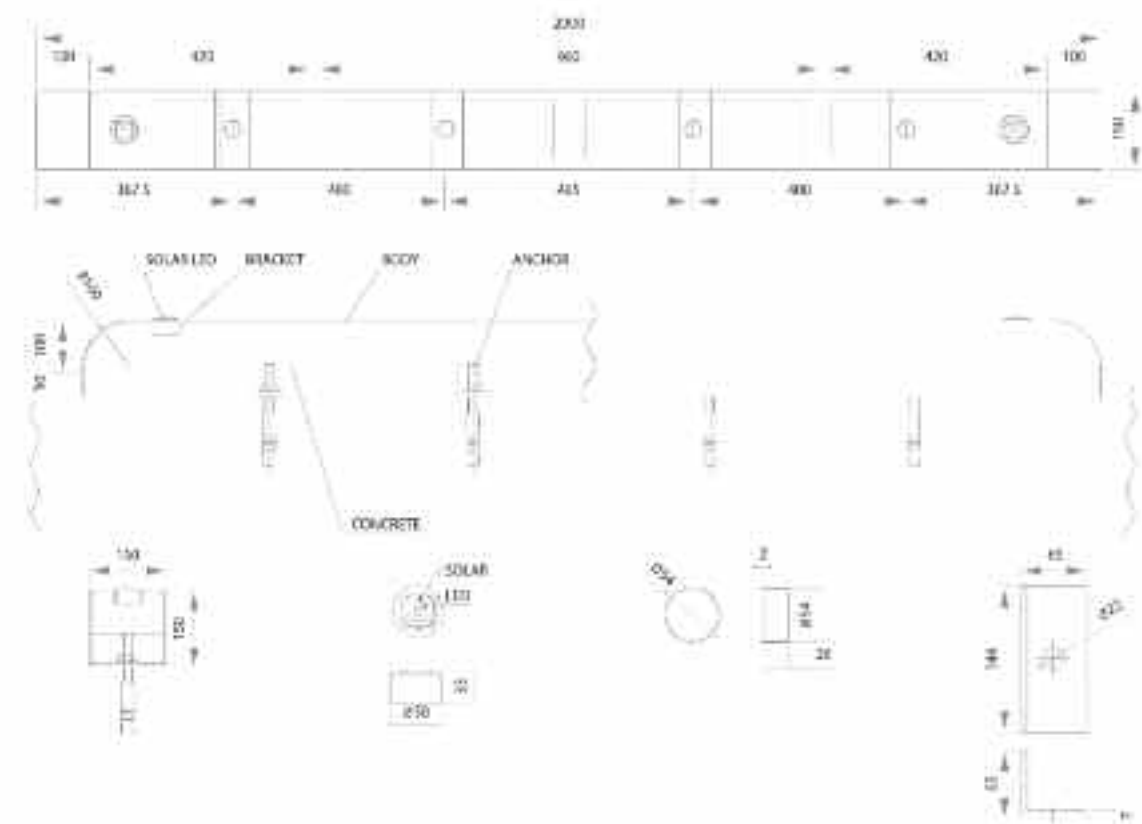
Luminescence Products

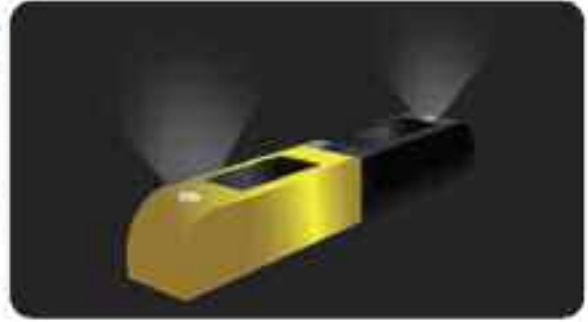
Luminescence Products are effective to create a waterfront and prevent negligent accidents of night piers and harbors using solarlight without supplying electricity

- Luminescence Corner Protection

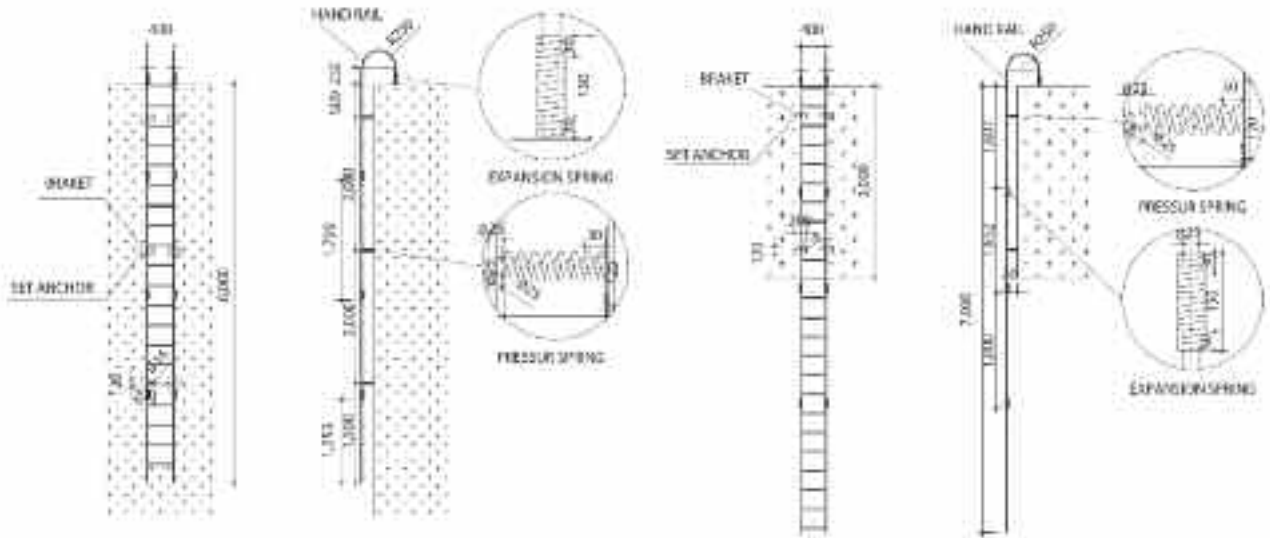


- Luminescence Car Stopper

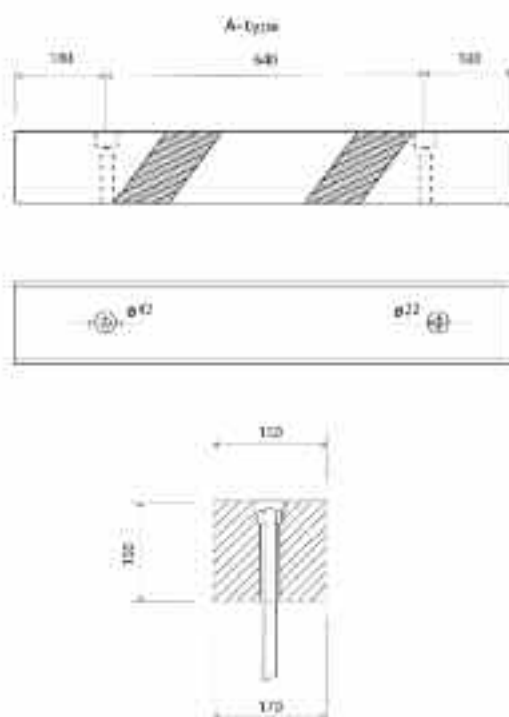




Shock Absorb Ladder



Rubber Car Stopper

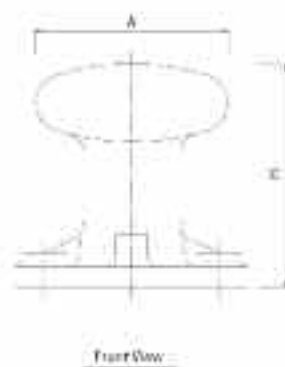
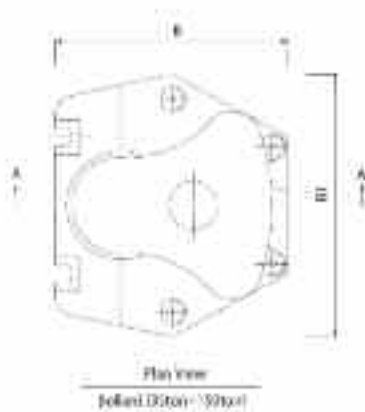


Rubber Ladder

Size : 200H × 850W × L

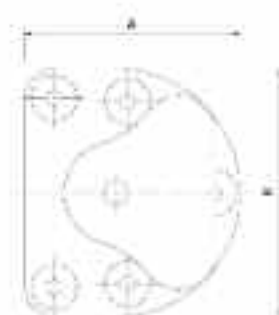


Bollard (5~150ton)

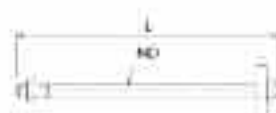


Capacity (ton)	Body											Anchor Bolt				
	φD	A	B	φ1	H	H1	φ2	φ3	φ4	T	φD	L	W	T1	Q/T1	
5	150	300	360	-	380	30	60	170	120	20	M20	450	80	16	4	
10	200	400	480	-	480	40	70	210	160	20	M27	600	108	22	4	
15	250	500	600	-	580	50	80	250	200	20	M33	700	132	25	4	
25	300	600	720	-	680	65	95	290	240	21	M42	850	168	35	4	
35	300	600	720	810	690	65	95	290	240	25	M42	850	168	35	6	
50	350	700	840	945	780	70	100	330	280	29	M48	1000	192	40	6	
70	400	800	1000	1130	900	90	120	370	320	33	M56	1150	225	45	6	
100	450	900	1200	1365	990	95	125	410	360	39	M64	1300	256	51	6	
150	550	1100	1600	1765	1260	120	145	490	505	49	M80	1450	300	65	6	

Bollard_EDC Type (30~200ton)



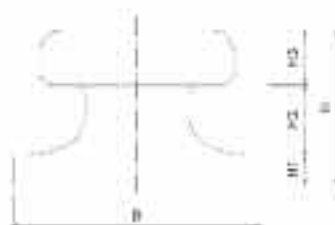
Plan View
Bollard (30ton~200ton)



Anchor Bolt Detail



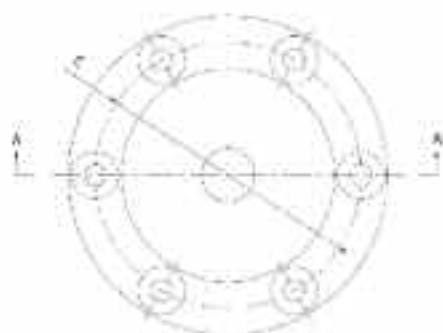
Right View



Front View

Capacity (ton)	Body						Anchor Bolt				
	A	B	H	H1	φ2	φ3	φD	L	W	T1	Q/T1
30	375	450	300	60	130	110	M30	500	110	30	5
40	490	570	360	70	160	130	M36	500	110	30	5
50	490	570	360	70	160	130	M36	500	110	30	5
100	660	760	475	90	215	170	M42	600	150	30	7
150	780	900	550	100	260	190	M48	750	150	40	7
200	850	1000	625	125	300	200	M60	950	175	50	8

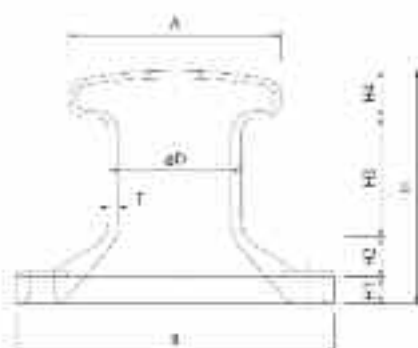
Straight Post (15~200ton)



Top View
Standard (15ton~200ton)



Anchor Bolt Detail



A-A Section



Capacity (ton)	Body										Anchor Bolt				
	φD	F	E	C	H	H1	H2	H3	H4	T	M12	L	W	T1	Q T1
15	250	400	600	500	463	45	80	250	88	20	M36	750	144	28	4
25	300	450	720	600	345	60	90	290	105	20	M48	1000	192	40	6
35	300	480	720	600	345	60	90	290	105	25	M48	1000	192	40	6
50	350	560	840	700	628	70	105	330	125	27	M56	1150	225	45	6
70	400	640	960	800	730	80	120	370	140	30	M64	1300	256	55	6
100	450	720	1180	1000	833	80	190	405	158	35	M64	1450	288	60	8
150	550	850	1440	1220	988	100	230	465	193	40	M80	1600	320	65	8
200	650	1040	1700	1440	1183	110	280	565	228	43	M90	1800	360	75	8

*

ETC



• Riser pipe



• Oil Sweeping Boom



• Rubber Sheet



• Rubber Gate Seal



• Hovercraft Skirt



• Immersed Tunnel Gasket



• Auto Cable Cover Belt



• Grout Seal

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