PNEUMATIC FENDER PRODUCTS

TECHNICAL DATA

Pacific Marine and Industrial
www.pacificmarine.net
info@pacificmarine.net

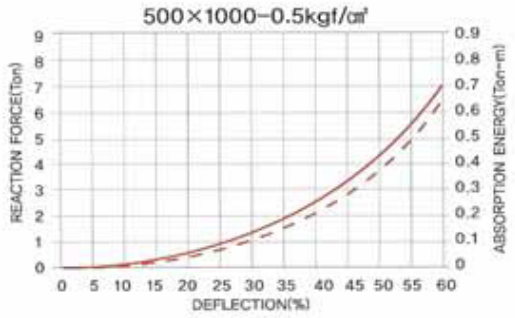
PERFORMANCE NOTE

NOMINAL SIZE DIA×LENGTH	GUARANTEED ENERGY ABSORPTION (Ton-m)	REACTION FORCE (Ton)	HULLPRESSURE (60%DEF) (tf/m²)	APPROX FENDER THICKNESS	SAFETY VALVE PRESSURE SETTING	TESTING PRESSURE (kgf/cm²)	WEIGHT OF NET TYPE (kg)				
							APPROX FENDER BODY WEIGHT (kg)	CHAIN NET (kg)	WIRE NET (kg)	SYNTHETIC FENDER NET (kg)	WEIGHT OF SLING TYPE (kg)
300×600	0.15	2.6	13.7	9	–	1.5	15	–	–	20	–
500×1000	0.71	7.3	13.4	12	–	1.5	26	–	30	20	29
700×1500	2.1	14.5	13.5	13		1.5	42				
800×1500	2.7	18.0	13.6	13	–	1.5	57	150	40	37	53
1000×1500	4.0	22.0	12.3	14	–	1.5	70	190	80	51	80
1000×2000	5.2	29.5	13.4	14	–	1.5	165	230	140	57	100
1200×2000	7.8	35.8	13.4	14		1.5	200	250			
1500×2500	15.2	56.1	13.4	15	–	1.5	370	360	220	–	270
1500×3000	18.3	66.8	13.4	15	–	1.5	410	490	350	–	320
1500×4000	31.0	86.0	12.9	15	–	1.5	500	980	640	–	560
2000×3000	32.0	89.0	12.9	17		1.5	540	870			
2000×3500	38.2	103.0	12.9	17	–	1.5	628	980	640	–	560
2500×4000	68.2	149.0	13.8	18	1.8	2.0	1070	1260	910	–	930
2500×5500	94.1	207.1	15.0	18	1.8	2.0	1350	1630	1160	–	1460
3000×5000	124.2	224.0	13.2	19	1.8	2.5	1500	1630	1270	–	–
3300×4500	134.0	226.0	14.7	20	1.8	2.5	1720	2340			
3300×6500	194.0	322.0	14.7	20	1.8	2.5	2900	2680	1910	–	–
3300×10600	316.0	524.0	16.0	20	1.8	2.5	3320	4638	–	–	–
4500×7000	386.2	472.4	16.0	20	1.8		3200	5100			
4500×9000	502.1	608.4	14.7	21	1.8	2.5	4360	4850	–	–	–

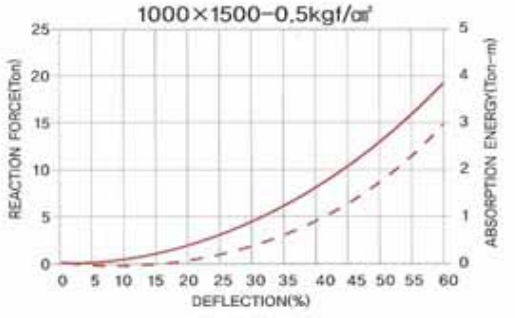
Notes

1. Initial Internal Pressure 0.5kg/cm²
2. "Guaranteed energy absorption" represents the guaranteed energy absorption at 60% deflection.
3. Tolerane of reaction force and deflection at guaranteed energy absorption are as follows:
   • Reaction: ±10% • Deflection: ±5%
4. Each reaction and energy absorption are measured under static condition.
5. Testing pressure rate indicates the testing pressure at factory.
6. Weight of fender body and net may vary ±10%
7. We can manufacture the special size except the above mentioned.

PERFORMANCE CURVE



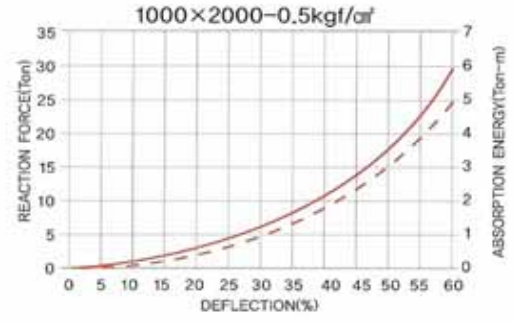
INITIAL INTERNAL PRESSURE	DEFLECTION	GUARANTED ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE
0.5 (kgf/cm²)	60 (%)	0.66 (Ton-m)	7 (Ton)	13.4 (tf/m²)



INITIAL INTERNAL PRESSURE	DEFLECTION	GUARANTED ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE
0.5 (kgf/cm²)	60 (%)	3.0 (Ton-m)	18.2 (Ton)	12.3 (tf/m²)

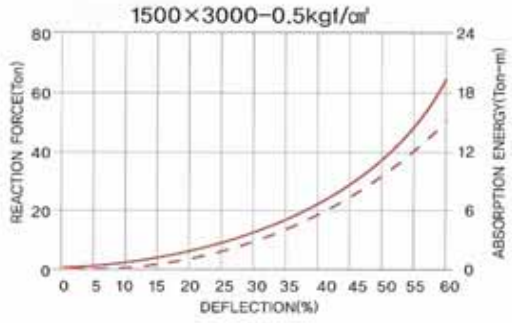
PERFORMANCE CURVE

1000×2000-0.5kgf/㎠



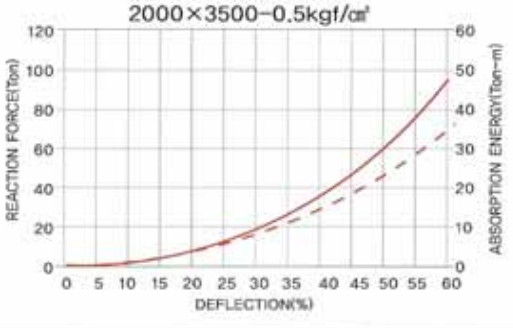
INITIAL INTERNAL PRESSURE	DEFLEC-TION	GUARANTED ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE
0.5 (kgf/㎠)	60 (%)	5.0 (Ton-m)	28.2 (Ton)	13.4 (tf/㎡)

1500×3000-0.5kgf/㎠



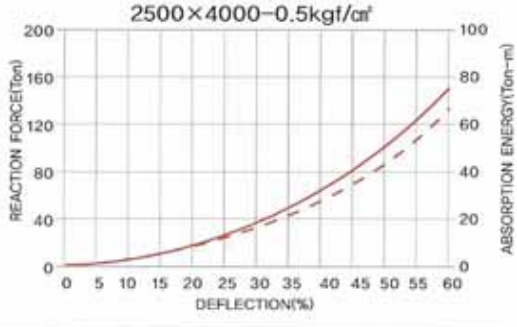
INITIAL INTERNAL PRESSURE	DEFLEC-TION	GUARANTED ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE
0.5 (kgf/㎠)	60 (%)	17.0 (Ton-m)	62.8 (Ton)	13.4 (tf/㎡)

2000×3500-0.5kgf/㎠



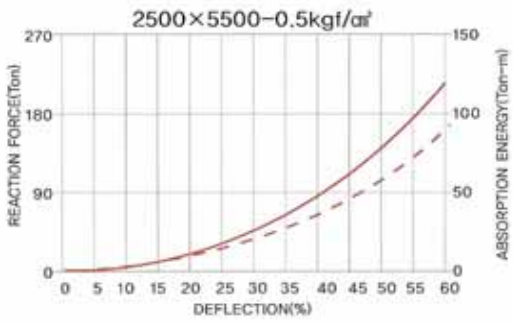
INITIAL INTERNAL PRESSURE	DEFLEC-TION	GUARANTED ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE
0.5 (kgf/㎠)	60 (%)	34.7 (Ton-m)	96.7 (Ton)	12.9 (tf/㎡)

2500×4000-0.5kgf/㎠



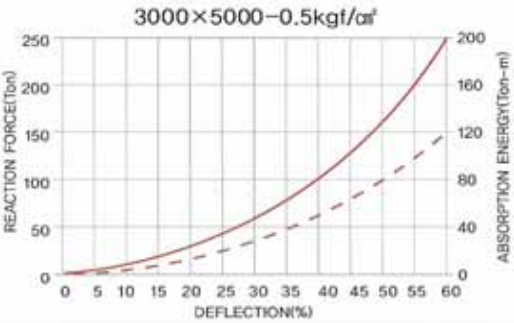
INITIAL INTERNAL PRESSURE	DEFLEC-TION	GUARANTED ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE
0.5 (kgf/㎠)	60 (%)	67.7(Ton-m)	145 (Ton)	13.8 (tf/㎡)

2500×5500-0.5kgf/㎠



INITIAL INTERNAL PRESSURE	DEFLEC-TION	GUARANTED ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE
0.5 (kgf/㎠)	60 (%)	95 (Ton-m)	205 (Ton)	15.0 (tf/㎡)

3000×5000-0.5kgf/㎠



INITIAL INTERNAL PRESSURE	DEFLEC-TION	GUARANTED ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE
0.5 (kgf/㎠)	60 (%)	120 (Ton-m)	250 (Ton)	13.2 (tf/㎡)

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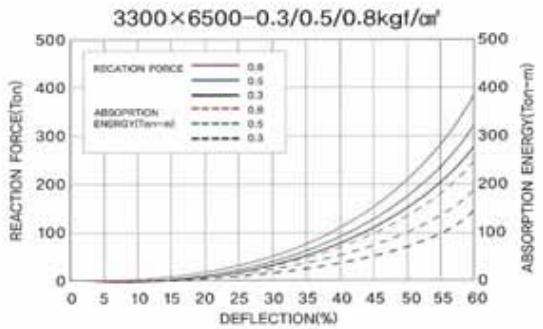
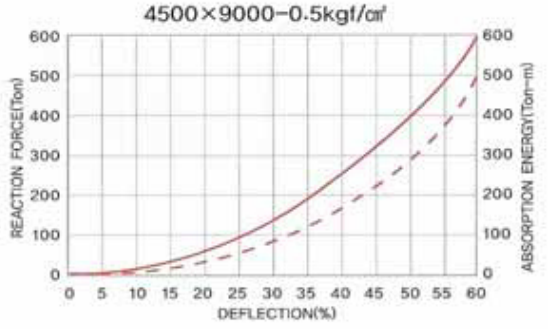


INITIAL INTERNAL PRESSURE	DEFLEC-TION	GUARANTED ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE
0.5 (kgf/㎠)	60 (%)	189 (Ton-m)	310 (Ton)	14.7 (tf/㎡)



INITIAL INTERNAL PRESSURE	DEFLEC-TION	GUARANTED ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE
0.5 (kgf/㎠)	60 (%)	491.5 (Ton-m)	596 (Ton)	14.70tf/㎡)

COMPRESSION TEST

0%

30%

60%

PHYSICAL PROPERTY OF RUBBER

		Test Item	Outer-Layer Rubber	Cord Rubber and Inner Layer Rubber
Physical Propety test	before aging	Tensile strength	Over 180kg/㎠	Over 100kgf/㎠
		Elongation	Over 400%	Over 400%
		Hardness	Under 70°	Under 65°
		Tear resistance	Over 40kg/㎝	–
	after aging	Tensile strength	Over 80% of value of the before aging	
		Elongation	Over 80% of value of the before aging	
		Hardness	Under +8° of value of the before aging	

Notes

1. The physical test upper mentioned is according to JIS K6301-1994.
   And about the same size, in the case of being identify the test method about over the two kinds, adopt the under mentioned methods.
   - hardness test: Spring type hardness test(A type)
   - aging test : air heating aging test
     test temperature : 70±1℃
     test time : 96 hours

REQUIRED ENERGY AT SHIP TO SHIP BERTHING

ENERGY-(tf-m) SIZE											
DWT		1,000		2,000		3,000		5,000		8,000	
VIRTUAL WEIGHT(T)		2,228		4,294		6,470		10,594		16,066	
APPROACHING VELOCITY(m/sec)		0.4		0.4		0.4		0.4		0.4	
DWT	VIRTUAL WEIGHT(T)										
1,000	2,228	4.5ft-m	1000×2000								
2,000	4,294	6.0	1200×2000	8.8ft-m	1350×2500						
3,000	6,470	6.8	1350×2500	10.5	1500×3000	13.2ft-m	1500×3000				
4,000	8,368	7.2	1350×2500	11.5	1500×3000	14.9	1500×3000				
5,000	10,594	7.5	1350×2500	12.4	1500×3000	16.4	1700×3000	21.6ft-m	2000×3500		
6,000	12,184	7.7	1350×2500	12.9	1500×3000	17.2	1700×3000	23.1	2000×3500		
7,000	14,084	7.9	1350×2500	13.3	1500×3000	18.1	1700×3000	24.7	2000×3500		
8,000	16,066	7.9	1350×2500	13.7	1500×3000	18.8	1700×3000	26.1	2000×3500	32.8ft-m	2200×4500

ENERGY-(tf-m) SIZE									
DWT		1,000		12,000		15,000		20,000	
VIRTUAL WEIGHT(T)		2,228		23,851		29,493		38,623	
APPROACHING VELOCITY(m/sec)		0.325		0.325		0.325		0.325	
DWT	VIRTUAL WEIGHT(T)								
10,000	20,373	27.4ft-m	2000×3500						
12,000	23,851	29.6	2000×3500	32.1ft-m	2200×4500				
15,000	29,493	32.5	2200×4500	35.5	2200×4500	39.7ft-m	2200×4500		
17,000	33,056	34.0	2400×4500	37.3	2200×4500	42.0	2200×4500		
20,000	38,623	35.9	2200×4500	39.7	2200×4500	45.1	2200×4500	52.0ft-m	2500×4000

ENERGY-(tf-m) SIZE									
DWT		25,0000		30,000		40,000		50,000	
VIRTUAL WEIGHT(T)		45,373		56,093		72,771		89,818	
APPROACHING VELOCITY(m/sec)		0.325		0.325		0.325		0.25	
DWT	VIRTUAL WEIGHT(T)								
25,000	45,946	61.9ft-m	2500×4000						
30,000	56,093	68.1	2500×5500	75.6ft-m	2500×5500				
35,000	63,084	71.6	2500×5500	80.0	2500×5500				
40,000	72,771	75.9	2500×5500	85.4	2500×5500	98.0ft-m	3300×4500		
45,000	77,986	77.9	2500×5500	87.9	2500×5500	101	3300×4500		
50,000	89,818	81.9	2500×5500	93.0	2500×5500	108	3300×4500	71.6ft-m	2500×5500

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ENERGY-(tf-m) SIZE									
DWT		60,000		70,000		100,000		120,000	
VIRTUAL WEIGHT(T)		45,373		56,093		72,771		89,818	
APPROACHING VELOCITY(m/sec)		0.325		0.325		0.325		0.25	
DWT	VIRTUAL WEIGHT(T)								
60,000	104,300	83.1ft-m	2500×5500						
65,000	114,637	87.1	2500×5500						
70,000	122,108	89.7	2500×5500	97.3ft-m	3300×4500				
80,000	136,972	94.4	2500×5500	103	3300×4500				
85,000	143,359	96.3	3300×4500	105	3300×4500				
100,000	166,004	102	3300×4500	112	3300×4500	72.5ft-m	2500×5500		2500×5500
120,000	200,083	109	3300×4500	121	3300×6500	79.2	2500×5500	87.3ft-m	3300×4500

ENERGY-(tf-m) SIZE									
DWT		150,000		200,000		250,000		330,000	
VIRTUAL WEIGHT(T)		251,896		327,735		401,268		548,670	
APPROACHING VELOCITY(m/sec)		0.185		0.185		0.185		0.185	
DWT	VIRTUAL WEIGHT(T)								
150,000	251,896	110ft-m	3300×4500						
200,000	327,735	124	3300×6500	143ft-m	3300×6500				
250,000	401,268	135	3300×6500	143	3300×6500	175ft-m	3000×6500		
330,000	548,670	151	3300×6500	143	3300×6500	175	3300×6500	240ft-m	3300×10600
370,000	627,016	151	3300×6500	143	3300×6500	175	3300×6500	240	3300×10600
480,000	795,540	151	v3300×6500	143	3300×6500	175	3300×6500	240	3300×10600

Pneumatic Fenders

ENERGY ABSORPTION AND APPROACHING VELOCITY OF VARIOUS SHIPS

Type of Ship	Tonnage	Displace-ment	Length (mt)	Breadth (mt)	Depth (mt)	Draft Loaded (mt)	Additional Weight (ton)	Potential Weight (ton)	Berthing Energy(t-m)	
									0.10m/sec	0.15m/sec
Oil Tanker	300	400	37.0	7.0	3.3	3.0	268	668	0.17	0.38
	500	667	43.0	7.8	3.8	3.5	424	1,091	0.28	0.63
	700	933	48.0	8.6	4.2	3.8	558	1,491	0.38	0.86
	1,000	1,333	53.0	9.1	4.7	4.1	717	2,050	0.52	1.18
	2,000	2,667	68.0	10.2	5.5	4.8	1,261	3,928	1.00	2.25
	3,000	4,000	81.0	11.3	6.3	5.4	1,900	5,900	1.51	3.39
	4,000	5,333	92.0	12.3	6.9	5.9	2,577	7,910	2.02	4.54
	5,000	6,667	102.0	13.3	7.5	6.3	3,257	9,924	2.53	5.70
	6,000	8,000	111.0	14.1	8.1	6.7	4,009	12,009	3.06	6.89
	8,000	10,667	126.0	15.7	9.0	7.4	5,552	16,219	4.14	9.31
	10,000	13,333	140.0	17.2	9.8	7.9	7,030	20,363	5.19	11.69
	12,000	16,000	150.0	18.4	10.4	8.3	8,314	24,314	6.20	13.96
	15,000	20,000	163.0	20.0	11.2	8.8	10,156	30,156	7.69	17.31
	17,000	22,667	170.0	21.0	11.7	9.1	11,327	33,994	8.67	19.51
	20,000	26,667	178.0	22.4	12.3	9.5	12,925	39,592	10.10	22.73
	25,000	33,333	190.0	24.2	13.0	10.0	15,287	48,620	12.40	27.91
	30,000	40,000	200.0	25.8	13.6	10.3	17,072	57,072	14.56	32.76
	35,000	46,666	208.0	27.4	14.2	10.6	18,804	65,470	16.70	37.58
	40,000	53,333	215.0	29.0	14.7	11.0	20,932	74,265	18.95	42.63
	50,000	66,667	230.0	32.0	16.0	11.8	25,767	92,434	23.58	53.06
	60,000	80,000	240.0	34.0	17.6	12.6	30,657	110,657	28.23	63.51
	80,000	106,667	260.0	37.6	19.6	14.3	42,778	149,445	38.12	85.78
	100,000	133,333	285.0	41.2	20.6	15.0	51,595	184,928	47.18	106.14
	150,000	200,000	307.0	47.5	24.0	16.5	67,250	267,250	68.18	153.40
Cargo Ship	700	933	50.0	8.3	4.2	3.9	612	1,545	0.39	0.89
	1,000	1,333	57.0	8.7	4.4	4.2	809	2,147	0.55	1.23
	2,000	2,667	75.0	10.8	5.7	4.9	1,449	4,116	1.05	2.36
	3,000	4,000	89.0	12.4	6.7	5.6	2,246	6,246	1.59	3.58
	4,000	5,333	101.0	13.7	7.5	6.1	3,024	8,357	2.13	4.80
	5,000	6,667	111.0	14.8	8.2	6.6	3,890	10,557	2.69	6.06
	6,000	8,000	119.0	15.6	8.8	7.0	4,692	12,692	3.24	7.28
	7,000	9,333	126.0	16.4	9.3	7.4	5,552	14,885	3.80	8.54
	8,000	10,667	132.0	17.0	9.8	7.7	6,297	16,964	4.33	9.74
	9,000	12,000	137.0	17.6	10.2	8.0	7,055	19,055	4.86	10.94
	10,000	13,333	142.0	18.1	10.6	8.2	7,683	21,016	5.36	12.06
	12,000	16,000	150.0	19.0	11.2	8.6	8,927	24,927	6.36	14.31
	15,000	20,000	160.0	20.0	11.9	9.1	10,661	30,661	7.82	17.60
	17,000	22,667	164.0	20.5	12.3	9.4	11,660	34,327	8.76	19.70
	20,000	26,667	170.0	21.0	12.7	9.8	13,137	39,804	10.15	22.85
Passenger Ship	500	500	50.0	8.2	4.5	4.0	644	1,144	0.29	0.66
	1,000	1,000	65.0	10.0	5.3	4.5	1,059	2,059	0.53	1.18
	2,000	2,000	82.0	12.0	6.4	5.2	1,784	3,784	0.97	2.17
	3,000	3,000	95.0	13.5	7.3	5.7	2,484	5,484	1.40	3.15
	4,000	4,000	105.0	14.8	8.0	6.3	3,353	7,353	1.88	4.22
	5,000	5,000	113.0	15.8	8.8	6.8	4,204	9,204	2.35	5.28
	6,000	6,000	121.0	16.7	9.5	7.2	5,047	11,047	2.82	6.34
	7,000	7,000	127.0	17.5	10.2	7.6	5,902	12,902	3.29	7.41
	8,000	8,000	135.0	18.2	10.8	8.0	6,952	14,952	3.81	8.58
	10,000	10,000	145.0	19.2	12.0	8.5	8,425	18,429	4.70	10.58
	15,000	15,000	165.0	21.5	13.0	8.8	10,281	25,281	6.45	14.51
	20,000	20,000	180.0	23.0	13.8	9.0	11,731	31,731	8.09	18.21
	30,000	30,000	210.0	26.5	15.5	9.5	15,250	45,250	11.54	25.97
	50,000	50,000	245.0	30.5	18.0	10.5	21,734	71,734	18.30	41.17
	80,000	80,000	290.0	36.0	21.0	11.7	31,942	111,942	28.56	64.25

Type of Ship	Tonnage	Displace-ment	Length (mt)	Breadth (mt)	Depth (mt)	Draft Loaded (mt)	Additional Weight (ton)	Potential Weight (ton)	Berthing Energy(t-m)	
									0.10m/sec	0.15m/sec
Ore Carrier	4,000	5,333	100.0	15.5	7.0	6.3	3,193	8,526	2.18	4.89
	6,000	8,000	118.0	16.6	8.3	6.9	4,520	12,520	3.19	7.19
	8,000	10,667	130.0	17.6	9.5	7.4	5,728	16,395	4.18	9.41
	10,000	13,333	140.0	18.5	10.5	7.9	7,030	20,363	5.19	11.69
	12,000	16,000	150.0	19.4	11.2	8.5	8,720	24,720	6.31	14.19
	15,000	20,000	163.0	20.7	12.0	9.0	10,623	30,623	7.81	17.58
	20,000	26,667	180.0	22.8	13.0	9.7	13,627	40,294	10.28	23.13
	25,000	33,333	194.0	24.7	13.8	10.3	16,560	49,893	12.73	28.64
	30,000	40,000	205.0	26.5	14.3	10.7	18,884	58,884	15.02	33.80
	40,000	53,333	218.0	29.5	15.6	11.3	22,397	75,730	19.32	43.47
	50,000	66,667	235.0	32.0	16.5	11.9	26,776	93,442	23.84	53.63
	60,000	80,000	245.0	34.5	17.6	12.5	30,801	110,801	28.27	63.60
	80,000	106,667	265.0	38.0	18.0	13.8	40,605	147,272	37.57	84.53
	100,000	133,333	270.0	40.0	19.5	15.0	48,879	182,212	46.48	104.59

Type of Ship		Tonnage	Displace-ment	Length (mt)	Breadth (mt)	Depth (mt)	Draft Loaded (mt)	Additional Weight (ton)	Potential Weight (ton)	Berthing Energy(t-m)	
										0.10m/sec	0.15m/sec
Barge	W	100	200	24.0	6.3	2.6	2.3	102	302	0.31	0.69
	S	100	200	25.0	5.3	2.5	2.5	126	326	0.33	0.75
	W	200	400	29.0	7.4	3.4	3.0	210	610	0.62	1.40
	S	200	400	33.0	6.6	3.3	3.3	289	689	0.70	1.58
	W	300	600	32.0	8.0	4.0	3.5	315	915	0.93	2.10
	S	300	600	38.5	7.2	3.6	3.6	401	1,001	1.02	2.30

Type of Ship	Tonnage	Displace-ment	Length (mt)	Breadth (mt)	Depth (mt)	Draft Loaded (mt)	Additional Weight (ton)	Potential Weight (ton)	Berthing Energy(t-m)	
									0.10m/sec	0.15m/sec
Car Ferry	100	120	20.0	6.0	2.3	2.0	64	184	0.19	0.42
	200	240	35.0	9.0	3.2	2.3	149	389	0.40	0.89
	300	360	42.0	10.0	3.5	3.0	304	664	0.68	1.52
	500	600	50.0	11.5	3.9	3.2	412	1,012	1.03	2.32
	1,000	1,200	64.0	13.0	4.4	3.4	595	1,795	1.84	4.12

Features

1. High energy absorption with lower reaction force.
2. Performance adjustable by varying initial pressure
3. Low maintenance
4. Suitable for areas with large or small tides
5. Optional chain net & tires for heavy duty applications