Technical Literature

Plasma® Sling Ratings

CORTLAND
A CORTLAND INTERNATIONAL COMPANY

Guidance for safe use

The purpose of this document is to provide technical sling performance data for safe choice and use of Cortland's Plasma® high performance synthetic slings.

While Cortland does manufacture heavy lift slings from other modern synthetic fiber materials such as Technora® (Aramid), Vectran® (LCP), Polyester and Nylon (Polyamide), the most popular fiber is Ultra High Molecular Weight Polyethylene (UHMWPE). Plasma® UHMWPE rope slings are extremely durable, have superior strength/weight benefits and have elongation properties after proof loading, similar to wire rope. Specifications of a synthetic rope sling may include additional mechanical components such as end termination hardware, (e.g. thimbles), fittings, (e.g. shackles) and wear protection. These slings are excellent lightweight lifting tools and can be used for many land-based and marine lifting applications.

If the information provided within this document does not address or answer all product support needs, please contact Cortland at +1 (360) 293-8488, toll-free at 1-888-525-8488 or email cortland@cortlandcompany.com.

Plasma®—The First, and Still the Best
Cortland's Plasma® 12-Strand and 12x12 ropes are the culmination of 25 years of engineering expertise in the HMPE industry. Our dedication to providing customers with industry-leading synthetic line is and always has been the goal. Our continued innovation and unwavering desire are to provide the strongest and most reliable product available.

Plasma® 12-Strand
Plasma® 12-Strand is made up of 12 twisted strands, 6 right-handed and 6 left-handed, which when braided together, create a torque neutral construction. During processing, a polyurethane coating is added to provide protection against application hazards such as abrasion. The finished Plasma is very durable, cut resistant (compared to other synthetic ropes) and has very good UV resistance. It also has excellent bending flex fatigue—far superior to wire rope. It is extremely flexible and conforms easily to surfaces.

Plasma 12x12
Plasma 12x12 is a 12-strand braided rope in which each of the twelve strands is, in turn, a 12-strand rope, or braided primary strand. This construction addresses the most critical properties of the fibers to provide very high strength translation efficiency for larger ropes. This design allows for long lay lengths, making rope that is more flexible for bending applications, easy to inspect, and can be quickly spliced using standard 12-strand splicing techniques. Plasma 12x12 is supplied with our standard polyurethane finish, although other coatings can be applied to suit specific applications.

Plasma® Sling Ratings in Hitch Configuration—LBS

Eye & Eye Sling

Vertical, choker and basket hitches
Basket hitch at varying angles

ratings based on Design Factor of 5:1

Nominal Size				Minimum Sling Length Ft/Inch	Vertical	Choker	90°	60°	45°	30°
						120° or >				
Dia. inch	Dia. mm	Circ. inch	MBL- Pounds		Sling Capacity Ratings at Work Load Limits (WLL) in Pounds					
					Plasma® 12-Strand					
1/4	6	3/4	8,000	2' 1"	1,600	1,120	3,200	2,770	2,260	1,600
5/16	8	15/16	11,700	2' 5"	2,340	1,630	4,680	4,050	3,300	2,340
3/8	9	1-1/8	17,500	2' 8"	3,500	2,450	7,000	6,060	4,940	3,500
7/16	11	1-1/4	21,000	3' 0"	4,200	2,940	8,400	7,270	5,930	4,200
1/2	12	1-1/2	31,300	3' 2"	6,260	4,380	12,500	10,800	8,850	6,260
9/16	14	1-3/4	37,900	3' 6"	7,580	5,300	15,100	13,100	10,700	7,580
5/8	16	2	51,400	3' 10"	10,200	7,190	20,500	17,800	14,500	10,200
3/4	18	2-1/4	68,500	4' 4"	13,700	9,590	27,400	23,700	19,300	13,700
13/16	20	2-1/2	74,000	4' 7"	14,800	10,300	29,600	25,600	20,900	14,800
7/8	22	2-3/4	92,600	4' 11"	18,500	12,900	37,000	32,000	26,100	18,500
1	24	3	110,000	5' 5"	22,000	15,400	44,000	38,100	31,100	22,000
1-1/16	26	3-1/4	129,200	5' 8"	25,800	18,000	51,600	44,700	36,500	25,800
1-1/8	28	3-1/2	147,000	5' 11"	29,400	20,500	58,800	50,900	41,500	29,400
1-1/4	30	3-3/4	165,000	6' 6"	33,000	23,100	66,000	57,100	46,600	33,000
1-5/16	32	4	196,000	6' 10"	39,200	27,400	78,400	67,800	55,400	39,200
1-1/2	36	4-1/2	221,000	7' 7"	44,200	30,900	88,400	76,500	62,500	44,200
					Plasma® 12x12					
1-5/8	40	5	291,000	9' 1"	58,200	40,700	116,400	100,800	82,300	58,200
1-3/4	44	5-1/2	314,000	9' 10"	62,800	43,900	125,600	108,700	88,800	62,800
2	48	6	355,000	11' 0"	71,000	49,700	142,000	122,900	100,400	71,000
2-1/8	52	6-1/2	428,000	11' 7"	85,600	59,900	171,200	148,200	121,000	85,600
2-1/4	56	7	481,000	12' 4"	96,200	67,300	192,400	166,600	136,000	96,200
2-1/2	60	7-1/2	530,000	13' 6"	106,000	74,200	212,000	183,500	149,900	106,000
2-5/8	64	8	596,000	14' 1"	119,200	83,400	238,400	206,400	168,500	119,200
2-3/4	68	8-1/2	660,000	14' 8"	132,000	92,400	264,000	228,600	186,600	132,000
3	72	9	780,000	16' 0"	156,000	109,200	312,000	270,100	220,600	156,000
3-1/8	76	9-1/2	850,000	16' 7"	170,000	119,000	340,000	294,400	240,400	170,000
3-1/4	80	10	940,000	17' 2"	188,000	131,600	376,000	325,600	265,800	188,000
3-1/2	84	10-1/2	1,108,000	18' 6"	221,600	155,100	443,200	383,800	313,300	221,600
3-5/8	88	11	1,250,000	19' 1"	250,000	175,000	500,000	433,000	353,500	250,000
3-3/4	92	11-1/2	1,317,000	19' 8"	263,400	184,300	526,000	456,200	372,500	263,400
4	96	12	1,520,000	21' 0"	304,000	212,800	608,000	526,000	429,900	304,000
4-1/8	100	12-1/2	1,622,000	21' 7"	324,400	227,000	648,000	561,000	458,700	324,400
4-1/4	104	13	1,697,000	22' 2"	339,400	237,500	678,000	587,000	479,900	339,400
4-1/2	108	13-1/2	1,827,000	23' 6"	365,400	255,700	730,000	632,000	516,000	365,400
4-5/8	112	14	1,880,000	24' 1"	376,000	263,200	752,000	651,000	531,000	376,000
4-3/4	116	14-1/2	1,927,000	24' 8"	385,400	269,700	770,000	667,000	545,000	385,400
5	120	15	2,069,500	25' 11"	413,900	289,700	827,000	716,000	585,000	413,900
5-1/8	124	15-1/2	2,212,000	26' 7"	442,400	309,600	884,000	766,000	625,000	442,400
5-1/4	128	16	2,355,000	27' 2"	471,000	329,700	942,000	815,000	666,000	471,000
5-1/2	132	16-1/2	2,497,500	28' 5"	499,500	349,600	999,000	865,000	706,000	499,500
5-5/8	136	17	2,640,000	29' 1"	528,000	369,600	1,056,000	914,000	746,000	528,000
5-3/4	140	17-1/2	2,782,500	29' 8"	556,000	389,500	1,113,000	963,000	787,000	556,000

Chart continues on next page, along with caution statements and effect of bending considerations.

Plasma® Sling Ratings in Hitch Configuration—LBS

Eye & Eye Sling

Vertical, choker and basket hitches
Basket hitch at varying angles

ratings based on Design Factor of 5:1

Nominal Size				Minimum Sling Length Ft/Inch	Sling Capacity Ratings at Work Load Limits (WLL) in Pounds					
					Plasma® 12-Strand					
Dia. inch	Dia. mm	Circ. inch	MBL- pounds		Vertical	Choker	90°	60°	45°	30°
						120° or >				
6	144	18	2,925,000	30' 11"	585,000	409,000	1,170,000	1,013,000	827,000	585,000
6-1/8	148	18-1/2	3,068,000	31' 6"	613,000	429,000	1,227,000	1,062,000	867,000	613,000
6-1/4	152	19	3,210,500	32' 2"	642,000	449,000	1,284,000	1,112,000	908,000	642,000
6-1/2	156	19-1/2	3,353,000	33' 5"	670,000	469,000	1,341,000	1,161,000	948,000	670,000
6-5/8	160	20	3,496,000	34' 0"	699,000	489,000	1,398,000	1,211,000	988,000	699,000
6-3/4	164	20-1/2	3,638,500	34' 8"	727,000	509,000	1,455,000	1,260,000	1,029,000	727,000
7	168	21	3,781,000	35' 11"	756,000	529,000	1,512,000	1,309,000	1,069,000	756,000
7-1/8	172	21-1/2	3,963,500	36' 6"	792,000	554,000	1,585,000	1,372,000	1,121,000	792,000
7-1/4	176	22	4,066,000	37' 1"	813,000	569,000	1,626,000	1,408,000	1,150,000	813,000
7-1/2	180	22-1/2	4,209,000	38' 5"	841,000	589,000	1,683,000	1,458,000	1,190,000	841,000
7-5/8	184	23	4,351,500	39' 0"	870,000	609,000	1,740,000	1,507,000	1,230,000	870,000
7-3/4	188	23-1/2	4,494,000	39' 7"	898,000	629,000	1,797,000	1,556,000	1,271,000	898,000
8	192	24	4,637,000	40' 11"	927,000	649,000	1,854,000	1,606,000	1,311,000	927,000
8-1/8	196	24-1/2	4,779,000	41' 6"	955,000	669,000	1,911,000	1,655,000	1,351,000	955,000
8-1/4	200	25	4,922,000	42' 1"	984,000	689,000	1,968,000	1,705,000	1,392,000	984,000

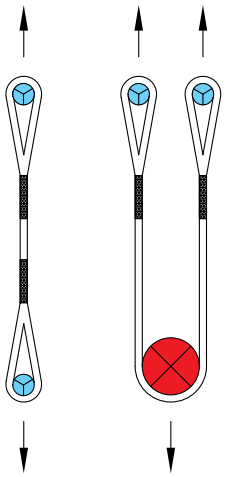
Minimum Break Load (MBL) in pounds or tonnes and is determined using spliced test samples in accordance with Cordage Institute 1500-02 - Test Method for Fiber Ropes.
Minimum Sling Length on Eye & Eye fabricated Cortland slings assumes 1) a compressed minimum eye splice of 6.75 times the rope diameter in inches, and 2) a clear span area between splices of 10 times Cortland rope circumference in feet.
The recommended Design Factor (DF) of 5:1 on this chart is based on several existing lifting sling standards including ASME B30.9. This design factor takes into account various factors including the use of UHMWPE (Ultra High Molecular Weight Polyethylene) fiber which is extremely durable and resistant to repeated high loads. Plasma® rope slings have and can be used with different DF ratios: however, this is a decision which must be made by a qualified person or designer of the lift in conjunction with the rope manufacturer.
Cortland, at this time, does not recommend the use of Plasma rope slings in a choker hitch at a lifting angle of less than 120°. Testing on rated values is not complete and available at this time.

Bending Guidance

In theory, a sling used in a basket configuration could have twice the working load as a sling in a vertical configuration because two ropes are now holding the load instead of one. However, because of bending reductions this theory is incorrect. Users must reduce that factor-of-two by an efficiency factor (i.e., a bending reduction factor).

The more tight a bend is, the more the bending efficiency reduces. If you have a gentle bend, the D:d ratio might be very high. But as the D:d ratio goes down, the bending reduction increases. Example: a 5:1 D:d ratio provides only 80% efficiency.

Reduced Basket Capacity Calculation
C = B x e
C = Reduced Basket Capacity due to bending efficiency reduction
B = Rated Basket Capacity with consideration of horizontal sling fleet angle
e = Bending efficiency percentage



Represents a contact surface that is equal to or greater than the rope diameter

Represents a contact surface with a D:d ratio of one or greater. Refer to the Efficiency Table for deductions as needed.

Efficiency Table	
D:d Ratio	eff % (e)
25:1	100.0%
8:1	82.5%
5:1	80.0%
3:1	75.0%
2:1	72.5%
1:1	65.0%

Plasma® Sling Ratings in Hitch Configuration—LBS

Endless Grommet Slings

One splice in one leg
Vertical, choker and basket hitches
Basket hitch at varying angles

Nominal Size				Minimum Sling Length Ft/Inch	Vertical	Choker (120° or >)	90°	60°	45°	30°
					Sling Capacity Ratings at Work Load Limits (WLL) in Pounds					
Dia. inch	Dia. mm	Circ. inch	MBL- Pounds		Plasma® 12-Strand					
1/4	6	3/4	13,200	0' 6"	2,640	1,120	4,750	4,110	3,360	2,370
5/16	8	15/16	19,305	0' 8"	3,860	1,630	6,940	6,010	4,910	3,470
3/8	9	1-1/8	28,875	0' 10"	5,770	2,450	10,300	9,000	7,350	5,190
7/16	11	1-1/4	34,650	0' 11"	6,930	2,940	12,400	10,800	8,820	6,230
1/2	12	1-1/2	51,645	1' 0"	10,300	4,380	18,500	16,100	13,100	9,290
9/16	14	1-3/4	62,535	1' 2"	12,500	5,300	22,500	19,400	15,900	11,200
5/8	16	2	84,810	1' 4"	16,900	7,190	30,500	26,400	21,500	15,200
3/4	18	2-1/4	113,025	1' 6"	22,600	9,590	40,600	35,200	28,700	20,300
13/16	20	2-1/2	122,100	1' 8"	24,400	10,300	43,900	38,000	31,000	21,900
7/8	22	2-3/4	152,790	1' 10"	30,500	12,900	55,000	47,600	38,800	27,500
1	24	3	181,500	2' 0"	36,300	15,400	65,300	56,500	46,200	32,600
1-1/16	26	3-1/4	213,180	2' 2"	42,600	18,000	76,700	66,400	54,200	38,300
1-1/8	28	3-1/2	242,550	2' 4"	48,500	20,500	87,300	75,600	61,700	43,600
1-1/4	30	3-3/4	272,250	2' 6"	54,400	23,100	98,000	84,800	69,300	49,000
1-5/16	32	4	323,400	2' 8"	64,600	27,400	116,400	100,800	82,300	58,200
1-1/2	36	4-1/2	364,650	3' 0"	72,900	30,900	131,200	113,600	92,800	65,600
					Plasma® 12x12					
1-5/8	40	5	480,150	3' 4"	96,000	40,700	172,800	149,600	122,200	86,400
1-3/4	44	5-1/2	518,100	3' 6"	103,600	43,900	186,500	161,500	131,800	93,200
2	48	6	585,750	4' 0"	117,100	49,700	210,800	182,600	149,100	105,400
2-1/8	52	6-1/2	706,200	4' 4"	141,200	59,900	254,200	220,100	179,700	127,100
2-1/4	56	7	793,650	4' 6"	158,700	67,300	285,700	247,400	202,000	142,800
2-1/2	60	7-1/2	874,500	5' 0"	174,900	74,200	314,800	272,600	222,600	157,400
2-5/8	64	8	983,400	5' 4"	196,600	83,400	354,000	306,500	250,300	177,000
2-3/4	68	8-1/2	1,089,000	5' 6"	217,800	92,400	392,000	339,500	277,200	196,000
3	72	9	1,287,000	6' 0"	257,400	109,200	463,300	401,200	327,600	231,600
3-1/8	76	9-1/2	1,402,500	6' 4"	280,500	119,000	504,000	437,200	357,000	252,400
3-1/4	80	10	1,551,000	6' 6"	310,200	131,600	558,000	483,500	394,800	279,100
3-1/2	84	10-1/2	1,828,200	7' 0"	365,600	155,100	658,000	569,000	465,300	329,000
3-5/8	88	11	2,062,500	7' 4"	412,500	175,000	742,000	643,000	525,000	371,200
3-3/4	92	11-1/2	2,173,050	7' 6"	434,600	184,300	782,000	677,000	553,000	391,100
4	96	12	2,508,000	8' 0"	501,000	212,800	902,000	781,000	638,000	451,400
4-1/8	100	12-1/2	2,676,300	8' 4"	535,000	227,000	963,000	834,000	681,000	481,700
4-1/4	104	13	2,800,050	8' 6"	560,000	237,500	1,008,000	872,000	712,000	504,000
4-1/2	108	13-1/2	3,014,550	9' 0"	602,000	255,700	1,085,000	939,000	767,000	542,000
4-5/8	112	14	3,102,000	9' 4"	620,000	263,200	1,116,000	967,000	789,000	558,000
4-3/4	116	14-1/2	3,179,550	9' 6"	635,000	269,700	1,144,000	991,000	809,000	572,000
5	120	15	3,414,675	10' 0"	682,000	289,700	1,229,000	1,064,000	869,000	614,000
5-1/8	124	15-1/2	3,649,800	10' 4"	729,000	309,600	1,313,000	1,137,000	929,000	656,000
5-1/4	128	16	3,885,750	10' 6"	777,000	329,700	1,398,000	1,211,000	989,000	699,000
5-1/2	132	16-1/2	4,120,875	11' 0"	824,000	349,600	1,483,000	1,284,000	1,049,000	741,000
5-5/8	136	17	4,356,000	11' 4"	871,000	369,600	1,568,000	1,358,000	1,108,000	784,000
5-3/4	140	17-1/2	4,591,125	11' 6"	918,000	389,500	1,652,000	1,431,000	1,168,000	826,000

Chart continues on next page, along with caution statements and effect of bending considerations.

Plasma® Sling Ratings in Hitch Configuration—LBS

Endless Grommet Slings

One splice in one leg
Vertical, choker and basket hitches
Basket hitch at varying angles

Nominal Size				Minimum Sling Length Ft/Inch	Sling Capacity Ratings at Work Load Limits (WLL) in Pounds					
					Plasma® 12-Strand					
Dia. inch	Dia. mm	Circ. inch	MBL- Pounds		Vertical	Choker	90°	60°	45°	30°
						120° or >				
6	144	18	4,826,250	12' 0"	965,000	409,000	1,737,000	1,504,000	1,228,000	868,000
6-1/8	148	18-1/2	5,062,200	12' 4"	1,012,000	429,000	1,822,000	1,578,000	1,288,000	911,000
6-1/4	152	19	5,297,325	12' 6"	1,059,000	449,000	1,907,000	1,651,000	1,348,000	953,000
6-1/2	156	19-1/2	5,532,450	13' 0"	1,106,000	469,000	1,991,000	1,724,000	1,408,000	995,000
6-5/8	160	20	5,768,400	13' 4"	1,153,000	489,000	2,076,000	1,798,000	1,468,000	1,038,000
6-3/4	164	20-1/2	6,003,525	13' 6"	1,200,000	509,000	2,161,000	1,871,000	1,528,000	1,080,000
7	168	21	6,238,650	14' 0"	1,247,000	529,000	2,245,000	1,945,000	1,588,000	1,122,000
7-1/8	172	21-1/2	6,539,775	14' 4"	1,307,000	554,000	2,354,000	2,038,000	1,664,000	1,177,000
7-1/4	176	22	6,708,900	14' 6"	1,341,000	569,000	2,415,000	2,091,000	1,707,000	1,207,000
7-1/2	180	22-1/2	6,944,850	15' 0"	1,388,000	589,000	2,500,000	2,165,000	1,767,000	1,250,000
7-5/8	184	23	7,179,975	15' 4"	1,435,000	609,000	2,584,000	2,238,000	1,827,000	1,292,000
7-3/4	188	23-1/2	7,415,100	15' 6"	1,483,000	629,000	2,669,000	2,311,000	1,887,000	1,334,000
8	192	24	7,651,050	16' 0"	1,530,000	649,000	2,754,000	2,385,000	1,947,000	1,377,000
8-1/8	196	24-1/2	7,885,350	16' 4"	1,577,000	669,000	2,838,000	2,458,000	2,007,000	1,419,000
8-1/4	200	25	8,121,300	16' 6"	1,624,000	689,000	2,923,000	2,531,000	2,067,000	1,461,000

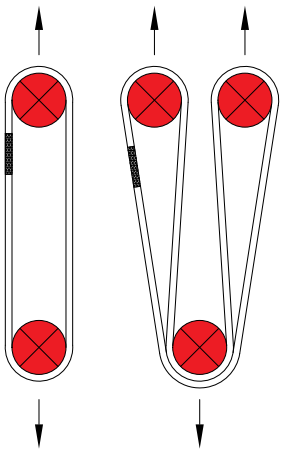
Minimum Break Load (MBL) in pounds or tonnes and is determined using spliced test samples in accordance with Cordage Institute 1500-02 - Test Method for Fiber Ropes.
Specifications for endless loop (grommet) Plasma® rope slings assume one end-to-end splice. The length of splice determines the minimum length of a grommet sling.
The recommended Design Factor (DF) of 5:1 on this chart is based on several existing lifting sling standards including ASME B30.9. This design factor takes into account various factors including the use of UHMWPE (Ultra High Molecular Weight Polyethylene) fiber which is extremely durable and resistant to repeated high loads. Plasma® rope slings have and can be used with different DF ratios: however, this is a decision which must be made by a qualified person or designer of the lift in conjunction with the rope manufacturer.
Cortland, at this time, does not recommend the use of Plasma rope slings in a choker hitch at a lifting angle of less than 120°. Testing on rated values is not complete and available at this time.

Bending Guidance

In theory, a sling used in a basket configuration could have twice the working load as a sling in a vertical configuration because two ropes are now holding the load instead of one. However, because of bending reductions this theory is incorrect. Users must reduce that factor-of-two by an efficiency factor (i.e., a bending reduction factor).

The more tight a bend is, the more the bending efficiency reduces. If you have a gentle bend, the D:d ratio might be very high. But as the D:d ratio goes down, the bending reduction increases. Example: a 5:1 D:d ratio provides only 97% efficiency.

Reduced Basket Capacity Calculation
C = B x e
C = Reduced Basket Capacity due to bending efficiency reduction
B = Rated Basket Capacity with consideration of horizontal sling fleet angle
e = Bending efficiency percentage



Represents a contact surface with a D:d ratio of one or greater. Refer to the Efficiency Table for deductions as needed.

Efficiency Table	
D:d Ratio	eff % (e)
8:1	100.0%
5:1	97.0%
3:1	91.0%
2:1	88.0%
1:1	79.0%

Plasma® Sling Ratings in Hitch Configuration—MT (tonnes)

Eye & Eye Sling

Vertical, choker and basket hitches
Basket hitch at varying angles

ratings based on Design Factor of 5:1

Nominal Size				Minimum Sling Length m	Sling Capacity Ratings at Work Load Limits (WLL) in tonnes					
					Vertical	Choker (120° or >)	90°	60°	45°	30°
Dia. inch	Dia. mm	Circ. inch	MBL tonnes		Plasma® 12-Strand					
1/4	**6**	3/4	3.6	0.7	0.7	0.5	1.4	1.2	1.0	0.7
5/16	**8**	15/16	5.3	0.8	1.0	0.7	2.1	1.8	1.5	1.0
3/8	**9**	1-1/8	7.9	0.9	1.5	1.1	3.1	2.7	2.2	1.5
7/16	**11**	1-1/4	9.5	0.9	1.9	1.3	3.8	3.2	2.6	1.9
1/2	**12**	1-1/2	14.2	1.0	2.8	1.9	5.6	4.9	4.0	2.8
9/16	**14**	1-3/4	17.2	1.1	3.4	2.4	6.8	5.9	4.8	3.4
5/8	**16**	2	23.3	1.2	4.6	3.2	9.3	8.0	6.5	4.6
3/4	**18**	2-1/4	31.1	1.3	6.2	4.3	12.4	10.7	8.7	6.2
13/16	**20**	2-1/2	33.6	1.4	6.7	4.6	13.4	11.6	9.4	6.7
7/8	**22**	2-3/4	42.0	1.5	8.4	5.8	16.8	14.5	11.8	8.4
1	**24**	3	49.9	1.7	9.9	6.9	19.9	17.2	14.1	9.9
1-1/16	**26**	3-1/4	58.6	1.8	11.7	8.2	23.4	20.3	16.5	11.7
1-1/8	**28**	3-1/2	66.7	1.8	13.3	9.3	26.6	23.0	18.8	13.3
1-1/4	**30**	3-3/4	74.8	2.0	14.9	10.4	29.9	25.9	21.1	14.9
1-5/16	**32**	4	88.9	2.1	17.7	12.4	35.5	30.7	25.1	17.7
1-1/2	**36**	4-1/2	100.2	2.3	20.0	14.0	40.0	34.7	28.3	20.0
					Plasma® 12x12					
1-5/8	**40**	5	131	2.8	26	18	52	45	37	26
1-3/4	**44**	5-1/2	142	3.0	28	19	56	49	40	28
2	**48**	6	161	3.4	32	22	64	55	45	32
2-1/8	**52**	6-1/2	194	3.6	38	27	77	67	54	38
2-1/4	**56**	7	218	3.8	43	30	87	75	61	43
2-1/2	**60**	7-1/2	240	4.1	48	33	96	83	67	48
2-5/8	**64**	8	270	4.3	54	37	108	93	76	54
2-3/4	**68**	8-1/2	299	4.5	59	41	119	103	84	59
3	**72**	9	353	4.9	70	49	141	122	99	70
3-1/8	**76**	9-1/2	385	5.1	77	53	154	133	108	77
3-1/4	**80**	10	426	5.3	85	59	170	147	120	85
3-1/2	**84**	10-1/2	502	5.7	100	70	200	173	141	100
3-5/8	**88**	11	566	5.9	113	79	226	196	160	113
3-3/4	**92**	11-1/2	597	6.0	119	83	238	206	168	119
4	**96**	12	689	6.4	137	96	275	238	194	137
4-1/8	**100**	12-1/2	735	6.6	147	102	294	254	207	147
4-1/4	**104**	13	769	6.8	153	107	307	266	217	153
4-1/2	**108**	13-1/2	828	7.2	165	115	331	286	234	165
4-5/8	**112**	14	852	7.4	170	119	340	295	240	170
4-3/4	**116**	14-1/2	874	7.6	174	122	349	302	247	174
5	**120**	15	938	7.9	187	131	375	324	265	187
5-1/8	**124**	15-1/2	1,003	8.1	200	140	401	347	283	200
5-1/4	**128**	16	1,068	8.3	213	149	427	369	302	213
5-1/2	**132**	16-1/2	1,132	8.7	226	158	452	392	320	226
5-5/8	**136**	17	1,197	8.9	239	167	478	414	338	239
5-3/4	**140**	17-1/2	1,262	9.1	252	176	504	437	356	252

Chart continues on next page, along with caution statements and effect of bending considerations.

Plasma® Sling Ratings in Hitch Configuration—MT (tonnes)

Eye & Eye Sling

Vertical, choker and basket hitches
Basket hitch at varying angles

ratings based on Design Factor of 5:1

Nominal Size				Minimum Sling Length m	Vertical	Choker (120° or >)	90°	60°	45°	30°
Dia. inch	Dia. mm	Circ. inch	MBL tonnes		Sling Capacity Ratings at Work Load Limits (WLL) in tonnes					
					Plasma® 12-Strand					
6	**144**	18	1,326	9.5	265	185	530	459	375	265
6-1/8	**148**	18-1/2	1,391	9.6	278	194	556	481	393	278
6-1/4	**152**	19	1,456	9.8	291	203	582	504	411	291
6-1/2	**156**	19-1/2	1,520	10.2	304	212	608	526	429	304
6-5/8	**160**	20	1,585	10.4	317	221	634	549	448	317
6-3/4	**164**	20-1/2	1,650	10.6	330	231	660	571	466	330
7	**168**	21	1,715	11.0	343	240	686	594	485	343
7-1/8	**172**	21-1/2	1,797	11.2	359	251	718	622	508	359
7-1/4	**176**	22	1,844	11.4	368	258	737	638	521	368
7-1/2	**180**	22-1/2	1,909	11.7	381	267	763	661	539	381
7-5/8	**184**	23	1,973	11.9	394	276	789	683	558	394
7-3/4	**188**	23-1/2	2,038	12.1	407	285	815	705	576	407
8	**192**	24	2,103	12.5	420	294	841	728	594	420
8-1/8	**196**	24-1/2	2,167	12.7	433	303	866	750	612	433
8-1/4	**200**	25	2,232	12.9	446	312	892	773	631	446

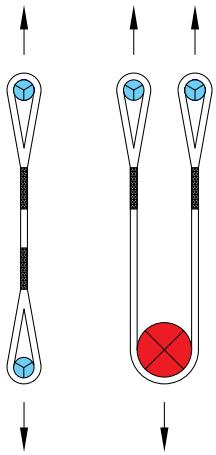
Minimum Break Load (MBL) in pounds or tonnes and is determined using spliced test samples in accordance with Cordage Institute 1500-02 - Test Method for Fiber Ropes.
Minimum Sling Length on Eye & Eye fabricated Cortland slings assumes 1) a compressed minimum eye splice of 6.75 times the rope diameter in millimeters, and 2) a clear span area between splices of 10 times Cortland rope circumference in feet.
The recommended Design Factor (DF) of 5:1 on this chart is based on several existing lifting sling standards including ASME B30.9. This design factor takes into account various factors including the use of UHMWPE (Ultra High Molecular Weight Polyethylene) fiber which is extremely durable and resistant to repeated high loads. Plasma® rope slings have and can be used with different DF ratios: however, this is a decision which must be made by a qualified person or designer of the lift in conjunction with the rope manufacturer.
Cortland, at this time, does not recommend the use of Plasma rope slings in a choker hitch at a lifting angle of less than 120°. Testing on rated values is not complete and available at this time.

Bending Guidance

In theory, a sling used in a basket configuration could have twice the working load as a sling in a vertical configuration because two ropes are now holding the load instead of one. However, because of bending reductions this theory is incorrect. Users must reduce that factor-of-two by an efficiency factor (i.e., a bending reduction factor).

The more tight a bend is, the more the bending efficiency reduces. If you have a gentle bend, the D:d ratio might be very high. But as the D:d ratio goes down, the bending reduction increases. Example: a 5:1 D:d ratio provides only 80% efficiency.

Reduced Basket Capacity Calculation
C = B x e
C = Reduced Basket Capacity due to bending efficiency reduction
B = Rated Basket Capacity with consideration of horizontal sling fleet angle
e = Bending efficiency percentage



Represents a contact surface that is equal to or greater than the rope diameter

Represents a contact surface with a D:d ratio of one or greater. Refer to the Efficiency Table for deductions as needed.

Efficiency Table	
D:d Ratio	**eff % (e)**
25:1	100.0%
8:1	82.5%
5:1	80.0%
3:1	75.0%
2:1	72.5%
1:1	65.0%

Plasma® Sling Ratings in Hitch Configuration—MT (tonnes)

Endless Grommet Slings

One splice in one leg
Vertical, choker and basket hitches
Basket hitch at varying angles

Nominal Size				Minimum Sling Length m	Vertical	Choker (120° or >)	90°	60°	45°	30°
Dia. inch	Dia. mm	Circ. inch	MBL tonnes		Sling Capacity Ratings at Work Load Limits (WLL) in tonnes					
					Plasma® 12-Strand					
1/4	**6**	3/4	5.9	0.2	1.1	0.5	2.1	1.8	1.5	1.0
5/16	**8**	15/16	8.7	0.2	1.7	0.7	3.1	2.7	2.2	1.5
3/8	**9**	1-1/8	13.0	0.3	2.6	1.1	4.7	4.0	3.3	2.3
7/16	**11**	1-1/4	15.7	0.3	3.1	1.3	5.6	4.9	4.0	2.8
1/2	**12**	1-1/2	23.4	0.4	4.6	1.9	8.4	7.3	5.9	4.2
9/16	**14**	1-3/4	28.3	0.4	5.6	2.4	10.2	8.8	7.2	5.1
5/8	**16**	2	38.4	0.4	7.6	3.2	13.8	11.9	9.7	6.9
3/4	**18**	2-1/4	51.2	0.5	10.2	4.3	18.4	15.9	13.0	9.2
13/16	**20**	2-1/2	55.3	0.5	11.0	4.6	19.9	17.2	14.0	9.9
7/8	**22**	2-3/4	69.3	0.6	13.8	5.8	24.9	21.6	17.6	12.4
1	**24**	3	82.3	0.7	16.4	6.9	29.6	25.6	20.9	14.8
1-1/16	**26**	3-1/4	96.6	0.7	19.3	8.2	34.8	30.1	24.6	17.4
1-1/8	**28**	3-1/2	110.0	0.7	22.0	9.3	39.6	34.3	28.0	19.8
1-1/4	**30**	3-3/4	123.4	0.8	24.6	10.4	44.4	38.5	31.4	22.2
1-5/16	**32**	4	146.6	0.9	29.3	12.4	52.8	45.7	37.3	26.4
1-1/2	**36**	4-1/2	165.4	1.0	33.0	14.0	59.5	51.5	42.1	29.7
					Plasma® 12x12					
1-5/8	**40**	5	217	1.0	43	18	78	67	55	39
1-3/4	**44**	5-1/2	235	1.1	47	19	84	73	59	42
2	**48**	6	265	1.3	53	22	95	82	67	47
2-1/8	**52**	6-1/2	320	1.3	64	27	115	99	81	57
2-1/4	**56**	7	359	1.4	71	30	129	112	91	64
2-1/2	**60**	7-1/2	396	1.6	79	33	142	123	100	71
2-5/8	**64**	8	446	1.7	89	37	160	139	113	80
2-3/4	**68**	8-1/2	493	1.7	98	41	177	154	125	88
3	**72**	9	583	1.9	116	49	210	182	148	105
3-1/8	**76**	9-1/2	636	2.0	127	53	229	198	161	114
3-1/4	**80**	10	703	2.0	140	59	253	219	179	126
3-1/2	**84**	10-1/2	829	2.2	165	70	298	258	211	149
3-5/8	**88**	11	935	2.3	187	79	336	291	238	168
3-3/4	**92**	11-1/2	985	2.3	197	83	354	307	250	177
4	**96**	12	1,137	2.5	227	96	409	354	289	204
4-1/8	**100**	12-1/2	1,213	2.6	242	103	437	378	309	218
4-1/4	**104**	13	1,270	2.6	254	107	457	395	323	228
4-1/2	**108**	13-1/2	1,367	2.8	273	116	492	426	348	246
4-5/8	**112**	14	1,407	2.9	281	119	506	438	358	253
4-3/4	**116**	14-1/2	1,442	2.9	288	122	519	449	367	259
5	**120**	15	1,548	3.1	309	131	557	482	394	278
5-1/8	**124**	15-1/2	1,655	3.2	331	140	595	516	421	297
5-1/4	**128**	16	1,762	3.3	352	149	634	549	448	317
5-1/2	**132**	16-1/2	1,869	3.4	373	158	672	582	475	336
5-5/8	**136**	17	1,975	3.5	395	167	711	616	502	355
5-3/4	**140**	17-1/2	2,082	3.6	416	176	749	649	530	374

Chart continues on next page, along with caution statements and effect of bending considerations.

Plasma® Sling Ratings in Hitch Configuration—MT (tonnes)

Endless Grommet Slings

One splice in one leg
Vertical, choker and basket hitches
Basket hitch at varying angles

Nominal Size				Minimum Sling Length m	Vertical	Choker (120° or >)	90°	60°	45°	30°
Dia. inch	Dia. mm	Circ. inch	MBL tonnes		Sling Capacity Ratings at Work Load Limits (WLL) in tonnes					
					Plasma® 12-Strand					
6	**144**	18	2,187	3.7	437	185	787	681	556	393
6-1/8	**148**	18-1/2	2,294	3.8	458	194	825	715	583	412
6-1/4	**152**	19	2,400	3.9	480	203	864	748	611	432
6-1/2	**156**	19-1/2	2,507	4.0	501	212	902	781	638	451
6-5/8	**160**	20	2,614	4.1	522	221	941	815	665	470
6-3/4	**164**	20-1/2	2,720	4.2	544	230	979	848	692	489
7	**168**	21	2,827	4.3	565	239	1017	881	719	508
7-1/8	**172**	21-1/2	2,963	4.4	592	251	1066	923	754	533
7-1/4	**176**	22	3,040	4.5	608	257	1094	947	773	547
7-1/2	**180**	22-1/2	3,147	4.6	629	267	1133	981	801	566
7-5/8	**184**	23	3,253	4.7	650	276	1171	1014	828	585
7-3/4	**188**	23-1/2	3,360	4.8	672	285	1209	1047	855	604
8	**192**	24	3,467	4.9	693	294	1248	1081	882	624
8-1/8	**196**	24-1/2	3,573	5.0	714	303	1286	1114	909	643
8-1/4	**200**	25	3,680	5.1	736	312	1324	1147	936	662

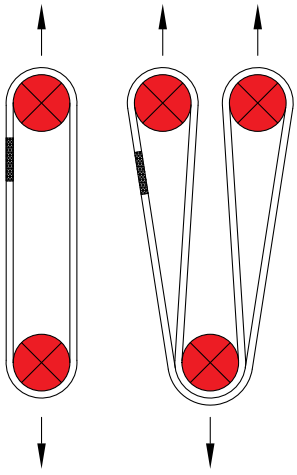
Minimum Break Load (MBL) in pounds or tonnes and is determined using spliced test samples in accordance with Cordage Institute 1500-02 - Test Method for Fiber Ropes.
Specifications for endless loop (grommet) Plasma® rope slings assume one end-to-end splice. The length of splice determines the minimum length of a grommet sling.
The recommended Design Factor (DF) of 5:1 on this chart is based on several existing lifting sling standards including ASME B30.9. This design factor takes into account various factors including the use of UHMWPE (Ultra High Molecular Weight Polyethylene) fiber which is extremely durable and resistant to repeated high loads. Plasma rope slings have and can be used with different DF ratios: however, this is a decision which must be made by a qualified person or designer of the lift in conjunction with the rope manufacturer.
Cortland, at this time, does not recommend the use of Plasma rope slings in a choker hitch at a lifting angle of less than 120°. Testing on rated values is not complete and available at this time.

Bending Guidance

In theory, a sling used in a basket configuration could have twice the working load as a sling in a vertical configuration because two ropes are now holding the load instead of one. However, because of bending reductions this theory is incorrect. Users must reduce that factor-of-two by an efficiency factor (i.e., a bending reduction factor).

The more tight a bend is, the more the bending efficiency reduces. If you have a gentle bend, the D:d ratio might be very high. But as the D:d ratio goes down, the bending reduction increases. Example: a 5:1 D:d ratio provides only 97% efficiency.

Reduced Basket Capacity Calculation
C = B x e
C = Reduced Basket Capacity due to bending efficiency reduction
B = Rated Basket Capacity with consideration of horizontal sling fleet angle
e = Bending efficiency percentage



Represents a contact surface with a D:d ratio of one or greater. Refer to the Efficiency Table for deductions as needed.

Efficiency Table	
D:d Ratio	**eff % (e)**
8:1	100.0%
5:1	97.0%
3:1	91.0%
2:1	88.0%
1:1	79.0%

Notes

Cortland is a global designer, manufacturer, and supplier of technologically advanced ropes, slings, and strength members. Collaborating with customers, our team uses its experience in high performance materials and market knowledge to transform ideas into proven products.

For more than 35 years, our custom-built solutions have been developed for work in the toughest environments and to overcome some of the world's greatest challenges. They consistently enable our customers to meet the demands of the aerospace, defense, research, subsea, marine, and energy industries.

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