



NORTHWEST INDUSTRIAL SUPPLY, INC.

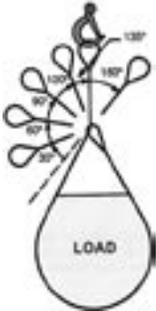
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Choker Hitch Capacities

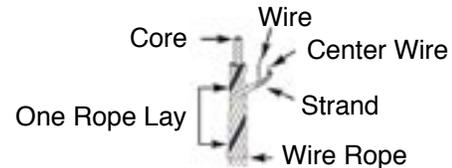
When the pull on a choker hitch results in an angle of less than 120°, the work load limit must be adjusted. Determine the angle of choke and multiply the choker hitch work load limit by the loss factor to get the reduced work load.



Angle of Choke (Degrees)	Loss Factor
120-180	1.00
90-119	.87
60-89	.74
30-59	.62
0-29	.49

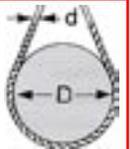


Wire Rope Construction



(D/d) Considerations

When wire rope is bent around the load diameter, the rope strength is decreased. The D/d ratio is the diameter of the object around which the rope is bent (D), divided by the diameter (d) of the rope.



Sling Load Chart

Showing Sling Stresses at Various Angles

All Angles Measured from Vertical (1,000 lb. Load)	Equivalent vertical load on 1 leg (lbs)	Increase in stress due to sling angle	Total Sling Stress (lbs.)	Angle
90°	1,000			90°
85°	1,000	1047%	11,473	85°
80°	1,000	476%	5,759	80°
75°	1,000	286%	3,863	75°
70°	1,000	192%	2,924	70°
65°	1,000	136%	2,366	65°
60°	1,000	100%	2,000	60°
55°	1,000	74.3%	1,743	55°
50°	1,000	55.5%	1,555	50°
45°	1,000	41.4%	1,414	45°
40°	1,000	30.5%	1,305	40°
35°	1,000	22.0%	1,220	35°
30°	1,000	15.4%	1,154	30°
25°	1,000	10.3%	1,103	25°
20°	1,000	6.4%	1,064	20°
15°	1,000	3.5%	1,035	15°
10°	1,000	1.5%	1,015	10°
5°	1,000	0.3%	1,003	5°
0°	1,000	0.0%	1,000	0°

This chart illustrates how the stress in a sling increases as the angle increases (all angles are measured from the vertical).

When one sling leg lifts 1,000 lbs. at 0°, the sling stress is also 1,000 lbs. If the sling angle increases to 45°, the stress actually exerted on the sling would be 1,414 lbs., an increase of 41.4%.

Should the sling angle be increased to 60°, the stress would be 2,000 lbs., or a 100% increase. At an 85° angle (highly unlikely), sling stress increases 1,047%. With a load of 1,000 lbs., the sling stress would be 11,473 lbs.

How to Select a Sling for Use at Any Angle

When calculating for selection of the proper sling, select the vertical angle in the chart at left. Read the "increase in stress" as a percentage factor. Multiply the actual load weight by this percentage, then add the answer to the actual load to be lifted. This gives the rated capacity to look for in selecting the proper size of sling.

Efficiencies of Wire Rope Slings

These figures represent the efficiency of the attachment. The approximate percentage of effective rope strength available with each type of fitting depends upon the diameter, construction and grade of rope.

Wire rope sockets - Spelter attachment 100%
 "Swage sleeve" thimble attachment 100%
 "Swage-sleeve" loop attachment 100%
 Wedge sockets (depending on design) 80-90%
 Clips (number of clips varies w/ rope size) 80%

Thimble Splice: 3/8" to 5/8" diameter 90-95%
 3/4" to 1 1/8" diameter 85-90%
 1 1/4" to 1 1/2" diameter 80-85%
 1 5/8" to 2" diameter 75-80%
 2 1/8" and up 70-75%

Loop Splice: The efficiency of a loop splice without a thimble is somewhat less than given above for a thimble splice.

Nylon Web Slings

Eye & Eye (EE) & Endless (EN) style slings - 1 & 2 Ply Slings
Rated Capacities in Lbs. based on 9800 lbs webbing. Design Factor = 5:1 when new.

Size & Type	Choker	Vertical	Basket @ 90°	Size & Type	Choker	Vertical	Basket @ 90°
EE1-901	1,200	1,600	3,200	EN1-901	2,500	3,200	6,400
EE2-901	2,500	3,200	6,400	EN2-901	5,000	6,400	12,800
EE1-902	2,500	3,200	6,400	EN1-902	5,000	6,400	12,800
EE2-902	5,000	6,400	12,800	EN2-902	10,000	12,500	25,000
EE1-903	3,800	4,800	9,600	EN1-903	7,600	9,600	19,200
EE2-903	7,000	8,860	17,720	EN2-903	14,000	17,500	35,000
EE1-904	5,000	6,400	12,800	EN1-904	10,000	12,500	25,000
EE2-904	9,000	11,400	22,800	EN2-904	18,000	23,500	47,000
EE1-906	7,600	9,600	19,200	EN1-906	15,300	19,200	38,400
EE2-906	13,000	17,000	34,000	EN2-906	26,000	32,500	65,000

Polyester Roundslings

Rated Capacities in Lbs. Design Factor = 5:1 when new.

Size & Type	Choker	Vertical	Basket @ 90	Size & Type	Choker	Vertical	Basket @ 90
RS 30	2,120	2,650	5,300	RS 240	17,000	21,200	42,400
RS 60	4,240	5,300	10,600	RS 360	24,800	31,000	62,000
RS 90	6,720	8,400	16,800	RS 400	32,000	40,000	80,000
RS 120	8,500	10,600	21,200	RS 600	43,000	53,000	106,000
RS 150	10,560	13,200	26,400	RS 800	52,000	66,000	132,000
RS 180	13,400	16,800	33,600	RS 1000	72,000	90,000	180,000

Slingmax® HPF Twin-Path Slings®

Rated Capacities in Lbs. Design Factor = 5:1 when new.

Twin-Path	Choker	Vertical	Basket	Bsk @ 60°	Bsk @ 45°	Single-Path
TUFXKS 1000	8,000	10,000	20,000	17,320	14,140	SP1000CF
TUFXKS 1500	12,000	15,000	30,000	25,980	21,210	SP1500CF
TUFXKS 2000	16,000	20,000	40,000	34,640	28,280	SP2000CF
TUFXKS 2500	20,000	25,000	50,000	43,300	35,350	SP2500CF
TUFXKS 3000	24,000	30,000	60,000	51,960	42,420	SP3000CF
TUFXKS 4000	32,000	40,000	80,000	69,280	56,560	SP4000CF
TUFXKS 5000	40,000	50,000	100,000	86,600	70,700	SP5000CF
TUFXKS 6000	48,000	60,000	120,000	103,920	84,840	SP6000CF
TUFXKS 7000	56,000	70,000	140,000	121,240	98,980	SP7000CF
TUFXKS 8500	68,000	85,000	170,000	147,220	120,190	SP8500CF
TUFXKS 10000	80,000	100,000	200,000	173,200	141,400	SP10000CF
TUFXKS 12500	100,000	125,000	250,000	216,500	176,750	--
TUFXKS 15000	120,000	150,000	300,000	259,800	212,100	--
TUFXKS 17500	140,000	175,000	350,000	303,100	247,450	--
TUFXKS 20000	160,000	200,000	400,000	346,400	282,800	--
TUFXKS 25000	200,000	250,000	500,000	433,000	353,500	--
TUFXKS 27500	220,000	275,000	550,000	476,300	388,850	--
TUFXKS 30000	240,000	300,000	600,000	519,600	424,200	--
TUFXKS 40000	320,000	400,000	800,000	692,800	565,600	--
TUFXKS 50000	400,000	500,000	1,000,000	866,000	707,000	--

Removal from Service Criteria for Synthetic Slings

All slings must be inspected daily or before each shift in normal service conditions. If conditions are severe or you're unsure if the sling has been inspected, YOU NEED TO INSPECT THE SLING BEFORE USING. Slings shall be removed from service if any of the following conditions are present :

All Slings

- Missing or illegible tag
- Holes, tears, cuts, snags, punctures or knots
- Acid or alkali burns
- Melting, charring or weld splatter
- Distortion, pitting, corrosion or other fitting damage
- Any condition that causes doubt as to the strength of the sling.
- Damaged slings must not be used for ANY purpose!

Roundslings And Twin-path® Slings

- Damage to the cover that exposes yarn
- Broken, cut or damaged core yarns
- Damage to the cover may indicate a loss of core yarn strength.

For Slings Equipped With:

- Check-Fast®: The EWI does not extend past the sling tag area.
- Tattle Tails: One or both of the tails does not extend past the sling tag area.
- Fiber Optics: Light is not transmitted.

Web Slings

- Excessive abrasion
- Crushed webbing
- Ultraviolet light damage
- Broken or worn stitching in load bearing splices
- Red core yarn if furnished. If there is damage and the red yarns are not visible, DO NOT USE THE SLING! Remember, **ANY DOUBT, DON'T!**

Wear Protection for Slings

All slings must be protected from damage by materials of sufficient strength, thickness and construction.

The edge of a load need not be "razor" sharp to cut slings.

If the load moves across the sling or the sling across the load, the sling may become damaged.

There is no such thing as "Cut Proof" wear protection. Cut resistant wear protection does exist.

There is a BIG difference between abrasion and cutting damage and the appropriate wear protection to use for each.

Gloves and cardboard are not wear protection devices.

Contact us for wear protection that is engineered to withstand tension and compression.

Engineered Wear Protection

- Cornermax® Sleeves
- Cornermax® Pad
- Magnetic Corner Protectors
- Meshguard®

Alloy Chain Slings Grade 80/Grade 100

Rated Capacities in Lbs. Design Factor = 4:1 when new.

Chain Size	Grade	Sgl Leg	Double Leg				Triple & Quad Leg		
		90	60	45	30	60	45	30	
9/32	80	3,500	6,100	4,900	3,500	9,100	7,400	5,200	
	100	4,300	7,400	6,100	4,300	11,200	9,100	6,400	
3/8	80	7,100	12,300	10,000	7,100	18,400	15,100	10,600	
	100	8,800	15,200	12,400	8,800	22,900	18,700	13,200	
1/2	80	12,000	20,800	17,000	12,000	31,200	25,500	18,000	
	100	15,000	26,000	21,200	15,000	39,000	31,800	22,500	
5/8	80	18,100	31,300	25,600	18,100	47,000	38,400	27,100	
	100	22,600	39,100	32,000	22,600	58,700	47,900	33,900	
3/4	80	28,300	49,000	40,000	28,300	73,500	60,000	42,400	
	100	35,300	61,100	49,900	35,300	91,700	74,900	53,000	

Sling Tension and Weight Distribution

Center of Gravity Centered

Tension in L = $\frac{\text{Length (L)}}{\text{Height (H)}} \times \text{Share of Load Wt. (SOL)}$

$\frac{L}{H}$ = Load Angle Factor (LAF)

Given: SOL = 2,500 lbs L = 12 H = 8

Tension in L = $\frac{L}{H} \times \text{SOL} \rightarrow \text{Tension in L} = \frac{12}{8} \times 2,500 = 3,750 \text{ lbs.}$

Offset Center of Gravity

6 ft. Leg

Proportional Share of the Load $\frac{3}{12} = .25$ Distance
 .75 Share of Load
 .75 x 55,000 = 41,250

x
 Load Factor $\frac{L1}{H} = \frac{6}{5} = 1.2$

Sling Tension 49,500 lbs.

10.5 ft. Leg

Proportional Share of the Load $\frac{9}{12} = .75$ Distance
 .25 Share of Load
 .25 x 55,000 = 13,750

x
 Load Factor $\frac{L2}{H} = \frac{10.5}{5} = 2.1$

Sling Tension 28,875 lbs.

Rigging Hardware Capacities

Rated Capacities in Lbs. Design Factor = 5:1 when new.

Size in Inches	Screw Pin Anchor Shackles		Turnbuckle		Crosby Forged Shoulder Eyebolt		Swivel Hoist Ring	
	Carbon	Alloy	Eye/Jaw End	Hook End	90°	45°	Capacity	Torque
1/4	1,000	--	500	400	650	195	600	6 ft/lbs
3/8	2,000	4,000	1,200	1,000	1,550	465	1,000	12 ft/lbs
1/2	4,000	6,600	2,200	1,500	2,600	780	2,500	28 ft/lbs
5/8	6,500	10,000	3,500	2,250	5,200	1,560	4,000	60 ft/lbs
3/4	9,500	14,000	5,200	3,000	7,200	2,160	5,000	100 ft/lbs
7/8	13,000	19,000	7,200	4,000	10,600	3,180	8,000	160 ft/lbs
1	17,000	25,000	10,000	5,000	13,300	3,990	10,000	230 ft/lbs
1 1/8	19,000	30,000	--	--	--	--	10,000	230 ft/lbs
1 1/4	24,000	36,000	15,200	--	21,000	6,300	11,500	470 ft/lbs
1 1/2	34,000	--	21,400	--	24,000	7,200	12,500	800 ft/lbs

Calculating Load Weights

Pounds/Cubic Foot

Material	Weight
Aluminum	165
Brass, cast-rolled	534
Brick, common	125
Bronze	534
Cement, Portland loose	90
Coal	56
Concrete, reinforced	150
Copper	560
Crushed Rock	95
Diesel Fuel	52
Earth, dry (loose)	76
Earth, dry (packed)	95
Granite	96
Gasoline	45
Ice	56
Iron, cast	450
Lead, cast-rolled	710
Lumber, fir	32
Lumber, oak	62
Lumber, railroad ties	50
Steel	490
Water, pure	83
Water, salt	65
Zinc, cast	440

Pounds/Square Foot

Plate Size	Steel	Aluminum
1/8"	5	1.75
1/4"	10	3.5
1/2"	20	7
1"	40	14

Read the Label!



ASME standards require all slings to be marked with manu-

facturer, stock number and rated loads for the types of hitches used and the angle upon which it is based, as well as other information pertinent to sling type.

Coefficients of Friction

Cast iron on steel	.25
Concrete on concrete	.65
Continuous lube surface	.15
Leather on metal	.40
Load on air	.002
Load on ice	.01
Load on wheels	.05
Metal on concrete	.60
Nylon on steel	.15-.25
Steel on steel	.10
Wood on metal	.30
Wood on wood	.50



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Wire Rope Slings



Rope Diameter (inches)	Standard Eye Size (Approx)	Choker Hook Size	EIPS IWRC [†]			
			Capacity – Tons			Eye Hook Cap.
			Vertical	Choker	Vertical Basket*	
1/4	2 x 4	3/8	.65	.48	1.3	1
5/16	2 1/2 x 5	3/8	1	.74	2	1
3/8	3 x 6	3/8	1.4	1.1	2.9	1.5
7/16	3 1/2 x 7	1/2	1.9	1.4	3.9	2
1/2	4 x 8	1/2	2.5	1.9	5.1	3
9/16	4 1/2 x 9	5/8	3.2	2.4	6.4	5
5/8	5 x 10	5/8	3.9	2.9	7.8	5
3/4	6 x 12	3/4	5.6	4.1	11	7
7/8	7 x 14	7/8	7.6	5.6	15	11
1	8 x 16	1	9.8	7.2	20	11
1-1/8	9 x 18	1-1/8	12	9.1	24	15
1-1/4	10 x 20	1-1/4	15	11	30	15
1-3/8	11 x 22	1-3/8	18	13	36	22
1-1/2	12 x 24	1-1/2	21	16	42	22
1-3/4	14 x 28	-	28	21	57	30
2	16 x 32	-	37	28	73	37

* These values apply only when D/d ratio is 20 or greater

Two Leg Bridle Slings



Rope Diameter (inches)	EIPS IWRC [†]			
	Capacity – Tons		Eye Hook Cap.	Link Stock Dia.
	Vertical Angle 30°	Vertical Angle 45°		
1/4	1.1	.91	1	1/2
5/16	1.7	1.4	1	1/2
3/8	2.5	2	1.5	1/2
7/16	3.4	2.7	2	3/4
1/2	4.4	3.6	3	3/4
9/16	5.5	4.5	5	3/4
5/8	6.8	5.5	5	1
3/4	9.7	7.9	7	1-1/4
7/8	13	11	11	1-1/4
1	17	14	11	1-1/2
1-1/8	21	17	15	1-1/2
1-1/4	26	21	15	1-3/4
1-3/8	31	25	22	1-3/4
1-1/2	37	30	22	2
1-3/4	49	40	30	2-1/4
2	63	52	37	2-3/4

Three Leg Bridle Slings



Rope Diameter (inches)	EIPS IWRC [†]			
	Capacity – Tons		Eye Hook Cap.	Link Stock Dia.
	Vertical Angle 30°	Vertical Angle 45°		
1/4	1.7	1.4	1	1/2
5/16	2.6	2.1	1	1/2
3/8	3.7	3	1.5	3/4
7/16	5	4.1	2	3/4
1/2	6.6	5.4	3	1
9/16	8.3	6.8	5	1
5/8	10	8.3	5	1-1/4
3/4	15	12	7	1-1/2
7/8	20	16	11	1-1/2
1	26	21	11	1-3/4
1-1/8	31	26	15	1-3/4
1-1/4	38	31	15	2
1-3/8	46	38	22	2-1/4
1-1/2	55	45	22	2-1/4

Four Leg Bridle Slings



Rope Diameter (inches)	EIPS IWRC [†]			
	Capacity – Tons		Eye Hook Cap.	Link Stock Dia.
	Vertical Angle 30°	Vertical Angle 45°		
1/4	2.2	1.8	1	1/2
5/16	3.5	2.8	1	3/4
3/8	5	4.1	1.5	3/4
7/16	6.7	5.5	2	1
1/2	8.8	7.1	3	1
9/16	11	9	5	1-1/4
5/8	14	11	5	1-1/2
3/4	19	16	7	1-3/4
7/8	26	21	11	2
1	34	28	11	2-1/4
1-1/8	42	34	15	2-3/4
1-1/4	51	42	15	2-3/4

† EIPS IWRC - Extra Improved Plow Steel with Independent Wire Rope Core

Alloy Links

Master		Joiners	
3/4 x 3 x 6	2 1/4 x 8 x 16	1/2 x 1 x 2 x 3	1 1/2 x 3 x 6 x 9
1 x 4 x 8	2 1/2 x 8 x 16	3/4 x 1 1/2 x 3 x 4 1/2	2 x 4 x 8 x 12
1 1/2 x 6 x 12	3 1/4 x 10 x 20	1 x 2 x 4 x 6	2 1/2 x 5 x 10 x 15
2 x 8 x 16	4 x 12 x 24	1 1/4 x 2 1/2 x 5 x 7 1/2	3 x 6 x 12 x 18

Sling Types



Sling Uses

