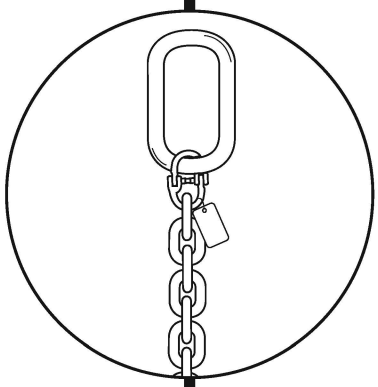
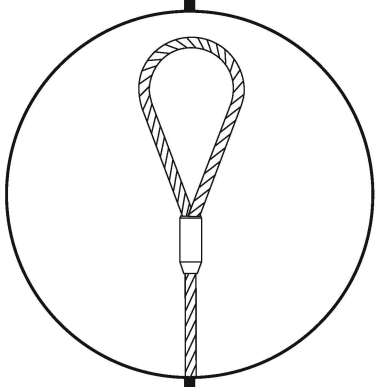
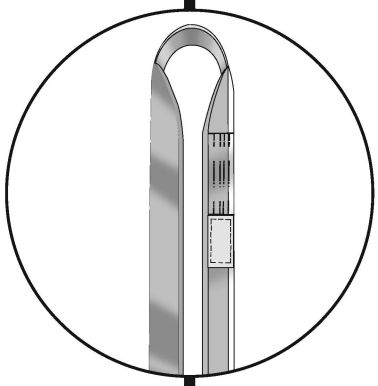
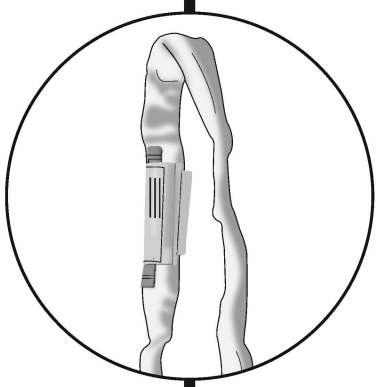








SLING CONSIDERATIONS

SLING CONSIDERATIONS - EFFECTS OF SLING ANGLES

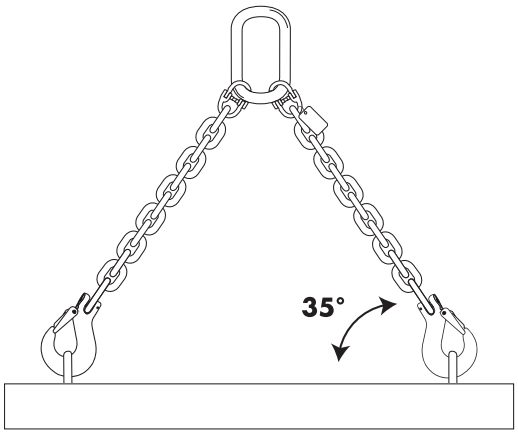
REDUCTION IN CAPACITY - MULTI-LEG SLING REDUCTION

The capacities of all slings are affected by the angle of the lift (sling to load) measured from the horizontal. To determine the actual capacity of a multi-leg sling at a given angle, multiply the vertical single leg sling capacity by the number of legs being used (this can be no more than three for chain slings). Multiply this total by the appropriate loss factor listed below.

Actual Sling Capacity = Factor x Rated Capacity

Angle In Degrees	Loss Factor	Angle In Degrees	Loss Factor
15°	.259	55°	.819
20°	.342	60°	.866
25°	.423	65°	.906
30°	.500	70°	.946
35°	.574	75°	.966
40°	.643	80°	.985
45°	.707	85°	.996
50°	.766	90°	1.000

Example:
3/8'' Grade 80 2-leg chain sling to be used at 35 degrees;



7100	x	**2**	x	**.574**	=	**8150**
Vertical Rated Capacity Single Leg		Number of Legs		Loss Factor		Rated Capacity

8150 LBS. Actual 2-leg Chain Sling Capacity

SLING CONSIDERATIONS - EFFECTS OF SLING ANGLES

INCREASED TENSION - MULTI-LEG AND BASKET HITCH

1. Determine the load weight.

2. Divide the load weight by the number of supporting legs (symmetrical loads only) to determine share of load to each sling leg (this can be no more than three for chain slings).

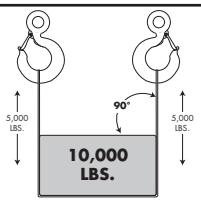
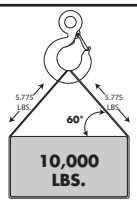
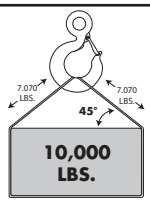
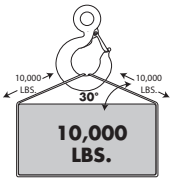
3. Determine the sling angle from the horizontal and the corresponding tension multiplier (from the chart below).

4. Multiply the sling leg's share of the load by the tension multiplier to determine the increased sling leg tension.

Effect of Sling Angle - Tension Factor Chart

Angle in Degrees From Horizontal	Tension Multiplier	Angle in Degrees From Horizontal	Tension Multiplier
90	1.000	55	1.221
85	1.004	50	1.305
80	1.015	45	1.414
75	1.035	40	1.555
70	1.064	35	1.742
65	1.104	30	2.000
60	1.155		

Example of the effect of Sling Angle on Tension

Tension in the Sling Increases as the Sling Angle Decreases				
Sling Angle (from Horizontal)	90°	60°	45°	30°
Tension Multiplier	1.00	1.155	1.414	2.000
Sling Tension (Lbs. Per Leg)	5,000	5,775	7,070	10,000

SLING CONSIDERATIONS - EFFECTS OF SLING ANGLES

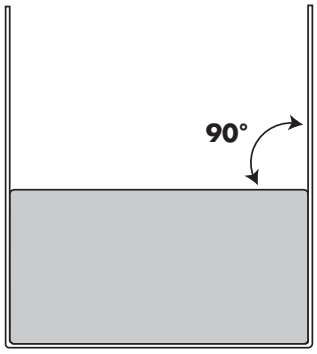
REDUCTION IN CAPACITY - BASKET HITCH REDUCTION

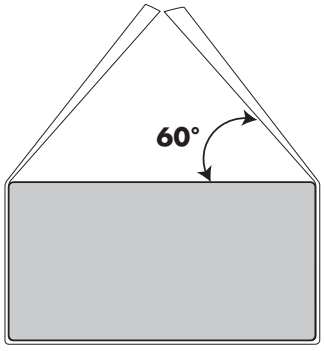
To find the actual sling capacity in a basket hitch, you must first, find the sling angle by measuring from the horizontal. Once the angle is determined, (using the 90° basket hitch capacity), multiply the sling capacity by the appropriate loss factor listed below.

Actual Sling Capacity = Factor x Rated Capacity

Angle In Degrees	Loss Factor	Angle In Degrees	Loss Factor
15°	.259	55°	.819
20°	.342	60°	.866
25°	.423	65°	.906
30°	.500	70°	.946
35°	.574	75°	.966
40°	.643	80°	.985
45°	.707	85°	.996
50°	.766	90°	1.000

Example:
1'', 1 ply endless web sling without fittings, 6400 lbs vertical basket rating (used at a 60 degree angle).





6400 LBS. Vertical Basket Rating	x	**0.866** Loss Factor	=	**5542 LBS.** Actual Sling Capacity

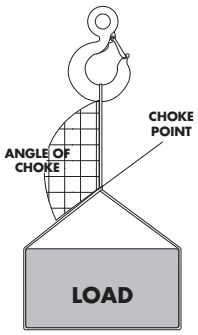
5542 LBS. Actual 60° Basket Sling Capacity

SLING CONSIDERATIONS - CHOKER HITCH REDUCTION

WIRE ROPE AND SYNTHETIC SLINGS

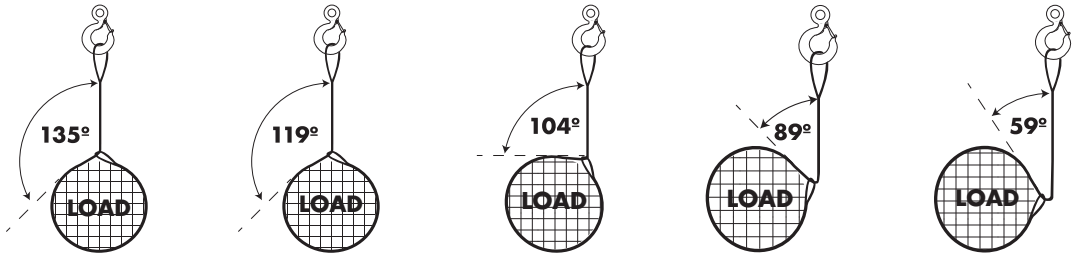
Rated Capacity of Choker Hitch

When the angle of choke is less than 120 degrees, the slings choker hitch capacity is affected. To determine the actual choker capacity at a given angle of choke, multiply the slings choker rating by the appropriate reduction factor shown.



RATED CAPACITY OF CHOKER HITCH TABLE

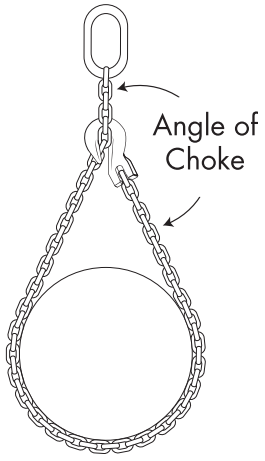
Angle of Choke (Degrees)		Angle of choke Reduction Factor
Equal to or greater than	Less than	
120	180	1.00
105	120	0.82
90	105	0.71
60	90	0.58
0	60	0.50



1.00 0.82 0.71 0.58 0.50

ALLOY CHAIN SLINGS

A alloy chain sling's capacity is affected by choke angle. The table shows the choke angle and the resultant percent of the sling's vertical rated capacity.



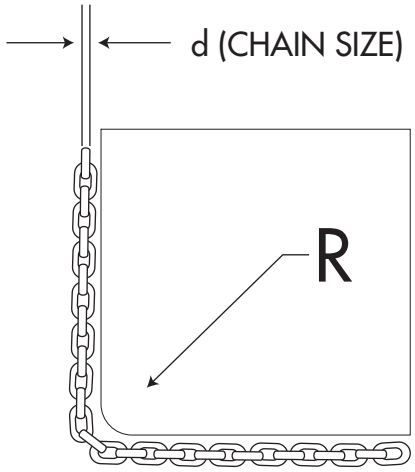
CHOKER HITCH RATED CAPACITY ADJUSTMENT

Choke Angle (Degrees)	Percent of Vertical Rated Capacity
120 - 180	80%
90 - 119	70%
60 - 89	60%
30 - 59	50%
0 - 29	40%

SLING CONSIDERATIONS - EDGE RADIUS REDUCTION

ALLOY CHAIN SLINGS

Edge radius reduction is used when an alloy chain sling is rigged over an edge. To calculate this loss, multiply the chain sling capacity by the reduction factor found in the table below.

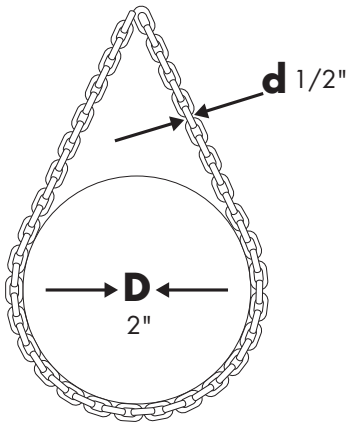


Edge Radius	R > 2 x Chain d	R > Chain d	R < Chain d
Reduction Factor	1.0	0.7	0.5

SLING CONSIDERATIONS - D/d

ALLOY CHAIN SLINGS

When using chain slings in basket applications where the D/d is less than 6, the rated capacities must be reduced by the values given in the table. Do not use a chain sling with a D/d that is less than two.



D/d CHAIN BASKET SLING DE-RATING FACTORS

D/d Ratio	% Rated Capacity
Less Than 2	Not Recommended
2	60
3	70
4	80
5	90
6 and above	100

Example:

When the diameter of the load is 4 times the diameter of the alloy chain sling the D/d ratio is 4/1 and the sling efficiency is 80%.

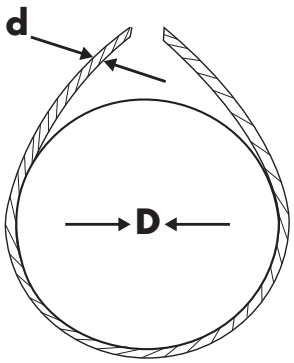
$$\frac{D}{d} = \frac{2}{\text{2'' load diameter (D)}} \div \frac{.5}{\text{1/2'' alloy chain sling diameter (d)}} = 4$$

$$\frac{4}{1} = \text{80\% efficiency}$$

SLING CONSIDERATIONS - D/d

WIRE ROPE SLINGS

When a wire rope sling is rigged as a basket, the diameter of the load can affect the sling's lifting capacity. How much the lifting capacity is affected can be calculated by dividing the diameter of the load (represented by ''D'') by the diameter of the wire rope (represented by ''d'').



D/d Ratio	Wire Rope Sling Strength Efficiencies
25/1	100%
20/1	92%
15/1	88%
10/1	86%
8/1	84%
6/1	80%
4/1	75%
2/1	65%
1/1	50%

Example:
When the diameter of the load is 4 times the diameter of the wire rope sling the D/d ratio is 4/1 and the sling efficiency is 75%.

$$\frac{D}{d} = \underset{\text{2'' load diameter (D)}}{\mathbf{2}} \div \underset{\text{1/2'' wire rope diameter (d)}}{\mathbf{.5}} = \mathbf{4}$$

$$\frac{4}{1} = \text{75\% efficiency}$$

WEB SLINGS

Capacity reductions are not required when considering D/d ratios for synthetic web slings.

POLYESTER ROUNDSLINGS

When considering D/d ratios for roundslings, the manufacturer's recommendations for the sling must be followed. Roundsling load fibers are of many different types and deniers. Different fiber types and component sizes react differently around pin diameters. Please contact us for further information.

ALLOY CHAIN SLINGS

ASME B30.9-1.8: Effects of Environment
9-1.8.1 Temperature
Extreme temperatures may reduce the performance of alloy steel chain slings. The sling manufacturer should be consulted when the slings are to be used in temperatures of -40 °F (-40 °C) or below. Rated load reductions for Grade 80 and Grade 100 alloy chain slings used at or after exposure to temperatures above 400 °F (204 °C) or higher are given in Table 9-1.8.1-1.
Shown below.

EFFECT OF ELEVATED TEMPERATURE ON THE WLL OF ALLOY CHAIN

Temperature		Grade of Chain			
		Grade 80		Grade 100	
°F	°C	Reduction of Working Load Limit **WHILE AT** Temperature	Permanent Reduction of Working Load Limit **AFTER EXPOSURE** to Temperature	Reduction of Working Load Limit **WHILE AT** Temperature	Permanent Reduction of Working Load Limit **AFTER EXPOSURE** to temperature
Below 400	Below 204	None	None	None	None
400	204	10%	None	15%	None
500	260	15%	None	25%	5%
600	316	20%	5%	30%	15%
700	371	30%	10%	40%	20%
800	427	40%	15%	50%	25%
900	482	50%	20%	60%	30%
1000	538	60%	25%	70%	35%
Over 1000	Over 538	Remove from service			

OSHA 1910.184 (e) Alloy Steel Chain Slings
[§1910.184(e)(6)]
Safe operating temperatures. Employers must permanently remove an alloy steel chain slings from service if it is heated above 1000 °F. When exposed to service temperatures in excess of 600 °F, employers must reduce the maximum working load limits permitted by the chain manufacturer in accordance with the chain or sling manufacturer's recommendations.

SLING CONSIDERATIONS - HEAT

WIRE ROPE SLINGS

ASME B30.9-2.8: Effects of Environment
9-2.8.1 Temperature
(a) Fiber core wire rope slings of all grades shall not be exposed to temperatures in excess of 180 °F (82 °C).

(b) When fiber core wire rope slings are to be used at temperatures below -40 °F (-40 °C), the sling manufacturer should be consulted.

(c) When IWRC wire rope slings are to be used at temperatures above 400 °F (204 °C) or below -40 °F (-40 °C), the sling manufacturer should be consulted.

OSHA 1910.184 (f) Wire Rope Slings
[§1910.184(f)(3)]
Safe operating temperatures. Fiber core wire rope slings of all grades shall be permanently removed from service if they are exposed to temperatures in excess of 200 °F. When non-fiber core wire rope slings of any grade are used at temperatures above 400 °F or below minus 60 °F, recommendations of the sling manufacturer regarding use at that temperature shall be followed.

OSHA 1926.251 (c) Wire Rope
[§1926.251(c)(14)]
Safe operating temperatures. Fiber core wire rope slings of all grades shall be permanently removed from service if they are exposed to temperatures in excess of 200 °F (93.33 °C). When nonfiber core wire rope slings of any grade are used at temperatures above 400 °F (204.44 °C) or below minus 60 °F (15.55 °C), recommendations of the sling manufacturer regarding use at that temperature shall be followed.

WEB SLINGS

ASME B30.9-5.8: Effects of Environment
9-5.8.1 Temperature
Polyester and nylon webbing slings shall not be used in contact with an object or at temperatures in excess of 194 °F (90 °C) or below -40 °F (-40 °C).

OSHA 1910.184 (i) Synthetic Web Slings
[§1910.184(i)(7)]
Safe operating temperatures. Synthetic web slings polyester and nylon shall not be used at temperatures in excess of 180 °F. Polypropylene web slings shall not be used at temperatures in excess of 200 °F.

OSHA 1926.251 (e) Synthetic Webbing
[§1926.251(e)(7)]
Safe operating temperatures. Synthetic web slings polyester and nylon shall not be used at temperatures in excess of 180 °F. (82.2 °C) Polypropylene web slings shall not be used at temperatures in excess of 200 °F (93.33 °C).

POLYESTER ROUNDSLINGS

ASME B30.9-6.8: Effects of Environment
9-6.8.1 Temperature
(a) Polyester roundslings shall not be used in contact with objects or at temperatures above 194 °F (90 °C) or below -40 °F (-40 °C).

(b) Some synthetic yarns do not retain their published breaking strength above 140 °F (60 °C). The roundsling manufacturer should be consulted for the temperature range of roundslings made from other synthetic yarns.

WSTDA-RS-1 4.9 Environmental Considerations
4.9.5
Roundslings containing polyester load bearing yarn shall not be used at temperatures in excess of 194 °F (90 °C), or at temperatures below minus 40 °F (-40 °C)

NOTES