



Rigging Hardware

Sling Tension & Load Angles

HORIZONTAL SLING ANGLES OF LESS THAN 30 DEGREES ARE NOT RECOMMENDED. REFER TO ANSI B30.9 FOR FULL INFORMATION.

LOAD ANGLE FACTORS

HORIZONTAL SLING ANGLE (A) DEGREE	LOAD ANGLE FACTOR = L/H
90	1.000
60	1.155
50	1.305
45	1.414
30	2.000

LOAD ON EACH LEG OF SLING = VERTICAL SHARE OF LOAD X LOAD ANGLE FACTOR

SLING TENSION

LOAD ON SLING (S1 + S2)
TENSION 1 = LOAD X D2 X S1 / (H(D1 + D2))
TENSION 2 = LOAD X D1 X S2 / (H(D1 + D2))

LOAD ON SLING (S1 + S2)
TENSION 1 = LOAD X D2 X S1 / (H(D1 + D2))
TENSION 2 = LOAD X D1 X S2 / (H(D1 + D2))

Slings – Load Factors

Effect of Angle Chart

Tension Factor (TF)	Angle From Horizontal	Reduction Factor (RF)
1.000	90°	1.000
1.155	60°	0.866
1.414	45°	0.707
2.000	30°	0.500

BASKET HITCH

ANGLE (A)	CAPACITY % OF SINGLE LEG
90	200%
60	170%
45	140%
30	100%

CHOKER HITCH

A CHOKER HITCH HAS 75% OF THE CAPACITY OF A SINGLE LEG WHEN THE CORNERS ARE PROTECTED AND THE ANGLE OF THE CHOKER IS GREATER THAN 120°

Center of Gravity/Weight of Material

CENTER OF GRAVITY AND SLING LOADING

WHEN LIFTING VERTICALLY, THE LOAD WILL BE SHARED EQUALLY IF THE CENTER OF GRAVITY IS PLACED EQUALLY BETWEEN THE PICK POINTS.

IF THE WEIGHT OF THE LOAD IS 10,000 LBS, THEN EACH SLING WILL HAVE A LOAD OF 5,000 LBS. AND EACH SHACKLE AND EYEBOLT WILL ALSO HAVE A LOAD OF 5,000 LBS.

WEIGHT = VOLUME X UNIT WEIGHT OF MATERIAL

UNIT WEIGHT STEEL = 490 LBS/FT³
UNIT WEIGHT ALUMINUM = 165 LBS/FT³
UNIT WEIGHT REINFORCED CONCRETE = 150 LBS/FT³
UNIT WEIGHT WOOD (FR-WET) = 50 LBS/FT³
UNIT WEIGHT WATER = 62 LBS/FT³
UNIT WEIGHT WET SAND AND GRAVEL = 120 LBS/FT³

CENTER OF GRAVITY AND SLING LOADING

WHEN THE CENTER OF GRAVITY IS NOT EQUALLY SPACED BETWEEN THE PICK POINTS, THE SLING AND FITTINGS WILL NOT CARRY AN EQUAL SHARE OF THE LOAD. THE SLING CLOSEST TO THE CENTER OF GRAVITY WILL CARRY THE GREATEST SHARE OF THE LOAD.

WEIGHT = VOLUME X UNIT WEIGHT OF MATERIAL

VOLUME OF SPHERE = $V = (4/3) \times 3.14 \times r^3$
VOLUME OF CYLINDER = $V = 3.14 \times r^2 \times H$

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Rigging Hardware

Level & Incline Planes

LEGEND

W – Weight of load F – Force required to move load R – Run, horizontal distance in feet
CF – Coefficient of friction H – Height in feet L – Length of ramp in feet

Level: $CF \times W \times F = F$

Uphill: $[CF \times W \times (R/L)] + [(H/L) \times W] = F$

Downhill: $[CF \times W \times (R/L)] - [(H/L) \times W] = F$

COEFFICIENTS OF FRICTION

Load on	Value	Material	Value	Material	Value
Load on air	≤0.01	Cast Iron on Steel	0.25	Wood on Concrete	0.45
Load on wheels	0.05	Wood on Metal	0.30	Wood on Wood	0.50
Steel on Steel	0.10	Leather on Metal	0.40	Metal on Concrete	0.60
Continuous Lubricated Surface	0.15	Manila Rope on Wood	0.40	Concrete on Concrete	0.65

Links/Turnbuckles

LINKS AND RINGS WITH GRADE 80 ALLOY STEEL CHAIN MATERIAL

WLL (tons)	P-6830 Diameter	P-6820 Diameter
1.5	31.1"	32.7"
2.5	32.7"	34.3"
3.5	34.3"	35.9"
4.5	35.9"	37.5"
5.5	37.5"	39.1"
6.5	39.1"	40.7"
8.2	40.7"	42.3"
8.5	42.3"	43.9"
10	43.9"	45.5"
10.6	45.5"	47.1"
12.8	47.1"	48.7"
13	48.7"	50.3"
15.5	50.3"	51.9"
17	51.9"	53.5"
20	53.5"	55.1"
25	55.1"	56.7"
27	56.7"	58.3"
30	58.3"	59.9"
37	59.9"	61.5"
40	61.5"	63.1"
50	63.1"	64.7"
60	64.7"	66.3"
63	66.3"	67.9"
80	67.9"	69.5"
100	69.5"	71.1"
125	71.1"	72.7"

TURNBUCKLES

SIZE	WLL EYE AND EYE (tons) S/1 DESIGN FACTOR	WLL HOOK AND HOOK (tons) S/1 DESIGN FACTOR
3/8	.54	.54
1/2	1	.68
5/8	1.59	1.02
3/4	2.36	1.36
7/8	3.27	1.81
1	4.54	2.27
1-1/4	6.9	2.95
1-1/2	9.71	3.4
1-3/4	12.7	-
2-1/2	27.2	-
2-3/4	34	-

Shackles/Hooks

SHACKLES

DIAMETER OF BOW (INCHES)	WORKING LOAD LIMIT (TONS)	INSIDE WIDTH AT PIN (INCHES)	DIAMETER OF PIN (INCHES)
1/2	2	7/8	5/8
5/8	3.25	1-1/16	3/4
3/4	4.75	1-7/32	7/8
7/8	6.5	1-13/32	1
1	8.5	1-11/16	1-1/8
1-1/8	9.5	1-27/32	1-1/4
1-1/4	12	2	1-3/8
1-3/8	13.5	2-1/4	1-1/2
1-1/2	17	2-3/8	1-5/8
1-3/4	25	2-29/32	2
2	35	3-9/32	2-1/4
2-1/4	42.5	3-3/4	2-9/16
2-1/2	55	4-1/8	2-3/4
3"	85	5	3-1/4

HOOKS

DIAMETER OF BOW (INCHES)	WLL (TONS) CARBON STEEL, GRADE 4	WLL (TONS) ALLOY STEEL, GRADE 8	HEADROOM LENGTH (IN) a	OPENING WIDTH (IN) d	WEIGHT (LBS)
0.8	1.25	3.22	0.787	0.59	
1	1.6	3.66	0.866	0.88	
1.6	2.5	4.05	0.905	1.21	
2	3.2	4.72	1.06	1.82	
3.2	5.4	5.78	1.37	4.18	
5	8.2	7.36	1.69	7.71	
7.5	12.8	9.05	2.08	15.21	
10	16	10.07	2.28	23.14	
15	22	12.51	3.07	38.58	

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Product Information Supplied Courtesy of VAN BEEST

