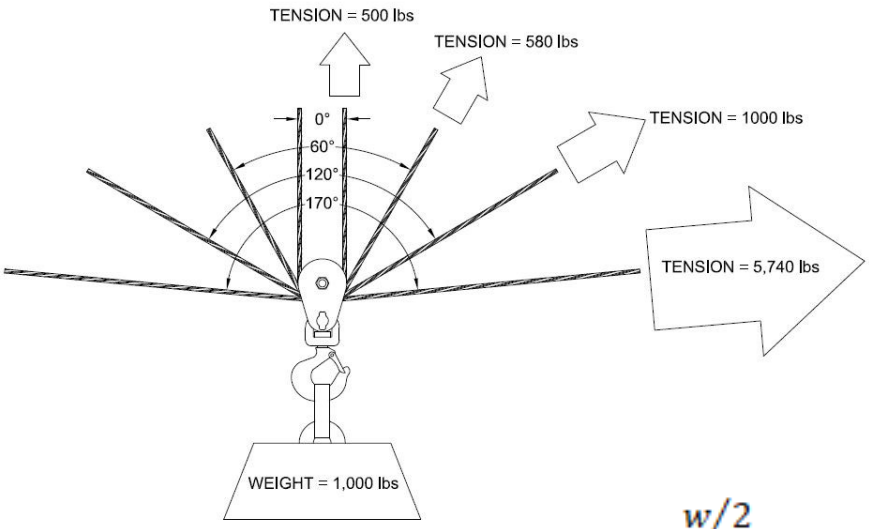
FIELD REFERENCE — RIGGING FOR TRAIL WORK

US Forest Service Rigging Curriculum

LINE LOADING

Calculate the tension in a fixed line based on the weight of the load, and the angle between the line legs



$$T = \frac{w/2}{\cos\left(\frac{\alpha}{2}\right)}$$

or

$$T = w \times \lambda$$

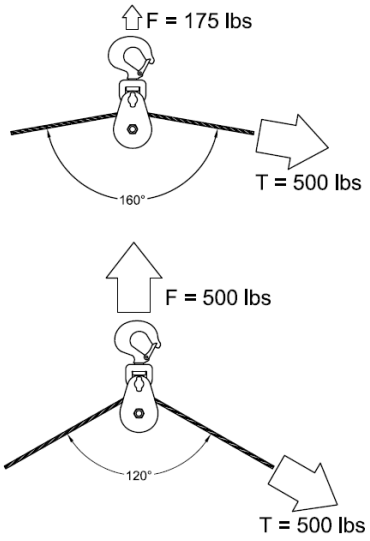
$T = Line\ Tension$
$w = weight$
$\alpha = angle\ between\ lines$
$\lambda = line\ factor$

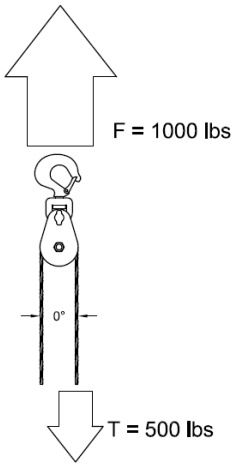
Leg Angle α	Line Factor λ
0°	0.50
20°	0.51
40°	0.53
60°	0.58
80°	0.65
90°	0.71
100°	0.78
110°	0.87
120°	1.0

Leg Angle α	Line Factor λ
130°	1.18
140°	1.46
150°	1.93
160°	2.88
165°	3.83
170°	5.74
175°	11.46
180°	∞ (undefined)

BLOCK LOADING

Calculate the force on a block, based on the line tension and angle between the line-legs





$$F = T \times \beta$$

or

$$F = 2T \times \cos\left(\frac{\alpha}{2}\right)$$

$T = Line\ Tension$
$\alpha = angle\ between\ lines$
$F = Force\ on\ Block$
$\beta = Block\ Factor$

Leg Angle α	Block Factor β
0°	2.00
20°	1.97
40°	1.87
60°	1.73
70°	1.64
80°	1.53
90°	1.41
100°	1.29

Leg Angle α	Block Factor β
110°	1.15
120°	1.00
130°	0.84
140°	0.68
150°	0.52
160°	0.35
170°	0.17
180°	0.0

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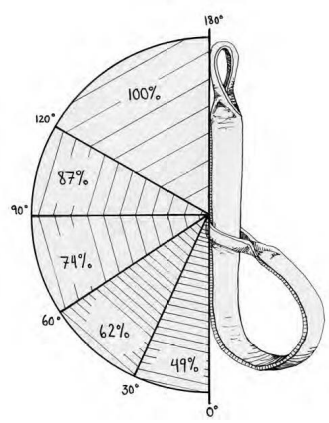
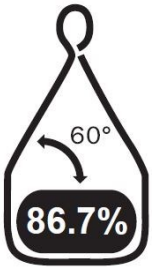
US Forest Service Rigging Curriculum

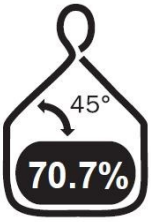
CHOKER HITCH REDUCTIONS

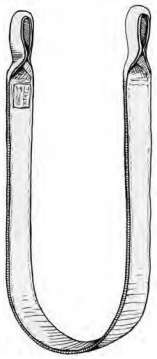


Leg Angle	Rated Capacity %
180° - 120°	100%
120° - 90°	87%
90° - 60°	74%
60° - 30°	62%
30° - 0°	49%

BASKET HITCH REDUCTIONS







Leg Angle	Rated Capaci-
90°	100%*
80°	98.5%
70°	94%
60°	86.7%
50°	76.6%
40°	64.3%
30°	50%

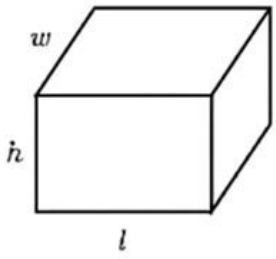
**per OSHA Standard 1910.184, leg angles 85° or less may be considered to be full strength.*

MATERIAL WEIGHTS

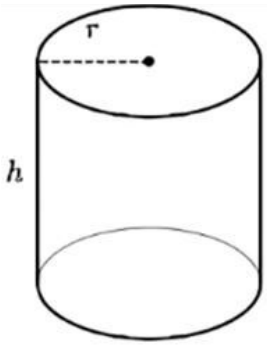
Material	Weight (lbs / cubic ft.)
Granite (Solid)	170 lbs
Sandstone (Solid)	145 lbs
Gravel (1/4– 2 inches, Dry)	105 lbs
Soil (Loam, Dry)	78 lbs
Soil (Loam, Wet)	90 lbs
Sand (Dry)	100 lbs
Sand (Wet)	130 lbs

Green Log Weight	Weight (lbs)	Weight of a 1 ft. section, based on average diameter (lbs)			
Species	**Cubic Foot**	**10”**	**16”**	**20”**	**24”**
Western Red Cedar	28 lbs	15 lbs	39 lbs	61 lbs	88 lbs
Ponderosa Pine	46 lbs	25 lbs	64 lbs	100 lbs	144 lbs
White Oak	62 lbs	34 lbs	88 lbs	137 lbs	198 lbs
Yellow Poplar	38 lbs	21 lbs	53 lbs	83 lbs	119 lbs

VOLUME



$$V = l \cdot w \cdot h$$



$$V = \pi r^2 h$$

1 cubic yard = 27 cubic feet

5 gallon bucket = 0.67 cubic feet