RIGCHECK · NCCCO RIGGER AND SIGNALPERSON

The Ultimate Sling Angle & Hitch Cheat Sheet

Tape this to the inside of the gang box lid.

1 Hitch Type Factors

Share of the sling's vertical rating kept by each hitch, before any angle effect is applied.

HITCH	SHARE OF VERTICAL RATING
Vertical	100%
Choker (choke angle 120° or wider)	75%
Basket, legs vertical	200%
Basket, legs at 60°	173%
Basket, legs at 45°	141%
Basket, legs at 30°	100%

Source: Standard rigging practice

2 Choker Angle Derating

Applied on top of the 75% choker factor once the choke closes tighter than 120 degrees.

CHOKE ANGLE	SHARE OF CHOKER RATING
120° to 180°	100%
90° to 119°	87%
60° to 89°	74%
30° to 59°	62%
Under 30°	49%

Source: Standard rigging practice

3 Load Angle Factors

Multiply each leg's plain share by this factor. It is 1 divided by the sine of the angle, and it is the same number as sling length divided by vertical height.

SLING ANGLE	INCLUDED ANGLE	LOAD ANGLE FACTOR
90°	0°	1.000
85°	10°	1.004
80°	20°	1.015
75°	30°	1.035
70°	40°	1.064
65°	50°	1.103
60°	60°	1.155
55°	70°	1.221
50°	80°	1.305
45°	90°	1.414
40°	100°	1.556
35°	110°	1.743
30°	120°	2.000
25°	130°	2.366
20°	140°	2.924
15°	150°	3.864
10°	160°	5.759

Source: Trigonometry

4 Wire Rope Efficiency Over a Bend (D/d)

D is the diameter of the pin or bar the rope bends around; d is the rope diameter. A sharper bend costs capacity that a bigger pin or a softener buys straight back.

D/D RATIO	EFFICIENCY
1 : 1	50%
2 : 1	65%
3 : 1	70%
4 : 1	75%
5 : 1	77%
6 : 1	79%
8 : 1	83%
10 : 1	86%
15 : 1	89%
20 : 1	91%
25 : 1	92%
30 : 1	93%
40 : 1	95%

Source: Wire Rope Technical Board efficiency curve

5 Conversions a Rigger Needs

The ones that turn up in exam questions and on job sites.

FROM	EQUALS
1 US ton	2,000 lb
1 metric tonne	2,205 lb
1 long ton	2,240 lb
1 kilogram	2.205 lb
1 metre	3.281 ft
1 cubic yard	27 cubic feet
1 cubic foot	1,728 cubic inches
1 foot	12 inches
Wind pressure	0.00256 x $(mph)^2$ lb/ft^2

Source: Standard conversions

Doing this by hand on site?

- Sling tension for one to four legs, with only the legs that really carry counted
- Hitch, choke and D/d derates applied in the right order, with the working shown
- Load weight from shape and material when nothing is marked
- 450 rigger and signalperson practice questions, free in your browser, and it works offline once opened

xernaitech.com/rigcheck

A study and field aid. Check every figure against the sling tag, the hardware maker's chart and the crane's own load chart before you rely on it.