

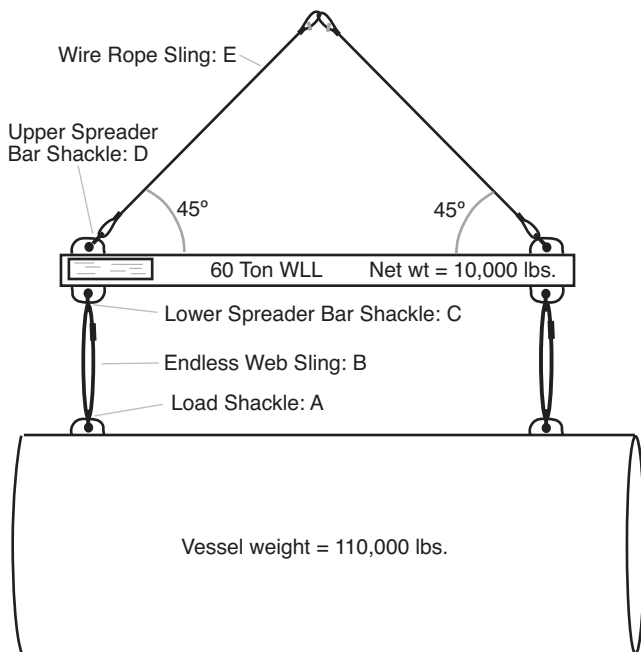


# TOOLBOX TALKS

ITI salutes National Safety Week with this informative series on Crane & Rigging Safety

## Rigging Selection

Rig from the bottom up. Select the correct rigging for the load below using the Master Rigger's Reference Card panels at the right.



1. Determine the approximate load per pick point.
2. Calculate the approximate tension per sling leg.
3. Identify the minimum rigging needed for A, B, C, D and E.

### Master Rigger's Reference Card

#### Angles / Ratios / Factors / Formulas / Data

Angle from horizontal	Sling length to height ratio Length : Height : Run	% of grade $\frac{R}{H} \times 100$	Sling Load Factor [r*] $\frac{L}{H} \times \frac{H}{L}$	Full Included Angle**	Block Load Factor [FIA**]	Angle from Ceiling
90	1.000 : 1 : 0.000	∞	1.00	0	2.00	90
85	1.004 : 1 : 0.090	1111.1	1.10	10	1.99	85
80	1.015 : 1 : 0.174	574.7	1.10	20	1.97	80
75	1.035 : 1 : 0.269	371.7	1.10	30	1.93	75
70	1.064 : 1 : 0.363	275.5	1.10	40	1.87	70
65	1.104 : 1 : 0.467	214.1	1.20	50	1.81	65
60	1.155 : 1 : 0.578	173.0	1.20	60	1.73	60
55	1.221 : 1 : 0.701	142.7	1.30	70	1.64	55
50	1.305 : 1 : 0.838	119.1	1.40	80	1.53	50
45	1.414 : 1 : 1.000	100.0	1.50	90	1.41	45
40	1.555 : 1 : 1.191	83.9	1.60	100	1.29	40
35	1.742 : 1 : 1.426	70.1	1.80	110	1.15	35
30	2.000 : 1 : 1.732	57.7	2.00	120	1.00	30
25	2.364 : 1 : 2.142	46.7	3.00	130	.84	25
20	2.924 : 1 : 2.748	36.4	3.00	140	.68	20
15	3.861 : 1 : 3.729	26.8	4.00	150	.52	15
10	5.747 : 1 : 5.659	17.1	6.00	160	.35	10
5	11.490 : 1 : 11.446	8.7	12.00	170	.17	5
0	∞ : 0 : ∞	0.0	∞	180	0	0

<b>A</b>  $A^2 + B^2 = C^2$ $C^2 - A^2 = B^2$ $C^2 - B^2 = A^2$	<b>B</b> $d$ = diameter • $r$ = radius • $L$ = length • $H$ = height • $W$ = width $\infty$ = infinity • $\pi$ or $Pi = 3.1416$ ( $3.2r^*$ ) • Circumference = $\pi d$ $r^*$ = rounded • Area of a circle = $\pi r^2$ or ( $d^2 \times .8$ ) • Volume = $LWH$ Area of a square = $LW$ • Area of triangle = $LW/2$ • Area of circle, when diameter is doubled it will quadruple the area • Fahrenheit to Celsius $^{\circ}C = 5/9(^{\circ}F - 32)$ , Celsius to Fahrenheit $^{\circ}F = (^{\circ}C \times 9/5) + 32$ • Wt. est. = Vol. in cu.ft. x 500 x density factor .02, .05, .10, .20, .30, etc.	<b>C</b> 1 mile = 5,280 ft., 1,760 yds, 1.61 km / 1 kilometer = .62 mile, 3,281 ft 1 yard = 3 ft, 36 inches, .91 meter / 1 meter = 1.09 yds, 3.28 ft, 39.37 in. 1 ton (short) = .891 long ton, .91 metric ton, 2,000 pounds, 907 kgs 1 ton (metric) = 1.1 short ton, .98 long ton, 2,204 lbs, 1000 kgs 1 pound = 16 ounces, .45 kg, / 1 kg = 1000 grams, 35 ozs, 2.2 lbs 1 gallon(US liq) = 4 qts, 3.8 liters / 1 liter = .264 gallon (US), 1.06 qts
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### Steel Beam & Rigging Gear Capacities

Point load of steel beam			In-line Tension Capacity Chart				
Wide flange beams (W"xI")	[Yield Stress (Fy) 36KSI]		Tension in pounds	Wire Rope Slings 6x19 IPS IWRC	Web Slings Flat Endless	Chain Slings Alloy G-8	Shackles Carbon Steel
	10' span	20' span					
4x4	2,500	500	2,000	3/8	1-901	7/32	3/8
6x4	1,100	200	8,000	3/4	1-903	1/2	3/4
8x8	13,700	3,800	16,000	1	2-903	5/8	1
10x4	1,200	200	24,000	1-1/4	3-903	3/4	1-1/4
10x10	20,400	10,200	34,000	1-1/2	4-904	7/8	1-1/2
12x8	21,100	5,800	45,000	1-3/4	3-906	1	1-3/4
12x12	28,400	17,600	60,000	2	3-908	1-1/4	2
14x8	25,000	6,300	72,000	2-1/4	3-910	1-1/4	2-1/2
14x10	31,300	14,300	86,000	2-3/8	4-910	—	2-1/2
16x10	38,700	16,300	100,000	2-5/8	4-912	—	2-1/2

The above capacities are based on a design factor of 4 and for estimation only. Verify with engineer before using in-plant beam for rigging point.

The above capacities, sling descriptions and choices are for estimating purposes only. Always confirm the actual ratings of rigging equipment prior to making any lift.

Anticipated Tension

Rigging Selection

- |    |          |           |
|----|----------|-----------|
| A. | _____ lb | _____ in. |
| B. | _____ lb | EN _____  |
| C. | _____ lb | _____ in. |
| D. | _____ lb | _____ in. |
| E. | _____ lb | _____ in. |



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## Rigging Selection Answers

Anticipated Tension	Rigging Selection
A. <u>55,000</u> lb	<u>2</u> in.
B. <u>55,000</u> lb	EN <u>3-908</u> in.
C. <u>55,000</u> lb	<u>2</u> in.
D. <u>84,600</u> lb	<u>2 1/2</u> in.
E. <u>84,600</u> lb	<u>2 3/8</u> in.



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Mike holds 34 years of progressive experience in wire rope, rigging, and crane operations in various industries including mining, maritime, electric utility, pulp and paper, manufacturing, nuclear, oil & gas, and construction. He has developed innovative training techniques, resource materials, workbooks, videos and reference cards which are widely used in the rigging industry today. Through ITI Field Services, Mike and his team provide consulting, accident investigation, and expert witness services.



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