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From: Carl Henning (CLCP), Safety Coordinator, STAR Energy Services

Date: July 9, 2018

Re: Lifting and Rigging Capacities

STAR recommends you keep the following critical items in mind when planning a heavy lift:

1. Weight of item to be lifted
2. Capacity of rigging equipment (shackles, spreader bars, hooks)
3. Capacity of slings (nylon, chain, cable)
4. Sling angle when load is applied
5. Attachment surface (sharp edges)
6. Capacity of boom/crane for the radius of where the item will be placed on a (pad, basement, ground sleeve)

Look at the capacity of the lifting device (sling/slings, bridle) and ensure there is plenty of capacity for the item to be lifted. Do you know the loaded sling angle to figure out what the lifting device's capacity will be when the load is applied?

Listed below are just a few comparisons to consider before making your next heavy lift.

Sling angles can be reduced by using longer slings depending on the spacing of the attachment points. The further the attachment points are apart from each other, the longer the slings will need to be to keep from lowering the loaded sling angles and reducing the capacity to a point that the lifting device may now become overloaded.

On the average a 300 kVA pad mount transformer weighs approximately 3700 lbs and a 500 kVA weighs approximately 5500 lbs.

Assuming that the transformer has four lifting attachments you could use four 7/32" grade 80 steel alloy chain slings with each chain sling having a lifting capacity of 2100 lbs. A rigger could look at the capacity rating and multiply that by four and think they have a capacity of 8400 lbs. That would only be true in a total vertical lift with no loaded sling angle reduction.

Now take the four 7/32" grade 80 steel alloy chain slings and use them in a four-legged bridle configuration. Being used in a bridle configuration guarantees some loaded sling angle capacity reduction. By using the Rigger's Capacity Card, the 8400 lbs sling capacity is greatly reduced based on loaded sling angle to a point where the four-legged bridle would only have enough capacity to lift the 500 kVA when used on nothing less than 60 degrees loaded sling angle. Any angles less than 60 degrees the 7/32" grade 80 steel alloy chain sling would be overloaded.

Safety Recommendation



When lifting the 500 kVA pad-mount transformer using four-legged bridle at loaded sling angle of 60 degrees, the applied weight of the transformer is 6353 lbs. If you use shorter sling lengths, that will increase you loaded sling angle, take the same 500 kVA transformer and lift it with a four-legged bridle at 45 degrees and the applied weight is 7777 lbs.

Be sure to consult your rigging provider to be assured that you are using the correct rigging to prevent injuries and property/equipment damage. You must know the answer to all the items listed on the top of the page before attempting to make any heavy lifts.

See the charts¹ below for examples of lifting capacity for a typical 500 kVA pad-mount transformer.

Wire Rope Slings • 6 X 19 or 6 X 37 • EIPS • IWRC • MS • Rated Capacity in Pounds

Rope Diameter (Inches)	1 LEG		Basket or 2-Leg	BASKET AND 2 LEG BRIDLE		
	Vertical	Choker		60 degree	45 degree	30 degree
3/8	2800	2200	5800	5000	4000	2800
7/16	3800	2800	7800	6800	5400	3800
1/2	5000	3800	10200	8800	7200	5000
9/16	6400	4800	12800	11000	9000	6400
5/8	7800	5800	15800	13600	11000	7800
3/4	11200	8200	22000	19400	15800	11200
7/8	15200	11200	30000	26000	22000	15200
1	19600	14400	40000	34000	28000	19600
1 1/8	24000	18200	48000	42000	34000	24000
1 1/4	30000	22000	60000	52000	42000	30000
1 3/8	36000	26000	72000	62000	50000	36000
1 1/2	42000	32000	84000	74000	60000	42000
1 5/8	48000	36000	98000	84000	70000	48000
1 3/4	56000	42000	114000	98000	80000	56000

* Rated capacities basket hitch based on D:D ratio of 25.
 * Rated capacities based on pin diameter no larger than natural eye width or less than the nominal sling diameter.
 * Horizontal sling angles less than 30 degrees shall not be used.

Rated Load for One-Ply, Class 5 Synthetic Webbing Slings

Hitch Type Width, in.	Types I, II, III, IV Sling Leg			Two-Leg or Single Basket Horizontal Angle				Type V
	Vertical	Choker	Vertical Basket	Vertical	60 deg	45 deg	30 deg	90° Endless
1	1100	880	2200	2200	1900	1600	1100	2200
1-1/2	1600	1280	3200	3200	2800	2300	1600	3200
1-3/4	1900	1520	3800	3800	3300	2700	1900	3800
2	2200	1760	4400	4400	3800	3100	2200	4400
3	3300	2640	6600	6600	5700	4700	3300	6600
4	4400	3520	8800	8800	7600	6200	4400	8800
5	5500	4400	11000	11000	9500	7800	5500	11000
6	6600	5280	13200	13200	11400	9300	6600	13200

* Horizontal sling angles less than 30 degrees shall not be used.
 * For choker hitch, the angle of choke shall be 120 degrees or greater (see ASME B30.9)

Alloy Steel Chain Slings • Grade 80 • Rated Capacity in Pounds

Chain Size (Inches)	mm	1 LEG			2 LEG		3 LEG AND 4 LEG		
		90 deg	60 deg	45 deg	30 deg	60 deg	45 deg	30 deg	
7/32	5.5	2100	3600	3000	2100	5500	4400	3200	
9/32	7	3500	6100	4900	3500	9100	7400	5200	
5/16	8	4500	7800	6400	4500	11700	9500	6800	
3/8	10	7100	12300	10000	7100	18400	15100	10600	
1/2	13	12000	20800	17000	12000	31200	25500	18000	
5/8	16	18100	31300	25600	18100	47000	38400	27100	
3/4	20	28300	49000	40000	28300	73500	60000	42400	
7/8	22	34200	59200	48400	34200	88900	72500	51300	
1	26	47700	82600	67400	47700	123900	101200	71500	
1 1/4	32	72300	125200	102200	72300	187800	153400	108400	

* Chain slings made with grades of steel other than Grades 80 and 100 alloy steel are not recommended for overhead lifting.
 * Rating of multi-leg slings adjusted for angle of loading between the inclined leg and the horizontal plane of the load.
 * 4 leg sling rating is same as 3 leg sling rating because normal lifting practice may not distribute load uniformly on all four legs.

Rigger's Capacity Card - 2015

¹ Rigger's Capacity Card, 2015, Crane Institute Certification