

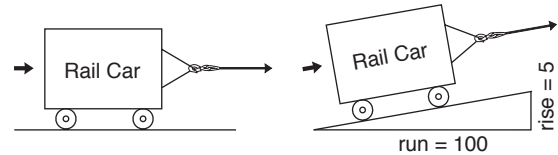
LINE PULL CALCULATIONS RAIL CAR PULLING

Rail Car Pulling Calculations

Calculating Line Pull

Line pull must be calculated by accounting for track curvature, track slope, and ambient temperature. Line pull may be roughly estimated from the tables and diagrams on this page, assuming the track is smooth, clean and in good condition and rail car wheels are well lubricated

We recommend that you have your rail car pulling application carefully reviewed by the factory or a qualified sales person before selecting a winch.



The amount of line pull due to slope is dependent on the percent of slope, calculated as follows:

$$\text{slope as percent} = (\text{rise} \div \text{run}) \times 100$$

$$\text{example: } 5 \div 100 \times 100 = 5\%$$

Line Pull Required Based on Temperature Effect (lb/ton)

ambient temp. below 32° F	ambient temp. above 32° F
21	18

Line pull shown is for each 2000 lb of total gross load weight.

Line Pull Required Based on Curvature and Slope (lb/ton)

Track Curvature			Track Grade						
radius of curve	degree of curve	chordal distance A	percent of rise						
			0%	1%	2%	3%	4%	5%	
0 ft	0°	0 in	0	20	40	60	80	100	
1146 ft	5°	3-1/2 in	5	25	45	65	85	105	
573 ft	10°	6-1/2 in	10	30	50	70	90	110	
388 ft	15°	9-3/4 in	15	35	55	75	95	115	
288 ft	20°	13 in	20	40	60	80	100	120	
231 ft	25°	16-1/2 in	25	45	65	85	105	125	
193 ft	30°	20 in	30	50	70	90	110	130	
166 ft	35°	23-1/5 in	35	55	75	95	115	135	
146 ft	40°	27 in	40	60	80	100	120	140	

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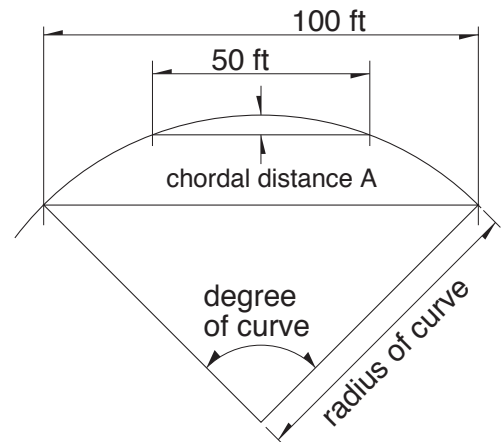
Example: 2 loaded rail cars weighing 120 gross tons each are pulled 800 ft on a track with a curvature of 5° and a slope of 2%. The track is in good clean condition, wheels are well lubricated, and the ambient temperature is frequently below 32° fahrenheit.

From Table 1: line pull required based on temperature effect = 21 lb/ton (factor 1)

From Table 2: line pull required based on curvature and slope = 45 lb/ton (factor 2)

Total Line Pull Calculation (Running Pull):

(gross weight per car) x (number of cars) x (factor 1 + factor 2) = total line pull
 (120 tons) x 2 x (21 lb/ton + 45 lb/ton) = (240 ton) x (66 lb/ton) = 15,840 lb (line pull)
 800 ft of travel puts us at mid drum: 4HS16M mid drum running line pull = 11,000 lb
 This application would require a 4HS26M (mid drum running line pull = 19,000 lb)



Curved sections of track place side forces on the load which must be overcome by the winch. The amount of line pull due to track curvature is dependent on the sharpness of the curve.

