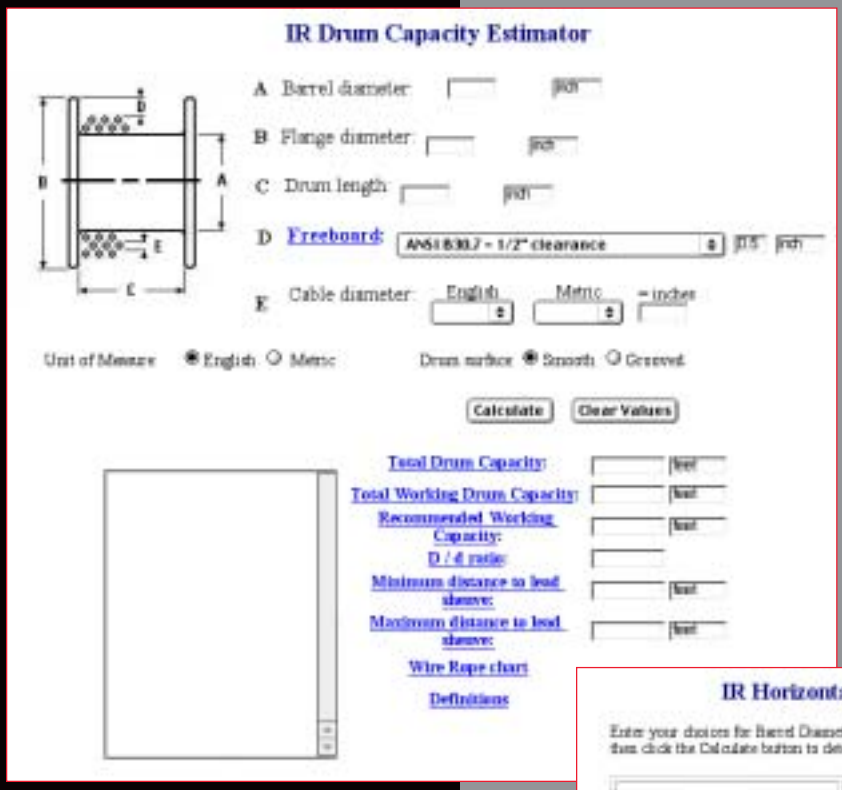
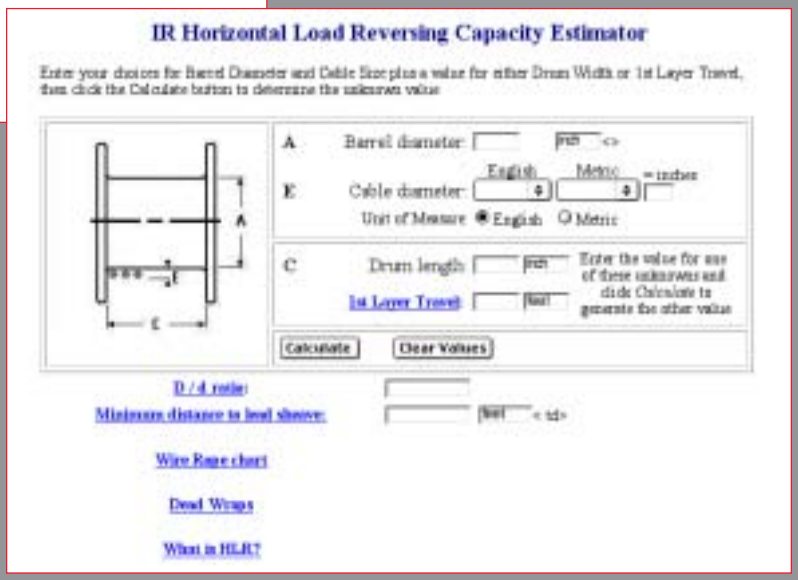
Tech Tips

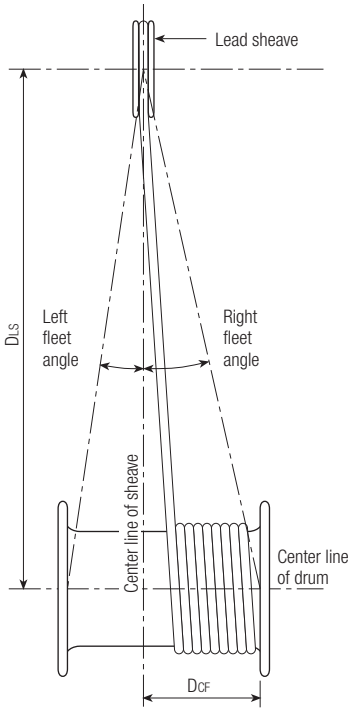
Technical support is an integral part of the Total System Solution philosohpy that IR is dedicated to providing. The following pages contain useful technical information to assist in the selection of high capacity hoists and winches.





For regular updates and additions, please see our website at www.airwinch.com for:

- *Drum Capacity Estimator program:* Plug in your numbers to determine the amount of wire rope a given size drum can hold.
- *Horizontal Load Reversing Capacity Estimator:* Calculates length of drum required to move a load a given distance.
- *Uplinks:* Technical discussions on various topics
- *Winch and hoist options:* Detailed descriptions and benefits of various options for IR hoists and winches
- *Seattle Specials:* Overviews and photos of engineered custom products not found in this catalog



The importance of fleet angle

If a wire rope leads over a sheave and on to a drum, the rope will not remain in alignment with the sheave groove. Instead, it will deviate to either side depending upon the width of the drum and its distance from the fixed sheave, often called the lead sheave. The angle between the center line through the lead sheave and the centerline of the rope leading to the drum is called the fleet angle.

Experience has shown that the best wire rope service is obtained when the maximum fleet angle is not more than 1 ½° for smooth drums, and 2° for grooved drums. Fleet angles of 1 ½° and 2° are the equivalents of approximately 38 feet and 29 feet, respectively, of lead for each foot of drum width either side of the center line of the lead sheave.

Courtesy of Broderick & Bascom Rope Co.

Based on the above information, the correct distance (D_{LS}) a lead sheave should be located from the winch drum may be derived by using the following formula:

D_{LS} for 1 ½° fleet angle = D_{CF} (in feet) x 38 D_{LS} for 2° fleet angle = D_{CF} (in feet) x 29

Example: For a winch with a smooth drum thus requiring a 1 ½° fleet angle:

If D_{CF} = 20 inches (1.66 ft) then D_{LS} = 1.66 x 38 = approximately 63 feet, the distance that the lead sheave should be positioned away from the drum.

Determining stall and line pull

Air pressure psi	Air pressure bar	Stall factor	Rope speed factor
60	4.2	0.67	0.58
70	4.9	0.78	0.72
80	5.6	0.89	0.86
90	6.3	1.00	1.00
100	7.0	1.11	1.14

To obtain performances of the winches in this catalog at operating pressures other than 90 psi, select the load or speed rating required from the applicable curve and multiply that value by the factor corresponding to the operating pressure from the table.

Example: Model BU7A with 1000 lbs (455 kg) line pull, 70 psi (4.9 bar), drum half full. Determine speed.

From performance curve at 90 psi (6.3 bar): 22 fpm (6.7 m/min) x 0.72 (rope speed factor from chart above) = 16 fpm (4.9 m/min)

Wire rope selection

Rope size		Breaking strength		Weight		Rec'd safe working loads 3.5:1		Rec'd safe working loads 5.:1	
in.	mm	lbs	kg	lbs/ft	kg/m	lbs	kg	lbs	kg
¼	6	6800	3091	0.12	.17	1943	883	1360	618
5⁄16	8	10540	4791	0.18	.27	3011	1369	2108	958
⅜	9	15100	6864	0.26	.39	4314	1961	3020	1373
7⁄16	12	20400	9273	0.35	.52	5829	2649	4080	1855
½	13	26600	12091	0.46	.69	7600	3455	5320	2418
⅝	15	41200	18727	0.72	1.07	11771	5351	8240	3745
¾	19	58800	26727	1.04	1.55	16800	7636	11760	5345
⅞	22	79600	36182	1.42	2.12	22743	10338	15920	7236
1	25	103400	47000	1.85	2.76	29543	13429	20680	9400
1⅛	28	130000	59091	2.34	3.49	37143	16883	26000	11818
1¼	28	159800	72636	2.89	4.31	45657	20753	31960	14527
1⅜	28	192000	87273	3.50	5.22	54857	24935	38400	17455

Ingersoll-Rand recommends that either 6 x 19 or 6 x 37 Extra Improved Plow Steel (EIPS) with independent wire rope core (IWRC) be used. This is a higher strength rope than Improved Plow Steel (IPS) offering, on average, approximately a 15% increase in breaking strength. We recommend it, as it is readily available and offers better value overall.

Spark and corrosion resistant equipment: The S•COR•E series product line is intended to provide improved levels of corrosion and spark-resistant protection for manual, pneumatic and electric powered hoists and trolleys, with capacities available from 1/2 to 50 tons.

The S•COR•E series of options provides for improved protection, durability and performance for hoist operations in corrosive or harsh environments.

It is generally accepted that rusty, and/or corroded steel is more likely to generate sparks than if free from corrosion or rust. Therefore, any improvement in corrosion or rust-resistance results in improved spark-resistance.

A spark of sufficient heat to ignite the surrounding atmosphere generally is unlikely in mechanical hoisting equipment, but it may potentially be generated by friction during operation or unintentional impact of a hoist or trolley with other metal components. In order to provide the user with corrosion and spark-resistance protection,

IR offers different levels of protection from which you can select to fit your particular needs.

The user is cautioned to check carefully the local and/or national standards, codes, etc. which may affect the selection and use of equipment in the intended environment.

Nickel diffused load chain(1) – designed specifically for corrosive and potentially harsh environments.

The manufacturer of the nickel-diffused chain advises us that compared with steel, stainless steel, alloy steel, and copper steel, (under like test conditions) ND chain produced fewer sparks. ND chain is our selection for use on S•COR•E products in the sizes available versus stainless steel, because the ND chain does not lose strength during the nickel-diffusing process. Additionally, the ND chain has a harder surface and greater corrosion and flaking resistance than the softer chains.

Eventually, both ND chain and most stainless steel chains will have corrosion and, perhaps, some rust. The user should therefore regularly examine the load chain for the appearance of corrosion and rust, which indicates the termination of its spark resistant life, and the chain should be replaced immediately.

Copper plating, zinc plating, solid bronze

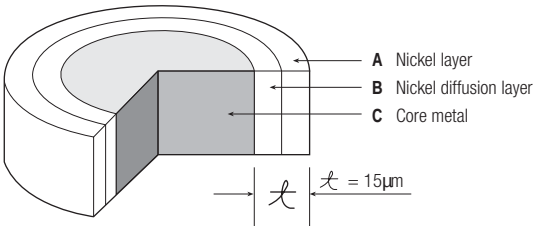
Various institutes and standards organizations have studied the corrosion and spark-resistant nature of metals. Most manufacturers, including IR, will offer products that are resistant to corrosion and sparking, but are not to be considered spark-proof. This is essentially because most metals, including zinc, bronze, and stainless steel, will spark from the application of sufficient striking force and energy.

S•COR•E series products use plated or solid, non-ferrous metals to provide "spark-resistance" by reducing the likelihood of corrosion and sparking, and also the temperature of the spark, if one should occur.

Ultimately, the selection of the correct corrosion and spark-resistant features is the responsibility of the customer.

Plated and "solid bronze" hoist and trolley components

Third party research provides overwhelming evidence that non-ferrous metals and substances offer excellent anti-sparking characteristics. Their use meets or exceeds all known requirements for protection against spark generation in a hydrocarbon environment.



Nickel diffused load chain

Please note; National Electric Code [NEC] and the National Electrical Manufacturers Association [NEMA] have established classes and divisions of hazardous environments for electrical components and equipment. The NEC and NEMA standards do not apply to the mechanical properties of equipment that electric motors may be mounted on.)

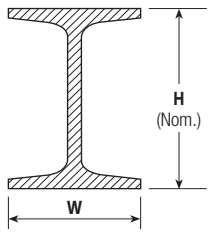
Warning: Before installation see maintenance and operations manual for additional warnings and precautions. This equipment is not to be used for lifting, supporting or transporting people, or lifting or supporting loads over people.

(1) Nickel diffused load chain is only available on Ingersoll-Rand manual chain hoist products.

The following table shows the standard size (H dimension), flange widths (W dimensions) and weights for both American Standard I-beams and Wide Flange H-beams. I-beams designated with an asterisk (*) denote New Series applications which conform to ASTM A6 standards, effective September 1, 1978.

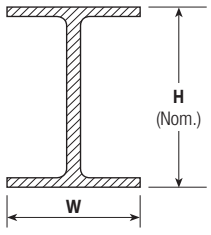
Wide Flange									American Standard		
H in.	W in.	Weight per ft/lbs	H in.	W in.	Weight per ft/lbs	H in.	W in.	Weight per ft/lbs	H in.	W in.	Weight per ft/lbs
6	3.940	8.5	10	10.117	66.0	16*	6.985	36	4	2.663	7.7
6*	4.0	9.0	10*	10.130	68.0	16	7.0	40	4	2.796	9.5
6	4.0	12.0	10	10.170	72.0	16*	6.995	40	5	3.004	10.0
6*	4.0	12.0	10	10.190	77.0	16	7.039	45	5	3.284	14.75
6	4.030	16.0	10*	10.190	77.0	16*	7.035	45	6	3.332	12.5
6*	4.030	16.0	10*	10.625	88.0	16	7.073	50	6	3.565	17.25
6*	5.990	15.0	10	10.275	89.0	16*	7.070	50	7	3.662	15.3
6	5.995	15.5	10	10.340	100.0	16*	7.120	57	7	3.860	20.0
6	6.020	20.0	10*	10.340	100.0	16	8.464	58	8	4.001	18.4
6*	6.018	20.0	10	10.415	112.0	16*	10.235	67	8	4.171	23.0
6	6.080	25.0	10*	10.415	112.0	16*	10.295	77	10	4.661	25.4
6*	6.080	25.0	12	3.968	14.0	16*	10.365	89	10	4.944	35.0
8	3.940	10.0	12*	3.970	14.0	16*	10.425	100	12	5.0	31.8
8*	3.940	10.0	12*	3.990	16.0	16	11.502	88	12	5.078	35.0
8	4.0	13.0	12	4.0	16.5	16	11.5	96	12	5.252	40.8
8*	4.0	13.0	12	4.005	19.0	18	6.0	35	12	5.477	50.0
8	4.015	15.0	12*	4.007	19.0	18*	6.0	35	15	5.501	42.9
8*	4.015	15.0	12	4.030	22.0	18	6.015	40	15	5.640	50.0
8	5.250	17.0	12*	4.030	22.0	18*	6.015	40	18	6.001	54.7
8*	5.250	18.0	12*	6.490	26.0	18*	6.060	46	18	6.251	70.0
8	5.268	20.0	12	6.497	27.0	18	7.477	45	20	6.25	65.4
8*	5.270	21.0	12*	6.520	30.0	18	7.5	50	20	6.385	75.0
8	6.495	24.0	12	6.525	31.0	18*	7.5	50	20	7.060	86.0
8*	6.5	24.0	12*	6.560	35.0	18	7.532	55	20	7.200	96.0
8	6.535	28.0	12	6.565	36.0	18*	7.530	55	24	7.001	79.9
8*	6.535	28.0	12	8.0	40.0	18	7.558	60	24	7.125	90.0
8	7.995	31.0	12*	8.005	40.0	18*	7.555	60	24	7.245	100.0
8*	7.995	31.0	12	8.042	45.0	18*	7.635	71	24	7.875	105.9
8	8.020	35.0	12*	8.045	45.0	18	8.715	64	24	8.050	121.0
8*	8.020	35.0	12	8.077	50.0	18	8.75	70			
8	8.070	40.0	12*	8.080	50.0	18	8.787	77			
8*	8.070	40.0	12	10.0	53.0	18*	11.035	76			
8	8.110	48.0	12*	9.995	53.0	18*	11.090	86			
8*	8.110	48.0	12	10.014	58.0	18*	11.145	97			
8	8.220	58.0	12*	10.010	58.0	18*	11.200	106			
8*	8.220	58.0	14	5.0	22.0	18*	11.265	119			
8	8.280	67.0	14*	5.0	22.0	18	11.75	96			
8*	8.280	67.0	14	5.025	26.0	21	6.5	44			
10	3.950	11.5	14*	5.025	26.0	21*	6.5	44			
10*	3.960	12.0	14	6.730	30.0	21*	6.530	50			
10	4.0	15.0	14*	6.730	30.0	21*	6.555	57			
10*	4.0	15.0	14	6.75	34.0	21	8.215	55			
10	4.010	17.0	14*	6.745	34.0	21	8.240	62			
10*	4.010	17.0	14	6.770	38.0	21*	8.240	62			
10	4.020	19.0	14*	6.770	38.0	21	8.270	68			
10*	4.020	19.0	14	8.0	43.0	21*	8.270	68			
10	5.75	21.0	14*	7.995	43.0	21	8.295	73			
10*	5.75	22.0	14	8.031	48.0	21*	8.295	73			
10	5.762	25.0	14*	8.030	48.0	21*	8.355	83			
10*	5.770	26.0	14	8.062	53.0	21*	8.420	93			
10	5.799	29.0	14*	8.060	53.0	21	8.962	82			
10*	5.810	30.0	14	10.0	61.0	24	7.005	55			
10	7.960	33.0	14*	9.995	61.0	24*	7.005	55			
10*	7.960	33.0	14	10.035	68.0	24*	7.040	62			
10	7.985	39.0	14	10.035	68.0	24	8.961	68			
10*	7.985	39.0	14	10.072	74.0	24*	8.965	68			
10	8.020	45.0	14*	10.070	74.0	24	8.965	76			
10*	8.020	45.0	14	12.0	78.0	24*	8.990	76			
10	10.0	49.0	14	14.5	87.0	24	9.015	84			
10*	10.0	49.0	14*	10.130	82.0	24*	9.020	84			
10	10.030	54.0	16	5.5	26.0	24	9.065	94			
10*	10.030	54.0	16	5.525	31.0	24*	9.065	94			
10	10.080	60.0	16*	5.525	31.0	–	–	–			
10*	10.080	60.0	16	6.692	36.0	–	–	–			

American Standard



Tapered "I " Beam

Wide Flange



Flat "H" Beam

Explanation of metric units

The kilogram (kg) is a unit of mass. Mass is the property of matter which determines its inertia. The mass of a body never varies and is independent of gravitational force.

The newton (N) is a unit of force. The first law of motion, force is equal to mass times acceleration, defines the newton in terms of base units. 1 N = 1 kg • m/s^2

The joule (J) is a unit of energy and is the work done when a force of one newton is displaced a distance of one meter in the direction of the force. 1 J = N • m

The watt (W) is a unit of power which produces energy at the rate of one joule per second. 1 W = J/s

The pascal (Pa) is a unit for pressure or stress of one newton per square meter. 1 Pa = 1 N/m^2

The kelvin (K) is the unit for Thermodynamic Temperature and is the preferred unit to express temperature and temperature intervals. However, it is permissible to use the Celsius scale where considered necessary. The temperature interval one degree Celsius equals one kelvin exactly.

Length

To convert US measure	multiply by	to obtain metric measure
Inches (in.)	25.4	millimeters (mm)
Inches (in.)	2.54	centimeters (cm)
Inches (in.)	0.0254	meters (m)
Feet (ft)	304.8	millimeters (mm)
Feet (ft)	30.48	centimeters (cm)
Feet (ft)	0.3048	meters (m)
Yards (yd)	0.9144	meters (m)

Area

Square inches (in^2)	645.16	square millimeters (mm^2)
Square inches (in^2)	6.4516	square centimeters (cm^2)
Square feet (ft^2)	929.03	square centimeters (cm^2)
Square yards (yd^2)	0.836	square meters (m^2)

Volume

Cubic inches (in^3)	16.39	cubic centimeters (cm^3)
Cubic feet (ft^3)	0.02832	cubic meters (m^3)
Cubic yards (yd^3)	0.7646	cubic meters (m^3)
Fluid ounces (fl oz)	29.57	milliliters (mL)
US quarts (qt)	0.946	liters (L)
US gallons (gal)	3.785	liters (L)
US gallons (gal)	0.003785	cubic meters (m^3)

Mass

Ounces (oz)	28.35	grams (g)
Pounds (lbs)	453.6	grams (g)
Pounds (lbs)	0.4536	kilograms (kg)
Pounds (lbs)	0.00045	metric tons (t)
US tons (T)	907.18	kilograms (kg)
US tons (T)	0.9072	metric tons (t)

Force

Pounds (lbs)	4.4448	Newtons (N)
Pounds (lbs)	0.0044	kilonewtons (kN)
Foot pounds (ft-lbs)	1.3557	Newton meters (Nm)

Flow rate

To convert US measure	multiply by	to obtain metric measure
Cubic feet per minute (cfm)	0.02832	cubic meters per minute (m^3/min)
Cubic feet per minute (cfm)	1.699	cubic meters per hour (m^3/h)
Cubic feet per hour (cfh)	0.02832	cubic meters per hour (m^3/h)
Feet per minute (fpm)	0.3048	meters per minute (m/min)
Pounds per minute (lb/m)	0.4536	kilograms per minute (kg/min)

Pressure stress

Pounds per square inch (psi)	6.895	kilopascals (kPa)
Pounds per square inch (psi)	0.0007	kilograms per square millimeter (kg/mm^2)
Pounds per square inch (psi)	0.07	bar
Foot pounds per square inch (lbf/in2)	0.006895	megapascals (mPa)
Bars	100	kilopascals (kPa)

Energy work

Foot pounds per foot	1.356	joules (J)
Calories	4.187	joules (J)
Btus	1.055	kilojoules (kJ)
Kilowatt hours	3.6	megajoules (MJ)

Power

Btus per hour (Btu/h)	0.2931	watts (W)
Btus per second (Btu/s)	1.055	kilowatts (kW)
Ft lbs per ft/min (ft lbf/min)	0.0226	watts (W)
Horsepower (hp)	0.7457	kilowatts (kW)

Temperature

Degrees Fahrenheit	1.8 + 32	degrees Celsius
Degrees Kelvin	degrees Celsius + 273.15	