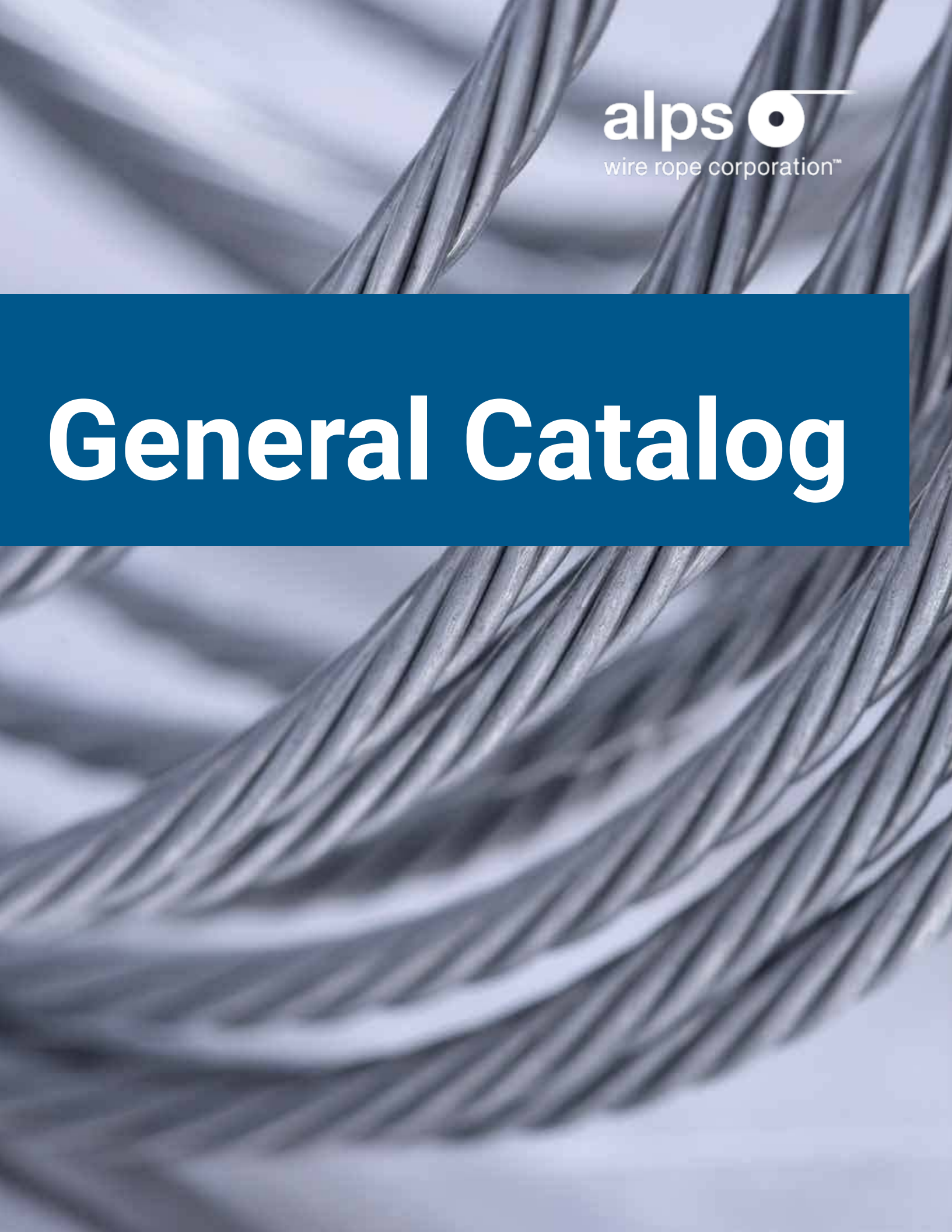


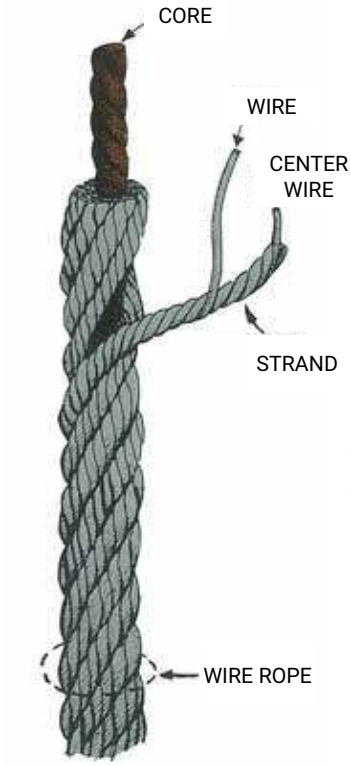
General Catalog

CONTENTS

INTRODUCTION

630.893.3888
alpswirerope.com

Wire Rope is a complex piece of machinery, in many cases containing hundreds of moving parts. Proper application, maintenance, storage and handling must be adhered to at all times so that it may be used to its maximum potential, both in safety and performance.



WIRE ROPE COMPONENTS

Wire rope consists of three basic components:
1) Individual wires
2) Multi-wire strands
3) A Core

WIRES

The individual wires that form strands are most commonly available in high-carbon steel, generally supplied in an uncoated, or "bright" finish. Zinc coated, or "Galvanized" rope is available in some sizes and carries a nominal strength of 10% below that of a bright rope. On special request, wire rope can be drawn-galvanized, offering the same nominal strength as a bright rope.

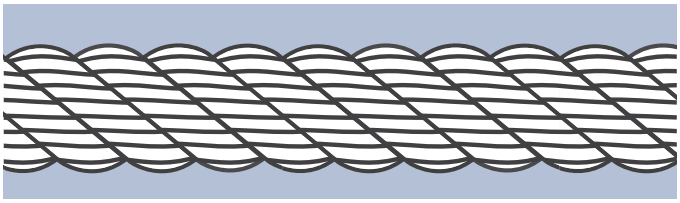
STRANDS

Wires are laid geometrically to form strands, each composed of two or more wires. Breaking these strand configurations into several classifications (P.4) is the basis for identifying wire rope.
These classifications may or may not be an actual construction. For example, a request for a "6x19", without further mention to a specific strand construction would be considered a request for a 6x25 Filler Wire, the most popular construction in the 6x19 classification.

CORES

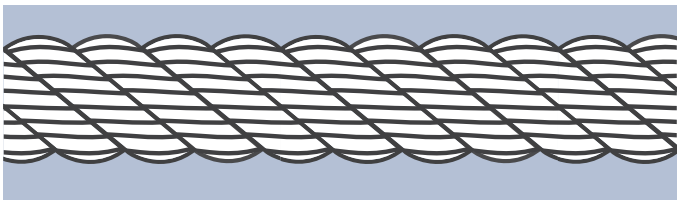
The core is the supporting member of the rope, made of either synthetic or sisal fibers, or steel. A fiber core rope offers flexibility; a steel center rope yields a higher strength along with the ability to resist crushing.
Steel cores are required when the environment exceeds 180°(F).
NOTE: When fiber core is specified, the core material (synthetic or sisal) could vary. The most popular fiber core is manufactured in polypropylene.

TYPICAL WIRE ROPE LAYS



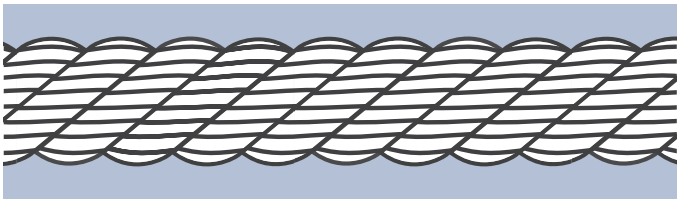
REGULAR LAY ROPE

Regular lay rope is the most standard, and accepted for a wide range of applications. The direction of the individual wires is opposite to the direction of the strands. Because of this, the rope is less likely to untwist, and therefore is easier to handle than lang lay rope. This rope is also less subject to crushing.



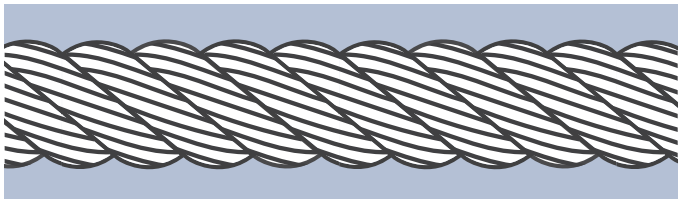
RIGHT LAY ROPE

A right lay rope is one in which the path of the strands in the rope is from left to right in a direction away from the observer. A right lay rope may either be regular lay or lang lay.



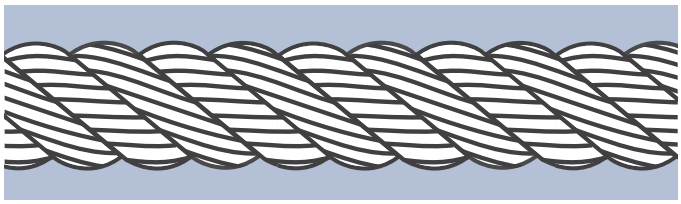
LEFT LAY ROPE

A left lay rope is one in which the path of the strands in the rope is from right to left in a direction away from the observer. A left lay rope may be either regular lay or lang lay.



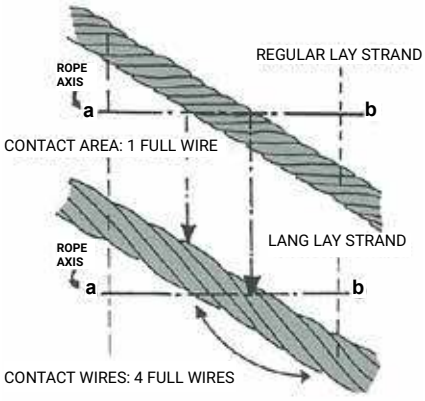
LANG LAY ROPE

Lang lay wire ropes have the individual wires matching the same lay direction as the strands. Considered a special construction for specific applications it provides improved bending fatigue and greater wear-resistance. It's uses are limited to applications (such as drag lines) where both ends are permanently fixed. Lang lay ropes will untwist if one end is free to rotate.



ALTERNATE LAY ROPE

An alternate lay rope is one in which the path of the strands in the rope alternate between right and left lay.



The above is a comparison of wear characteristics between regular lay and lang lay ropes. The greater metal area along the rope's axis (a-b) promotes more wear-resistance than a regular lay rope. The longer exposed length of outer wires in a lang lay rope offers an easier bend, resulting in greater fatigue resistance (page 12).

CONSTRUCTIONS

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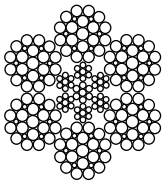
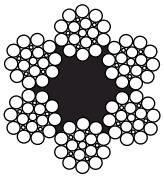
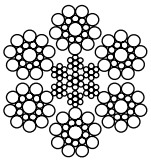
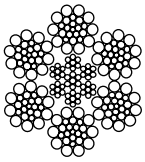
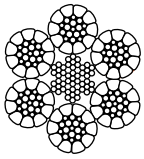
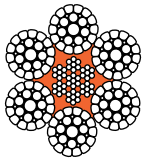
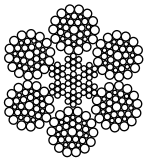
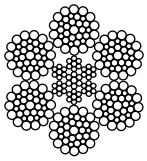
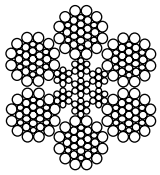
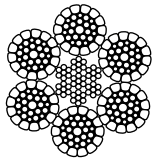
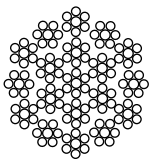
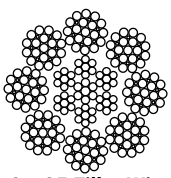
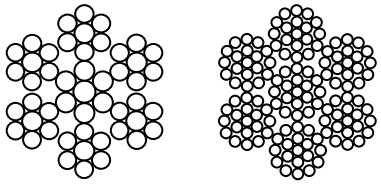
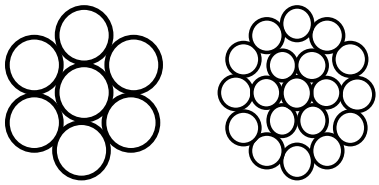
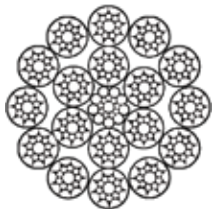
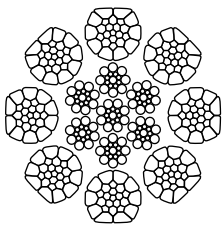
CLASSIFICATION	CROSS-SECTION	CONSTRUCTIONS
6 x 19	 **6 x 25 Filler Wire***  **6 x 21 Filler Wire**  **6 x 19 Seale***  **6 x 26 Warrington Seale***  **6 x 26(WS) Compacted**  **6 x 26(WS) Compacted + Plastic**	6 strands containing 15 through 26 wires, with a maximum of 12 outside wires. **Construction Count (Inside to Outside)** 6 x 25 (FW): 1 - 6 - (6) - 12 6 x 21 (FW): 1 - 5 - (5) - 10 6 x 19 (S): 1 - 9 - 9 6 x 26 (WS): 1 - 5 - (5+5)-10 *Also available in Fiber Core
6 x 37	 **6 x 36 Warrington Seale***  **6 x 41 Warrington Seale**  **6 x 31 Warrington Seale**  **6 x 36(WS) Compacted**	6 strands containing 27 through 49 wires, with a maximum of 18 outside wires. **Construction Count (Inside to Outside)** 6 x 36 (WS): 1 - 7 - (7+7) - 14 6 x 41 (WS): 1 - 8 - (8+8) - 16 6 x 31 (WS): 1 - 6 - (6+6) - 12 *Also available in Fiber Core
19 x 7 **(Rotation-Resistant Category 2)**	 **19 x 7**	19 strands containing 7 wires each. The 7 x 7 core is left lang lay, the 12 outer strands are right regular lay. These directional changes result in a rotation-resistant characteristic.
8 x 19 **(Rotation-Resistant Category 3)**	 **8 x 25 Filler Wire**	8 strands containing 15 through 26 wires each. Using a 7 x 7 wire core in left lang lay, coupled with 8 outer strands of right regular lay again promote rotation-resistant properties.

CLASSIFICATION	CROSS-SECTION	CONSTRUCTIONS
7 x 7 & 7 x 19	 **7 x 7** **7 x 19**	7 strands containing 7 or 19 wires, with a maximum of 6 or 12 outside wires. **Construction Count (Inside to Outside)** 7 x 7: 1 - 6 7 x 19: 1 - 6/12
1 x 7 & 1 x 19	 **1 x 7** **1 x 19**	1 strand containing 7 or 19 wires, with a maximum of 6 or 12 outside wires. **Construction Count (Inside to Outside)** 1 x 7: 1 - 6 1 x 19: 1 - 6 - 12
Compact 19 (Rotation-Resistant Category 2)	 **19 x 19 Compacted**	19 strands containing 19 wires each and compacted. Stranded rope constructed in such a manner that it has significant resistance to rotation, has at least 10 outer strands, and comprises an assembly of two or more layers of strands laid helically over a center in two or three operations, the direction of lay of the outer strands being opposite to that of the underlaying layer. **Construction Count (Inside to Outside)** 19 x 19(S): 1 - 9 - 9
Compact T8 (Non-Rotation-Resistant)	 **8 x 26(WS) Compacted & Swaged**	8 strands containing 15 through 26 wires each. All outer strands are compacted and rotary swaged. **Construction Count (Inside to Outside)** 8 x 26(WS): 1 - 5 - (5+5) - 10

General-Purpose Wire Rope

Dia. (in)	6 x 19 • 6 x 37 CLASS Fibre Core - I.P.S.		6 x 19 • 6 x 37 CLASS Independent Wire Rope Core - E.I.P.S.		
	Weight lb/ft	Nominal Strength (Tons)-BRT	Weight lb/ft	Nominal Strength (Tons) BRT	GALV
3/16	.059	1.55	—	—	—
1/4	.105	2.74	.116	3.40	3.06
5/16	.164	4.26	.18	5.27	4.74
3/8	.236	6.10	.26	7.55	6.80
7/16	.32	8.27	.35	10.2	9.18
1/2	.42	10.7	.46	13.3	12.00
9/16	.53	13.5	.59	16.8	—
5/8	.66	16.7	.72	20.6	18.50
3/4	.95	23.8	1.04	29.4	26.50
7/8	1.29	32.2	1.42	39.8	35.80
1	1.68	41.8	1.85	51.7	46.50
1 1/8	2.13	52.6	2.34	65.0	—
1 1/4	2.63	64.6	2.89	79.9	—
1 3/8	—	—	3.50	96.0	—
1 1/2	3.78	92.0	4.16	114.0	—

Semi-Rotation Resistant Wire Rope

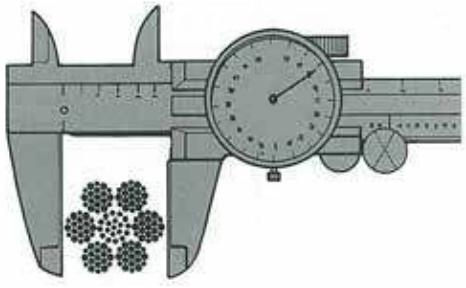
Dia. (in)	19 x 7 E.I.P.S.		8 x 25 I.W.R.C. • E.I.P.S.	
	Weight lb/ft	Nominal Strength-Tons	Weight lb/ft	Nominal Strength (Tons)
3/16	.064	1.57	—	—
1/4	.113	2.77	—	—
5/16	.177	4.30	—	—
3/8	.252	6.15	—	—
7/16	.346	8.33	—	—
1/2	.431	10.8	.47	11.6
9/16	.577	13.6	.60	14.7
5/8	.714	16.8	.73	18.1
3/4	1.02	24.0	1.06	25.9
7/8	1.39	32.5	1.44	35.0
1	1.82	42.2	1.88	45.5
1 1/8	2.30	53.1	—	—

Diameter Tolerance

Nominal Diameter	Tolerance in. (-0)	Maximum Dia.-in
3/64"	+.008	.055
1/16"	+.010	.073
3/32"	+.012	.106
1/8"	+.014	.139
5/32"	+.016	.172
3/16"	+.018	.206
7/32"	+.018	.237
1/4"	+.015	.265
5/16"	+.015	.328
3/8"	+.019	.394
7/16"	+.021	.459
1/2"	+.025	.525
9/16"	+.028	.591
5/8"	+.031	.656
3/4"	+.038	.788
7/8"	+.044	.919
1"	+.050	1.050
1 1/8"	+.056	1.181
1 1/4"	+.063	1.313
1 3/8"	+.069	1.444
1 "	+.075	1.575

Above tolerances refer to: Aircraft Cable, 3/64" thru 7/32" Wire Rope, 1/4" thru 1 1/2".

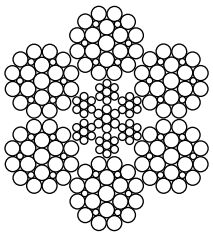
HOW TO MEASURE WIRE ROPE



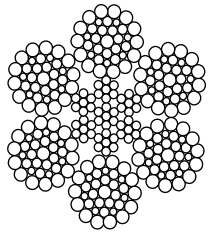
The true diameter of wire rope is measured at it's largest point.

WARNING: The nominal strengths listed throughout this publication are the results of testing under ideal conditions: straight pull, no bending, ambient temperatures, with loading applied at a gradual speed. In most applications, the applied load should not exceed 20% of the nominal strengths.

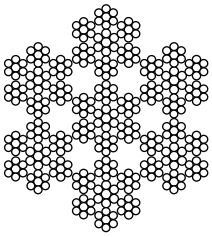
MISCELLANEOUS WIRE ROPE



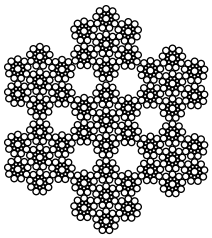
6 x 25 FILLER WIRE
IWRC



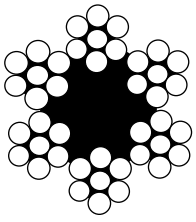
6 X 36 WARRINGTON-SEALE
IWRC



7 x 7 x 7



7 x 7 x S (19)



6 x 7 FC

Wire Rope · IWRC
Type 304 Stainless Steel

Diameter (in)	Weight (lb/ft)	Nominal Strength (lb)	
		6 x19 Class	6 x 37 Class
1/4	.110	—	5,400
5/16	.180	—	8,300
3/8	.240	—	11,700
7/16	.330	—	15,800
1/2	.458	22,800	20,400
9/16	.590	28,500	25,600
5/8	.715	35,000	31,400
3/4	1.05	49,600	—
1	1.87	85,400	—

Other sizes and constructions available upon request. Some items available in Type 316 Stainless Steel.

Galvanized Cable-Laid
Sling Ropes

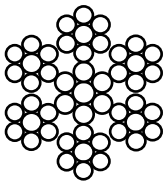
Diameter (in)	Construction	Weight lb/ft	Nominal Strength (Tons)
1/4	7 x 7 x 7	.094	2.38
3/8	7 x 7 x 7	.21	5.7
1/2	7 x 7 x 7	.37	9.75
5/8	7 x 7 x 7	.58	14.6
3/4	7 x 7 x 19	.88	21.4
7/8	7 x 7 x 19	1.19	28.4
1	7 x 7 x 19	1.56	36.2
1 1/8	7 x 7 x 19	1.72	47.4
1 1/4	7 x 7 x 19	2.18	65.05
1	7 x 7 x 19	2.96	88.75

Sandlines
6 x 7 Class Bright • FC

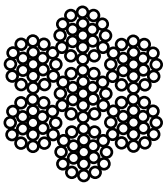
Diameter (in)	Weight lb/ft	Nominal Strength (Tons)
5/16	.15	4.10
3/8	.21	5.86
7/16	.29	7.93
1/2	.38	10.3
9/16	.48	13.0

AIRCRAFT CABLE & STRANDS

Galvanized Aircraft Cable (GAC) • Stainless Steel Type 304 Aircraft Cable



7 x 7

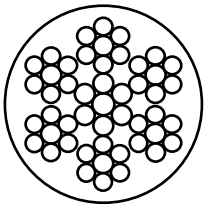


7 x 19

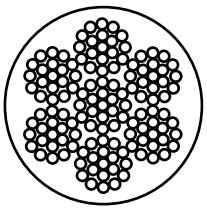
Diameter (in)	7 x 7			7 x 19		
	Weight lb/1000ft	Nominal Strength (lb)		Weight lb/1000ft	Nominal Strength (lb)	
		GAC	SSAC		GAC	SSAC
1/16	7.5	480	480	—	—	—
3/32	16	920	920	17	1,000	920
1/8	28	1,700	1,700	29	2,000	1,760
5/32	43	2,600	2,400	45	2,800	2,400
3/16	62	3,700	3,700	65	4,200	3,700
7/32	—	—	—	86	5,600	—
1/4	—	—	—	110	7,000	6,400
5/16	—	—	—	173	9,800	9,000
3/8	—	—	—	243	14,400	12,000

Some items also available in Type 316 Stainless Steel

PVC - Vinyl Coated G.A.C.



7 x 7



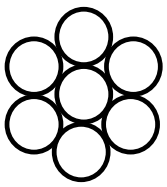
7 x 19

Cable Dia. - O.D.	Construction	Weight (lb/1000ft)	Nominal Strength (lb)
1/16 - 1/8	7 x 7	11.8	480
3/32 - 3/16	7 x 7	25.8	920
1/8 - 3/16	7 x 7	35.2	1,700
1/8 - 3/16	7 x 19	36.2	2,000
3/16 - 1/4	7 x 19	77.5	4,200
7/32 - 9/32	7 x 19	103	5,600
1/4 - 5/16	7 x 19	123	7,000

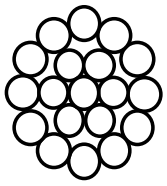
Standard coating is clear P.V.C. Also available upon request: Nylon coating, colored P.V.C. and Nylon, coated Stainless Steel, other sizes and constructions.

Note: If the full strength of the bare cable is required, plastic must be stripped from cable, with the fittings attached in direct contact with the cable.

Strands • E.H.S. Galvanized • Stainless Steel Type 304



1 x 7



1 x 19

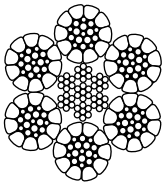
Diameter (in)	Construction	Weight (lb/1000ft)	Nominal Strength (lb)	
			E.H.S. GALV.	Stainless Steel
1/16	1 x 19	8.5	500	500
3/32	1 x 19	20	1,200	1,200
1/8	1 x 19	35	2,100	2,100
5/32	1 x 19	55	—	3,300
3/16	1 x 19	77	—	4,700
3/16	1 x 7	73	3,990	—
1/4	1 x 7	117	6,650	—
5/16	1 x 7	205	11,200	—
3/8	1 x 7	273	15,400	18,000
1/2	1 x 7	517	26,900	—

alps SPECIAL WIRE ROPE

COMPACTED WIRE ROPE

Compacted Ropes Provide:

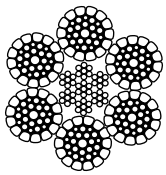
- Higher breaking strengths for given diameters
- Better drum winding characteristics
- Increased flexibility under load
- Improved resistance to crushing
- Reduces drum and sheave wear



6 x 26(WS)
Compacted

Compact 626

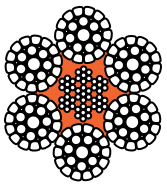
Nominal Diameter		Weight		Nominal Strength	
				1960 N/mm²	2160 N/mm²
Inch	mm	kg/m	lbs/ft	US ton	US ton
-	10	0.461	0.310	9.40	10.00
7/16	11.1	0.568	0.382	11.25	13.05
-	12	0.664	0.446	13.10	14.00
1/2	12.7	0.72	0.484	14.75	15.65
-	13	0.769	0.517	15.45	16.40
9/16	14.3	0.93	0.625	18.75	20.05
5/8	16	1.15	0.773	23.35	24.90
-	18	1.45	0.974	29.65	31.65
3/4	19.1	1.63	1.10	33.40	35.60
-	20	1.79	1.20	36.60	39.00
-	22	2.17	1.46	44.30	47.30
7/8	22.2	2.21	1.49	45.95	49.05
-	24	2.58	1.73	52.80	56.35
-	25	2.8	1.88	57.30	61.05
1	25.4	2.89	1.94	59.20	63.05
-	26	3.03	2.04	61.95	66.15
-	28	3.51	2.36	71.85	
1 1/8	28.6	3.66	2.46	74.95	
-	30	4.03	2.71	82.45	
1 1/4	31.8	4.53	3.04	92.70	
-	32	4.59	3.08	93.90	
-	34	5.18	3.48	105.95	
1 3/8	35	5.46	3.67	112.45	
-	36	5.81	3.90	119.05	
1 1/2	38	6.51	4.37	132.30	
-	40	7.16	4.81	146.60	



6 x 36(WS)
Compacted

Compact 636

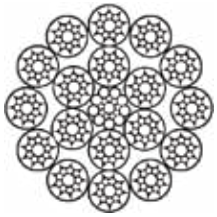
Nominal Diameter		Weight		Nominal Strength	
				1960 N/mm²	2160 N/mm²
Inch	mm	kg/m	lbs/ft	US ton	US ton
1/4	6.35	0.191	0.128	3.80	4.05
5/16	8	0.303	0.204	6.05	6.45
-	9	0.384	0.258	7.65	8.15
3/8	9.5	0.427	0.287	8.55	9.10
-	10	0.474	0.318	9.45	10.05
7/16	11.1	0.57	0.383	11.35	12.00
-	12	0.682	0.458	13.25	14.10
1/2	12.7	0.749	0.503	14.90	15.75
-	13	0.785	0.527	15.55	16.55
9/16	14.3	0.95	0.638	18.95	20.15
5/8	16	1.18	0.793	23.60	25.15
-	18	1.49	1.00	29.85	31.85
3/4	19.1	1.68	1.13	33.60	35.80
-	20	1.84	1.24	36.80	39.25
-	22	2.23	1.50	44.65	47.60
7/8	22.2	2.27	1.53	46.30	49.05
-	24	2.65	1.78	53.15	56.65
-	25	2.89	1.94	57.65	61.50
1	25.4	2.98	2.00	59.50	63.50
-	26	3.12	2.10	62.40	66.60
-	28	3.61	2.43	72.30	77.15
1 1/8	28.6	3.77	2.53	75.50	80.60
-	30	4.15	2.79	83.10	88.60
1 1/4	31.8	4.66	3.13	93.35	99.65
-	32	4.72	3.17	94.45	100.85
-	34	5.33	3.58	106.70	
1 3/8	35	5.61	3.77	113.55	
-	36	5.97	4.01	120.15	
1 1/2	38	6.69	4.50	133.40	
-	40	7.38	4.89	147.70	



6 x 26(WS)
Compacted+ Plastic

Compact 6P

Nominal Diameter		Weight		Nominal Strength	
				1960 N/mm²	2160 N/mm²
inch	mm	kg/m	lbs/ft	US ton	US ton
3/8	10	0.472	0.317	9.40	9.95
-	11	0.571	0.384	11.35	12.05
-	12	0.680	0.457	13.55	14.35
1/2	12.7	0.762	0.512	15.15	16.10
-	13	0.798	0.536	15.90	16.85
9/16	14	0.926	0.622	18.45	19.55
-	15.0	1.06	0.714	21.15	22.45
5/8	16	1.21	0.812	24.10	25.55
-	17.0	1.37	0.917	27.20	28.85
-	18	1.53	1.03	30.50	32.35
3/4	19.0	1.71	1.15	34.00	36.05
-	20	1.89	1.27	37.65	39.95
-	21	2.08	1.40	41.50	44.00
-	22	2.29	1.54	45.55	48.35
7/8	22.2	2.37	1.59	47.25	50.10
-	23	2.50	1.68	49.80	52.80
-	24	2.72	1.83	54.20	57.50
-	25	2.95	1.98	58.85	62.40
1	25.4	3.05	2.05	60.75	64.45
-	26	3.19	2.14	63.65	67.50
-	27	3.44	2.31	68.65	72.80
-	28	3.70	2.49	73.80	78.30
1 1/8	28.6	3.86	2.59	76.90	81.55
-	29	3.97	2.67	79.20	84.00
-	30	4.25	2.86	84.75	89.90
-	31	4.54	3.05	90.50	96.00
1 1/4	32.0	4.84	3.25	96.40	102.25
-	33	5.14	3.46	102.55	108.75
-	34	5.46	3.67	108.85	115.45
1 3/8	35.0	5.79	3.89	115.30	122.40
-	36	6.12	4.11	122.05	129.45
1 1/2	38.0	6.82	4.58	136.00	144.20
-	40	7.56	5.08	150.70	159.80
1 5/8	41.3	8.05	5.41	160.35	170.15
-	42	8.33	5.60	166.10	176.20
-	44	9.15	6.15	182.30	193.40
1 3/4	45.0	9.57	6.43	190.70	202.30



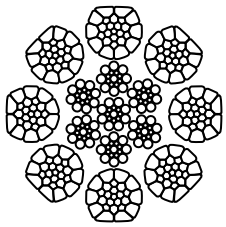
19 x 19
Compacted

Compact 19

Nominal Diameter		Weight		Nominal Strength - Tons	
				1960 Grade	2160 Grade
inch	mm	kg/m	lbs	US ton	US ton
5/16	8	0.31	0.21	6.15	6.80
-	9	0.40	0.27	7.80	8.60
3/8	9.5	0.44	0.30	8.70	-
-	10	0.49	0.33	9.65	-
7/16	11.1	0.60	0.40	11.90	-
-	12	0.70	0.47	13.90	-
1/2	12.7	0.79	0.53	15.55	-
-	13	0.82	0.55	16.30	-
9/16	14.3	1.00	0.67	19.75	-
5/8	16	1.25	0.84	24.70	-
-	18	1.58	1.06	31.30	-
3/4	19.1	1.76	1.18	35.25	-
-	20	1.95	1.31	38.60	-
-	22	2.36	1.59	46.85	-
7/8	22.2	2.40	1.61	47.60	-
-	24	2.81	1.89	55.65	-
-	25	3.05	2.05	60.40	66.35
1	25.4	3.15	2.12	62.40	68.45
-	26	3.30	2.22	65.35	71.75
-	28	3.82	2.57	75.75	83.20
1 1/8	28.6	3.99	2.68	79.05	86.85
-	30	4.39	2.95	86.95	95.55
1 1/4	31.8	4.93	3.31	97.75	107.35
-	32	4.99	3.35	99.00	108.70
-	34	5.64	3.79	111.35	-
1 3/8	35	5.98	4.02	117.95	-
-	36	6.32	4.25	124.55	-

CALL FOR INFO

Compact 19 strands have a flattened strand surface giving to a wider contact area between sheave and rope which increases the resistance to abrasion.



8 x 26(WS)
Compacted &
Swaged

Compact T8

Nominal Diameter	Approximate Weight		Nominal Strength - Tons
			2160 Grade
mm	kg/m	lbs/ft	US ton
8	0.296	0.20	7.2
9	0.375	0.25	9.2
10	0.463	0.31	11.3
11	0.560	0.38	13.7
12	0.666	0.45	16.3
13	0.782	0.53	19.1
14	0.907	0.61	22.1
15	1.041	0.70	25.4
16	1.184	0.80	28.9
18	1.499	1.01	36.6

- Compact T8 is a flexible rope. All strands are compacted and rotary swaged.
- Compact T8 has an extremely high breaking strength and is very resistant against abrasion.
- Compact T8 is most suitable for multi-layer spooling systems with guided loads.
- Compact T8 is fully lubricated and made out of galvanized or ungalvanized wires.
- **Compact T8 must not be used on a swivel.**

WIRE ROPE SELECTION

SELECTION FACTORS: STRENGTH • ABRASION • CRUSHING • FATIGUE

Choosing the rope best suited for a specific application requires attention to all four factors shown above. While it is impossible to possess the ultimate physical properties for every factor, establishing an order of priorities is essential in choosing the wire rope best suited to an application.

1. SUFFICIENT STRENGTH

First and foremost, wire rope must have sufficient strength to handle the ultimate applied load. The following factors must be considered when calculating applied load potential:

- Dead Weight • abrupt starts • sudden stops
- Shock Loads • high speeds • friction
- Loss of Efficiency when rope is bent over sheaves
- Location of sheaves and drums
- Environmental conditions - heat, humidity, etc.

Special considerations - danger to human life; value of load

The true total load includes all of the above. The sum of these factors is then multiplied by a "Design Factor", defined as the ratio of the nominal strength of a wire rope to the total load it is expected to carry. For an average application, a common design factor is 5:1, or if there is danger to life, this factor could be as high as 10:1. For proper design selection, consulting industry standards and OSHA requirements is recommended.

RESERVE STRENGTH

The reserve strength of a wire rope is the strength exclusive of the outside wires, which are the first to wear out under abrasion. As the number of layers of wires per strand increases, the reserve strength increases. Well lubricated ropes in service have the following reserve strengths (approximately) in terms of strengths of new ropes:

Wire Rope Construction	Reserve Strength
6 x 7	18%
6 x 19 (S)	32%
6 x 21 (FW)	36%
6 x 25 (FW)	43%
6 x 31 (WS)	43%
6 x 36 (WS)	49%
6 x41 (WS)	54%

2. ABRASION RESISTANCE

Whether a rope is dragged against gravel or dirt, or passed over sheaves, it is subject to abrasive wear. Internal wear can also occur, depending upon application and construction. When choosing a rope to resist abrasion, a good rule-of-thumb is to keep in mind that larger outside wires and lang lay ropes are generally more abrasion-resistant than regular lay ropes.

3. RESISTANCE TO CRUSHING

Or in simpler terms, abuse. Wire rope crushing can occur from a number of abuses: undersized grooves on drums and sheaves; excessive pressure over drums and sheaves; and overwinding on drums, or irregular winding. Steel center ropes have a better tendency to resist crushing than fiber core ropes as does regular lay versus lang lay.

4. RESISTANCE TO FATIGUE

Operating ropes experiencing shortened rope service life is frequently due to a condition known as early fatigue. To picture this action, a clothes hanger, when bent repeatedly back and forth at the same point, will eventually break. All wire ropes running over sheaves and drums are subjected to bending stresses, and the rope wires will eventually fatigue. The tighter (and faster) the bend, the quicker the eventual fatigue. As the number of wires per strand in a rope increases, the ability to resist fatigue increases as well. The diameter of the sheave or drum in relationship to the diameter of rope is a critical factor in establishing the ropes' ability to resist fatigue.

Following the ratios shown below is important, particularly in applications where bending fatigue is the major consideration

Suggested Sheave & Drum Ratios

Wire Rope Construction	Minimum D/d Ratio
6 x 7	42 : 1
6 x 19 (S)	34 : 1
6 x 21 (FW)	30 : 1
6 x 25 (FW)	26 : 1
6 x 26 (WS)	30 : 1
6 x 31 (WS)	26 : 1
6 x 36 (WS)	23 : 1
6 x 41 (WS)	21 : 1
6 x 30 (G) FSR	30 : 1
19 x 7	34 : 1
8 x 25 (FW)	21 : 1

D = Diameter of Drum d = Diameter of Rope

To determine the recommended diameter of sheaves or drums, the diameter of the rope should be multiplied by the D/d ratio as listed above.

For example; a 1/2" 19 x 7 (.5 x 34) should have a minimum 17 inch diameter drum or sheave.
If a change in construction is being considered as a means for delaying wire fatigue influenced by bending stresses, the table below may me useful. For example; a change from a 6 x 25 (FW) with a factor of 1.00 to a 6 x 36 (WS) with a factor of 1.16 would mean the service life could be expected to increase by 16%.

Rope Construction	Factor
6 x 7	.61
19 x 7	.67
6 x 19 (S)	.81
6 x 21 (FW)	.89
6 x 26 (WS)	.89
6 x 30 (G) FSR	.90
6 x 25 (FW)	1.00
6 x 31 (WS)	1.00
6 x 36 (WS)	1.16

Caution: These Figures apply only to bending stresses. Other factors which may contribute to rope deterioration have not been considered, such as abrasive wear.

In summary, fatigue resistance is dependent upon:

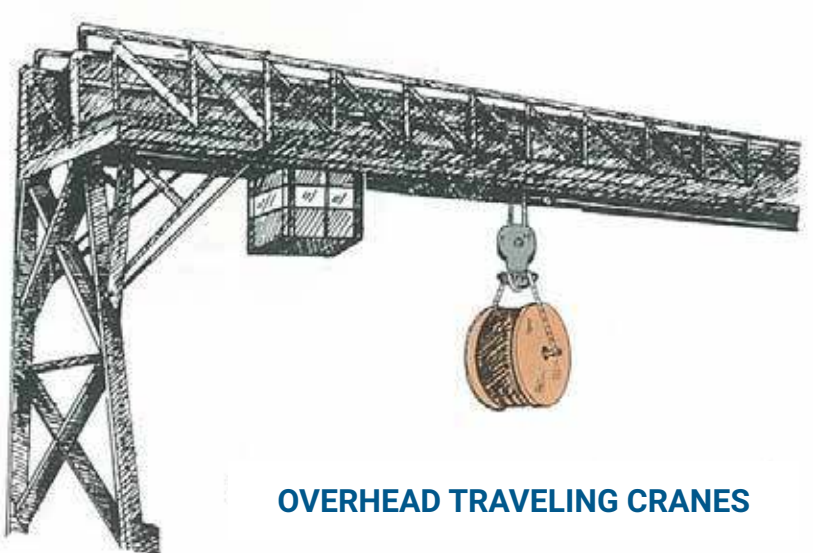
- The size of the individual wire
- The size of the sheave or drum
- The construction of the rope
- The speed of operation

An example of wire fatigue:

This rope was subjected to tight bending over small sheaves resulting in early fatigue.

GENERAL APPLICATIONS

These pages depict some of the most common uses for wire rope. In most applications, a standard 6 x 19 or 6 x 37 - class rope is used, either in Fiber Core or I.W.R.C. Consulting the Original Equipment Manufacturer and O.S.H.A. Standards is recommended to ensure proper selection.



OVERHEAD TRAVELING CRANES

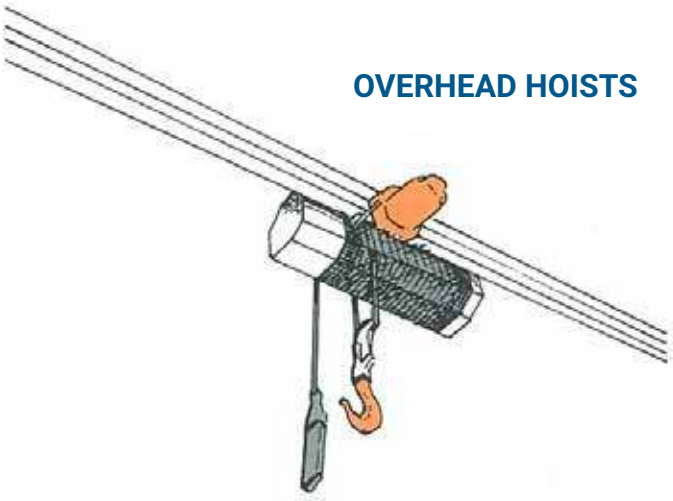
OVERHEAD CRANE WITH LADLE

TRUCK CRANES

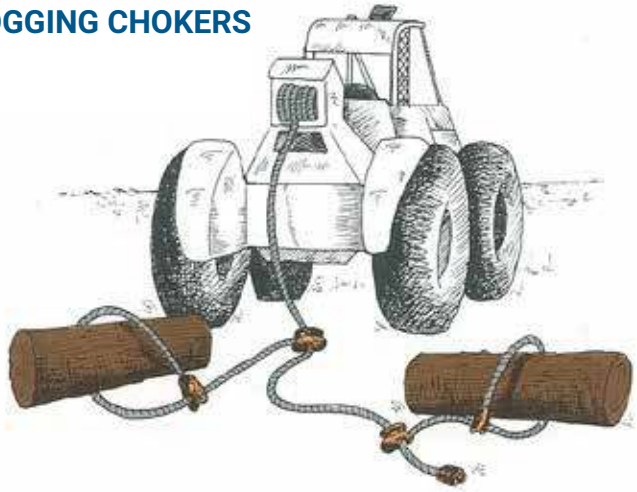
WRECKERS

POWER WINCHES

OVERHEAD HOISTS

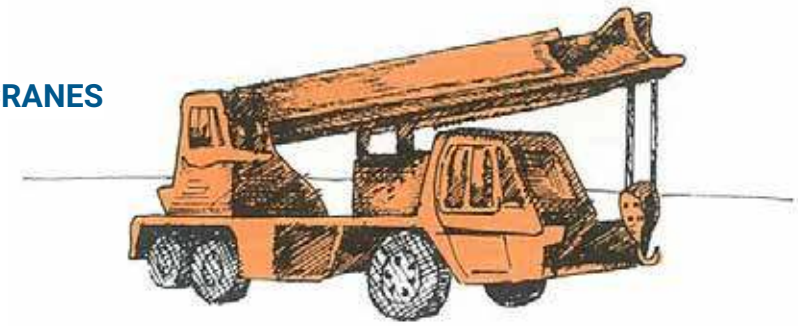


LOGGING CHOKERS



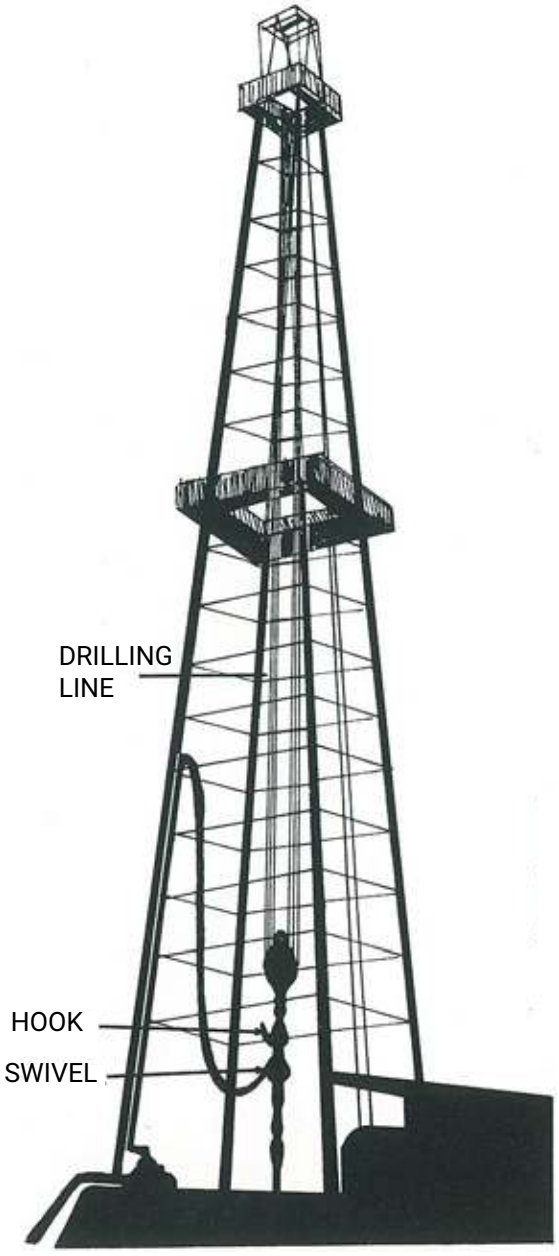
WIRE ROPE SLINGS

MOBILE CRANES



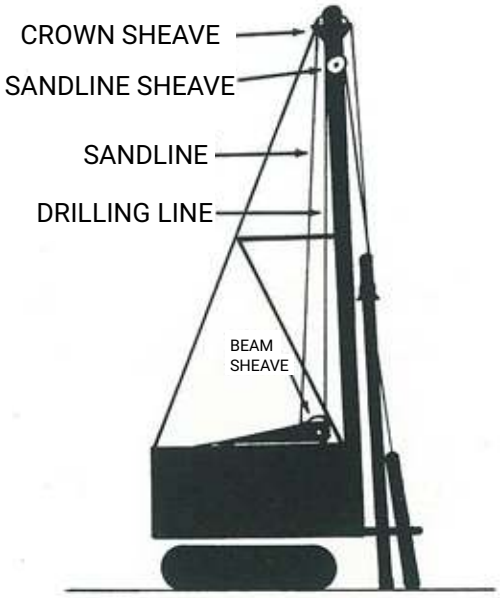
alps OILFIELD

ROTARY DRILL RIG



Drill Line: 6 x 19 (S) IWRC, RRL
or 6 x 26 (WS), IWRC, RRL, EIPS

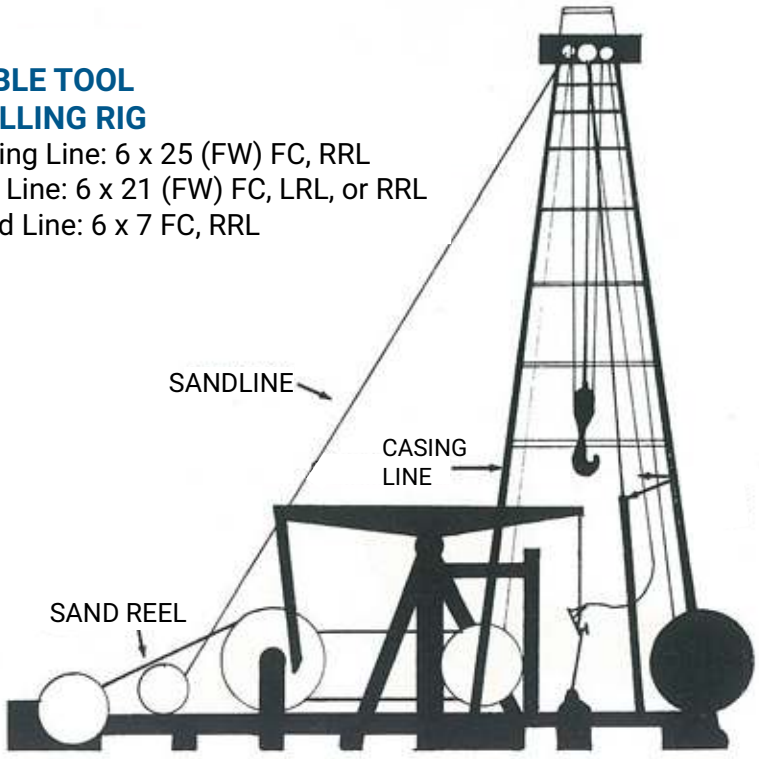
SPUDDER



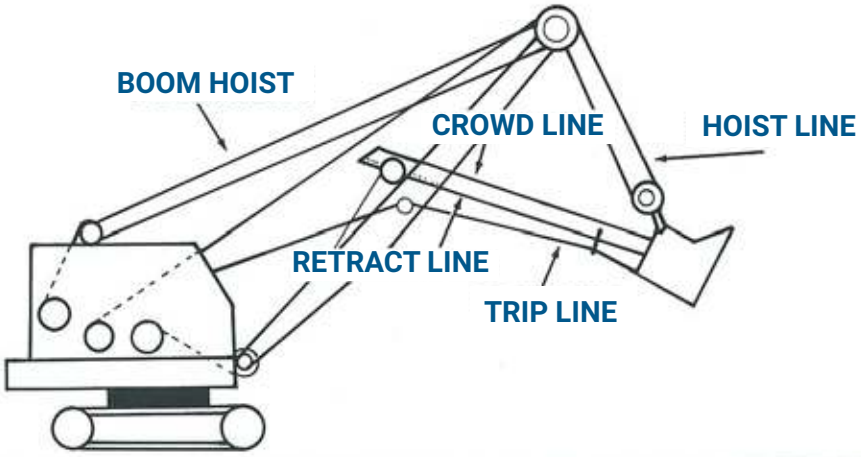
Sand Line: 6 x 7 FC, RRL
Drilling Line: 6 x 21 (FW) FC, LRL or RRL

CABLE TOOL DRILLING RIG

Casing Line: 6 x 25 (FW) FC, RRL
Drill Line: 6 x 21 (FW) FC, LRL, or RRL
Sand Line: 6 x 7 FC, RRL



CONSTRUCTION & MINING



SHOVEL/FACE SHOVEL
HOIST, CROWD & RETRACT
7/8" & smaller: 6 x 25 (FW) or
6 x 36 (WS), RLL; IWRC
1" & larger: 6 x 41 (FW),
RLL; IWRC

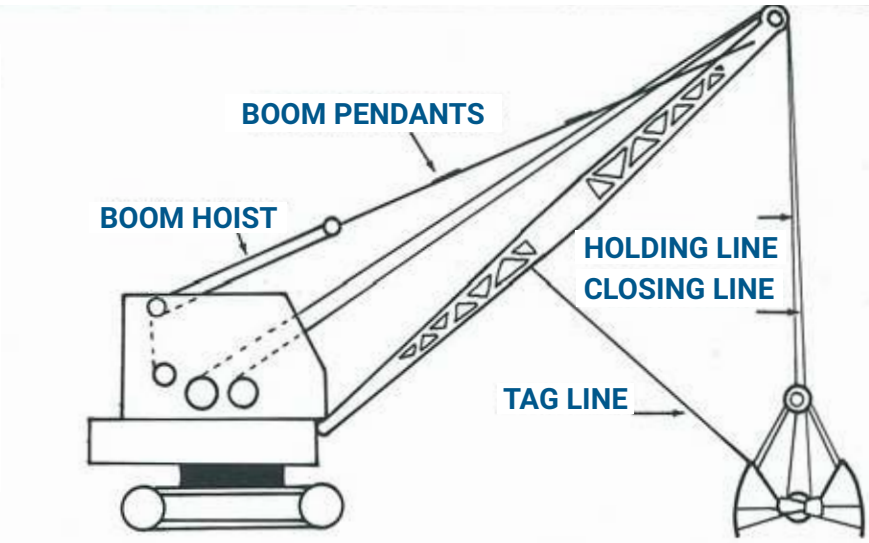
TRIP LINE
6 x 25 (FW) or 6 x 36 (WS),
RRL; IWRC

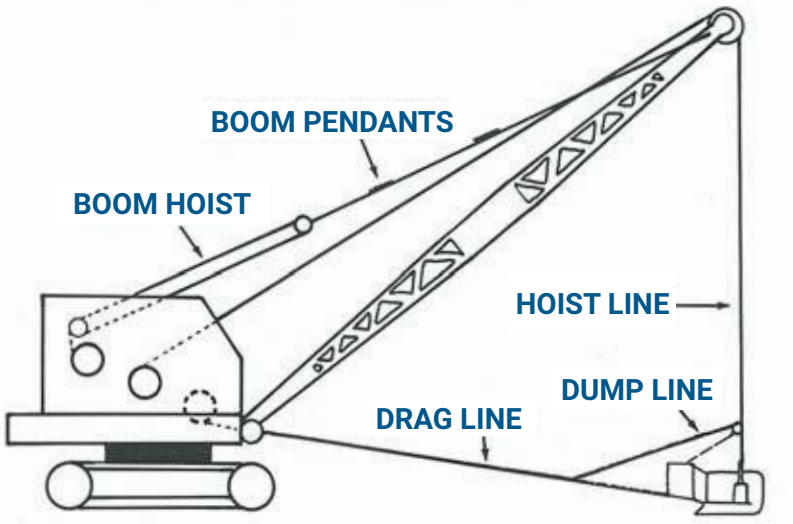
BOOM HOIST
6 x 25 (FW), RRL, or
6 x 30 (G) FSR, RLL; IWRC

CRANE/CLAMSHELL
CLOSING & HOLDING
6 x 25 (FW) or 6 x 36 (WS),
RRL or RLL, IWRC or FC, or
6 x 30 (G) FSR, RLL; IWRC

BOOM HOIST
6 x 25 (FW), RRL, or
6 x 30 (G) FSR, RLL; IWRC

TAG LINE
6 x 25 (FW) or 6 x 36 (WS),
RRL; IWRC





DRAGLINE EXCAVATOR
DRAGLINE
1/2" - 1-3/8": 6 x 21 (FW) or
6 x 30 (G) FSR, RLL; IWRC
1-1/2" - 2-1/2": 6 x 21 (FW), or
6 x 26 (WS) or 6 x 30 (G) FSR, RLL; IWRC

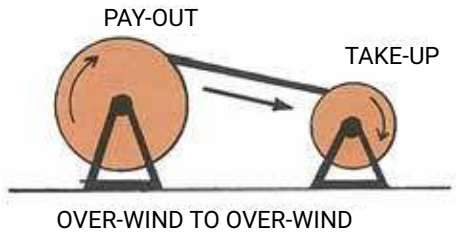
HOIST LINE
7/8" & smaller: 6 x 25 (FW) or
6 x 36 (WS), RRL or RLL; IWRC
1" & larger: 6 x 41 (WS), RLL; IWRC

BOOM HOIST
6 x 25 (FW), RRL, or
6 x 30 (G) FSR; IWRC

DUMP LINE
6 x 25 (FW), RRL or RLL; IWRC

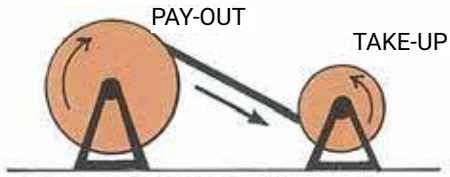
NOTE: Actual constructions may vary depending on equipment and application.

Correct Re-Spooling



OVER-WIND TO OVER-WIND

Improper Re-Spooling



OVER-WIND TO UNDER-WIND OR
VICE-VERSA CAUSES TWISTING.

UNREELING AND UNCOILING

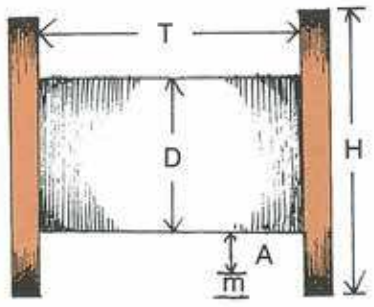
Unwinding wire rope from it's original reel to another reel, coil, or drum requires careful attention. As shown in the illustration to the left, it is advised that the rope travel from the top of the pay-out to the top of the take-up. Doing the opposite will cause reverse bending, as evidence by the fact that the spools are traveling in opposite directions. In most cases, this reverse bending will cause the rope to become livelier and harder to handle, inevitably resulting in twists and kinks. When unwinding a coiled rope, simply free the outside end and roll the coil along the ground.

When re-spooling rope to other reels or drums, it is common practice to wind in uniform layers, with each layer set into the grooves formed between 2 wraps of the previous layer. Bearing this uniformity in mind, the formula below is a reliable method for figuring spool capacity for a given rope diameter. It takes into consideration a normal oversize in diameter, but can vary depending upon construction and actual dimensions of the reel or drum. A clearance ("m") is important in avoiding damage to the wire rope.

FORMULA FOR SPOOLING CAPACITY

Let F = Factor for wire rope size (shown below)

H = Diameter of flange in inches
D = Diameter of drum in inches
A = Depth of space on flange in inches
T = Width (or "traverse") between flanges in inches
m = Margin for Rope Clearance



The formula is
F x A x T x (D + A) = maximum capacity. (Feet)
Table of Size Factors (.2618 ÷ diameter^2):

Rope Diameter	Factor	Rope Diameter	Factor
1/4"	4.19	3/4"	.465
5/16"	2.68	7/8"	.342
3/8"	1.86	1"	.262
7/16"	1.37	1-1/8"	.207
1/2"	1.05	1-1/4"	.168
9/16"	.827	1-1/2"	.116
5/8"	.670		

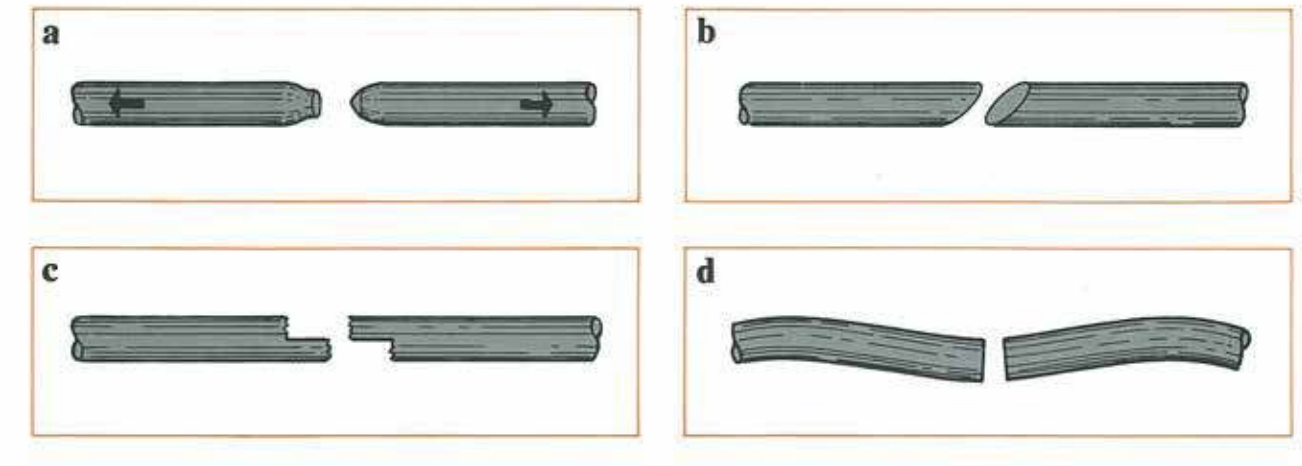
WIRE ROPE INSPECTION

So that optimum safety and performance is achieved, it is important to:
- Consult industry standards and OSHA requirements
- Inspect rope and equipment for any flaws prior to installation
- Periodically inspect rope and equipment during use.

Wire rope may fail if it is damaged, abused, overused, or improperly maintained. Any rope with changes from its original appearance must be considered for replacement. Finding any of the following conditions is most likely a cause for replacement:

A) Reduction in rope diameter
B) Distortion of rope lay
C) Excessive external wear
D) Internal nicking
E) Peening
F) Scrubbing
G) Corrosion
H) Broken Wires

COMMON WIRE BREAKS



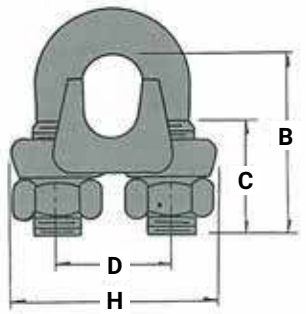
A wire broken under a tensile load that exceeds its strength is recognized by the “cup and cone” configuration at the fracture point (a). The *necking down* of the wire at this point shows that failure occurred while the wire retained its ductility. Shear-tensile fracture (b) occurs in wire subjected to a combination of transverse and axial loads. Fatigue breaks are usually characterized by squared-off ends perpendicular to the wire either straight across or Z-shaped (c & d).

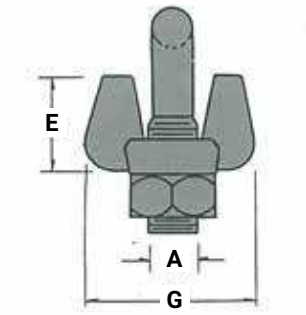
SHEAVE GROOVES & ALIGNMENT

Matching groove diameter with rope diameter is critical to optimum service life. An old, worn rope that has been pulled down in diameter will cause the sheave or roller to wear down as well. When a new rope is installed, it is being forced to operate in this undersize groove. This will pinch the rope and inevitably result in:
- A decrease of strand & wire clearance
- Increased abrasion
- Increased bending stress
- Internal nicking

Sheaves that are running out of alignment with the axis of the rope, along with sheaves running on worn bushings, will cause the rope to chafe against the flange. This will create premature failure of both the rope and the sheave.

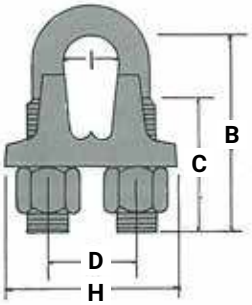
WIRE ROPE CLIPS

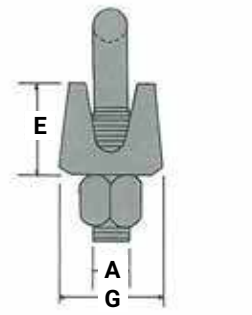




Drop-Forged Wire Rope Clips
Hot Dipped Galvanized
Federal Specification FF-C-450D Type I, Class 1

Clip & Rope Size	DIMENSIONS IN INCHES							Wt. Per 100 Pcs. (lb)	No. of Clips Required	Amt. of Rope to Turn Back In.	Torque (lb/ft)
	A	B	C	D	E	G	H				
1/4	5/16	1 1/32	1/2	3/4	21/32	1 3/16	1 7/16	18	2	4 3/4	15
5/16	3/8	1 3/8	3/4	7/8	23/32	1 5/16	1 11/16	30	2	5 1/4	30
3/8	7/16	1 1/2	3/4	1	29/32	1 5/8	1 15/16	42	2	6 1/2	45
1/2	1/2	1 7/8	1	1 3/16	1 1/8	1 29/32	2 9/32	75	3	11 1/2	65
5/8	9/16	2 3/8	1 1/4	1 5/16	1 11/32	2 1/18	2 1/2	100	3	12	95
3/4	5/8	2 3/4	1 7/16	1 1/2	1 13/32	2 1/4	2 27/32	150	4	18	130
7/8	3/4	3 1/8	1 5/8	1 3/4	1 19/32	2 7/16	3 5/32	240	4	19	225
1	3/4	3 1/2	1 13/16	1 7/8	1 25/32	2 5/8	3 15/32	250	5	26	225
1 1/8	3/4	3 7/8	2	2	1 29/32	2 13/16	3 19/32	310	6	34	225





Malleable Wire Rope Clips
Electro Galvanized
Federal Specification FF-C-450D Type I, Class 2

Clip & Rope Size	DIMENSIONS IN INCHES							Wt. Per 100 Pcs. (lb)	No. of Clips Required	Amt. of Rope to Turn Back (in)	Torque (lb/ft)
	A	B	C	D	E	G	H				
1/16	3/16	13/16	1/2	15/32	15/32	1/2	15/16	3	3	3 1/4	4.5
1/8	3/16	13/16	1/2	15/32	1/2	19/32	15/16	4	3	3 1/4	4.5
3/16	1/4	31/32	5/8	19/32	17/32	5/8	1 3/32	6 1/2	3	3 3/4	7.5
1/4	5/16	1 3/16	3/4	3/4	21/32	23/32	1 1/4	13	3	4 3/4	15
5/16	5/16	1 5/16	27/32	13/16	23/32	3/4	1 7/16	15	3	5 1/4	30
3/8	3/8	1 5/8	1	15/16	27/32	7/8	1 19/32	21	3	6 1/2	45
1/2	7/16	2	1 3/16	1 1/16	1	1 1/8	1 27/32	37	4	11 1/2	65
5/8	1/2	2 1/4	1 3/8	1 1/4	1 3/16	1 11/32	2 1/8	59	4	12	95
3/4	9/16	2 9/16	1 9/16	1 3/8	1 7/16	1 5/8	2 13/32	84	5	18	130
7/8	5/8	3 1/16	1 13/16	1 5/8	1 3/4	1 7/8	2 7/8	125	5	19	225
1	5/8	3 7/16	2	1 7/8	2 1/16	2	3	166	6	26	225
1 1/8	3/4	4 1/8	2 3/4	2 1/16	2 3/16	2 1/8	3 7/16	243	7	34	225

Type 316 Stainless Steel Wire Rope Clips Drop-Forged

Metric Size	Fits Cable Size	No. of Clips Required	Weight/ ea (lb)
2mm	1/16"	2	.024
2mm	3/32"	2	.024
3mm	1/8"	2	.035
5mm	3/16"	2	.06
6mm	1/4"	2	.18
8mm	5/16"	2	.31
10mm	3/8"	2	.31
12mm	1/2"	3	.63
16mm	5/8"	3	1.0
19mm	3/4"	4	1.5
26mm	1"	5	2.7

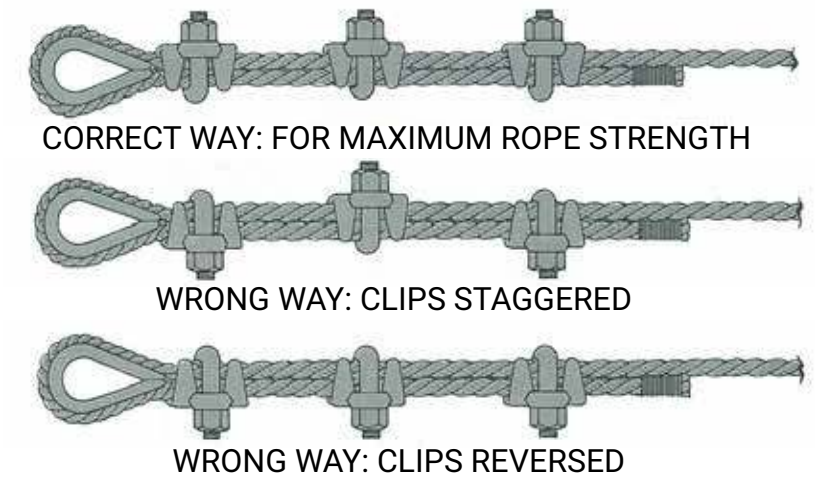
Oval & Stop Sleeves Aluminum and Zinc-Plated Copper

Cable Dia.	Weight per hundred pieces (Approximate)			
	Aluminum Ovals	Copper Ovals	Aluminum Stops	Copper Stops
1/16	.10	.275	.06	.19
3/32	.32	.664	.23	.78
1/8	.80	1.72	.21	.70
5/32	.80	2.79	.37	1.18
3/16	1.52	5.45	.35	1.06
1/4	2.52	7.54	2.10	6.20
5/16	4.35	11.86	—	5.20
3/8	5.82	17.60	—	4.40
1/2	19.0	39.6	—	—

Some items also available in Stainless Steel.

Refer to Galvanized Charts for Turn-Back & Torque Requirements.

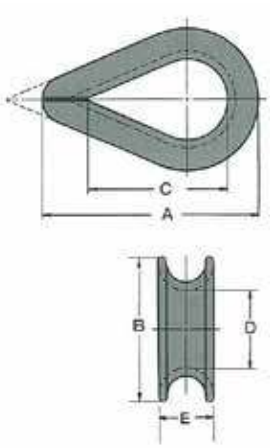
APPLYING U-BOLT CLIPS



1) Turn back the specified amount of rope from the thimble. Apply the first clip one base width from the dead end of the rope. Tighten to specified torque.
2) Apply the next clip as near the loop as possible. Turn on nuts firm but do not tighten.
3) Space additional clips (if required) evenly between the first two. Turn on nuts firm but do not tighten.
4) Take up rope slack and tighten all nuts to specified torque.
5) Apply initial load and re-tighten to specified torque.

alps WIRE ROPE HARDWARE

Galvanized Heavy-Duty Thimbles
Fed. Spec. FF-T-276B, Type III



For Rope Dia.	Weight lb/ea	Max Pin Dia.	Dimensions (in)				
			Overall Length A	Overall Width B	Inside Length C	Inside Width D	Thickness E
1/4"	.075	13/16"	2 3/16	1 1/2	1 5/8	7/8	13/32
5/16"	.14	15/16"	2 1/2	1 13/16	1 7/8	1 1/16	1/2
3/8"	.25	1 1/16"	2 7/8	2 1/8	2 1/8	1 1/8	21/32
1/2"-9/16"	.51	1 7/16"	3 5/8	2 9/16	2 3/4	1 1/2	27/32
5/8"	.75	1 5/8"	4 1/4	3	3 1/4	1 3/4	1
3/4"	1.47	1 7/8"	5	3 1/2	3 3/4	2	1 1/4
7/8"	1.85	2 1/8"	5 1/2	4	4 1/4	2 1/4	1 3/8
1"	3.00	2 3/8"	6 1/8	4 3/8	4 1/2	2 1/2	1 9/16
1 1/8"-1 1/4"	3.80	2 3/4"	7	5 5/8	5 1/8	2 7/8	1 7/8
1 3/8"-1 1/2"	11.00	3 1/4"	9 1/16	7 1/8	6 1/2	3 1/2	2 5/8

Some items also available in Light-Duty.

Stainless Steel Thimbles Standard-Duty Type 304

For Rope Dia.	Maximum Pin Dia.	Weight/ 100 Pcs. (lb)
1/8"	5/8"	3.3
3/16"	5/8"	3.3
1/4"	5/8"	3.3
5/16"	3/4"	4.0
3/8"	7/8"	7.5
1/2"	1 1/16"	13.8
5/8"	1 1/4"	36.0
3/4"	1 1/2"	120
1"	2 3/8"	220

Some items also available in Type 316.

Galvanized Screw-Pin Anchor Shackles
Forged Carbon Steel · Alloy Pins
Fed. Spec. RR-C-271B, Type IV - Class 1

Nominal Shackle Size (D)	Working Load Limit (Tons)	Weight/ea (lb)	Dimensions (in)			
			Inside Length (L)	Inside Width (W)	Inside Bow (B)	Pin Dia. (P)
1/4"	1/2	.13	1 1/8	1/2	25/32	5/16
5/16"	3/4	.21	1 7/32	17/32	27/32	3/8
3/8"	1	.33	1 7/16	21/32	1 1/32	7/16
1/2"	2	.76	1 7/8	13/16	1 5/16	5/8
5/8"	3 1/4	1.44	2 3/8	1 1/16	1 11/16	3/4
3/4"	4 3/4	2.32	2 13/16	1 1/4	2	7/8
7/8"	6 1/2	3.50	3 7/16	1 7/16	2 1/4	1
1"	8 1/2	5.19	3 3/4	1 11/16	2 11/16	1 1/8
1 1/8"	9 1/2	6.97	4 1/4	1 13/16	2 29/32	1 1/4
1 1/4"	12	9.50	4 11/16	2 1/32	3 1/8	1 3/8
1 1/2"	17	16.5	5 3/4	2 3/8	3 7/8	1 5/8

Above working load limit is based on a design factor of 6:1.
Shackles stamped with nominal stock size and working load limit.
Some items also available in Stainless Steel.

FABRICATION & SERVICES

630.893.3888
alpswirerope.com

FABRICATION

- **Custom Wire Rope Fabrication & Fittings**
- **Standard Industry Assemblies**
    - Buttons
    - Sockets (Swaged & Spelter)
    - Eyes (Flemish & Turnback)
    - Studs
    - Logging Chokers
    - Bridle Assemblies

OTHER SERVICES

- Taper & Welding (1/4” to 2-3/8”)
- Flash Cutting (1/32” to 3/8”)
- Cut to Length/Floor Measuring
- Pressure Lubrication (1/4” to 1”)
- Proof Loading/Break Testing (500 to 99,000 lb)

TOOLS

- Handheld Wire Rope Cutters
- Handheld Wire Rope Swagers
- Sheave Gauges
- Measuring Lines

COMMON WIRE ROPE ABBREVIATIONS & SYMBOLS FOR CHEMICAL ELEMENTS

BRT	Bright
C	Carbon
Cr	Chromium
DF	Drop-Forged
EHS	Extra-High Strength
EIPS	Extra Improved Plow Steel
FC	Fiber Core
Fe	Iron
(FW)	Filler-Wire
FSR	Flattened Strand Rope
GAC	Galvanized Aircraft Cable
GALV	Galvanized
HD	Heavy-Duty
IPS	Improved Plow Steel
IWRC	Independent Wire Rope Core
LD	Light Duty
LLL	Left Lang Lay
LRL	Left Regular Lay
Mall	Malleable
mm	Millimeter
Mn	Manganese
Mo	Molybdenum
Ni	Nickel
P	Phosphorus
PC	Poly Core
PREF	Preformed
PVC	Poly-Vinyl Chloride
RLL	Right Lang Lay
RRL	Right Regular Lay
S	Sulfur
(S)	Seale
SD	Standard Duty
SSAC	Stainless Steel Aircraft Cable
WR	Wire Rope
(WS)	Warrington-Seale
WSC	Wire Strand Core

CONVERSIONS

LINEAR MEASURE

1 millimeter = .03937 inches
1 centimeter = 10 millimeters
1 decimeter = 100 millimeters
1 meter = 3.28083 feet
1 inch = 25.4 millimeters
1kilometer = 3280.83 feet
1 mile = 1.60935 kilometers

WEIGHTS

1 metric ton = 2204.6 pounds
1 kilogram = 2.2046 pounds
1 pound = 453.6 grams
1 kilonewton = 224.8 pounds

CAPACITY

1 liter = .03531 cubic feet
1 cubic foot = 28.317 liters
1 gallon = 3.785 liters

DECIMAL & METRIC EQUIVALENTS

Fraction	Decimal	Metric	Fraction	Decimal	Metric
1/64	.015625	.397 mm	1/4	.250	6.350 mm
1/32	.03125	.794 mm	9/32	.28125	7.144 mm
3/64	.04688	1.191 mm	5/16	.3125	7.938 mm
1/16	.0625	1.588 mm	3/8	.375	9.525 mm
5/64	.07813	1.985 mm	7/16	.4375	11.113 mm
3/32	.09375	2.381 mm	1/2	.500	12.700 mm
7/64	.10938	2.778 mm	9/16	.5625	14.288 mm
1/8	.125	3.175 mm	5/8	.625	15.875 mm
9/64	.14063	3.572 mm	11/16	.6875	17.463 mm
5/32	.15625	3.969 mm	3/4	.750	19.050 mm
3/16	.1875	4.763 mm	7/8	.875	22.225 mm
7/32	.21875	5.556 mm	1	1.00	25.400 mm

HOW TO ORDER

630.893.3888
alpswirerope.com

Shown below are examples of properly written orders for wire rope, aircraft cable, and hardware. Following this method in the order given will ensure the order to be correctly and promptly filled.

WIRE ROPE:

A	B	C	D	E	F	G	H	I
2	x	5000 ft.	1/2”	6 x 25	RRL	EIPS	BRT.	IWRC, A-1

A - Number of pieces
B - Length
C - Diameter
D - Construction
E - Lay
F - Grade
G- Finish
H - Core
I - Lubrication

AIRCRAFT CABLE:

A	B	C	D	E
2	x 5000 ft.	3/8”	7x19	GAC

A - Number of pieces
B - Length
C - Diameter
D - Construction
E - Finish or grade

FITTINGS:

A	B	C
500 pcs.	1/2”	Galv. Drop-Forged Wire Rope Clips

A - Number of pieces
B - Size
C - Product Description

ACKNOWLEDGEMENTS

Some of the technical data, drawings and graphs used in this publication have been reproduced in full or part from the Wire Rope Users Manual, with thanks to:

The Committee of Wire Rope Producers
American Iron & Steel Institute
1000 16th St., N.W.
Washington, DC 20036

Further information is available through:

American National Standards Institute (ANSI)
New York, NY (212) 642-4900

American Petroleum Institute (API)
Washington, DC (202) 682-8000

American Society for Testing Materials (ASTM)
West Conshohocken, PA (610) 832-9500

Occupational Safety & Health Administration (OSHA)
Washington, DC (800) 321-6742

Wire Rope Technical Board
Alexandria, VA (703) 299-8550

alps wire rope corporation™

MIDWEST - Chicago
2530 Production Drive
Saint Charles, IL 60174
Phone: (630) 893-3888

SOUTH - Houston
5714 Delany Road, Suite B
Hitchcock, TX 77563
Phone: (713) 941-2068

EAST - Harrisburg
1549 Bobali Drive, Suite C
Harrisburg, PA 17104
Phone: (717) 943-1935

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