Moving Stuff: Techniques, Tools and Applications for trail work

Jacob Quinn
US Forest Service

Course Outline:

- Materials overview – what we need to move
  - What It weighs
  - What it really weighs
- Physics review – how things can be moved
  - Simple machines
  - Mechanical advantage
- Tool and equipment overview – the stuff we have to move stuff with
- Griphoist and rigging procedures

Materials overview: “what we need to move”

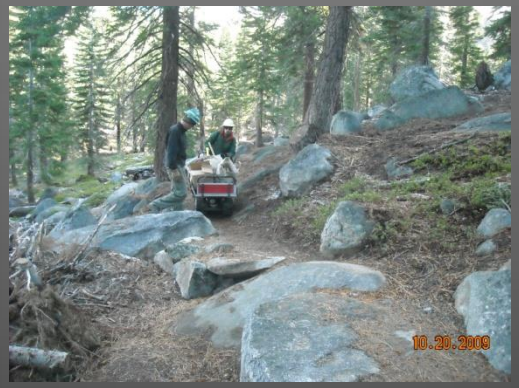
Rock

Lumber

Logs/Timbers

Gravel/Soil/Fill

Tools



Everything else…

What stuff weighs: things to remember

- Weights can be highly variable
  - dry vs. wet
  - where you found it
  - actual size
- Can I move it? Should I move it?
- What it weighs can determine how you move it
- Can/should I adjust the weight?

Not all types of stuff weighs the same…

…can be highly variable even within the same kind of stuff

Material	-	Weight per cubic foot (avg.)
Solid granite	-	168
Pine (dry)	-	26
Sand (dry)	-	100
Water	-	62.4
Douglas Fir	-	33
Gravel (dry)	-	95
Soil	-	78-125


10.11.2009


V04038
MAX 2t
CE
lbs
470
10.11.2009

Calculating the load based on weight:

Is the weight of the stuff being moved the only thing to consider?

What about…

- Slope – uphill, downhill, flat
- Rolling vs. sliding vs. dragging vs. carrying
- Shape and type of material being moved

If the stuff will be rolled, slid or dragged:

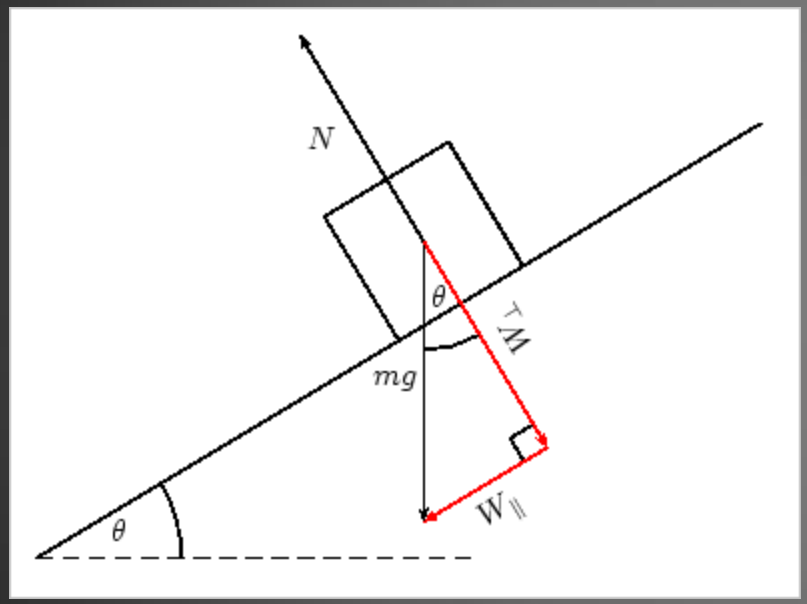
•Uphill = more weight, bigger load

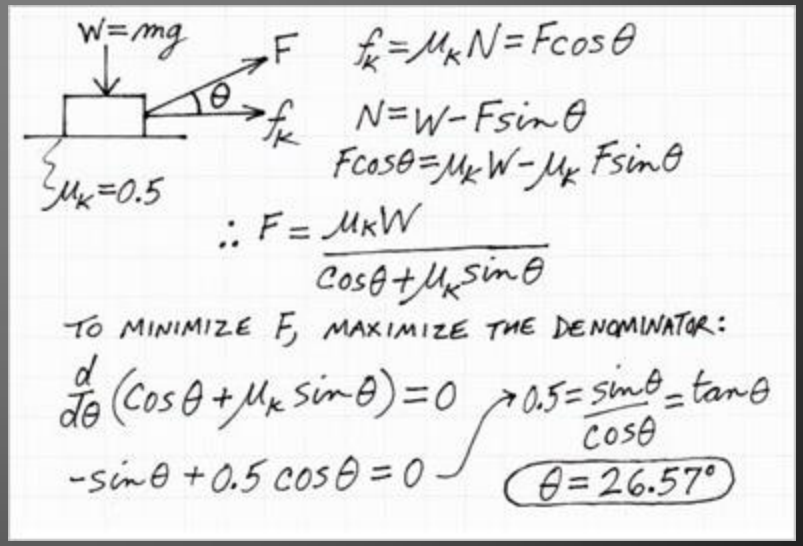
•Downhill = less weight, possible smaller load
- •may need load control
- •potential to shock load

•Flat ground = must consider the surface underneath
- •friction = increased weight, bigger load

There will always be resistance in the system – friction will always reduce efficiency and add to the total load every time

The coefficient of friction:





Friction coefficients of common materials

Friction Coefficient for Concrete Cast on Soil
(reference 4)

Interface Materials	Friction Coefficient, f
Mass concrete on the following foundation materials:	
Clean sound rock	0.70
Clean gravel, gravel--sand mixtures, coarse sand	0.55 to 0.60
Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	0.45 to 0.55
Clean fine sand, silty or clayey fine to medium sand	0.35 to 0.45
Fine sandy silt, nonplastic silt	0.30 to 0.35
Very stiff and hard residual or preconsolidated clay	0.40 to 0.50
Medium stiff and stiff clay and silty clay	0.30 to 0.35

Coefficients of Friction

R45

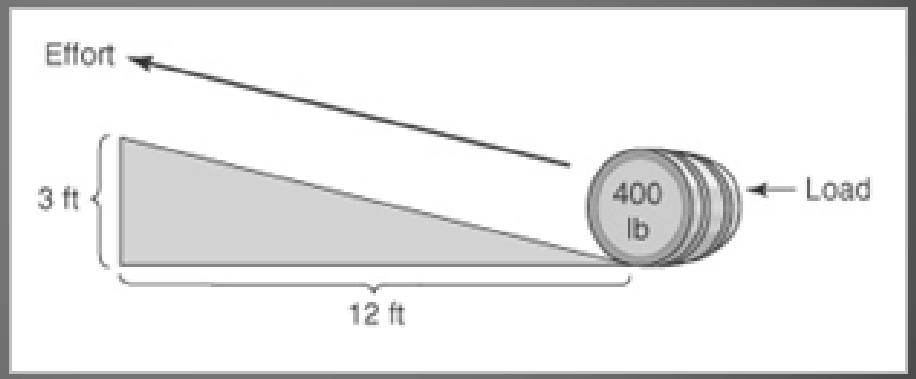
Concrete on concrete	.65	Manila rope on wood	.40	Continuous lubricated surface	.15
Metal on concrete	.60	Leather on metal	.40	Steel on steel	.10
Wood on wood	.50	Wood on metal	.30	Load on wheels	.05
Wood on concrete	.45	Cast iron on steel	.25		

Level & Incline Planes

[For Estimation Only] (6)

Legend	Formulas
W = **W**eight of load	Level: CFxW=F
CF = **C**oefficient of **F**riction	
F = **F**orce required to move load	Uphill: [CFxWx(R/L)]+[(H/L)xW] = F
H = **H**eight in feet	
R = **R**un, horizontal distance in feet	Downhill: [CFxWx(R/L)]-[(H/L)xW] = F
L = **L**ength of ramp in ft.	

W = 400
CF = .20 est.
H = 3ft
R = 12ft
L = 12.4ft



[.20 x 400 x (12/12.4)] + [(3/12.4) x 400] = 174.19

It will take 174 lbs of force to move this load up the ramp

Physics review: “how stuff can be moved”

- An object at rest tends to stay at rest unless acted upon by unbalanced forces

- You are the unbalanced forces

Since objects don’t want to move, we have to apply force to move them

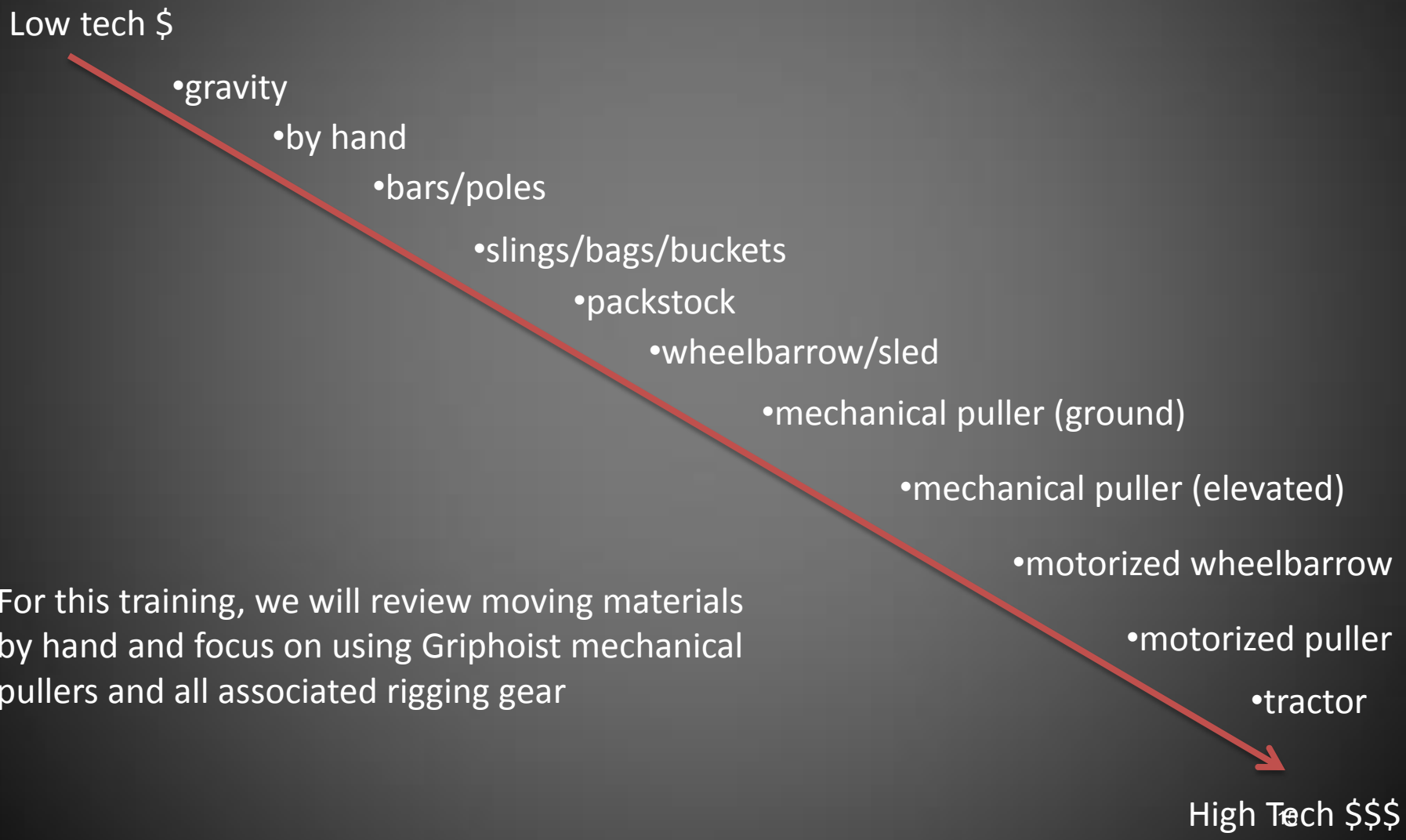
The stuff we want to move is heavy and hard to move

So we use simple machines and mechanical advantage to get the job done

In general, they are the simplest mechanisms that use mechanical advantage to multiply force

Simple machines common to trail work:

Tools and equipment: “the stuff we have to move stuff with”



For this training, we will review moving materials by hand and focus on using Griphoist mechanical pullers and all associated rigging gear

Moving materials by hand is the most common, lowest tech option

This can be the least expensive option, but isn't necessarily:

Salaries

Transportation

Insurance, etc

Administration

Come-along

Griphoist

Lewis Winch

Model	unit	T-508	T-516	T-532
Rope travel/ stroke lifting	in.	2	1.4	5
Nominal capacity	lbs. (kg)	2,000* (800)	4,000* (1,600)	8,000* (3,200)
Machine weight	lbs. (kg)	14.25 (6.6)	30 (13.5)	51 (24)
Wire rope weight	lbs. (kg)	30ft./9m 8 (3.5)	60ft./18m 28.9 (13)	30ft./9m 8 (3.5)
Machine dimensions	in. (mm)	16 1/2 x 9 7/8 x 3 7/8 (420 x 250 x 99)	20 7/8 x 12 7/16 x 5 (530 x 315 x 127)	24 7/16 x 14 x 5 1/8 (631 x 357 x 148)
Handle ext./closed	in. (mm)	27/16 (690/405)	45/26 (1147/648)	45/26 (1147/648)
Wire rope dia.	in. (mm)	5/16 (8.3)	7/16 (11.5)	5/8 (16.3)
Min. W.R. breaking strain	lbs. (kg)	10,000 (4,500)	20,000 (9,000)	40,000 (18,000)

Model	unit	TU-17	TU-28	TU-32
Rope travel/ stroke lifting	in.	2	1.4	.5
Nominal capacity	lbs. (kg)	2,000*/ 1,500** (800/600)	4,000*/3,000** (1,600/1,200)	8,000*/6,000** (3,200/2,400)
Machine weight	lbs. (kg)	18.5 (8.4)	41 (20)	59.5 (27)
Wire rope weight	lbs. (kg)	30ft./9m 8 (3.6)	60ft./18m 28.9 (13)	30ft./9m 8 (3.5)
Machine dimensions	in. (mm)	203/4 x 93/4 x 41/2 (825 x 284 x 113)	26 x 13 x 5 3/4 (660 x 360 x 145)	27 x 13 x 6 1/8 (685 x 365 x 156)
Handle ext./closed	in. (mm)	28/18 (730/450)	45/26 (1147/648)	45/26 (1147/648)
Wire rope dia.	in. (mm)	5/16 (8.3)	7/16 (11.5)	5/8 (16.3)
Min. W.R. breaking strain	lbs. (kg)	10,000 (4,500)	20,000 (9,000)	40,000 (18,000)

* capacity for material handling (conversions are approximate)

**capacity for manriding

Basically – it’s a lever with spring loaded jaws inside

Only use Griphoist wire rope and a Griphoist Handle

Make sure the wire rope and handle are made for the unit you are using

Incorrect diameter wire rope will not hold under tension

Incorrect handle will provide too much or too little leverage for the unit

Griphoist and rigging gear: Rules to live by

Only setup a rigging operation if you need to
- Is there another way to get the job done?
- Takes time to properly setup and teardown

Know your equipment
- Know the history
- Know the capacity
- Know the condition

Only use gear and equipment that meets manufacturers specs
- Never use modified equipment

Understand the load you are trying to move

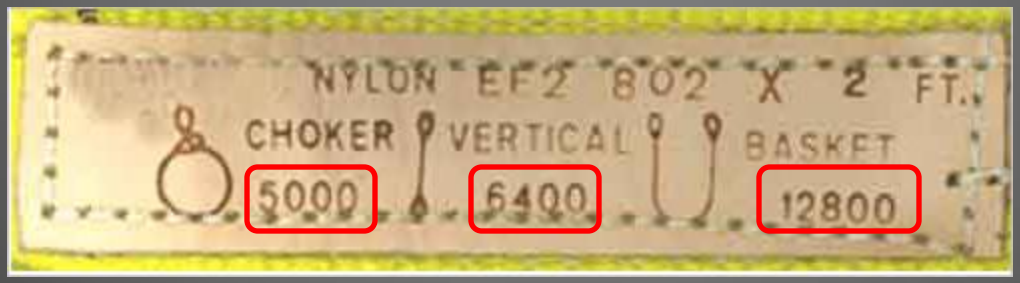
Maintain a safety factor of 5 in all operations

Griphoist and rigging gear: Safety factor rating

All equipment and gear must have a manufacturers load rating

You need to determine what that number means (refer to manufacturer)

- It may be the failure point
- It may have a safety factor already incorporated



This is a Liftall sling – these ratings have a safety factor of 5 built it

- It has been tested to fail at or above 5x these ratings

Nylon slings

Code	Color	Rated Capacity (lbs.) * Vertical	Choker	Basket	Minimum Length (ft.)	Approximate Measurements Weight (lbs. / ft.)	Body Dia. Relaxed (in.)	Width at Load (in.)
EN30	Purple	2,600	2,100	5,200	1 ½	.2	5/8	1 1/8
EN60	Green	5,300	4,200	10,600	1 ½	.3	7/8	1 ½
EN90	Yellow	8,400	6,700	16,800	3	.4	1 1/8	1 7/8
EN120	Tan	10,600	8,500	21,200	3	.5	1 1/8	2 1/8
EN150	Red	13,200	10,600	26,400	3	.7	1 3/8	2 1/4
EN180	White	16,800	13,400	33,600	3	.8	1 3/8	2 ½
EN240	Blue	21,200	17,000	42,400	3	1.1	1 3/4	3
EN360	Grey	31,000	24,800	62,000	3	1.6	2 1/4	3 3/4
EN600	Brown	53,000	42,400	106,000	8	2.5	2 3/4	4 5/8
EN800	Olive	66,000	52,800	132,000	8	3.1	3 1/8	5 1/4
EN1000	Black	90,000	72,000	180,000	8	4.0	3 5/8	6

- Excellent strength
- Low cost
- Fairly durable
- Can be cleaned
- Grip materials well
- Can be used in different orientations
- Lighter than chain or wire

- Easily abraded
- Can be cut on sharp edges
- Get dirty quickly
- Damaged by fuels/solvents
- Damaged by UV exposure over time

*Check with manufacturer to determine working load limit (WLL)

Griphoist and rigging gear: Chain

Grade 100 Alloy Chain	Premium quality, highest strength alloy chain, heat treated, used in a variety of sling and tie down applications. For overhead lifting applications, only Alloy Chain should be used.
Grade 80 Alloy Chain	Premium quality, high strength alloy chain, heat treated, used in a variety of sling and tie down applications. For overhead lifting applications, only Alloy Chain should be used.
Grade 70 Transport Chain	A high quality, high strength carbon steel chain, heat treated, used for load securement. **Not to be used in overhead lifting.**
Grade 43 High Test Chain	A carbon steel chain widely used in industry, construction, agricultural and lumbering operations. **Not to be used in overhead lifting.**
Grade 30 Proof Coil Chain	General purpose, carbon steel chain. Used in a wide range of applications. **Not to be used in overhead lifting.**
Machine Chain	Short pitch straight link or twist link, general utility chain made of carbon steel. **Not to be used in overhead lifting.**
Coil Chain	Long pitch straight link or twist link, general utility chain made of carbon steel. **Not to be used in overhead lifting.**
Passing Link Chain	Short, wide link chain which resists kinking or tangling, made of carbon steel. **Not to be used in overhead lifting.**
Stainless Steel Chain	A corrosion-resistant chain manufactured from stainless steel, used in food processing, chemical, marine, and high temperature environments. Certain stainless steel chains may be used for overhead lifting. Consult with the manufacturer before using any stainless steel chain for overhead lifting.

Griphoist and rigging gear: Chain

Grade 30 Proof Coil Chain
(Not to be used in overhead lifting applications)

Nominal Chain Size		Material Diameter		Working Load Limit (Max.)		Proof Test** (Min.)		Minimum Breaking Force**		Inside Length (Max.)		Inside Width (Min.)	
in	mm	in	mm	lbs	kg	lbs	kN	lbs	kN	in	mm	in	mm
1/8	4.0	0.156	4.0	400	180	800	3.6	1,600	7.2	0.94	23.9	0.25	6.4
3/16	5.5	0.217	5.5	800	365	1,600	7.2	3,200	14.4	0.98	24.8	0.30	7.7
1/4	7.0	0.276	7.0	1,300	580	2,600	11.6	5,200	23.2	1.24	31.5	0.38	9.8
5/16	8.0	0.331	8.4	1,900	860	3,800	16.9	7,600	33.8	1.29	32.8	0.44	11.2
3/8	10.0	0.394	10.0	2,650	1,200	5,300	23.6	10,600	47.2	1.38	35.0	0.55	14.0
7/16	11.9	0.488	11.9	3,700	1,680	7,400	32.9	14,800	65.8	1.64	41.6	0.65	16.6
1/2	13.0	0.512	13.0	4,500	2,030	9,000	40.0	18,000	80.0	1.79	45.5	0.72	18.2
5/8	16.0	0.630	16.0	6,900	3,130	13,800	61.3	27,600	122.6	2.20	56.0	0.79	20.0
3/4	20.0	0.787	20.0	10,600	4,800	21,200	94.3	42,400	188.6	2.76	70.0	0.98	25.0
7/8	22.0	0.866	22.0	12,800	5,810	25,600	114.1	51,200	228.2	3.03	77.0	1.08	27.5
1	26.0	1.020	26.0	17,900	8,140	35,800	159.1	71,600	318.2	3.58	90.9	1.25	31.7

The Proof Test and Minimum Breaking Force loads **shall not be used as criteria for service and design purposes. See Section 3.0.

Grade 43 High Test Chain
(Not to be used in overhead lifting applications)

Nominal Chain Size		Material Diameter		Working Load Limit (Max.)		Proof Test** (Min.)		Minimum Breaking Force**		Inside Length (Max.)		Inside Width (Min.)	
in	mm	in	mm	lbs	kg	lbs	kN	lbs	kN	in	mm	in	mm
1/4	7.0	0.276	7.0	2,600	1,180	3,900	17.3	7,800	34.6	1.24	31.5	0.38	9.8
5/16	8.7	0.343	8.7	3,900	1,770	5,850	26.0	11,700	52.0	1.29	32.8	0.44	11.2
3/8	10.0	0.406	10.3	5,400	2,450	8,100	36.0	16,200	72.0	1.38	35.0	0.55	14.0
7/16	11.9	0.468	11.9	7,200	3,270	10,800	48.0	21,600	96.0	1.64	41.6	0.65	16.6
1/2	13.0	0.531	13.5	9,200	4,170	13,800	61.3	27,600	122.6	1.79	45.5	0.72	18.2
5/8	16.0	0.630	16.0	13,000	5,910	19,500	86.5	39,000	173.0	2.20	56.0	0.79	20.0
3/4	20.0	0.787	20.0	20,200	9,180	30,300	134.7	60,600	269.4	2.76	70.0	0.98	25.0
7/8	22.0	0.866	22.0	24,500	11,140	36,750	163.3	73,500	326.6	3.03	77.0	1.08	27.5

The Proof Test and Minimum Breaking Force loads **shall not be used as criteria for service and design purposes. See Section 3.0.

Griphoist and rigging gear: Chain

Grade 70 Transport Chain
(Not to be used in overhead lifting applications)

Nominal Chain Size		Material Diameter		Working Load Limit (Max.)		Proof Test** (Min.)		Minimum Breaking Force**		Inside Length (Max.)		Inside Width (Min.)	
in	mm	in	mm	lbs	kg	lbs	kN	lbs	kN	in	mm	in	mm
1/4	7.0	0.281	7.0	3,150	1,430	6,300	28.0	12,600	56.0	1.24	31.5	0.38	9.8
5/16	8.7	0.343	8.7	4,700	2,130	9,400	41.8	18,800	83.6	1.29	32.8	0.44	11.2
3/8	10.0	0.406	10.3	6,600	2,990	13,200	58.7	26,400	117.4	1.38	35.0	0.55	14.0
7/16	11.9	0.468	11.9	8,750	3,970	17,500	77.8	35,000	155.4	1.64	41.6	0.65	16.6
1/2	13.0	0.531	13.5	11,300	5,130	22,600	100.4	45,200	200.8	1.79	45.5	0.72	18.2
5/8	16.0	0.630	16.0	15,800	7,170	31,600	140.4	63,200	280.8	2.20	56.0	0.79	20.0
3/4	20.0	0.787	20.0	24,700	11,200	49,400	219.6	98,800	439.2	2.76	70.0	0.98	25.0

**The Proof Test and Minimum Breaking Force loads shall not be used as criteria for service and design purposes. See Section 3.0.

Grade 80 Alloy Chain
(For overhead lifting applications, only alloy chain should be used)

Nominal Chain Size		Material Diameter		Working Load Limit (Max.)		Proof Test** (Min.)		Minimum Breaking Force**		Inside Length (Max.)		Inside Width Range	
in	mm	in	mm	lbs	kg	lbs	kN	lbs	kN	in	mm	in	mm
7/32	5.5	0.217	5.5	2,100	970	4,200	19.0	8,400	38.0	0.69	17.6	0.281 - 0.325	7.14 - 8.25
9/32	7.0	0.276	7.0	3,500	1,570	7,000	30.8	14,000	61.6	0.90	22.9	0.375 - 0.430	9.53 - 10.92
5/16	8.0	0.315	8.0	4,500	2,000	9,000	40.3	18,000	80.6	1.04	26.4	0.430 - 0.500	10.92 - 12.70
3/8	10.0	0.394	10.0	7,100	3,200	14,200	63.0	28,400	126.0	1.26	32.0	0.512 - 0.600	13.00 - 15.20
1/2	13.0	0.512	13.0	12,000	5,400	24,000	107.0	48,000	214.0	1.64	41.6	0.688 - 0.768	17.48 - 19.50
5/8	16.0	0.630	16.0	18,100	8,200	36,200	161.0	72,400	322.0	2.02	51.2	0.812 - 0.945	20.63 - 24.00
3/4	20.0	0.787	20.0	28,300	12,800	56,600	252.0	113,200	504.0	2.52	64.0	0.984 - 1.180	25.00 - 30.00
7/8	22.0	0.866	22.0	34,200	15,500	68,400	305.0	136,800	610.0	2.77	70.4	1.080 - 1.300	27.50 - 33.00
1	26.0	1.020	26.0	47,700	21,600	95,400	425.0	190,800	850.0	3.28	83.2	1.280 - 1.540	32.50 - 39.00
1-1/4	32.0	1.260	32.0	72,300	32,800	144,600	644.0	289,200	1,288.0	4.03	102.4	1.580 - 1.890	40.00 - 48.00

**The Proof Test and Minimum Breaking Force loads shall not be used as criteria for service and design purposes. See Section 3.0.

Griphoist and rigging gear: Chain

Grade 100 Alloy Chain
(For overhead lifting applications, only alloy chain should be used)

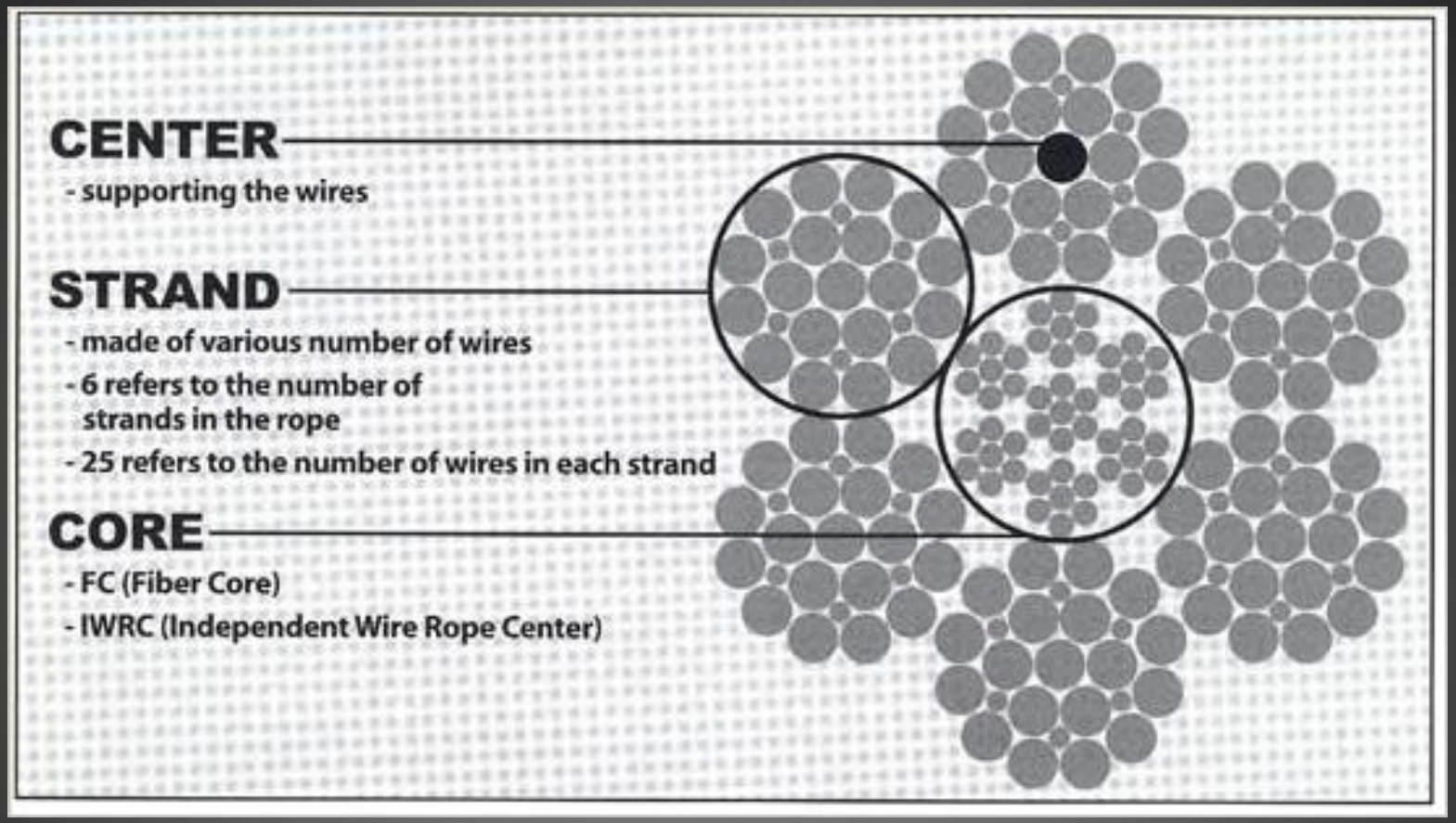
Nominal Chain Size		Material Diameter		Working Load Limit (Max.)		Proof Test** (Min.)		Minimum Breaking Force**		Inside Length (Max.)		Inside Width Range	
in	mm	in	mm	lbs	kg	lbs	kN	lbs	kN	in	mm	in	mm
7/32	5.5	0.217	5.5	2,700	1,220	5,400	23.8	10,800	47.6	0.69	17.6	0.281 - 0.325	7.14 - 8.25
9/32	7.0	0.276	7.0	4,300	1,950	8,600	38.5	17,200	77.0	0.90	22.9	0.375 - 0.430	9.53 - 10.92
5/16	8.0	0.315	8.0	5,700	2,600	11,400	51.0	22,800	102.0	1.04	26.4	0.430 - 0.500	10.92 - 12.70
3/8	10.0	0.394	10.0	8,800	4,000	17,600	79.0	35,200	158.0	1.26	32.0	0.512 - 0.600	13.00 - 15.20
1/2	13.0	0.512	13.0	15,000	6,800	30,000	134.0	60,000	268.0	1.64	41.6	0.688 - 0.768	17.48 - 19.50
5/8	16.0	0.630	16.0	22,600	10,300	45,200	201.0	90,400	402.0	2.02	51.2	0.812 - 0.945	20.63 - 24.00
3/4	20.0	0.787	20.0	35,300	16,000	70,600	315.0	141,200	630.0	2.52	64.0	0.984 - 1.180	25.00 - 30.00
7/8	22.0	0.866	22.0	42,700	19,400	85,400	381.0	170,800	762.0	2.77	70.4	1.080 - 1.300	27.50 - 33.00

**The Proof Test and Minimum Breaking Force loads shall not be used as criteria for service and design purposes. See Section 3.0.

Chain should be inspected prior to use:

- Look for physical damage
- Look for deformed links
- Look for stretching
- Inspect hooks/ends

Griphoist and rigging gear: Wire rope



Very strong
Easy to work with
Flexible
Good for long pulls/highlines

Relatively heavy
Can kink and become unuseable
Broken wires will cut you
Requires cleaning – time consuming

Griphoist and rigging gear: Wire rope

Diameter in Inches	6 x 25 & 6 x 37 (EIPS) IWRC	Weight lbs/ft.
1/4"	3.40 tons	.12
5/16"	5.27 tons	.18
3/8"	7.55 tons	.26
7/16"	10.20 tons	.35
1/2"	13.30 tons	.46
9/16"	16.80 tons	.59
5/8"	20.60 tons	.72
3/4"	29.40 tons	1.04
7/8"	39.80 tons	1.42
1"	51.70 tons	1.85
1-1/8"	65 tons	2.34
1-1/4"	79.90 tons	2.89
1-3/8"	96 tons	3.50
1-1/2"	114 tons	4.16

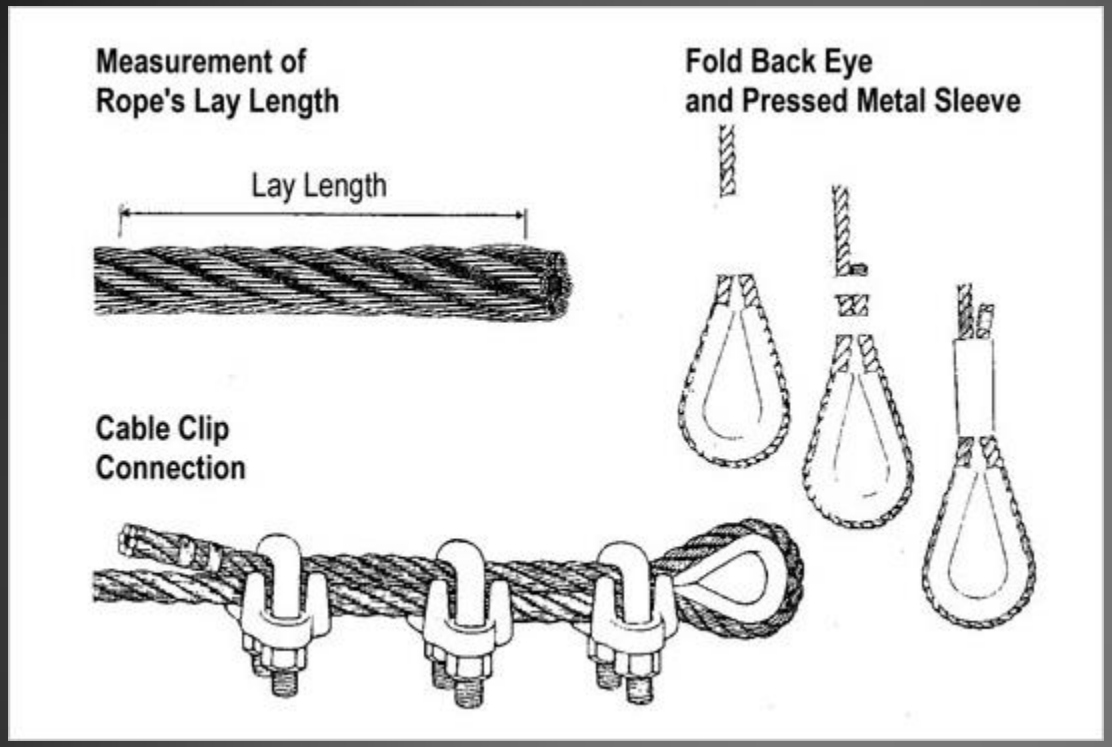
CAPACITY RATINGS FOR VERTICAL LIFT, CHOKER AND BASKET LIFTS

Rope diameter	Capacity in tons of 2000 lbs.			Eye loop size in inches (W x L)	Weight per foot
	Vertical 	Choker 	Vertical basket 		
1/4	0.7	0.5	1.3	2 X 4	.116
3/8	1.4	1.1	2.9	3 X 6	.26
1/2	2.5	1.9	5.0	4 X 8	.46
5/8	3.9	2.9	7.8	5 X 10	.72
3/4	5.6	4.2	11.2	6 X 12	1.04
7/8	7.6	5.7	15.2	7 X 14	1.42
1	9.8	7.4	19.6	8 X 16	1.85
1-1/8	12.4	9.3	24.8	9 X 18	2.34
1-1/4	15	11.3	30.0	10 X 20	2.89
1-3/8	18	13.5	36	11 X 22	3.5
1-1/2	21	15.8	42	12 X 24	4.16

*Ratings for assemblies reflect mechanical eye splices and a multiple 5 safety factor.
*Rated capacities will change on choker and vertical baskets as rope angle changes.
*Ratings are EIPS (Extra Improved Plow Steel). IPS (Improved Plow Steel) ratings are slightly less.

These are examples: check with your manufacturer

Griphoist and rigging gear: Wire rope

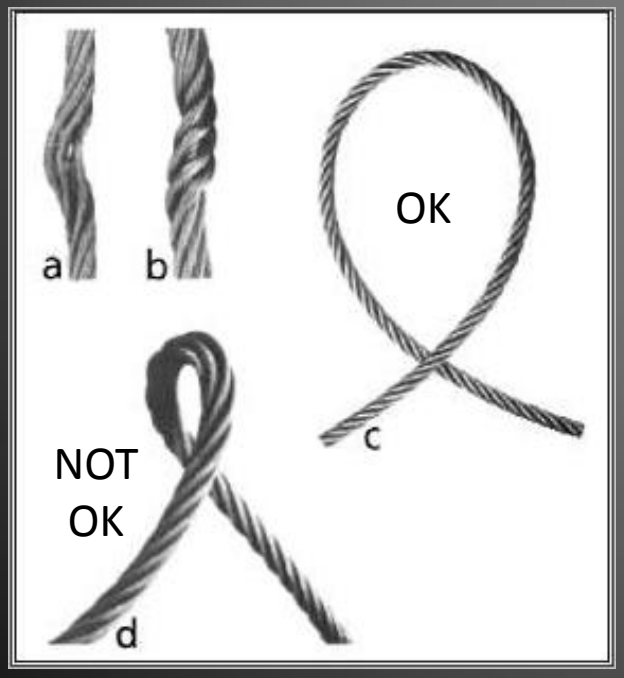


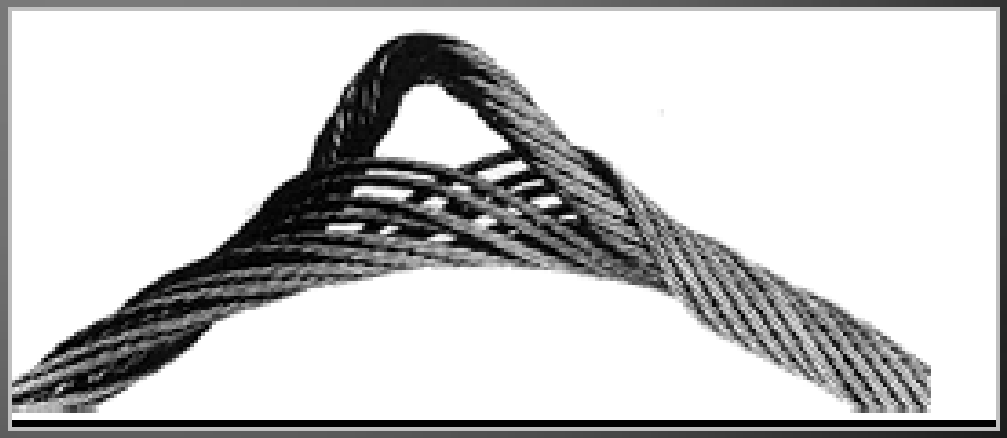
Pressed metal sleeves are much stronger, and can be equal to wire rope strength

Cable clips are weaker (only 80% of rope strength at best), tend to fray rope at end

Note the use of metal thimbles – this is stronger and will extend the life of the wire rope greatly

Griphoist and rigging gear: Wire rope inspection and maintenance





Griphoist and rigging gear: Wire rope inspection and maintenance

OSHA says:

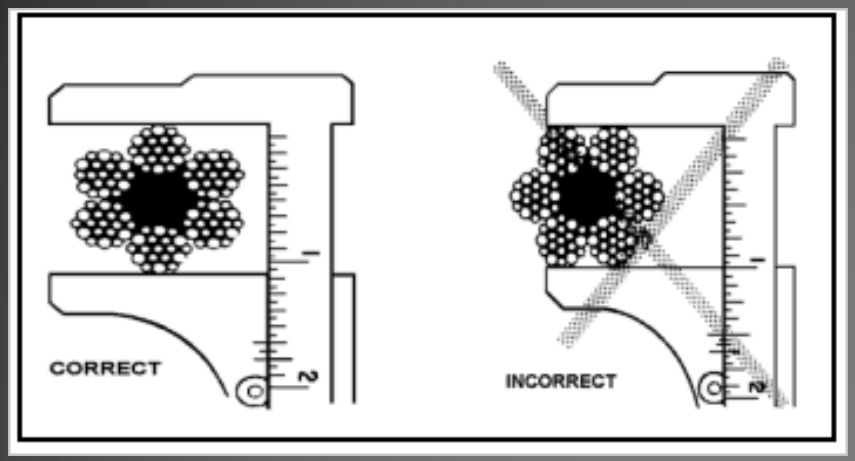
Always wear gloves while inspecting wire rope

Check the full length for deformities, broken strands, kinks, abrasion, corrosion, etc

If ten randomly distributed wires in one lay are broken, or five wires in one strand of a rope lay are damaged, it must not be used

All other factors being equal, misuse or abuse of wire rope will cause it to become unsafe long before any other factor

Griphoist and rigging gear: Wire rope inspection and maintenance



Rope Diameter (inches)	Maximum Allowable Nominal Diameter Reduction (inches)
5/16 and smaller	1/64
3/8 to 1/2	1/32
9/16 to 3/4	3/64
7/8 to 1 1/8	1/16
1 1/4 to 1 1/2	3/32
19/16 to 2	1/8
2 1/8 to 2 1/2	5/32

Maintenance:

- Always wear gloves
- Stretch the wire rope out under light tension
- Use a wire brush to brush off loose dirt
- Wipe down the wire rope with a rag
- Apply a light coat of lubricant (check manufacturers specs

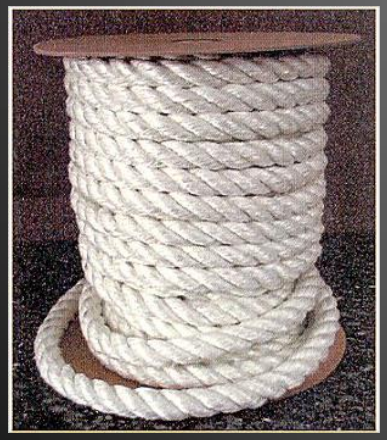
Griphoist and rigging gear: Additional rigging components

Shackles

Keyhole/grab link

Snatch blocks

Rope



Hook link

Wire rope gripper

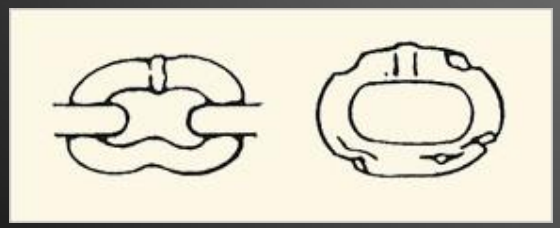
Griphoist and rigging gear:

Climbing gear

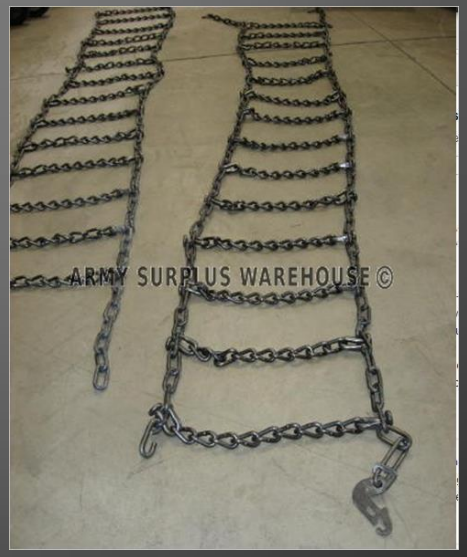
What not to use

Equipment with no rating information

Damaged equipment



Equipment not rated for rigging



When moving stuff with Griphoists and rigging – you will need at least 1 anchor point

Big rocks are great anchor points – make sure they are bigger than the load you need to move

Anchor points cont'd

Trees are great anchors – but evaluate them carefully

Alive or dead?

Solidly rooted?

Overhead hazards?

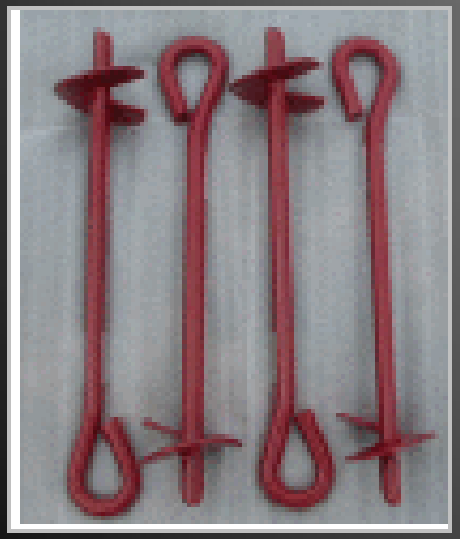
Protect the tree

Anchor points cont'd

Stationary vehicle (wheels chocked)

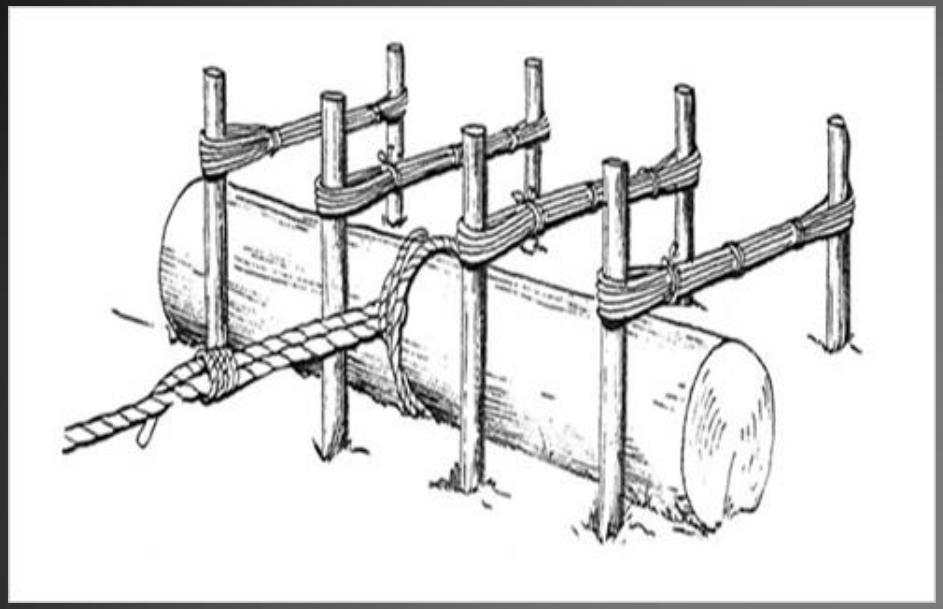
Fixed poles

Helical soil anchors



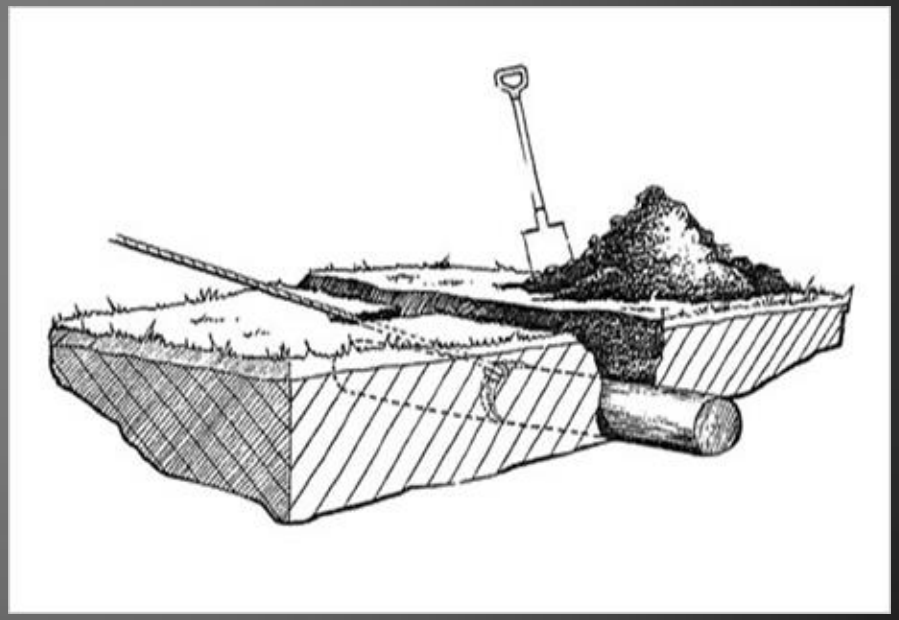
Rock expansion bolts

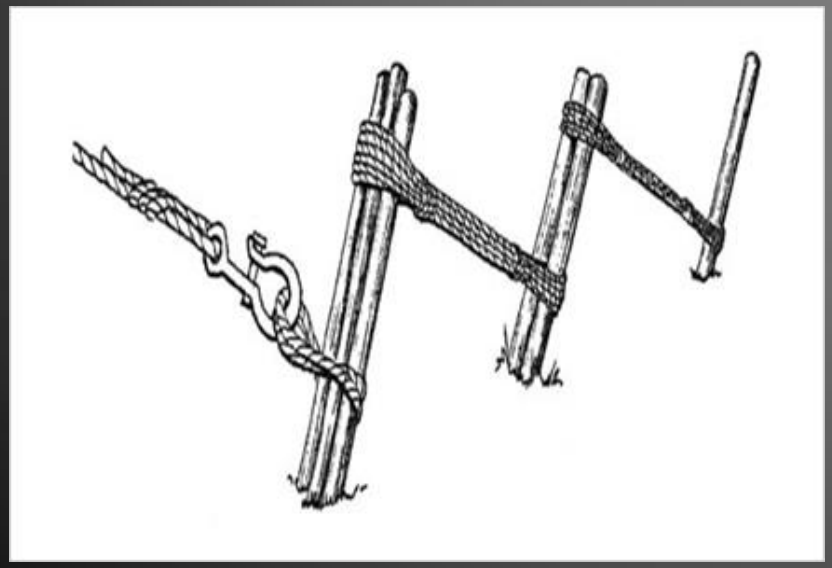
Anchor points cont'd



Deadman anchors:

- Low tech
- Low cost
- Labor intensive
- Strength rating?





Griphoist and rigging operations

All Personal Protective Equipment (PPE) must be worn at all times
- In good condition and properly fitted

Sizeup the worksite and the task at hand
- Identify what is being moved to where
- Perform load calculations

Choose equipment rated for the job
- Inspect prior to use

Identify anchor point or points
- Carefully evaluate each for suitability

Layout equipment in place
- Carefully connect all pieces in the system
- Make note of the WLL of each

Griphoist and rigging operations

Verbalize the entire rigging system from start to finish

- Identify each component and its rating
- Double-check each connection
- Identify the weak point in the system – all other things being equal, this is where failure will occur if it occurs

Put moderate tension on the system

- Watch for shifts and/or changes
- Some things will twist or settle into place – expect it
- Pay close attention to the anchor point(s)
- Also watch the load for shifting or unexpected movement

Walk through the system again and check each component

If all components are good – proceed with your operation

Griphoist and rigging operations

Most rigging operations will involve a single, straight pull

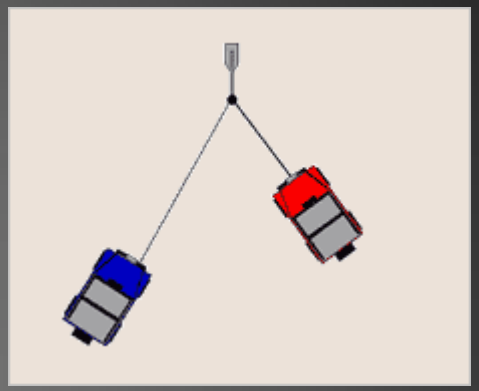
While this is a simple operation, bad things can still happen if you do not follow the rules

Take every rigging operation seriously

Griphoist and rigging operations

Complex rigging may include:

- Directional changes



- Mechanical advantage

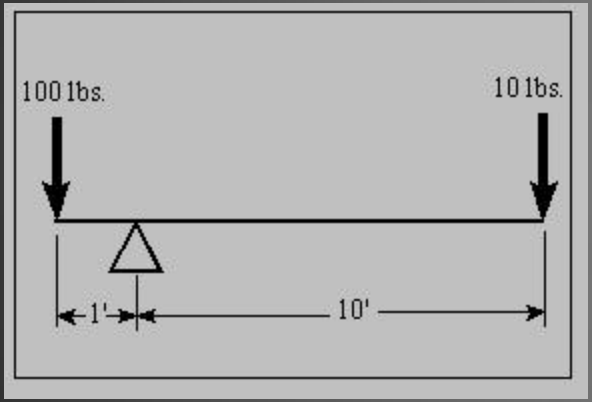
Griphoist and rigging operations

Highlines/Skylines

Mechanical advantage is the factor by which a mechanism multiplies the force applied to it

MA = Output Force/Input Force

Simple Lever (think rock bar)

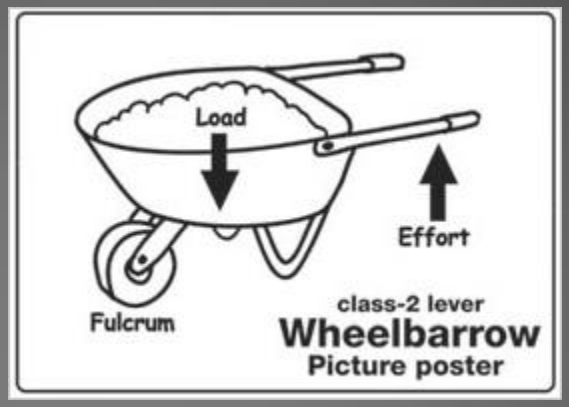


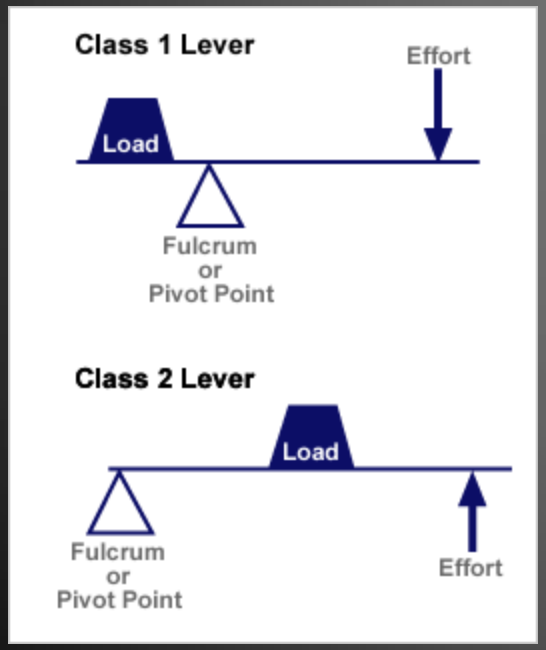
= 10:1 mechanical advantage

Mechanical advantage, der Hebelarm, effet mécanique, μηχανικό όφελοσ, 수압기 등의 기기에 의한 힘의 확대율, mehanička efikasnost, superioridad mecánica

Mechanical advantage cont'd

A wheelbarrow typically has a MA of 2.2



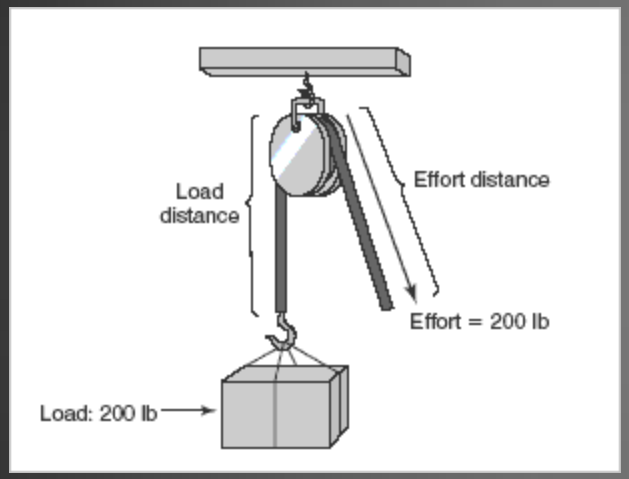


A shovel has a MA of around 12 (note: this is also a wedge)

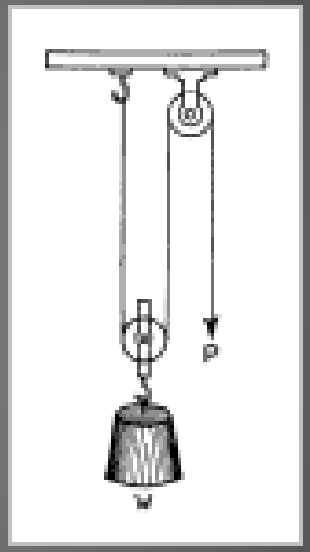
A rock bar has a variable MA depending on the fulcrum point

Griphoist and rigging operations

Snatch blocks can provide a change in direction and/or mechanical advantage depending on how you use them



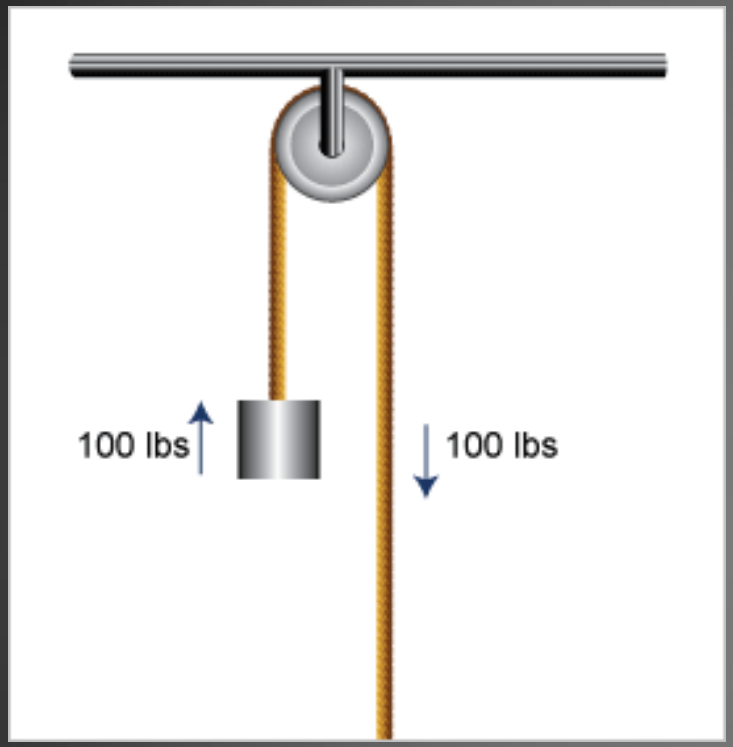
Change of direction



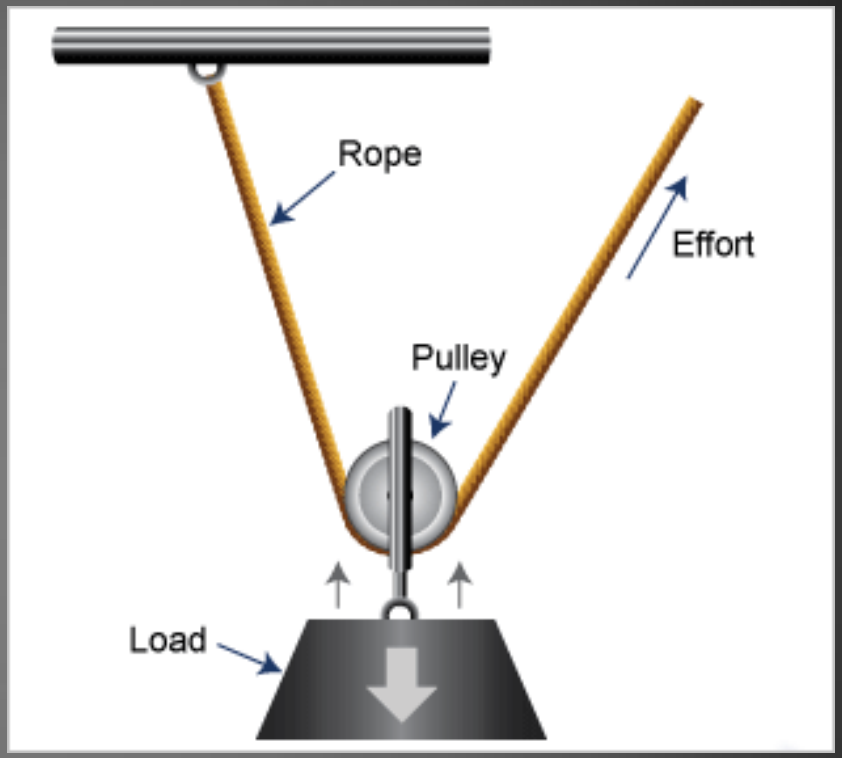
Mechanical advantage

Know the difference!

Snatch blocks cont'd



1:1 directional only – no MA – force in equals force out



2:1 MA – force in is doubled

Key Difference: pulley on the left is a *standing pulley* – it does not move.
pulley on the right is a *traveling pulley* – it moves with the load

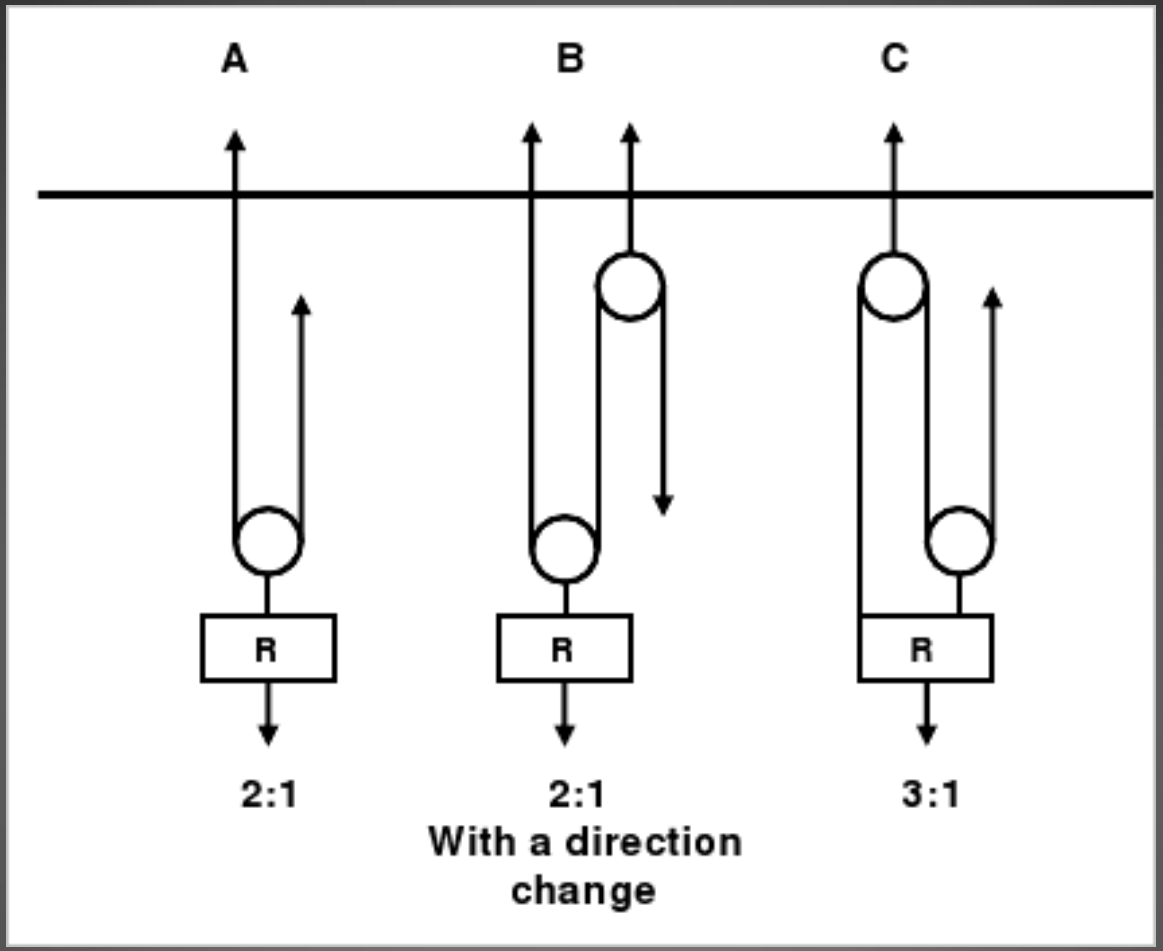


Fig. 7-A. A simple 2:1 system with one supporting line. The pulling line counts because it comes from the Traveling Pulley.

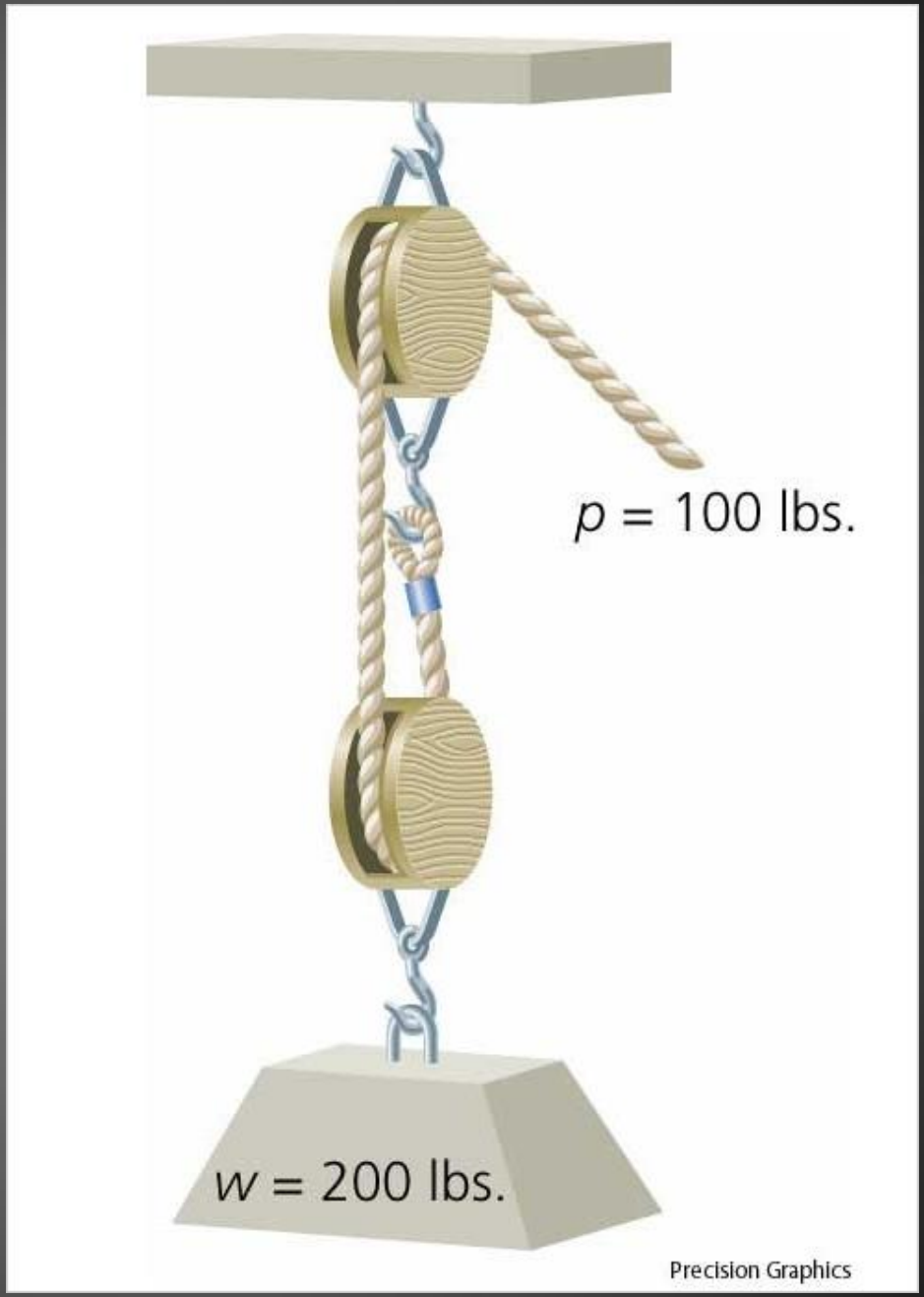
Fig. 7-B. A 2:1 system with a direction change by means of a Standing Pulley. The pulling line does not count, because it comes from the Standing Pulley.

Fig. 7-C. A 3:1 system with two supporting lines. The pulling line counts because it comes from the Traveling Pulley.

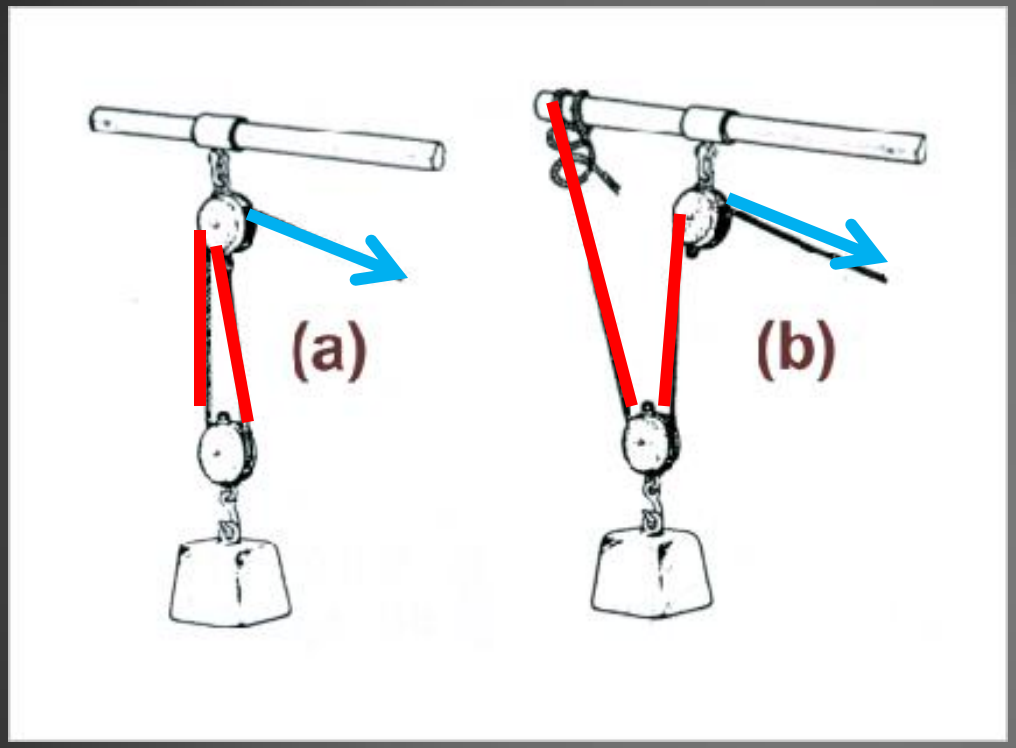
Snatch blocks cont'd

Simple system giving a 2:1 MA

Note: this assumes a frictionless system (ideal MA), which is not possible. There will always be some loss to heat and friction



Snatch blocks cont'd



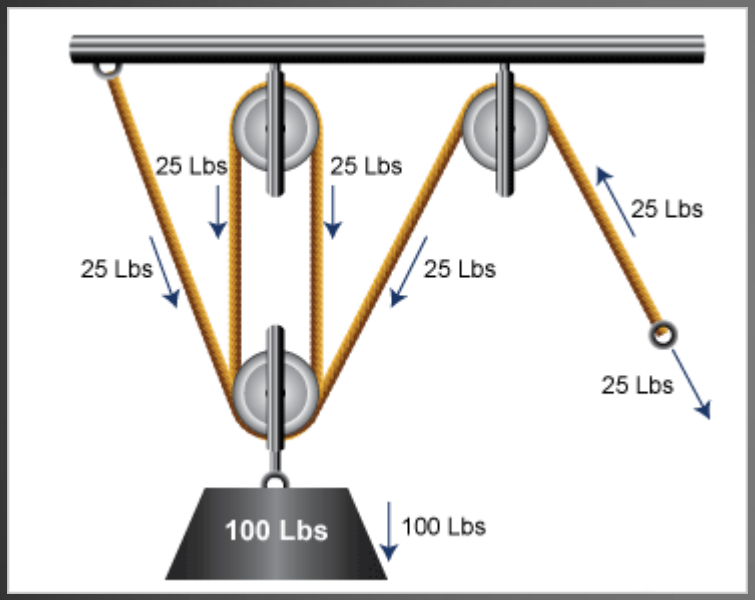
More simple 2:1 systems

Think of it this way: how many legs on the load vs. the load line

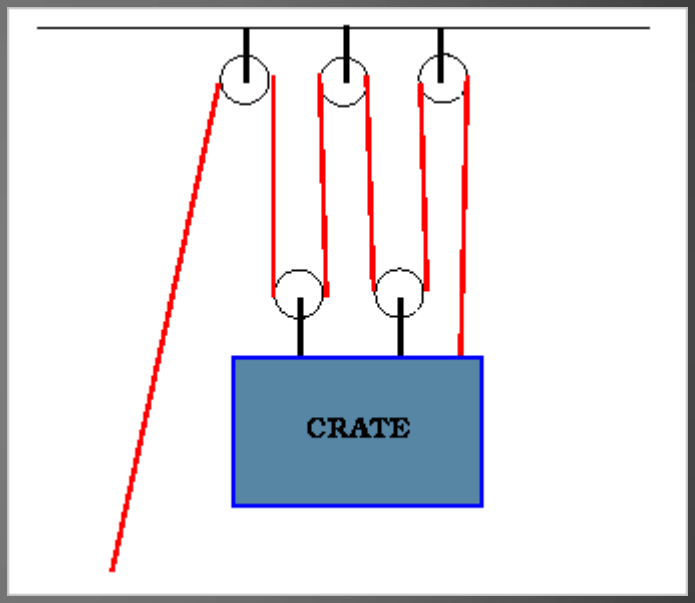
2 lines on the load, 1 load line = 2:1 MA

Advanced systems

What is the MA for each?



4:1

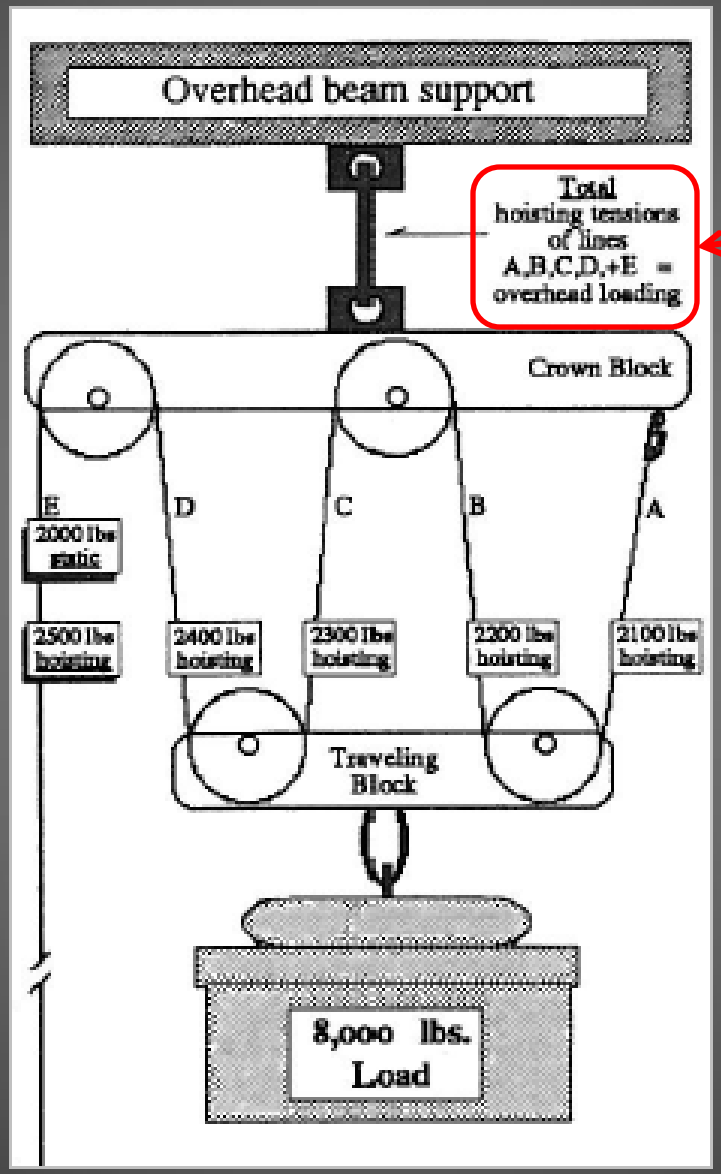


5:1

Remember: more components in the MA pulley system = less distance the load travels

Pay close attention to the load experienced by each individual component of the system

In this case, the line experiences no more than 2,500 lbs



The top connection point receives a much higher load than the line

*Note: this example accounts for friction in the blocks

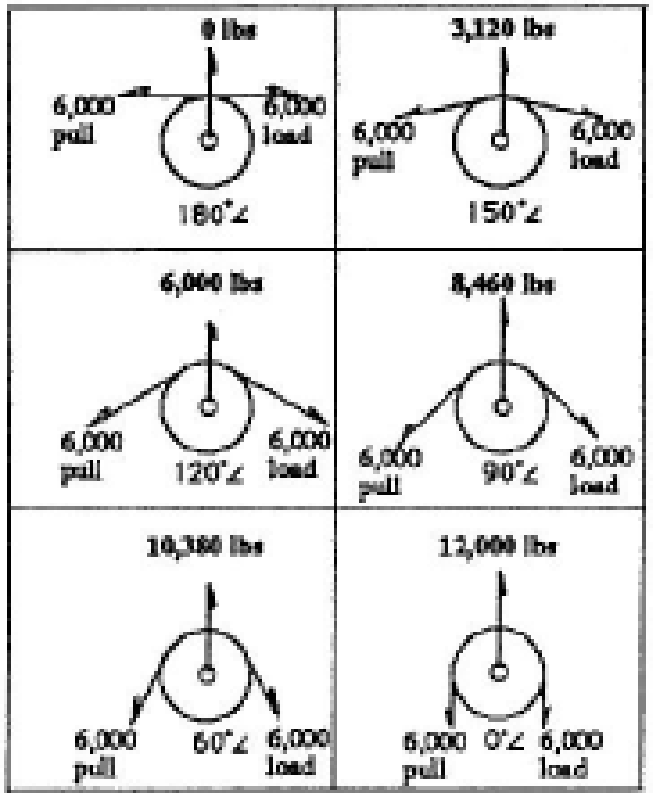
What it looks like in the field:

2:1 Mechanical advantage to rotate a boulder

What it looks like in the field:

Griphoist #1 (center of photo): directional change only
Griphoist #2 (far right): 2:1 MA with additional block as a directional

Line Angle	Load Factor	Line Pull		Block Tension
180	-0-	x 6000	=	-0-
150	.52	x 6000	=	3,120
120	1.00	x 6000	=	6,000
90	1.41	x 6000	=	8,460
60	1.73	x 6000	=	10,380
0	2.00	x 6000	=	12,000



The load on the block changes dramatically as the angles of the line increase from zero (straight) to zero (parallel)

It is easy to overload a block by simply changing line angles

Load control: do not lose the things you are trying to move

Chain wraps, sling used to equalize the pull

Sling in choker configuration

Ladder or basket type sling

Sling in choker orientation

Chain double-wrapped around boulder, keyhole link to connect to chain, shackle connecting keyhole link to block, block setup as 2:1

Review:

All PPE in place first

Size-up the task thoroughly – what you need to do, calculate the load

"I need to move this 250 lb rock 20 feet across flat trail. I can safely do this with a griphoist and rigging gear"

Select the appropriate tools and equipment

"*I will use a TU-17, shackles, chain for the rock, a sling for the tree anchor, etc"*

Layout and connect all components in the system

"make my connections, paying attention to the rating of each piece of gear"

Double-check all components and verbalize the entire system

"I have a solid tree anchor basket-wrapped with a sling (10,000lbs WLL), connected to my griphoist with a ½" shackle (4,000lbs WLL), etc"

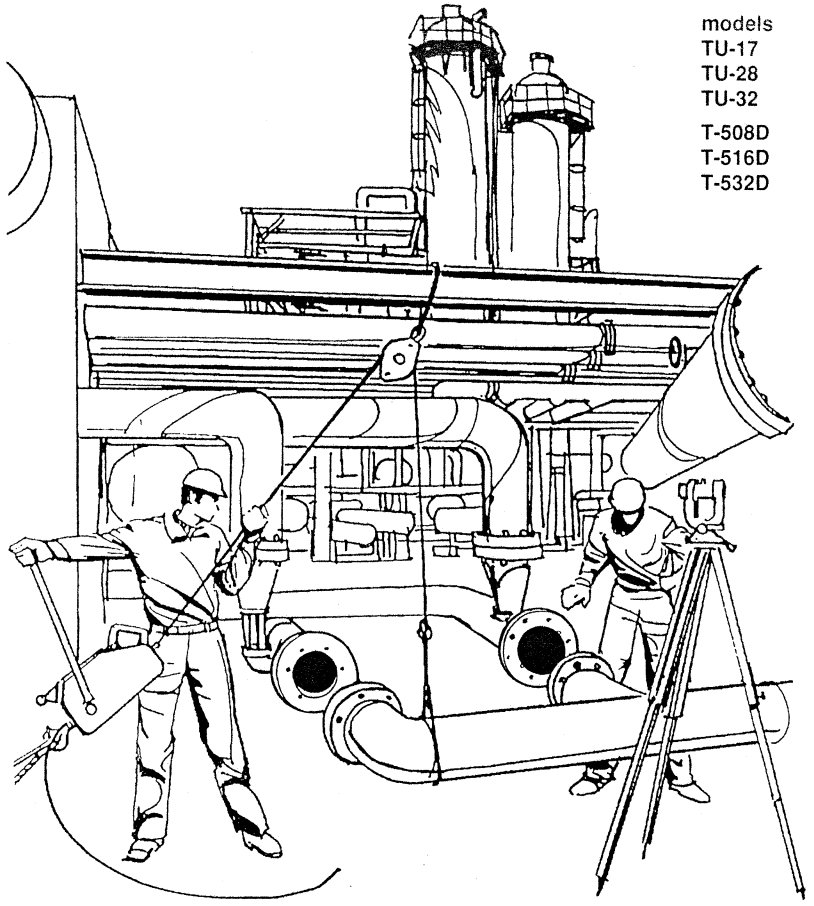
Put moderate tension on the system, watch carefully and recheck

"all components look good, my anchor sling rotated but remains secure, chain on the load is good, etc"

Perform the operation keeping an eye out for changes/shifts, etc

griphoist®

manual hoists
operating and maintenance



models
TU-17
TU-28
TU-32

T-508D
T-516D
T-532D

Griphoist Inc.

Main Office 392 University Avenue - P.O. Box 68 - Westwood, MA 02090
Tel.: (617) 329-5650 - Wats: 1-800-421-0246 - Telex: 940-502 - Fax.: (617) 329-6530
Branch Office: 331 Littlefield Avenue, S. San Francisco CA 94080 - Tel.: (415) 583-4008

008402315/1

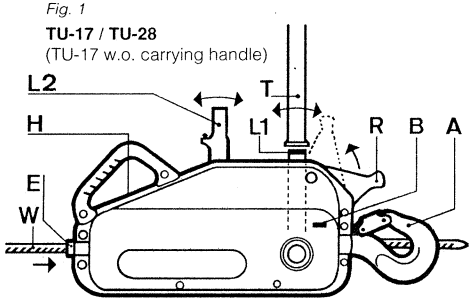
P2019US-04/96

Griphoist Inc.

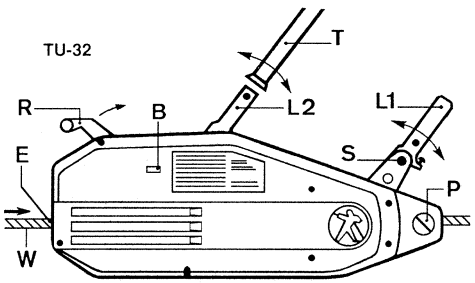
SUMMARY Page

Fig. 1

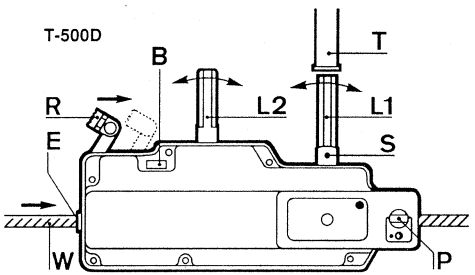
TU-17 / TU-28
(TU-17 w.o. carrying handle)



TU-32



T-500D



A	Anchor hook
P	Anchor pin
L1	Forward lever
L2	Reverse lever
R	Rope release lever
B	Lock button
T	Telescopic operating handle
S	Shear pin
H	Oil hole
E	Wire rope entry
W	Wire rope

READ THIS PAGE, FIRST

⚠ GENERAL WARNING ⚠

IT IS THE RIGGER'S AND THE OPERATOR'S RESPONSIBILITY, AND THEIR EMPLOYER'S RESPONSIBILITY, IF THEY OPERATE UNDER AN EMPLOYER'S CONTROL, TO STRICTLY CONFORM TO THE FOLLOWING WARNINGS.

THIS GRIPHOIST MACHINE IS A LIFTING MACHINE **FROM WHICH A LOAD CAN BE SUSPENDED.** THEREFORE, SERIOUS INJURY AND EVEN DEATH OF THE OPERATOR **AND OTHERS** MAY RESULT FROM MISUSE OR IMPROPER RIGGING OR MAINTENANCE OF THE MACHINE OR OF ITS ROPE, AND FROM NOT FOLLOWING THE INSTRUCTIONS CONTAINED IN THIS MANUAL.

A - It is imperative, for safety and efficiency, that this manual be read and fully understood by the rigger and the operator before rigging or operating the GRIPHOIST machine, and that all the instructions contained herein be carefully and strictly followed. For manriding operations, refer to chapter 10.

B - Always keep this manual ready for reference by the rigger or the operator at any time. Extra copies of this manual are available from GRIPHOIST Inc. Should this manual not be available on site of operation in due time, do not fail to get another one BEFORE rigging and operating.

C - Never rig or operate the machine if any warning, operating or capacity instruction, normally attached to the hoist, is obscured or missing. Refer to chapter 11. GRIPHOIST Inc. will supply a new one. This warning applies also to the BLOCSTOP when used.

D - Before rigging and operating this GRIPHOIST machine, the rigger and the operator must become aware of all the requirements of applicable federal, state and local safety regulations, specially those relating to the features of the equipment, to its use, maintenance, control and overhaul.

E - Every time the machine is to be rigged or used, check that the machine, wire rope and ancillary equipment are in good condition. (See chapters 7 and 8). Never operate the machine if damage is noted on it or on the wire rope. This warning applies also to the BLOCSTOP when used.

F - A careful and regular inspection of the GRIPHOIST machine and its wire rope is part of the maintenance requirements for safe operation, specially under site conditions. Thorough overhaul servicing is available from the GRIPHOIST organization.

G - GRIPHOIST Inc. declines any responsibility for the consequences of dismantling or altering the machine, or repairing its wire rope, by anyone who is not authorized by GRIPHOIST Inc. Only GRIPHOIST parts must be used. Never substitute.

H - GRIPHOIST Inc. assumes no liability for the adequacy of particular installations incorporating one or several GRIPHOIST machines, beyond the information given in this manual.

I - Do not hand over this machine for use or rigging to anybody who is not reasonably fit to operate it in a responsible manner.

J - The models of GRIPHOIST machines described in this manual are designed exclusively for hand operation. NEVER ATTEMPT TO MOTORIZE OR TO MECHANICALLY OPERATE THEM. If this is desired, contact GRIPHOIST Inc. for special motorized machines.

THIS MANUAL MUST NOT BE TAKEN AS AN OVERALL SURVEY ON PULLING, LIFTING AND PROFESSIONAL OPERATIONS IN WHICH THE GRIPHOIST MACHINE MAY BE USED.
WHENEVER CALCULATIONS AND SPECIFIC RIGGING AND HANDLING OR PROFESSIONAL OPERATION ARE INVOLVED, THE OPERATOR SHOULD BE PROFESSIONALLY TRAINED TO THAT END, PRIOR TO SUCH OCCURENCES.

1. INTRODUCTION

The GRIPHOIST machine is a hand operated wire rope lifting and pulling machine, designed for heavy duty and professional work. It is versatile, portable and multipurpose, not only for pulling and lifting, but also for lowering, tensioning and guying.

The range of GRIPHOIST machines comprises two different series: the T-500D series and the TU series. Each series includes three models of different capacities. **The TU machines are designed to comply with manriding requirements, and are UL classified.**

GRIPHOIST machines are shipped in a cardboard box which contains:

- the hoist
- a telescopic handle
- this operating and maintenance manual
- a spare parts list
- a guarantee card

Each GRIPHOIST machine is shipped with a standard length of equipped special GRIPHOIST wire rope, reeled on a lightweight metal reel. Each equipped wire rope is composed of:

- a wire rope with a welded and tapered round end
- a hook with a latch, fitted at the other end by mechanically swaged sleeve and thimble.

NOTE: As a rule, GRIPHOIST units are not sold without special GRIPHOIST wire rope.

⚠ **WARNING:** THE T-500D SERIES MACHINES (T-508D, T-516D, T-532D) ARE NOT CLASSIFIED BY UL FOR MANRIDING AND MUST NOT BE USED FOR MANRIDING IN THE USA.

NOTE: FOR THE USE OF TU MODELS FOR MANRIDING, CAREFULLY READ CHAPTER 10: "SPECIAL INSTRUCTIONS FOR MANRIDING".

GRIPHOIST machines are wire rope hoists; their special technical design requires that they be used exclusively with the appropriate model of GRIPHOIST wire rope which is specially designed for them.

⚠ **WARNING:** GRIPHOIST MACHINES MUST BE USED ONLY WITH A GRIPHOIST WIRE ROPE.

Each GRIPHOIST machine has been carefully manufactured and assembled from quality materials, and has been **individually tested to 25 % overload.** It will give you quality service, provided that the instructions of this manual are carefully followed.

2. DESCRIPTION

2.1. Working principle and its advantages

The principle of the GRIPHOIST machines is based on a unique arrangement of two pairs of grip jaws which are enclosed in a casing. These pairs of grip jaws work like two hands alternately seizing the wire rope to pull it for lifting, tensioning, or pulling the load, or retain it during lowering, or slackening, according to the lever which is operated, **without any ratchet and pawl mechanism.**

ADVANTAGES

A removable telescopic handle is connected to one of the two operating levers, according to the direction of the wire rope movement, and supplies the required leverage. Since no ratchet and pawl system is used, any handle movement moves the load.

1 THE WIRE ROPE MOVES WITH THE UTMOST PRECISION AT THE SLIGHTEST MOVEMENT OF THE HANDLE. THE LOAD IS HELD IN ANY POSITION OF THE OPERATING LEVER.

The jaws are self gripping under the action of the load or effort. The initial pressure which causes the jaws to grip the wire rope and engages them in the self gripping action, is provided by **powerful springs.**

2 THE HEAVIER THE LOAD, THE STRONGER THE GRIP.

The grip jaws are manufactured to a radius to suit the wire rope diameter. Their surfaces are smooth, and grip the wire rope in a straight line without damaging it.

3 THE WIRE ROPE HAS A LONG LIFE.

Instead of the wire rope being reeled on a drum, as it is on an ordinary winch, it is pulled through the GRIPHOIST in a straight line.

4 THE WIRE ROPE TRAVEL IS UNLIMITED.

Since the machine and the wire rope are separate parts when not in operation, they can be stored and transported separately.

5 THE MACHINE IS LIGHT AND PORTABLE, WHATEVER THE REQUIRED LENGTH OF WIRE ROPE FOR THE JOB.

The machine can be anchored in any position and, because of its design, aligns itself with the wire rope when under load.

6 THE MACHINE CAN WORK IN ANY POSITION.

Because of the above features,

7 THE MACHINE CAN BE USED TRAVELLING ON A FIXED WIRE ROPE OR FIXED, WITH THE WIRE ROPE TRAVELLING, AND THE ANCHORING REQUIREMENTS ARE SIMPLE.

2.2. Technical specifications

Model		T-508D	TU-17*	T-516D	TU-28*	T-532D	TU-32*
Rated load for materials	**lbs	2,000	2,000	4,000	4,000	8,000	8,000
Rated load for manriding	* lbs		1,500		3,000		6,000
Wire rope breaking strength	lbs	10,000	10,000	20,000	20,000	40,000	40,000
Approx. speed per minute	ft.p.m.	7 - 9	7 - 9	6	7 - 8	6	5
Weight:							
hoist w.o. operating handle	lbs	15	19	30	41	53	64
operating handle	lbs	2	2	5	5	5	5
Overall dimensions	ins.	16-1/2 x9-7/8 x3-7/8	20-3/4 x9-3/4 x4-1/2	20-7/8 x12-7/16 x5	26 x13 x5-3/4	24-7/16 x14 x5-1/8	27 x13 x6-1/8
Length of operating handle closed	ins.	16	18	25-1/2	25-1/2	25-1/2	25-1/2
extended		27-1/4	29	45-1/4	45-1/4	45-1/4	45-1/4
GRIPHOIST wire rope:							
standard length***	ft.	30	30	60	60	30	30
diameter	ins.	5/16	5/16	7/16	7/16	5/8	5/8
	mm	8.4	8.4	11.6	11.6	16.3	16.3
	ref.	C8	C8	C12	C12	C16	C16
Construction - Galv. XIPS		4x26	4x26	4x26	4x26	4x36	4x36

* UL classified
** **Rated load for materials hoisting.** For manriding, conform to all safety regulations.
*** any odd lengths supplied on request.
Unless specified otherwise, wire rope is fitted with its standard eye hook with latch at one end and welded tip at the other end.

NOTE: The rated load for manriding includes the weight of lifted personnel and of all the equipment which is lifted with the main load.

2.3. Equipment required

The following standard equipment is required:

a. the appropriate GRIPHOIST machine for the load to be handled, with its telescopic handle,
b. the corresponding equipped GRIPHOIST wire rope of sufficient length for the job,
c. corresponding wire rope or chain slings for anchoring the hoist and for attaching the load to the wire rope,
d. properly rated pulley blocks, when an increased working capacity is required,
e. oil to lubricate the inner mechanism of the machine and the wire rope.

3. INSTALLATION INSTRUCTIONS

NOTE: Parts mentioned below and referenced by a letter are illustrated on page two, Fig. 1.

3.1. Procedure

WARNING: BEFORE EACH USE, CHECK THAT THE GRIPHOIST MACHINE AND ITS HANDLE, THE GRIPHOIST WIRE ROPE, THE ANCHORING ACCESSORIES AND OTHER EQUIPMENT ARE IN GOOD AND SAFE WORKING CONDITION.

CAUTION: Before using a GRIPHOIST machine, lubricate generously by pouring motor oil inside the machine through its openings (lever openings and oil hole). There is no risk of overlubricating.

CAUTION: Before fitting the GRIPHOIST wire rope into the machine, always uncoil it in a straight line in order to prevent loops which might untwist strands or form kinks when under tension. The correct and incorrect procedures are shown in Fig. 22 and Fig. 23.

CAUTION: WE SPECIALLY RECOMMEND ANCHORING THE MACHINE BY MEANS OF A SLING, since this allows a maximum ability to align it in the direction of the effort, and is part of the safe operating procedure.

3.1.1. Procedure for TU-17

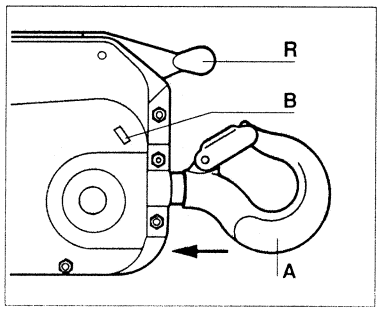


Fig. 2 - TU-17 sliding hook.

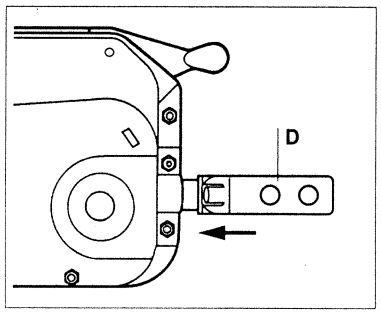


Fig. 2a - TU-17 sliding stirrup bar.

1 - **Before pushing in the lock button (B), push the sliding anchor hook A** (or sliding stirrup bar D - Fig. 2a) until collar contacts casing, to unlock release lever (R). Push reversing lever (L 2) towards wire rope entry (E).

2 - Push in and maintain pressure on the lock button (B) and start pulling up the rope release lever (R). Release lock button. Pull release lever further until it locks itself into open position (see Fig. 3). Both pairs of jaws are now open.

3 - Push reversing lever (L2) towards hook. Insert GRIPHOIST wire rope at entry (E) and push until it comes out of the anchor hook (A).

4 - Pull the slack wire rope through machine by hand (wear gloves), until it becomes nearly tight on the load. (Allow some extra length for anchoring the machine).

5 - Anchor the machine hook A (Fig. 2) or the stirrup bar D (Fig. 2a See also detailed instructions page 12) and the wire rope hook. **Check that hook latches are closed** (Fig. 5 and Fig. 11).

6 - To close jaws on wire rope, pull up release lever (R) slightly. Then, push and maintain pressure on the lock button (B) and allow the release lever to slowly return to initial position. Release lock button. Machine is now ready for use.

7 - Place the telescopic handle (T) on lever (L1) to lift or pull, or on lever (L2) to lower or to slacken the wire rope. **Twist the handle to ensure that it is locked in position.**

8 - To remove the wire rope from the machine, slacken the rope by operating lever (L2) before operating the release lever (R) as in 2 above.

CAUTION: Before operating the machine, check that the rope hook and machine h... latches are closed. (See Fig. 5 and 11).

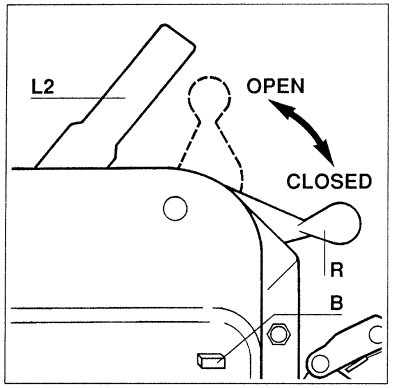


Fig. 3 - TU-17 and TU-28 rope release lever R.

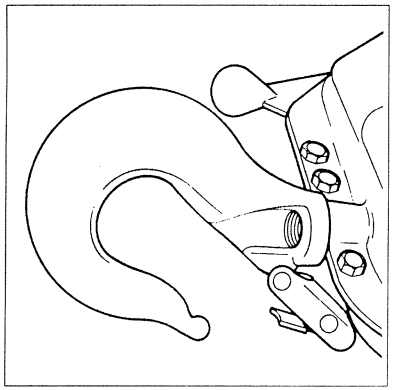


Fig. 4 - TU-17 and TU-28.
*Machine hook latch in **opened** position.*

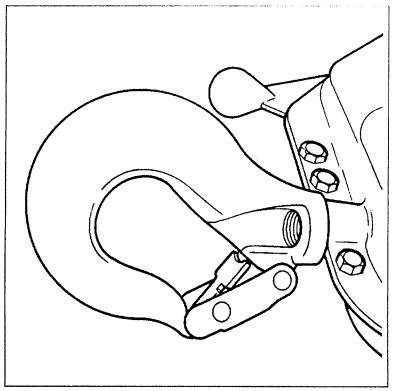


Fig. 5 - TU-17 and TU-28.
*Machine hook latch in **closed** position.*

3.1.2. Procedure for TU-28

1 - Push reversing lever (L2) towards carrying handle.

2 - Push in and maintain pressure on the lock button (B) and start pulling up the rope release lever (R). Release lock button. Pull release lever further until it locks itself into open position (see Fig. 3). Both pairs of jaws are now open.

3 - Push reversing lever (L2) towards hook (A). Insert GRIPHOIST wire rope at entry (E) and push until it comes out of the anchor hook (A).

4 - Pull the slack wire rope through the machine by hand (wear gloves), until it becomes nearly tight on the load. (Allow some extra length for anchoring the machine).

5 - Anchor the machine hook (A) and the wire rope hook. **Check that hook latches are closed** (Fig. 5 and Fig. 11).

6 - To close jaws on wire rope, pull release lever (R) slightly towards carrying handle. Then, push and maintain pressure on the lock button (B) and allow the release lever to slowly return to initial position. Release lock button. Machine is now ready for use.

7 - ⚠ Place the telescopic handle (T) on lever (L1) to lift or pull, or on lever (L2) to lower or to slacken the wire rope. **Twist the handle to ensure that it is in locked position.**

8 - To remove the wire rope from the machine, slacken the rope by operating lever (L2) before operating the release lever (R) as in 2 above.

CAUTION:

Before operating the machine, check that the rope hook and machine hook latches are closed. (See Fig. 5 and Fig.11).

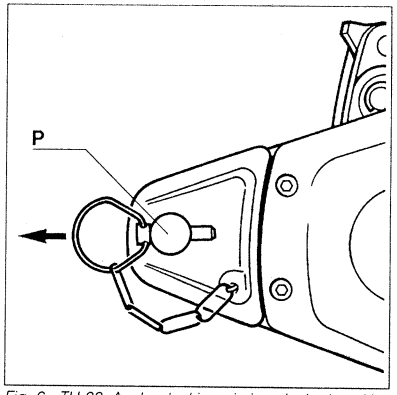


Fig. 6 - TU-32. Anchor locking pin in unlocked position for removing the anchor pin.

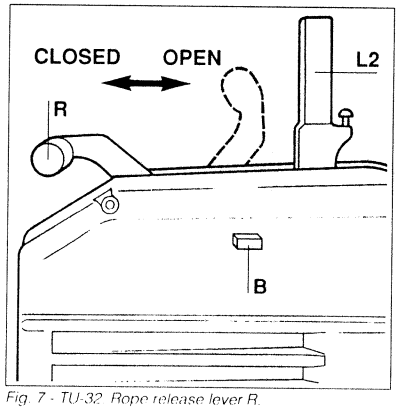


Fig. 7 - TU-32. Rope release lever R.

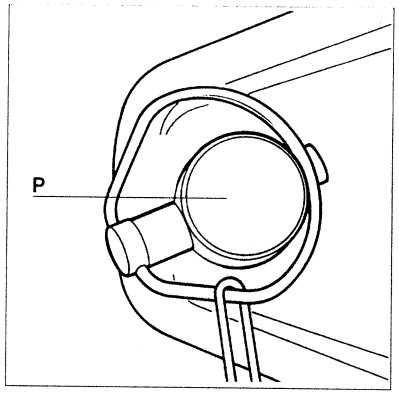


Fig. 8 - TU-32 and T-500D series anchor locking pin in locking position.

3.1.3. Procedure for TU-32

1 - Remove the anchor locking pin (see Fig. 6) and withdraw the anchor pin (P).

2 - Push in and maintain pressure on lock button (B) and start pushing the rope release lever (R) towards the anchor pin end of the machine. Release lock button. Pull release lever further until it locks itself into open position (see Fig. 7). Both pairs of jaws are now open.

3 - Push reversing lever (L2) towards the anchor pin end of the machine. Insert GRIPHOIST wire rope at entry (E) at the opposite end from the anchor pin end and push until it comes out of the other end.

4 - Pull the slack wire rope through the machine by hand (wear gloves), until it becomes nearly tight on the load. (Allow some extra length for anchoring the machine).

5 - Position the anchor sling and refit the anchor pin through the eyes of the sling. Refit the anchor locking pin in locking position (see Fig. 8). Ensure that the rope passes beneath the anchor pin. Anchor the wire rope hook. **Check that the wire rope hook latch is closed** (Fig. 11).

6 - To close jaws on the wire rope slightly push the rope release lever (R) towards the anchor pin. Push in and maintain pressure on the lock button (B) and allow the release lever to slowly return to initial position. Release lock button. Machine is now ready for use.

7 - ⚠ Place the telescopic handle (T) on lever (L1) to lift or pull, or on lever (L2) to lower or slacken the wire rope. **Twist the handle to ensure that it is in locked position.**

8 - To remove the wire rope from the machine, slacken the rope by operating lever (L2) before operating the release lever (R) as in 2 above.

⚠ **CAUTION:**

Before operating the machine, check that the rope hook latch is closed (see Fig. 11) **and that the anchor pin is safely positioned and locked by the locking pin** (see Fig. 8).

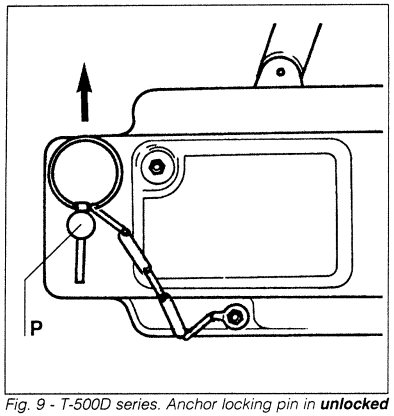


*Fig. 9 - T-500D series. Anchor locking pin in **unlocked** position for removing anchor pin.*

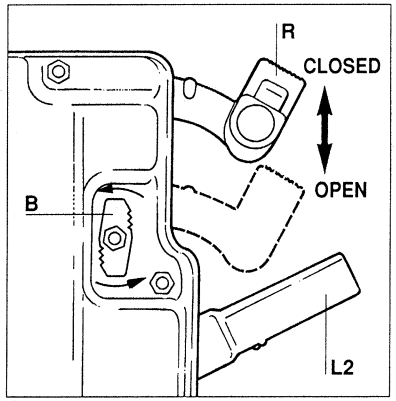


Fig. 10 - T-500D series. Rope release lever R.

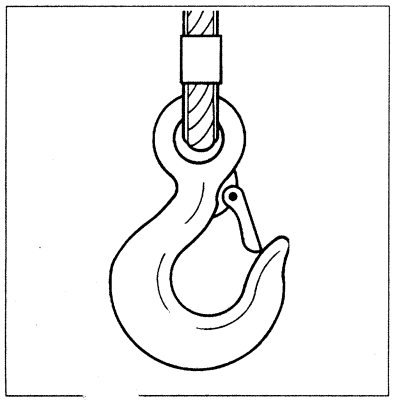


Fig. 11 - W hook latch in closed position.

3.1.4. Procedure for T-500D series

1 - Remove the anchor locking pin (see Fig. 9) and withdraw the anchor pin (P).

2 - Tilt the machine until it rests vertically on its anchor pin end. Turn the lock button (B). Push the rope release lever (R) firmly forward towards the anchor pin end, until it locks itself into open position (see Fig. 10). Both pairs of jaws are now open.

3 - Now, place the machine horizontally. Push both levers (L1) and (L2) towards anchor pin end. Insert the end of the rope through the rope entry (E) at the opposite end from the anchor pin end and push until it passes completely through the machine.

4 - Pull the slack wire rope through the machine by hand (wear gloves), until it becomes nearly tight on the load. (Allow some extra length for anchoring the machine).

5 - Position the anchor sling and refit the anchor pin (P) through the eyes of the sling. Refit the anchor locking pin in locking position (see Fig. 8). Ensure that the rope passes beneath the anchor pin. Anchor the wire rope hook. **Check that the wire rope hook latch is closed** (Fig. 11).

6 - To close jaws on the wire rope, push the rope release lever (R) downwards and allow the release lever to return to initial position. Machine is now ready for use.

7 - ⚠ Place the telescopic handle (T) on lever (L1) to lift or pull, or on lever (L2) to lower or slacken the wire rope. **Twist the handle to ensure that it is in locked position.**

8 - To remove the wire rope from the machine, slacken the rope sufficiently so that the machine can be fitted vertically on its anchor pin end. Remove the anchor pin as explained in 1 and proceed as explained in 2.

⚠ **CAUTION:**

Before operating the machine, check that the rope hook latch is closed (see Fig. 11) **and that the anchor pin is safely positioned and locked by the locking pin** (see Fig. 8).

⚠ WARNING: WHATEVER THE MODEL MAY BE, CHECK EVERY TIME THE MACHINE IS TO BE RIGGED, THAT THE WIRE ROPE IS LONG ENOUGH SO THAT THE SLACK END ALWAYS REMAINS VISIBLE AT THE HOOK END (OR THE ANCHOR PIN END, OR THE STIRRUP BAR END) OF THE MACHINE.

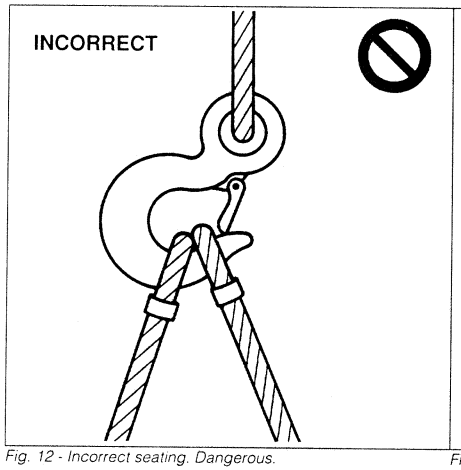


Fig. 12 - Incorrect seating. Dangerous.

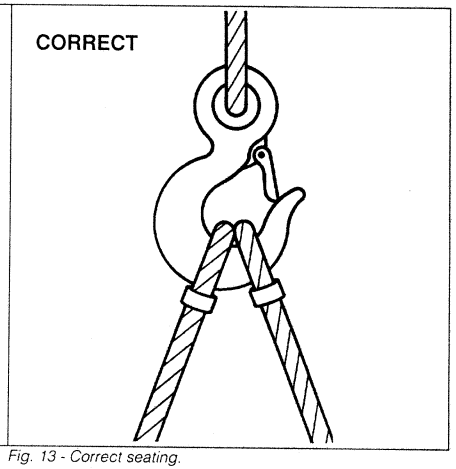


Fig. 13 - Correct seating.

3.2. Rigging

WARNING: RIGGING IS THE RESPONSIBILITY OF THE USER. DO NOT ATTEMPT TO RIG A JOB UNLESS YOU KNOW HOW. FAILURE OF RIGGING COULD RESULT IN SERIOUS INJURY, EVEN IN DEATH OF OPERATOR **OR OTHERS.**

Fig. 14.1

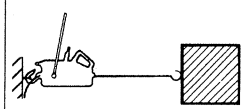


Fig. 14.2

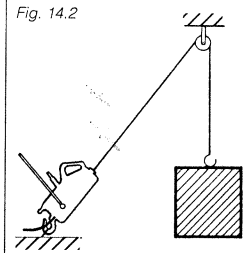


Fig. 14.3

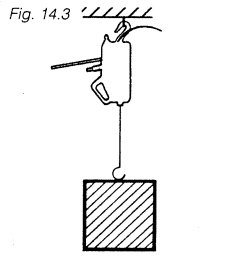
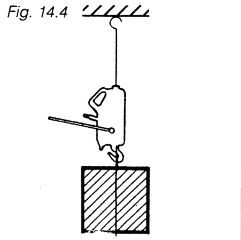


Fig. 14.4



WARNING: A ROPE UNDER TENSION IS EXTREMELY DANGEROUS, IN PULL-ING AS WELL AS IN LIFTING. IF ONE OF ITS ENDS (ROPE HOOK OR MACHINE ANCHORING POINT) CAN DETACH ITSELF FROM THE FIXING POINT. ALWAYS CHECK EACH ANCHORING POINT CAREFULLY. WHEN USING A SLING, CHECK THAT IT IS CORRECTLY SEATED IN THE HOOK (SEE FIG. 12 AND 13).

WARNING: BEFORE EVERY USE, MAKE SURE THAT SUPPORTING STRUCTURES, AND ALL LOAD ATTACHING DEVICES USED IN CONJUNCTION WITH THE GRIPHOIST MACHINE, PROVIDE AN ADEQUATE SAFETY FACTOR TO HANDLE THE LOAD APPLIED, INCLUDING THE WEIGHT OF THE EQUIPMENT. IF IN DOUBT, CONSULT A QUALIFIED STRUCTURAL ENGINEER.

WARNING: ALSO ENSURE THAT THE LOAD OR EFFORT TO BE APPLIED TO THE MACHINE WILL NOT EXCEED ITS RATED LOAD.

Anchor the wire rope by its hook, and the GRIPHOIST by its hook, anchor pin, or stirrup bar (according to the model), with a proper sling or chain, to any SUFFICIENTLY RESISTANT FIXED POINT.

As GRIPHOIST machines work equally well in any position - horizontally, vertically or angled - the operator may choose the most convenient anchoring point.

There are several ways of anchoring the machine:

PULLING (Fig. 14.1.)
For pulling operations, the machine is generally anchored to a fixed point and the load is pulled to it.

LIFTING (Fig. 14.2.)
When a reversing sheave is used, the machine can be anchored to any fixed point away from the load. This is the most commonly used method. In this case, it must be stressed that **the effort on the sheave anchoring point** is greater than the load and **can double plus friction** if the pull by the GRIPHOIST is vertical. For lifting a load up a pole, see Fig. 15 and 16.

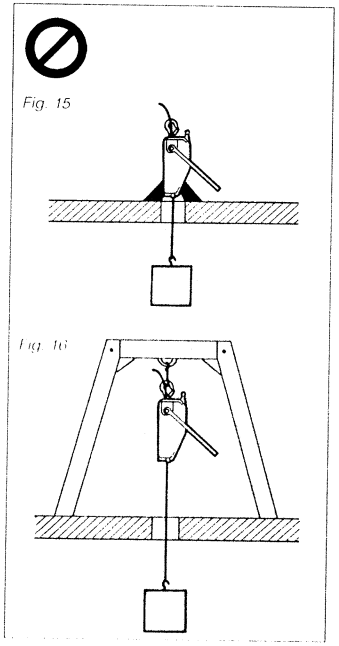
LIFTING (14.3.)
Machine anchored above the load to be lifted.

LIFTING (Fig. 14.4.)
GRIPHOIST anchored directly to the load. In this case the wire rope remains static and the machine and load climb the wire rope.

When rigging the machine for operation, always observe the following recommendations:

WARNING: IT IS ESSENTIAL FOR SAFETY OF OPERATION THAT THE UNIT CAN FREELY ALIGN ITSELF WITH THE DIRECTION OF EFFORT OR LOAD. FOR THAT PURPOSE, THE BEST WAY IS TO ANCHOR IT WITH A SLING. **NEVER FIT THE UNIT RIGIDLY IN A STRUCTURE.**

Fig. 15



- **All levers (forward lever L1, reversing lever L2 and wire rope release lever R) must be free to move without obstruction.**

CAUTION: **If you use one or more pulleys to change the direction of the effort, ensure that you can properly evaluate the strength of the anchoring point of such pulleys and that they are strong enough for the applied load.**

- **Ensure that the rope exit is clear of obstruction so that the wire rope will not be forced back into the machine.**
- **Ensure that there are no obstructions around the machine which could prevent the rope, machine and suspension point from operating in a straight line.**

In order to provide extra safety, we recommend the use of our BLOCSTOP safety device (UL classified) for manriding and all uses where additional safety measures are required by the ruling Federal, State and local regulations.

The machine hooks (on TU-17 & TU-28 models) and the wire rope hooks are fitted with a latch to retain loose slings or devices under slack conditions. **Ensure that the latch is in the closed position** (see Fig. 5 and 11) **and properly lies on the hook edge** after the sling or other anchorage means is passed inside the hook. This latch is not intended to be an anti-fouling device, **so caution should be used to prevent it from supporting any of the load.** Periodic inspection of the latch must be made to make sure it is not defective or missing. If it is, replace it prior to use.

WARNING: THE MACHINE MUST ALWAYS BE SET UP IN A LIFTING POSITION BY MEANS OF ITS HOOK OR ANCHORING PIN, ACCORDING TO THE MODEL. IT SHOULD NEVER BE PLACED WITH ITS ROPE ENTRY END STANDING ON A PLATFORM. (SEE FIG. 15 FOR THIS FORBIDDEN USAGE). FOR RIGGING THE MACHINE, CREATE A SUSPENSION POINT CAPABLE OF SUPPORTING THE INTENDED LOAD WITH A PROPER SAFETY FACTOR (Fig. 16). REFER TO APPLICABLE REGULATIONS FOR SAFETY FACTOR.

WARNING: ONCE THE MACHINE IS RIGGED AND UNDER TENSION EITHER FOR PULLING OR LIFTING OPERATIONS, IT IS IMPERATIVE NOT TO RELEASE, REMOVE, ALTER OR OBSTRUCT ANY PART UNDER TENSION. YOU MUST COMPLETELY REMOVE ANY TENSION BEFORE DOING SO.

4. OPERATING INSTRUCTIONS

4.1. General

For maximum effort, extend the telescopic handle and twist its two parts one in the other, so as to lock them in the extended position.

Place the telescopic handle (T) on lever (L1) for lifting or pulling, or on lever (L2) for lowering or slackening. **Lock it into position by twisting so that handle will not fall off** (this is particularly important on a suspended platform). When it is left in any position, it will, then, remain stationary.

The rope is moved through the machine (or the machine along the rope) by moving the operating handle to and fro.

As a GRIPHOIST machine is not a ratchet and pawl device, the operating handle need not be used through its full stroke; if space is confined, short strokes can be made.

If the effort required is too hard for one person, the machine should be used in conjunction with blocks (see below).

CAUTION: FOR OPERATING A GRIPHOIST MACHINE, NEVER USE ANY MEANS OTHER THAN THE GRIPHOIST TELESCOPIC HANDLE. ITS LENGTH AND STRENGTH HAVE BEEN CALCULATED TO OPERATE THE MACHINE WITHIN ITS CAPACITY. IF DAMAGED, ORDER A NEW ONE.

WARNING: NEVER ATTEMPT TO OPERATE THE RELEASE LEVER (R) WHEN THE MACHINE IS UNDER LOAD.

WARNING: NEVER OPERATE THE FORWARD LEVER (L1) AND REVERSE LEVER (L2) AT THE SAME TIME. EACH LEVER MUST MOVE FREELY AT ALL TIMES.

The rope end emerging from the anchoring end of the hoist must remain slack under all circumstances. **It should not be tied to anything,** tensioned, loaded or utilized for any purpose.

WARNING: WHEN INSERTING THE WIRE ROPE IN THE MACHINE OR WHEN OPERATING THE HANDLE, **NEVER FORCE** A DAMAGED SECTION OF ROPE INTO THE MACHINE. IF THE WIRE ROPE APPEARS DAMAGED, TAKE THE LOAD ONTO ANOTHER SAFE LOAD SUPPORTING LINE AND REMOVE THE MACHINE AND WIRE ROPE IMMEDIATELY.

4.2. Removing the wire rope

As the jaws are locked by the effort on the wire rope, the tension must first be removed. Slacken the rope completely by a few s on the reversing lever. When the tension has been removed, open the jaws by placing the release lever (R) c pen position, and remove wire rope by hand. Always handle wire rope with gloves to avoid injury.

5. OVERLOAD PROTECTION

5.1. Overload Protection Device

On all GRIPHOIST machines the forward lever (L1) is connected to the crankshaft by means of one or more (depending on the model) overload shear pins (See Fig. 17, 18 and 19).

NOTE: The diameter and the composition of these shear pins have been predetermined to shear in case of noticeable overload, depending on working conditions.

This protects the machine from severe overloading. Although sheared pins prevent further pulling or lifting, reverse action is still possible using the reversing lever (L2) to remove the load.

Spare overload shear pins will be found inside the forward lever (L1) (models TU-17 & TU-28), or inside the rope release lever (R) (models TU-32, T-508D, T-516D & T-532D). Just remove the plastic cap of the lever.

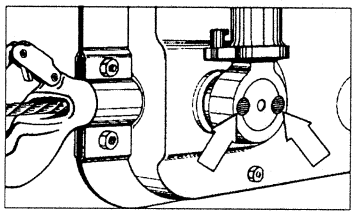


Fig. 17 - TU-17 / TU-28

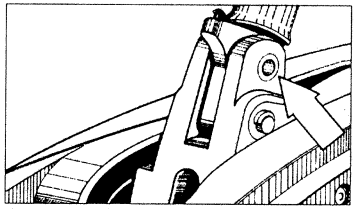


Fig. 18 - TU-32

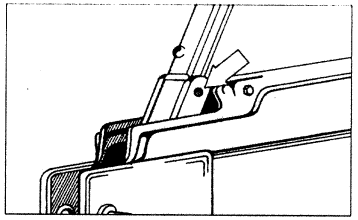


Fig. 19 - T-500D model

5.2. Replacement of shear pin(s)

NOTE: Always have sufficient quantity of spare shear pins in stock so as to avoid interruption of work, in case of incident.

Broken shear pins can be replaced in a few minutes. Stop operating or lower the load, leave machine under light tension to facilitate the operation.

a) For GRIPHOIST TU-32 and all T-500D models:
Remove shear pin by means of a pin punch. Align upper and lower parts of the forward lever (L1) and drive in the new shear pin **smoothly**, with a hammer. Place the side of the forward lever on a supporting plate while doing it.

b) For GRIPHOIST TU-17 and TU-28:
Use a gear puller to remove the forward lever from crankshaft. When no gear puller is available, it may be possible to remove the forward lever while the machine is under tension, by using the telescopic operation handle. Place it between the casing and the lever and move it left and right alternately to ease off the forward lever.

Remove broken pins, clear off the burr produced by shearing. Grease crankshaft, replace forward lever on crankshaft as shown in Fig. 17, and fix it by means of the new shear pins. Drive them in **smoothly** with a hammer, take care not to damage the crankshaft.

The machine is again ready for use. Considering that the pin(s) sheared because of overloading, it is necessary to use one or several blocks to increase the capacity of the system (see Fig. 20), or reduce the load to finish the work without further overload.

NOTE: Do not use the shear pin(s) to measure the maximum load to be lifted. It is an overload protective device only.

WARNING: USE ONLY GRIPHOIST OVERLOAD SHEAR PINS. THE USE OF NON-STANDARD SHEAR PINS OR OF ANY OTHER MATERIAL COULD DAMAGE THE GRIPHOIST MACHINE, OR ALLOW A SEVERE OVERLOAD. NEVER WELD SHEAR PIN HOLES.

NOTE: The manufacturer will reject any liability in case of injury or damage caused to or by a GRIPHOIST machine on which the original GRIPHOIST shear pins have been replaced by any other means.

Fig. 20 - Sheave block combinations

Fig. 20.1 - Pulling

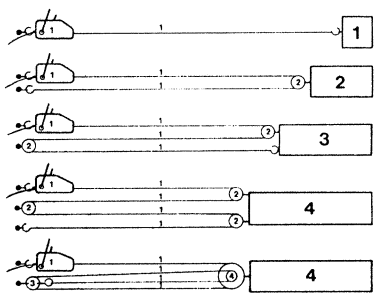


Fig. 20.2 - Lifting by means of reversing sheaves

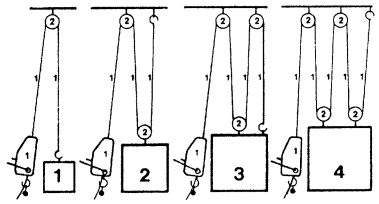


Fig. 20.3 - Lifting Machine anchored above the load

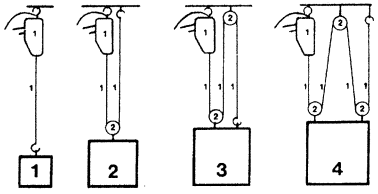
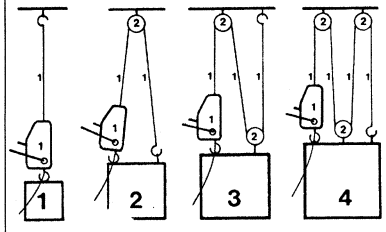


Fig. 20.4 - Lifting Machine anchored to the load



6. TO INCREASE THE CAPACITY WITH A GRIPHOIST

By using GRIPHOIST machines in conjunction with blocks you will extend their application to many other lifting and pulling problems. The rated load of GRIPHOIST machines can then be multiplied 2, 3 and even 4 times as shown in Fig. 20.

As a rule, it is not difficult to calculate the number of line parts to be used for a given load. It is **however important,** especially when there is a greater number of line parts, to take into consideration the friction in the sheaves, which can increase the load on the hoist and on the top anchoring hook of the block.

For a specific lifting or pulling problem, the table below allows you to rapidly determine the most appropriate block combination. When sheaves are used they must be capable to handle the load with a proper safety factor (see applicable regulations).

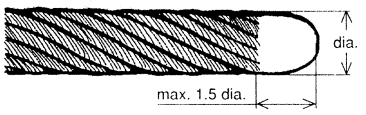
	TU-17 T-508D	TU-28 T-516D	TU-32 T-532D
2.000	1	1	1
4.000	2	1	1
6.000	3	2	1
8.000	4	2	1
12.000	-	3	2
16.000	-	4	2
24.000	-	-	3
max. load lbs material lifting	block combination no. (see Fig. 20)		

NOTE:
When using the GRIPHOIST **for pulling purposes,** it should be remembered that **the required effort is not equal to the weight** of the load to be moved. It depends on the weight of load, coefficient of friction between load and ground, and angle of slope if any.

Since work is equal to effort multiplied by displacement, the working speed is reduced in proportion to the increase of the capacity.

CAUTION:
ENSURE THAT THE SHEAVES OF THE BLOCKS OR REVERSING SHEAVES ARE OF A SUFFICIENT DIAMETER WITH RESPECT TO THE WIRE ROPE DIAMETER, **so that the wire rope is not damaged by passing around each sheave. A rule of thumb for sheave diameter is at least 18 times the diameter of wire rope. (Refer to applicable regulations). This is relevant for any pulley used in connection with the GRIPHOIST wire rope.**

Fig. 21



7. GRIPHOIST WIRE ROPE

The different GRIPHOIST wire ropes have been developed specially to meet the requirements of each model of GRIPHOIST machine.

WARNING: OTHER WIRE ROPES MAY DEFORM UNDER PRESSURE OF THE JAWS, OR DEVELOP OTHER DEFECTS CAUSING MALFUNCTION OF THE MACHINES.
FOR THIS REASON USE ONLY THE GRIPHOIST WIRE ROPE, WHICH CAN ALONE ENSURE PROPER AND SAFE WORKING OF YOUR MACHINE.

WARNING: BEFORE INSERTING THE WIRE ROPE INTO THE MACHINE, CHECK EVERY TIME, THAT YOU INSERT A WIRE ROPE HAVING THE PROPER DIAMETER. FOR WORN WIRE ROPE SEE SECTION 8.2.

CAUTION: **Before inserting the wire rope into the machine ensure that it is in good condition and wiped clean (metal brush). For longer life and better performance, the wire rope should be kept oiled regularly.**

WARNING: DAMAGED WIRE ROPES AND, SPECIALLY, KINKED OR CRUSHED WIRE ROPES WILL NOT WORK IN THE GRIPHOIST MACHINE. FOR THIS REASON:
A - **ALWAYS REEL AND UNREEL THE WIRE ROPE IN A STRAIGHT LINE** (FIG. 22) AVOID PROCEEDING OTHERWISE (FIG. 23) TO PREVENT LOOPS WHICH WOULD CAUSE KINKS (FIG. 24).
B - **NEVER USE THE GRIPHOIST WIRE ROPE AS A SLING.** IN OTHER WORDS, NEVER PASS IT AROUND ANY OBJECT FOR ANCHORING THE LOAD OR THE MACHINE. THIS WOULD BEND AND DAMAGE THE WIRE ROPE (SEE FIG. 24 - CRUSHING, CUT WIRES, ETC. . .) AND CAUSE PROBLEMS WITH THE HOIST.
ALWAYS USE A SEPARATE WIRE ROPE SLING OR CHAIN SLING.

CAUTION: TO KEEP THE GRIPHOIST WIRE ROPE IN PROPER CONDITION, FOR SAFE WORKING WITH THE GRIPHOIST MACHINE, OBSERVE THE FOLLOWING INSTRUCTIONS:

- **Never bend the wire rope over sharp edges. It must be only passed over pulleys of appropriate diameter (see section 6: last paragraph).**

- **Never subject the wire rope to abrasion by rubbing over sharp edges.**

- **Never expose the wire rope to temperatures beyond 212° F (100° centigrade).**

- **Never use wire rope that has been subject to damage such as fire, corrosive chemicals or atmosphere, or exposed to electric current, etc. . .**

- **To avoid unwrapping the strands, never allow a wire rope which has a load, to rotate, specially for long hanging wire ropes.**

CAUTION: IF YOU HOLD IN YOUR INVENTORY SEVERAL GRIPHOIST MACHINES OF DIFFERENT CAPACITIES, CAREFULLY MARK THE GRIPHOIST MODEL ON EACH ROPE REEL SO AS TO AVOID USING WRONG DIAMETER ROPE IN A MACHINE. THIS WOULD BE VERY DANGEROUS (SEE SECOND WARNING ON PAGE 17).

NOTE: THE MANUFACTURER DECLINES ALL RESPONSIBILITY FOR MACHINES USED WITH A WIRE ROPE OTHER THAN GRIPHOIST WIRE ROPE OF THE APPROPRIATE DIAMETER , OR WITH A GRIPHOIST WIRE ROPE WHICH HAS BEEN ALTERED BY ANYONE WHO IS NOT AUTHORIZED BY GRIPHOIST INC.

CAUTION: **When the anchoring end of a wire rope is fitted with an eye assembled by bolted clamps,** CHECK BEFORE EACH OPERATION THAT THE CLAMPS ARE CORRECTLY FITTED **for holding the load with a proper safety factor. Refer to safety regulations for proper fitting** (see section 8.2.3.).

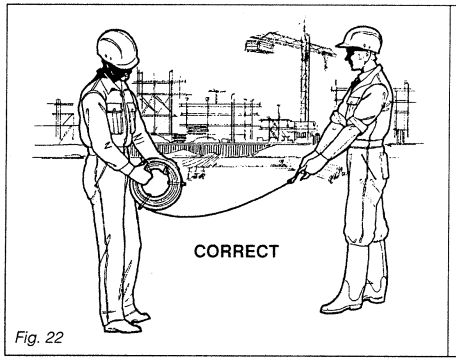


Fig. 22

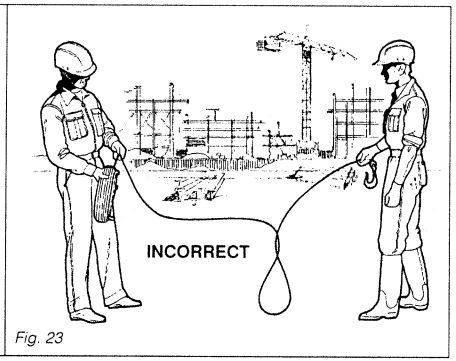


Fig. 23

8. MAINTENANCE AND LUBRICATION

WARNING: PROPER MAINTENANCE AND LUBRICATION OF MACHINES AND ROPES ARE THE BEST GUARANTEE FOR THE GOOD WORKING AND SAFE USE OF GRIPHOIST MACHINE. CONDUCT PERIODIC VISUAL INSPECTIONS OF MACHINE AND WIRE ROPE, AND ENSURE THAT NECESSARY LUBRICATION AND REPAIRS ARE MADE.

WARNING: Greases and oils containing additives such as molybdenum disulphide or graphite must not be used in GRIPHOIST machines and on their wire ropes, as it might reduce the gripping efficiency of the jaws.

8.1. GRIPHOIST Machine

Although the casing provides good protection, dust and dirt can penetrate into the mechanism through the openings of the casing, as well as through the guide holes of the wire rope. **The machine should therefore never be left lying about in mud, and the wire rope should be cleaned before it is introduced into the machine.**

For storage, the GRIPHOIST machine should be left with its release lever (R) in the closed working position, and well oiled. This will extend the life of the pre-gripping springs.

8.1.1. Lubrication

LUBRICATE THE MACHINE FREQUENTLY, INCLUDING EACH TIME BEFORE THE MACHINE IS RIGGED OR USED.

For normal lubrication, squirt SAE 90 to 120 motor oil through the openings of the casing. To allow lubricant to penetrate to all the parts of the mechanism, alternately operate forward lever and reversing lever, preferably with jaws open. (If not under load). Lubrication may also be provided without releasing in operating conditions. Without wire rope in the machine, it is important that, for total penetration of oil into the jaw assembly, the release lever (R) be open. Otherwise oil does not easily get into the gripping mechanism.

NOTE: An excess of lubrication will not cause the wire rope to slip. Lack of lubrication is the greatest cause of malfunction.

8.1.2. General maintenance cleaning

Dip the machine into a cleaning solvent that will not attack nylon or rubber. Shake well to dislodge foreign materials and turn the machine quickly upside down to drain. Then do not fail to thoroughly lubricate as indicated in 8.1.1.

8.1.3. Thorough cleaning of very dirty machine

For thorough cleaning of the machine, it is necessary to unbolt and remove casing, and to fully lubricate after cleaning.

WARNING: CONSIDERING THAT CERTAIN PRECAUTIONS HAVE TO BE TAKEN FOR DISMANTLING AND RE-ASSEMBLING THE CASING, THE ABOVE OPERATIONS MUST BE DONE ONLY BY PERSONS AUTHORIZED BY GRIPHOIST.

NOTE: The manufacturer declines any responsibility for the consequences of dismantling the machine by anyone who is not authorized by GRIPHOIST.

8.1.4. Overhaul servicing

CAUTION: Periodic inspection and overhaul servicing of the GRIPHOIST machines by GRIPHOIST authorized repairers (at least once per year) will provide the best working condition of each machine and protect against the risk of worn or damaged machines, specially for machines used on work sites. GRIPHOIST authorized repairers will also overhaul and repair your GRIPHOIST wire ropes. If used in contaminated environments (abrasive or caustic materials, cement, compounds, etc. . .) the machine should be returned for inspection, at least every three months, to a GRIPHOIST authorized service center.

8.1.5. Repairs

A spare parts list is shipped with each machine in order to allow the customer to cor cate with the repairer. **GRIPHOIST Inc. strongly recommends shipping any machine for repair only t IPHOIST authorized repairer.**

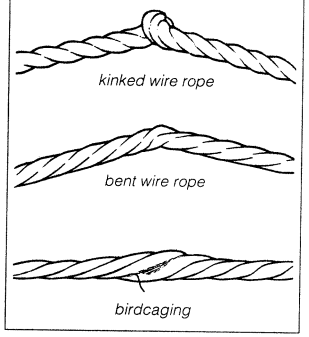
8.2. Wire rope

8.2.1. General

Periodically clean and oil it with a rag soaked with motor oil SAE 10 W 40 or equivalent WITHOUT molybdenum disulphide or graphite additive.

WARNING: ANY ABNORMAL APPEARANCE ON THE STRANDS OR WIRES OF THE WIRE ROPE SHOULD BE CONSIDERED AS WEAKENING THE STRENGTH OF THE WIRE ROPE, REPLACE IT.

Fig. 24 - Damaged wire rope



WARNING: WIRE ROPE MUST BE REPLACED, IF ANY OF THE FOLLOWING CONDITIONS IS NOTED:
- PROTRUDING OR BROKEN WIRES OR STRANDS,
- BENDING, LOOPS, KINKING, CRUSHING, BIRDCAGING, OR ANY OTHER DISTORSION OF THE WIRE ROPE STRUCTURE (See Fig. 24).
- EXCESSIVE CORROSION
- HEAT DAMAGE, EVIDENT THROUGH DISCOLORED WIRES,
- REDUCTION FROM NOMINAL DIAMETER OF THE WIRE ROPE BY MORE THAN 10 %.

NOTE: We recommend consulting the "Wire Rope Users Manual" published by American Iron and Steel Institute, for a comprehensive list and pictures or examples of critical inspection and replacement factors for wire rope.

CAUTION: Ropes with unwelded or damaged ends must be removed, and ends must be properly rewelded and ground-round. Preparing and repairing wire rope is a specialist's job.

CAUTION: Damaged wire ropes may injure if handled without gloves. Always wear gloves to protect hands when handling a wire rope.

After use, coil the wire rope on its reeler and store it in a dry location.

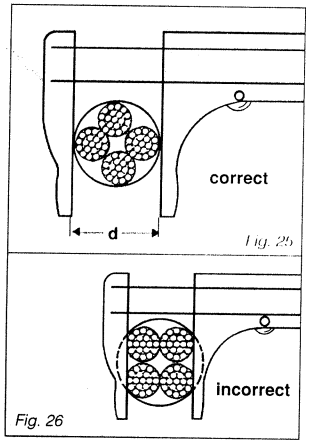


Fig. 25

Fig. 26

8.2.2. Measuring rope diameter

WARNING: CHECKING THE WIRE ROPE DIAMETERS IS OF THE UTMOST IMPORTANCE

The correct diameter of the wire rope is the diameter of a circumscribed circle, which will enclose all strands. The measurement should be made carefully with precision calipers. Fig. 25 shows the **correct** method, and Fig. 26 the **incorrect** method of measuring the wire rope diameter. Inspect your GRIPHOIST wire ropes at regular intervals and at least every six months. Keep records.

8.2.3. Clamping of wire rope end loops

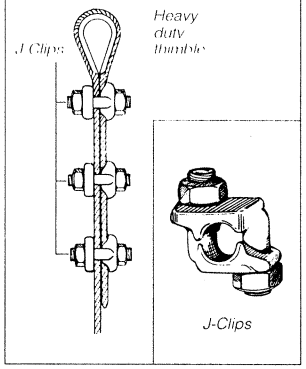
In some cases the GRIPHOIST user may be obliged to use GRIPHOIST wire ropes which have been cut at the wire rope hook end and fitted with a loop around a thimble, which is fixed by means of wire rope J-clips.

In such cases, the user must check that the following rules are respected. The clips used for that purpose must be of the type shown on Fig. 27 and made of forged steel. They must meet Federal specification FF-C-450 Type III. Thimbles must be heavy duty type.

The following method is recommended for applying such J-clips:

1) Turn back specified amount of rope from the thimble (see table page 20). Apply the first J-clip one base width from the dead end of the wire rope. Screw on nuts firmly.

Fig. 27



2) Apply the next J-clip as near the loop as possible. Screw on nuts firmly, but do not tighten.
3) Space additional J-clips if required equally between the first two. Screw on their nuts. Then tighten all nuts evenly on all J-clips to recommended torque (see table below).
4) CAUTION: apply the rated load and retighten nuts to the recommended torque. Rope will stretch and shrink in diameter when loads are applied. Inspect periodically and retighten.

The tightening torque values shown are based upon the threads being clean, dry and free of lubrication.

Wire rope diameter (inches)	min. N° of J-clips	Minimum amount of w.r. to turn back (inches)	Torque in ft / lbs
5/16	3	7.5	30
7/16	3	10	65
5/8	4	18	130

NOTE: If a greater number of J-clips is used than shown in the table, the amount of rope turnback should be increased proportionately.

WARNING: ONLY WIRE ROPE SECTION IN GOOD CONDITION AS NEW MUST BE USED FOR LOOP CLAMPING. ABOVE INDICATIONS ARE GIVEN ONLY FOR GRIPHOIST WIRE ROPES DESCRIBED IN THIS MANUAL.

When setting a J-clip on the wire rope, check that the size of the J-clip is appropriate for the wire rope diameter.

9. TROUBLESHOOTING

GRIPHOIST machines are designed to be troublefree. However, from time to time, certain problems may occur. These mainly result from insufficient oiling and lack of cleaning, or from damaged wire ropes.

9.1. Pumping

A lack of lubricant in a GRIPHOIST sometimes causes a condition known as **"pumping".** As the forward lever is moved to and fro, the machine moves up and down (if used for lifting) by about one inch. Pouring motor oil inside the casing, if the situation allows, should remedy it. If this cannot be done, then lower the machine or the load back to the ground by operating the reversing lever (L2), which is not affected by this trouble. The GRIPHOIST should then be thoroughly lubricated with motor oil and it will be ready again for service.

9.2. Jerking

Another symptom of the lack of lubrication is jerking when lowering a load. Thorough oiling will cure that trouble.

9.3. Other problems

WARNING: IN CASE OF OTHER PROBLEMS WHICH CANNOT BE CURED BY LUBRICATING, STOP OPERATING THE MACHINE IMMEDIATELY AND DO NOT CONTINUE USE.

Should damaged or badly maintained wire rope become jammed in the machine, place another lifting or pulling device or load line into a safe position in order to take the load, and remove the faulty unit with rope. Then, if the rope is blocked inside the machine, cut it outside the casing, leaving the short damaged wire rope inside, and send back the equipment to GRIPHOIST Inc., or to one of its authorized repairers.

10. SPECIAL INSTRUCTIONS FOR MANRIDING

10.1. GENERAL AND SAFETY WARNINGS FOR MANRIDING WITH GRIPHOIST MACHINES:

I - AN OPERATOR MUST NOT BE ASSIGNED TO A SUSPENDED JOB IF HE IS NOT:

A) COMPETENT FOR THE JOB TO BE PERFORMED IN SUSPENDED CONDITIONS
B) FAMILIAR WITH ALL SAFETY REQUIREMENTS APPLICABLE TO SUCH CONDITIONS
C) FAMILIAR WITH THE RIGGED EQUIPMENT
D) MENTALLY AND PHYSICALLY FIT FOR THE PURPOSE
E) PROFESSIONALLY TRAINED FOR THE ABOVE REQUIREMENTS

II - **For manriding, rigging must be performed exclusively by professional specialists.**

III - **All the instructions and warnings contained in this manual are relevant for manriding, provided that they comply with applicable Federal, State and local regulations. Due to the risks inherent to manriding they must be read, understood and applied with a special attention. Special care must be taken for maintenance and overhaul.**

IV - DISMANTLING AND REPAIR OF MANRIDING GRIPHOIST UNITS MUST BE EXCLUSIVELY ENTRUSTED TO PERSONS AUTHORIZED BY GRIPHOIST INC. GRIPHOIST SPARE PARTS IN ACCORDANCE WITH THE SERIAL NUMBER OF EACH MACHINE MUST BE EXCLUSIVELY UTILIZED. NO SUBSTITUTIONS ARE ALLOWED.

V - ONCE THE SUSPENDED PLATFORM OR CRADLE HAS BEEN LIFTED OFF ITS INITIAL SUPPORT (GROUND OR ANY OTHER LEVEL), IT IS IMPERATIVE NOT TO RELEASE, REMOVE, ALTER OR OBSTRUCT ANY PART OF THE EQUIPMENT UNDER LOAD. (SPECIALLY GRIPHOIST MACHINE, BLOCSTOP AND PLATFORM STIRRUP).

VI - **NEVER** ALLOW ANY CONDITION WHICH WOULD ALLOW A SUSPENSION WIRE ROPE TO BECOME **SLACK,** DURING THE OPERATION:
a) **unless the suspended platform or cradle is safely supported on a sufficiently resistant level giving a safe access to the operator, in compliance with safety regulations; or,**
b) **unless another safe suspension wire rope has been safely rigged to the suspended platform or cradle.**

VII - **The user, operator and rigger must comply with all OSHA Federal, State, and local regulations relevant for rigging and operating the whole equipment involved in manriding.**

VIII - **A code of safe practices such as reproduced on pages 30 and 31 of this manual, should be taken as a minimum general guideline for this purpose and given to the scaffold rigger and user or posted on site.**

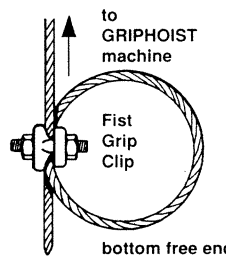
IX - **Due to the risks inherent in manriding, GRIPHOIST Inc. strongly recommends to equip every manriding installation with a BLOCSTOP mounted on a safety wire rope aside each suspension wire rope and anchored to a separate point (see 10.4b). The BLOCSTOP is UL classified as an "Independent secondary brake".**

X - ALSO REFER TO GENERAL WARNING ON PAGE 3.

THE GRIPHOIST TU MODELS (TU-17 / TU-28 / TU-32) ARE UL CLASSIFIED AS "MANUALLY OPERATED SCAFFOLD HOISTS".

WARNING: THE T-500D SERIES MACHINES (T-508D, T-516D, T-532D) ARE NOT CLASSIFIED BY UL FOR MANRIDING AND MUST NOT BE USED FOR MANRIDING IN THE USA.

Fig. 28



10.2. Special notices

NOTE: The rated load for manriding of each hoist and of each BLOCSTOP includes the weight of lifted personnel, of the platform and of all equipment, tools and materials as well as of any other items supported by the hoist.

CAUTION: When operating scaffolding with more than one hoist, take care to operate the hoists so that the platform remains in a level position. When operating with more than two hoists, take care to operate so that all the suspension wire ropes remain permanently under tension.

CAUTION: In case of **welding** operations on a suspended platform or of any other work operating with a source of heat, **take care to protect the wire ropes.** An electrode can damage or cut a wire rope if contacted.

CAUTION: **Special care must be taken for protecting and cleaning the GRIPHOIST and the BLOCSTOP when they are rigged and used for sand-blasting operation or under any contaminating conditions (cement, compound spray, etc...). Protection can be improved by individual covers. Special attention should be paid to overhaul and maintenance under such circumstances.**

CAUTION: **Check, before any operation, that there is enough wire rope to reach to the ground with about three feet extra for ensuring safety. Ensure that the hanging wire rope does not interfere with any structure, electric cable, etc... and does not cause danger to the environment. If it is not possible to secure a sufficient length of rope, it is imperative for safety to loop and clamp the bottom end of the wire rope as shown on Fig. 28.**

CAUTION: Special care should be taken, every time the machine is operated, for locking the telescopic handle on to the appropriate operating lever. Fit it correctly on the operating lever, and then twist it so that it gets locked by the retaining nut of the operating lever. **The operator must ensure that the telescopic handle does not fall out of the platform or cradle.**

10.3. BLOCSTOP safety device

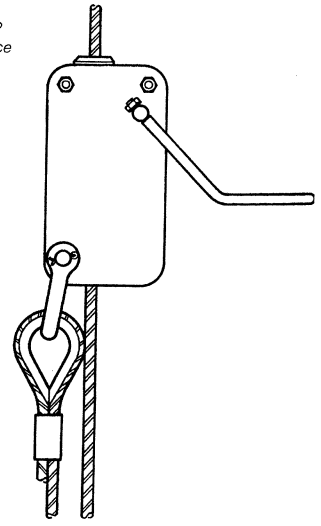
When manriding is concerned, no safety measure can be considered excessive; that is why we recommend usage of the BLOCSTOP (see Fig. 29) on the GRIPHOIST wire rope **or, preferably, on a separate safety wire rope** of the same capacity, anchored to an **anchorage point separate** to that of the suspension wire rope. In the latter case, it provides additional and **independent safety** in the event of the failure of the suspension wire rope or of its anchoring point.

The BLOCSTOP device (see Fig. 30) consists essentially of a brake mechanism formed by a pair of self clamping jaws pressed against each other by a powerful spring, and enclosed in a casing.

A release handle (fig. 30-4) allows the operator to open the jaws for descent by operating this handle upwards.

The wire rope is passed through the BLOCSTOP which is then placed above the GRIPHOIST. The BLOCSTOP is fitted with a shackle (fig. 30-5) and it is fixed by means of a sling to the suspension point of the scaffold. In normal position, that is when the release handle is not operated, the BLOCSTOP holds the wire rope with a strength which is **self clamping** by the suspended load, through the same principle of construction as that of the GRIPHOIST: **the heavier the load the stronger the grip.**

Fig. 29
BLOCSTOP safety device



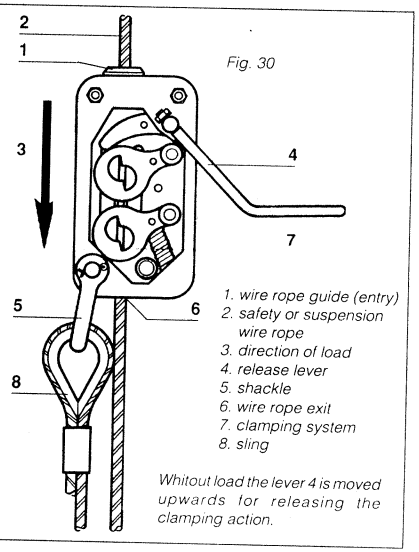


Fig. 30

1. wire rope guide (entry)
2. safety or suspension wire rope
3. direction of load
4. release lever
5. shackle
6. wire rope exit
7. clamping system
8. sling

Whitout load the lever 4 is moved upwards for releasing the clamping action.

The BLOCSTOP does not damage the wire rope when operating in emergency.

The BLOCSTOP sling must have at least the same capacity with the same safety factor as the suspension wire rope, and must comply with all applicable Federal, State and local Safety regulations.

Technical specifications

Type of BLOCSTOP	Rated Load*	Diameter of wire rope**	GRIPHOIST Model
*** BS. 15.301	1,500 lbs	5/16"	TU-17
BS. 20.301	3,000 lbs	7/16"	TU-28
BS. 35.30	6,000 lbs	5/8"	TU-32

* Safety factor: 6:1 when operating under the rated capacity loads.
** If wear on wire rope exceeds 10 % of new wire rope diameter, the wire rope has to be changed.
*** NEW YORK STATE - B.S.A. APPROVAL 6563
All the above models are U.L. classified.

10.4. Installation with BLOCSTOP (machine fitted with a hook)

NOTE: For special rigging of the BLOCSTOP on the stirrup, or automatic model, consult GRIPHOIST Inc.

a) BLOCSTOP mounted on the suspension wire rope (Fig. 31)

1. - The suspension wire rope being safely anchored at its upper end, and its lower end reaching the ground, wearing gloves, insert the tapered end of the wire rope into the BLOCSTOP wire rope entry at the **opposite** end from the shackle. Push the wire rope through, until it emerges at the shackle end. It is easier to pass the wire rope through the BLOCSTOP if the release lever is held open while the wire rope is being inserted.
2. - Slide the BLOCSTOP up the wire rope to a position where it is located above the suspension point of the platform stirrup, by a little more than the length of the GRIPHOIST.
3. - Engage the GRIPHOIST on the wire rope as explained above in 3.1. When the machine is clamping the wire rope, operate the forward lever until the machine hook or anchor pin is a little below the level of the suspension point of the platform, and anchor it as explained in 3.2. Check that it is safely secured. Ensure that the throat of the anchor hook faces the interior of the scaffold for regular visual inspection.

4. - Then continue operating the forward lever until the wire rope is under tension.
5. - Allow the slack end of the wire rope to pass through **a wire rope guide** situated in the floor of the platform or adjacent to it.
6. - If the sling is not already engaged in the BLOCSTOP shackle, remove the BLOCSTOP shackle, engage the sling eye on the shackle axle, replace the shackle **and check that it is properly secured.**
7. - Fix the other end of the sling near to the suspension point of the stirrup of the platform where the GRIPHOIST is anchored. This will be done by a shackle or directly by passing the eye of the other end of the sling through the anchor axle - if there is any - of the stirrup.

CAUTION: Always check that shackles are safely secured.

Operate in the same way with the other BLOCSTOP and GRIPHOIST if there is more than one point suspension staging (i.e. swing scaffold).

Fig. 31

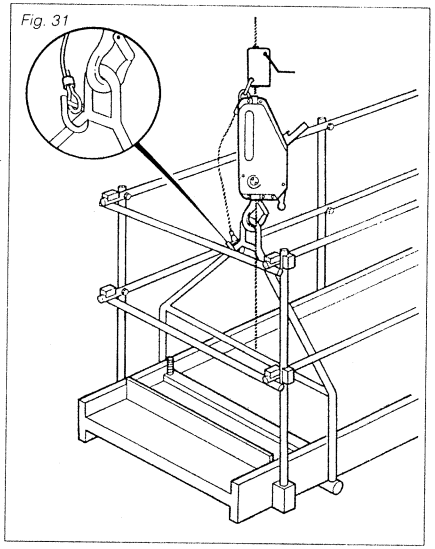
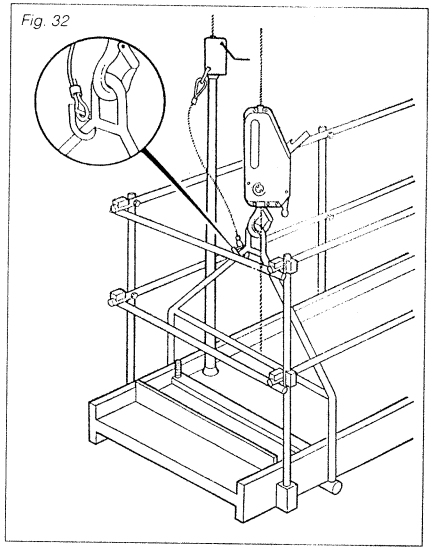


Fig. 32



b) BLOCSTOP on separate wire rope (Fig. 32)

The procedure is the same but the BLOCSTOP and the GRIPHOIST are engaged on separate wire ropes. **A push-tube, or an equivalent means, MUST be passed on the safety wire rope between the BLOCSTOP and the floor of the platform** in order to push up the BLOCSTOP during ascent.It is recommended fitting a weight at the lower end of the **safety** wire rope for tensioning it. Such weight should be tied to the ground, and should be prevented from allowing the rope to rotate and swing. Such system should be placed aside each suspension wire rope.

CAUTION: Never load the slack lower end of a suspension wire rope.

WARNING: IN ANY CASE, THE LENGTH OF THE SLING SHOULD NOT ALLOW A DROP OF MORE THAN 12 INCHES WHEN THE SLACK OF THE SLING IS AT ITS MAXIMUM. IF THE BLOCSTOP IS PLACED ON A SEPARATE WIRE ROPE AND NOT DIRECTLY FIXED TO THE STIRRUP, THE LENGTH OF THE PUSH TUBE OR THE PLACE OF THE EQUIVALENT MEANS SHOULD BE DETERMINED ACCORDINGLY.

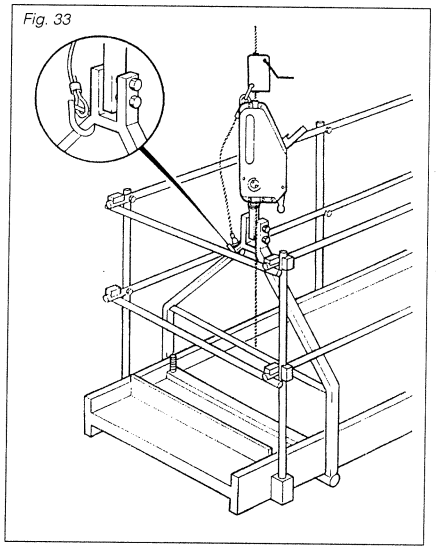
10.5. Installation with a machine fitted with a stirrup bar

According to the type of stirrup to be used, a special type of TU 17 can be supplied fitted with a stirrup bar instead of a hook. See Fig. 2a.

The fitting process is the same as above except that the stirrup bar must be inserted between the two ears of the stirrup and connected by two appropriate bolts. These bolts must be with a 5/8 in diameter (16 mm) and of high tensile steel Grade 5 or better each fitted with a locking washer and nut.

WARNING: EVERY TIME THE INSTALLATION IS PUT INTO WORKING CONDITION, THE NUT AND WASHER MUST BE CHECKED IN ORDER TO ASCERTAIN THAT THE ASSEMBLY IS SAFE. See Fig. 33.

Fig. 33



WARNING: NEVER INSERT AN INTERMEDIATE CONNECTING PIECE BETWEEN THE STIRRUP AND THE STIRRUP BAR OF THE MACHINE. NEVER MODIFY PARTS TO BE CONNECTED.

10.6. OPERATING WITH THE BLOCSTOP

Ascent:

As BLOCSTOP jaws allow free passage of the wire rope when the device moves up (i.e. opposite to the direction of the load) the operator is not required to manipulate the device during ascent. Depending on type of mounting, the BLOCSTOP is simply pushed upwards by either the hoist (Fig. 31) or the push tube (Fig. 32) (or equivalent means) placed between the BLOCSTOP and the platform. When the BLOCSTOP is at rest, the device locks on the rope and prevents free fall of the suspended scaffold in case of hoist failure.

Descent:

OPERATE HOIST AND BLOCSTOP **ALTERNATELY** UPON DESCENT.

1. Lower the hoist, leaving the BLOCSTOP **locked** on the rope until the BLOCSTOP anchor sling is **almost** tight.
2. Hold the BLOCSTOP release handle open **manually** by pushing it upwards while sliding the BLOCSTOP down until it is in contact with the top of the hoist.
3. **Let the release handle go down:** the BLOCSTOP is again locked on the rope. This operation is repeated until the descent is completed.

If inadvertently the BLOCSTOP gets locked under load during descent, it can be unlocked by slightly raising the platform, through operating the forward lever of the hoist.

In case of failure of the hoist, or breakage or failure of suspension wire rope beneath the BLOCSTOP (BLOCSTOP on safety wire rope), this is enough to cause the immediate locking action of the BLOCSTOP. If the BLOCSTOP is mounted on a separate wire rope, the provided safety extends to any failure of the suspension wire rope or of its anchoring point.

The opening operation of the BLOCSTOP is automatic during ascent and manual during descent.

WARNING: NEVER TIE OPEN OR BLOCK OPEN THE RELEASE HANDLE. KEEP THE ANCHOR SLING ATTACHED TO BLOCSTOP AND TO THE PLATFORM STIRRUP AT ALL TIMES. ALWAYS CHECK, BEFORE OPERATION ON SITE, THAT THE SLING IS IN GOOD CONDITION AND PROPERLY CONNECTED AT BOTH ENDS.

10.7. Maintenance and overhaul of the BLOCSTOP

a) Protection against bad weather:

Although the casing provides good protection, it is impossible to prevent rain from running down the rope, and entering into the BLOCSTOP. This water may cause malfunction through rust or frost. It is, therefore recommended that storing the BLOCSTOP in places exposed to bad weather be avoided.

WARNING: BEFORE EVERY USE, IT IS ESSENTIAL TO MAKE SURE OF THE PROPER FUNCTIONING OF THE BLOCSTOP. DURING FROSTY PERIODS, THIS MUST BE CHECKED A MINIMUM OF EVERY HOUR.

b) Cleaning and Lubrication:

CHECK DAILY THE MECHANISM WHEN ON SITE BY OPERATING THE RELEASE HANDLE: the movement on the handle should be easy and thorough in both directions. It must **firmly grip** the wire rope when released. Otherwise it must be replaced by another BLOCSTOP.

If the problem is caused by a freezing environment, the BLOCSTOP should be thawed out by using a heat source, **operating under 212° F (100° C).** After thawing out the unit, blow pressurized dry air through the unit by the lower opening, and lubricate generously as for the GRIPHOIST machine (see 8.1.1.).

WARNING: IF THE MOVEMENT OF THE RELEASE HANDLE IS STILL NOT FREE AND THOROUGH, AFTER PROCEEDING AS ABOVE, THEN REMOVE AND RETURN THE BLOCSTOP TO A GRIPHOIST AUTHORIZED REPAIRER. IT IS A GOOD PRECAUTION TO KEEP A SPARE BLOCSTOP READY FOR REPLACEMENT.

NOTE: The manufacturer declines any responsibility for the consequences of dismantling the BLOCSTOP by an operator who is not a GRIPHOIST authorized repairer.

NOTE: For the proper control of the maintenance of hoist and the BLOCSTOP, a record log should be kept recording every incident noted and maintenance operations executed for each unit with dates and signatures.

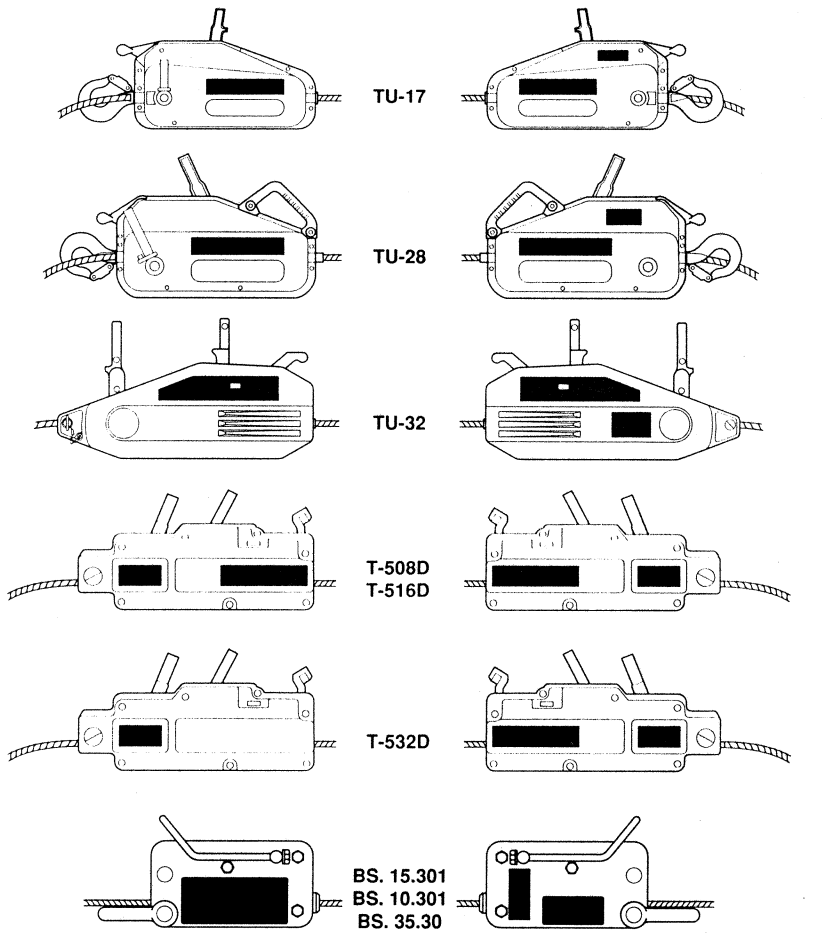
10.8. Other equipment for manriding

Other equipment is available from GRIPHOIST Inc. such as lifting platforms and stirrups, specially designed to be used with GRIPHOIST machines, slings, odd lengths of wire rope, fixed or mobile suspension jibs. Motorized systems are also available from GRIPHOIST Inc.

DO NOT HESITATE TO CALL ON GRIPHOIST Inc. FOR YOUR MANRIDING OR ACCESS NEEDS.

11. LABELS

LEFT SIDE **RIGHT SIDE**



Ensure that labels indicated above in black are in place and legible. Replacement labels can be supplied on request.

Always concerned to improve the quality of its products, the manufacturer reserves the right to modify the specifications without prior notice.

GIVE TO SCAFFOLD ERECTOR & USER OR POST ON JOB

CODE OF SAFE PRACTICES
FOR

SUSPENDED SCAFFOLDS

It shall be the responsibility of all employees and users to read and comply with the following common sense guidelines which are designed to promote safety in the erection and use of scaffolds. These guidelines are not all-inclusive nor do they supplant or replace other additional safety and precautionary measures to cover usual or unusual conditions. If these guidelines conflict in any way with any state, local or federal statute or governmental regulation, said statute or regulation shall supersede these guidelines and it shall be the responsibility of each employer and user to comply therewith and also to be knowledgeable and understand all state, local or federal statutes or governmental regulations pertaining to suspended scaffolding.

A. GENERAL GUIDELINES

1. Post these safety guidelines in a conspicuous place and be sure that all persons who erect, use, relocate, or dismantle suspended scaffold systems are fully aware of them.
2. **NEVER TAKE CHANCES:** If in doubt regarding the safety or use of suspended scaffolds, consult your scaffold supplier.
2. **READ, UNDERSTAND AND FOLLOW THESE GUIDELINES** and manufacturers' instruction located in manuals supplied with and on plates posted on scaffolding equipment.
3. **FOLLOW ALL EQUIPMENT MANUFACTURERS' RECOMMENDATIONS** as well as all state, local and federal codes, ordinances and regulations, pertaining to suspended scaffolding.
4. Survey the job site for hazards such as exposed electrical wires, constructions that could overload or tip the suspended scaffold when it is raised or lowered, unguarded roof edges or openings, inadequate or missing tieback anchorages or the need for overhead protection where exposure to failing objects exist. These conditions must be corrected before installing or using suspended scaffold systems.
5. **INSPECT ALL EQUIPMENT BEFORE EACH USE.** Never use any equipment that is damaged or defective in any way. Tag damaged or defective equipment and remove it from the job site.
6. **ALWAYS USE FALL ARREST EQUIPMENT** when using suspended scaffolds (see section E for further details).
7. Erect, use, and dismantle suspended powered scaffold equipment in accordance with design and/or manufacturer's recommendations.
8. Do not erect, dismantle, or alter suspended scaffold systems unless under the supervision of a qualified person.
9. **DO NOT ABUSE, MISUSE, OR USE SUSPENDED SCAFFOLD EQUIPMENT** for purposes or in ways for which it was not intended.
10. **USERS MUST BE TRAINED** on how to safely operate equipment and how to handle emergency situations. If in doubt, consult a qualified person.
11. **ERECTED SUSPENDED SCAFFOLDS SHOULD BE CONTINUOUSLY INSPECTED** by the user to ensure that they are maintained in a safe condition. Report any unsafe condition to your supervisor.
12. **CARE MUST BE TAKEN WHEN OPERATING AND STORING EQUIPMENT DURING WINDY CONDITIONS.**
13. **PLATFORMS MUST NEVER BE OPERATED NEAR LIVE POWER LINES** unless proper precautions are taken. Consult the power service company for advice.
14. **DO NOT WORK ON SCAFFOLDS** if you feel dizzy, unsteady in any way or are impaired in any way by drugs or any other substance.

B. RIGGING GUIDELINES

1. **WHEN RIGGING ON EXPOSED ROOFS OR FLOORS, WEAR FALL PREVENTION EQUIPMENT. WHEN RIGGING FROM OVERHEAD SUPPORTS, SUCH AS BRIDGES, BEAMS, ETC., WEAR FALL ARREST EQUIPMENT.**
2. Roof hooks, parapet clamps, outrigger beams, or other supporting devices, including tiebacks and their anchorages, must be capable of supporting the rated load of the hoist with a safety factor of 4.
3. Verify that the building or structure will support the suspended loads with a safety factor of at least 4.
4. Overhead rigging, including counterweights, must be secured from unintentional movement in any direction.
5. Counterweights used with outrigger beams must be of a non-flowable material and fastened to the beam.
6. Outrigger beams that to do not use counterweights must be installed and secured on the roof structure with devices specifically designed for that purpose.
7. Tie back all transformable rigging devices with wire rope and hardware that has strength equal to the hoist rope.
8. Install tiebacks at right angles to the face of the building and secure without slack to a structurally sound portion of the structure. In the event tiebacks cannot be installed at right angles, use two tiebacks at opposing angles to prevent movement.
9. **RIG SO THAT SUSPENSION POINTS ARE DIRECTLY ABOVE THE HOISTING MACHINES.**
10. The platform must be secured to prevent swaying. Do not tie it to window cleaning anchors.

C. WIRE ROPE AND HARDWARE GUIDELINES

1. Use only wire rope and attachments as specified by the hoisting machine manufacturer. Do not use wire rope that is kinked, birdcaged, corroded, undersized, or damaged in any way.
2. Be sure that wire rope is long enough to reach to the lowest possible landing.
3. Clean, lubricate and handle wire rope in accordance with the wire rope or hoist manufacturer's instructions.
4. Coil and uncoil wire rope in accordance with the wire rope or hoist manufacturer's instructions in order to avoid kinks and damage.
5. Use thimbles at all wire rope suspension terminations.
6. Use J-Type clamps or swaged fittings to fasten wire rope. **DO NOT USE U-CLAMPS.**
7. Tighten wire rope clamps in accordance with the clamp manufacturer's instructions.
8. Wire ropes used with traction hoist must have prepared ends in accordance with the manufacturer's recommendation.
9. INSPECT WIRE ROPE DURING EACH ASCENT AND DESCENT. Do not expose wire rope to fire, undue heat, corrosive atmosphere, chemicals, or to passage of electrical currents or to damage by tools or handling.

D. FALL ARREST EQUIPMENT GUIDELINES

1. Each person on a suspended scaffold must be attached to a rail arrest system at all times.
2. Each lifeline must be fastened to a separate anchorage.
3. When wrapping lifelines around structural members the lines must be protected and a suitable anchorage system must be used.
4. Protect lifelines at sharp corners to prevent chafing.
5. Rig fall arrest systems to prevent free fall in excess of six feet.
6. Lifelines must be suspended freely without contact with structural members or building facade.
7. Use lifeline of size and construction that is compatible with the fall arrester and complies with applicable safety codes.
8. **BE SURE FALL ARRESTER IS INSTALLED ON THE LIFELINE IN THE PROPER DIRECTION ABOVE YOUR HEAD** and in accordance with the manufacturer's recommendations.
9. Use a body support device that is properly sized and fitted.
10. Be sure body support device has a lanyard attached to the D-ring at the center of the back.

E. SOME ADDITIONAL GUIDELINES

1. **USE ALL EQUIPMENT AND ALL DEVICES IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.**
2. Do not overload, modify, or substitute equipment.
3. Before commencing work operations pre-load wire rope and equipment with the maximum working load, then retighten rigging clamps to manufacturer's recommendations.
4. Be sure platform and cages have a proper guardrail system.
5. Secure stirrups no less than six inches from the end of the platform.
6. All components must be securely fastened to prevent them from falling off the platform.
7. Use roller bumpers or buffers to prevent damage to the structure or equipment.
8. Use care to prevent damage to equipment by corrosive or other damaging substances.
9. Clean and service equipment regularly.
10. Traction hoists must have wire rope that is long enough to reach from the highest point of support to the lowest possible landing, plus reeving lengths.
11. Do not join platforms unless the installation was designed for that purpose.
12. **DO NOT MOVE SUSPENDED SCAFFOLDS HORIZONTALLY WHEN OCCUPIED.**
13. When re-rigging for another drop be sure sufficient wire rope is available before moving the suspended scaffold system horizontally.
14. **WHEN WELDING FROM SUSPENDED SCAFFOLDS:**
    a. Be sure platform is grounded to structure.
    b. Insulate wire rope above and below the platform to protect from damage by the welding torch or electrode.
    c. Insulate wire rope at suspension point and be sure wire rope does not contact structure along its entire length.

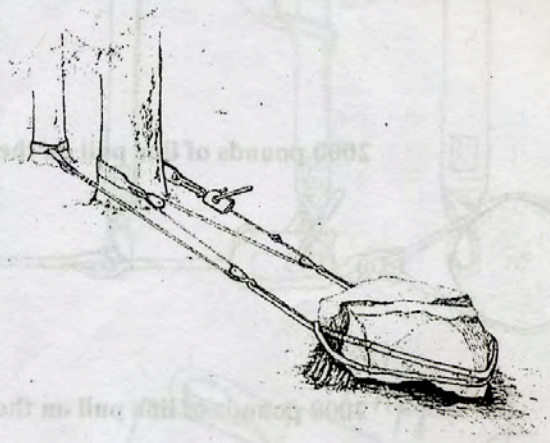
These Safety Guidelines (Code of Safe Practices) set forth some common sense procedures for safety erecting, dismantling and using suspended scaffolding equipment. Since equipment and scaffolding systems differ, reference must always be made to the instructions and procedures of the supplier and/or manufacturer of the equipment.
Since field conditions vary, and are beyond the control of the Scaffold Industry Association, safe and proper use of scaffolding is the sole responsibility of the employer and user.

Rigging Safety Guidelines

- Always wear Personal Protective Equipment (PPE) appropriate to the task.
- Establish a standard system of communication and use it.
- Establish accountability by making sure each worker has a job or task.
- Always have a designated Safety Officer and a designated Communicator.
- Know the breaking strength and Working Load Limit (WLL) of every component.
- Do not exceed the WLL of any component- usually 20% or 10% of the breaking strength.
- Quantify and communicate the maximum amount of force on every component in the system.
- Quantify and communicate the direction of force on every component in the system.
- Identify and communicate all fly zones before the system goes under tension.
- Make sure each person is in the safest possible working position outside of the fly zones.
- Do not compromise the D/d ratio of any wire or fiber rope.
- Know the compatibility and designed use of all components.
- Do not use any component in a manner outside of it's designed capabilities.
- If you shear a pin, adjust the system before continuing.
- Avoid shock loading at all costs.

Hoists and Wire Rope

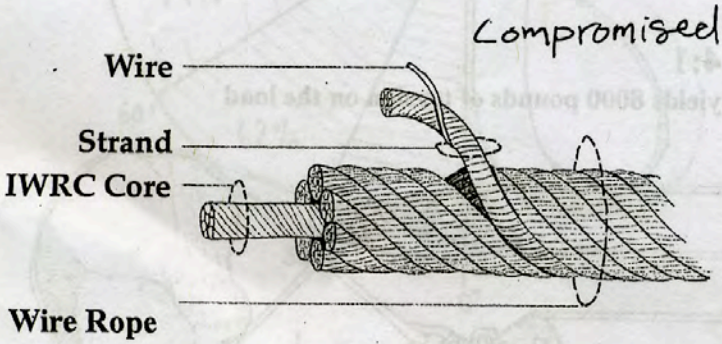
Trail crews often employ winches to accomplish work that would otherwise be unsafe, difficult, or perhaps impossible. The Griphoist is the original and best known power source for tasks such as pulling stumps, dragging rocks or moving bridge stringers and large rocks through the air. It is a hand powered continuous feed wire rope winch that is both portable and highly versatile. There are a number of models and sizes, the most popular are listed in the chart below.



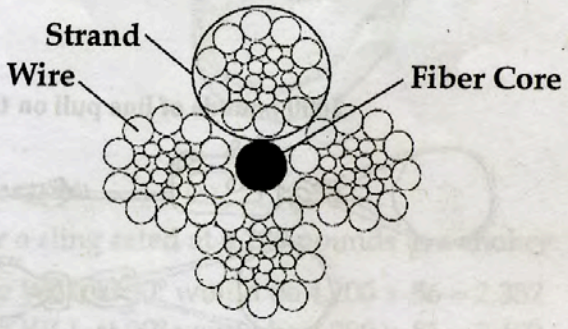
Model	Rated Capacity for People	Rated Capacity for Material	Weight	Wire Rope Diameter
TU-17	1,500 lbs.	2,000 lbs.	18.5 lbs.	5/16"
TU-28	3,000 lbs.	4,000 lbs.	41 lbs.	7/16"
TU-32	6,000 lbs.	8,000 lbs.	59.5 lbs.	5/8"
T-508	n/a	2,000 lbs.	14.3 lbs.	5/16"
T-516	n/a	4,000 lbs.	30 lbs.	7/16"
T-532	n/a	8,000 lbs.	51 lbs.	5/8"

Take

Different types of wire rope (often referred to as cable) are used inside the Griphoist and as extensions. The basic components of wire rope are the *core*, the *strands*, and the *wires*. The core is a central element that the strands rotate around. It can be made of fiber, plastic, or steel. The strands are bundles of wire that are rotated as a group around the core. The wires are made of thin steel and make up the strands. The type of steel, direction of rotation, number of wires, number of strands, and composition of the core dictate the flexibility, strength, and use of different wire ropes. Griphoists use a 4 x 26 or a 5 x 26 Warrington Seale wire rope. More commonly found (and less expensive) wire rope is 6 x 19 Independent Wire Rope Core IWRC.



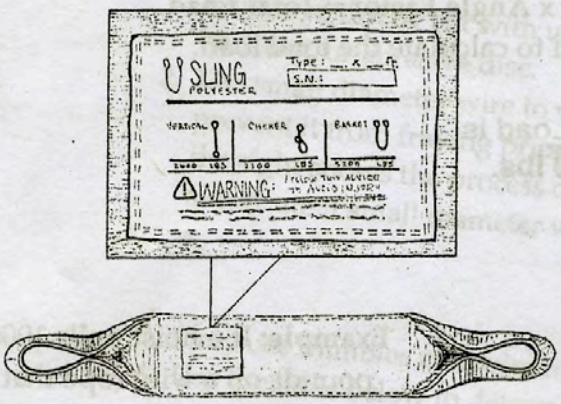
Typical 6 x 19 IWRC



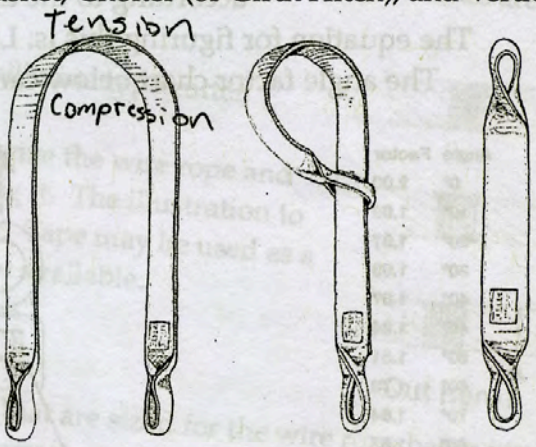
4 x 26 Warrington Seale

Sling Orientation and Strength Ratings

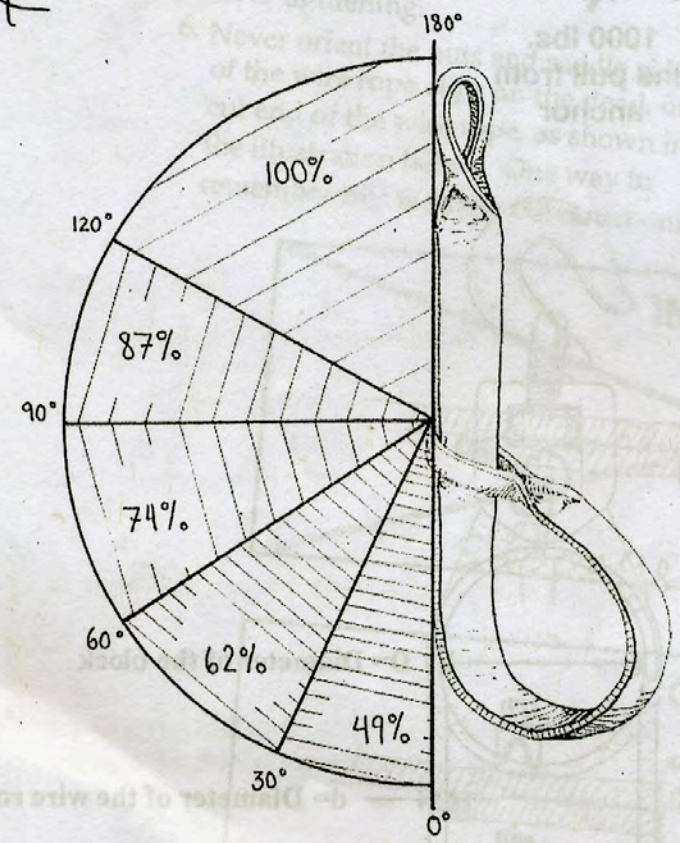
Every sling should have a tag with a WLL rating for each orientation



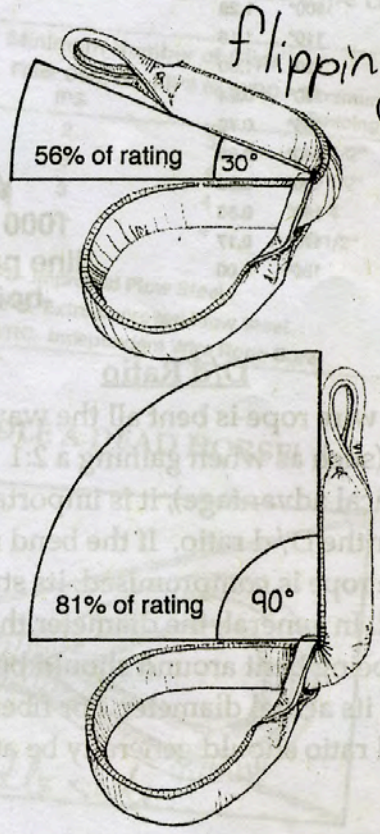
The orientations are from left to right: Basket, Choker (or Girth Hitch), and Vertical



- The choker rating listed on the sling tag is reduced further if the sling is bent back on itself, as illustrated by the diagram below



flipping



Example:

For a sling rated at 4,200 pounds in a choker:

The WLL at 30° would be 4,200 x .56 = 2,352

The WLL at 90° would be 4,200 x .81 = 3,402

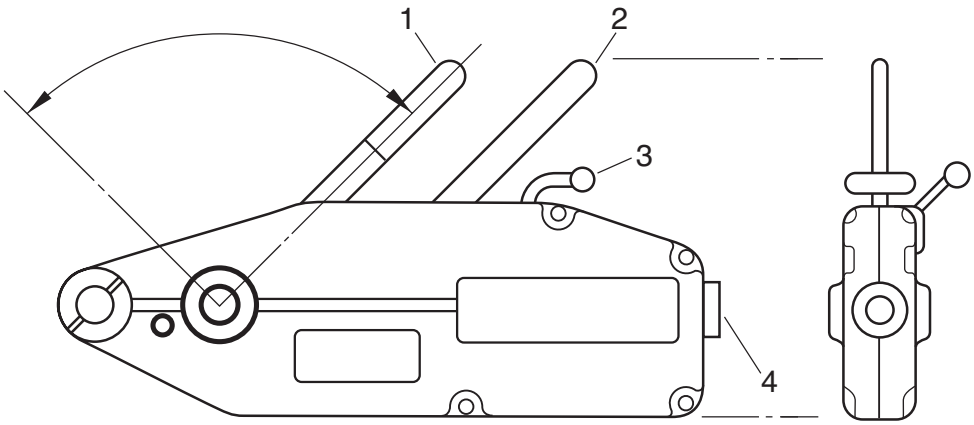
Bend Ratio Reduce Strength

Winch - Horizontal Plans
Hoist - Any Direction

MAGNA®
LIFTING PRODUCTS

WIRE ROPE PULLER
MANUAL

OPERATING INSTRUCTIONS



This unit comes with extra shear pins located in the handle.

To release the jaws, hold reversing lever (2) and release lever (3) together with one hand, pull lever (1) forward slightly at the same time pushing (2) and (3) forward until release lever (3) slips into notched position in casing. Insert the tapered end of the wire rope into the rope entry (4) and push through until it extends through the outlet. The wire rope end may have to be pushed up or down slightly to clear the hook or fitting at forward end.

Pull the wire rope through by hand to take up the slack to the load and ensure that the exit is not obstructed.

Push the release lever (3) down, it will spring back into original position. The jaws are now closed on the wire rope.

Place the telescopic handle on either (1) or (2) depending upon whether forward or reverse action is required, and crank the operating lever forward and backward evenly.

Return the release lever to “release” position when not in use.

Wire Rope:

MAGNA’s wire rope is sold separately in 33 and 65 foot lengths with hook attached at one end.
The class of wire rope used is 6x19, wire core and galvanized, including 6x21, 6x25 and 6x26.
The wire rope used by our factory is 6x25. The end to be inserted into the unit should be tapered and burned for easy use.

⚠ WARNING

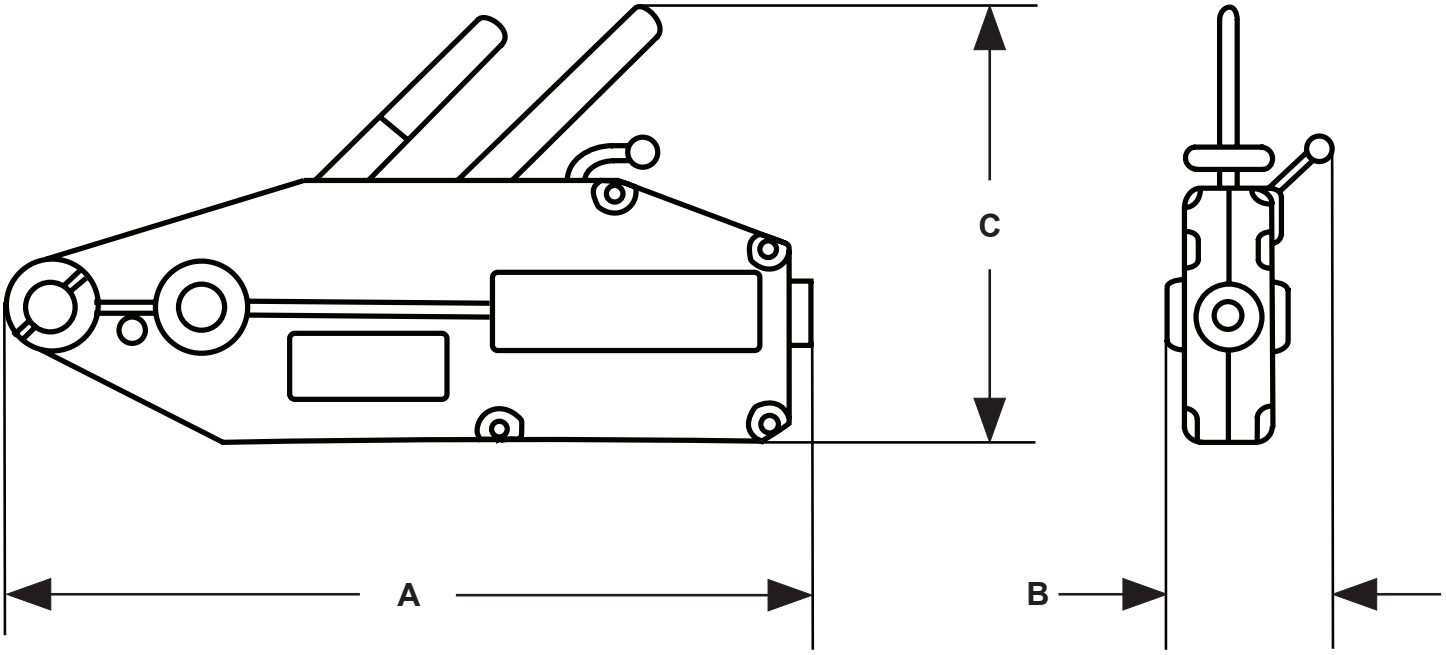
- DO NOT USE TO LIFT OR SUSPEND PERSONNEL. THIS UNIT IS NOT MAN-RATED.
- Remove dirt and grit from wire rope and winch.
- Do not use wire rope that is kinked or damaged.
- Keep inside parts properly lubricated with oil.

4202 Meridian St. Suite 100, Bellingham, WA 98226 | t. 360.392.0432 | f. 360.464.2544
toll free 1.888.48.MAGNA | sales@magnalifting.com | www.magnalifting.com

2016-V1

WIRE ROPE PULLERS
DATA SHEET

MAGNA® LIFTING PRODUCTS



MODEL NUMBERS	WRP075C	WRP150C	WRP300C
LIFTING CAPACITY (POUNDS)	1,760	3,525	7,050
ROPE ADVANCE PER FULL STROKE (INCHES)	2.0	2.2	1.1
ROPE DIAMETER (INCHES)	5/16	7/16	5/8
STANDARD WIRE ROPE LENGTH (FEET)	33 AND 65	33 AND 65	33 AND 65
NET WEIGHT WITH HANDLE (POUNDS)	20	36	58
HANDLE LENGTH (INCHES)	32.5	47.5	47.5
PULLING EFFORT AT RATED CAPACITY (KILOGRAMS)	64	93	99
DRIVE STEP	1	1	1
DIMENSIONS (INCHES)			
A (OVERALL LENGTH)	17.0	21.5	26.0
B (OVERALL WIDTH)	2.5	3.8	4.5
C (OVERALL HEIGHT)	9.0	10.3	12.5

MAGNA Lifting Products • **Address:** *1140 Yew Ave Blaine, WA 98231* • **Phone:** *1-888-48-MAGNA* • **Email:** *sales@magnalifting.com*

WORKING SAFELY WITH GRIPHOIST® POWERED SYSTEMS

by Lester C. Kenway - Illustrated by Julian Wiggins

Many trail crews roll heavy loads along cables tensioned by Griphoist® . Described as "high lines", these systems can be used to lift 400 pound step stones 100 feet up a steep slope to a new staircase on the trail.

These systems contain 4 basic components:

1. 1 or more Griphoist® with wire rope.
2. Towers or trees for vertical supports.
3. Anchors - usually trees, stumps, or boulders.
4. Accessories - slings, blocks, shackles, etc.

In order for any of these "high line" systems to work well, and to *prevent the failure* of any of these four components, several safe practices must be maintained.

1. Use wire rope in good condition that meets specifications for the Griphoist® machine being used.

The wire rope provided with Griphoist® machines has a breaking strength that is 5 times the rating of the winch. The shear pins will release at 150% capacity. On a 2000 lb. winch, the pins break at 3,000 lb., well below the 10,000 pounds needed to break the wire rope. The following could lead to breaking a wire rope:

- Disabling the safety shear pins in order to use a longer handle
- Using damaged, or inferior wire rope
- Shock loading - such as pulling a rock off a cliff while it was attached to a tight high line.

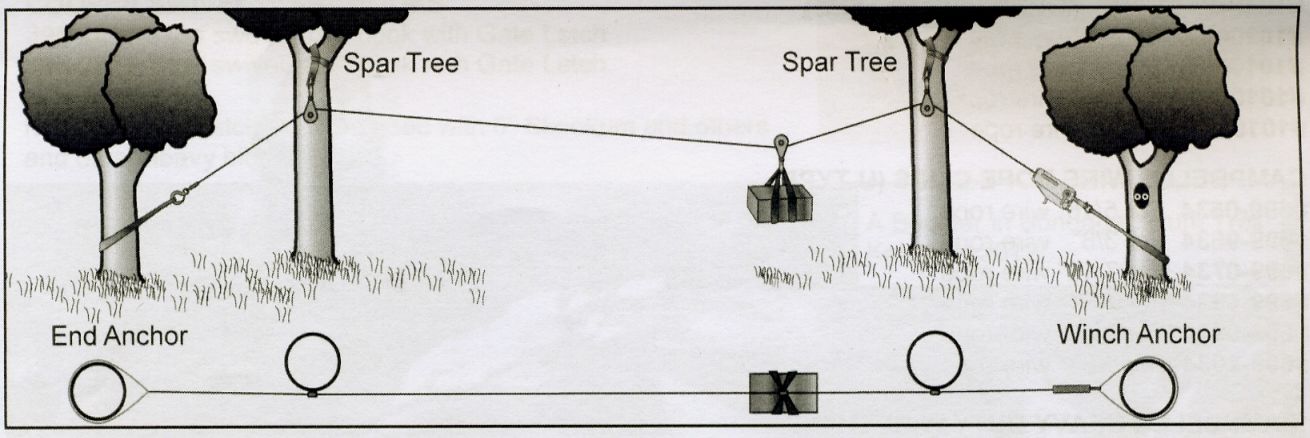
The danger of breaking a wire rope is minimized when properly maintained hoists are matched with the appropriate wire rope.

2. When using trees as vertical supports, always analyze the forces being put on the tree and use appropriate guy lines to prevent toppling or breaking the tree.

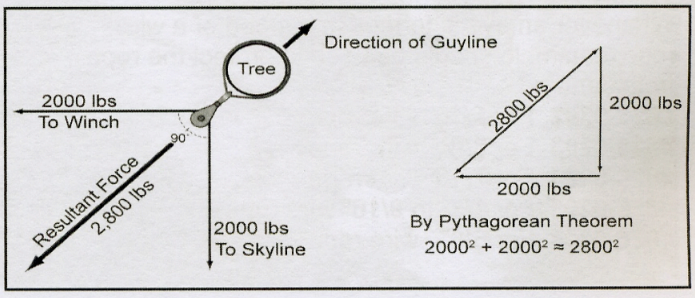
It can take 2000 pounds of tension to lift a 300 pound load in a typical 100 foot long high line system. If this horizontal force were to be applied to a tree 12 to 16 feet off the ground, it could pull the tree over. The simplest way to prevent excessive sideways force on the "Spar" tree is to layout the system in a near linear fashion.

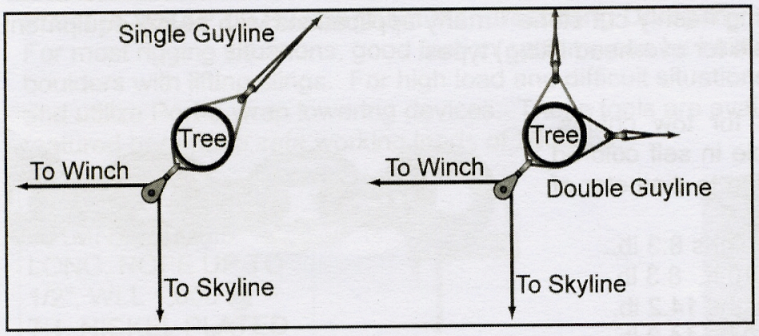
With a linear arrangement, the force on the spar trees by the line is matched by the tension from the Griphoist and end anchor. With this set-up, the spar trees experience a downward force.

When spar trees are the focus of a horizontal change in direction of the cable, the angles must be studied and a guy line(s) or backstay(s) applied that will oppose the **resultant** force that will be applied to the tree by the wire rope.



A line running through a 90 degree angle will create a resultant force that is 40% greater than the line tension! ———->

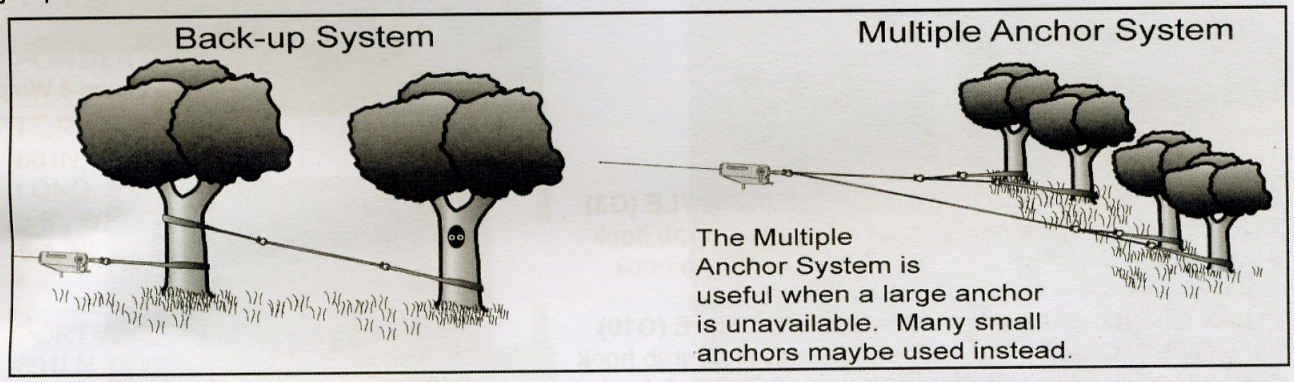




Since an angled line multiplies the resultant force experienced by the spar tree, at least one guy line made from lifting slings, chain or wire rope may be needed. If it is difficult to estimate the direction of the resultant force, two guy lines can be used, each one directly opposite of the two cable directions.

3. Pick solid anchors, and monitor them for changes. Use multiple anchors when in doubt.
The most common anchors are stout trees or large boulders. Even smaller trees can serve well as anchors if the lines are attached at ground level. Things to monitor:
1. Excessive *tilting* of trees or movement of boulders.
2. Evidence of impending tree fracture (*cracking noises*).
3. Slings *creeping* up the anchor - provoked by too steep an angle towards a spar tree.
4. Progressive *abrasion damage* or cutting of slings by rough edges on the anchor.

When the available anchor points appear to be small or questionable, use multiple anchor points:
Good, (as climbers say - "*Bombproof*") anchors are the foundation of these systems. It pays to do the best job possible with the anchors. ***Anchor failure is likely to hurt someone.***



4. Maintain a safety factor of 5 when applying all accessories and hardware to a system.
Quite simply put this means "Use the right tool for the job". Only "load rated" components should be used in these systems, and attention should be paid to avoid exceeding these limits. (Note: the WLL "Working Load Limit" marked on many products is 1/5 of the breaking strength of the part.) The safety factor of 5 is standard throughout much of the rigging industry. Examples:

- A Griphoist® machine that produces 2000 pounds of tension needs an anchor sling rated at 2000 pounds WLL (breaking strength of 10,000 pounds)
- A 4000 pound WLL snatch block (breaking strength of 20,000 pounds) is certainly OK for lifting a 500 pound boulder.

Griphoist powered rigging systems can help trail crews move rock, wood, and other materials to work sites, up steep slopes, and across many barriers. They are tools that can empower people of many ages and abilities to do impressive things. It is important for those who work these machines to be attentive to safe work principles. It pays to learn as much as we can about safe ways to use this equipment. As with many endeavors in life - ***knowledge is safety.***

Drawings by Julian Wiggins

Many Trail Crews who work in the backcountry are substituting Amsteel Blue synthetic rope for their high lines. Amsteel Blue serves as the overhead line which is them pulled by a Griphoist with a shorter wire rope. Amsteel Blue is stronger than a wire rope of the same diameter and 1/7th the weight. Synthetic rope needs to handled with care as it is not as durable as wire rope.

SNATCH BLOCKS

Picking the Right Snatch Block

A *snatch block* can be opened on one side to accept a line or wire rope. On "*Drop Side*" snatch blocks, theside plate rotates to create an opening. "*Steel Plate*" blocks have a hinged link that can be opened . All snatch blocks have a grooved wheel called a "*sheave*", which cradles and turns with the line.

Three factors when choosing a snatch block:
1. **What size & type of wire rope will be used?**
2. **What function will the snatch block serve?**
3. **What loads will the block be subject to?**

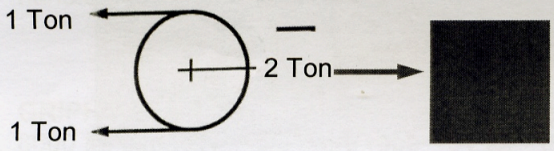
1. What size and type of wire rope will be used with the snatch block?

The wire rope and snatch block must be carefully matched, to prevent damage and accelerated wear.

"Undersize sheaves are probably responsible for more rope failures than any other single cause" - W. E. Rossnagel - Handbook of Rigging

Running wire rope over too small a sheave results in displacement of the strands of the rope and overstresses the wires. For 4x26 Griphoist wire rope, the minimum sheave diameter is 16 times the diameter of the wire rope:

For 5/16" 4 x 26 Wire Rope = 5"
For 7/16" 4 x 26 Wire Rope = 7"

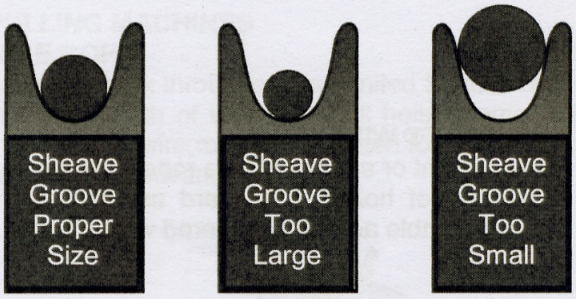


For 6x19 IWR (commonly available) wire rope, the minimum sheave diameter is 18 to 20 times the diameter of the wire rope.

If the diameter of the sheave's groove is too small, the wire rope will bridge across the groove, causing the wire rope to damage the sheave. If the groove is larger than the diameter of the wire rope, the wire rope will be flattened, as it rolls around the sheave.

2. What function will the snatch block serve?
- **-Double the line for a 2:1 advantage?**
- **-Support a high line?**
- **-Roll loads along a cable?**
- **-Provide a change in direction?**

The sheave diameter of a snatch block used for a 2:1 pull must meet minimum standards.



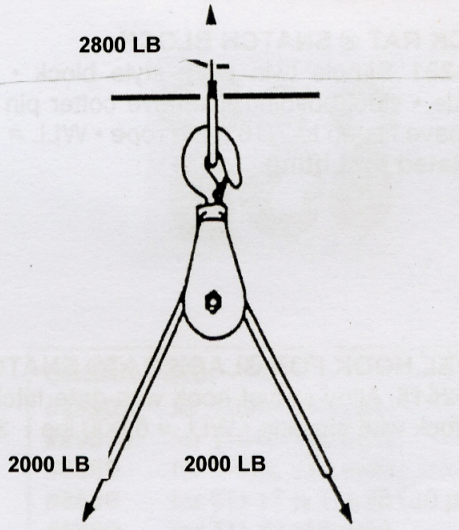
Note: Deep corrugated grooves, worn into the sheave over time can cut into wires and damage the wire rope. Be sure to replace the sheave when corrugations are pronounced, or when it is time to replace the wire rope with a new one.

Smaller blocks used for high anchors, that roll along tight wire ropes, or that provide changes of direction greater than 90° may often be employed with no harm to the wire rope, thereby reducing expense and weight carried by the crew. If smaller diameter snatch blocks are to be used, they still should have the proper diameter groove, to avoid damage to the sheave.

3. What loads will the block be subject to?

Snatch blocks are generally rated at 1-1/2 to 2 times the safe working load of the wire rope. A snatch block used to lift loads on a highline will be subject to a load equal to the weight being lifted.

A snatch block used as a high anchor will be subject to loads greater than the line tension. For example, if a skyline cable passes through a high anchor at a 45° angle, the snatch block will be subjected to a force 140% of the line tension. A 2000 LB tension applied through the angle will apply a downward force of about 2800 lb. on the snatch block.



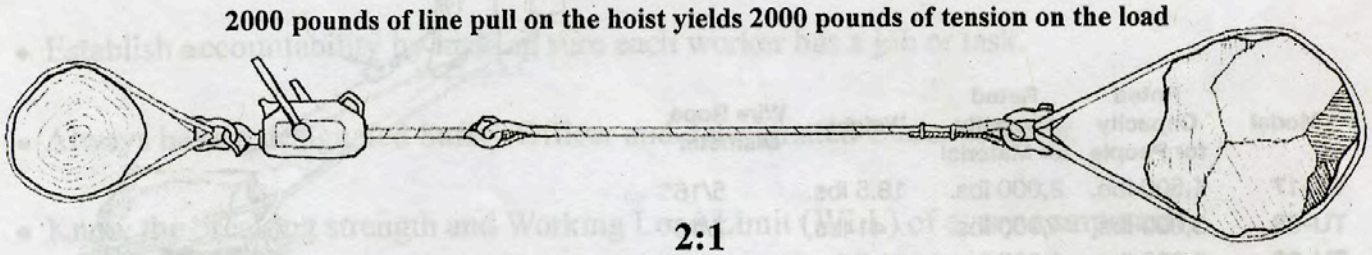
Understanding Mechanical Advantage

The power of a hoist may be multiplied by adding blocks to the load. Some points to remember are:

- In a 2:1 advantage, the power source must pull two feet of line to move the load to move one foot.
- In a 4:1 advantage, the power source must pull four feet of line to move the load to move one foot, etc.
- Mechanical advantage also adds more force to the slings and blocks in the system: make sure they are rated accordingly.
- The mechanical advantage ratio is fully achieved only when the lines run parallel to each other.

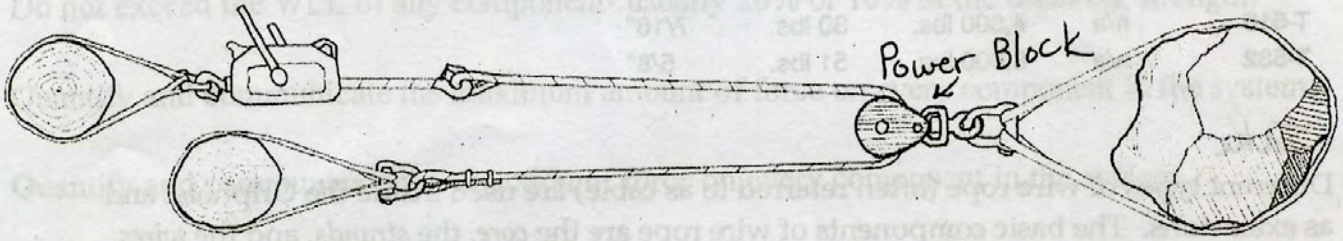
1:1

2000 pounds of line pull on the hoist yields 2000 pounds of tension on the load



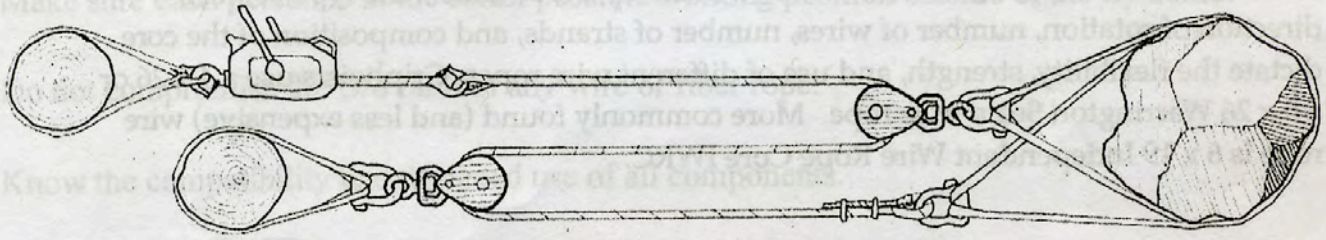
2:1

2000 pounds of line pull on the hoist yields 4000 pounds of tension on the load



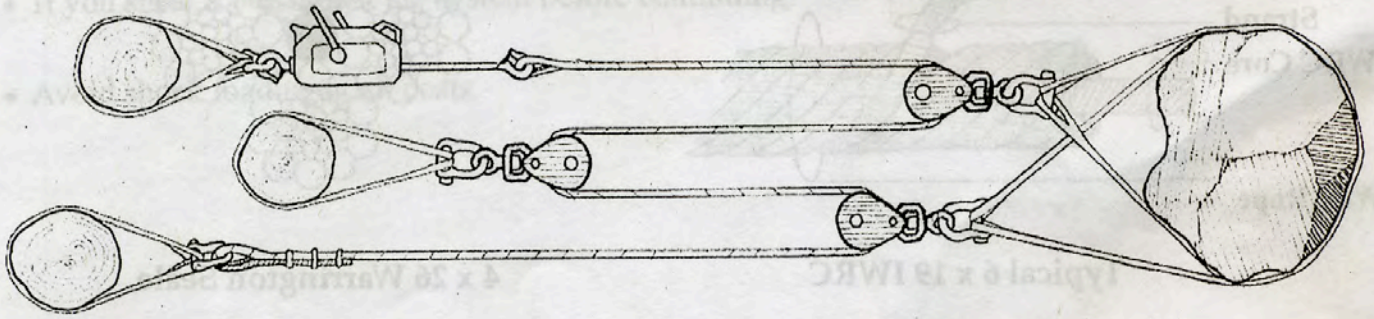
3:1

2000 pounds of line pull on the hoist yields 6000 pounds of tension on the load



4:1

2000 pounds of line pull on the hoist yields 8000 pounds of tension on the load



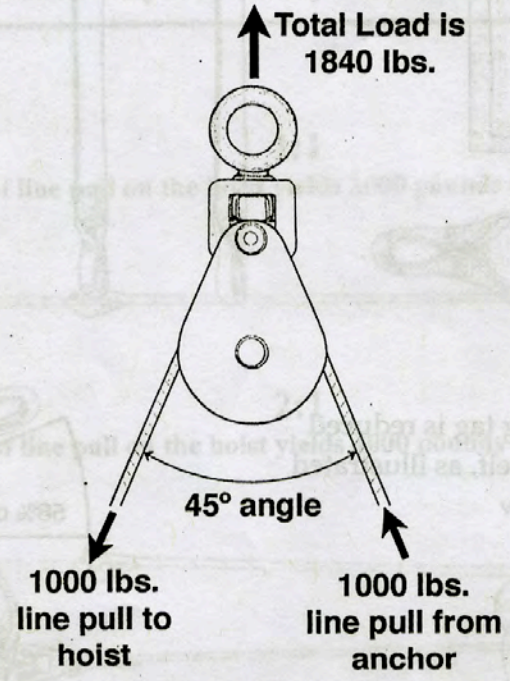
Block Loading and D/d Ratios

When a wire rope passes through a block, the forces on the block and the sling change according to the angle of the wire rope.

The equation for figuring this is: **Line Pull x Angle Factor = Total Load.**

The angle factor chart below can be used to calculate the total load.

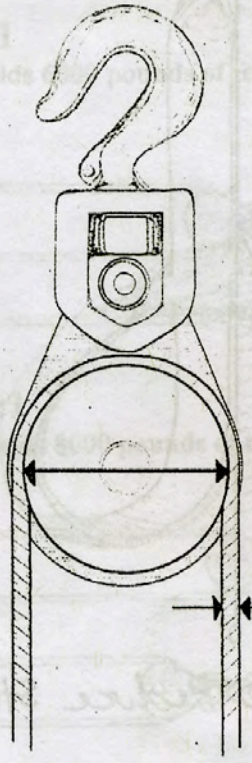
Angle	Factor
0°	2.00
10°	1.99
20°	1.97
30°	1.93
40°	1.87
45°	1.84
50°	1.81
60°	1.73
70°	1.64
80°	1.53
90°	1.41
100°	1.29
110°	1.15
120°	1.00
130°	0.84
135°	0.76
140°	0.68
150°	0.52
160°	0.35
170°	0.17
180°	0.00



Example: If a hoist pulls 1000 pounds on a wire rope that passes through a block at 45° (1000 x 1.84), the tension on the block is **1,840 pounds.**

D/d Ratio

When a wire rope is bent all the way around a block (such as when gaining a 2:1 mechanical advantage), it is important to consider the D/d ratio. If the bend radius of the wire rope is compromised, its strength is reduced. In general, the diameter that a wire rope is being bent around should be 20 times or more its actual diameter. For fiber ropes the D/d ratio should generally be at least 7:1.



Example: If the wire rope depicted on the right is ½" in diameter (d), the block should be ½ x 20 = 10" in diameter (D). A ½" fiber rope requires a block that is ½" x 7 = 3.5 inches in diameter.