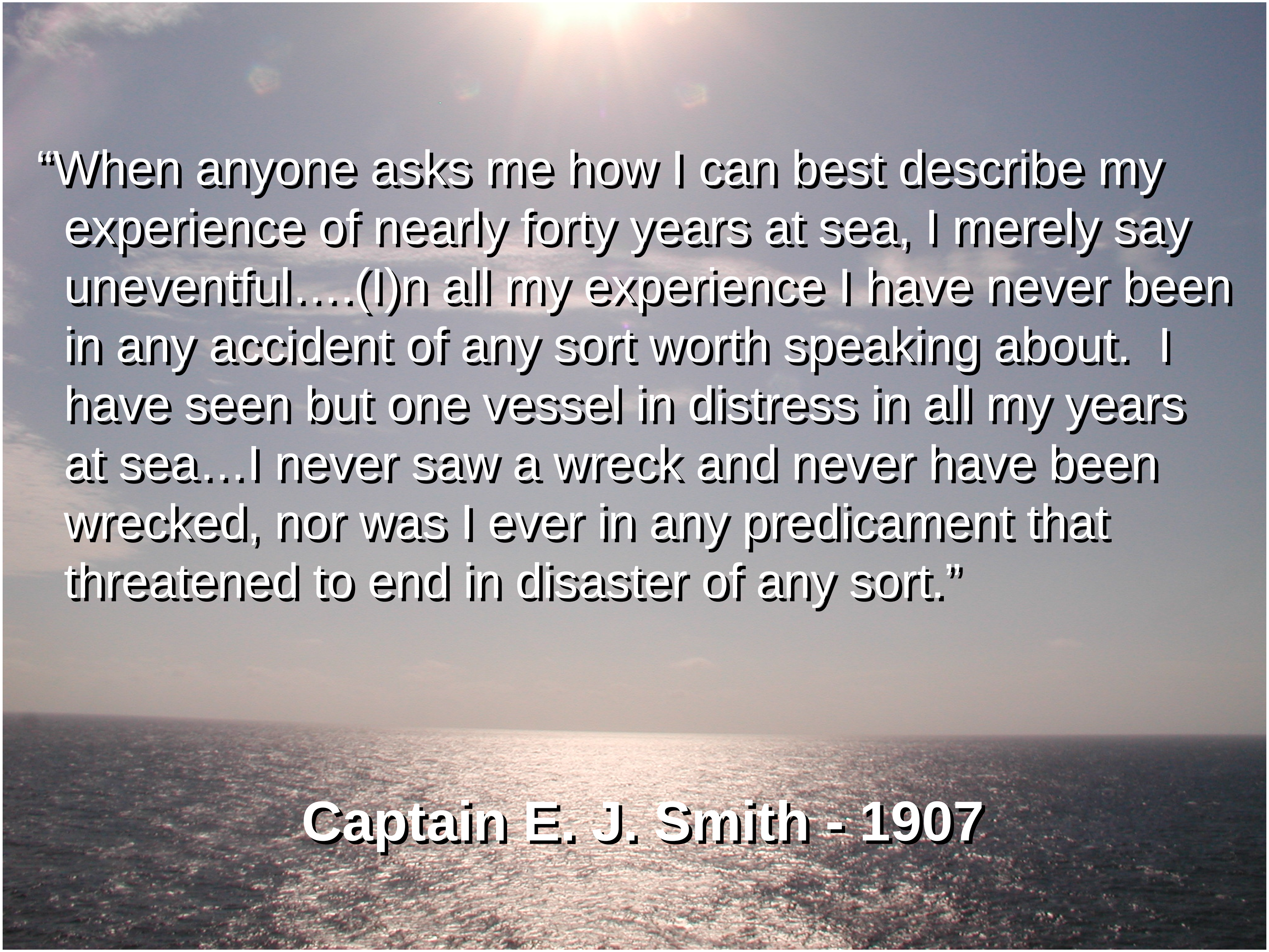
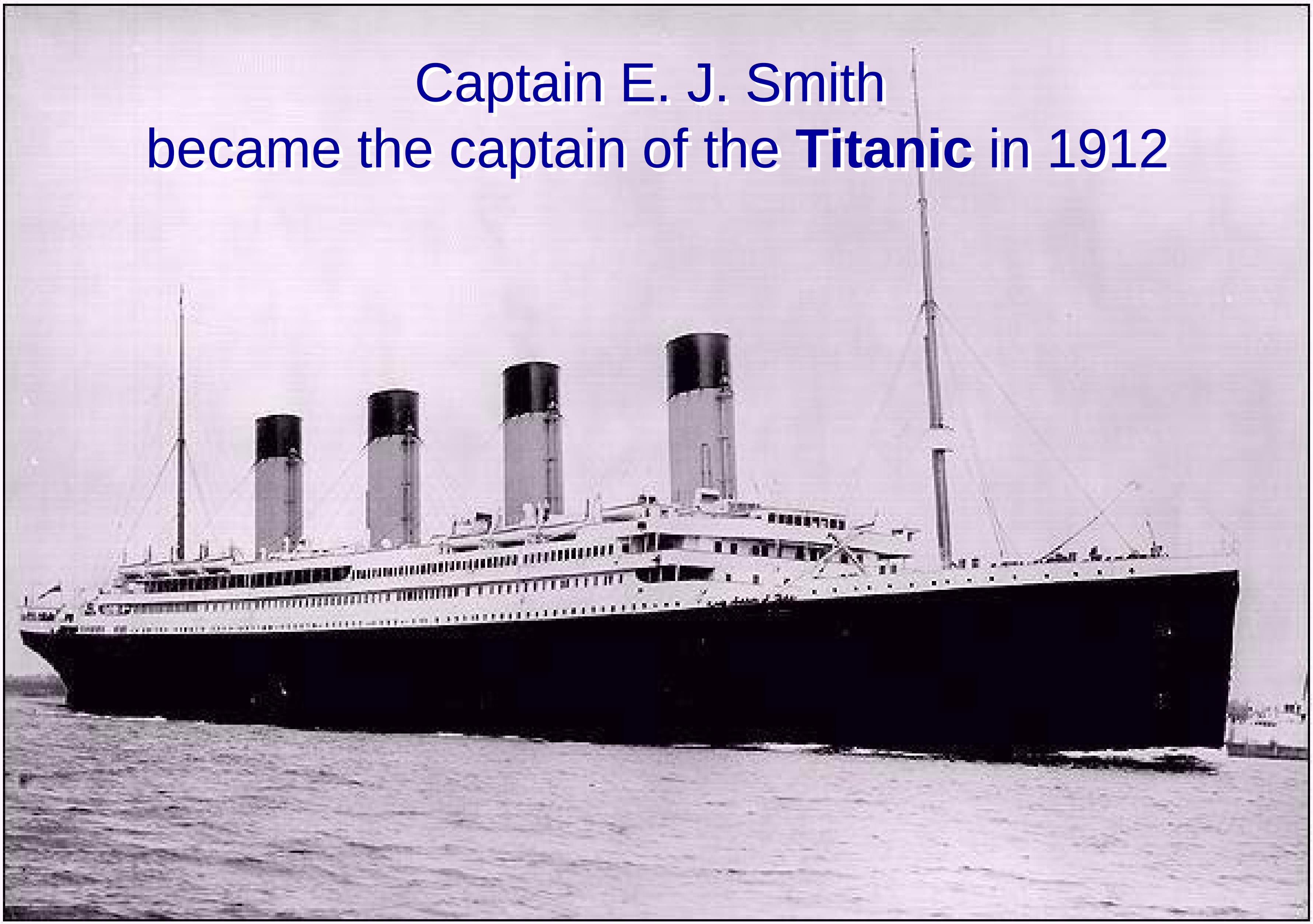
DOCK AND VESSEL MOUNTED

CRANE & RIGGING CONSULTANTS

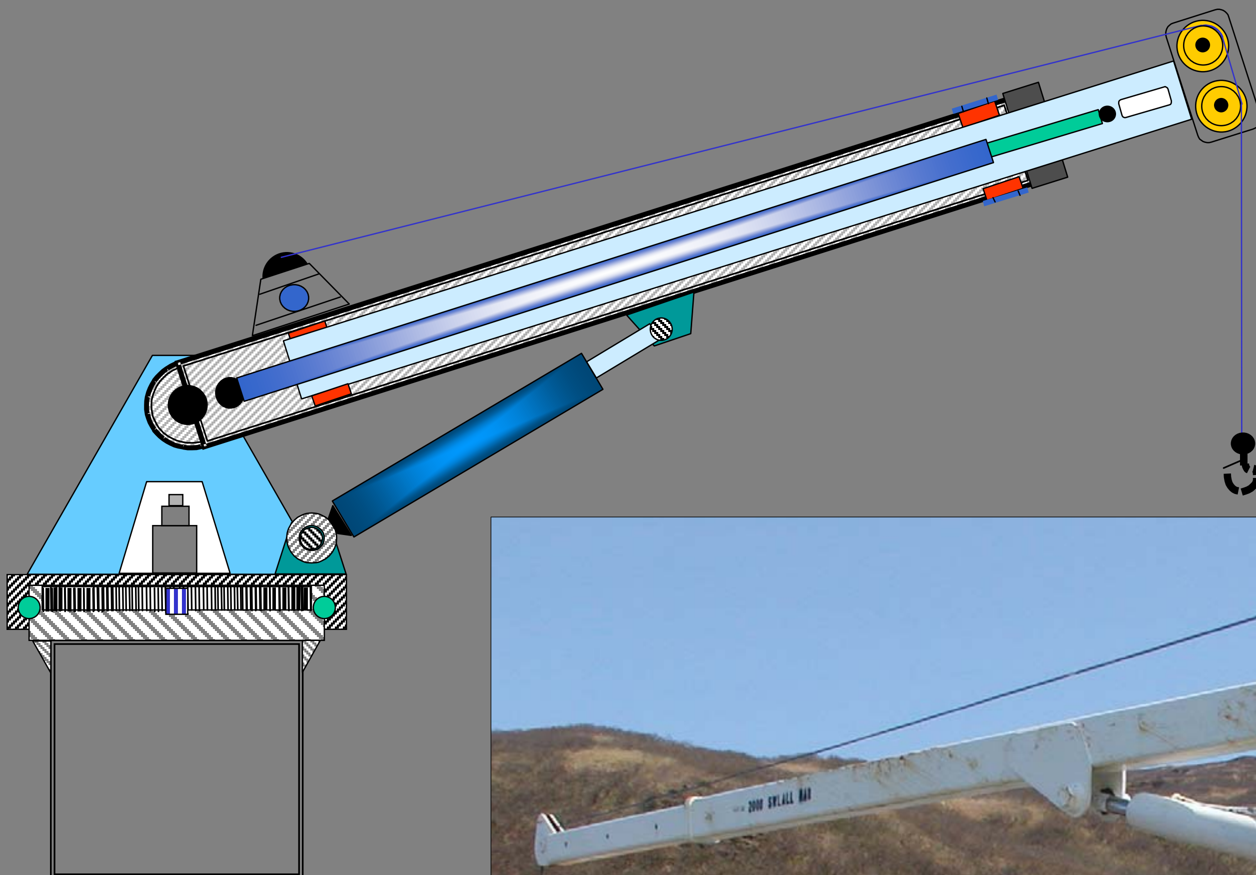
PEDESTAL CRANE OPERATOR SAFETY TRAINING


"When anyone asks me how I can best describe my experience of nearly forty years at sea, I merely say uneventful….(I)n all my experience I have never been in any accident of any sort worth speaking about. I have seen but one vessel in distress in all my years at sea…I never saw a wreck and never have been wrecked, nor was I ever in any predicament that threatened to end in disaster of any sort."
Captain E. J. Smith - 1907

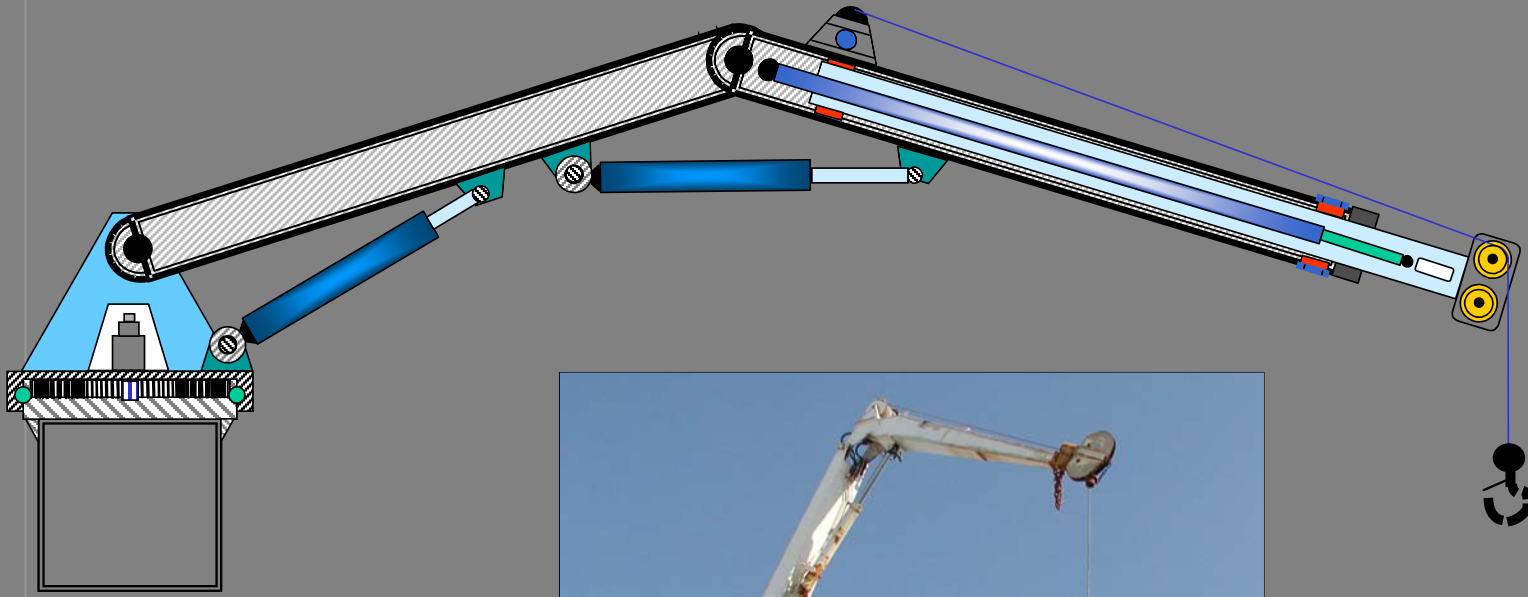
Captain E. J. Smith
became the captain of the **Titanic** in 1912



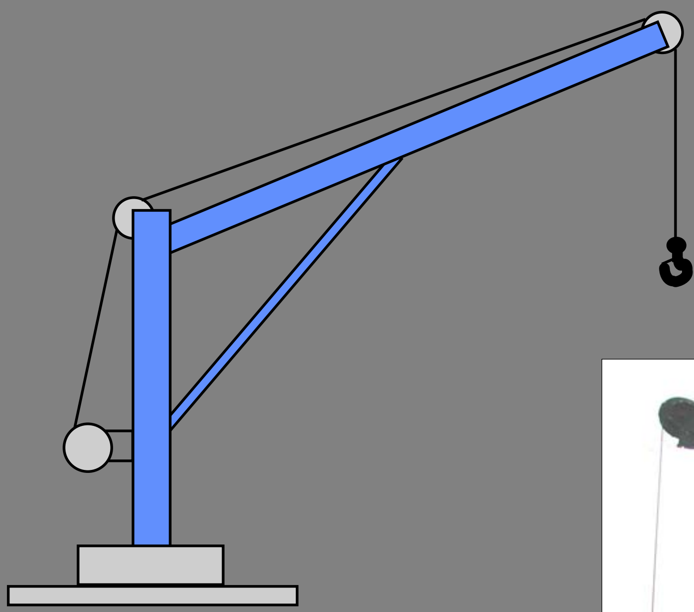
TELESCOPING BOOM CRANE



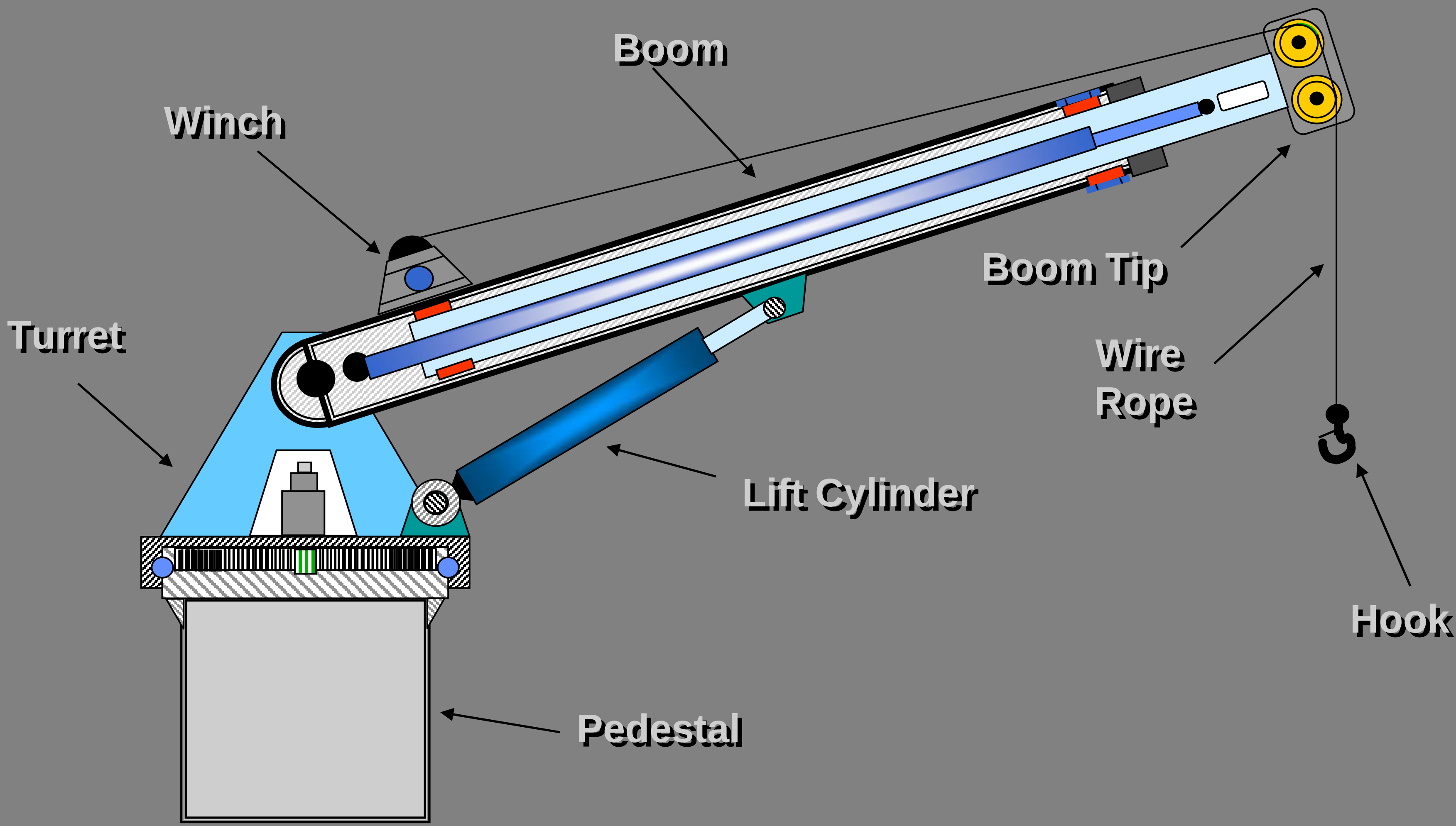
KNUCKLE BOOM CRANE



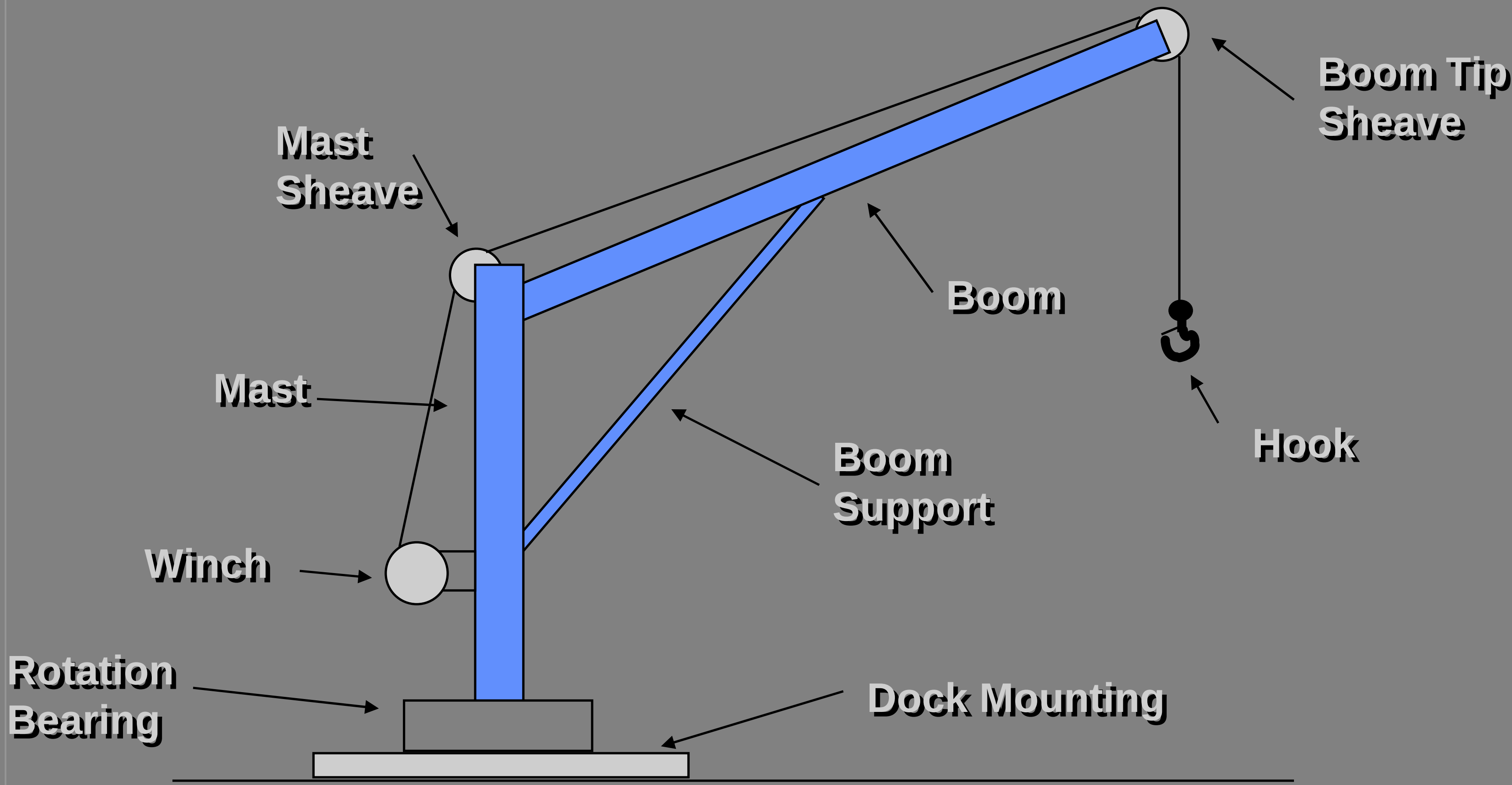
SWINGING BOOM CRANE



CRANE COMPONENTS



SWINGING BOOM CRANE COMPONENTS

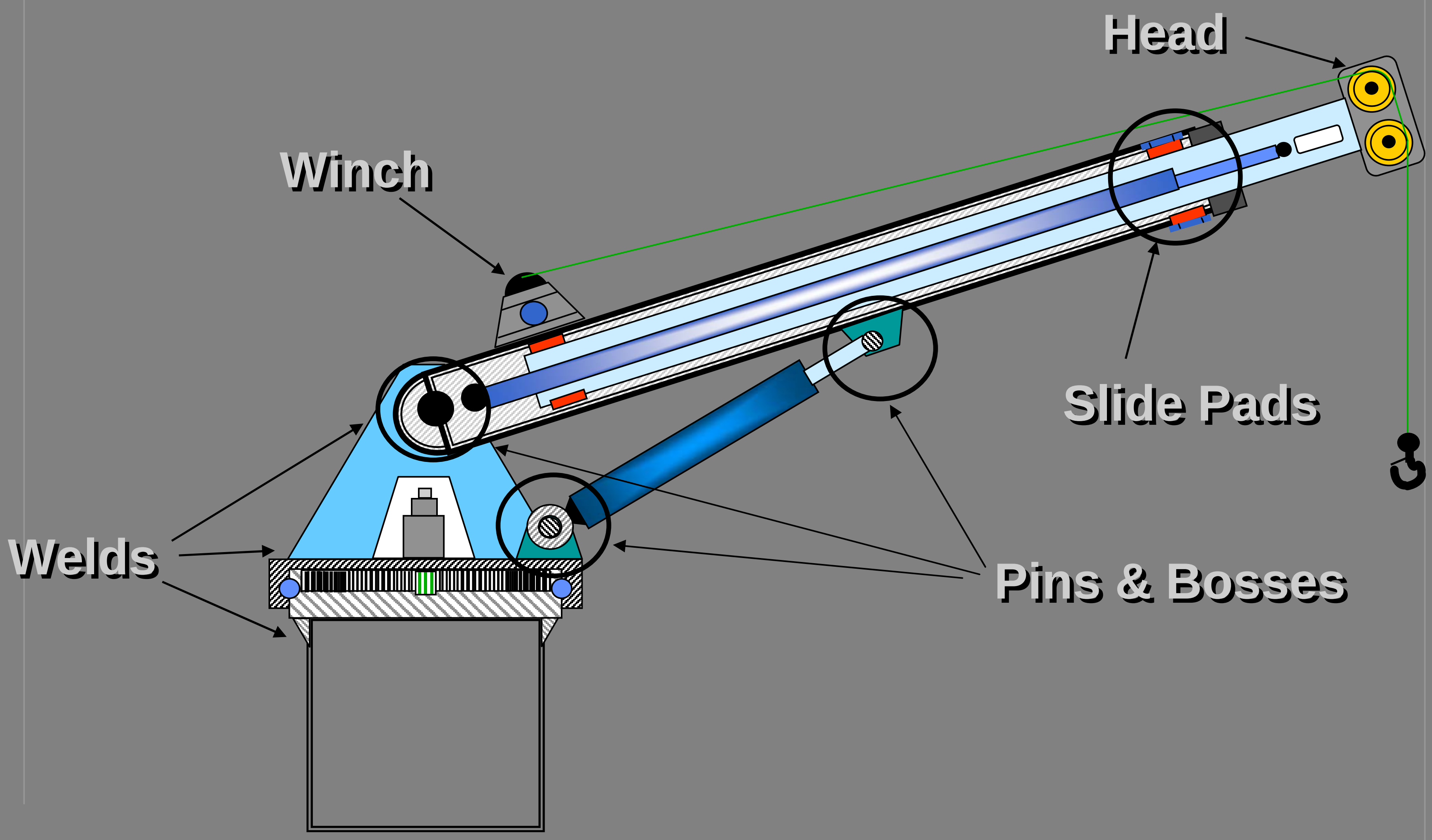


PEDESTAL MOUNTED CRANE
Inspection Check List

INSPECTION AREA	INSPECTION RESULTS			
	Sat.	Unsat.	N/A	Comments
Supporting Structure				
Welds				
Bolts				
Rotating System				
Bull & PinionGear				
Swing Brakes				
Hydraulic Drive Motor				
Boom				
Welds				
Stress & Distortion				
Hinge Pin				
Boom Cylinder & Pins				
Wear Pads				
Telescopic Operation				
Tip Section & Sheaves				
Angle/Radius Indicator				
Anti-Two Blocking Sys.				
Winch System				
Wire Rope Condition				
Rope Reeving				
Mounting Bolts				
Brakes				
Functional Operation				
Hydraulic System				
Pump Performance				
Control Functions				
Control Markings				
Hydraulic Leaks				
Hose Condition				
Fluid Level				
Load Block				
Sheaves				
Pins				
Swivel				
Hook				

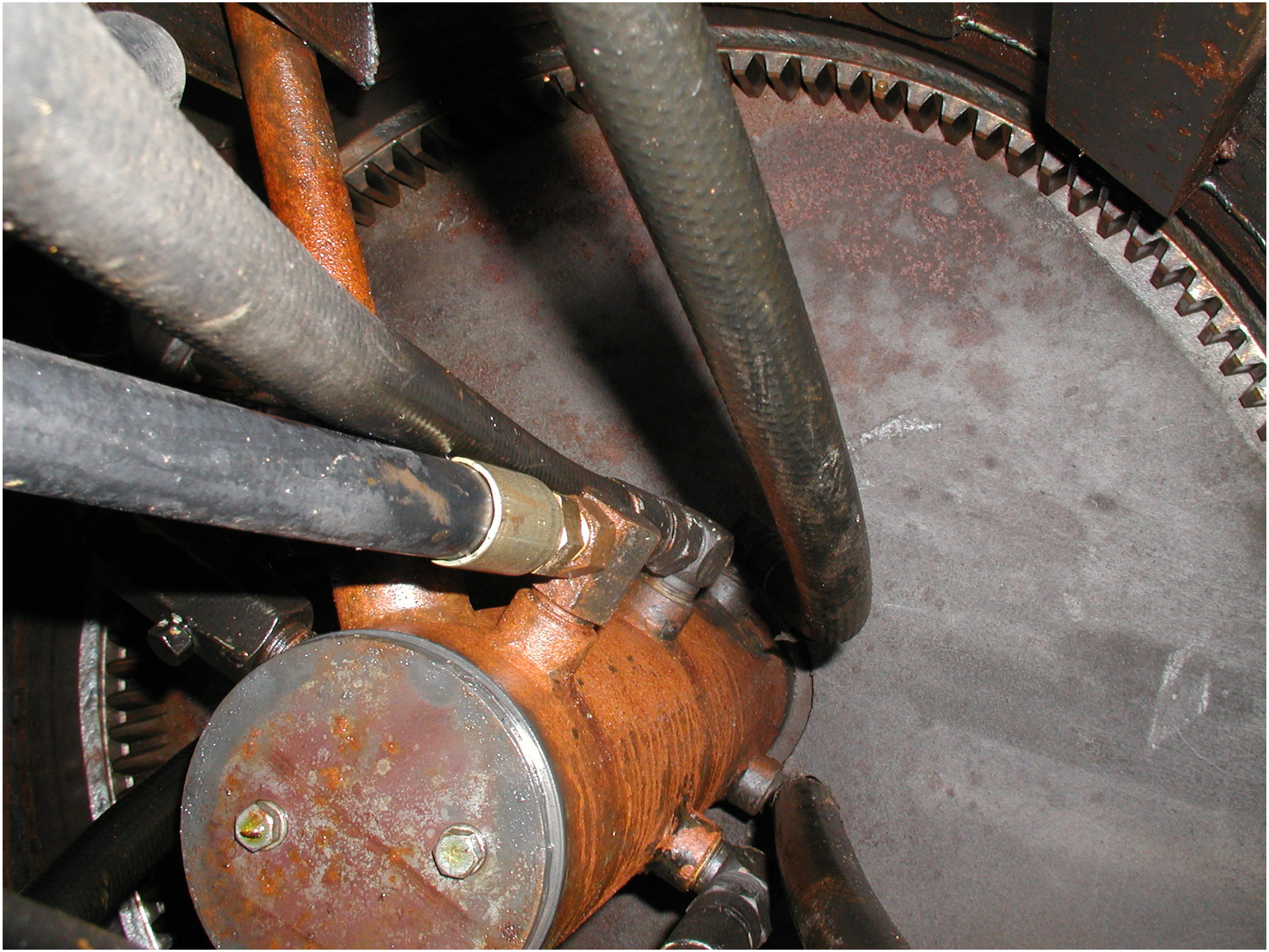
The operator is responsible for inspecting the crane prior to using it.

BOOM & TURRET INSPECTION



TYPICAL DOCK MOUNTING METHODS

Check mounting methods to ensure that bolts are not loose and that no damage to the mounting or the dock is apparent.



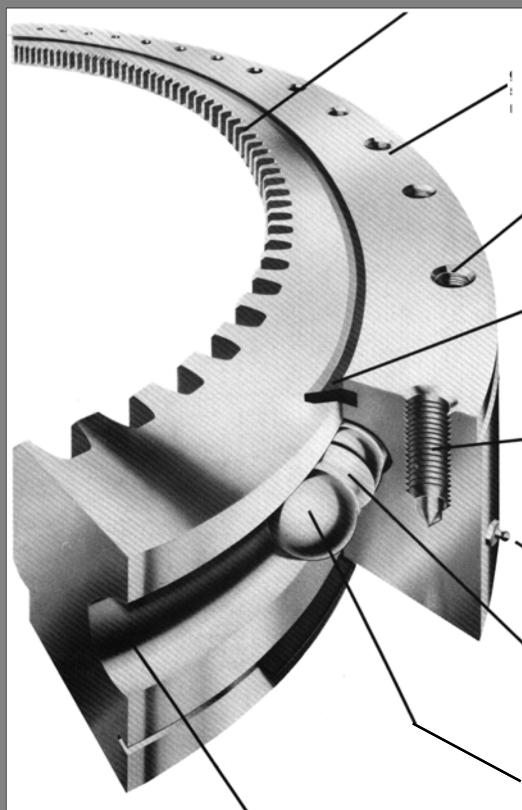
INSPECT FOR LEAKING HYDRAULIC HOSES AND CYLINDERS

Leaking Cylinders

Chaffed, leaking, or damaged hoses

ROTATION BEARING

Rotation gear



Rotation ring

Mounting holes

Seal

Holes spaced for uniform load

Grease fitting

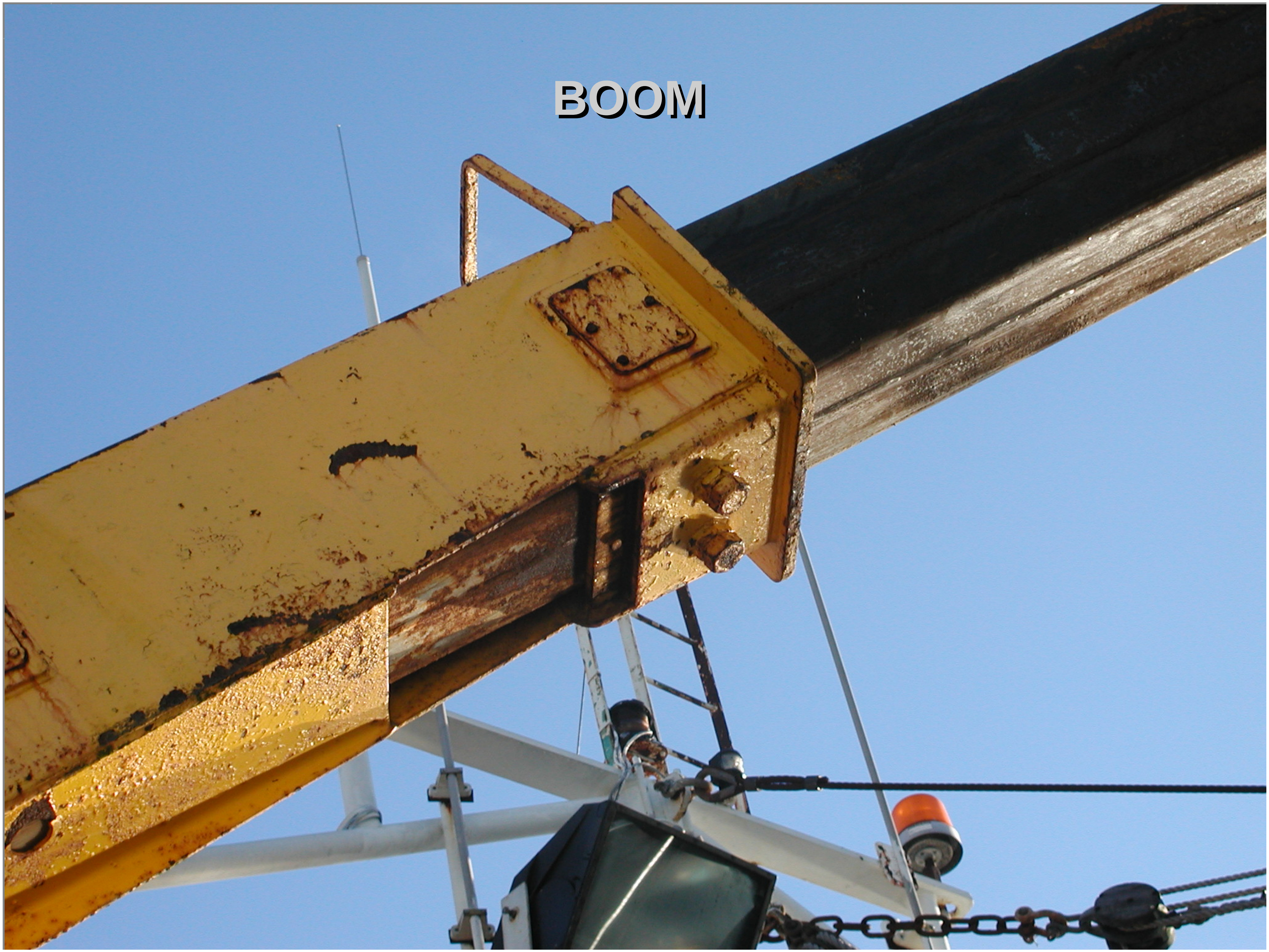
Bearing spacer

Ball bearing

Bearing raceway

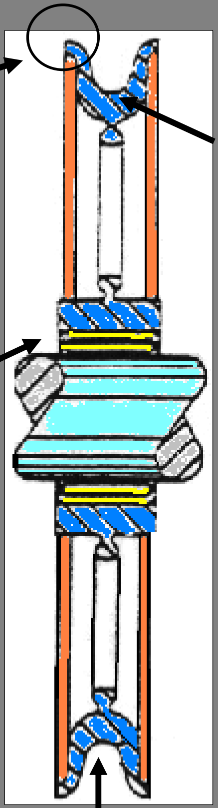

WINCH

BOOM

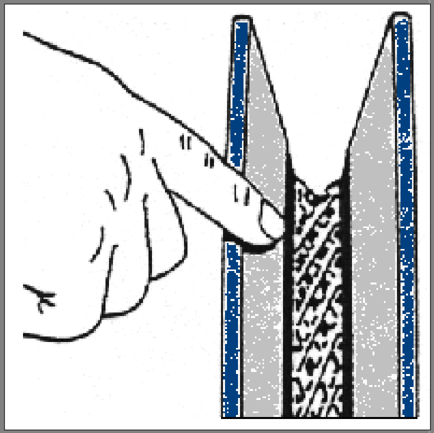


INSPECTING SHEAVES

CHECK FLANGES FOR CHIPS, CRACKS, WEAR

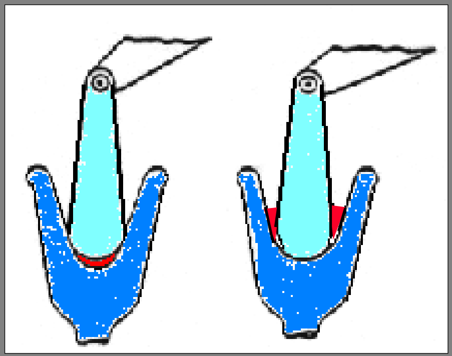


CHECK GROOVE WEAR

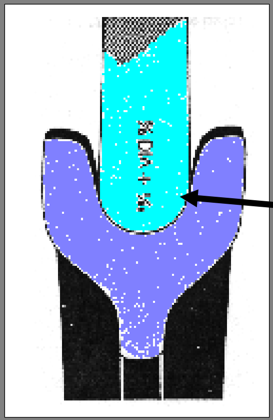


CHECK BEARINGS FOR WOBBLE, GREASE, EASE OF ROTATION

MEASURE GROOVE



WORN GROVES



150º CONTACT

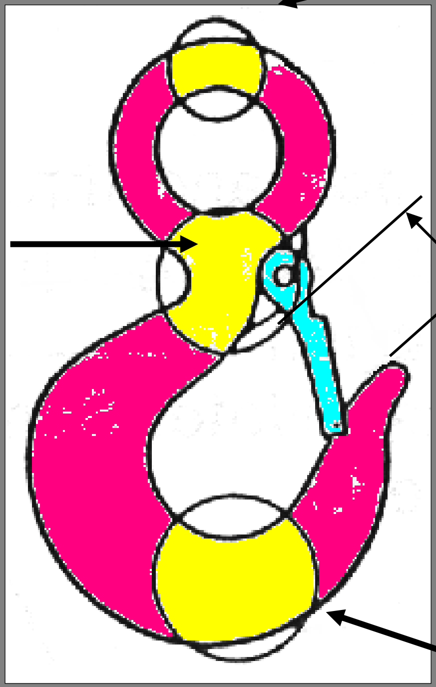
PROPER SIZE GROVE

HOOK INSPECTION

CHECK FOR:

- Wear
- Deformation
- Cracks & Sharp Nicks
- Modifications
- Safety Latches
- Swivel Wear & Lubrication
- Hook Shackle Mousing

Self-closing hook

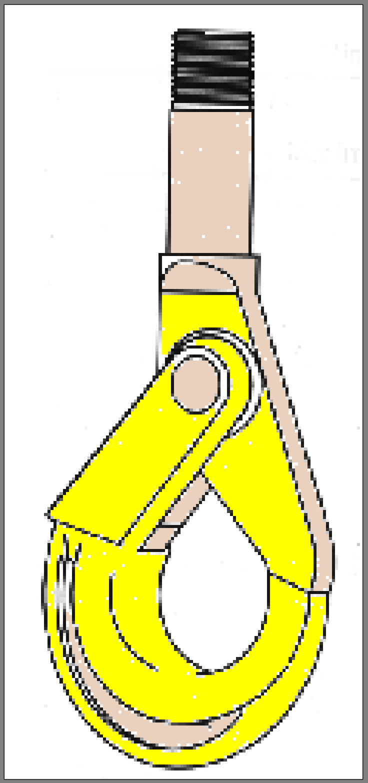


Standard safety latch hook

HOOK INSPECTION

Check for:

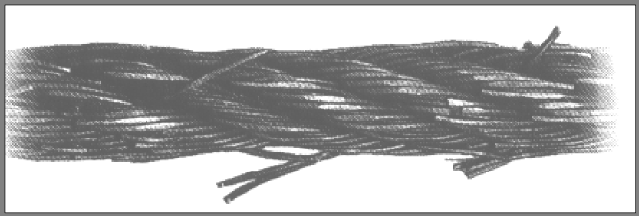
- Wear
- Deformation
- Cracks & Sharp Nicks
- Modifications
- Safety Latches
- Swivel Wear & Lubrication
- Hook Shackle Mousing



Self-closing hook

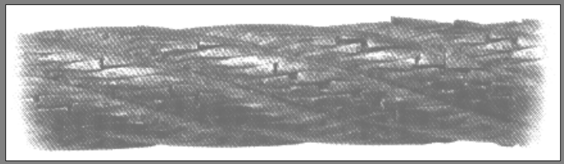
WIRE ROPE INSPECTION

FATIGUE FAILURE



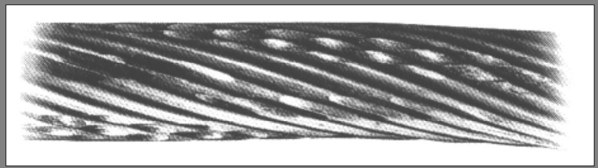
Heavy loads over small sheaves

FATIGUE BREAKS



Repeated bending, normal loads

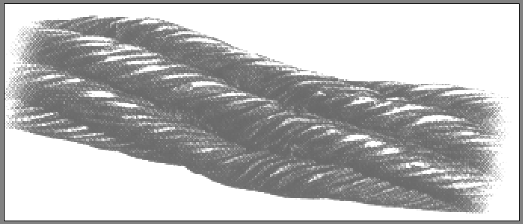
STRAND KNICKING



Accentuated with heavy loads

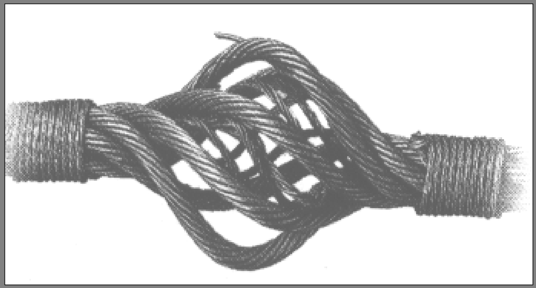
WIRE ROPE INSPECTION

KINKED WIRE ROPE



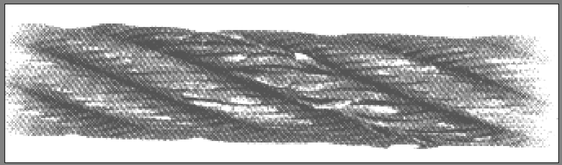
Crossed lines on drum

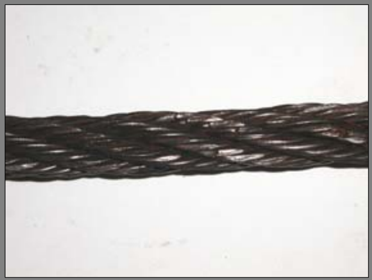
BIRDCAGE



Sudden tension release

HIGH STRAND

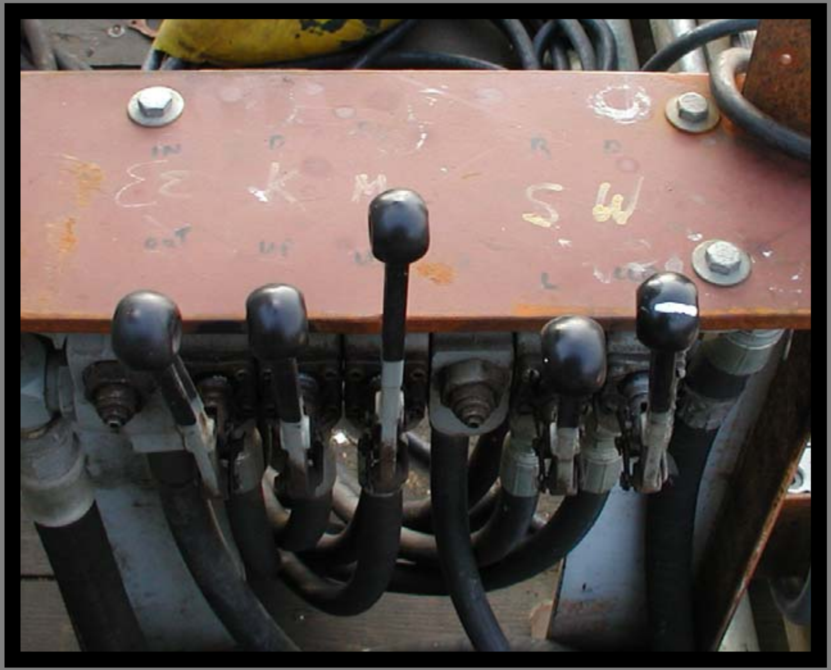




Improper socketing, kinks

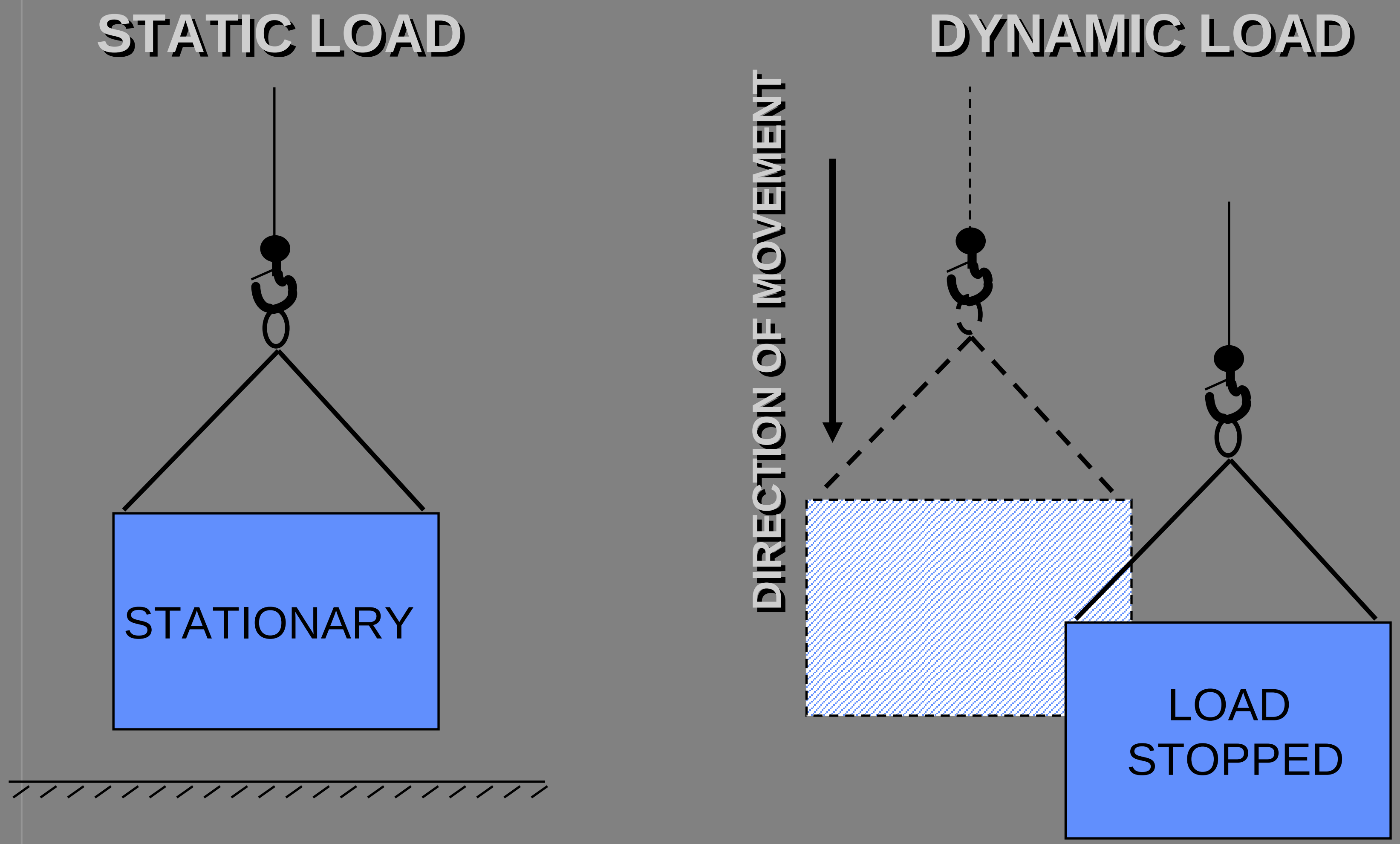
CRANE CONTROLS

Crane controls need to function smoothly and without excessive play in the control linkage. All controls need to be properly labeled including function and direction of motion.



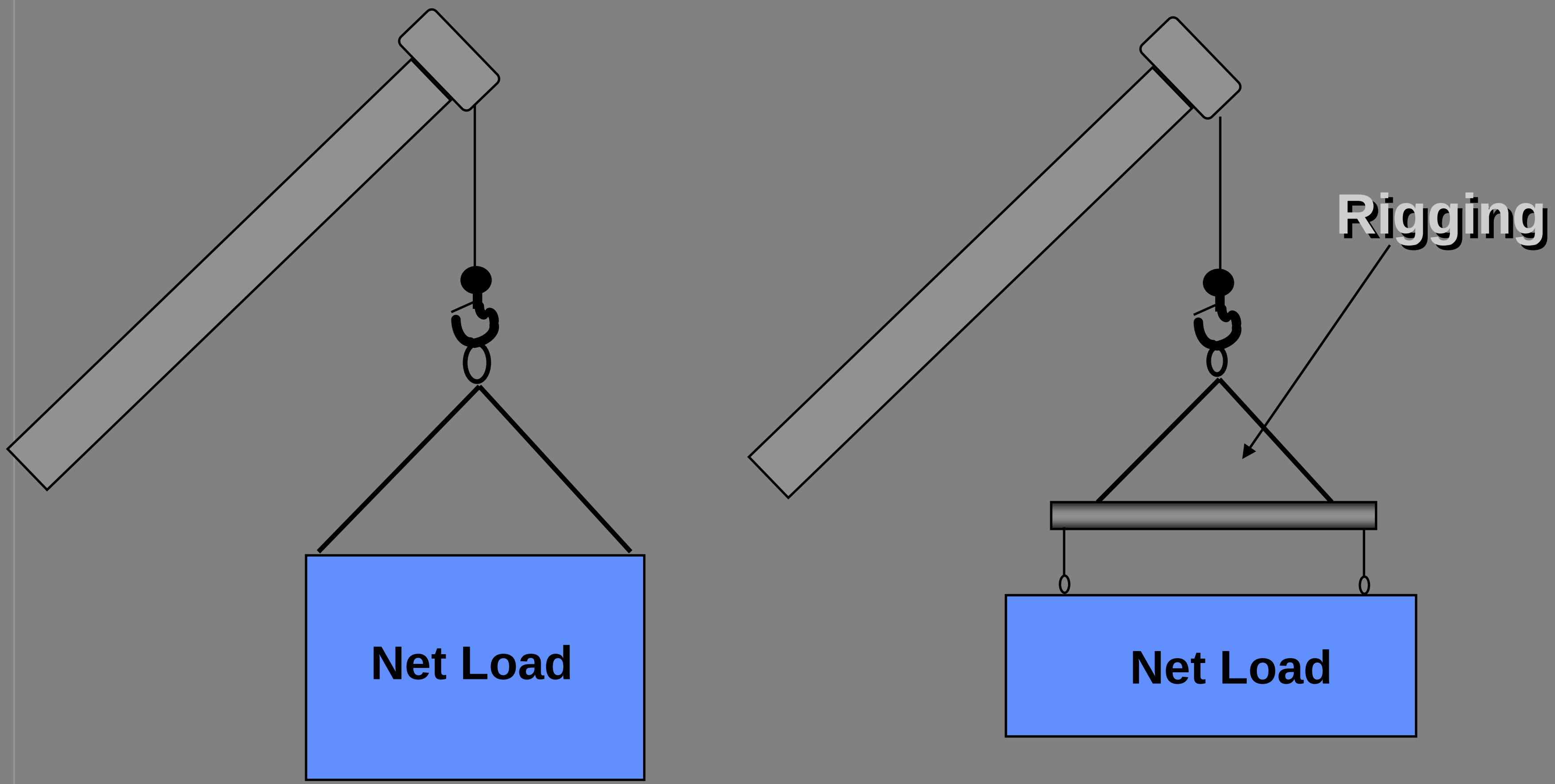
ELECTRICAL CONTROLS

DYNAMIC LOAD



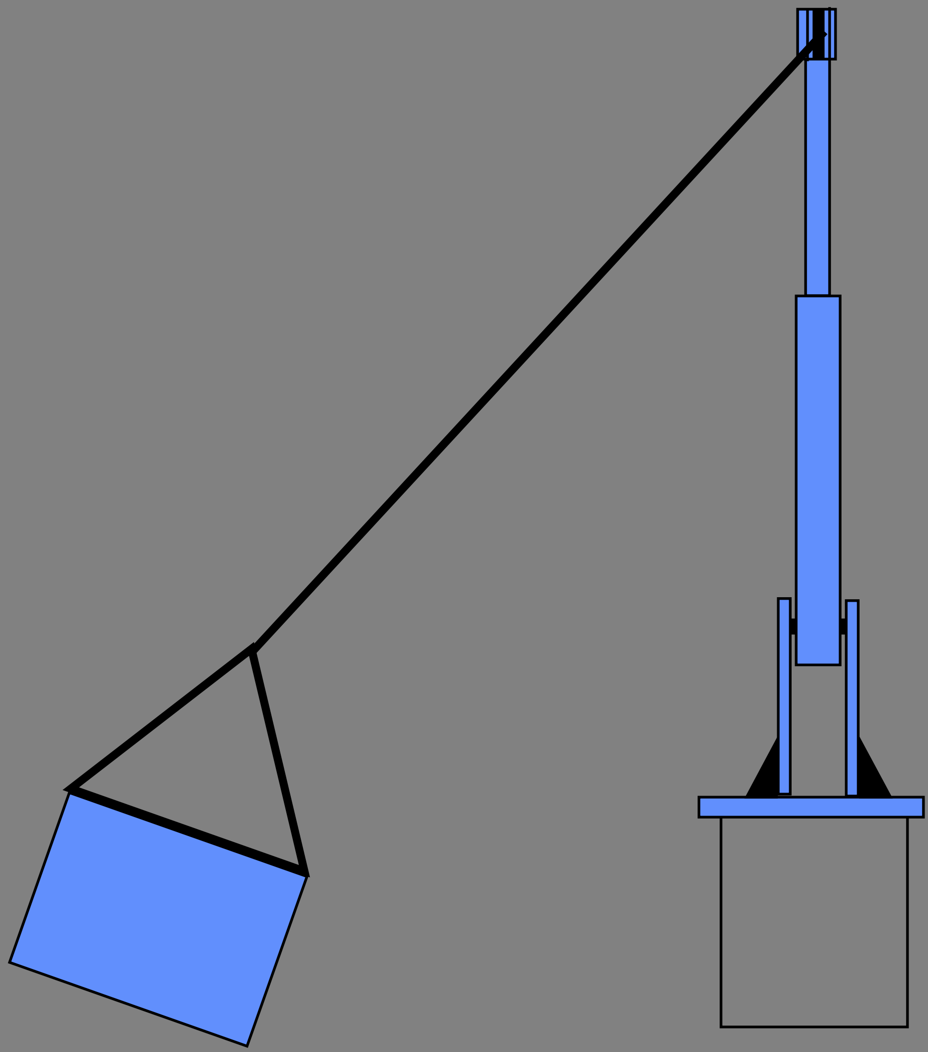
Total Load = Static Load + Dynamic Load

GROSS LOAD



Gross Load = Net Load + Rigging + Attachments

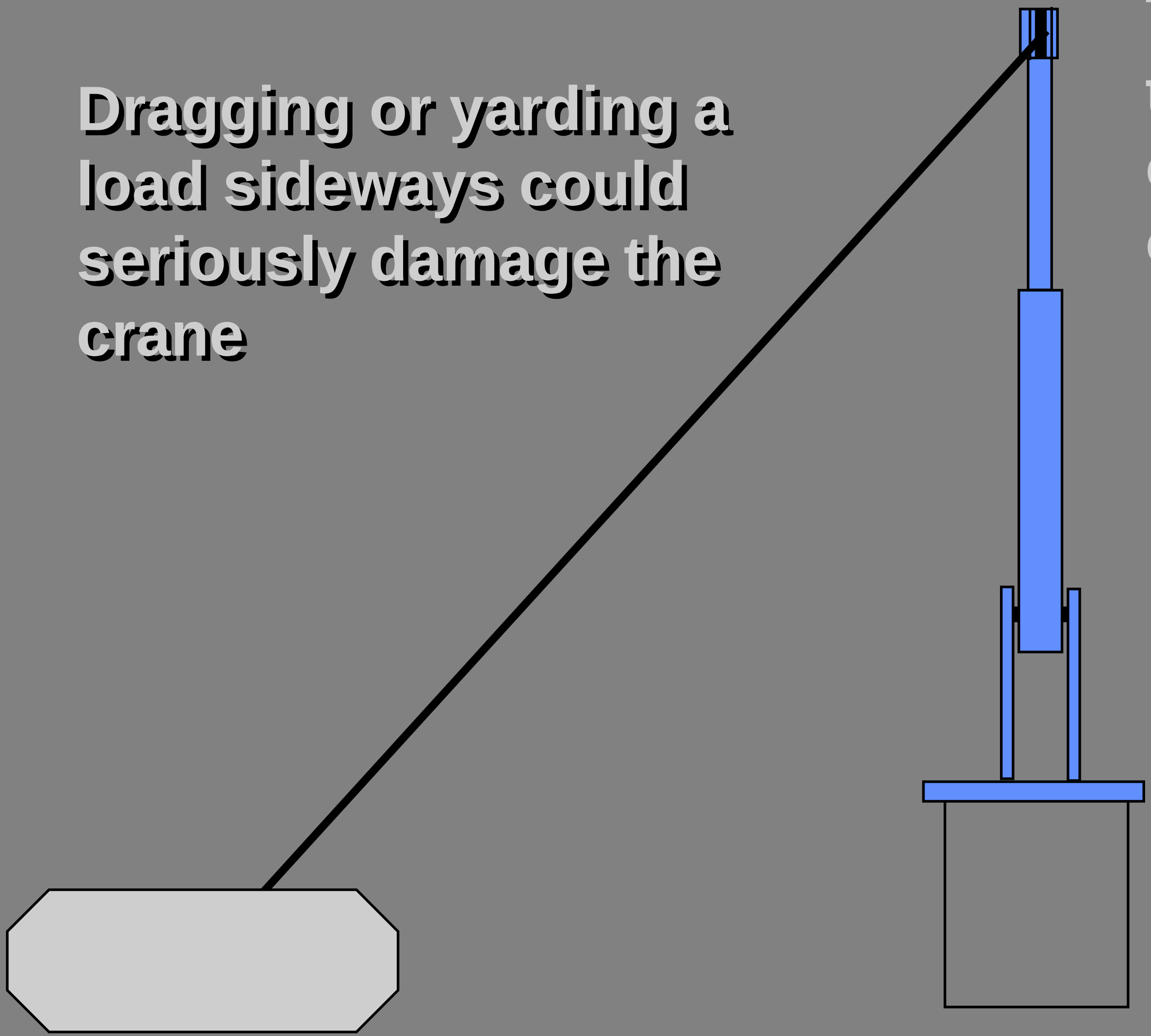
SIDE LOADING



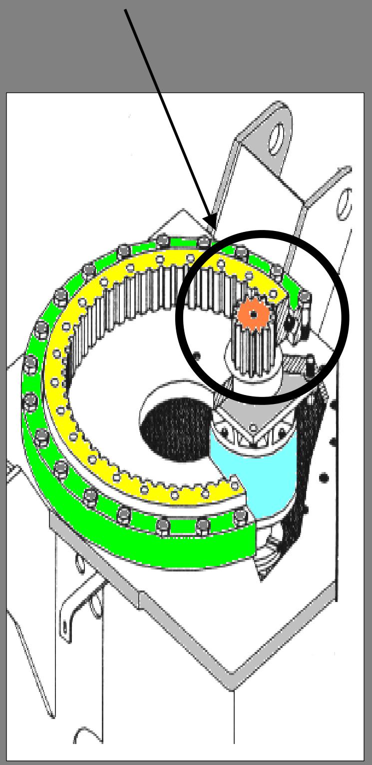
AVOID SIDE LOADING

SIDE LOADING

Dragging or yarding a load sideways could seriously damage the crane



This practice puts tremendous strain on the pinion gear of the swing motor



DETERMINING LIFTING CAPABILITY

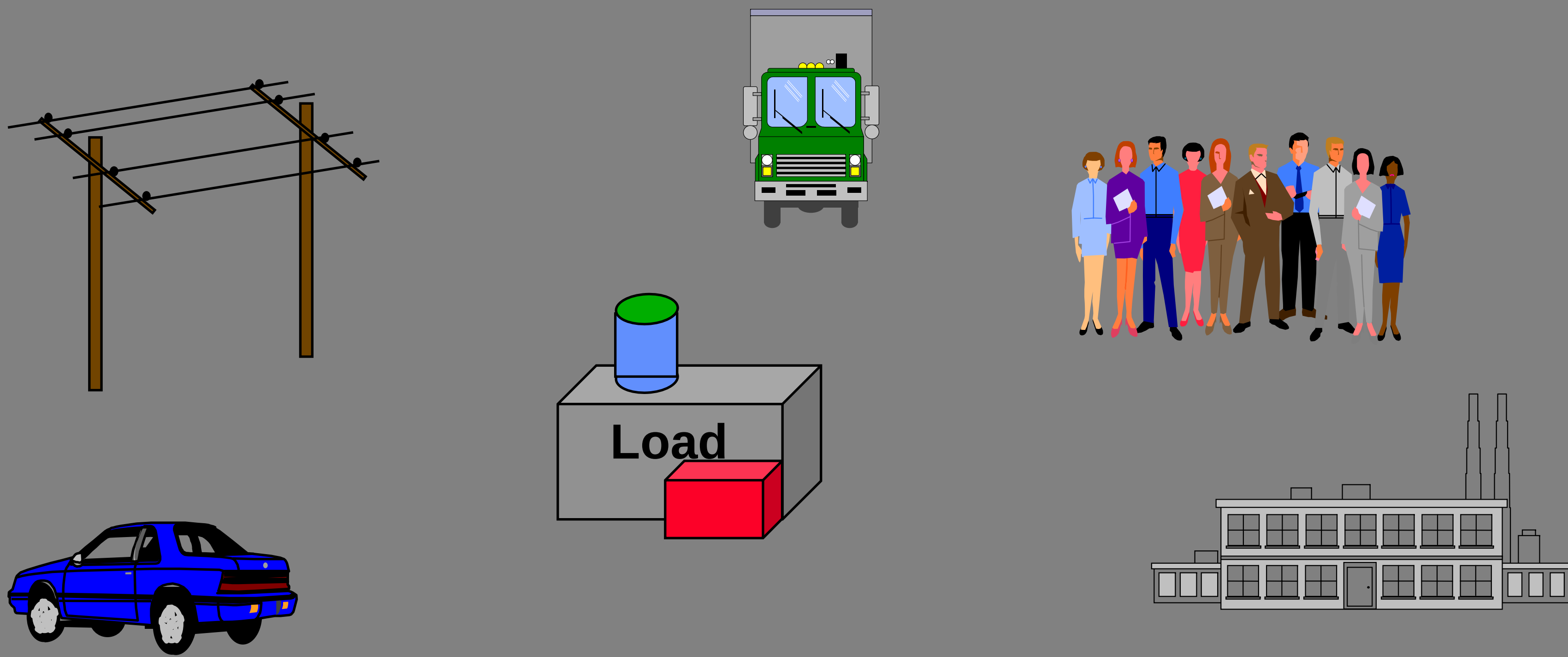
- Calculate the gross load
- Determine the maximum radius
- Determine the maximum height
- Refer to load chart to determine if lift will be within the crane’s capacity.

LOAD CHARTS

LOAD CAPACITY CHART
ALASKA MARINE CRANE
MODEL MCT-1250

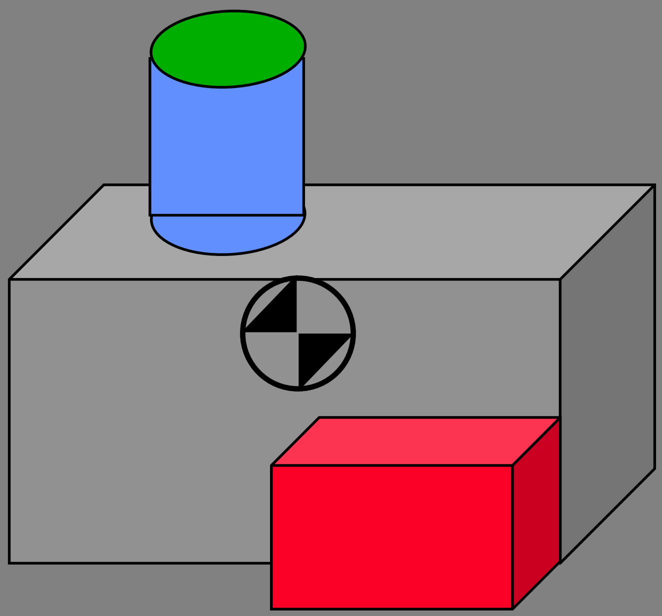
BOOM RETRACTED			BOOM EXTENDED		
BOOM ANGLE IN DEG.	LOAD DIST. IN FEET	LOAD CAP. IN POUNDS	BOOM ANGLE IN DEG.	LOAD DIST. IN FEET	LOAD CAP. IN POUNDS
63	10	24,000	79	10	16,000
47	15	17,170	73	15	12,800
30	20	13,140	68	20	9,700
1	22	10,700	58	25	8,250
			50	30	6,960
			45	35	5,900
			38	40	5,130
			27	45	4,500
			1	50	3,300

ASSESSING THE LIFTING REQUIREMENTS



The Big Picture

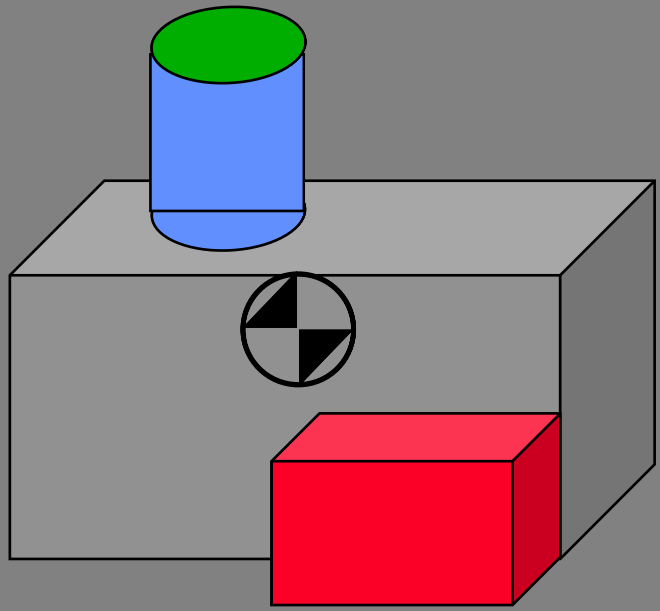
ASSESSING THE LOAD



Need to Know:

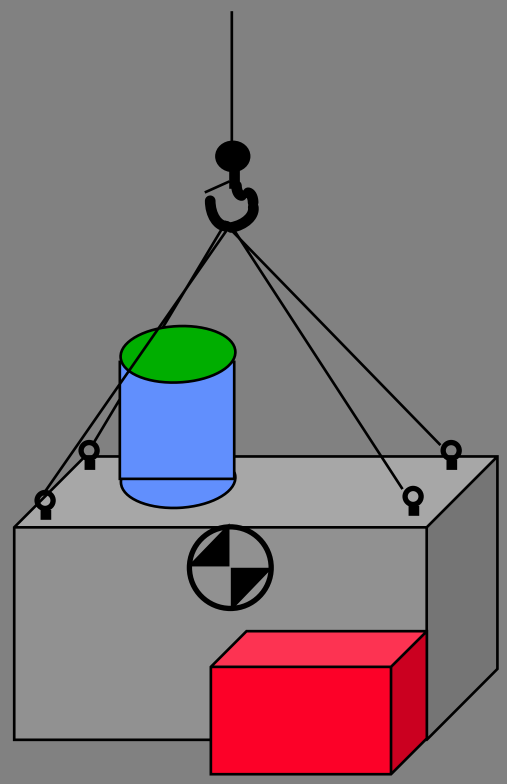
- Weight
- Size
- Center of Gravity

RIGGING REQUIREMENTS



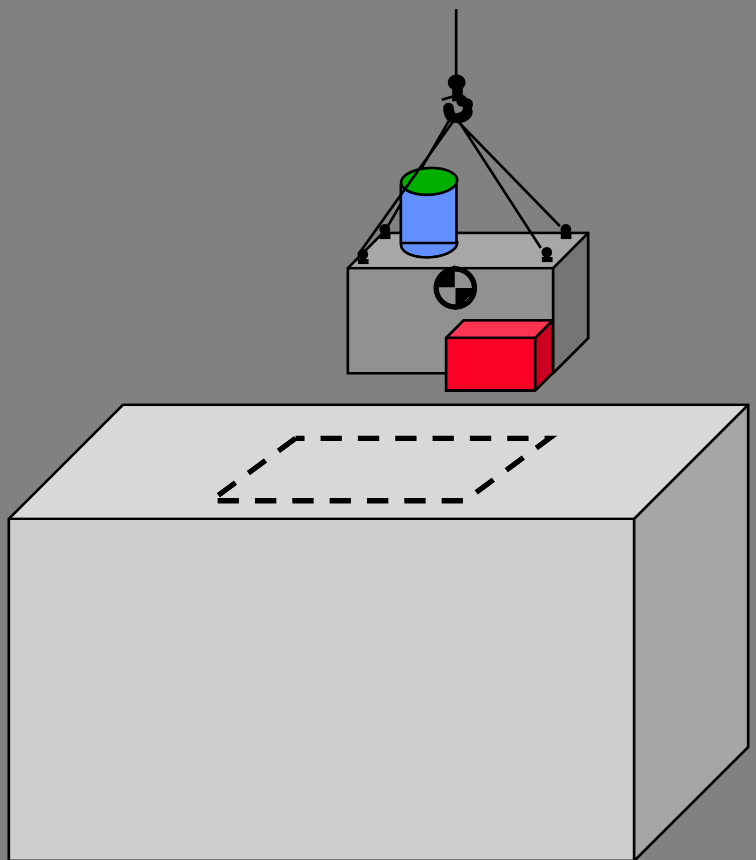
- Slings
- Chains
- Eyes
- Special Hardware

ASSESSING THE 'PICK' AREA



- Obstruction
- Visibility
- Personnel Safety
- Pedestrians
- Load Free to Pick
- Height of Lift
- Reach
- Tag Line Required

ASSESSING THE ‘PLACEMENT’ AREA



- Obstruction
- Visibility
- Personnel Safety
- Pedestrians
- Load Support
- Height of Lift
- Reach
- Accuracy of Placement

HAND SIGNALS

SWING

STOP

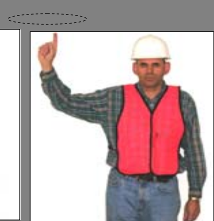
DOG EVERYTHING

FLOAT IN

KNUCKLE

FLOAT OUT

WIRE DOWN



WIRE UP

WIRE DOWN

WIRE UP

SLOWLY

TELESCOPE OUT

TELESCOPE IN

ONE HAND

BOOM UP

BOOM DOWN

TELESCOPE IN

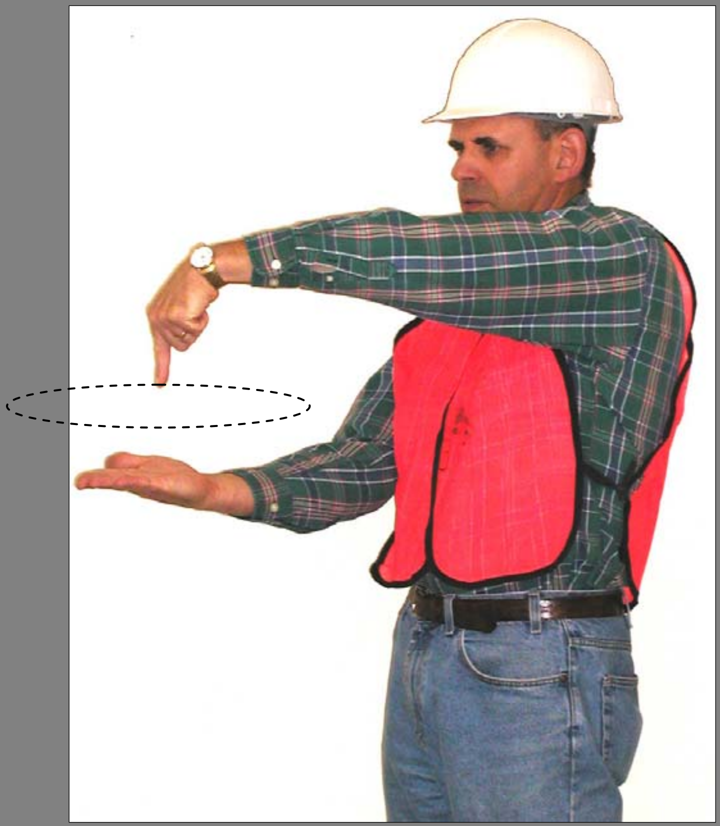
TELESCOPE OUT

EMERGENCY STOP

HAND SIGNALS

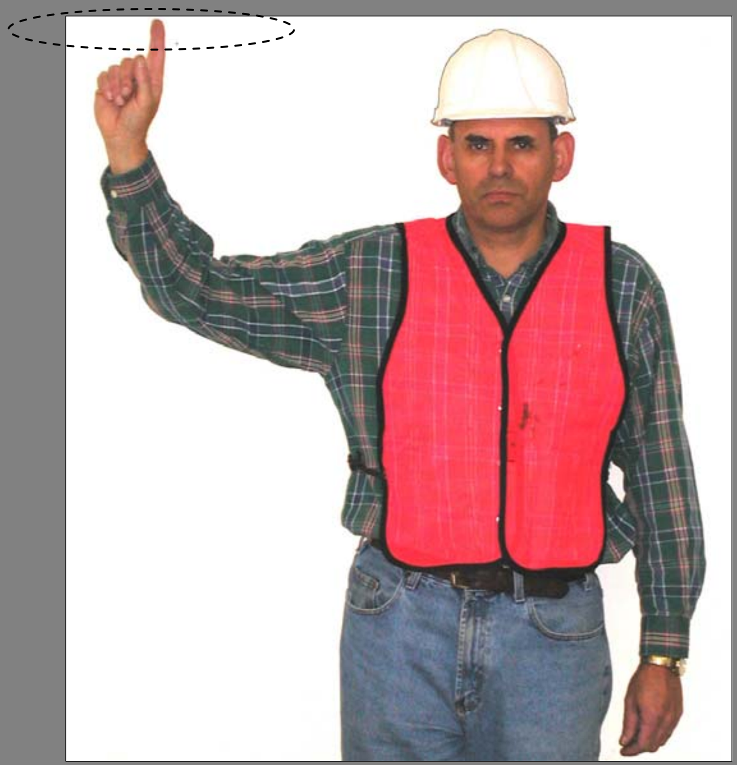
Wire Down

HAND SIGNALS



Wire Down Slowly

HAND SIGNALS



Wire Up

HAND SIGNALS

Wire Up Slowly

HAND SIGNALS

Boom Up

HAND SIGNALS

Boom Down

HAND SIGNALS

Swing Boom

HAND SIGNALS

Knuckle Boom

HAND SIGNALS

Telescope in

HAND SIGNALS

Telescope Out

HAND SIGNALS

Telescope Out (One Hand)   Telescope In (One Hand)

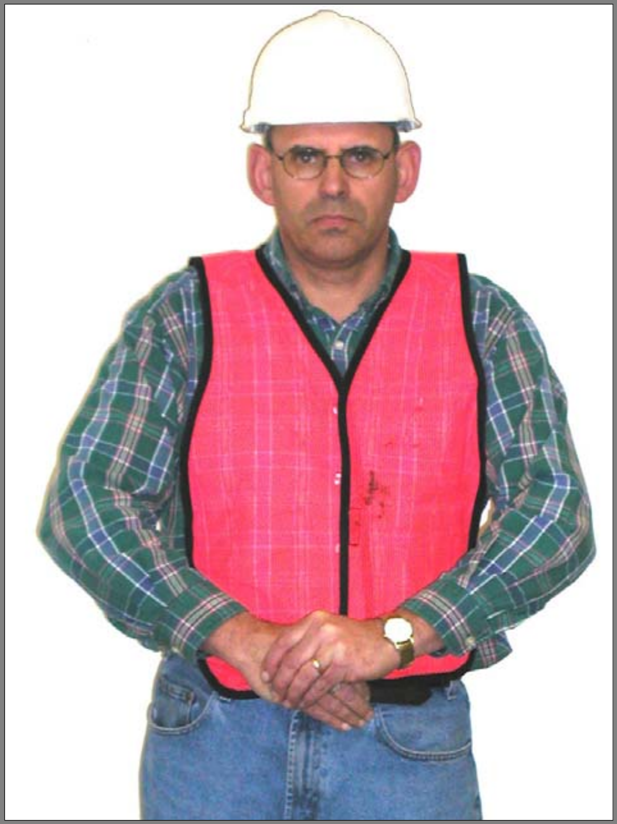
HAND SIGNALS

Stop

HAND SIGNALS

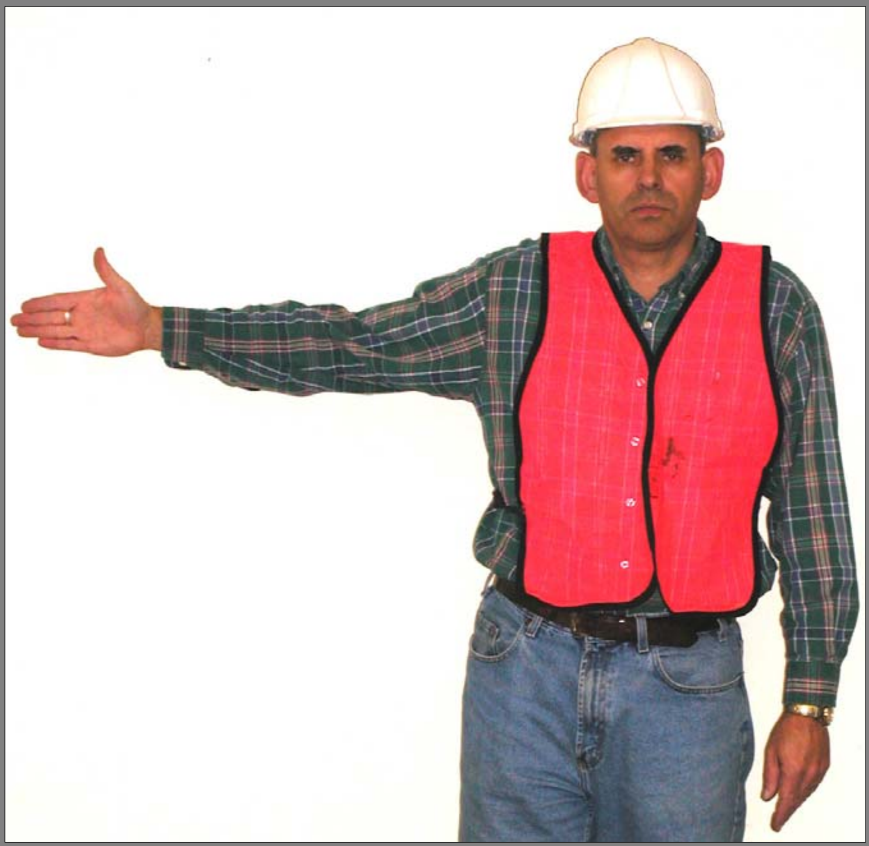
Emergency Stop

HAND SIGNALS



Dog Everything

HAND SIGNALS



Boom Up, Wire Down (Float Load In)

HAND SIGNALS

Boom Down, Wire Up (Float Load Out)

MAKING THE LIFT

- Review the lift scenario with the operator, riggers and signal person
- Attach taglines when necessary
- Position signal person within visibility of the load and operator
- Begin by lifting the load ***slowly***
- Re-check the boom angle indicator to assess radius increase
- Keep load as low as possible when moving it
- Swing ***slowly*** to avoid swing out.
- Avoid erratic booming
- Follow signal and stop operation when uncertain
- Lower load ***slowly***

CRANE SAFETY

- Avoid two-blocking the crane
- Do not leave the crane with a suspended load
- Rig the crane with sufficient parts of line for the load
- Always have a minimum of three wraps of cable on the drum
- Monitor the winch to make sure the it is spooling correcting
- Do not lift loads over personnel
- Lift one load at a time

LOADING PALLETS

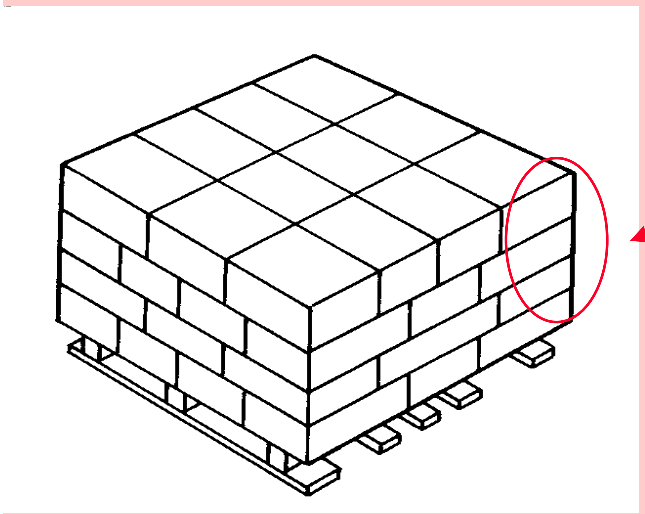
UNSAFE TO MOVE

SAFE TO MOVE

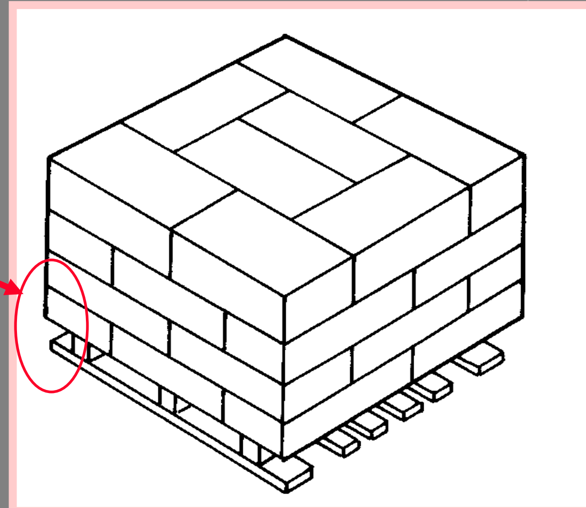
STACKING PRODUCT

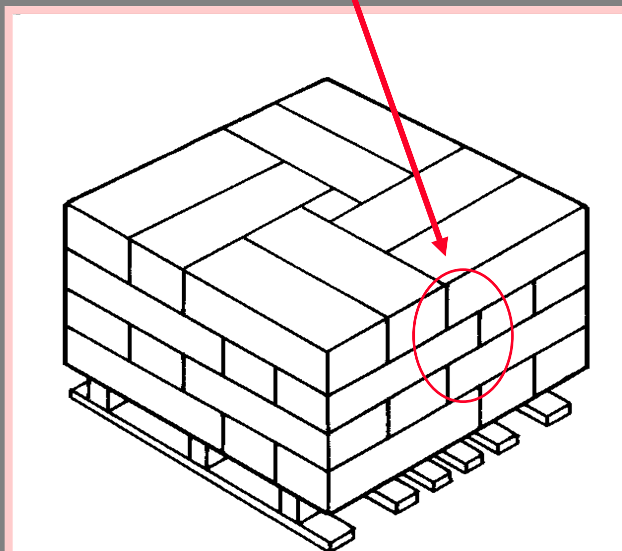
LOOSE PACKAGES NEED TO BE SECURED BEFORE MOVING.

PROPER STACKING METHODS



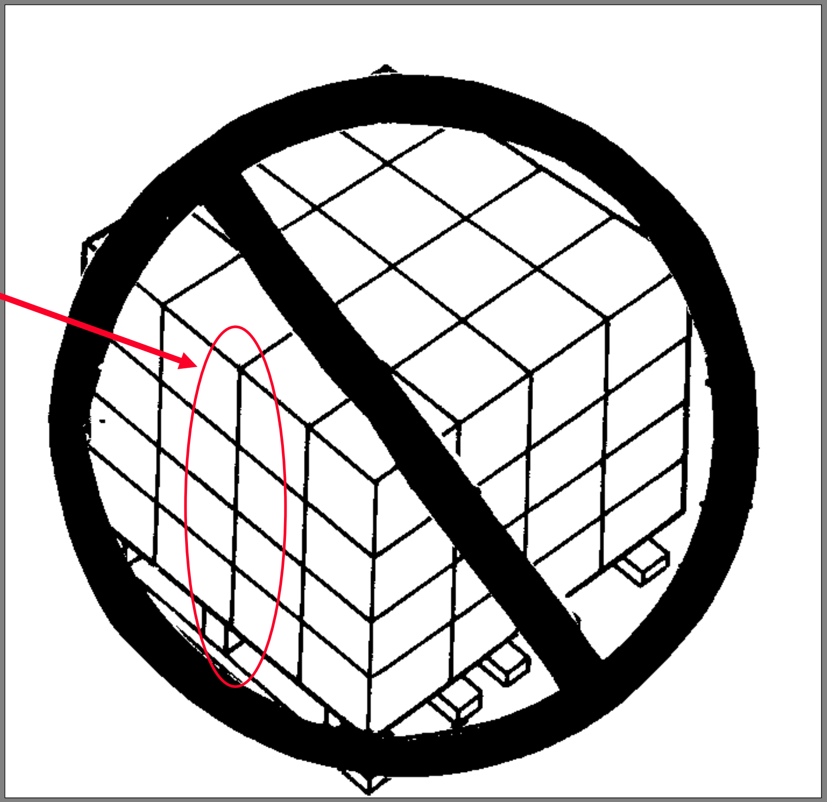
For proper stacking of boxes, edges of an upper layer should not be over the lower edges.





UNSAFE STACKING METHOD

Avoid having box edges line up from layer to layer



CARGO NETS

CARGO NETS

PROPERLY LOADED

OVERLOADED

PALLET BARS

Inspect pallet bars for damaged bars, wire rope, synthetic rope, and hardware.

LIFTING GAS CYLINDERS

NEVER lift gas cylinders by the valve or valve protection housing. Cylinders should be lashed onto a pallet or lifted by cylinder cages.

PLACING CARGO ON DECK

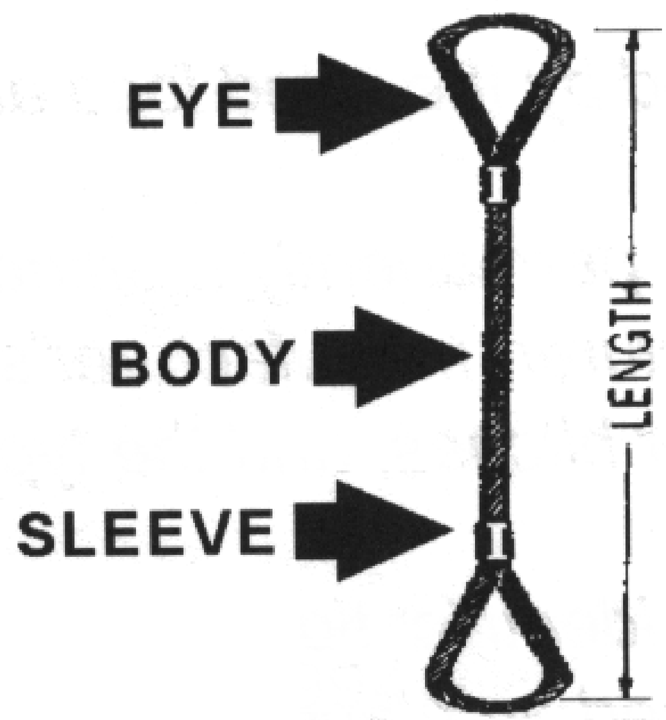
Cramped space on vessel decks can make cargo handling dangerous.

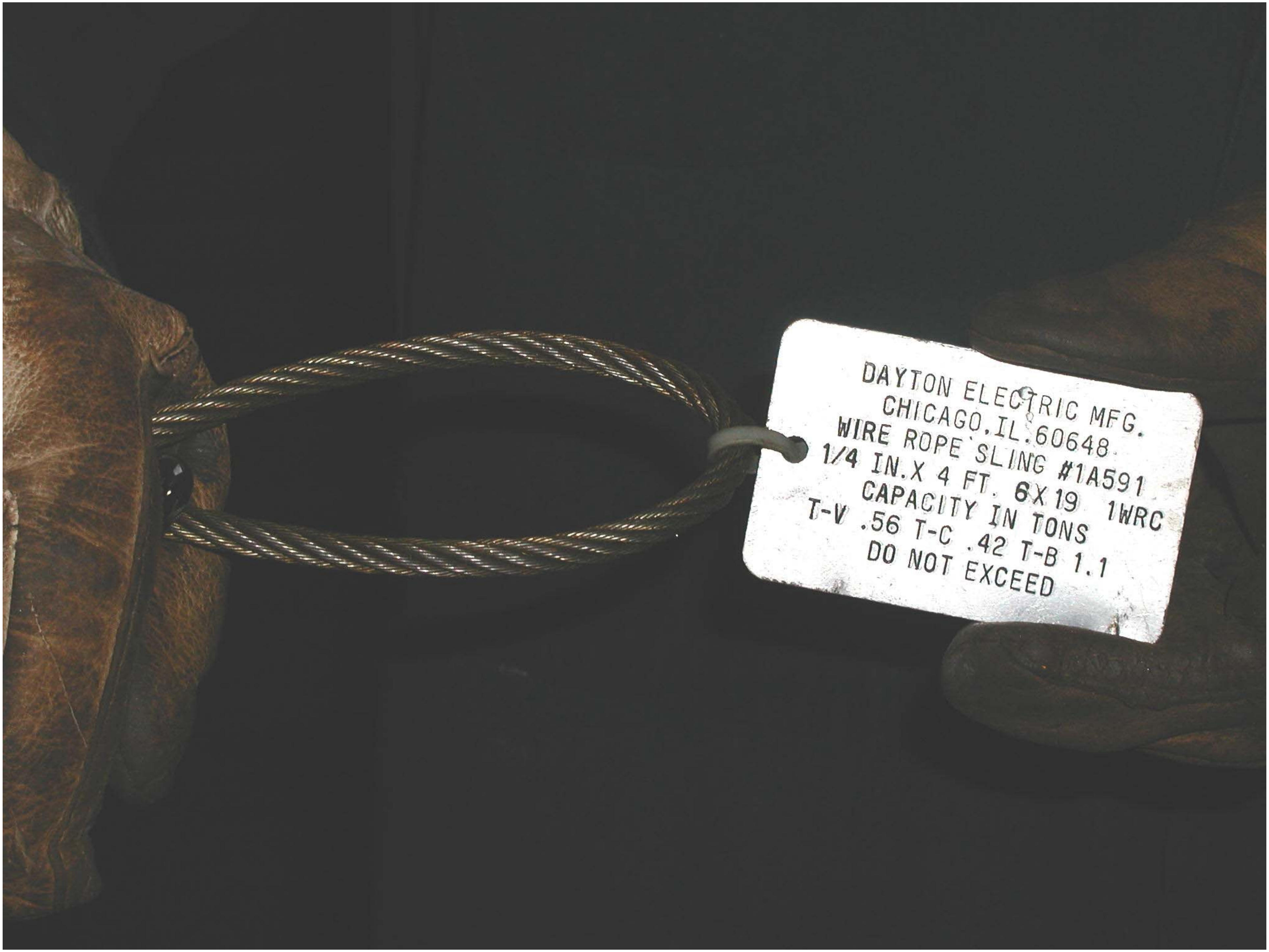
HANDLING BULKY LOADS

Bulky loads should be broken down and lifted as individual items.

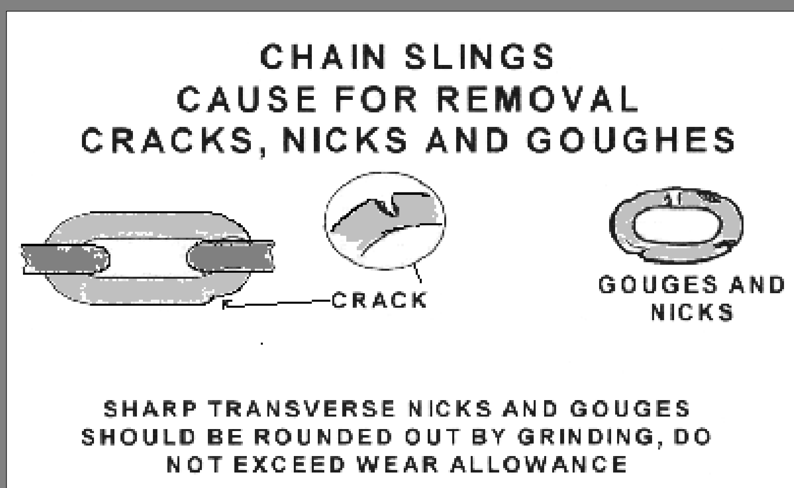
WIRE ROPE SLING INSPECTION

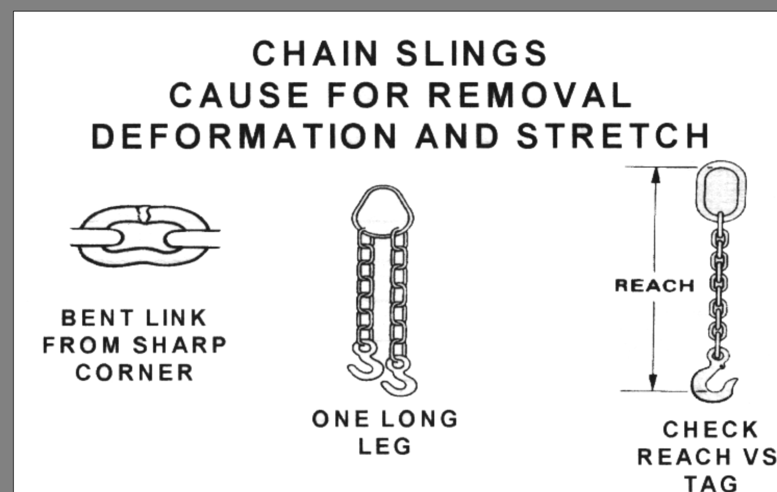
KINKING
CRUSHING
UNSTRANDING
BIRDCAGING
STRAND DISPLACEMENT
CORE PROTRUSION
CORROSION
BROKEN OR CUT
STRANDS
BROKEN WIRES




DAYTON ELECTRIC MFG.
CHICAGO.IL.60648.
WIRE ROPE SLING #1A591
1/4 IN.X 4 FT. 6X19 1WRC
CAPACITY IN TONS
T-V .56 T-C .42 T-B 1.1
DO NOT EXCEED

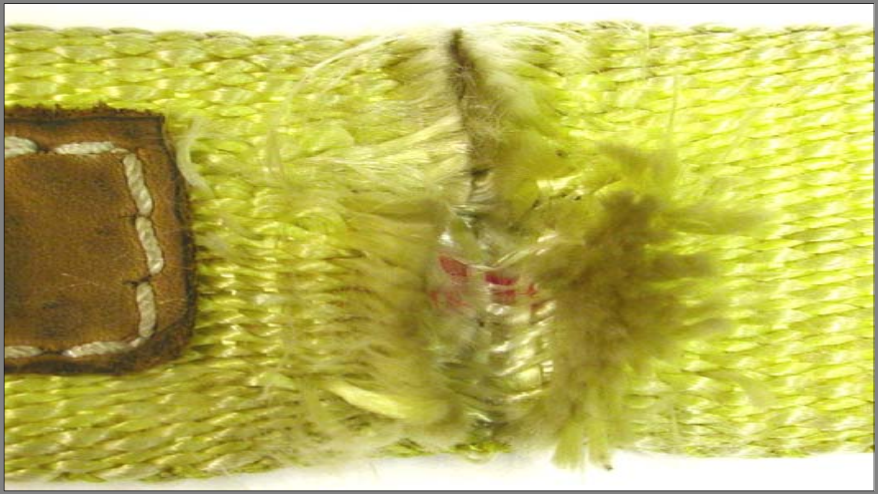
CHAIN SLING INSPECTION





SLING INSPECTION

CUT SLING

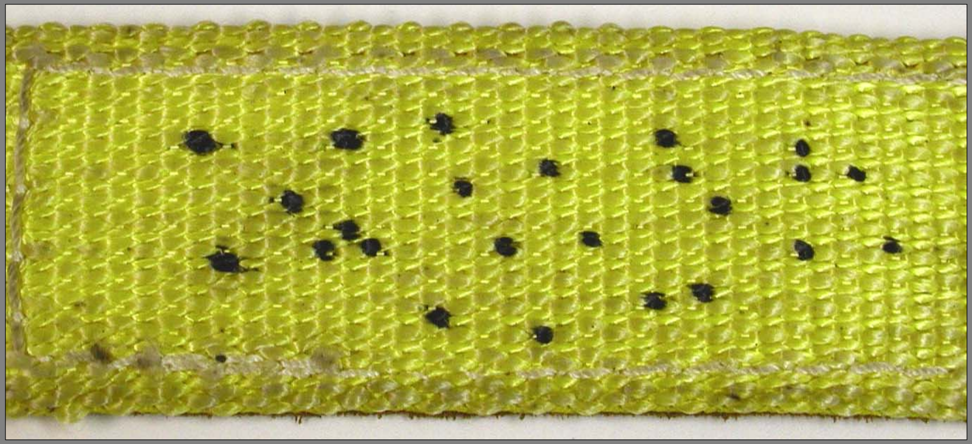


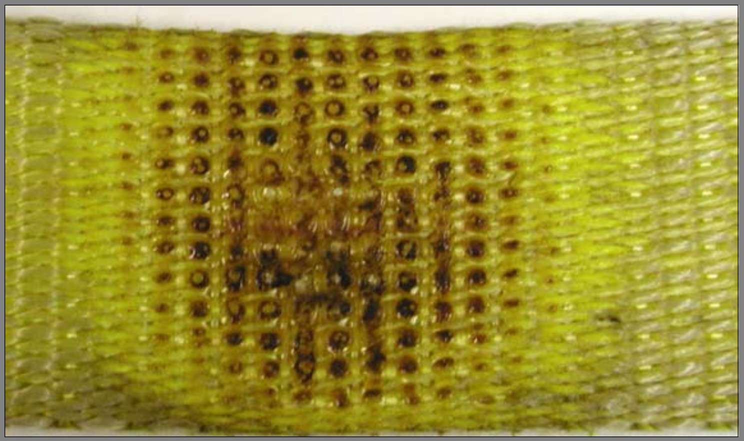
CHAFFED SLING

PUNCTURED SLING

SLING INSPECTION

KNOTS IN SLING





WELD SPLATTER DAMAGE

HEAT DAMAGE

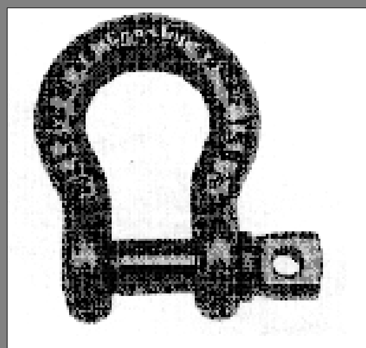
SLING INSPECTION

ILLEGIBLE DATA TAG

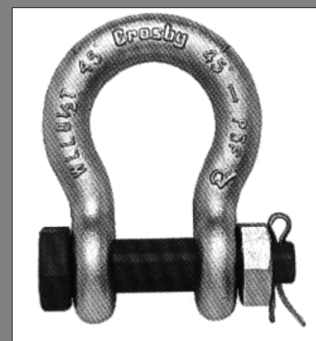
BROKEN STITCHES

EXPOSED RED YARNS

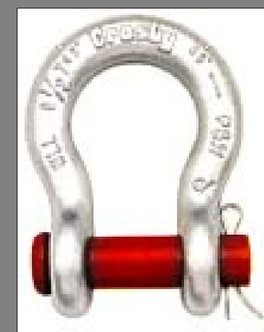
SHACKLES



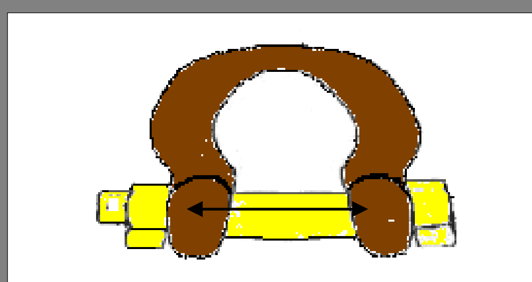
SCREW PIN



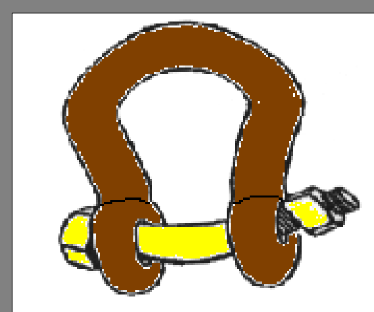
ANCHOR BOLT



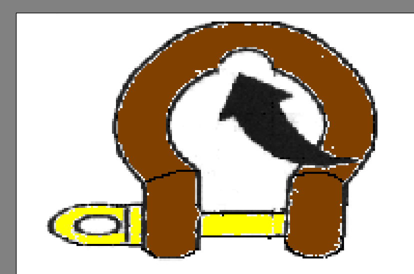
PIN WITH COTTER
(NOT LEGAL FOR LIFTING)



DEFORMATION

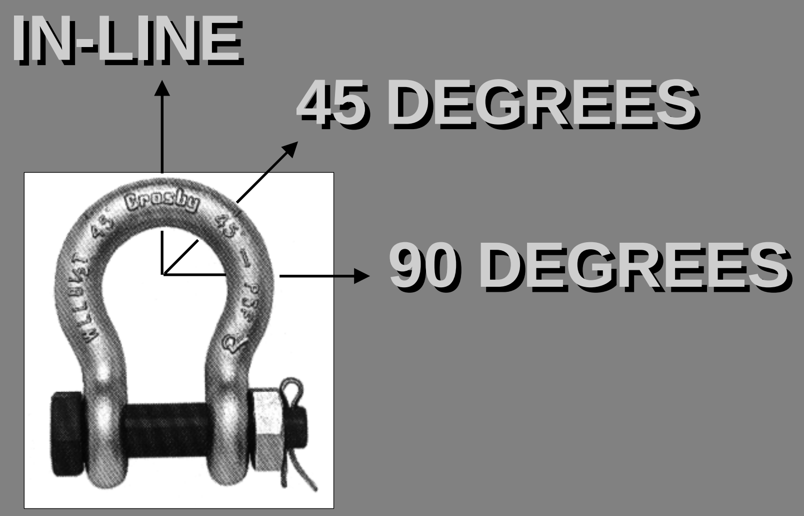


BOLT SUBSTITUTION



WEAR

SHACKLES

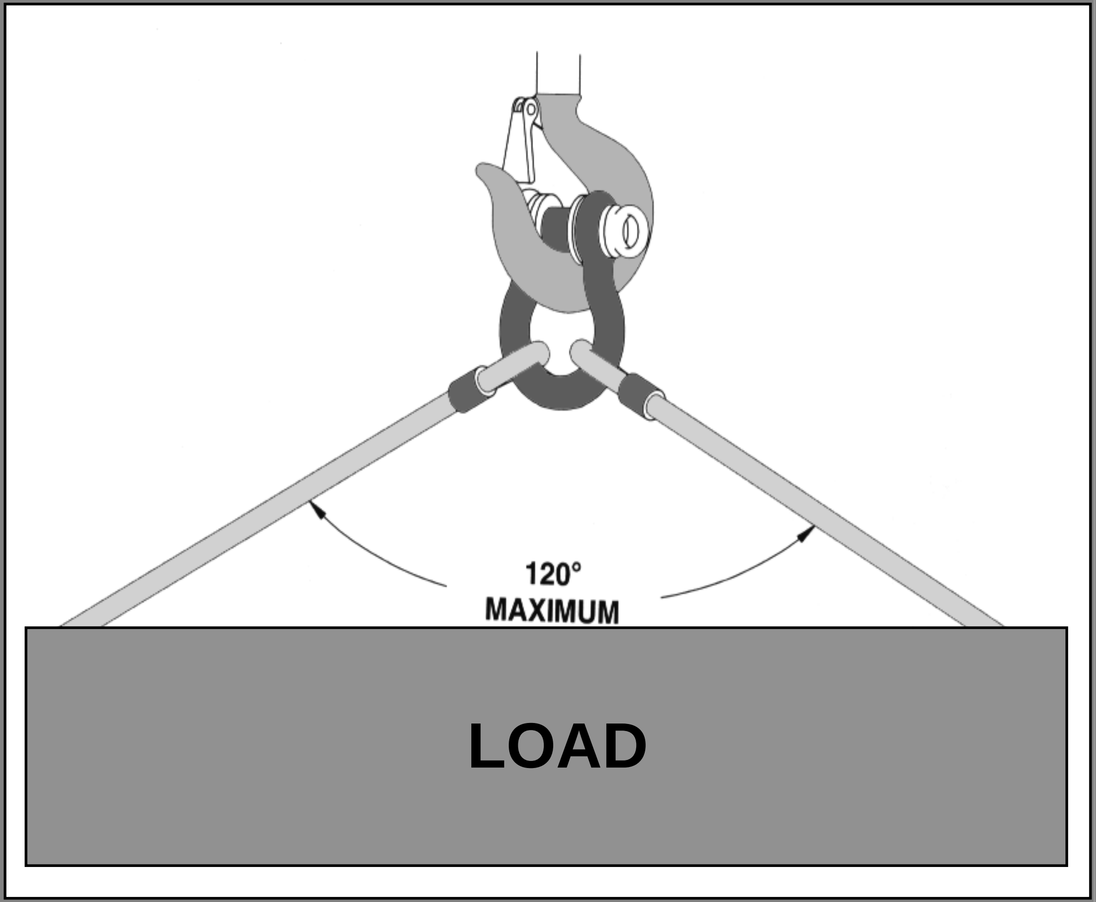


Side Loading Reduction Chart For Screw Pin & Bolt Type Shackles Only†	
Angle of Side Load	*Adjusted Working Load Limit*
0° In-Line	100% of Rated Working Load Limit
45° from In-Line	70% of Rated Working Load Limit
90° from In-Line	50% of Rated Working Load Limit

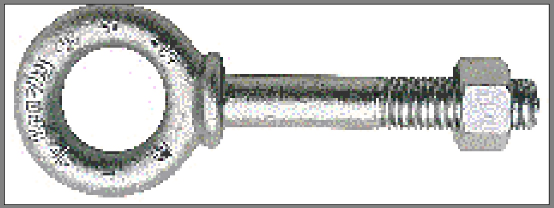
† DO NOT SIDE LOAD ROUND PIN SHACKLES

SHACKLES

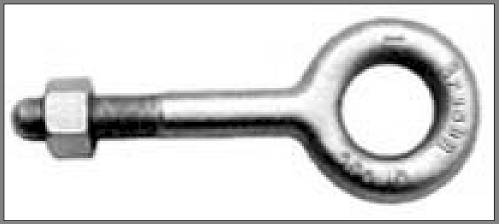
Shackles symmetrically loaded with two leg slings having a maximum included angle of 120 deg. can utilized to full Working Load Limit.



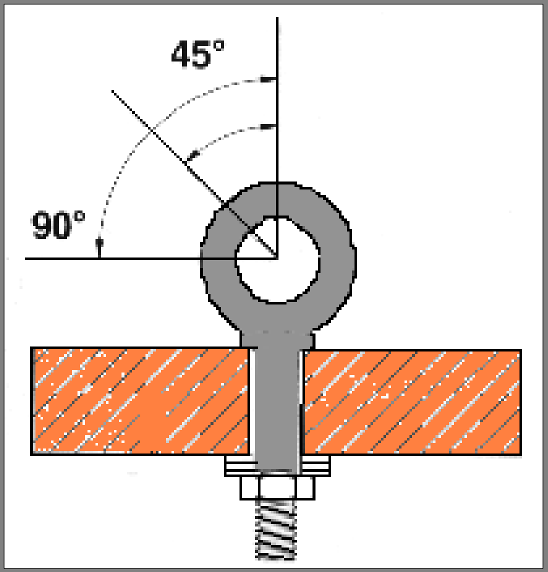
EYE BOLTS



SHOULDERED



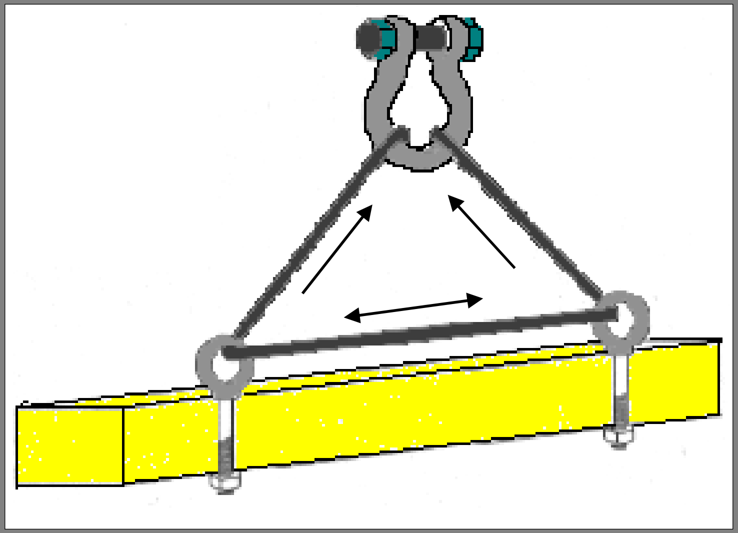
UNSHOULDERED



DIRECTION OF PULL	ADJUSTED WORKING LOAD
In-Line	Full Rated Working Load
45 Degrees	30% of Rated Working Load
60 Degrees	25% of Rated Working Load

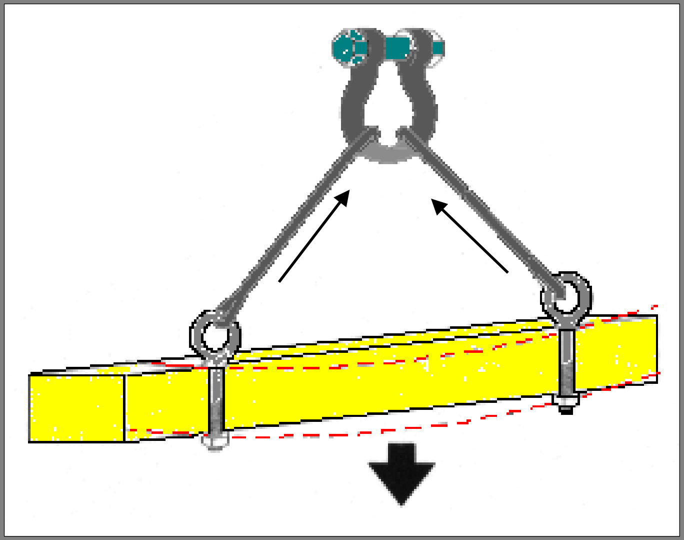
EYE BOLTS

WRONG!



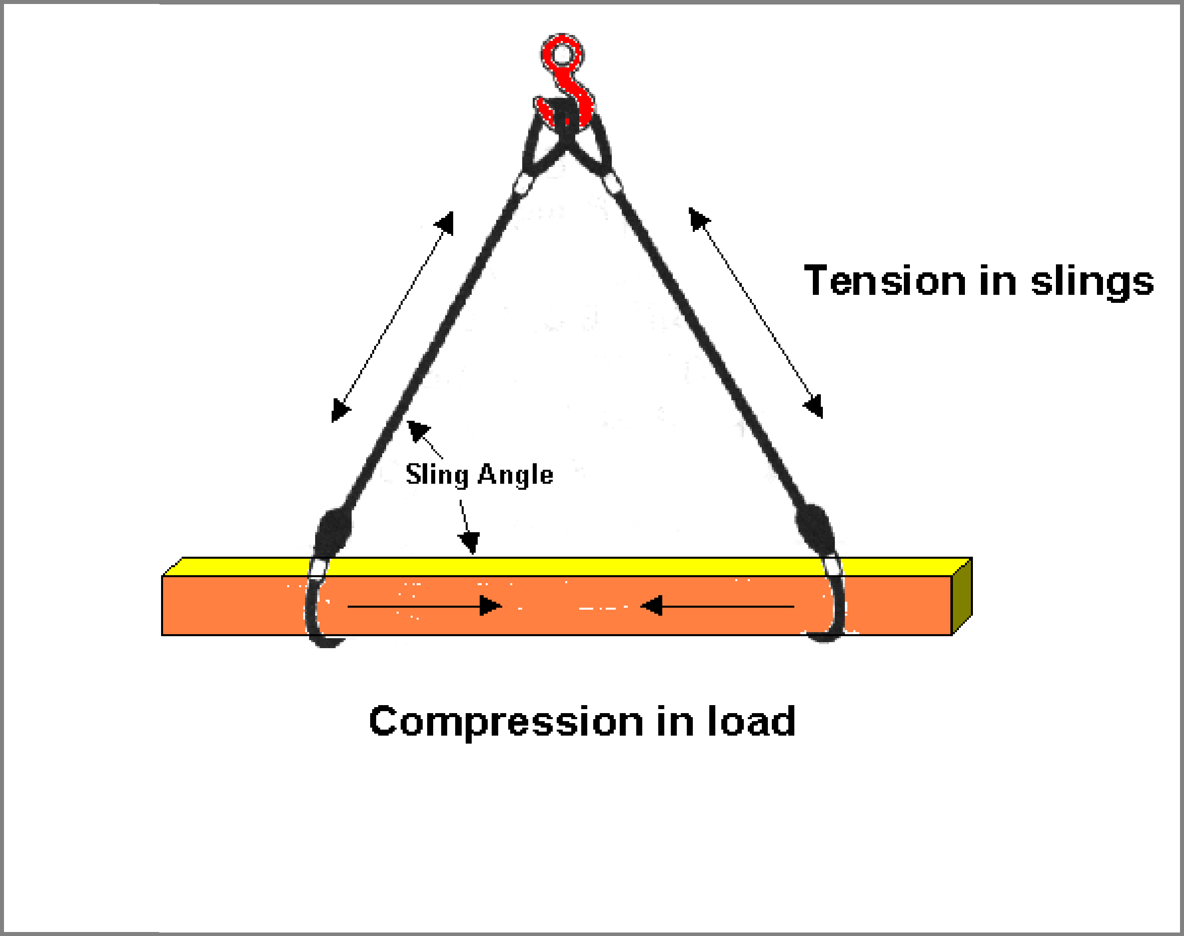
DO NOT REEVE SLINGS ONE EYE BOLT TO ANOTHER. LOAD ON BOLT IS ALTERED.

CAUTION!



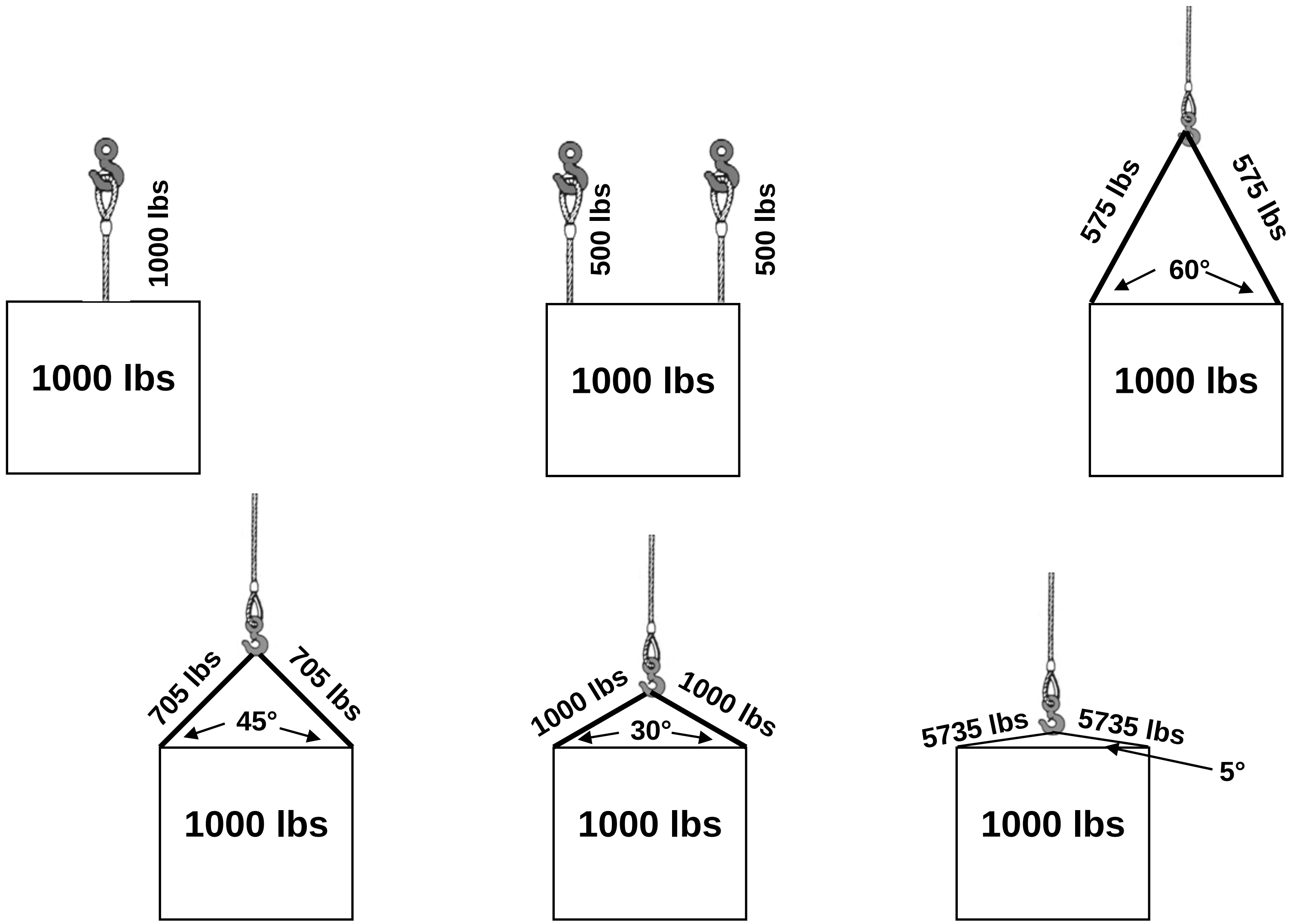
STRUCTURE MAY BUCKLE FROM COMPRESSION FORCES.

SLING ANGLES

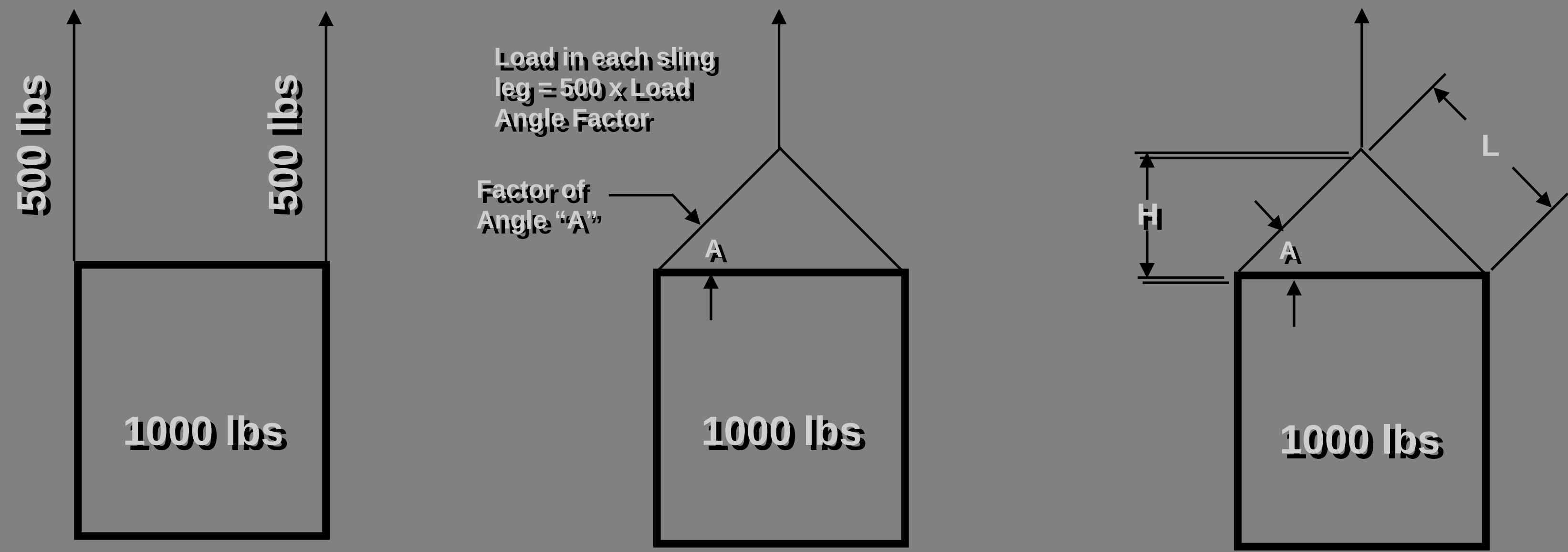


Stresses in the slings and the load increase as the sling angle decreases

SLING ANGLES



SLING ANGLES



Sling Angle Degree (A)	Load Angle Factor = L/H
90	1.000
60	1.155
50	1.305
45	1.414
30	2.000
Load On Each Leg Of Sling = (Load / 2) X Load Angle Factor	

ESTIMATING WEIGHTS

Acceptable methods of determining weight

You may find the weight from:

- Data on manufacturing label plates.
- Manufacturer documentation.
- Blueprints or drawings.
- Shipping receipts.
- Weigh the item.
- Bill of lading (be careful)
- Stamped or written on the load
- Approved calculations

Never use word of mouth to establish the weight of and item!

ESTIMATING WEIGHTS

Calculating the weight

To find the weight of any item you need to know its volume and unit weight.

- Volume x Unit weight = Load weight
- Unit weight is the density of the material
- Unit weight is normally measured by pounds per cubic foot.

ESTIMATING WEIGHTS

Here are some examples of common materials and their unit weight:

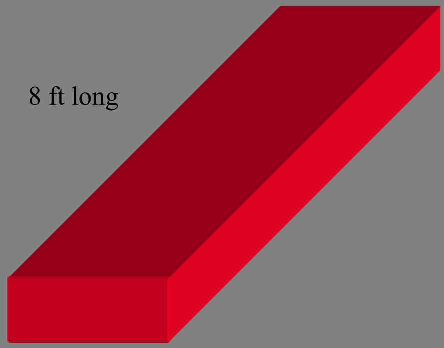
METALS		**TIMBER**	
Aluminum	165	Cedar	34
Brass	535	Cherry	36
Bronze	500	Fir, seasoned	34
Copper	560	Fir, wet	50
Iron	480	Hemlock	30
Lead	710	Maple	53
Steel	490	Oak	62
Tin	460	Pine	30
MASONARY		Poplar	30
Ashlar masonry	160	Spruce	28
Brick, soft	110	White pine	25
Brick, pressed	140	Railroad ties	50
Clay tile	60	**LIQUIDS**	
Rubble masonry	155	Diesel	52
Concrete, cinder, haydite	110	Gasoline	45
Concrete, slag	130	Water	64
Concrete, stone	144	**EARTH**	
Concrete, reinforced	150	Earth, wet	100
MISC.		Earth, dry	75
Asphalt	80	Sand and gravel, wet	120
Glass	160	Sand and gravel, dry	105

CALCULATING VOLUME

Volume of a cube

Length x Width x Height = Volume

8 ft x 4 ft x 2 ft = 64 cubic feet



If the material was **cedar**, then all we would have to do to determine it's weight would be to multiply the unit weight of cedar x 64.

Unit weight x Volume = Weight

34 lbs. X 64 cubic ft. = 2,176 lbs.

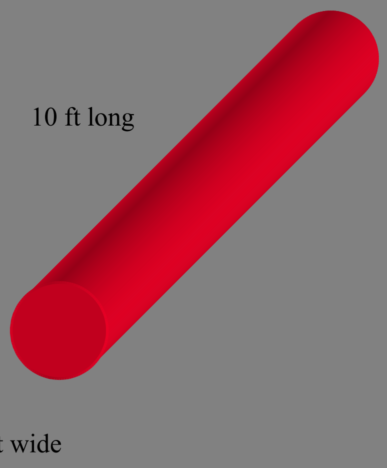
CALCULATING VOLUME

Volume of a cylinder

Pi x Radius Squared x Length = Volume

π x Radius² x Length = Volume

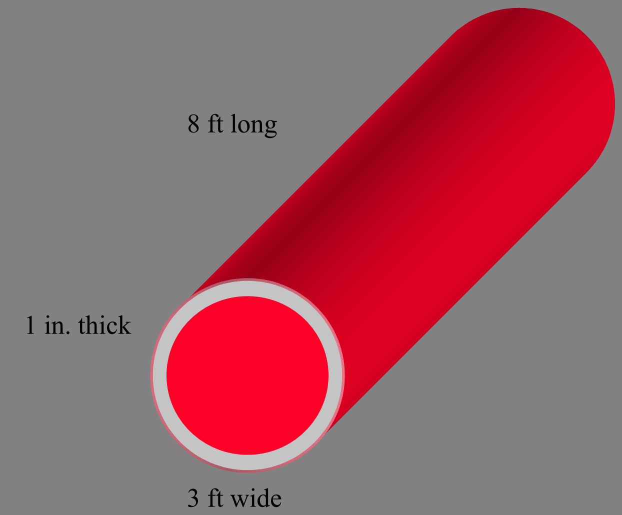
3.14 x 1² ft x 10 ft = 31.4 cubic ft



If the material was **reinforced concrete,** then all we would have to do to determine it's weight would be to multiply the unit weight of reinforced concrete x 31.4.

150 lbs. X 31.4 cubic ft. = 4,710 lbs.

CALCULATING VOLUME



Volume of pipe

Calculating the volume of pipe is a bit trickier but it is just simply subtracting
the volume of the hole from the volume of the pipe.

If the pipe were one inch thick, three feet wide and 8 feet long, then we would figure the volume of the entire pipe and subtract the volume of the hole to get the the volume of the material.

3.14 x (1 ½ ft.)^2 x 8 feet = total volume of pipe (56.52 ft^3)

3.14 x (1ft 5 in.)^2 x 8 feet = volume of hole (50.41 ft^3)

56.52 ft^3 – 50.41 ft^3 = 6.11 ft^3

Volume of material x unit weight = total weight

If this pipe were **steel** then the unit weight would be 490 lbs.

6.11 x 490 lbs = 2,9994 lbs.

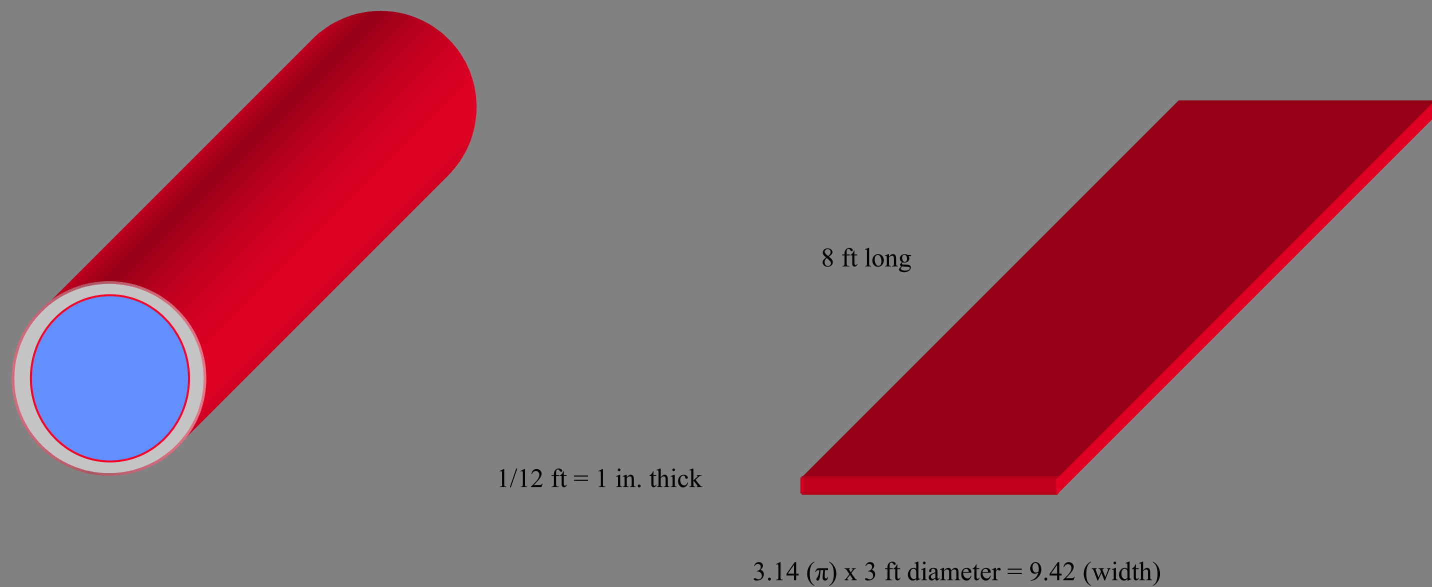
CALCULATING VOLUME

For thin pipe a quick way to *ESTIMATE the volume is to split the pipe open and calculate the volume like a cube. The formula would be:

π x diameter = width, so:

π x diameter x length x thickness x unit weight = weight of object

3.14 x 3 ft x 8 ft x 1/12 ft (or .08 ft) x 490 lbs = *3,077.2 lbs



WEIGHT TABLES

WEIGHT TABLES

Weight tables are an excellent way to calculate load weight.
If you are handling certain materials often, then having a chart
that gives you the weight per cubic foot, cubic yard, square foot,
linear foot or per gallon. Here are a few examples:

METAL PLATES

STEEL PLATES weigh approximately 40 lbs per sq. ft. at 1 inch thick.
1/2 inch thick would then be about 20 lbs. per sq. ft.

A steel plate measuring 8 ft. x 10 ft. x 1/2 inch would then weigh about
3,200 lbs. (8 x 10 x 40 lbs = 3,200 lbs.)

BEAMS

Beams come in all kinds of materials and shapes and lengths. STEEL
I-BEAMS weigh approximately 40 lbs a linear ft. at 1/2 inch thick and
8 inches x 8 inches. If it were 1 inch thick then it would be 80 lbs a
linear ft. If it were 20 feet long at 1 inch thick then it would weigh about
1,600 lbs. (20 ft. x 80 lbs. = 1,600lbs.)

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