Key People / Qualifications

- Operator
  - Crane operator certificate, testing, hours in seat, substance abuse testing.
- Qualified Rigger
  - ASME standards, equipment and practices, load calculations, dynamics, WAC Part L, written and practical testing.
- Assembly/Disassembly Director
  - "Meet criteria of both competent and qualified person".
- Lift Director
  - "Qualified in performing duties of lift director".
- Signal Person
  - Know and understand the standard method for hand signals.
  - Know and understand the voice signal protocol.
  - Be competent in the application of the type of signal used.
  - Have a basic understanding of equipment operation and limitations including crane dynamics and boom deflection.

Signal Person / Responsibilities

- Act as the crane operator's *eyes*.
- Signal the load or hook based on observation and evaluation of site conditions.
- Ensure that each load is securely rigged with hook over the load's center of gravity.
- Monitor all parts of the crane, rigging, and load to ensure clearances of obstructions.
- Be certain other workers are in the clear before requesting crane maneuvers.
- Keep the crane operator informed of load weights and radii.

Key People / Signal Person Proof of Competency

- Pass a written and practical exam.
- Examinations may be provided by a third party qualified evaluator or by an employer qualified evaluator.
- Evaluations will not be considered portable if conducted by the employer qualified evaluator.
- Documentation for whichever option is used shall be available while the signal person is employed by the employer.

Initial Key Terms

- Radius
  - Increasing radius will generally decrease the lifting capacity of a crane and increase ground pressure applied by the crane.
  - Extending the boom or booming down will cause radius to increase.
  - Rapid swinging will cause the load, block, or ball to move out past the tip of the crane boom increasing radius.
  - Booming down rapidly and stopping will cause the load, block, or ball to move past the tip of the crane increasing radius.
  - Boom deflection if not compensated for will allow the load, when it leaves the ground, to move out past the tip of the crane boom increasing radius.

- Rated Capacity
  - Rated capacity is the maximum allowable load that can be applied to a crane at a given radius and crane configuration. As the radius increases, the rated capacity generally decreases.
  - The rated capacities per radius and configuration are found in the load charts and may or may not take into consideration many variables that must be accounted for in safely operating the crane.

- Boom Angle
  - Boom angle is the angle of the boom to the ground or horizontal.
  - When lowering the boom the boom angle will decrease.
  - Increasing the boom angle or decreasing the boom angle will increase or decrease radius. This will result in changes to lifting capacity and ground bearing pressure.
  - The longer the boom and the lower the boom angle the more flex the boom will have and will appear to bow in the middle.

Notes

- Operator's Manual
  - Assembly and disassembly procedures.
  - Crane operational procedures and notes.
  - Crane specifications and components.
  - Safe working instructions.
  - Load charts.
  - Range diagrams.
  - Quadrants of operation.
  - Must be available for reference by the operator.
  - It is required that a copy of this manual be kept in the cab of the crane.
  - The manual must be specific to the crane and can be identified by the crane serial number.

Deviation from Manufacturer

- When manufacturer procedures are unavailable, the employer must develop and ensure compliance with procedures necessary for safe operation of equipment and attachments.
- Procedures for the operational controls must be developed by a qualified person.
- Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.

Scope of Equipment WAC 296-155 Part L

- Rough terrain crane.
- Lattice boom truck crane.
- Crawler cranes.
- Boom truck.
- Barge cranes.
- Tower crane.
- Deck crane.
- Multi-purpose machine.
- Powered industrial trucks (forklifts).
- Knuckle boom & material handlers.

Specifically Excluded from Scope

- Cranes used in tree trimming operations.
- Chain falls, come-alongs, roustabouts.
- Aerial lifts and bucket trucks.
- Mechanic's truck when performing maintenance work.
- Dedicated drill rigs.
- Machines equipped with a boom that is limited to up and down movement only and does not rotate.
- Gantry cranes.
- Earth moving equipment.
- Gin poles.

Main Classifiers of Mobile Cranes

- Wheel mounted.
- Track mounted.
- Fixed cab.
- Swing cab.
- Lattice boom.
- Telescopic boom.

Operational Aids and Safety Devices

- When operational aids are under repair work may OSHA allows for work to proceed provided additional safeties are implemented.
- Washington State requires operational aids and safety devices to be used 100% depending on crane date of manufacture and maximum gross capacity.

- Crane Level Indicator
- Boom Stops
- Jib Stops
- Foot Pedal Brakes with Locks
- Equipment on Rails with Rail Stops
- Horn
- Hydraulic Outrigger Jacks with Integral Holding Device

- Boom Hoist Limiting Device (1969)
- Luffing Jib Limiting Device
- Anti Two-Blocking Device (1992)
- Boom angle or radius indicator
- Boom Length Indicator
- Load Weighing Devices (2003, Cap over 6,000lbs)
- Jib Angle Indicator
- Outrigger/Stabilizer Position Sensor/Monitor
- Hoist Drum Rotation Indicator

Mobile Crane Signaling General Requirements

- Voice Signal Protocol.
- ASME B30.5 Standard Method Hand Signals.

Mobile Crane Signaling / Signal Person is Required

- The operator cannot see the load.
- The operator cannot see the load landing area.
- The operator cannot see the path of travel of the load or of the crane.
- The operator is far enough away from the load to make judgment of distance difficult.
- The crane is the boom's length distance to the limit of approach near power lines.
- When the equipment is traveling, the view in the direction of travel is obstructed.
- Due to site-specific safety concerns.

Signals General

- Signals to operate must be by hand, voice, or audible (example; horn).
- The type of signals used must be agreed upon by the lift director, the operator, and the signal person.
- All signals shall be given in the operator's perspective.
- If at any time signals cannot be clearly seen or understood, lift operations shall stop until communication is restored and a proper signal is given and understood.
- If it is desired to give instructions to the operator, other than those provided by the established signal system, the crane movements must be stopped.
- When a signal person is required, signals shall be maintained continuously during all crane movements.

Mobile Crane Signaling / Electronic Signals

- Radios and electronic devices used for signaling must be tested prior to use.
- Tests must ensure effective, clear, and reliable transmission.
- When radios are used, a dedicated channel must be provided for crane use, but multiple cranes may share a dedicated channel for crane operations.
- If at any time the ability of the device to transmit signal is interrupted the operator must safely stop operations until transmission is re-established.
- The operator's reception of signals must be made by a hands-free system.

Mobile Crane Signaling / Voice Signal Protocol

- Prior to beginning operations the operator, signal person, and lift director must contact each other and agree on the voice signals that will be used.

- **Each Voice Signal must contain the following 3 elements, given in the following order**. For example;

  1. **Function and Direction ("Swing Left"; "Boom Up"; "Hoist"; "Lower").**
  2. **Distance and/or Speed ("25 feet, 10 feet, 5 feet, 2 feet"; or "Slowly"; "Faster").**
  3. **Function Stop ("Swing Stop"; "Boom Stop"; "Hoist Stop").**

Audible Travel Signals

- **STOP: One short audible signal.**
- **GO AHEAD: Two short audible signals.**
- **BACK UP: Three short audible signals.**

Hand Signal Protocol

- When using hand signals in Washington State you must use the "standard method" as provided by ASME B30 and adopted by Washington State.
- If the standard method for hand signals is infeasible, nonstandard hand signals may be used.
- Nonstandard signals must be agreed upon by the lift director, operator, and signal person.

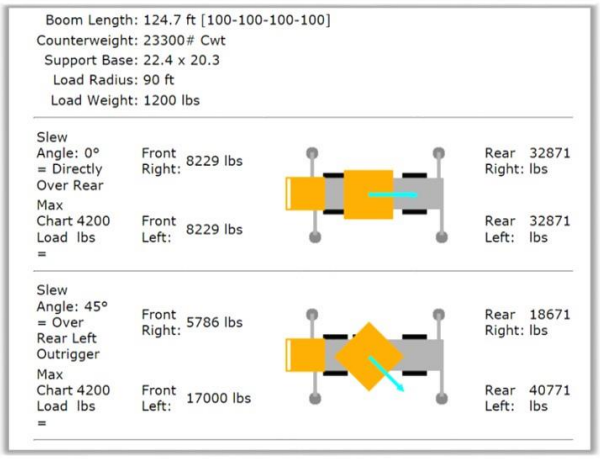
Example Signals

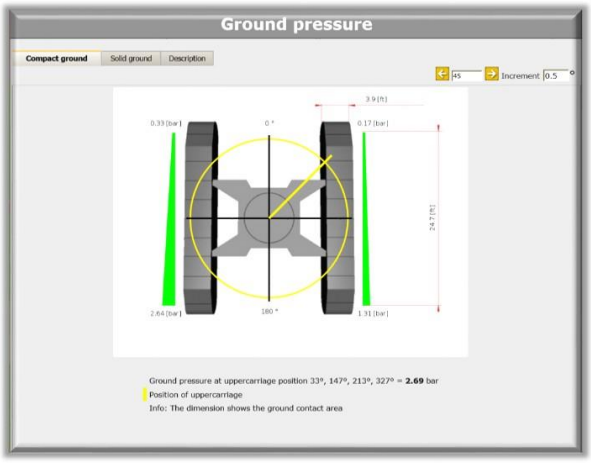
Foundations / Bearing Capacity

- The supporting surface must be capable of supporting the weight of the crane and load.
- What is ground bearing capacity and where can you find your ground bearing capacity?
- Have you considered subsurface hazards such as vaults and utilities, excavations, retaining walls, ice, or water?

Foundations / Bearing Pressure

- How much weight is distributed to each outrigger or track throughout the pick?
- Where can you obtain outrigger bearing pressures?





Foundations / Supporting Materials

- How can outrigger and crane track bearing pressures be disbursed to meet bearing capacity?

You are planning a critical crane pick with a 150 ton telescopic crane with outriggers.

Your geotechnical report indicates that your soil conditions have a ground bearing capacity of 3,000 psf.

Your crane manufacturer has reviewed your load analysis and crane configuration, providing a maximum outrigger bearing pressure of 40,771 lbs.

The outrigger floats on your crane measure 2' x 2' square.

What size crane mats will you need to disperse the load?

Minimum Area Required Under Each Outrigger

$$Minimum\ Area\ of\ Mat = \frac{40{,}771lbs}{3{,}000psf} = 13.59sf$$

3' x 5' mats = 15sf area

Rules of thumb for cranes using outriggers:

- 3 x Area of Float.
- Crane Capacity / 5.

You are the operator on a 150 ton crane with outriggers.

The outrigger floats are 34 inches in diameter

Cribbing material available is 4”x4”x6’ rough cut oak.

Area of Cribbing = 3 x Area of Float

First determine area of float: $A = \pi r^2$
Radius is 17 inches ***or 1.42 feet***

1.42’ x 1.42’ = 2.01sf
2.01sf x 3.14 (pi) = 6.33sf
3 x 6.33sf = 18.99sf

Each outrigger will need 18.99sf of cribbing

Using 6’ long 4x4s as cribbing how many 4x4s will you need?

6’x = 18.99sf → 18.99sf ÷ 6’ = 3.16’ → 3.16’ ÷ 4” = 9.48

Your cribbing needs to be 6’L x 3.16’W

The float is 34 inches wide….
The cribbing is 3.16’ x 12” = 37.92”
Is the entire cribbing mat effective?

This situation requires a second layer on top of the bottom layer. The top layer must be at right angles to the bottom layer and completely support the float.

Example 3 x Area of Float

You are the operator on a 150 ton crane with outriggers.

The outrigger floats are 36 x 36 inches in diameter

Cribbing material available is 4”x4”x6’ rough cut oak.

Area of Cribbing = capacity ÷ 5

155 ÷ 5 = 31

Each outrigger will need 31sf of cribbing

Example Crane Capacity / 5

You may need to obtain engineering on the “supporting materials” to ensure they will sustain the load without deformation such as bending or breaking.

- Hardwood.
- Steel Plates.
- Composite / Engineered Products.

Wind – Basic Safety Concerns

- Uncontrolled swinging of load.
- Increased side load stress.
- May cause load to contact the boom.
- May cause increased radius.
- May cause increased load weight.

Crane Design - Wind

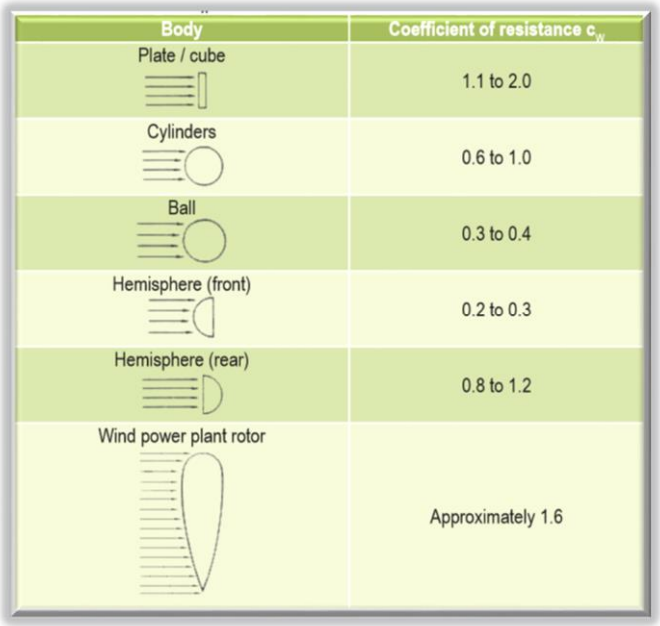
- SAE procedures for determining structural capacities include applying side load forces:
  - 2% rated capacity lattice boom.
  - 3% rated capacity cantilevered boom.
  - To account for wind conditions up to 20mph.
- SAE procedures for stability does NOT include side loading additions;
  - Deduction of 75% / 85% of rated capacity.

Operator's Manual - Wind

- Permissible, allowable, or recommended wind speeds may be provided in the operator's manual.

Designed Load Calculations

- The SAE testing procedures include *assumed* factors for calculating wind loads and allowable wind speeds.
- Some examples include:
  - Load shape.
  - Effective surface area.
  - Wind gust duration.



Body	Coefficient of resistance c_w
Plate / cube	1.1 to 2.0
Cylinders	0.6 to 1.0
Ball	0.3 to 0.4
Hemisphere (front)	0.2 to 0.3
Hemisphere (rear)	0.8 to 1.2
Wind power plant rotor	Approximately 1.6

Example Liebherr 1080 Wind Velocity Calculation

1. Load Weight
2. Coefficient of Resistance
3. Surface Area
4. Max Wind Speed per Load Chart

1. 85 Ton
2. 1.2
3. $85m^2$
4. $9m/s$

$$Vmax = \frac{9m}{1s} * \frac{\sqrt{\frac{1.2m^2}{1t} * 85t}}{\sqrt{1.2 * 85m^2}}{1}$$

$$Vmax = \frac{9m}{1s} = 20.13\text{mph}$$

1. 85 Ton
2. 1.6
3. $85m^2$
4. $9m/s$

$$Vmax = \frac{9m}{1s} * \frac{\sqrt{\frac{1.2m^2}{1t} * 85t}}{\sqrt{1.6 * 85m^2}}{1}$$

$$Vmax = \frac{8.45m}{1s} = 18.09\text{mph}$$

Common Formulas for Wind Calculations

Wind Pressure $= \frac{1}{2} * air\ density * velocity^2$

Wind Load (Force) = *area x wind pressure x coefficient of resistance*

Wind Load Moment = *wind load x height of load center*

Equivalent Gravity Load $= \frac{wind\ load\ moment}{radius\ of\ load\ center}$

Notes

Power Lines

- Amps.
- Identify your work site.
- Trigger distances – 20’ and 50’.
- Table 4.
- Preventing encroachment.
- Emergency procedures.

Preventing Encroachment

- Conduct a planning meeting.
- If using tag lines, they must be non-conductive taglines.
- Erect and maintain an elevated warning line, barricade, or line of signs in view of operator at 20’ or Table 4 distance.
- Implement one of the following;
  - Proximity alarm – device that warns operator of encroachment.
  - Device that automatically stops movement prior to encroachment.
  - An insulating link.
  - Dedicated spotter.

Dedicated Spotter Must

- Meet the requirements of a qualified signal person.
- Be equipped with a visual aid to assist in identifying the minimum clearance distance, such as clearly visible lines painted on the ground, a clearly visible line of stanchions, or a set of clearly visible line-of-sight landmarks.
- Be positioned to effectively gauge the clearance distance.
- Use equipment that enables the dedicated spotter to communicate directly with the operator.
- Give timely information to the operator so that the required clearance distance can be maintained.
- Use a device that automatically warns the operator when to stop movement, such as a range-control warning device that is set to give the operator sufficient warning to prevent encroachment.

Approach Distances

- Power Lines up to 350kV have a 20’ trigger.
- Power lines above 350kV have a 50’ trigger.
- Table 4.
- There are additional requirements for Assembly/Disassembly.
- Consider weather conditions such as heat and ice when defining proper distance.

Power Lines / Contact

- Break contact if possible.
- Operator to stay in cab except when there is danger from fire, explosion, etc.
- Keep people away.
- Notify power company.
- Notify emergency services.
- Notify the crane owner (have technician dispatched).
- Remove crane and equipment from service.
- Notify the Department of Labor and Industries.

Mobile Crane Dynamics / Drift

- *Drift* is a condition that occurs when the load continues to move after the crane or crane boom has stopped.
- Drift can be either an in-and-out motion, a side-to-side motion, or in a circle.
- Drift is caused when booming or swinging functions are started or stopped too rapidly.
- The motion will cause increased radius and/or side loading of the boom.

Drift - Catching the Load

- When drift occurs, the Operator can *catch the load* to minimize the drift.
- To minimize the effects of load drift the Operator can;
  - Boom up to move the boom tip over top of the ball or block as it reaches its inward apex.
  - Boom down to move the boom tip over the top of the ball or blocks as it reaches its outward apex.
- To minimize the effects of swing drift the Operator can;
  - Swing the boom tip over the top of the ball or block when it reaches its right or left apex.
- To minimize the chance of excessive drifting, it is important to begin the booming or swinging function slowly and allow plenty of time to slow the function down before stopping.

Mobile Crane Dynamics / Two - Blocking

- Two-blocking is a condition that occurs when the ball or load block comes into contact with the sheaves at the tip of the boom.
- As the hoist line breaks and line weight is released, dynamic unloading occurs.
- Dynamic unloading may cause shock load damage to the crane or cause a loss of backward stability.
- If the crane is equipped with an *Anti-Two-Block* device, this device should never be used as a limiting device.
- The crane functions that could cause two-blocking are;
  - Extending the boom.
  - Booming down.
  - Hoisting.

Mobile Crane Dynamics / Boom Deflection

- Boom deflection occurs when a load is applied to the crane, compressing the boom, and slightly bending it.
- If boom deflection is not compensated for prior to lifting the load off the ground, the load will move out away from the crane putting the ground crew at risk and increasing radius.
- It is extremely important that the hoist line is plumb when the load leaves the ground.

Mobile Crane Dynamics / Boom Deflection

- As a signal person, you must verify that the hoist line is plumb.
- This can be accomplished by taking a step back and visually determine that the boom tip is centered over the load and the hoist line is plumb in all directions.
- If the hoist line is not plumb the signal person must stop the operation and compensate for the deflection.

Mobile Crane Dynamics / Dynamic Loading

- Dynamic loading occurs when the motion of the load increases the amount of stress applied to the crane.
- Dynamic loading can be caused by rapidly accelerating while lifting a load or rapidly stopping while lowering a load.
- The dynamic load applied to the crane may be many times the weight of the original load.
- Before a *Hoist* signal is given, make sure the crane is not near its rated capacity.
- Always double check that all rigging is free from catching.
- A steady increase in speed increases stress on the crane much less than a sudden increase.

Mobile Crane Dynamics / Dynamic Unloading

- Dynamic Unloading is a condition that occurs when the load applied to the crane during lifting operations is suddenly released. Sudden and uncontrolled release of a load can cause loss of stability, structural damage, or collapse.

Mobile Crane Dynamics / Side Loading

- Side loading can cause structural damage.
- Side loading is limited to freely suspended loads.
- Side loading can be caused by;
  - Lifting a load without the boom tip completely centered over top of the load.
  - Rapid swinging.
  - Sudden stopping of swing.

Mobile Crane Dynamics / Basic Crane Functions

- Hoist
- Lower
- Boom Up
- Boom Down
- Boom Up and Lower the Load
- Boom Down and Raise the Load
- Swing (Right or Left)
- Extend Boom
- Retract Boom
- Travel (Wheeled Machines- Forward or Reverse)
- Travel Both Tracks (Crawler Machine) - (Forward or Reverse)
- Travel One Track (Crawler Machine) - (Left or Right) (Forward or Reverse)
- Stop

Notes

Rigging Fundamentals for the Signal Person

- Rigging / General Requirements;
  - Washington State requires all rigging devices to bear identification of SWL, WLL, or Rated Capacity.
  - Custom home-made equipment must be engineered and proof tested to 125%.
  - Loads should not be rested on slings, or slings pulled from under loads.
  - Daily / pre-shift inspections are required for all rigging.
  - No twisting or knotting slings to reduce length.
  - Protect from sharp edges.
  - Do not overload.

Rigging / Understanding Load Weights

- Shipping ticket.
- Calculate weight of load.
- Weight volume tables.
- Shop drawings.
- Equipment spec sheet.
- Data plates.
- Submittals.
- Phone the manufacturer.
- Load cell.

Wire Rope Slings

- Economic, lightweight, flexible, durable.
- Damage easily detectable.
- Tags are required.
- Eyes.
- Thimbles.

One lay length means the distance it takes one strand of the wire rope to make a complete revolution around the core.

Washington State allows for wire rope clips to be used to make-up wire rope slings. However, field identification of this practice is cause for stopping work to ensure all State requirements regarding this practice have been met.

Synthetic Slings (Web Slings and Round Slings)

- Easy to use, light, less likely to damage load.
- Easily damaged.
- Tags required.
- Use special fittings.
- Inspection;
  - Internal vs external damage.
  - Acid or caustic damage.
  - Brittleness, stiffness, discoloration (UV).
  - Acid or caustic burns.
  - UV or Heat damage.
  - Holes, tears, cuts, wear, or snags that expose core yarns.
  - Knots.

Chains

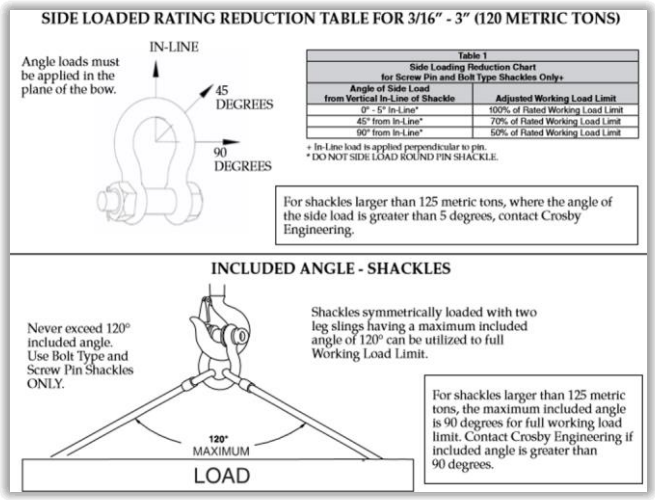
- Highly resistant to heat, abrasion, and wear.
- Most time consuming to inspect, requires periodic documented inspection.
- Highest potential for damage to load.
- Most versatile.

Bridles

- Can be made of synthetic, wire rope, or chain.
- Multiple legs connected to a master link.
- Sling angle factor is often a concern.
- Problems with load share.

Shackles

- Inspect for wear per manufactures specifications, wear typically 10%.
- Use correct shackle pins.
- No Welding or cutting.
- No bolts to replace pins.
- Reductions for angular loading.
- Malleable vs forged.



Hooks

- Accept limited number of slings.
- Latches required, exception – shake-out hooks.
- Typical inspection requirements;
  - Deformation – Any visible bend or twist from the plane of the unbent hook.
  - Throat opening exceeding 5 percent, not to exceed ¼" (or per manufacturer).
  - Wear – Any wear exceeding 10 percent (or per manufacturer).
  - Cracks.
  - Any self-locking hook that does not lock.
  - No welding or cutting.

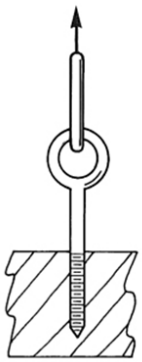
Rope Clips

- Proper direction of installation.
- Torque values.
- Malleable vs forged.

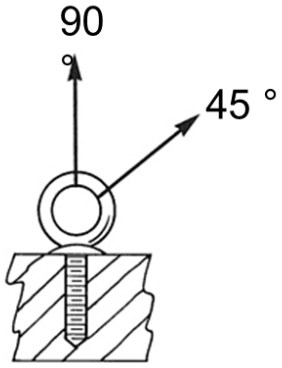
Eye Bolts

- Must have load rating.
- Malleable vs forged.
- Loading bolts without shoulders.
- Loading bolts with shoulders.

Shoulderless eye bolts may only be loaded in this direction



Shouldered eye bolts may be loaded *between 45 and 90 degrees.*



Spreader Beams

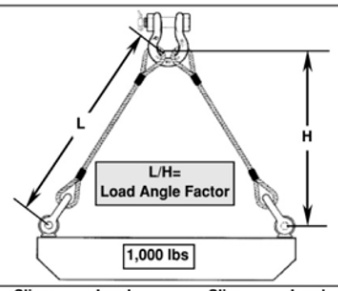
- Used to gain rigging foot print / reduce sling angle.
- Used to equalize the load.
- Often Custom Fabricated.
- Must be engineered and proof tested to 125% of anticipated rated SWL.

Rigging Common Hitches

- Vertical
- Choker
- Basket
- Double Wrap Basket

Rigging Sling Angles and Sling Tension

- Position of sling relative to horizontal.
- Tension in sling increases as angle to horizontal decreases.



Sling Angle	Load Factor	Sling Angle	Load Factor
90 Deg.	1.000	45 Deg.	1.414
85 Deg.	1.004	40 Deg.	1.555
80 Deg.	1.015	35 Deg.	1.742
75 Deg	1.035	30 Deg.	2.000
70 Deg.	1.064	25 Deg.	2.364
65 Deg.	1.104	20 Deg.	2.924
60 Deg.	1.155	15 Deg.	3.861
55 Deg.	1.221	10 Deg.	5.747
50 Deg.	1.305	5 Deg.	11.490

In this example, both slings support half the load or 500 pounds. Due to sling angles, a load factor must be applied to account for mechanical tension in the slings. The **LOAD ANGLE FACTOR** is calculated as follows.

L = 25'
H = 21.25'

$$\frac{25'}{21.25'} = 1.176$$

Sling angle is near 60 degrees
500 lbs X 1.176 = 588 lbs per sling

Load Weight	Times	Load Angle Factor	Equals Divide by # Legs
500 lbs.	X	1.155 (60 °)	577.5 lbs.
500 lbs.	X	2.000 (30°)	1000 lbs.

D/d Ratio

To Determine Strength Reduction:

- D = Diameter of bend
- d = Diameter of sling

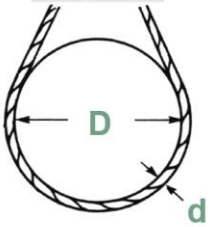
Example:

¾" wire rope; 10" pipe; D/d Ratio is 10" divided by ¾" = 13:1

½" wire rope; 10" pipe; D/d Ratio is 10" divided by ½" = 20:1

¼" wire rope; 10" pipe; D/d Ratio is 10" divided by ¼" = 40:1

D/d Ratio Strength Efficiencies	
D/d	Capacity
30:1	95%
20:1	92%
10:1	86%
5:1	75%
1:1	50%



Plan View Drawing

- Shows the crane, load, and any nearby structures that could cause interference. This should be to scale and should note;
  - Manufacturer, model, and counter weight if variable.
  - Foundations concerns such as excavations, retaining walls, and utilities.
  - Outrigger pad or mat size and placement.
  - Initial lifting position of the load and radius.
  - Final placement position of the load and radius.
  - Powerlines and delineation.
  - Personnel placement.
  - Traffic control.
  - Controlled access zones.

Elevation View Drawing

- Shows the crane, load, and any nearby structures that could cause interference. This should be to scale and should note;
  - Crane manufacturer, model, and counter weight if variable.
  - Elevation of crane.
  - Elevation of load lift and load placement.
  - Load center of gravity and load distribution.
  - Boom length, boom angle, and possible boom deflection.
  - Ball/block headroom with rigging and load clearance.
  - Lift radius.
  - Obstructions.

Rigging Plan

- Shows the load and rigging to be used. This should be to scale and should note;
  - All rigging such as slings, shackles, spreader beams, blocks, hooks.
  - Rigging specifications such as ID number, length, and safe working loads.
  - Sling angles and reduction factors.
  - Pads or softeners.
  - Load center of gravity.

Notes

Capacity Analysis

- A calculation to understand if the intended load is within the crane's rated capacity. This should include;
  - Determine gross rated capacity of the crane in the configuration specified.
  - Determine deductions from gross rated capacity for all equipment per manufacturer's instructions to determine net capacity.
  - Determine load weight.
  - Combine load weight with weight of deductions to determine gross load.
  - Compare gross load to gross rated capacity.

Capacity Analysis

- What information is needed to conduct a lift analysis for rated capacity?
  - Crane configuration.
  - Radius from lift to placement.
  - Elevation at lift and placement.
  - Load weights.
  - Load charts.
  - Range diagrams.
  - Operator's notes and manufacturer's listed deductions.
  - Hoist rope capacity.
  - Allowable line pull and reeving.

Take-Aways

- Has a step by step plan for lifting, travel, and placement of the load been developed?
- Has the lift plan been reviewed with the crane operator, riggers, and all other personnel involved in the lifting operation?
- Does the lift plan calculate the weight of the load and the crane's lifting capacity?
- Does the lift plan include a pre-lift meeting to address last minute concerns? Have supervisors, operators and rigging personnel been included in this meeting?
- Have communication signals, whether hand or radio, been agreed upon and understood by all personnel?
- Does the lift plan consider contingencies for high winds or other bad weather conditions, and who will monitor those conditions?