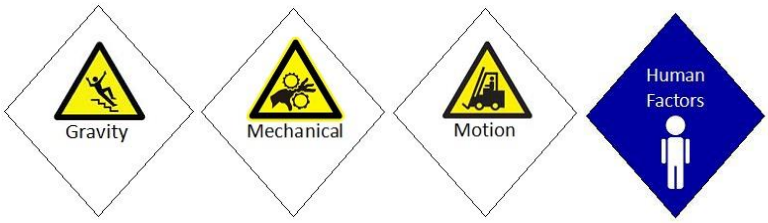
PURPOSE/APPLICATION

Rigging can vary considerably depending on the load weight, shape and circumstances. Rigging can range from a single sling to rigging components in multiple lengths and styles. This SWP will provide guidance to workers around the selection, inspection and use of a variety of rigging components.

PPE
- CPES minimum requirements
- Additional PPE as determined by HIAC

TRAINING
- CPES and Site-Specific Requirements
- On the job instruction and trade related rigging instruction

HAZARDS & CONCERNS
- Personal injury
- Property damage
- Motion (crush/pinch points)
- Gravity (slips/falls)



PRECAUTIONS

- The rigger must know the weight of the load and rigging hardware, the capacity of the hoisting device and the working load limit of the hoisting rope, slings, and hardware.
- Ensure that wire rope, alloy steel chain, synthetic fibre rope, and metal mesh slings all meet the requirements of ASME Standard B30.9-2014, Slings.
- Recognize factors such as wear, temperature, improper sling angles, point loading, and centre of gravity that can affect the rated working load limits of equipment and hardware.
- Lifts which meet certain criteria require the completion of a lift plan to calculate the weight of the rigging involved, see CF-S-42 and SWP 41 Critical Hoisting for more information.

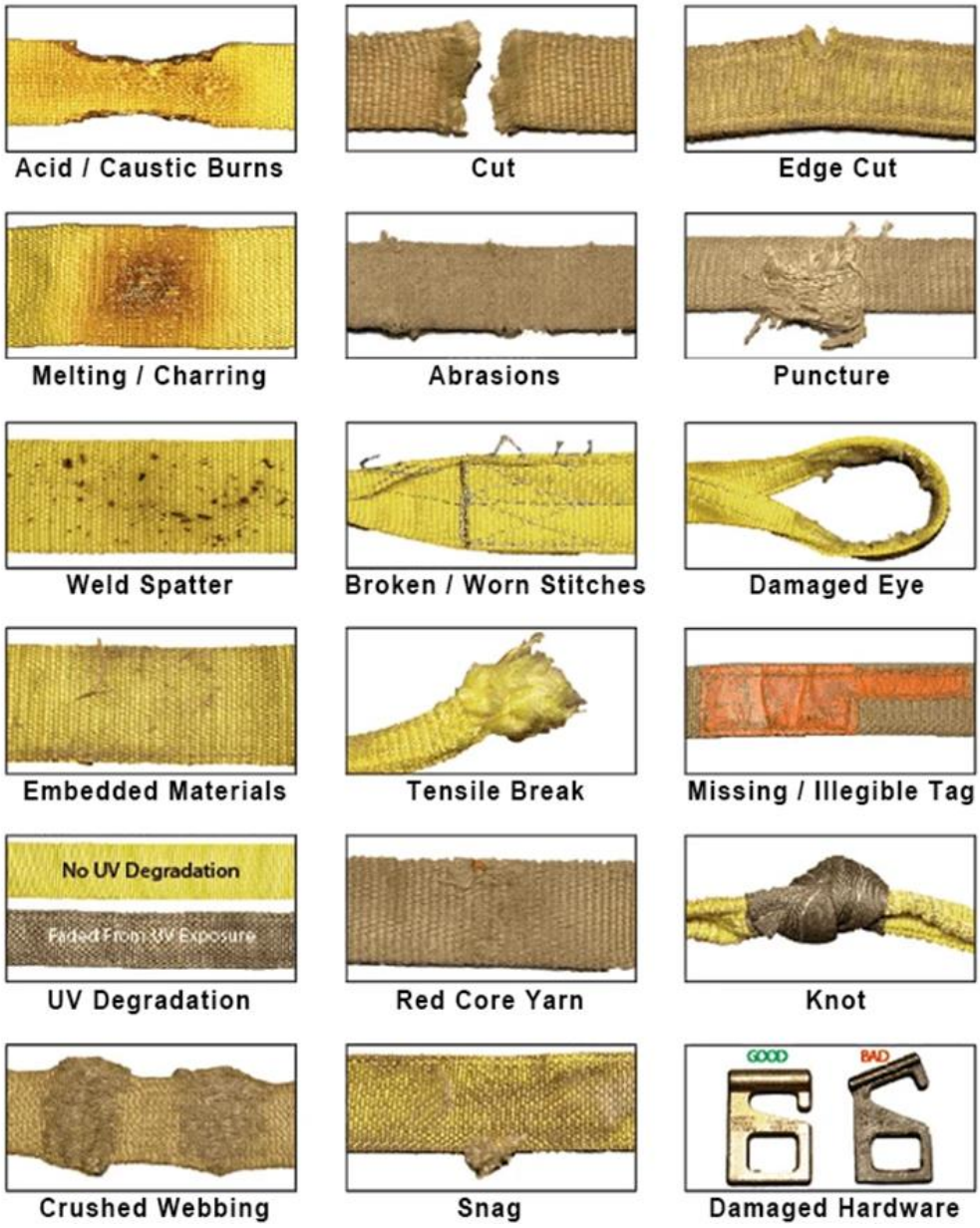
INSPECTIONS

- All rigging equipment including wire rope, slings, shackles, etc. is to be inspected prior to use to ensure that the rigging is in good condition, functional and safe.
- Any defective rigging identified must be removed from service, tagged out of service, returned, and reported to the Supervisor.
- Any sling, strap or other lifting device that is damaged must be permanently removed from service as required by manufacturers specifications. A worn, damaged, or deformed hook is to be permanently removed from service if the wear or damage exceeds the manufacturers specifications allowed.
- Many lifting components require formal inspection or certification at least annually, verify any OEM requirements of the equipment prior to use.

Note that even new slings may have manufacture defects and require a Pre-Use Inspection prior to being placed in service.

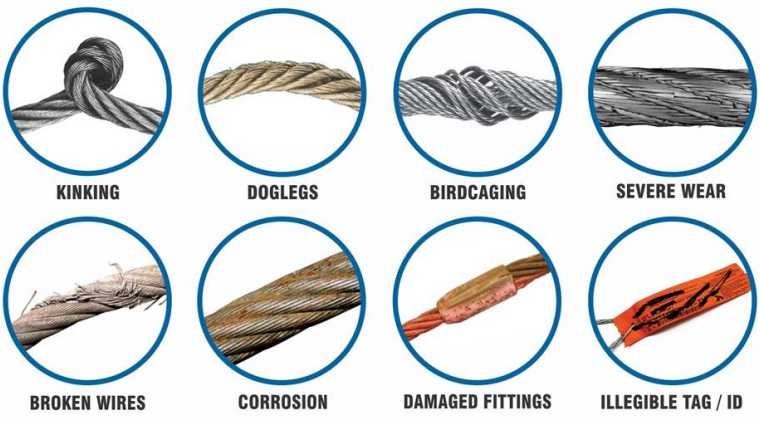
SYNTHETIC WEB OR ROUND SLINGS

- Ensure the identification tag is attached and includes manufacturer's name or trademark, the manufacturer's code or stock number, the rated capacities of the three basic hitch types, the angles on which the capacities are based, the type of core material and cover material (if different from the core material).
- Inspect inch by inch and ensure damaged areas are identified.
- Look for melting or charring, chemical damage, cuts, tears, snags, or any other fiber damage.
- Check for worn or broken stitching, abraded areas, brittle fibers, and hardened areas.
- Inspect any permanently attached fittings for rust, corrosion, bends, cracks, gouges, or sharp edges.



WIRE ROPE SLINGS

- Ensure the identification tag is attached and states the size, grade, rated capacity, and manufacturer's name.
- Inspect inch by inch to identify any damage areas.
- Look for broken, worn, abraded, or stretched wires. Provincial and OEM standards specifications for maximum numbers of broken strands permitted, review these requirements prior to inspecting.
- Check for signs of corrosion, rust, pitting, discoloration, and any heat damage such as melted areas and burn marks.
- Watch for "bird caging" (when the wire rope strands begin to unravel or push away from other strands).



ALLOY STEEL CHAIN SLINGS

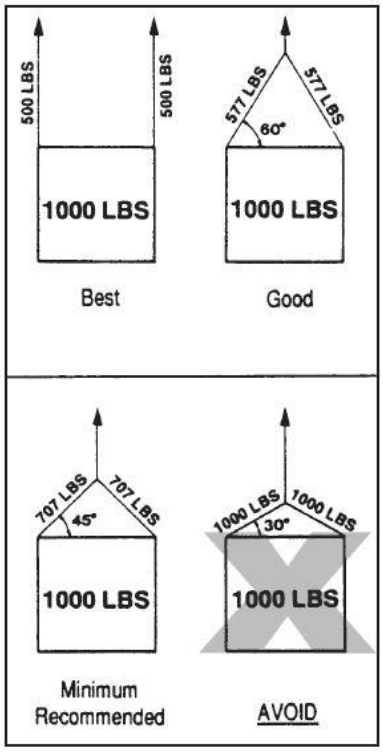
- Ensure the identification tag is attached and states the size, grade, rated capacity, and manufacturer's name.
- Only Alloy Grades 80 or 100 may be used for overhead lifting.
- Carefully inspect each link and hook for bends, cracks, gouges, or marks showing excessive wear.
- Check the links for stretching.
- Ensure there is a non-conductive sling between the metal components and any mechanical lifting device (e.g. crane, side boom, etc.) if welding will be completed on the load.

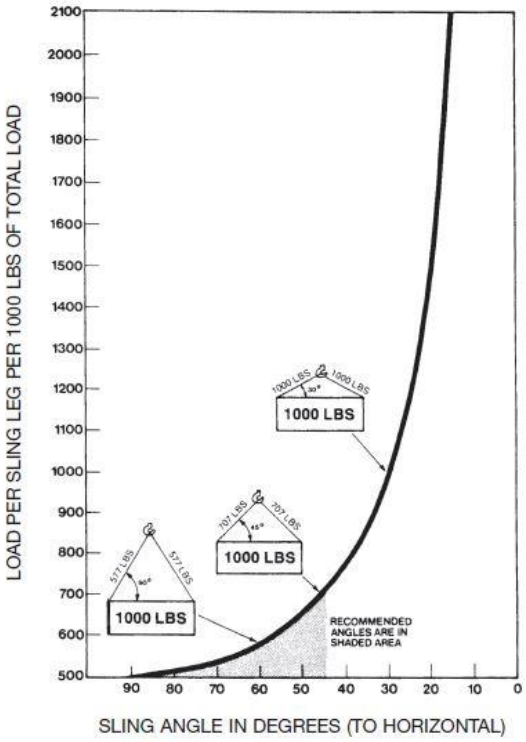
RIGGING HARDWARE (SHACKLES, HOOKS, SPREADER BARS, EYE BOLTS, ETC.)

- Ensure identification markings are visible and legible.
- Check carefully for cuts, gouges, corrosion, rust (other than surface rust), bends, twists or areas that have been stretched, cracked, or broken.
- Inspect for melted areas, welding arc CPESs, welding slag or other hot work markings.
- Check pins and threads for damage or stretching or where the pin does not sit or thread properly.
- Carefully examine the area of the hardware that bears most of the load.

ANGLES AND TENSION

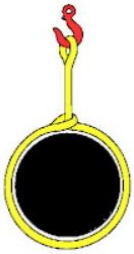
- The working load limits of hoisting equipment apply only to freely suspended loads on plumb hoist lines. If the hoist line is not plumb during load handling, side loads are created which can destabilize the equipment and cause structural failure or tip-over with little warning.
- The rated capacity of any sling depends on its size, configuration and the angles formed by its legs with the horizontal. The smaller the sling angle, the more weight there is on each sling. At 30°, each sling is subjected to the full weight of the load.
- Hardware's rated capacity also decreases when it is pulled from any direction other than vertical.
- Low sling angles create large, compressive forces on the load and may cause buckling, especially in longer flexible loads.
- Ensure that the sling angle is always greater than 45° and preferably between 60° and 90°. When the horizontal distance between the attachment points on the load is less than the length of the shortest sling leg, then the angle is greater than 60° and generally safe.

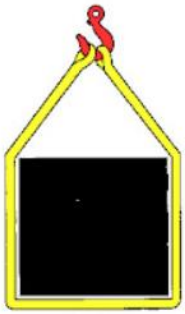




SLING HITCHES

- The capacity of a lifting sling will vary depending on the hitch that is used to rig the load, it is important to understand how the lifting capacity of the sling will be impacted by the hitch.
- Remember, the overall strength of the rigging will be dictated by the capacity of the weakest component.

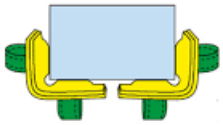
Hitch		Capacity Impact
Vertical Hitch		Sling will have 100% capacity when there is a straight attachment to the load by using hooks, shackles, or other hardware,
Chocker Hitch		A choker hitch has 80% of the capacity of a single leg sling if the angle of the choke is 120 degrees or greater. A choke angle that is less than 120 degrees will result in a capacity as low as 40% of the single leg.

Basket Hitch		Basket hitches distribute a load equally between the two legs of a sling. When using a basket hitch, the load is cradled by running the sling underneath the load and then attaching both eyes of the sling separately to the hook. A basket hitch has twice the lifting capacity of a single leg vertical hitch when the legs are in a true 90° vertical fashion. If the sling angle is less than 90° when using a basket hitch, the sling capacity is reduced. Single Leg Capacity based on the angle of the legs: 90° 200% 60° 170% 45° 140% 30° 100%

GENERAL DOs AND DON'Ts

THE DOs

DO HIAC the task beforehand to determine the hazards and put in the appropriate controls
DO Communicate the hazards to anyone involved in the task and any other workers in the area
DO Determine the weight of the load. Use the information on shipping papers, design plans, catalogue data and manufacturer's specifications. You can calculate the weight of a standard steel object using a standard formula
DO Select the properly rated rigging for the task and ensure that the tags are marked with the working loads
DO Determine the proper hitch based on load type
DO Be aware of the location of pinch points and keep your hands and body clear. Note the specific pinch points on your HIAC
DO Ensure load is centered/balanced. While it is easy to determine the centre of gravity on uniform objects, oddly configured loads may require more trial and error. Have the operator perform a slow, careful test lift a few inches off the ground. If the load tilts during the trial, signal the operator to set it back down and then re-rig the load
DO Ensure that the hoist line is plumb. Side loads are created when the hoist line is not plumb and can de-stabilize the equipment and cause structural failure or tip-over
DO Protect slings from cuts and tears from sharp edges on a load. Place softeners such as padded materials between slings and edges. Ensure the material is strong enough to withstand the increased force of the sharp edges when the load is lifted



DO Select one or more taglines to control the load as required (based on site and lift conditions)
DO Select a rope tagline that is free of knots and long enough for the worker to be a safe distance from the load during the entire lift
DO Hold the tagline such that it can easily be released it if the load swings dangerously
DO Attach a tagline to a spot where it can be easily removed
DO Be aware of the direction of the swing and the roll of the load
DO Ensure that the hook is secured by a safety latch, mousing, shackle, or other effective means where the dislodgment of a hook could injure a worker
DO Perform one or more test lifts so that you can see where any adjustments need to be made. If the load tilts during the test lift, then the load must be re-rigged until the centre of gravity is determined
DO Prepare adequate blocking before loads are lowered. Blocking can help prevent damage to slings
DO Ensure all loads have been safely landed and supported to prevent any load shift or movement of any kind before removing any rigging equipment
DO Store rigging in a clean, dry place and protect it from the elements, where possible
DO Attach a "dead man" sling when the rigging will include any mechanical devices (i.e., chain falls or come-a-long) in case of failure

****Remember, lift with a chain fall, pull with a come-a-long****

THE DON'Ts

DON'T Use rigging equipment for vehicle or equipment recovery or towing. If rigging has been used to tow or recover equipment it must be tagged and removed from service
DON'T Conduct hoisting or rigging operations in high winds
DON'T Use a wire tagline
DON'T Wrap a tagline around your hand

DON'T Ever stand or walk under a suspended load
DON'T Use a shackle or any other rigging hardware if you cannot read the identification markings. These components must be immediately removed from service
DON'T Ever point-load a hook unless it is designed and rated for such use. Applying the load to the tip can reduce the safe working load by more than 50%, sorting hooks have different capacities at different parts of the hook
DON'T Ever tie two of more slings together. Always connect two slings with a shackle
DON'T Use single-leg wire rope slings with hand-spliced eyes. The load can spin, causing the rope to unlay and the splice to pull out. Use slings with Flemish Spliced Eyes
DON'T Permit bending near any splice or attached fitting as the bend will weaken the splice or swaging, verify there is no bending near any attached fittings
DON'T Attach a sling directly to a lifting lug, use a shackle
DON'T Allow a sling to bunch up on a shackle, or load the hook's latch

REFERENCES / ADDITIONAL INFORMATION

ASME Standard B30.9-2014, Slings

Infrastructure Health & Safety Association Hoisting and Rigging Safety Manual

MCAA Rigging Safety Guide

CF-S-42 Lift Plan

SWP 41 Critical Hoisting

Alberta OHS Code
Part 21 Rigging

Saskatchewan OHS Regulation
Part 14 Rigging

British Columbia OHS Regulation
Part 15 Rigging

Manitoba Workplace Health and Safety Regulation

Part 23.33-23.37 Rigging

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