USE AND INSPECTION OF SLINGS

Workers involved in hoisting and rigging must exercise care when selecting and using slings. The selection of slings should be based upon the size and type of the load, and the environmental conditions of the workplace. Slings should be visually inspected before each use to ensure their effectiveness. Improper use of hoisting equipment, including slings, may result in overloading, excessive speed (e.g., taking up slack with a sudden jerk, shock loading), or sudden acceleration or deceleration of equipment.

There are generally six types of slings: chain, wire rope, metal mesh, natural fiber rope, synthetic fiber rope, or synthetic web. Slings tend to be placed into three groups: chain, wire rope and mesh, and fiber rope web. Each type has its own particular advantages and disadvantages. Factors to consider when choosing the best sling for the job include size, weight, shape, temperature, and sensitivity of the material being moved, and the environmental conditions under which the sling will be used. The following guide may be useful in selecting the appropriate sling:

Chains

Alloy steel chains are strong and able to adapt to the shape of the load. Care should be taken when using chain slings because sudden shocks will damage them. This may result in sling failure and possible injury to workers or damage to the load.

Chain slings must be visually inspected prior to use. During the inspection, pay particular attention to any stretching, nicks, gouges, and wear in excess of the allowances made by the manufacturer. These signs indicate that the sling may be unsafe and must be removed from service immediately.

Wire Rope

Wire rope is composed of individual wires that have been twisted to form strands. Strands are then twisted to form a wire rope. When wire rope has a fiber core, it is usually more flexible but less resistant to environmental damage. Conversely, wire rope with a core that is made of a wire rope strand tends to have greater strength and is more resistant to heat damage.

When selecting a wire rope sling to give the best service, there are four characteristics to consider: strength, ability to withstand fatigue (e.g., to bend without distortion), ability to withstand abrasive wear, and ability to withstand abuse.

Strength – Strength of wire rope is a function of its size (e.g., diameter of the rope), grade, and construction, and must be sufficient to accommodate the maximum applied load.

Fatigue (Bending without Failure) – Fatigue failure of wire rope is caused by the development of small cracks during small radius bends. The best means for preventing fatigue failure of wire rope slings is to use blocking or padding to increase the bend radius.

Abrasive Wear – The ability of wire rope to withstand abrasion is determined by the size and number of the individual wires used to make up the rope. Smaller wires bend more readily and offer greater flexibility, but are less able to withstand abrasion. Larger wires are less flexible, but withstand abrasion better.

Abuse – Misuse or abuse of wire rope slings will result in their failure long before any other factor. Abuse can lead to serious structural damage, resulting in kinks or bird caging. (In bird caging, the wire rope strands are forcibly untwisted and become spread outwards.) To prevent injuries to workers and prolong the life of the sling, strictly adhered to safe and proper use of wire rope slings.

Wire rope slings must be visually inspected before use. Slings with excessive broken wires, severe corrosion, localized wear, damage to end-fittings (e.g., hooks, rings, links, or collars), or damage to the rope structure (e.g., kinks, bird caging, distortion) must be removed from service and discarded.

Fiber Rope and Synthetic Web

Fiber rope and synthetic web slings are used primarily for temporary work, such as construction or painting, and are the best choice for use on expensive loads, highly finished or fragile parts, and delicate equipment.

Fiber rope slings deteriorate on contact with acids and caustics and, therefore, must not be used around these substances. Fiber rope slings that exhibit cuts, gouges, worn surface areas, brittle or discolored fibers, melting, or charring must be discarded. A buildup of powder-like sawdust on the inside of a fiber rope indicates excessive internal wear and that the sling is unsafe. Finally, if the rope fibers separate easily when scratched with a fingernail, it indicates that the sling has suffered some kind of chemical damage and should be discarded.

Synthetic web slings are commonly made of nylon, polypropylene, or polyester and have the following properties in common:

Strength - Depending upon their size, synthetic web slings can handle loads of up to 300,000 pounds.

Convenience and Safety - Synthetic web slings adjust to the load contour and hold it with a tight, non-slip grip.

Load Protection - Unlike other sling materials, synthetic web is less likely to mar, deface, or scratch highly polished surfaces.

Shock Absorbency - Regardless of the construction material, shock loading (e.g., excessive speed, rapid acceleration or deceleration) of slings should be minimized. However, it should be noted that synthetic web slings can absorb heavy shocks without damage.

Temperature Resistance – The lifting capacity of synthetic web is unaffected by temperatures up to 180 degrees Fahrenheit.

Economy and Long Life – Synthetic web slings have a low initial cost and a long service life. They are unaffected by mildew, rot, or bacteria, resist some chemical action, and have excellent abrasion resistance.

Synthetic web slings must be inspected before use and should be removed from service if found to have acid or caustic burns, melting or charring of any part of the surface, snags, tears, or cuts, broken stitches, distorted fittings, or wear or elongation beyond the manufacturer's specifications.

Safe Lifting Practices

Selection of the sling is only the first step in the rigging process. The next step is learning how to safely use it to hold and move a suspended load. There are four primary factors to consider when lifting a load safely. These are:

Load Size, Weight, and Center of Gravity – The center of gravity of an object is that point at which the entire weight may be considered to be concentrated. To make a level lift, the hoist hook must be located directly above this point. If the hook is too far to either side of the center of gravity, dangerous tilting will result, causing unequal stress in the sling legs. Load imbalances must be corrected immediately.

Number of Legs and Angle with the Horizontal – The smaller the angle between the sling legs and the horizontal, the greater the stress on the individual sling legs. This increased stress effectively decreases the weight that can be safely lifted with any given sling size. Large (heavy) loads can be safely moved by keeping this angle as large as possible and, when necessary, distributing the weight of the load among more sling legs.

Rated Capacity of the Sling – The rated capacity of a sling varies depending upon the type of material the sling is made of, the size of the sling, and the type of hitch. Workers must know the capacity of the sling, and can obtain this information through charts or tables available through the manufacturer. The rated capacity of a sling must not be exceeded, under any circumstances.

History of Care and Use – Mishandling and misuse of slings are the leading causes of sling failure. Following the manufacturer's recommendations for proper care and use are essential for maximum sling service life and safety.

Training

Workers involved in hoisting and rigging operations should receive training in the following:

Sling and hitch types
Sling capacity determination
Equipment inspection, care, and maintenance
Load weight and center of gravity determination
Safe lifting techniques

Scaffold checklist

This checklist is intended to clarify when scaffold design is required and what level of training and competence those erecting, inspecting and supervising the erection, alteration and dismantling of scaffolding are expected to have obtained.

Design and inspection issues

All tube and fitting scaffolds should be designed, and have strength and stability calculations provided by a competent person, unless it is a 'Basic Scaffold' designed in accordance with NASC Technical Guidance TG20.

System scaffolding should be designed, erected and stabilised in accordance with the manufacturers or suppliers Handbook. Any proposed modifications, or alterations, outside a system scaffolding manufacturer's guidelines should be designed by a competent person. Handover certificates should refer to any relevant drawings, working platform loadings and any specific restrictions on use. All scaffolding inspection should be carried out by a person whose training and competence reflects the complexity of the scaffold they are inspecting. A non-scaffolder who has attended a suitable scaffold inspection course and has the necessary background experience would also be competent to inspect a basic scaffold (ie a site manager).

The scaffold inspection register should note any defects and corrective actions taken, even when those actions are taken promptly as this assists with the identification of any recurring problems.

To prevent use by unauthorised persons, all incomplete scaffolds must display warning signs identifying the areas where access is restricted and be suitably protected by physical means.

Competence and supervision issues

All employees should be competent for the type of scaffolding work they are undertaking and should have received appropriate training relevant to the system they are working on. Employers must provide appropriate levels of supervision taking into account the complexity of the work and the levels of training and competence of the scaffolders involved. Every scaffold gang should contain a qualified scaffolder as a minimum requirement.

Trainee scaffolders should always work under the direct supervision of a qualified scaffolder (i.e. a working foreman). Scaffolders are classed as ‘trainees’ until they have completed the approved training and assessment required to be deemed a qualified ‘Scaffolder’.
Erection, alteration and dismantling of complex designed scaffolding (e.g. suspended scaffolds, shoring, temporary roofs etc) should be done under the direct supervision of an advanced scaffolder.
Scaffold structures that need to be designed
Scaffolds that fall outside the scope of ‘Basic Scaffolds’ detailed in NASC guidance note TG20
Dead Shores
Flying shores
Raking shores
Cantilevered scaffolds
Truss-out Scaffolds
Access Birdcages
Façade retention
Access scaffolds with more than the 2 working lifts allowed with TG20 ‘Basic Scaffolds’
Buttressed free-standing scaffolds
Temporary roofs and temporary buildings
Support scaffolds
Loading Bays founded on the ground
Mobile and static towers outside base/height limitations
Free standing scaffolds outside base/height Limitations
Temporary ramps and elevated roadways
Staircases and fire escapes
Spectator Terraces and Seating Stands
Bridge scaffolds
Towers requiring guys or ground anchors
Offshore scaffolds outside Offshore Contractors Association (OCA) handbook
Pedestrian footbridges or walkways
Slung and Suspended scaffolds
Protection fans, Nets and Pavement Frames
Marine scaffolds
Boiler scaffolds
Power line crossings
Lifting gantries and towers
Steeple scaffolds
System scaffolds outside users guide parameters
Sign board supports
Sealing end structures
Temporary Storage on Site

Masts, Lighting Towers and Transmission Towers
Advertising hoardings/banners
Any scaffold structure subject to:

- Vibration
- High Loading
- Long term duration
- High risk areas
- Loading from passenger/goods hoists

Note: The above list is not exhaustive and any scaffold that does not comply with manufacturers' guidelines as published in handbooks will require a specific design produced by a competent person.