



USA office: 511 Avenue of America's, # 601, New York, NY 10011  
Canada office: 655 - 32<sup>nd</sup> Avenue, Suite 201, Lachine, QC., Canada, H8T 3G6  
tel.: 514 634 3434 - fax: 514 634 9736

## ***RIGGING***

All PFI Standards and Best Practices are advisory only. There is no agreement to adhere to any PFI Standard or Best Practice and their use by anyone is entirely voluntary.

## ***PFI Rigging Best Practice***

These practices are intended to maintain a safe workplace for employees; therefore, it cannot be overemphasized that only qualified and competent individuals shall inspect and use rigging equipment. The guidance within these practices applies to the inspection and use of rigging equipment to move and/or lift material and to all personnel who use such devices.

### **Shop Foreman is responsible for:**

- Ensuring that employees under their supervision receive the required training and are deemed qualified to rig material and hoist in their areas through a competency evaluation.
- Ensuring that rigging equipment is inspected and tested prior to use by a qualified individual.

### **Employees are responsible for:**

- Performing rigging activities safely.
- Conducting a thorough inspection prior to using the equipment.
- Selecting and using rigging equipment appropriately.

### **Safety Department is responsible for:**

- Conducting training or coordinating training for individuals using rigging equipment.
- Classifying employees as qualified to perform rigging activities.
- Interpreting rigging safety rules and standards.

### **Rigging use requirements:**

A qualified employee must be used for all rigging activities.

The qualified employee only needs to have the ability to properly rig the load for the work being completed. The employee does not need to be qualified for every type of rigging job.

Qualified employee shall be competent in the following areas directly related to the work they are performing:

- Know and identify various sling types and rigging hardware.
- Know and identify various rigging hardware.
- Know and identify various below the hook lifting devices.
- Know and understand the pre-use inspections for various sling types and rigging hardware.
- Know and identify the various sling hitches and how to apply them for various load configurations.
- Know how to read rigging charts for various hitches and hardware.
- Understand the requirements to know the load weight and the load center of gravity.

- Know dangers of working around Power Lines.
- Know and understand the requirements to keep clear of the load.

### **Rigging Equipment General Safety Rules**

- Rigging equipment (Hooks, slings, cables, ropes and lifting devices) for material handling shall be inspected prior to use on each shift and as necessary during its use to ensure that it is safe. Equipment shall be free from defects (deformities, stretching, loss of flexibility, pitting, corrosion, weld splatter, excessive wear, abrasion, broken components). Defective rigging equipment shall be removed from service.
- All slings shall have a permanently affixed durable identification stating size, rated capacity, and sling manufacturer. All contents of tag shall be legible.
- Hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links, or other attachments, shall have a rated capacity at least equal to that of the sling.
- Rigging equipment shall not be loaded in excess of its recommended safe working load.
- Sling legs shall not be kinked or knotted.
- Extreme Weather, Ultraviolet light, and a chemical environment may have an effect on rigging equipment. Consult your sling manufacturer or a qualified person prior to using a sling in any of these environments.
- Some materials that are lifted have sharp edges that can wear on synthetic slings when wrapped around the material. Softeners must be placed between such materials and slings to protect the integrity of the sling. Softeners must be stabilized to ensure proper lift when used.
- Calculate center of gravity before attaching rigging to a load.
- The rigging shall be secure and the load in a manner that minimizes any slippage of the rigging.
- Always perform a test lift to ensure the load is properly balanced.
- Loads shall not be lifted by the tip of the hook.
- The sling shall not be pulled from under a load when the load is resting on the sling.
- Hands and feet shall not be placed under the material being raised or lowered.
- Flag persons, when applicable, shall stand in a safe position while the load is being moved.
- Shackles should be used instead of treading the eye of a choker or sling.
- When using shackles, the running section of the rope or sling shall be on the curve of the shackle and not over the shackle pin.
- Wire rope slips shall be attached to wire rope so that the curve of the U-bolt is always over the dead end of the rope.
- Hands shall be kept clear of pinch points while the slack is being taken up on the load.

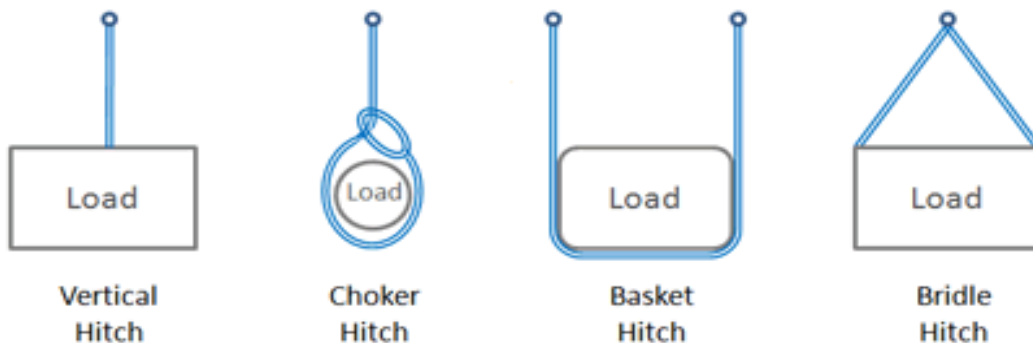
- The safety latch shall be closed immediately after attaching the hook to the rigging.
- Wire rope shall be kept lubricated according to the manufacturer's specifications.
- Shock loading is prohibited.
- When not in use slings shall be moved from the immediate work area to avoid damage.
- Hooks shall not be painted, welded or otherwise modified.
- The load shall be attached directly to the hook by means of slings or other approved devices.
- Tag lines, where applicable, shall be used to control loads.

**Slings** - There are a wide variety of slings available for rigging. They can be manufactured from fiber or wire rope, metal mesh, chain, or synthetic materials such as nylon, polypropylene and polyester. Slings can also be combined with various attachments such as hooks and rings. Consult your sling manufacturer for rules specific to their slings.

- The safe use of slings requires staying within their rated capacity, largely depends upon three important factors:
  - The hitch in which the sling is configured.
  - The angle of the sling.
  - The sharpness of the edges of the load which the sling passes around.

**Hitches** - The method in which a sling is rigged or attached to a load is referred to as a hitch. The weight and shape of the load will largely determine which type of slings and hitches are used. There are four basic types of hitches- vertical, bridle, choker, and basket, with each hitch capable of being set into various configurations.

Diagram: Basic types of hitches



- **Vertical** - This type of hitch is best used with a shackle attached to an eye bolt or lifting eye. When one end is attached to the load and the other end is attached to the lifting device or mechanism with the angle of loading being less than 5 degrees. This type of hitch should not be used for lifting loose material or loads that are long and difficult to balance.
- **Choker** - A choker hitch is accomplished by passing a sling around the load and through one eye or end fitting where it is then attached to a lifting hook. A double choker hitch can also be used, which is the same as a choker except that an additional wrap is placed around the load. The sling load is reduced due to angle of the choke. When used properly the two legs should form a 60 degree angle to the horizontal. Do not jam or beat the choke eye down on to the load.
- **Bridle** - A sling or hitch is composed of two or more individual legs attached to a lifting hook or gathered in a fitting. This hitch provides good load stability when the load weight is distributed among the legs and the hoisting hook is directly over the load's center of gravity. Slings that are angle loaded increase stress in the sling leg. When using a three or four leg bridle the weight may not be distributed evenly throughout all the legs, in this situation the capacity of two sling legs must be great enough to support the load.
- **Basket** - Wrapping or passing a sling around a load and attaching the eyes to a lifting device such as a hook is how a basket hitch is configured. Basket hitches within 5 degrees of vertical can double the lifting capacity of a single leg sling. Because the load can shift or even fall out of the sling, a single basket hitch must not be used to lift loads that are difficult to balance. A double wrap basket hitch is the same as a basket hitch with an additional wrap that goes completely around the load, it is ideal for lifting loose material (Ex: pipe bundles). The gripping effect helps prevent the slings from sliding inward. Slings used in a basket hitch shall have the loads balanced to prevent slippage.

**Angles** - It is very important for slings to remain within the rated capacities that are listed in capacity tables. The rated capacity of the slings used to lift a load largely depends on the angles that are formed between the sling legs and horizontal plane. As the sling angles decrease, the loading or tension on the slings increases. It is not recommended to use sling angles below 30 degrees. Manufacturer's recommendations should be consulted prior to hoisting materials.

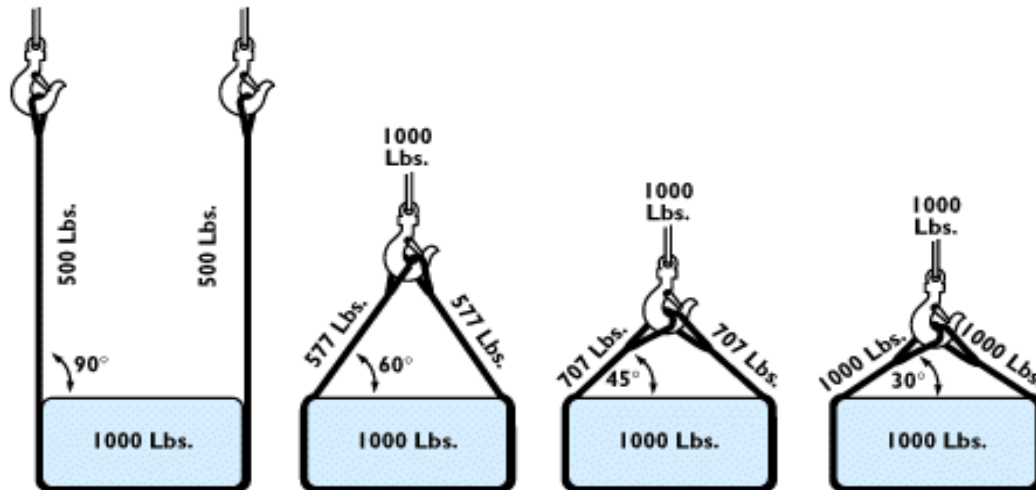


Illustration: Sling Stress Distribution

**Hardware General Information** - Hardware is an integral and important part of a rigging operation. There are many different types of hardware including but not limited to- hooks, shackles, eye bolts, hoist rings, master links, turnbuckles, and blocks. Where practical, hardware should be marked with its size and rated capacity. Modifications should only be made when approved by the manufacturer, and repairs made in accordance to the manufacturer's instructions.

- **Hooks** - Hooks are made in many different sizes and shapes to meet a wide range of applications. There are many different types of hooks- eye, shank, clevis, grab, sorting, sliding choker. They can be attached to load blocks, slings, and other lifting devices such as lifting beams.
  - When using two slings placed in a hook, ensure that the included angle between the slings is not greater than 90 degrees. This prevents the slings from coming out of the hook and prevents points loading which reduces hook capacity. If the angle is greater than 90 degrees use a shackle to attach the sling legs to the hook, this prevents the slings from coming out of the hook and from reducing the capacity of the hook.
  - Ensure that the hook, not the latch, supports the load. The sling or lifting device must always be seated properly in the bowl of the hook. Never side, back, or point load a hook. All reduce hook strength and create an unsafe condition. Point loading can reduce hook capacity as much as 60%. Before use, hooks must be inspected by a competent person. Never repair, alter, or reshape a hook by welding, heating, burning or bending, unless approved by the hook manufacturer.

- **Shackles** - Shackles are normally used to connect two lifting devices and are essential elements of most rigging operations. They should be stamped or embossed with their rated capacity and size. Shackle size is determined by the diameter of the body, not by the diameter of the pin. Some shackles are designed for a specific application, such as shackles manufactured for synthetic web slings. This type of shackle provides a wider bearing surface giving an increased area for load distribution on the sling. When using a shackle with a hook the shackle pin must be positioned across the hook. Shackles must be inspected by a competent person before being used. Any shackle that has been altered or repaired must be approved by the shackle manufacturer.
- **Lifting Beams** - The most common types of lifting beams are the rigid beam and the spreader beam. Both styles of lifting beams are engineered specifically for the weight capacity identified on the lifting beam itself. Rigid beams are of a rigid structural member and can either have fixed or adjustable lift points. Spreader beams are composed of a structural member supported by rigging which directs most of the load stress to attachment points. A combination of both can sometimes be used. Lifting beams are used so that slings can be used in a vertical configuration. The safe use of lifting beams requires that the load be supported in such a manner that the beam and load remain level. The beam's rated capacity must never be exceeded. Inspection of lifting beams must be completed by a competent person before being used and annually thereafter with documentation kept.

## Procedures

- **Determining weight of load** – The weight of the load must be known prior to rigging and lifting a load. The weight of the load is needed in order to determine proper rigging and hoisting equipment and to understand sling angle stress. The weight of the load can be obtained from the manufacturer or from shipping papers.
- **Center of gravity** – the point in the object around which weight is evenly distributed. Putting a support under this point of an object would balance it on the support. When the center of gravity is not in the center of the object, slings will not be evenly loaded. Whenever possible attach slings above the center of gravity or place the load on a skid and attach to the skid of high center of gravity loads.
- **Securing Loads** - Loads must be secured before lifting, especially when lifting loose material such as pipe. Loads must be well secured and properly balanced in the sling or approved lifting device.

- **Work area control** – Control access to the area where a load is being rigged, hooked, and unhooked. Employees should not work directly under a supported load and should be notified they are in an area where a load may be passing overhead.
- **Turning Loads** - To turn a load, use a double choker with sling body passing through the eyes of the sling, eyes being placed in the opposite direction of the turn. Ensure that the center of the sling body is placed over the hook and not the sling eyes. This method provides good control over the load because its weight is applied against the sling, allowing little or no movement between sling and load. Using only one hook requires the sling to be attached to the side of the load above the center of gravity. To prevent the load from sliding, load may have to be simultaneously lifted and moved in the direction of the turn.
- **Taglines** - A common misconception is that a tagline is required to be used on every load. This can often make controlling a lift more difficult and sometimes even compromise safety if the tagline becomes tangled with a structure or piece of equipment. When a tagline is used ensure that it has sufficient strength and is long enough to keep personnel a safe distance from the load. When working around power lines be sure to use a non-conductive rope.
- **Placement of Loads** - All loads must be placed on blocks. Slings must never be pulled from under a load while the load is resting on the slings. This can cause severe damage to the sling and ruin the integrity of the sling. Slings should be pulled from material by hand when possible, if pulled free by a crane personnel should stand clear. When storing loads make sure that blocking has sufficient strength to support the load and should be placed in a stable manner.