



Participant Handbook

Sector
Iron & Steel

Sub-Sector
Steel, Sponge Iron

Occupation
Mechanical Maintenance

Reference ID: **ISC/Q0908, Version 1.0**
NSQF Level 3



**Rigger: Rigging of
Heavy Material**

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Shri Narendra Modi
Prime Minister of India

“ Skilling is building a better India.
If we have to move India towards
development then Skill Development
should be our mission. ”



Certificate

**COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL
STANDARDS**

is hereby issued by the

Indian Iron & Steel Sector Skill Council

for

SKILLING CONTENT : PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/ Qualification Pack: ' Rigger: Rigging of Heavy Material ' QP No. ' ISC/Q0908 NSQF Level 3 '

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Authorised Signatory
Indian Iron & Steel Sector Skill Council

About this book

This Participant Handbook is designed to enable training for the specific Qualification Pack(QP). Each National Occupational (NOS) is covered across Unit/s.

The job is all about selection of tools and tackles, understanding and analysis of load distribution and lifting, moving (to be tied with rope to arrest lateral movement) of loads safely as per needs of the group (Fitter, Welder etc). This job requires the individual to work independently as well as in teams. He should be physically fit, not have color blindness, have analytical skills, problem solving attitude, high concentration levels and willingness to work in a factory environment.

Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS. The symbols used in this book are described below.

Symbols Used



Key Learning Outcomes



Steps



Exercise



Tips



Notes



Unit Objectives

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UNIT 1.3: Role of rigger in industry

Unit Objectives

At the end of this unit, you will be able to:

1. Know about rigging
2. Know about job responsibilities of a rigger

1.3.1 Rigging

Rigger: Rigger directs dangerous or pre-engineered lifts.

If the lift is pre-engineered lift, then extra measures are required before the operation. If lift is critical, then specialized engineering riggers are required.

During the lift, it is necessary to check Lift Planning checklist and consider weather factors for safe lifting operation.



Fig. 1.3.1 Rigger

Rigging Requirements

For safe lifting - correct rigging equipment like slings, turnbuckles, shackles etc. and crane is required. Proper selection, inspection and connection of equipment is required before starting the rigging operation.

Check following items before selecting rigging components:

- Weight of lift
- Center of Gravity
- Lift points
- Anchor capacity
- Speed, height, width, and length of lift
- Wind, temperature and visibility
- Sharp corners and angles on load
- Sling angles
- Load angle factor
- Travel route clearance
- Floor loading capacity
- Work zone safety

Job Duties and Tasks for: “Rigger”

1. Proper alignment and attachment of equipment.
2. Attaching loads with crane and preparation of hand and power tools required during operation.
3. Attaching pulleys and blocks with beams, ceilings etc by securing them with bolts and clamps.



Fig. 1.3.2 Rigging work

4. Moving heavy loads through narrow openings or confined spaces by utilizing chainfalls, slings and other equipment.
5. Dismantling and storing of rigging equipment after completion of work.
6. Fabrication and repairing of hoists, supporting structures and pulling gear, if required.
7. Manipulation of hoists, rigging lines and pulling gear for moving heavy equipment, ships etc.



Fig. 1.3.3 Rigging work

2.3.3 Safe material handling

Every worker has to lift and move heavy weight during the job whenever required. He may be required to move the job manually or by using forklift for lifting and moving. Extreme care should be taken while lifting or moving the job so that no damage occurs to the job or plant and also to prevent accidents at work place.

- Lifting and moving the job manually
- Lifting or moving the job using fork lift
- Assist in lifting of heavy job
- Attaching the job to the overhead crane's sling / hook in a proper and balanced manner.

Points to be taken care of while lifting / moving material

- Lift the materials in correct posture.
- Do not try to lift too heavy materials alone.
- Ensure the grip is right so that the job doesn't slip from hand and fall
- Put down the job at the destined place properly.
- Do not throw the job on ground.
- Avoid double handling.
- Take rest breaks during heavy or repetitive work

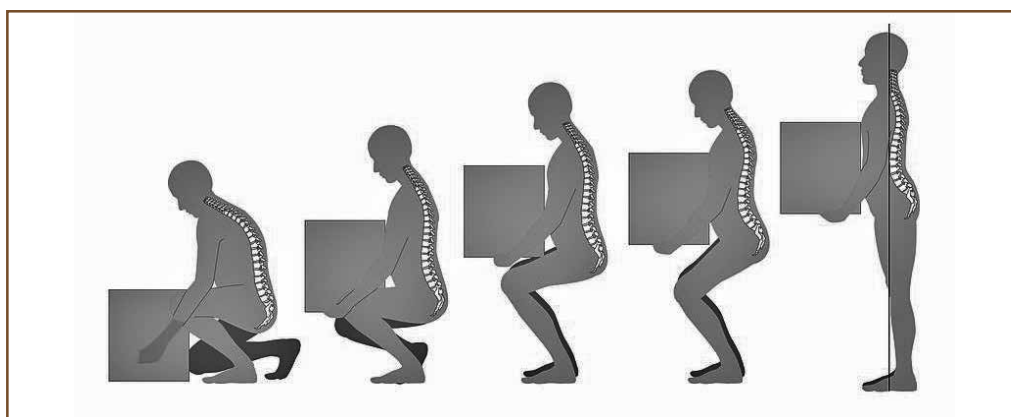


Fig 2.3.2 Body bending movement during manual handling

Material handling equipments Eliminate the need to lift or lower manually by using handling equipments that can assist you. Few types of equipment are:

- Trucks
- Forklifts

- Dollies
- Carts
- Wheelbarrows
- Hoists

Make pushing and pulling of loads easier by using the following:

- carts, hand trucks and dollies and
- handles on loads and mechanical aids,



Fig 2.3.3 Material handling equipments

Wrong handling can cause:

- Strain & sprains
- Neck and back injuries
- Slips falls and crush accidents
- Hernia
- Cuts and bruises
- Occupational overuse syndrome (OOS), also known as repetitive strain injury.



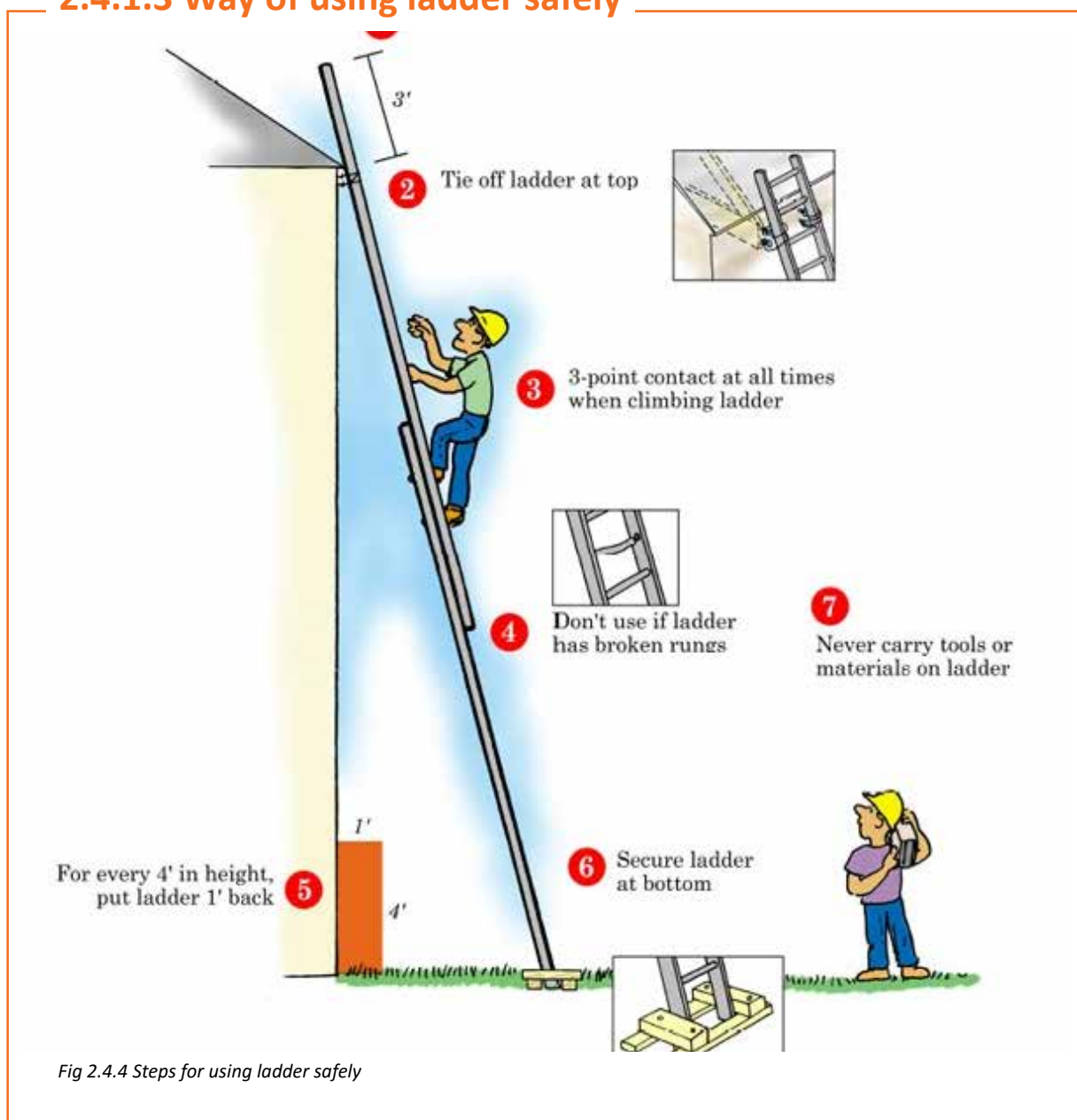
Fig 2.3.4 Fork Lift

Exercise

1. The safe way of working is
 - (a) an effective and right way of working
 - (b) an ancient way of working
 - (c) a way of handling the work in a hurry
 - (d) a way of normal working

2. The best way of avoiding accident is by
 - (a) doing work in ancient way
 - (b) doing work in one's own way
 - (c) observing safety rules related to job, machine and workplace

2.4.1.3 Way of using ladder safely



2.4.2 Safe working at Confined spaces

Spaces which are enclosed from all around and risk of death or serious injury from dangerous conditions and hazardous substances is very high, are known as confined spaces. Confined spaces have limited openings, for example:

- storage tanks
- reaction vessels

- sewers
- silos
- enclosed drains
- combustion chambers in furnaces
- vats
- open-topped chambers
- ductwork
- poorly ventilated rooms

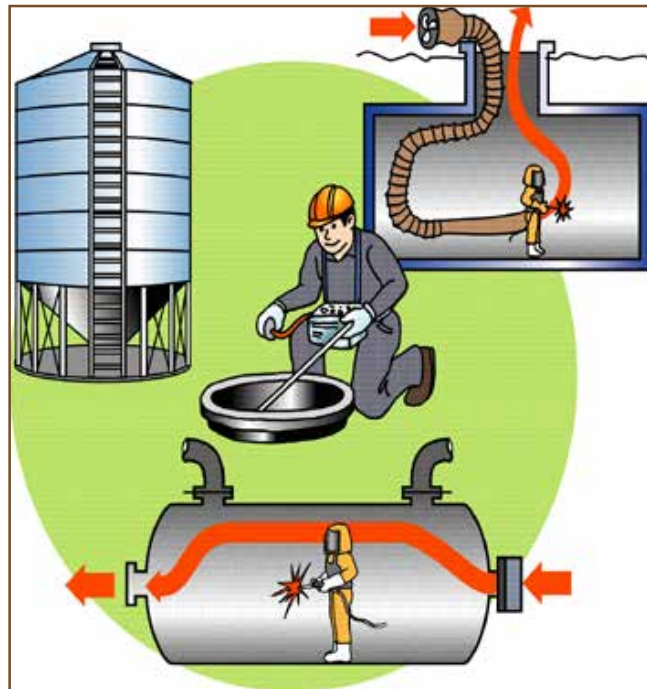


Fig 2.4.5 Confined spaces

2.4.2.1 Dangers at Confined spaces

Dangers can arise in confined spaces because of the following issues.

- **Lack of oxygen**
 - Spaces where reaction between some soils type and oxygen happens in the atmosphere;
 - Reaction of groundwater with limestone produces carbon dioxide;
 - Rust formation inside the vessels and steel tanks.
- **Poisonous gases and fumes**
 - Formation of poisonous gases in sewers and manholes;
 - Leakage of gases and fumes into trenches and pits in a poisonous area.
 - enter tanks or vessels from connecting pipes;
- Fire and explosions due to excess oxygen and flammable vapours.

Damage or wear to synthetic web slings causes are include:

- **Acid or Caustic Attack:** It is generally by discoloration of the fabric. It can also affect the fabric to look to be unpleasant.
- **Melting or Charring:** To take a sling out of service the charring or melting on a little part of the sling is enough. Damaged areas will be melted, hard and blackened like speckled or plastic as when spoiled from weld spatter.
- **Holes, Tears, Cuts or Snags:** To decide on the sling is to be taken out of service or not, judgments call is on if tears, holes, snags or cuts look on synthetic web slings. As they compose 80% of the sling's strength, the inner damage of thread must be determined. The sling must be taken out of service when Red Guard warning yarn is unprotected (red thread that is sewn in by the manufacturer).
- **Excessive Abrasive Wear:** It is described by frayed fibers on the surface webbing of the sling that hold in place the load-bearing (longitudinal) fibers. It caused when slings are permissible to be pulled from under a load or when a load slips in a sling.
- **Broken or Worn Stitching:** Slings must be examined for this stitching in the load bearing joints of the sling. It occurs in any other part of the sling and is not of a serious nature. However, splices can affect enough decrease of sling ability in load bearing if broken or worn stitching is there.
- **Knots:** Any part of slings if knots exist shall not be used. The sling capacity of sling is reduce up to 50% in the area of knot.

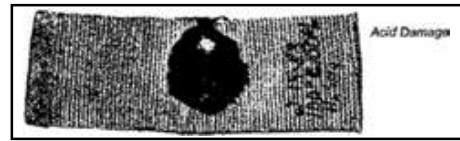


Fig. 4.1.10 Acid damage

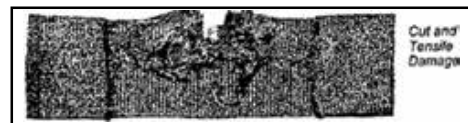


Fig. 4.1.11 Cuts and tensile damage



Fig. 4.1.12 Abrasion damage

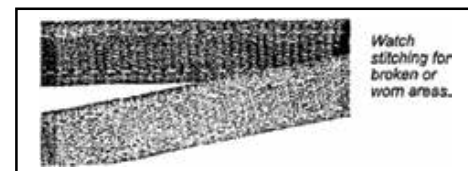


Fig. 4.1.13 Worn stitching

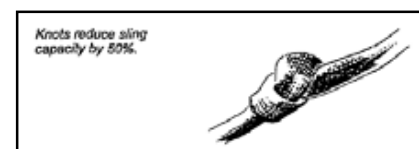


Fig. 4.1.14 Knots

4.1.3 Chain sling

These are created by chain rings. The benefit of chain slings is that they corrode and deteriorate less. Alloys are used to create chain slings. Under temperatures of 50oF they can keep their Safe Working Loads. However, if difficulties rise in any section the whole chain turns out to be dangerous. An injured chain sling will

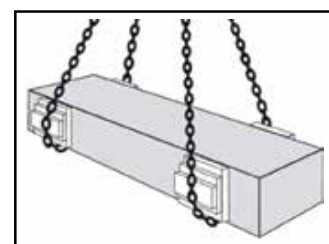


Fig. 4.1.15 Chain sling

rapidly break and the harm is not as simply noticeable as related to rope slings.

Chain slings discovery application where high temperature resistance, flexibility, abrasion resistance or ruggedness is important. At the time of wire rope will do the job the failure of chain is sudden.

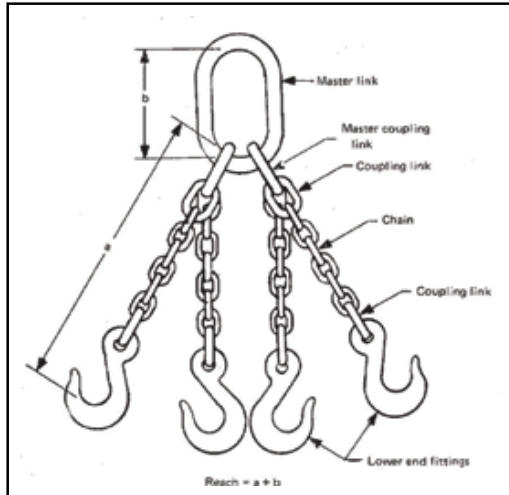


Fig. 4.1.16 Chain sling parts

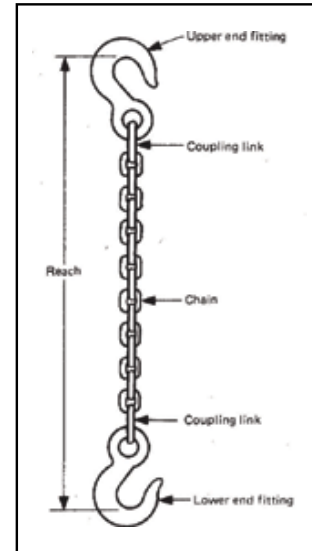


Fig. 4.1.17 Chain sling link damage

4.1.3.1 Chain sling pre use inspection

Following inspection must be follow to find defects on chain slings:

- **Length:** To match up with the length on the tag check whole length. If a sling is longer or shorter than the length on the tag then sling must be booked out of service.
- **Master Link:** Check the master link for elongation and wear on its bearing points.
- **Identification Tag:** Always confirm that proper information should be available and the identification tag is legible.
- **Connecting Link:** Always check the connecting link to see if it's deformed, twisted, or bent in any way.
- **Links:** Chain links must be tested for gouges, cracks and nicks.
 - Elongation
 - Bends or twists

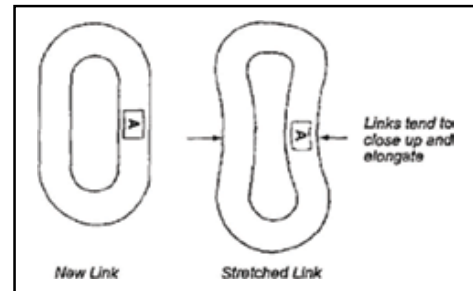


Fig. 4.1.18 Damage links

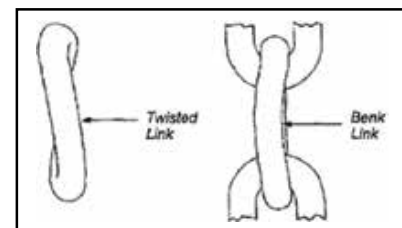


Fig. 4.1.19 Safe use of chain sling

- At the time of angular lifts, the shoulder must be flat and making full connection with the load. Otherwise, vertical lifts are permissible.

Selection of Right Eye Bolt

The marking of thread size define eye bolts NOT with their rated abilities. Always select the exact eyebolt based on its capacity and type for the lift you are directing.

- For vertical loading always use regular or plain eye bolts (non-shoulder) or ring bolts. Bend or break is possible in case of angle loading on non-shoulder bolts.
- For angle or vertical loading always use shoulder eye bolts. The safety of load is reducing while lifting eye bolts at an angle.
- In case of angle loading follow the manufacturer's recommended method

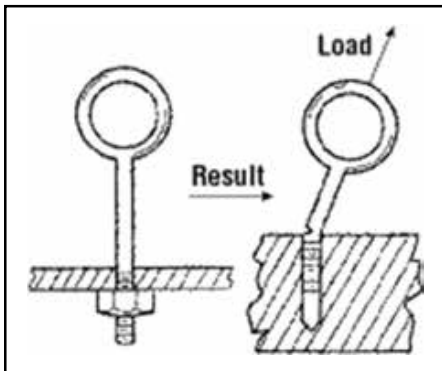


Fig. 4.2.10 Incorrect use of shoulder Bolt

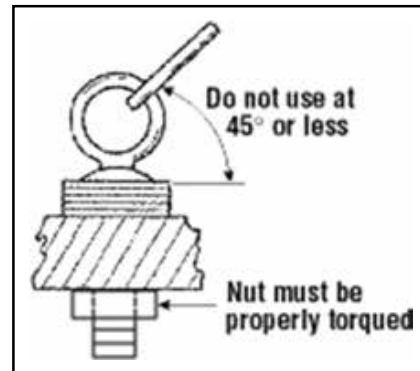


Fig. 4.2.11 Shoulder eye bolt with load

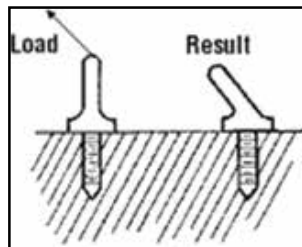


Fig. 4.2.12 Incorrect way of applying angle load

Safety measures using eye bolt

- The slings are in line with the position the eye bolt. The eye bolt may bend in case if the load is applied sideways.
- For the confirmation of the eye bolt firmly contacts the surface the washers is pack between the load surface and the shoulder. Confirm that the nut is correctly torqued.
- While using washers or shims always engage at

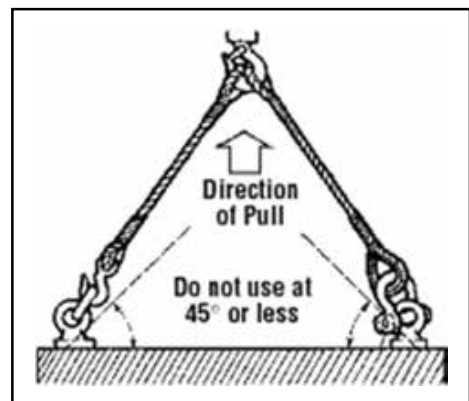


Fig. 4.2.13 Correct use of eye bolt

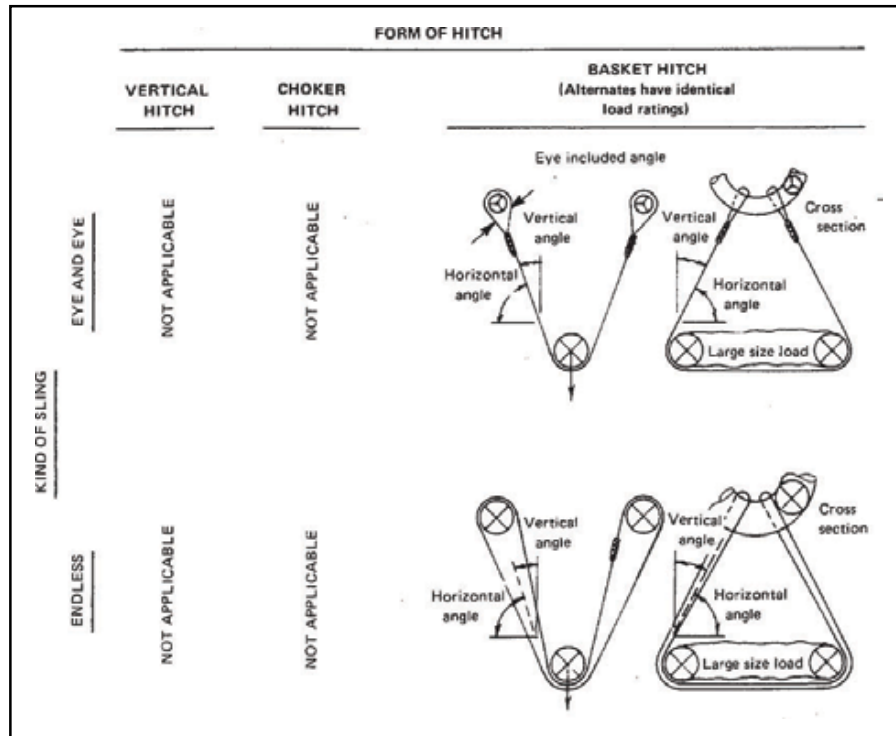


Fig. 4.3.16 Form of hitches

- Bridle Hitches:** This used when load has two or more attachment points. It uses only two legs for carrying the loads doesn't matter three-leg or four-leg bridle hitch method is utilized. The left over legs only makes balance. Measure of sling legs length (L) and headroom between the hook and load (H) is:

$$SWL = SWL \text{ (of chain)} \times H/L \times 2$$

This formula is for two-leg bridle hitch, but it can also be utilized in case of the three- and four-leg hitches.

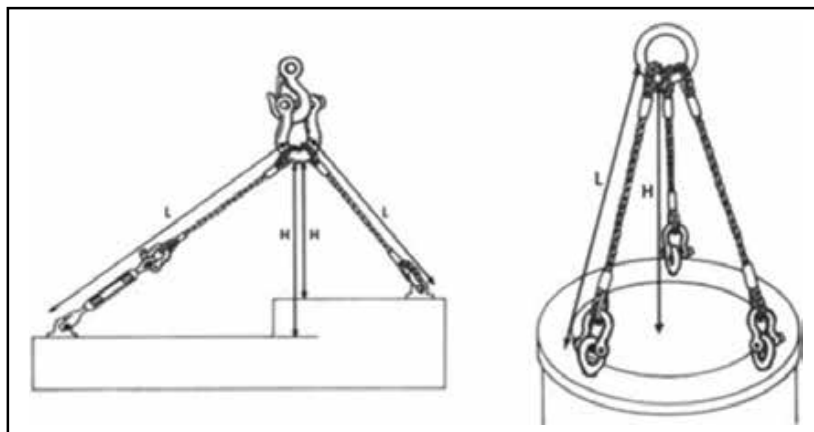


Fig. 4.3.17 Bridle hitches



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