SLINGER SIGNALLER

STUDY NOTES

This publication is designed to be used as additional course study only. It should not be deemed, used or substituted for the need for suitable and adequate training.

Attention should be drawn to other available sources of information relevant for additional study:

- • Health and Safety Executive for information on health and safety at work with free information and publications (www.hse.gov.uk)
- • Construction Plant Competence Scheme (www.citb.co.uk)
- • Health and Safety at Work Act
- • Provision and Use of Working Equipment Regulations
- • Lifting Operations and Lifting Equipment Regulations
- • Supply of Machinery (safety) Regulations
- • Road Traffic Act
- • HSE (Approved Codes of Practice)
- • Manufactures Recommendations / Operators Manuals

SLINGER / SIGNALLER - INTRODUCTION

The role of a Slinger/ Signaller on site can both be a physical and mentally demanding role, The slinger/signaller must have both the practical and theoretical knowledge to be able to carry out the lifting activities both safely and efficiently. The duties of a slinger/signaller can vary depending on the type of lifting equipment being used.

Safe Working Load (SWL)

The SWL is the maximum load that the accessory is allowed to lift in certain configurations. Most polyester webbing slings are coloured and have black lines on them that may indicate the SWL of the accessory. Always refer to the manufacturer's literature for colour coding information. The SWL on multi leg slings only applies when both legs are equally loaded and within an included angle of 90°.

Centre of Gravity (C of G)

This is the point that the load is in balance, this should be determined prior to lifting and a test / trial lift must be carried out to confirm the C of G and ensure the load is equally supported; secure and all lifting accessories are attached correctly.

Lifting Accessories

The following sling configurations are available:

- Single
- Two legs
- Three legs
- Four legs
- Endless

They are normally one of three types; Chain, Steel Wire Rope, and Fibre (natural or artificial).

Chain Slings

Chain slings are generally the most versatile type of sling, as well as being the most robust. General purpose chain slings usually have one, two, three or four legs.

Chain Sling Advantages

- Able to withstand rougher handling
- More flexible when not under load tension
- Will grip a load more firmly
- Not as easily damaged by sharp corners and edges
- Resistant to abrasion

Swivel hook

Swivel hook are used to prevent any twisting of the lifting accessories and are very useful when moving long loads with a machine with a short radius, the signaller can twist the load away from the machine stopping the load contacting the machine.

Shortening Clutches

Are only available on chain slings and enable the shortening of one leg per shortening clutch on a multi leg chain sling to adjust to the load to be lifted.

Round and Flat Web Sling

Round and flat web slings are used for easily damaged or delicate loads and for their lightness and ease of handling. They are susceptible to damage and should be protected from sharp edges with suitable packing.

Round and flat web sling disadvantages are:

- More vulnerable to cuts and abrasion than chains and steel wire rope.
- More liable to wear and mechanical damage.
- May be weakened to some degree by damp, chemicals, heat etc.

Steel Wire Rope

SWR slings are strong general purpose accessories available in a range of capacities i.e. safe working load.

Advantages of steel wire rope are:

- Very little stretch when subjected to max SWL.
- Can be supplied as single, multi leg.
- Can be fitted with a range of terminal endings (hooks, shackles etc).

End Fittings

The end fittings on chain slings will generally be either sling hooks fitted with safety catches, or C hooks. Both of these are designed to minimise the risk of the load slipping out of the hook. Special purpose fittings are available for lifting drums, pipes, cases, etc.

Hook With Safety Catch ‘C’ Hook

Shackles

Shackles must always be used on lifting hooks if more than one sling is to be connected to it to avoid the overcrowding of the hook bowl.

Dee Shackle

Normally used as a terminal shackle at the load and used in a vertical position.

Bow or Harp Shackle

Used at the lifting hook to prevent overcrowding of hook bowl when more than one sling is used.

Dee Shackle Bow or Harp Shackle

Lifting Spreader Beam

Lifting spreader beams are designed for lifting long loads. They must be a tested piece of equipment marked with its SWL.

Plate Clamps

Plate clamps are used for lifting sheets of metal or beams. They must be free from grease and oil and must be a tested piece of equipment marked with its SWL.

Inspection of Accessories (pre and post operational checks)

The slinger signaller should carry out an inspection of the lifting accessories they propose to use to ensure they are safe for use prior to use, and similarly after use to ensure no damage has occurred to the accessory through the lifting operation. Ensure gloves are worn when carrying out these checks as they can prevent skin diseases and cuts/ abrasions from the accessories.

This inspection can be broken down into three stages:

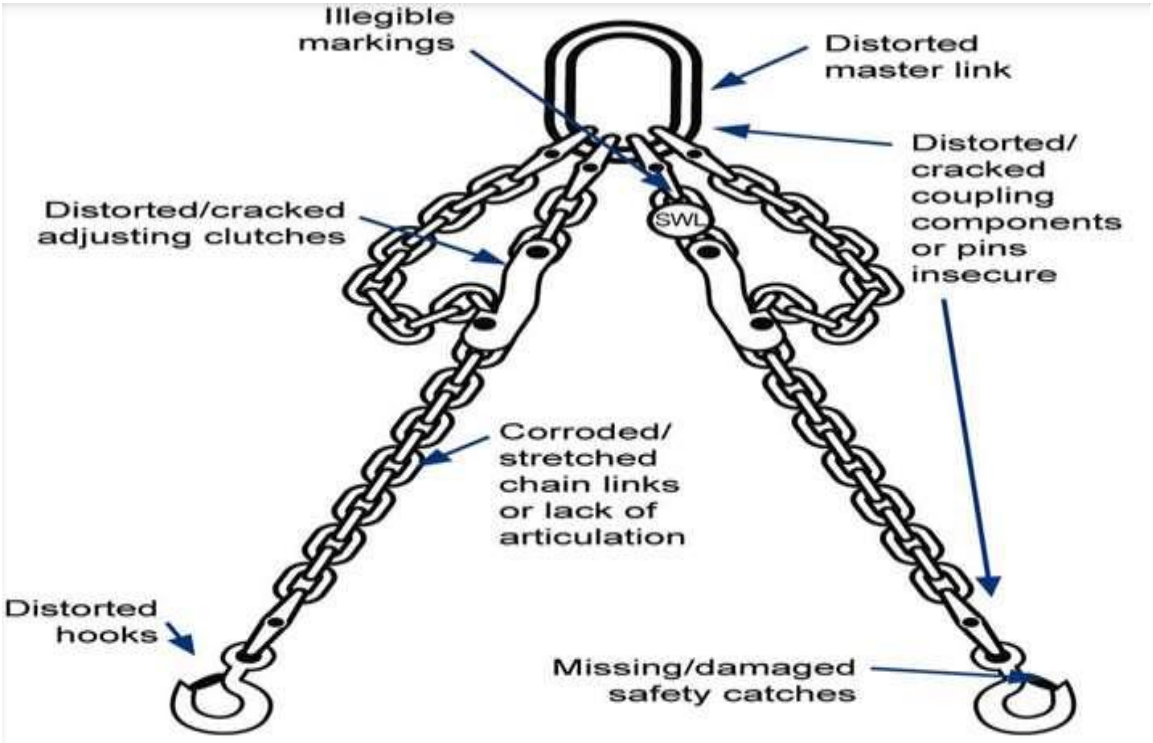
- • Carry out checks in accordance with manufacturer's recommendations and relevant regulations.
- • Record when these checks have been carried out and the findings of these checks.
- • Report any defects immediately. Damaged accessories must be taken out of service and clearly marked as unusable.

Lifting accessories must be:

- • In a safe working condition and suitable for their proposed use.
- • Inspected prior to and after use.
- • Thoroughly examined/ tested by an authorised and competent person at least every six months and a test certificate issued after testing is found satisfactory.
- • Carry an identification tag with its SWL and serial number
- • Accompanied with the appropriate paper work /test certificates
- • Of the correct safe working load for the proposed operation and not exceeded, if it is suspected an accessory has exceeded its SWL then it must be taken out of service, marked appropriately and thoroughly examined by a competent person.
- • Used in accordance with manufacturers
- • Taken out of service if found to be faulty, damaged or defective.

Pre Use Checks - Chain Slings

- Check Safe Working Load and included angle.
- Damage or excessive wear to links and link interfaces.
- Cracks / distortion in links, hooks or master ring.
- Stretching of sling legs (Multi leg slings- ensure all legs are of equal length. Single leg- check for stretched, elongated links).
- Corrosion / rust.
- Sling ID number – check it corresponds with test certificate and in date.
- CE mark, when marked on a product, signifies the product meets applicable safety criteria/ requirements of a European directive.



Pre Use checks - Fibre / Flat Web Slings

- Safe working Load.
- Wear, cuts and abrasions.
- Excessive wear in sling eye.
- Stitching in tact.
- Rot, mildew or chemical damage.
- Internal damage.
- Sling ID number – check it corresponds with test certificate and in date.
- CE mark.

Pre Use Checks - Steel Wire Rope

- • Safe working Load.
- • Severe kinking or bending.
- • Flattening or broken wires.
- • Sling ID number – check it corresponds with test certificate and in date.
- • CE mark.

Pre Use Checks – Shackles

- • Safe Working Load.
- • Cracks / corrosion.
- • Distortion of shackle pin or body.
- • Condition of shackle and pin thread.
- • Compatibility of pin to shackle.
- • Wear on pin and in shackle crown.
- • Sling ID number – check it corresponds with test certificate and in date.
- • CE mark.

Safe Use of Slings

Working load limit - The WLL is the maximum mass which the sling or lifting accessory has been designed to raise, lower or suspend under normal conditions.

Safe Working Load - The SWL is the maximum mass, which may be raised, lowered or suspended under specific conditions. These will vary with the angle of lift and conditions of use.

Note: When using a single leg sling for a vertical lift the sling will be capable of taking the full SWL applicable to the sling. In the case of multi-leg slinging applications the SWL of each sling is reduced as the lifting angle is increased. In addition to this, the SWL may be reduced or increased depending on the type of slinging method (choke hitch, basket hitch etc).

The following table gives an example of the factors to be multiplied to the SWL in order to work out the new SWL for a particular sling and slinging method.

Example: webbing sling with SWL 1t. Choke hitch applied, new SWL 0.8t. SWL reduced by 20%.

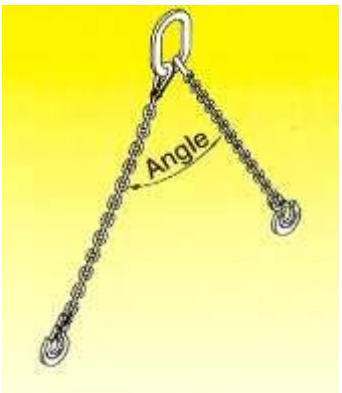
Safe Use of Slings

For two legged slings the angle between the opposing legs and the slinging method used (choke hitch, basket etc) will determine the safe working load.

Two Legged Sling This will be marked with its SWL at 90°, which will apply for all angles between 0° and 90°. Some may be marked with additional SWL of 90° which will apply for angles between 90° and 12°0. If the legs of the chains are more than 90° apart, then the SWL must be reduced accordingly. It is generally good practice to keep the angle between 60° and 90° with 60° being the recommended.

Sling Configurations – Mode Factors
The maximum load that can be lifted = mode factor x SWL marked on the sling
NP = Not Preferred NA = Not Applicable

Type of Sling	Single leg in-line	Single leg choked	Single leg basket	Single leg back hooked	Single leg halshed	Endless in-line	Endless choked	Endless basket 0-90°
Fibre Rope	1	0.8	1.4	1	1.6	1	0.8	1.4
Webbing	1	0.8	1.4	NA	NP	1	0.8	1.4
Roundsling	NA	NA	NA	NA	NA	1	0.8	1.4
Wire Rope	1	0.8	1.4	1	1.6	NP	0.8	1.4
Chain	1	0.8	1.4	1	NP	NP	1	NP



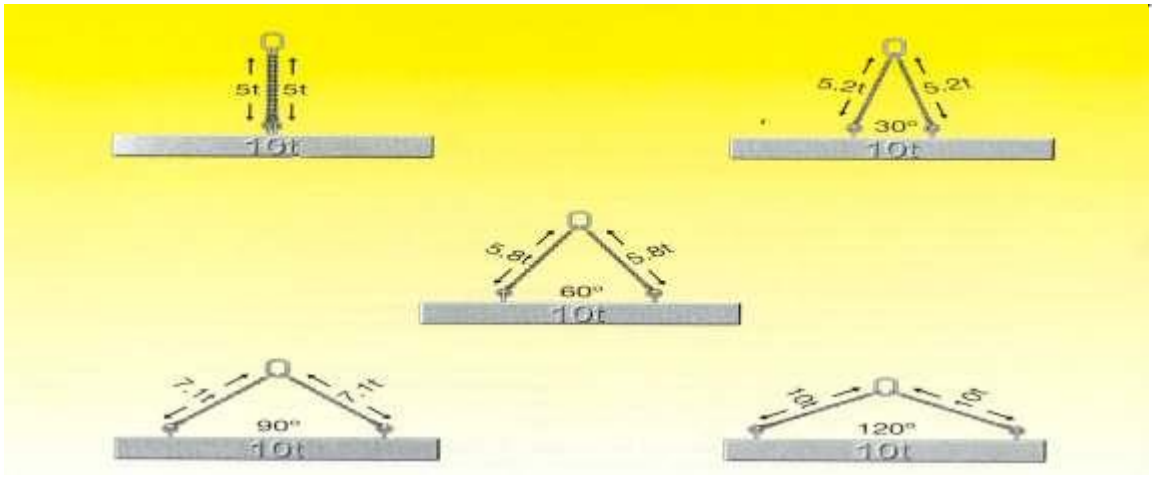
Three Legged Sling This will be marked with its SWL at 45°. The SWL is only good if all 3 legs are attached to the load. If you are lifting the load with only 2

of the 3 legs then de-rate the sling by two-thirds of the SWL. The same applies if lifting on 1 leg; the SWL will be one-third of the stated SWL. Maximum angle of lift is 45°.

Four Legged Sling This will be marked with its SWL at 90°. The maximum angle between opposite legs of the sling will determine the SWL. Like 2 and 3 legged slings the SWL stated is when all 4 legs are attached. When using less than the 4 legs de-rate as required. Example: Only two legs of an 8t four leg chain sling are being used- maximum load that can be lifted = 4t. The maximum angle must not exceed 120°.

An example of how the load in each leg increases as the angle is increased.

Slinging Methods
Single Leg Straight Lift Two Single Legs Two Leg Lift



Single leg

Straight Lift

Rate as two leg sling

Two leg sling with only one leg in use

Should be rated as a single Leg Rate at 50% of WLL

Single Leg Slings In Basket Hitch

Basket Hitch

Choke lift single leg

Choke lift two legs

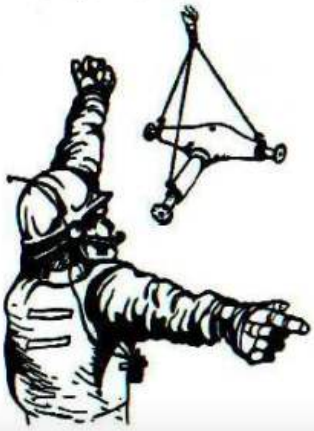
Choke Hitch

Tubes / bundles - when lifting bundles, tubes or other loose materials, whether banded or not, slings should be double wrapped around the load and a choke hitch applied for load security, similarly a double wrap and choke should be applied where there may be possibility of the legs sliding together.

Common Sense.

CONCENTRATION
OBSERVATION
MACHINE CONDITION - VISUAL CHECKS, DAILY INSPECTION
MACHINE KNOWLEDGE – MECHANICS, CAPABILITIES, **C**ONTROLS
ONLY ACT ON YOUR OWN JUGEMENT
NEVER TAKE A CHANCE – ALWAYS TAKE CARE

SELECT CORRECT SLINGS – LIFTING EQUIPMENT
EXPERIENCE OF SIMILAR LIFTS – LIFTING EQUIPMENT
NEVER BE HURRIED – KEEP WITHIN YOUR OWN LIMITATIONS
S.L.I. CORRECT FOR JIB LENGTH & CRANE/RADIOUS PLATE
EXERCISE YOUR RIGHT TO QUESTION ANY LIFT



REMEMBER

You are the person in charge of the lift, and the lives of your workmates depend upon your ability

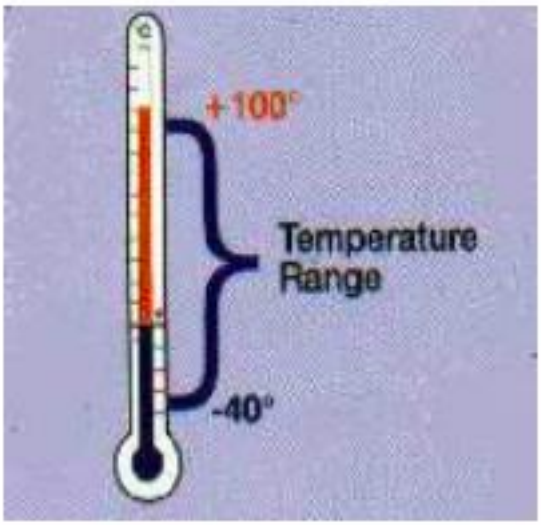
BETTER TO BE SAFE THAN SORRY

Rules for safe slinging.

It is difficult to lay down rules that will cover all slinging methods, as these must vary according to circumstances, but certain general rules and precautions should be followed to ensure safe working practices.

The following points are designed to assist the slinger in the safe handling and transfer of loads:

- Know the weight of the load to be lifted and ensure that it does not exceed the Safe Working Load (SWL) of the tackle and crane.
- Use only authorised tackle, which is marked with the SWL. Unmarked tackle should be reported to the Supervisor.
- Inspect ALL tackle before use. Report damaged tackle and have it destroyed.
- Remember that with 3 or 4-legged slings, 2 legs may take all the weight.
- When reeving slings around a load the angle at the bight must not exceed 120 degrees.
- NEVER tie knots in slings or shorten by wrapping them around crane hooks or by using a nut and bolt.
- ALWAYS use the correct pins in shackles and fasten them securely.
- NEVER use rusty wire ropes, or fibre ropes, which have been in contact with acids or alkalis.
- Rings and shackles must ride freely on the crane hook. NEVER lift with the point of the hook.
- NEVER put sharp bends in wire ropes. Always protect slings from sharp corners by using packing.



Wire rope Slings
Weaknesses & Reasons for Failure

Wire rope
Slings may be
Damaged when
Kinked sharply
Or put under
Stress when
Twisted

Never use if more than 5% of the wires, can be seen to be broken in any 10 Diameter lengths

Regularly examine Chains for

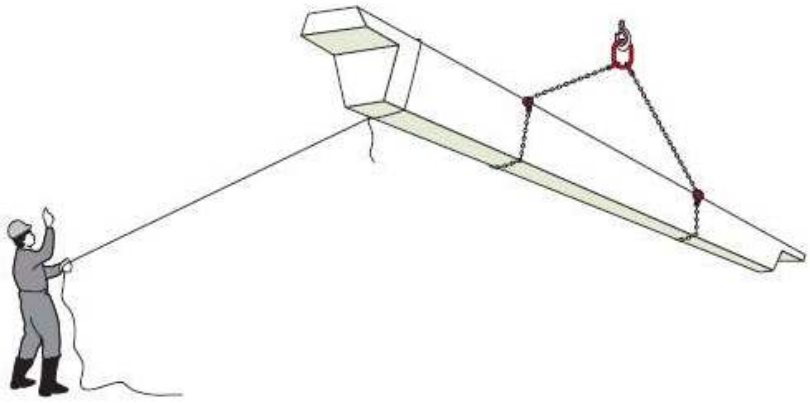
Stretch – are both chains of equal length
Legible markings
Worn, Stretched or twisted links
Cuts, Nicks, Gouges, Cracks, Corrosion
Heat discoloration
Or any other defect apparent to the fittings

Bent Link

Gouged Link

Maximum wear on a link 10%

Tag Lines



When lifting long loads, particularly in confined spaces, slingers should attach a rope or tag line to one or both ends of the load so that rotational movement may be controlled. Tag lines should be kept as short as possible slingers should also look out for overhead electric cables or weather conditions lighting strikes can conduct electricity down through tag lines.

A Tag line should be a minimum of 16 mm diameter

Planning the Lift

Before any lift can take place the lift needs to be properly planned and appropriately supervised.

A lift plan must be drawn up by a competent person (appointed person) and a risk assessment and detailed method statement should be put in place for the proposed operation.
This should also cover any movement of the lifting equipment, for which a traffic management plan should be in place.

Before Lifting

- • The area should be checked for suitable signs and barriers
- • There is no other works being carried out that could interfere with the lifting operation
- • There is no unauthorised plant or personnel in the area
- • All personnel involved in the operation are suitably trained and authorised to carry out the task
- • Only trained and authorised slinger signallers should carry out the lifting operation.

- • Risk assessments, method statements and lift plan for the operation acknowledged.
- • Relevant test certificates (crane and accessories) and crane operator competence card checked.
- • Slings checked and properly attached and secure to the load.
- • Ensure the crane hoist rope is vertical before lifting, if not readjust as this may cause the load to swing and put the load out of the cranes radius.
- • Are the legs of the multi-leg slings equally loaded and within the recommended SWL for the angle applied.
- • A line of communication (hand signals / radios) agreed and confirmed with the crane operator.
- • Area the load is travelling free of people and hazards.
- • Landing site prepared and ready for receiving the load.
- • Weather conditions acceptable.
- • If required, hand / tag lines attached and suitable.

If any of the above are not in place this could affect the integrity of the lifting operation

During the Lift

- • Carry out initial test / trial lift of load to determine centre of gravity and ensure load secure and stable.
- • Ensure a suitable amount of line / rope length as this will affect the load swing. (Longer the line length - slower and further the swing, Shorter the line length - faster and shorter the swing).
- • Remain in full communication with the operator of the crane at all times.
- • Give clear and precise instruction.
- • Remain vigilant for any changes to the area the load will be travelling i.e. people, plant, obstructions.
- • Lift / travel and lower load smoothly and maintain full control of the lift at all times.

Landing the load

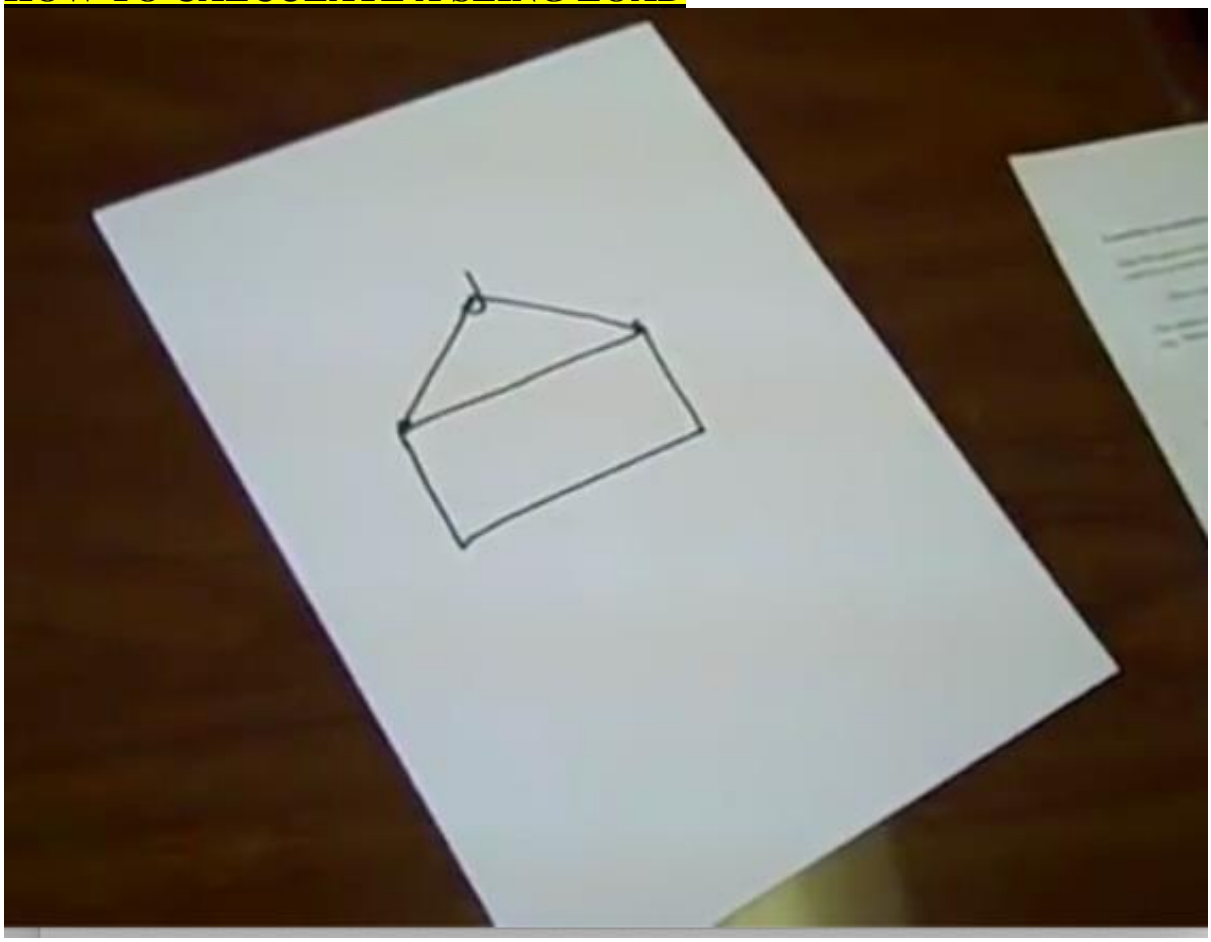
- • The landing site should be clear of all obstructions, level and capable of taking the weight and size of the load.

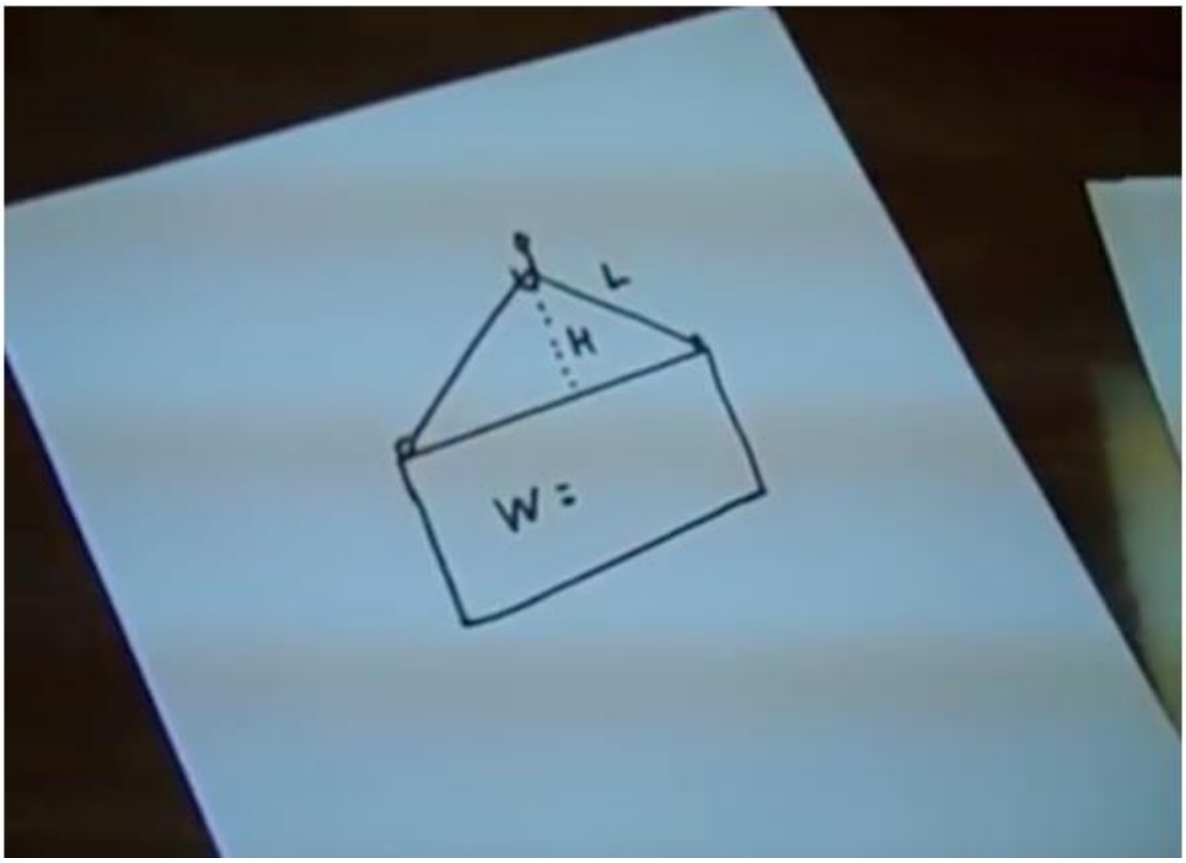
- • Where necessary lower the load on to chocks to prevent crushing the slings and to enable easy removal.
- • After removal of the slings from the load, ensure they are back-hooked to the master link to reduce the likelihood of fouling obstructions or striking personnel.
- • Ensure when detaching the lifting accessories from loose bundles and similar items that suitable chocks are in place to prevent them rolling/ collapsing when released.

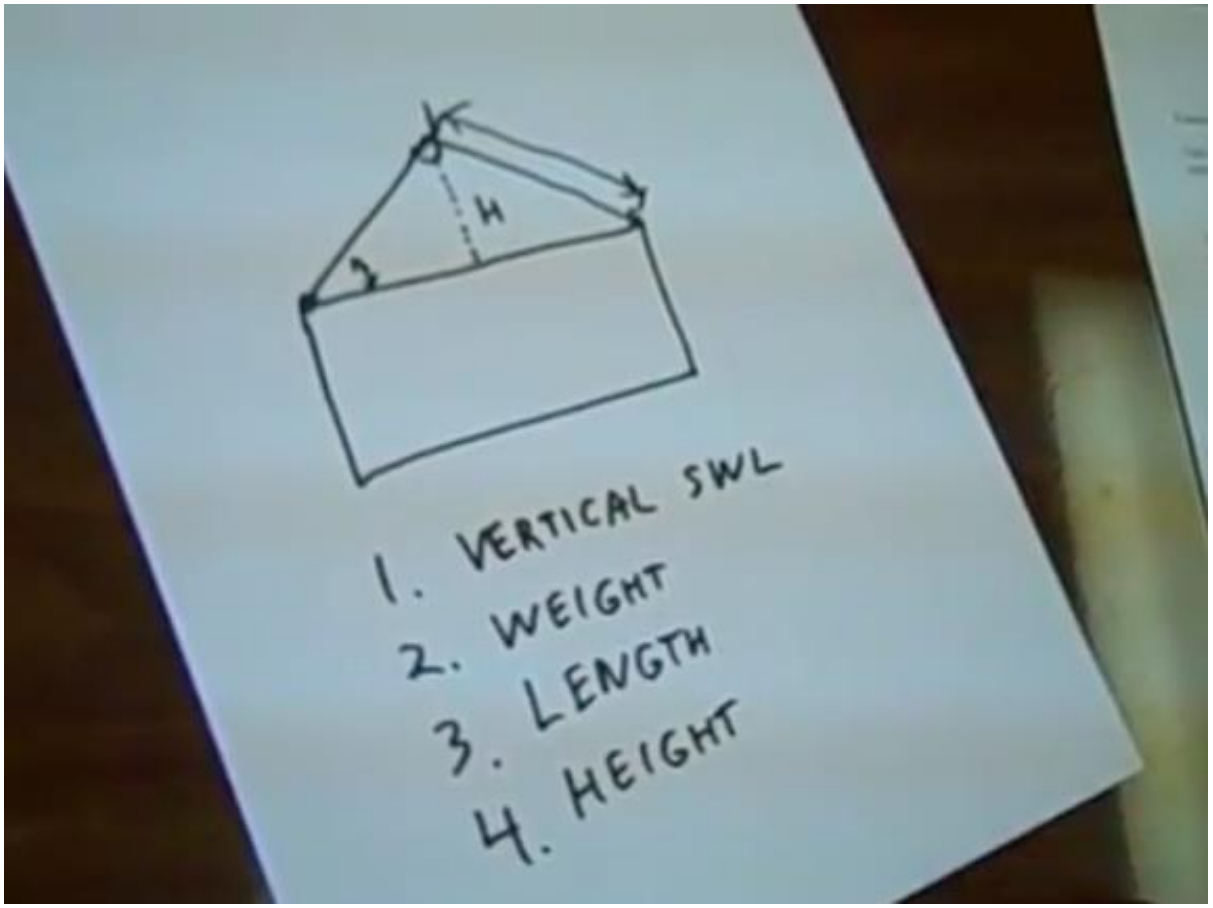
After the Lift

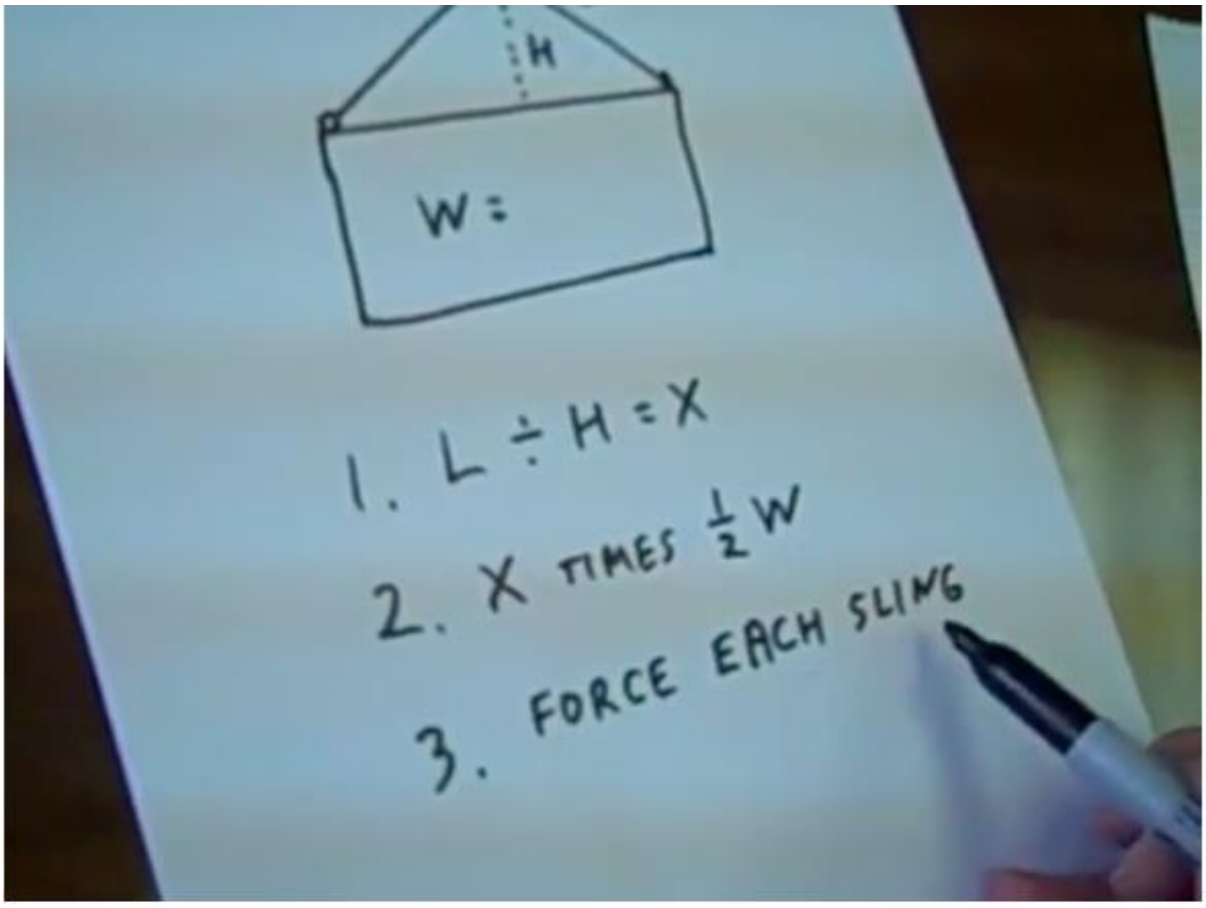
- • After the lifting is complete, carry out checks to all the lifting accessories to ensure no damage has occurred to them during the work.
- • Ensure correct storage and maintenance of the lifting accessories after use.
- • Store accessories in dry conditions, preferably hung up and free from pollution and extremes of temperature.
- • Clean and allow to dry naturally.

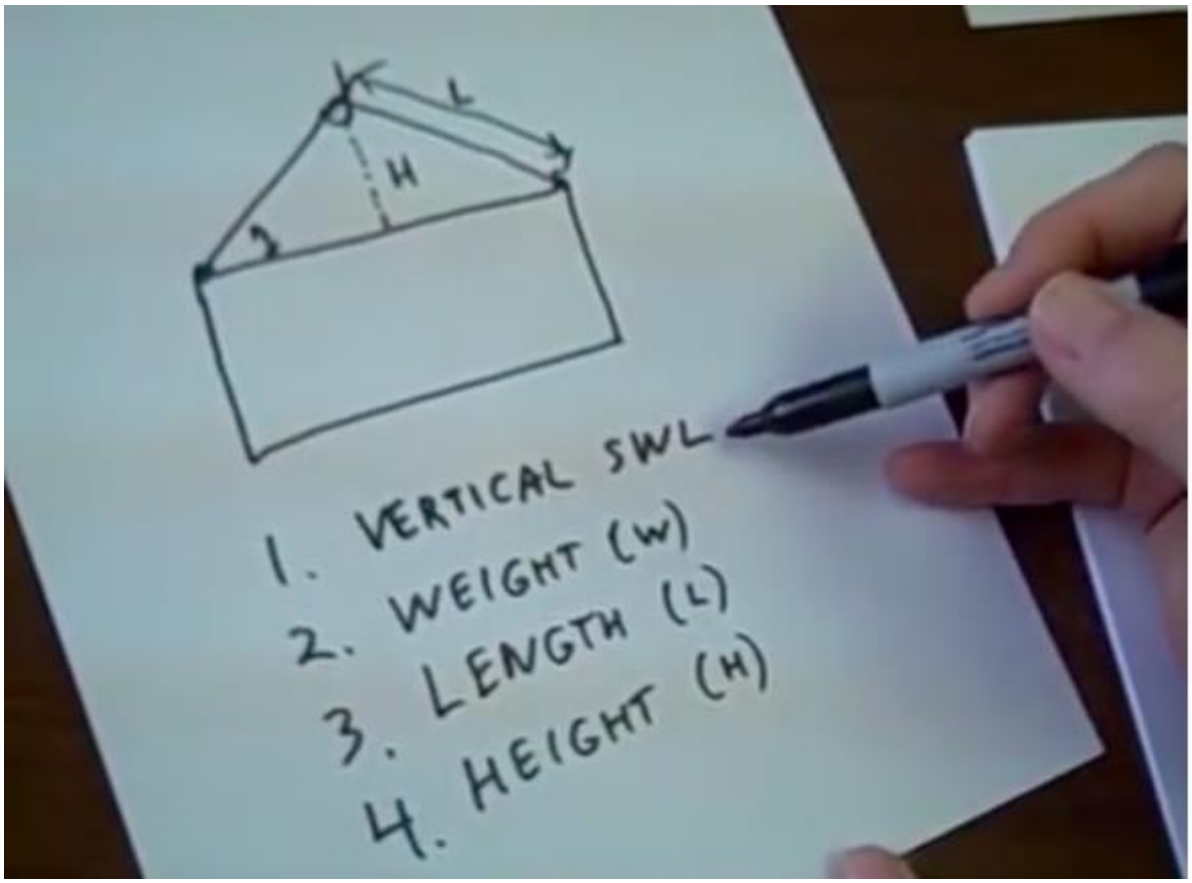
HOW TO CALCULATE A SLING LOAD

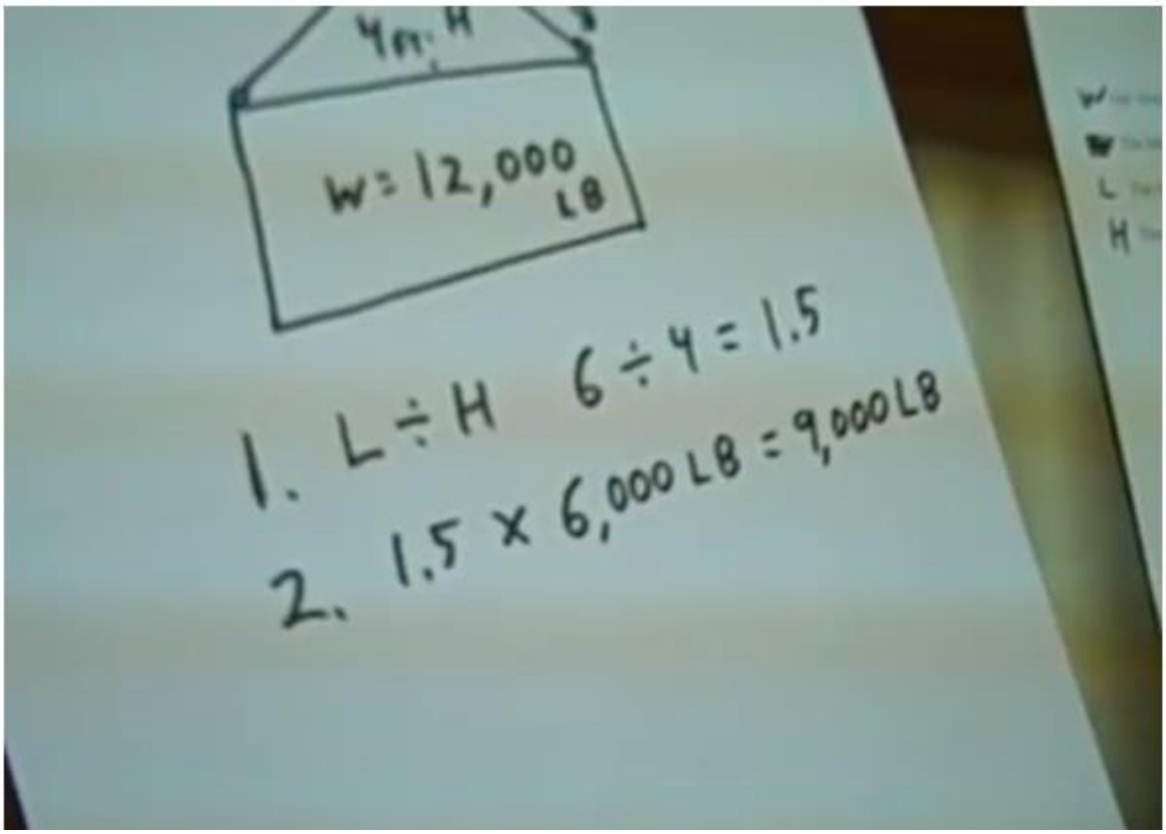



L
H
W =


H
1. VERTICAL SWL
2. WEIGHT
3. LENGTH
4. HEIGHT


H
W=
1. L ÷ H = X
2. X TIMES ½ W
3. FORCE EACH SLING


L
H
1. VERTICAL SWL
2. WEIGHT (W)
3. LENGTH (L)
4. HEIGHT (H)


4ft H
W: 12,000 LB
1. L ÷ H 6 ÷ 4 = 1.5
2. 1.5 x 6,000 LB = 9,000 LB