

Trade hand tools - specification - standards - NEC code 2011 - lifting of heavy loads

Objectives: At the end of this lesson you shall be able to

- list the tools necessary for an electrician
- specify the tools and state the use of each tool
- explain the care and maintenance of electrician hand tools.

It is important that the electrician uses proper tools for his work. The accuracy of workmanship and speed of work depend upon the use of correct tools. If the tools are properly used, and maintained, the electrician will find the working efficiency increases and the skills becomes a work habit.

Listed below are the most commonly used tools by electrician.

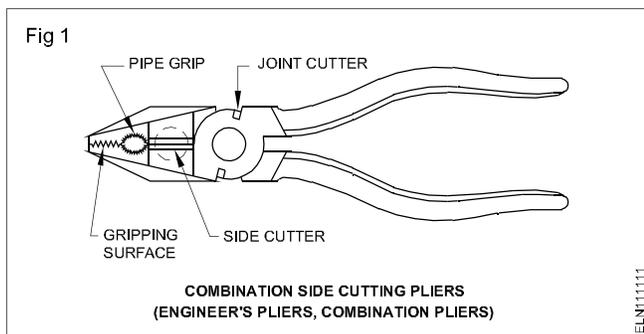
Their specifications and BIS number are given for your reference. Proper method of care and maintenance will result in prolonged tool life and improved working efficiency.

Pliers

They are specified with their overall dimensions of length in mm. The pliers used for electrical work will be of insulated grip.

- 1 **Combination pliers with pipe grip, side cutter and insulated handle.** BIS 3650 (Fig 1)

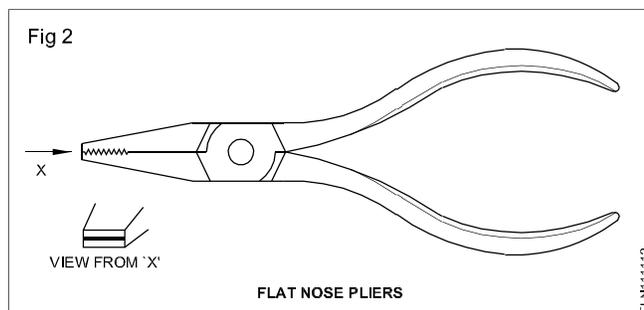
Size 150 mm, 200 mm etc.



It is made of forged steel. It is used for cutting, twisting, pulling, holding and gripping small jobs in wiring assembly and repairing work. A non-insulated type is also available. Insulated pliers are used for work on live lines.

- 2 **Flat nose pliers** BIS 3552 (Fig 2)

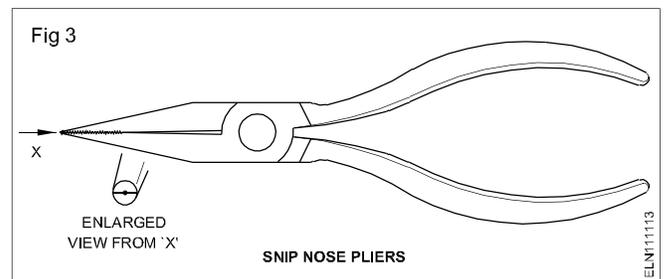
Size 100 mm, 150 mm, 200 mm etc.



Flat nose pliers are used for holding flat objects like thin plates etc.

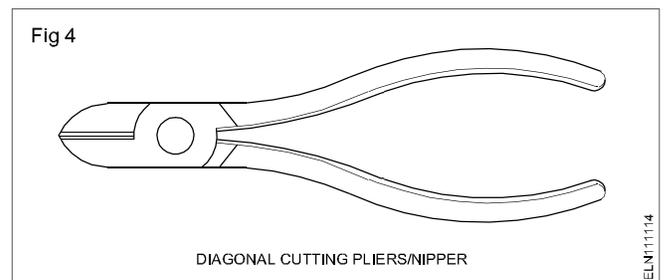
- 3 **Long nose pliers** or (snip nose pliers) with side cutter. BIS 5658 (Fig 3)

Size 100 mm, 150 mm etc.



Long nose pliers are used for holding small objects in places where fingers cannot reach.

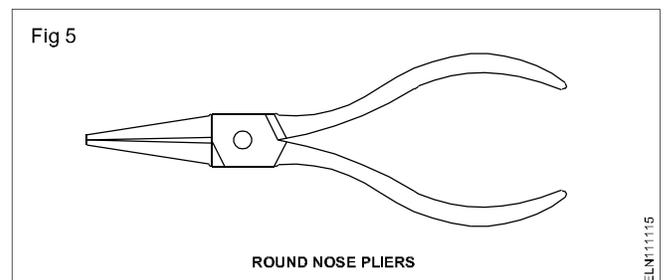
- 4 **Side cutting pliers** (Diagonal cutting pliers) BIS 4378 (Fig 4) Size 100 mm, 150 mm etc.



It is used for cutting copper and aluminium wires of smaller diameter (less than 4mm dia).

- 5 **Round nose pliers** BIS 3568 (Fig 5)

Size 100 mm, 150 mm etc.

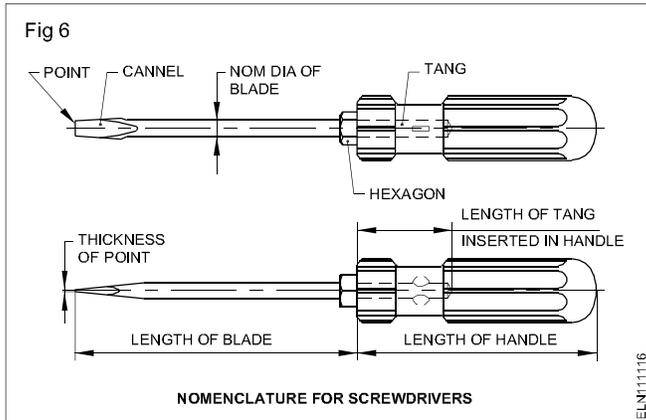


Wire hooks and loops could be made using the round nose pliers.

Care and maintenance of pliers

- Do not use pliers as hammers.
- Do not use pliers to cut large sized copper or aluminium wires and hard steel wires of any size.
- While using the pliers avoid damages to the insulation of hand grips.
- Lubricate hinged portions.

6 Screwdriver BIS 844 (Fig 6)



The screwdrivers used for electrical works generally have plastic handles and the stem is covered with insulating sleeves. The size of the screw driver is specified by its blade length in mm and nominal screwdriver's point size (thickness of tip of blade) and by the diameter of the stem.

- eg. 75 mm x 0.4 mm x 2.5 mm
 150 mm x 0.6 mm x 4 mm
 200 mm x 0.8 mm x 5.5 mm etc.

The handle of screwdrivers is either made of wood or cellulose acetate.

Screwdrivers are used for tightening or loosening screws. The screwdriver tip should correctly fit the grooves of the screw to have maximum efficiency and to avoid damage to the screw heads.

As the length of the screw driver is proportional to the turning force, for small work choose a suitable small sized screwdriver and vice versa.

Star-head Screwdriver

It is used for driving star headed screws.

Care and maintenance

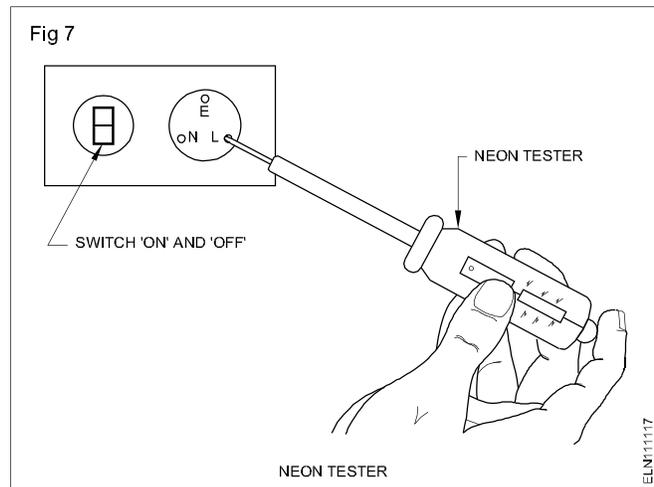
- Never use a screwdriver as a lever to apply force as this action will make the stem to bend and the use of the screw driver will be lost.
- Keep the tip in correct shape and in rare cases it could be grinded to shape.

7 Neon tester BIS 5579 - 1985 (Fig 7)

It is specified with its working voltage range 100 to 250 volts but rated to 500 V.

It consists of a glass tube filled with neon gas, and electrodes at the ends. To limit the current within 300

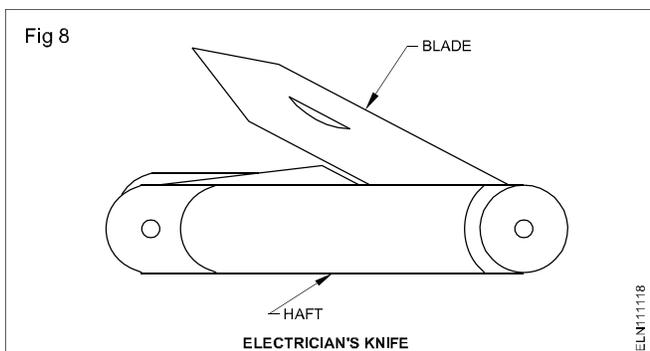
micro-amps at the maximum voltage, a high value resistance is connected in series with one of the electrodes. It may have a tip like a probe or screwdriver at one end. The presence of supply is indicated by the glow of the lamp when the tip is touched on the live supply and the brass contact in the other end of neon tester is touched by hand.



Care and maintenance

- Never use the neon tester for voltage higher than the specified range.
- While testing see the circuit is completed through the body. In case if you are using rubber soled shoes, the earthing of the body could be provided by touching the wall by one hand.
- Use the screwdriver tipped neon tester for light duty work only.

8 Electrician's knife (Double blade) (Fig 8)



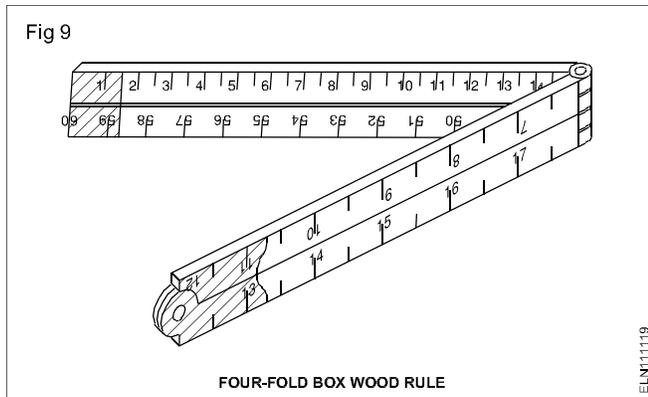
The size of the knife is specified by its largest blade length eg. 50 mm, 75 mm.

It is used for skinning the insulation of cables and cleaning the wire surface. One of the blades which is sharp is used for skinning the cable and the rough edged blade is used for cleaning the surface of the wires.

Care and maintenance

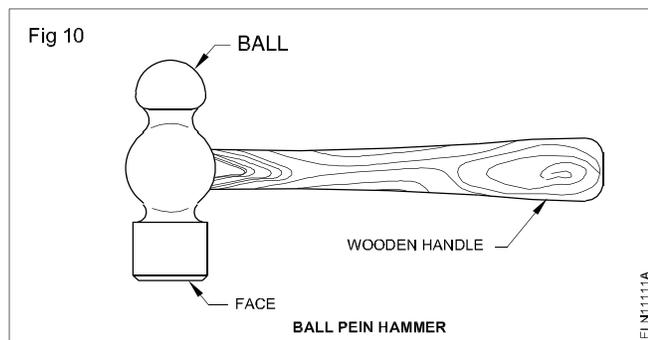
- Do not use the knife for cutting wires.
- Keep it free from rust.
- Keep one of the blades in a sharp condition.
- Fold the knife blade when not in use.

9 Four-fold box wood rule 600mm (Fig 9)



Used for measuring short lengths. To be kept in folded condition when not in use.

10 Hammer ball pein (Fig 10)



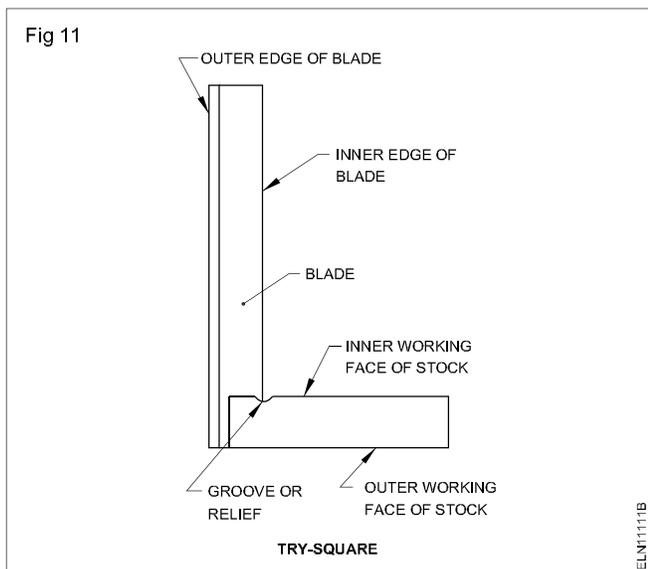
The size of the hammer is expressed in weight of the metal head. Eg. 125 gms, 250 gms etc.

The hammer is made out of special steel and the striking face is tempered. Used for nailing, straightening, and bending work. The handle is made of hard wood.

Care and maintenance

- Do not use a hammer with a loose handle.
- The face of the hammer must be free from oil, grease and mushrooms.

11 Try-square (Engineer's square) (Fig 11) BIS 2103



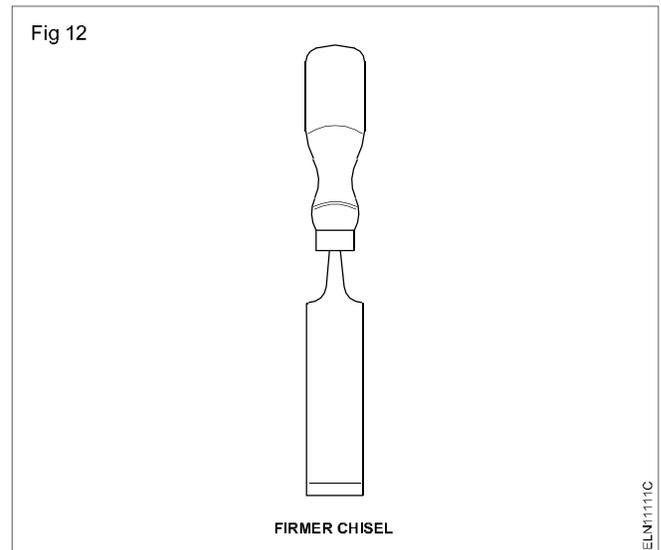
This is specified by its blade length.

- Eg. 50 mm x 35 mm
100 mm x 70 mm
150 mm x 100 mm etc.

There are two types; one is the bevelled edge with stock and the other is the flat edge without stock. It is used to check whether the object is plane, perpendicular and at right angle. Two straight blades set at right angles to each other constitute the try-square. The steel blade is riveted to the stock. The stock is made of cast iron. The stock should be set against the edge of the job.

Do not use it as a hammer.

12 Firmer chisel (Fig 12)

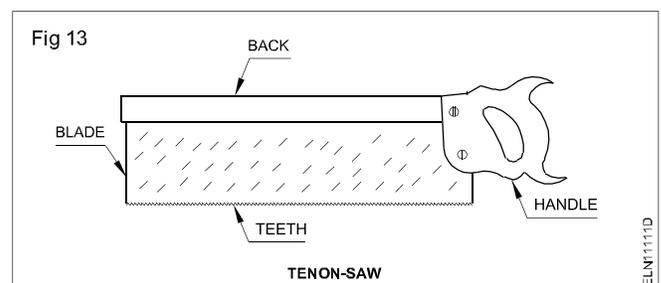


It has a wooden handle and a cast steel blade of 150 mm length. Its size is measured according to the width of the blade eg. 6 mm, 12 mm, 18 mm, 25 mm. It is used for chipping, scraping and grooving in wood.

Care and maintenance

- Do not use it for driving screws.
- Use mallet for chiseling.
- Grind on a water stone and sharpen on an oilstone.
- Do not use it in places where nails are driven.

13 Tenon-saw (Fig 13) BIS 5123, BIS 5130, BIS 5031

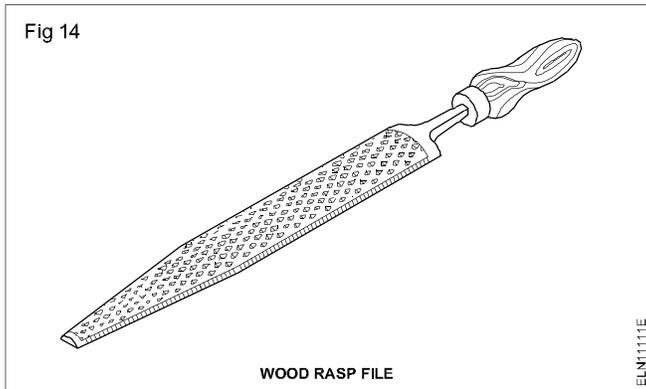


Generally the length of a tenon-saw will be 250 or 300 mm. and has 8 to 12 teeth per 25.4 mm and the blade width is 10 cm. It is used for cutting thin, wooden accessories like wooden batten, casing capping, boards and round blocks.

Care and maintenance

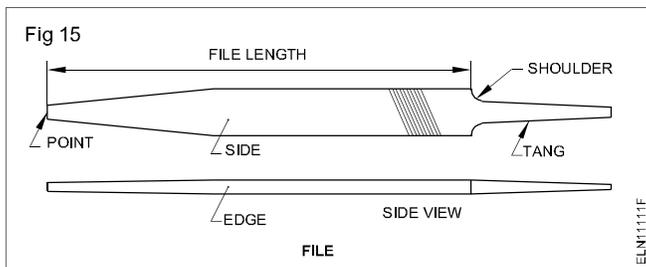
- Keep free from rust.
- Apply grease when not in use.

14 Wood rasp file (Fig 14) BIS 1931



It is used for filing wooden articles where finish is not important. Wood rasp files are of half round shape. They have sharp coarse single cut teeth.

15 Files (Fig 15) BIS 1931



These are specified by their nominal length.

Eg. 150 mm, 200 mm, 250 mm 300 mm etc.

These files have different numbers of teeth designed to cut only in the forward stroke. They are available in different lengths and sections (Eg.flat, half round, round, square, triangular), grades like rough, bastard second cut and smooth and cuts like single and double cut.

These files are used to remove fine chips of material from metals. The body of the file is made of cast steel and hardened except the tang.

Care and maintenance

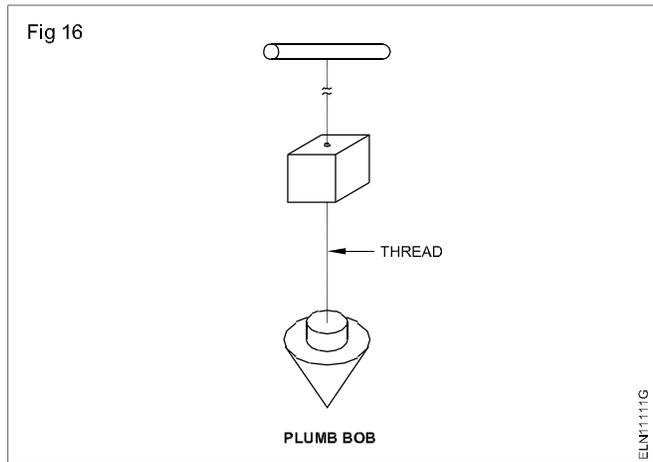
- Never use the file as a hammer.
- Do not use the file without the handle.
- Do not throw a file since the teeth get damaged.

16 Plumb bob (Fig 16)

It has a pointed tip with a centre hole at the top for attaching a string as shown in Fig 16. It is used for marking vertical lines on the wall.

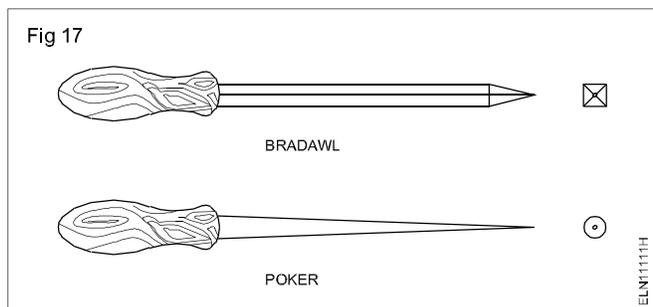
Care and maintenance

Do not drop to the ground.



17 Bradawl square pointed (or poker) (Fig 17)

BIS 10375 - 1982



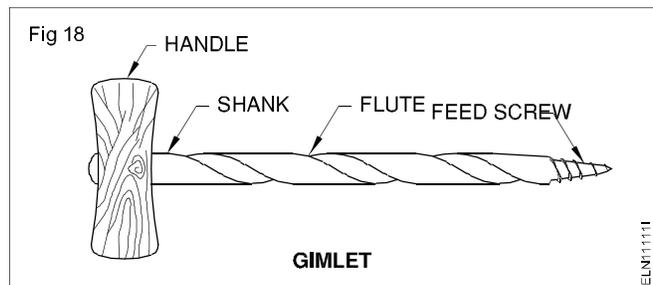
It is specified by its length and diameter eg. 150 mm x 6 mm.

It is a long sharp tool used for making pilot holes on wooden articles to fix screws.

Care and maintenance

- Do not use it on metals for making holes.
- Keep it in good sharpened condition.

18 Gimlet (Fig 18)

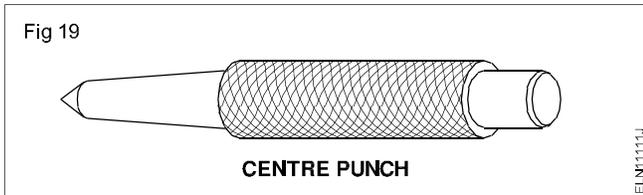


It is used for boring small holes on wooden articles. It has a wooden handle and a boring screwed edge. The size of it depends upon its diameter. Eg. 3 mm, 4 mm, 5 mm, 6 mm.

Care and maintenance

- Do not use it without the handle.
- Do not use it on nails.
- Keep it straight while making holes, otherwise the screwed portion can get damaged.

19 Centre punch (Fig 19) BIS 7177



The size is given by its length and diameter of the body.

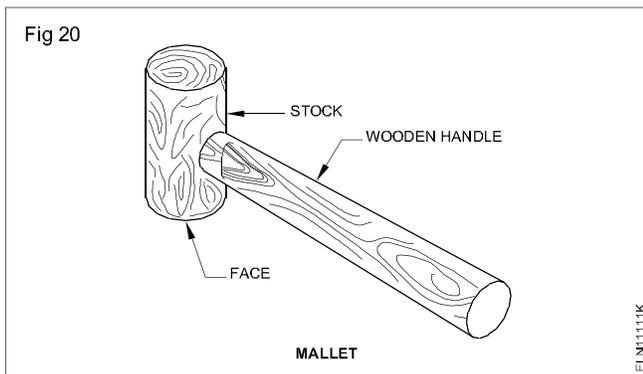
Eg. 100 mm x 8 mm. The angle of the tip of the centre punch is 90°.

It is used for marking and punching pilot holes on metals. It is made of tool steel and the ends are hardened and tempered.

Care and maintenance

- Keep the tip sharp and at a proper angle.
- Avoid mushroom heads.

20 Mallet (Fig 20)



The mallet is specified by the diameter of the head or by the weight.

eg. 50 mm x 150 mm

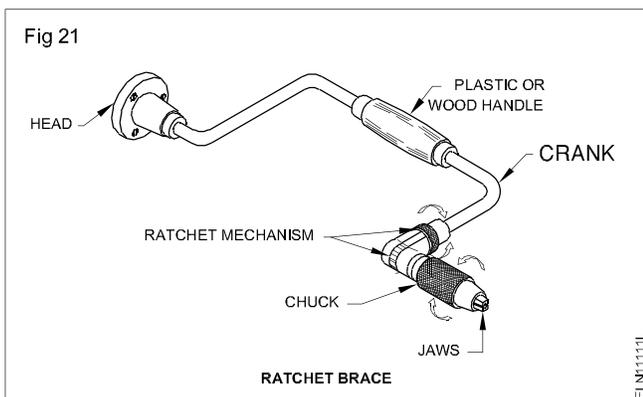
75 mm x 150 mm or 500gms, 1 Kg.

It is made out of hard wood or nylon. It is used for driving the firmer chisel, and for straightening and bending of thin metallic sheets. Also it is used in motor assembly work.

Care and maintenance

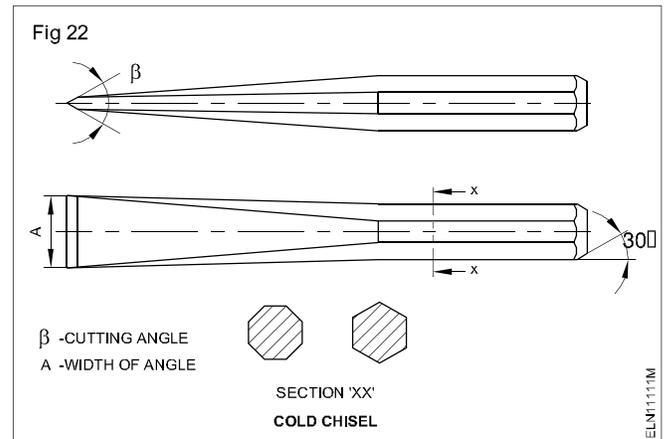
- Do not use it for fixing nails.
- Never use it on hard metal like steel and iron.

21 Ratchet brace (Fig 21) BIS 7042



The size of a ratchet brace is given by the size of drill bit it can accommodate ie. 0 - 6 mm, 0 - 12 mm. It is used to drill holes on wooden blocks.

22 Flat cold chisel (Fig 22) BIS 402



Its size is given by the nominal width and length.

- ie. 14 mm x 100 mm
- 15 mm x 150 mm
- 20 mm x 150 mm

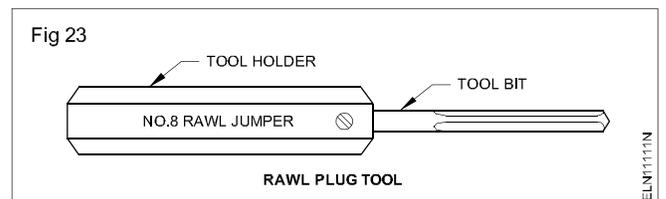
The body shape of a cold chisel may be round or hexagon.

The cold chisel is made out of high carbon steel. Its cutting edge angle varies from 35° to 45°. The cutting edge of the chisel is hardened and tempered. This chisel is used for making holes on wall etc.

Care and maintenance

- The edge of a chisel must be maintained as per the required angle.
- While grinding a chisel apply a coolant frequently so that its temper may not be lost.

23 Rawl plug tool and bit (Fig 23)



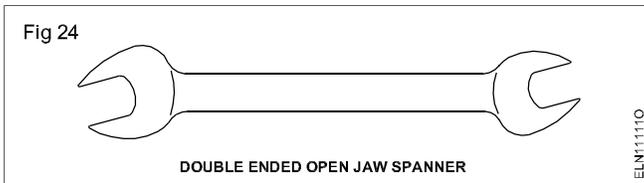
Its size depends upon the number. As the number increases, the thickness of the bit as well as the plug also increases. Eg. Nos.8, 10, 12, 14 etc.

A rawl plug tool has two parts, namely the tool bit and tool holder. The tool bit is made of tool steel and the holder is made of mild steel. It is used for making holes in bricks, concrete wall and ceiling. Rawl plugs are inserted in them to fix accessories.

Care and maintenance

- Slightly rotate the holder after each hammering stroke.
- Hold the tool straight.
- Do not throw it on the ground.
- Keep its head free from mushrooms.

24 Spanner: double ended (Fig 24) BIS 2028



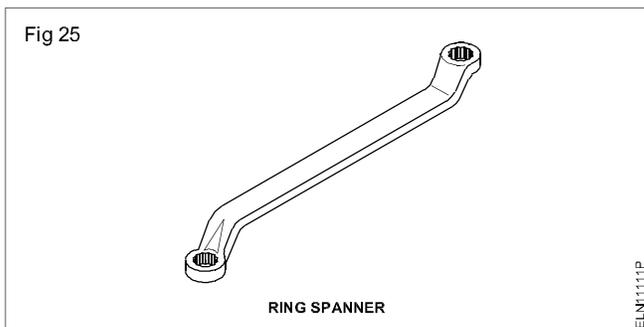
The size of a spanner is indicated so as to fit on the nuts. They are available in many sizes and shapes.

The sizes, indicated in double-ended spanners are

- 10-11 mm
- 12-13 mm
- 14-15 mm
- 16-17 mm
- 18-19 mm
- 20-22 mm.

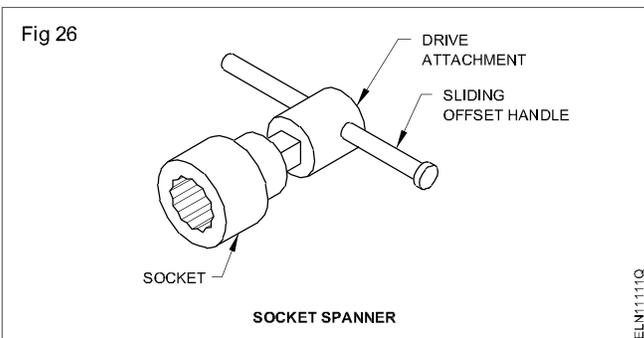
For loosening and tightening of nuts and bolts, spanner sets are used. It is made out of cast steel. They are available in many sizes and may have single or double ends.

25 Ring spanner set (Fig 25) BIS 2029



The ring spanner is used in places where the space is restricted and where high leverage is required.

26 Socket (box) spanner (Fig 26) BIS 7993, 7991, 6129



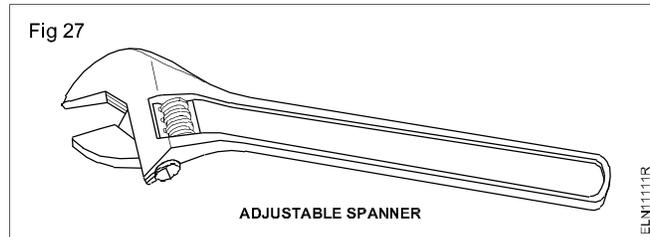
These spanners are useful at places where the nut or bolt is located in narrow space or at depth.

27 Single ended open jaw adjustable spanner (Fig 27) BIS 6149

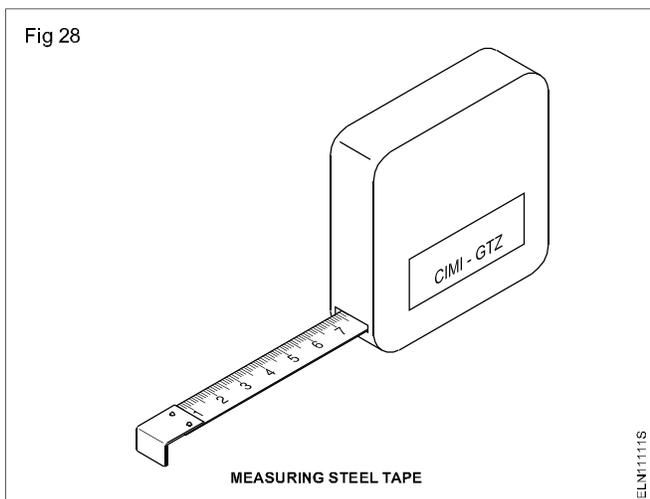
It saves time and working. The movable jaw is made adjustable by operating a screw. It is known as a monkey wrench also. Available in 150,200,250mm etc.

Care and maintenance

- Use correct size spanner suitable to the size of nut and bolt.
- Do not use a spanner as a hammer.
- While using a spanner do not strike it with a hammer.
- Prevent the grease and oil traces on its jaws.



28 Measuring steel tape (Fig 28)



The size will be the maximum length it can measure. Eg. Blade 12 mm wide 2 metres long.

The measuring tape is made of thin steel blade, bearing dimensions on it.

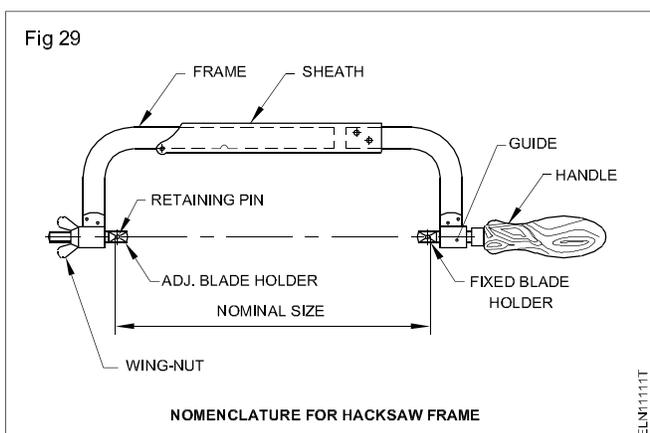
It is used for measuring the dimension of the wiring installation and general measurements.

Care and maintenance

Handle with great care as carelessness may spoil the graduation.

29 Hacksaw (Fig 29) BIS 5169-1986 for frames

BIS 2594 - 1977 for blades

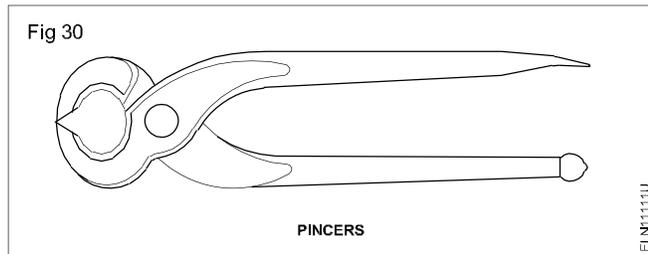


It is made out of sturdy nickel plated steel frame. The frame can be adjusted for 250 mm to 300 mm blades. It should be fixed on the frame with its teeth pointing away from the handle in order to do the cutting in forward stroke. It is mainly used for cutting metals.

Care and maintenance

- The blade should be properly tightened.
- Use a coolant while cutting.
- It should be straight during cutting.
- Lift the saw slightly on the return stroke.
- Do not attempt to saw too fast.

30 Pincers (Fig 30) BIS 4195



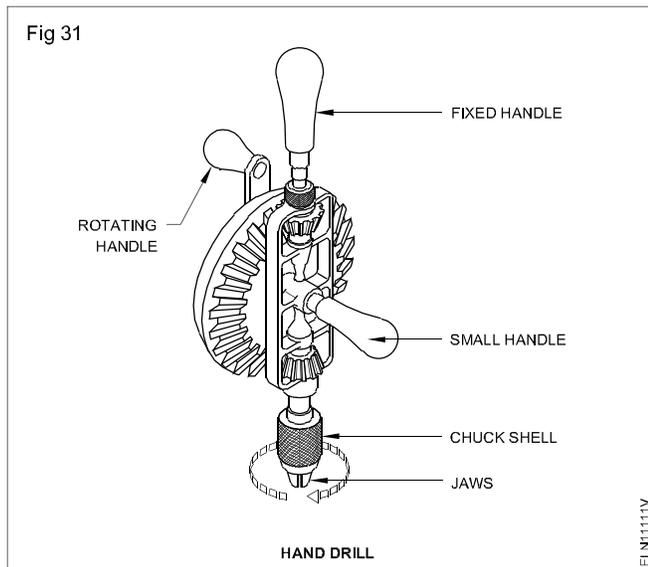
The size is given by its length. Eg. 100 mm, 150 mm, 200 mm.

It is used for extracting nails from the wood.

Care and maintenance

- Do not use it as a hammer.

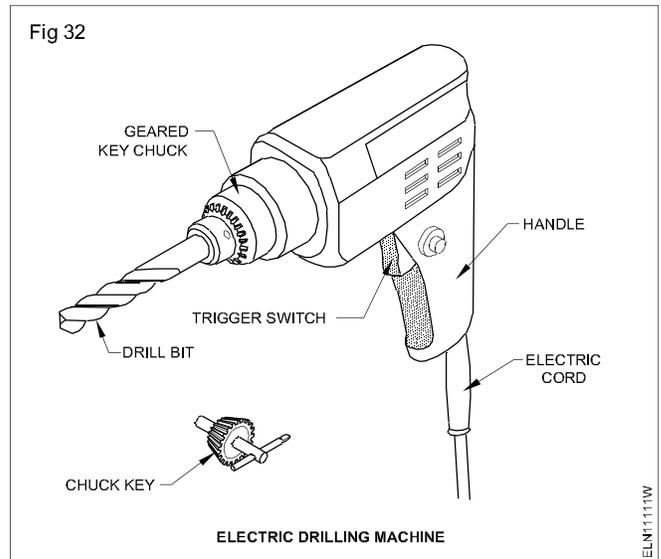
31 Hand drill (Fig 31)



The size is given by the twist drill bits which can be fitted in. Eg. 6 mm, 0-12 mm capacity.

A hand drill machine is used for making holes in thin metal sheets or wooden articles.

32 Portable Electric drilling machine (Fig 32)



When power is available, a power drilling machine is a more convenient and accurate tool for drilling holes on wooden and metal articles.

Care and maintenance

- Lubricate all the moving parts of the machine.
- Fix the drill bit firmly in the jaws.
- Before drilling, mark the job with a centre punch.
- For taking out the drill bit move the chuck in the reverse direction.
- Do not apply excess pressure on small bits.
- In the case of an electric drilling machine it must be properly earthed and the insulation should be sound.

Standard and standardisation

Objectives: At the end of this lesson you shall be able to

- state what is meant by standardisation and standard
 - state the names of various standard organisation
 - read and interpret the basic concept of electrical code 2011
 - state the types of injury caused by the improper lifting method
 - describe the procedure to be followed for moving heavy equipments
-

Standardisation can be defined as the process of formulating and applying rules for an orderly approach to specific activity for the benefit of the user and the manufacturer, and in particular for the promotion of optimum overall economy taking due account of functional conditions and safety requirement.

It is based on the consolidated results of science, technique and experience. It determines not only the basis for the present but also for future development, and to keep pace with progress.

The materials/tools/equipment produced in any country should be of certain standard. To meet this requirement, the international organisation for standardization (ISO) is started and specifies the units of measurement, technology and symbols, products and processes, safety of persons and goods through a number of booklets coded with ISO number.

Standard can be defined as a formulation established verbally, in writing or by any other graphical method or by means of a model, sample or other physical means of representation to serve during a certain period of time for defining designating or specifying certain features of a unit or basis of measurement, physical object, an action, process, method, practice, capacity, function, duty, right of responsibility, a behaviour, an attitude a concept or a conception.

To sell Indian goods in the local and international market certain standardization methods are essential. The standard is specified by the **Bureau of Indian Standard BIS** (ISI) for various goods through their booklets. The BIS only certifies a good often the product meets the specification and passes necessary tests. The manufacturer allows to use the BIS (ISI) mark on the product only after BIS certification.

These are a number of organisation for standardisation throughout the world in different countries.

The standard organisation and the respective countries are given below:

BIS	- Bureau of Indian Standard (ISI) - India
ISO	- International standard Organisation
JIS	- Japanese Industrial Standard - Japan
BSI	- British Standards Institution BS(S) - Britain
DIN	- Deutsche Industrie Normen - Germany
GOST	- Russian
ASA	- American standards association - America

Advantages of BIS (ISI) certification marks scheme:

A number of advantages accrue to different sectors of economy from the BIS (ISI) certification marks scheme.

To manufacturers

- Streamlining of production processes and introduction of quality control system.
- Independent audit of quality control system by BIS
- Reaping of production economics accruing from standardization
- Better image of products in the market, both internal and overseas
- Winning for whole-salers, retailers and stockists consumer confidence and goodwill
- Preference for ISI-marked products by organised purchasers, agencies of Central and State Governments, local bodies, public and private sector undertakings etc. Some organised purchasers offer even higher price for ISI-marked goods.
- Financial incentives offered by the Industrial Development Bank of India (IDBI) and nationalised banks.

To consumers

- Conformity with Indian Standards by an independent technical, National Organisation
- Help in choosing a standard product
- Free replacement of ISI-marked products in case of their being found to be of substandard quality
- Protection from exploitation and deception
- Assurance of safety against hazards to life and property

To organised purchasers

- Convenient basis for concluding contracts
- Elimination of the need for inspection and testing of goods purchased, saving time, labour and money
- Free replacement of products with ISI-mark, found to be sub-standard

To exporters

- Exemption from pre-shipment inspection, wherever admissible
- Convenient basis for concluding export contracts

To export inspection authorities

- Elimination of the need for exhaustive inspection of consignments exported from the country, saving expenditure, time and labour.

Introduction to National Electrical Code - 2011

National Electrical Code - 2011

National electrical code describes several Indian standards deciding with the various aspects relating to electrical installation practice. It is therefore recommended that individual parts/ sections of the code should be read in conjunction with the relevant Indian standards.

There are 8 parts and each part contains number of sections. Each section refers to the description of the electrical item/ devices, equipment etc.

Here, 20 sections of the part - 1 are described which aspect it covers

In part 1, 20 sections are there. Each section's reference is given below.

Section 1 part 1/ section 1 of the code describes the scope of the NEC.

Section 2 covers definition of items with references.

Section 3 covers graphical symbols for diagrams, letter symbols and signs which may be referred to for further details.

Section 4 covers guidelines for preparation of diagrams, chart and tables in electro technology and for marking of conductors.

Section 5 covers units and systems of measurement in electro technology.

Section 6 covers standard values of AC and DC distribution voltage, preferred values of current ratings and standard systems frequency.

Section 7 enumerates the fundamental principles of design and execution of electrical installation.

Section 8 covers guidelines for assessing the characteristics of buildings and the electrical installation there in.

Section 9 covers the essential design and constructional requirement for electrical wiring installation.

Section 10 covers guidelines and general requirements associated with circuit calculations.

Section 11 covers requirements of installation work relating to building services that use electrical power.

Section 12 covers general criteria for selection of equipment.

Section 13 covers general principles of installation and guidelines on initial testing before commissioning.

Section 14 covers general requirements associated with earthing in electrical installations. Specific requirements for earthing in individual installations are covered in respective parts of the code.

Section 15 covers guidelines on the basic electrical aspects of lightning protective systems for buildings and the electrical installation forming part of the system.

Section 16 covers the protection requirements in low voltage electrical installation of buildings.

Section 17 covers causes for low power factor and guidelines for use of capacitors to improve the same in consumer installations.

Section 18 covers the aspects to be considered for selection of equipment from energy conservation point of view and guidance on energy audit.

Section 19 covers guidelines on safety procedures and practices in electrical work.

Section 20 gives frequently referred tables in electrical engineering work.

The above description is part 1 only you can refer remaining parts and sections for other electrical installation, items, devices and equipments.

Lifting and handling of loads

Many of the accidents reported involve injuries caused by lifting and carrying loads. An electrician may need to install motors, lay heavy cables, do wiring, which may involve a lot of lifting and carrying of loads. Wrong lifting techniques can result in injury.

A load need not necessarily be very heavy to cause injury. The wrong way of lifting may cause injury to the muscles and joints even though the load is not heavy.

Further injuries during lifting and carrying may be caused by tripping over an object and falling or striking an object with a load.

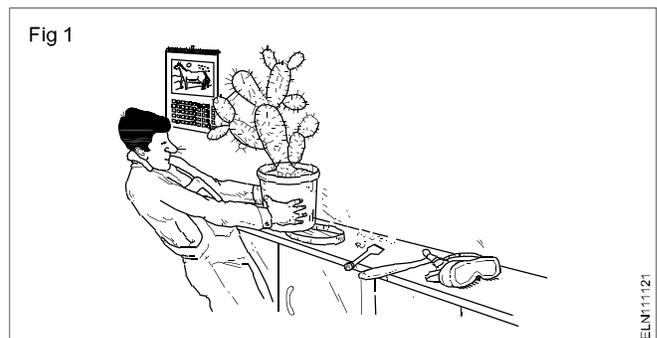
Types of injury and how to prevent them?

Cuts and abrasions

Cuts and abrasions are caused by rough surfaces and jagged edges:

- By splinters and sharp or pointed projections. (Fig 1)

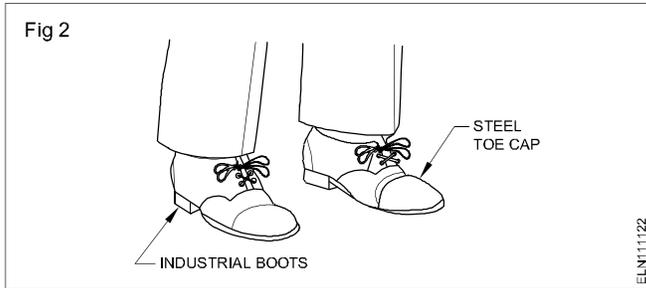
Leather hand gloves will usually be sufficient for protection, but the load should be checked to make sure of this, since large or heavy loads may involve body contact as well.



Crushing of feet or hands

Feet or hands should be so positioned that they will not be trapped by the load. Timber wedges can be used when raising and lowering heavy loads to ensure fingers and hands are not caught and crushed.

Safety shoes with steel toe caps will protect the feet. (Fig 2)



Strain to muscles and joints

Strains to muscles and joints may be the result of:

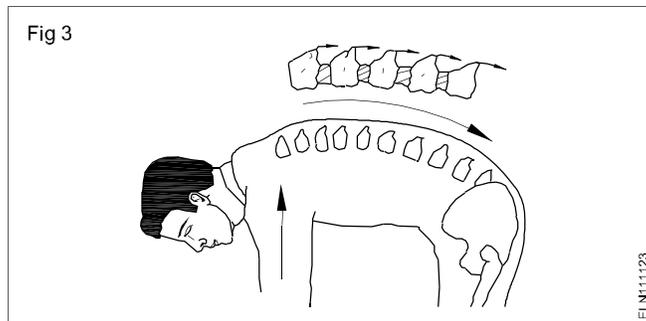
- Lifting a load which is too heavy, or of lifting incorrectly.

Sudden and awkward movements such as twisting or jerking during a lift can put severe strain on muscles.

'Stoop lifting' - lifting from a standing position with the back rounded increases the chance of back injury.

The human spine is not an efficient weight lifting machine and can be easily damaged if incorrect techniques are used.

The stress on a rounded back can be about six times greater than if the spine is kept straight. Fig 3 shows an example of stoop lifting.



Preparing to lift

Load which seems light enough to carry at first will become progressively heavier, the farther you have to carry it.

The person who carries the load should always be able to see over or around it.

The weight that a person can lift will vary according to:

- Age
- Physique, and
- Condition

It will also depend on whether one is used to lifting and handling heavy loads.

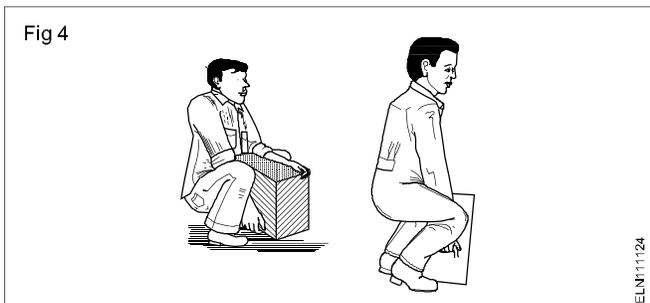
What makes an object difficult to lift and carry?

- 1 Weight is not the only factor which makes it difficult to lift and carry.
- 2 The size and shape can make an object awkward to handle.

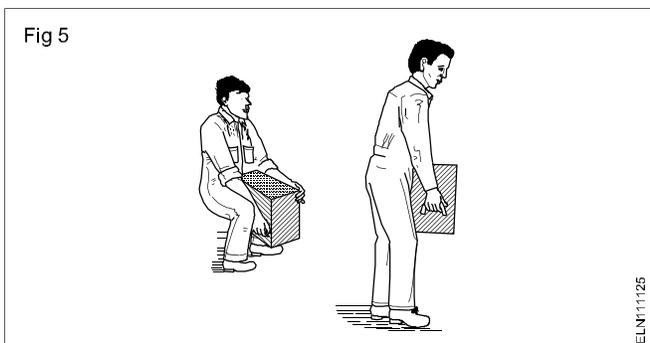
- 3 Loads high require the arms to be extended in front of the body, place more strain on the back and stomach.
- 4 The absence of hand holds or natural handling points can make it difficult to raise and carry the object.

Correct manual lifting techniques

- 1 Approach the load squarely, facing the direction of travel
- 2 The lift should start with the lifter in a balanced squatting position, with the legs slightly apart and the load to be lifted held close to the body.
- 3 Ensure that a safe firm hand grip is obtained. Before the weight is taken, the back should be straightened and held as near the vertical position as possible. (Fig 4)



- 4 To raise the load, first straighten the legs. This ensures that the lifting strain is being correctly transmitted and is being taken by the powerful thigh muscles and bones.
- 5 Look directly ahead, not down at the load while straightening up, and keep the back straight; this will ensure a smooth, natural movement without jerking or straining (Fig 5)



- 6 To complete the lift, raise the upper part of the body to the vertical position. When a load is near to an individual's maximum lifting capacity it will be necessary to lean



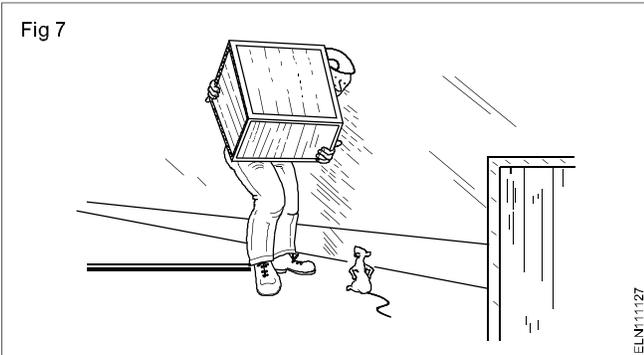
back on the hips slightly (to counter balance the load) before straightening up. (Fig 6)

Keeping the load well near to the body, carry it to the place where it is to be set down. When turning, avoid twisting from the waist - turn the whole body in one movement.

Lowering the load

Make sure the area is clear of any obstructions. (Fig 7)

Bend the knees to a semi-squatting position; keep the back and head erect by looking straight ahead, not down at the load. It may be helpful to rest the elbows on the thighs during the final stage of lowering.



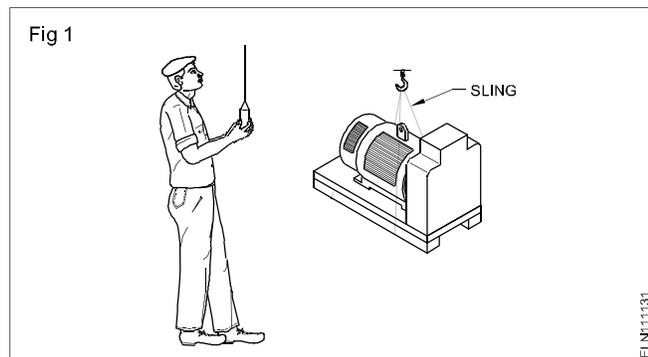
Moving heavy equipment

Heavy equipments are moved in industry using any of the following methods.

- Crane and slings
- Winches
- Machine moving platforms
- Layers and rollers

Using crane and slings

This method is used whenever loads are to be lifted and moved. (Fig 1)



Examine the steel rope sling for any cut, abrasion, wear, fraying or corrosion.

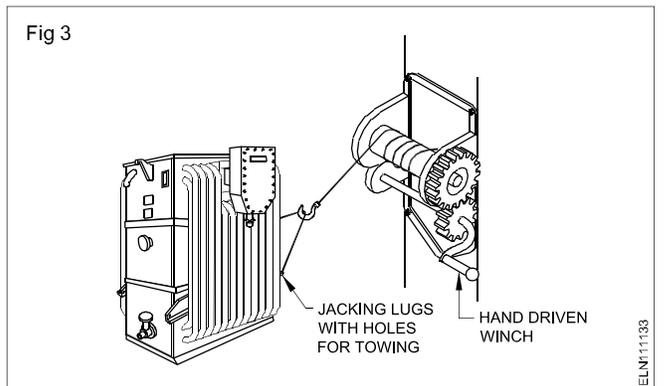
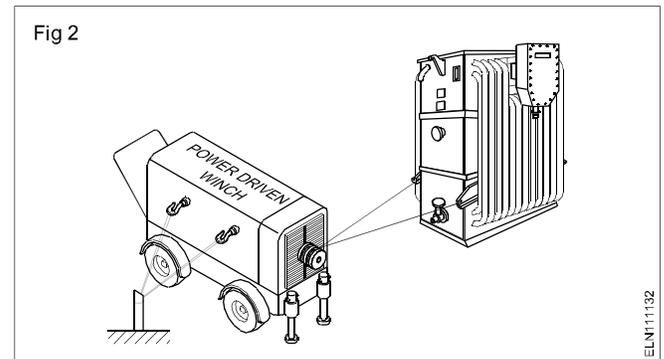
Damaged slings must not be used.

Distribute the weight as evenly as possible between the slings when using more than one sling. (Fig 1)

Keep the slings as near to vertical as possible.

Winches

Winches are used to pull heavy loads along the ground. They may be power-driven (Fig 2) or hand operated. (Fig 3).



Ensure that the safe working load (SWL) of the winch is adequate for the task.

Secure the winch to a structure which is strong enough to withstand the pull.

On open ground, drive long stakes into the ground and secure the winch to them.

Choose a suitable sling and pass it around the base of the load. Secure it to the hook of the winch.

Some heavy items have special lugs welded to them for jacking and towing purposes.

Safety consideration

Before using any winch, check that the brake and ratchet mechanism are in working order. Practise how to use the brakes.

Keep hands and fingers well away from the gear wheels.

Keep the bearings and gears oiled or greased.

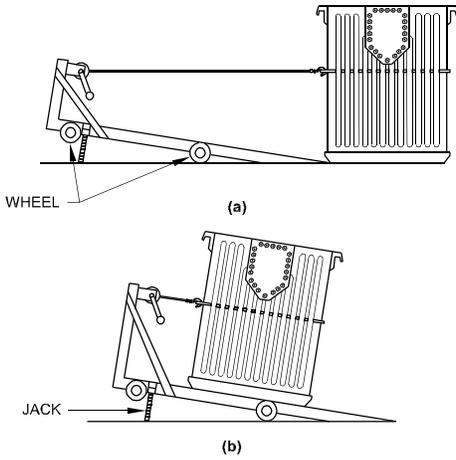
Machine moving platforms

This is a special device made to move heavy equipment in industry. Fig 4 shows the method of loading a heavy transformer.

Pass a suitable sling round the load at a convenient height.

Attach the sling to the hook of the winch and draw the load on the platform until its centre of gravity lies between the front and rear wheels.

Fig 4



Lower the jacks so that the platform rests on its wheels.

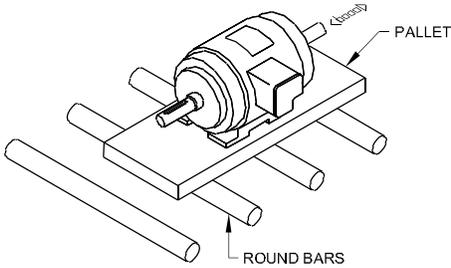
For unloading follow the procedure in the reverse order.

Using layers and rollers

Sometimes a load cannot be moved along the ground because of the irregular shape of its base or because it is not rigid enough.

Place such a load on a flat-bottomed pallet or 'layer' resting on the round bars. (Fig 5)

Fig 5



Ensure the bars (rollers) are long enough to project at each side of the load, for ease of handling.

They should be large enough to roll easily over any uneven surface along the route but should be small enough to be handled easily.

Two or three bars of equal diameter are sufficient for most loads but if four or more are used, the load may be moved faster as there is no delay when moving the rear bar to the front. (Fig 5)

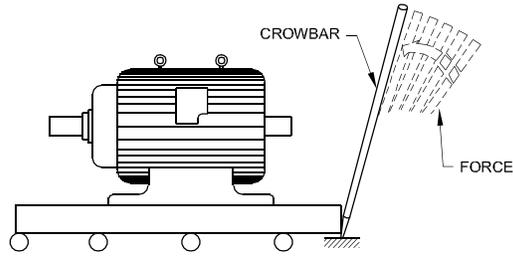
Move the load by using a crowbar as shown in Fig 6. Keep the crowbar at the end of the pallet with an angle and a firm grip on the ground. Apply the force at the top of the bar as shown.

When a load is on rollers, only shallow slopes can be negotiated.

Hold the load in check all the time if it is on the slope.

Use a winch with an effective brake for this operation.

Fig 6

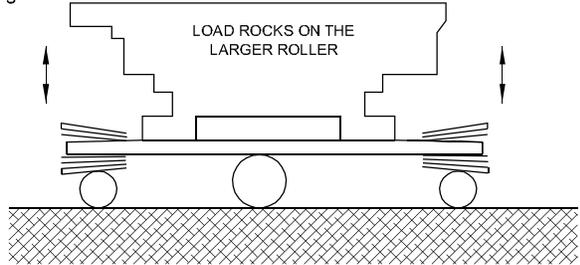


To negotiate a corner on rollers

For a moderate load, insert one roller a little larger in diameter than the others as the corner is approached.

When this roller is under the centre of gravity of the load, the load can be rocked to and fro on the roller and swivelled around sideways. (Fig 7)

Fig 7

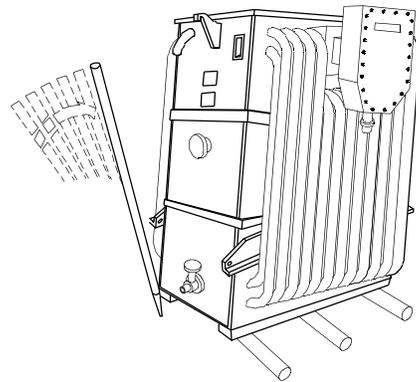


For heavier loads

Stop the load on the roller at the beginning of the corner.

Twist the load round on the rollers by pushing the sides with crowbars until the load is just over the ends of the rollers. (Fig 8)

Fig 8



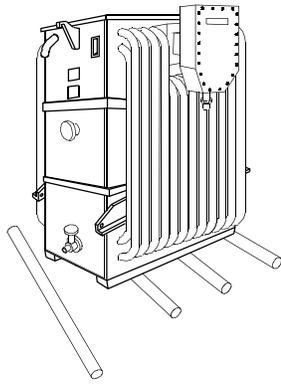
Place some rollers at an angle to the front of the load. (Fig 9)

Push the load forward on to these rollers.

Twist the load further round and place the freed rollers in front of and at an angle to the load.

Continue until the load is pointing in the desired direction.

Fig 9



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Safety consideration

Moving heavy loads with crowbars or jacks

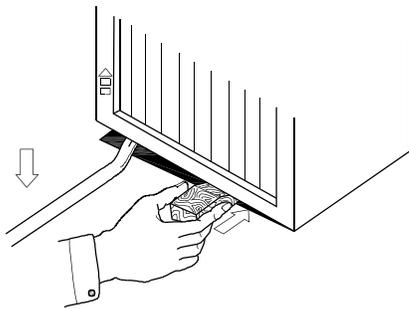
Make sure your hands are clear of the load before lowering it on to the packing or rollers.

Do not use your hands underneath the packing when positioning it. Use a push block.

Place the packing on the floor and push it under the load. (Fig 10)

Hold it by its side faces keeping the fingers well away from the lower edge of the load and from the floor. (Fig 10)

Fig 10



ELN1113A

Raising a load

Check that the slings are correctly secured to the load and to the hook. Ensure they are not twisted or caught on a projecting part of the load.

Before starting to lift a load, if you cannot see an assistant on the far side of the load, verify that he is ready to lift the load and ensure that his hands are clear of the slings.

Warn nearby workers that the lifting is about to begin.

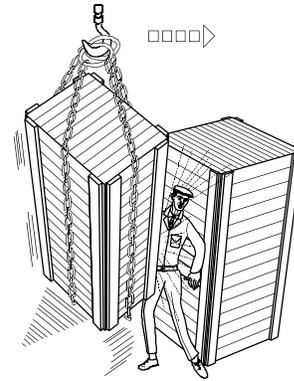
Lift slowly.

Take care to avoid being crushed against other objects as the load rises. (Fig 11) it may swing or rotate as it leaves the ground.

Minimise such movement by locating the hooks as accurately as possible above the centre of gravity of the load.

Keep the floor clear of unnecessary objects.

Fig 11

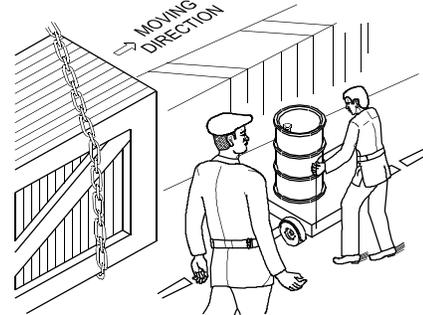


ELN1113B

Moving a load

Check that there are no obstacles in the way of the crane and load. (Fig 12)

Fig 12



ELN1113C

Stand clear off the load and move it steadily.

Be prepared to stop the load quickly if somebody moves into its path.

Allow for the natural swing of the load when changing speed or direction.

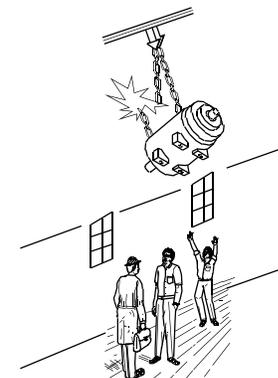
Ensure that the load will not pass over the head of other people. (Fig 13)

The tackle or sling may fall or slip.

Warn other workers to stand clearly away from the route of the load.

Remember that accidents do not happen, they are caused.

Fig 14



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