ELECTRICAL WIRING SUPPORT SYSTEMS

THERE ARE THREE MAIN TYPES OF SUPPORT SYSTEM

CONDUIT

TRUNKING

TRAY WORK

SELECTING CONDUIT

METAL CONDUIT

Screwed steel conduit is the most common form used. This conduit is manufactured from seam welded steel tube processed from hot or cold rolled steel strip to BS 4568 EN 61386 and can be widely seen in modern commercial and industrial premises

Advantages

- Good mechanical protection to conductors
- Allows easy wiring
- Reduces fire risk

Disadvantages

- Moisture can form under certain conditions
- Expensive compared to PVC
- Can suffer corrosion where exposed to acids, alkalis and other fumes if not galvanised
- Requires more time for assembly utilising bend formers and thread cutting dies

Extruded PVC Conduit

General indoor domestic/office use, High Impact types if it is more likely to receive damage i.e. corridors, kitchens

Advantages

- Lightweight allows quick and easy installation
- Cheaper than steel
- Good for moist and corrosive environments
- More aesthetically pleasing and hygienic than steel
- Causes less condensation due to low conductivity of heat

Disadvantages

- Is susceptible to damage through impact
- Cannot be installed in temperatures below freezing or when an installation is subjected to direct sunlight as it becomes brittle
- Becomes soft in higher ambient temperatures
- Expands around five times as much as steel and does not offer fire protection

Disadvantages Continued

- Adhesives used to bond components can cause dizziness if not used in a well ventilated area
- Adhesives are flammable
- Can take a long time to completely set, particularly if too much is used
- If too much adhesive is used, it can cause a barrier across the inside of conduit
- If to little adhesive is used it will not provide a waterproof barrier

Conduit

Steel conduit
Can be supplied in black enamelled finish for general dry conditions, or galvanised for damp outdoor conditions.

It is available in in 3.75 metre lengths in the following diameters:-

16mm, 20mm, 25mm and 32mm

HEAVY GUAGE SCREWED CONDUIT.
Standard for good class work, connections are made by screw thread and form a continuous electrical circuit .

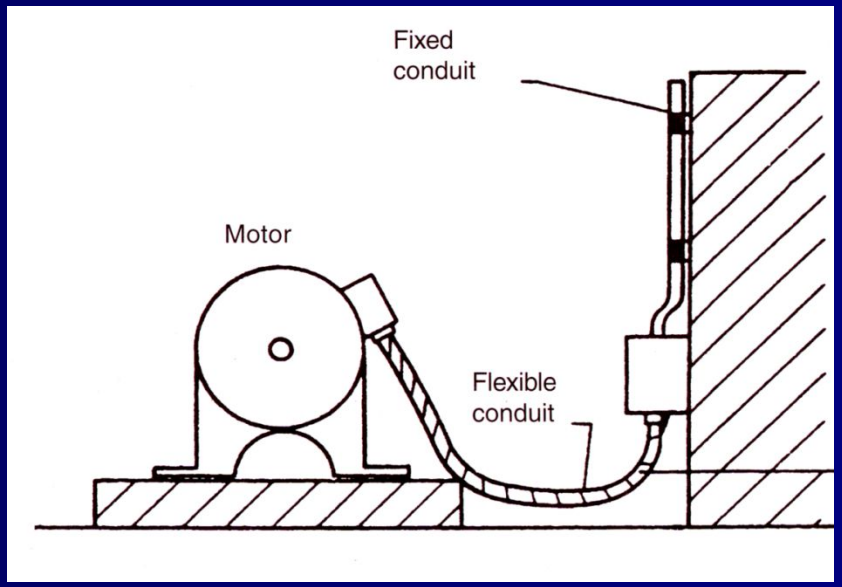
Conduit

LIGHT GAUGE CONDUIT.
A continuous tube made from sheet metal and normally used as protection for flush installations.

FLEXIBLE CONDUIT.
Spiral wound steel strips forming a tube, commonly used for connecting machinery. It DOES NOT provide a good earth path.

PVC FLEXIBLE CONDUIT
Used where safe to do so and no danger of any impact.

Flexible Conduit



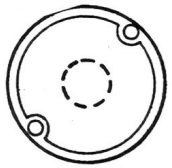
Conduit Fittings and Saddles

There are many different fittings for conduit tubes and wherever possible, to ensure a more attractive installation, the conduit should be bent instead of using fittings

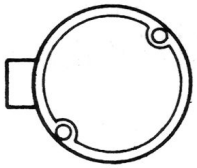
As well as socket boxes, other boxes can also be used. These boxes are threaded and the conduit will screw directly into them. They are often used to provide inspection points and any inspection points should allow an easy access point, for maintenance and allow cables to be drawn in more easily using fish wires

An inspection box should be provided every 180 degrees, or every 2 lengths on a straight run

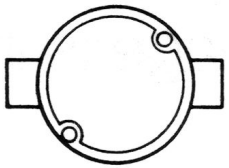
DIFFERENT TYPES AND STYLES OF FITTINGS AND SADDLES



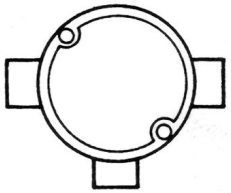
Black outlet box



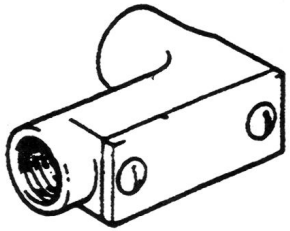
Terminal box



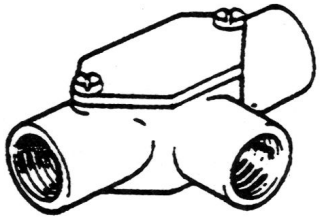
Through box



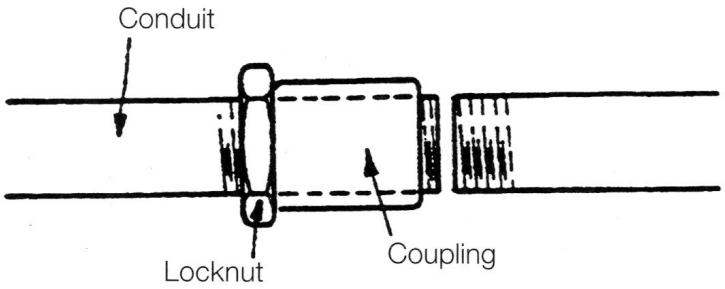
'T' or 3-way box



Elbow. Top Outlet Inspection



Tee. Channel Inspection



Straight coupler

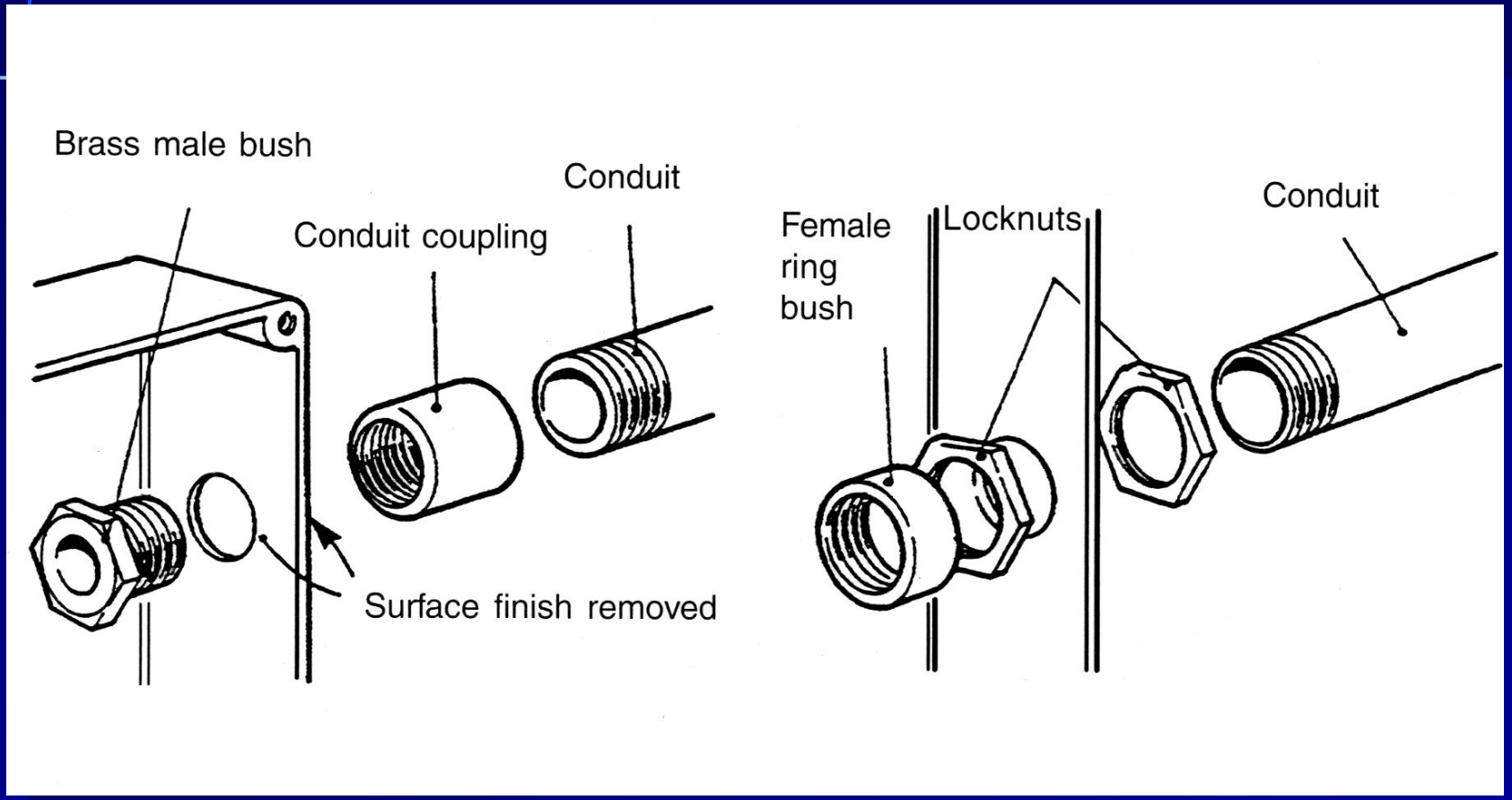
Connections to socket boxes are typically made with either a coupler and male bush, or a lock nut and female bush.

Socket boxes are secured to walls using a variety of fitting techniques depending on the wall material, such as rawlplugs, toggle bolts etc.

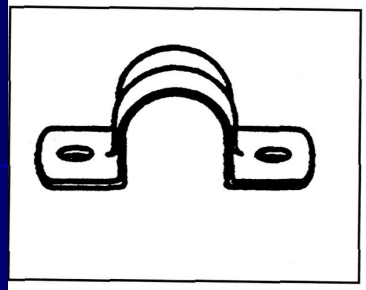
The screw fixing used should not protrude to ensure it cannot damage the cable insulation.

The conduit itself must also be secured to the wall to improve the overall security of the installation

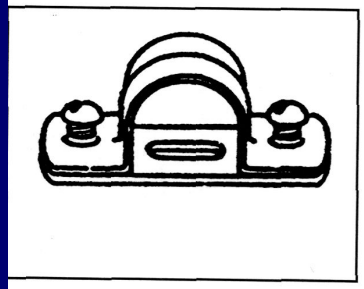
CONNECTIONS TO SOCKET BOXES



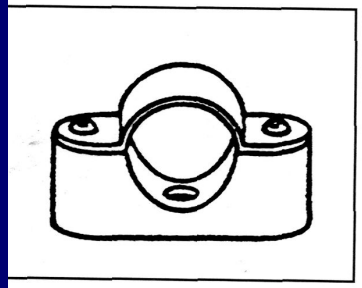
FITTINGS FOR MOUNTING CONDUIT TO WALLS



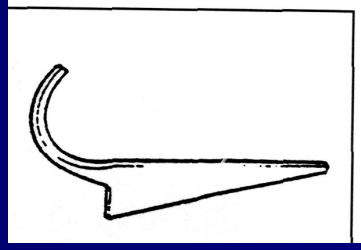
Saddle



Spacer bar



Distance saddle

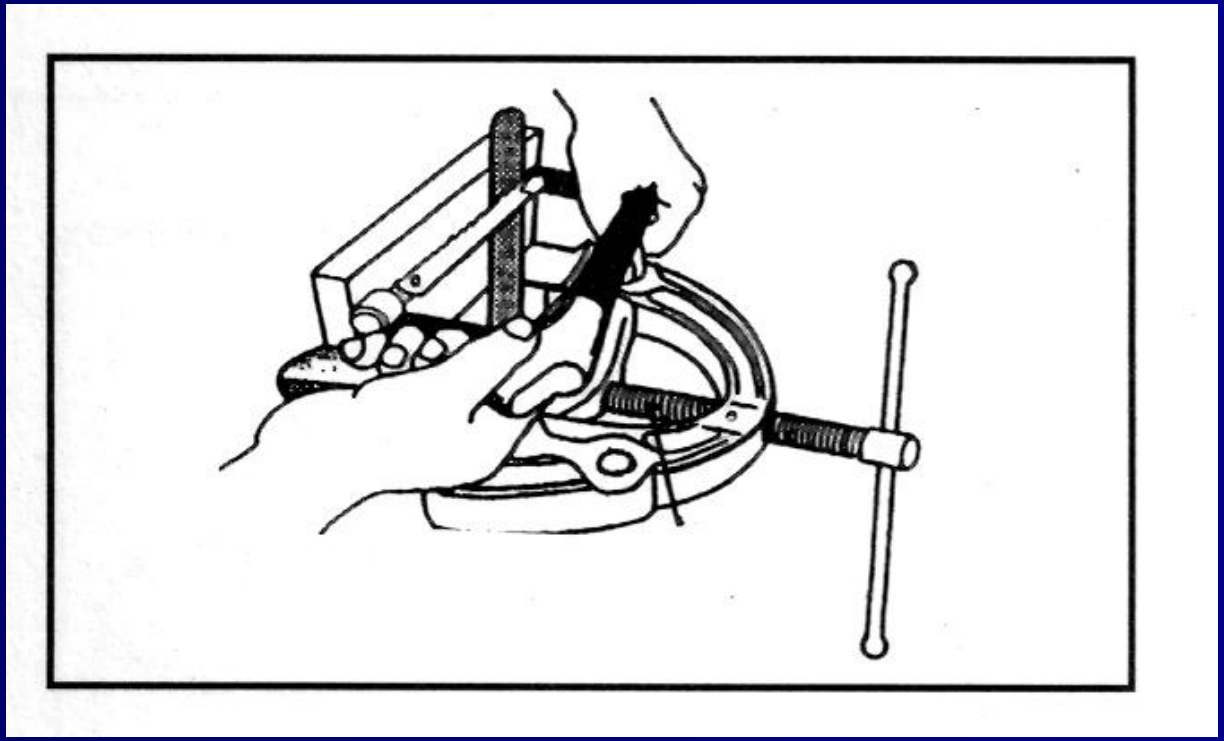


Pipe hook
(Not used for surface work)

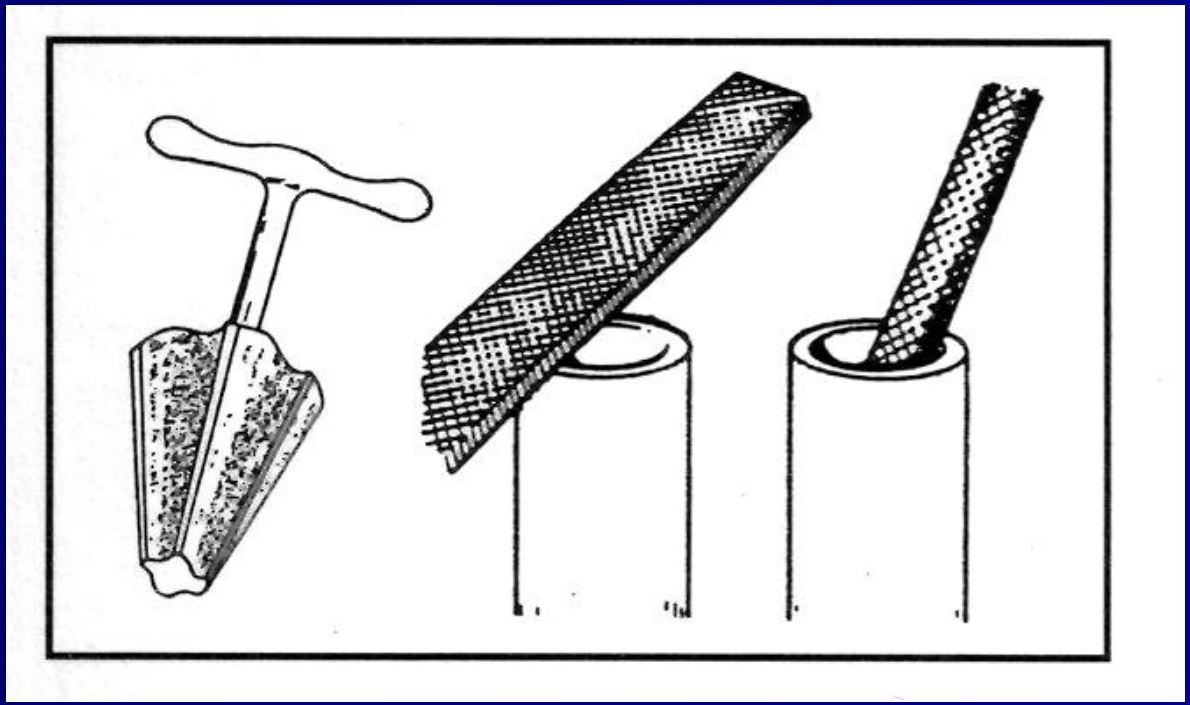
USING STEEL CONDUIT

Metal conduit should be cut at 90 degrees using a hacksaw with 24 tpi

ALWAYS hold the conduit securely in a pipe vice

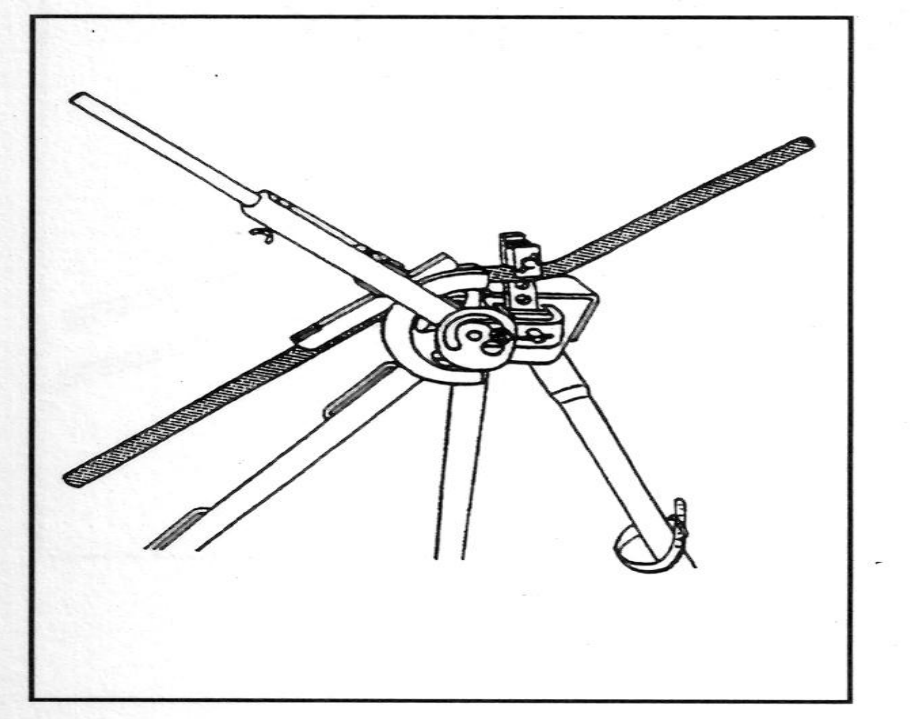


When the cut is complete burrs should be removed with a round file or reamer to ensure sharp edges cannot damage cables.

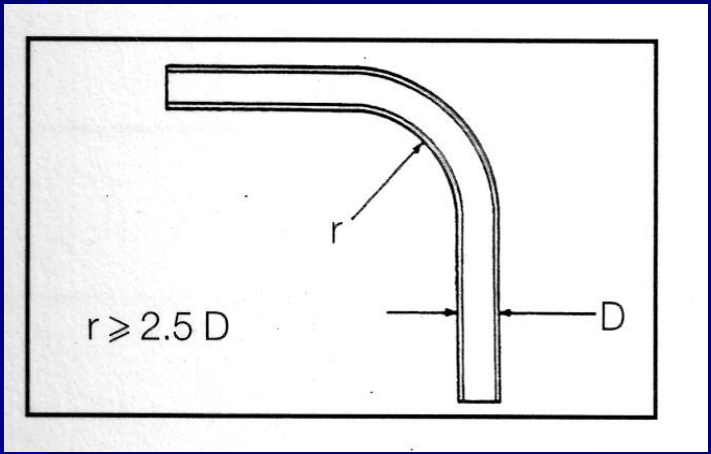


A bending machine is essential when bending steel conduit. The machine will have different sizes of bending wheel and normally incorporate a vice.

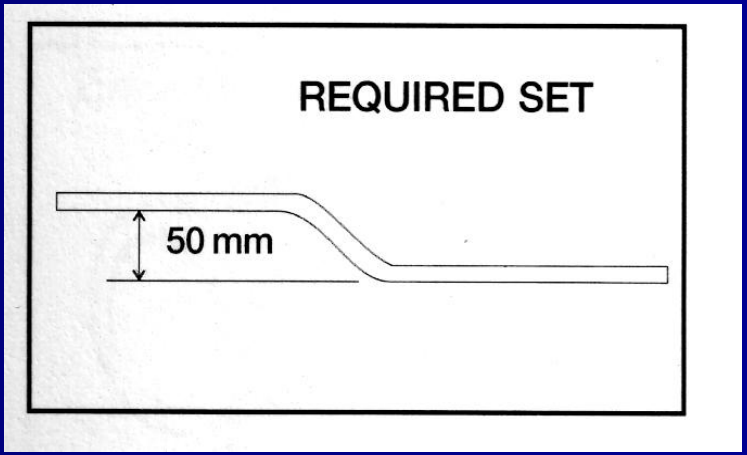
ALWAYS follow the makers instructions as there is a **danger** of entrapment crushing and amputation when using a bending machine.



The standard types of bends made are usually, the right angle bend and double set. The IET on-site guide Appendix E states that the minimum internal radius of bend should not be less than 2.5 x diameter. That is the EXTERNAL diameter of the conduit.



90^0 BEND

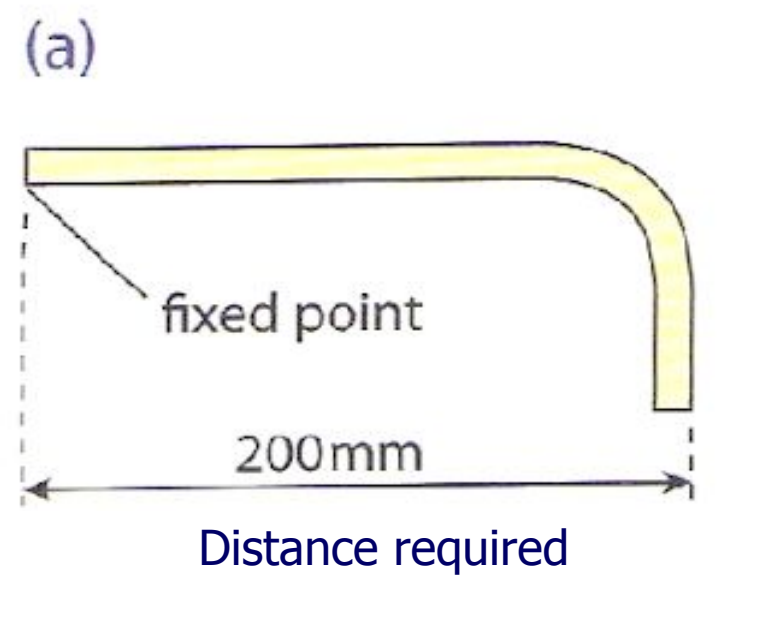


30^0 SET

Bending Methods

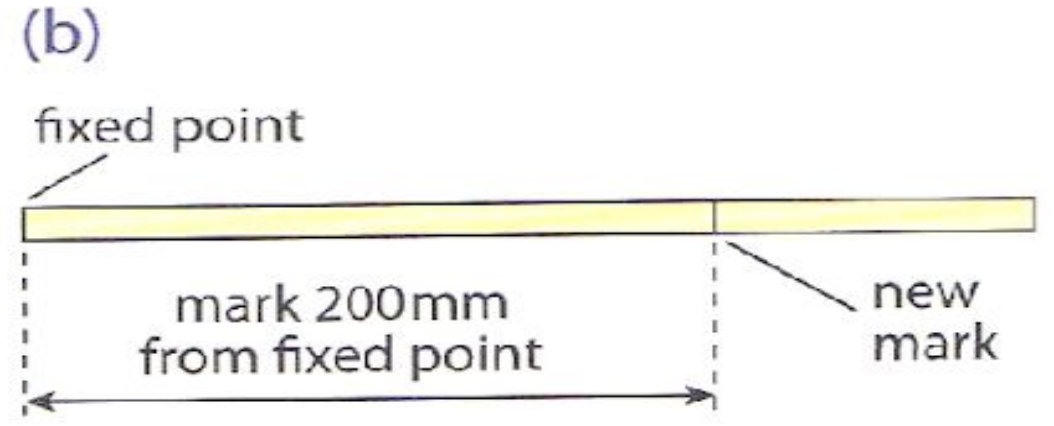
Making a 90° Bend from a fixed point

Diagram (a) shows the required bend.



Bending Methods

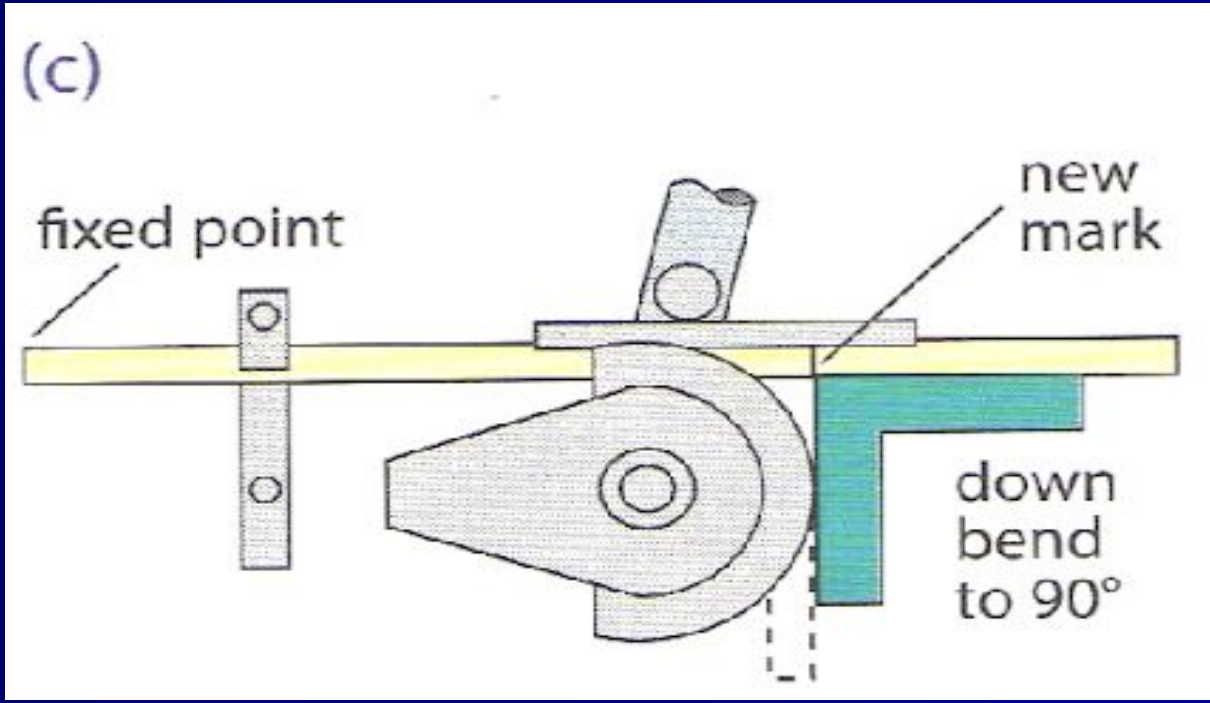
Making a 90° Bend from a fixed point



Mark the conduit as shown in diagram (b), from fixed point. If the distance is given to the inside or centre of the tube, simply add on either the diameter or half the diameter respectively to give the bend measurement.

Bending Methods

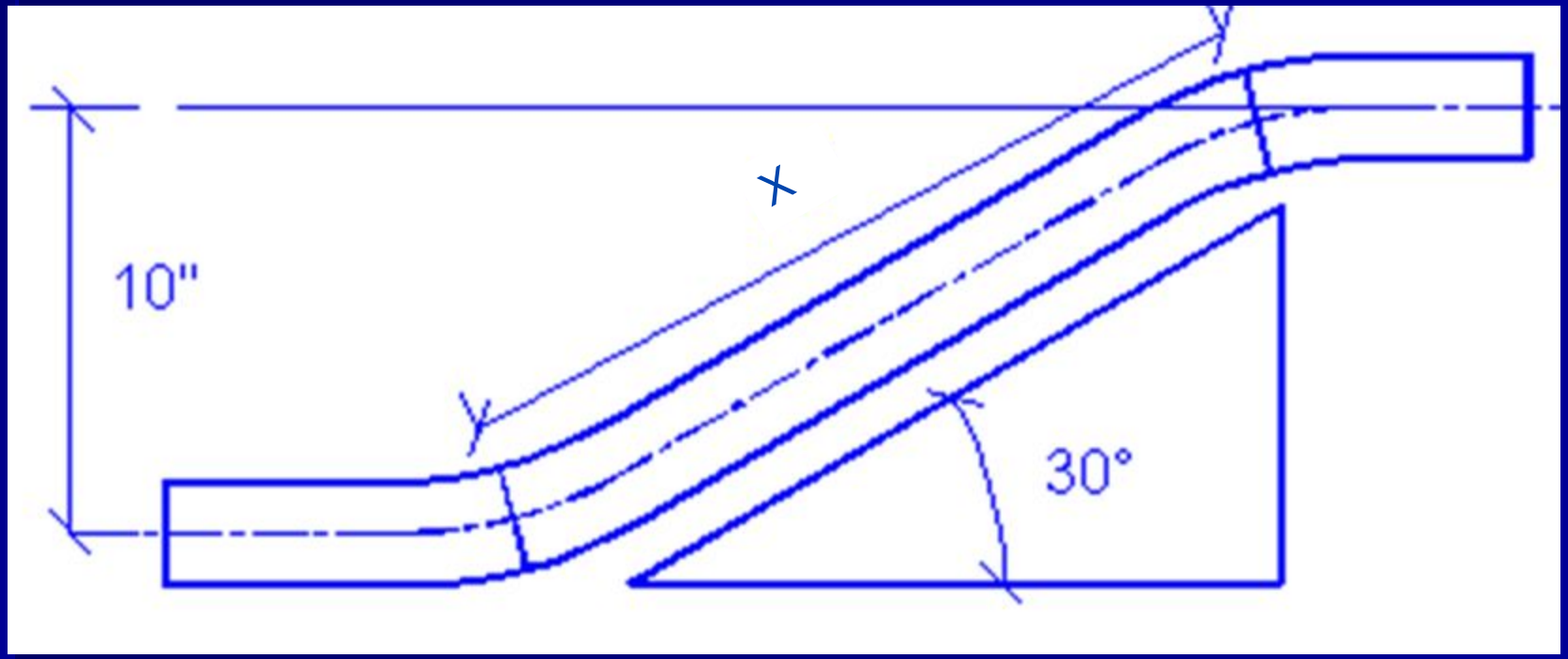
Place the tube in the 'former' and select the 90^0 position in the former with the fixed point to the rear. Position the tube so that a square held against the tube touches and forms a tangent to the leading edge of the former, bend down until it stops.



Bending Sets

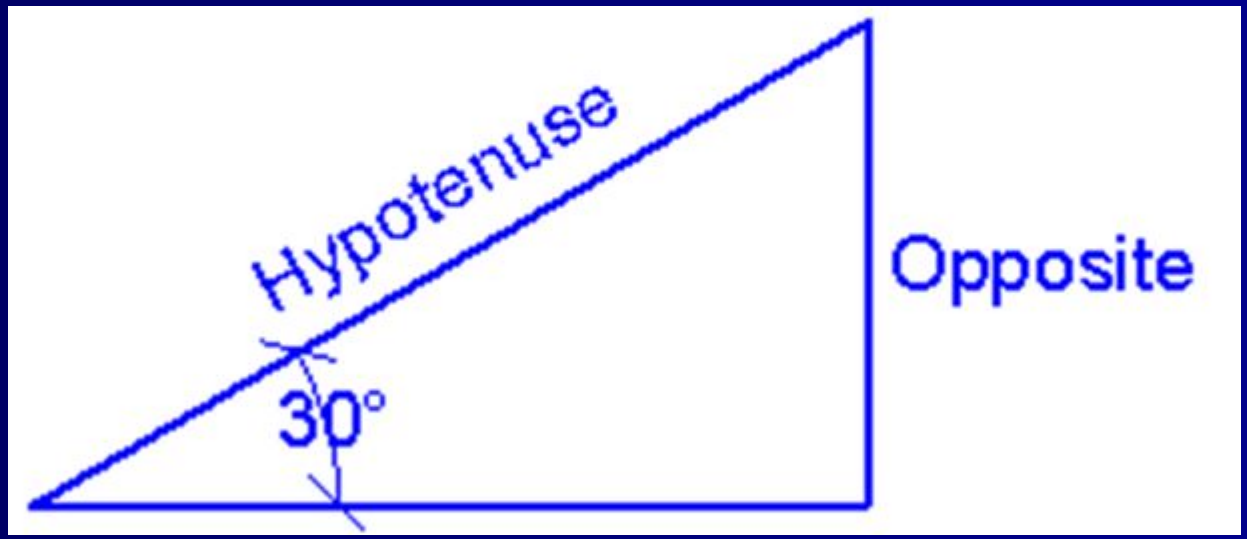
There are a few different methods an engineer can use to fabricate set bends (or doglegs). One way is to determine the center to center distance of the offset.

Here it is 10 inches



Bending Methods

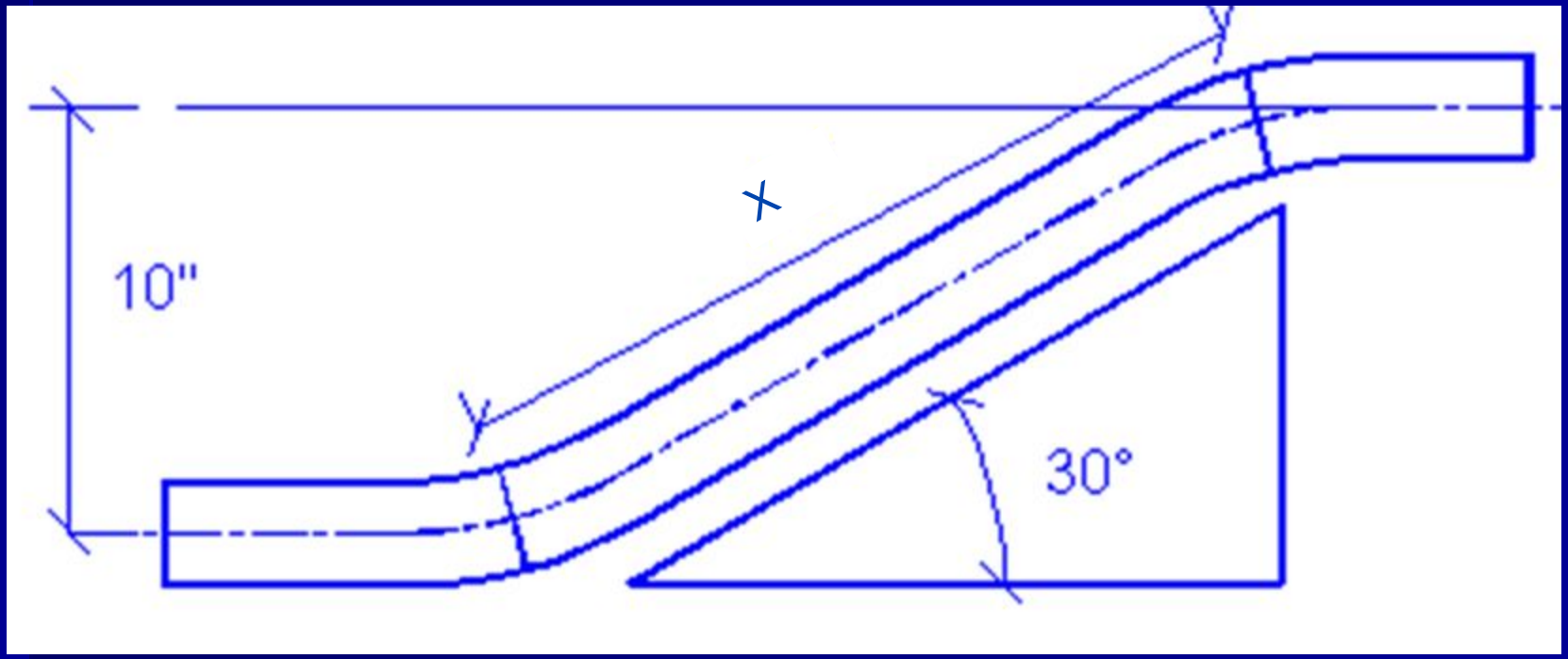
Next, he/she must determine the angle of bend to use for the offset. The angle used here is 30º, which is the most popular angle used for bending offsets though this could be any angle determined by the situation of the conduit run.



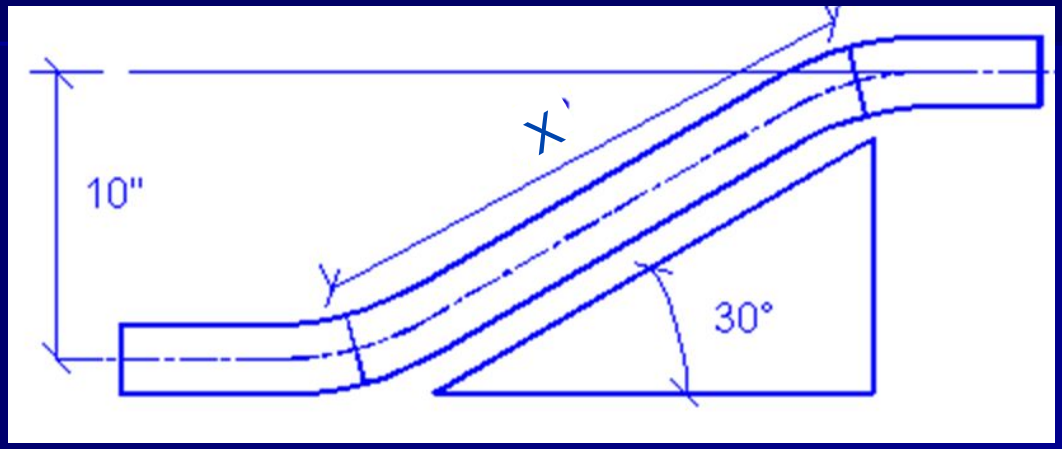
Bending Methods

The center to center dimension of this offset is 10". The angle used to make the bends for the offset is 30º. The Angle of 30º is 2.0 (i.e. 1/Sin 30^0) The formula used to determine the center to center distance between bends is:

X = 10 x 2, or X = 20”



Bending Sets

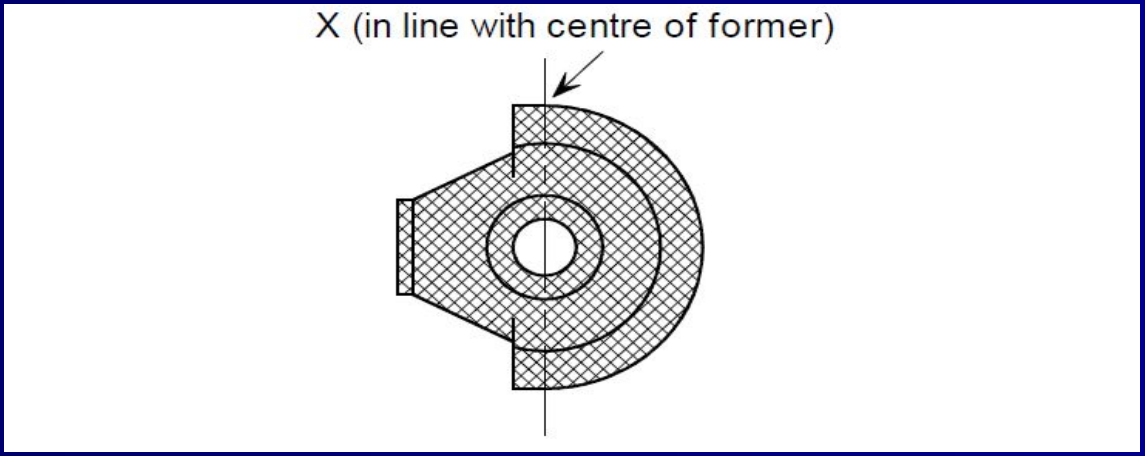


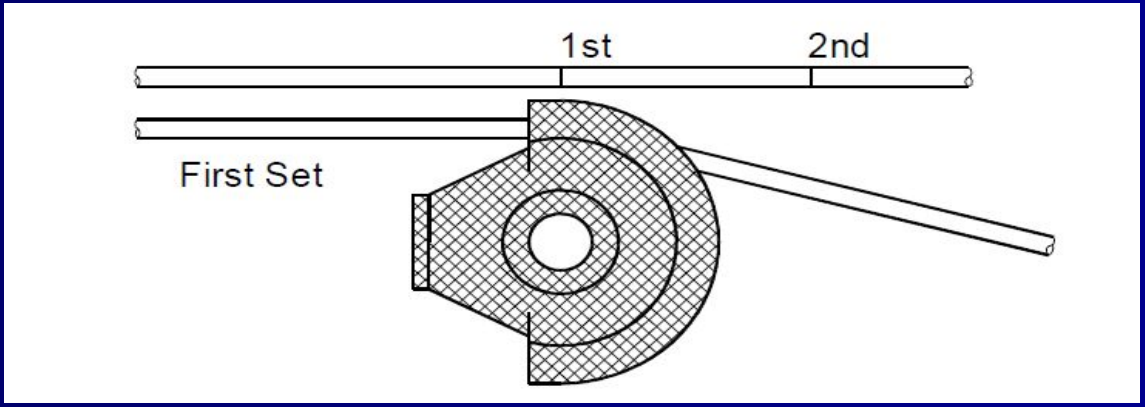
Distance between bends = $\frac{\text{Hypotenuse}}{\text{Opposite}}$

Easy Method for calculating 30 degree off set (dog leg) bend is

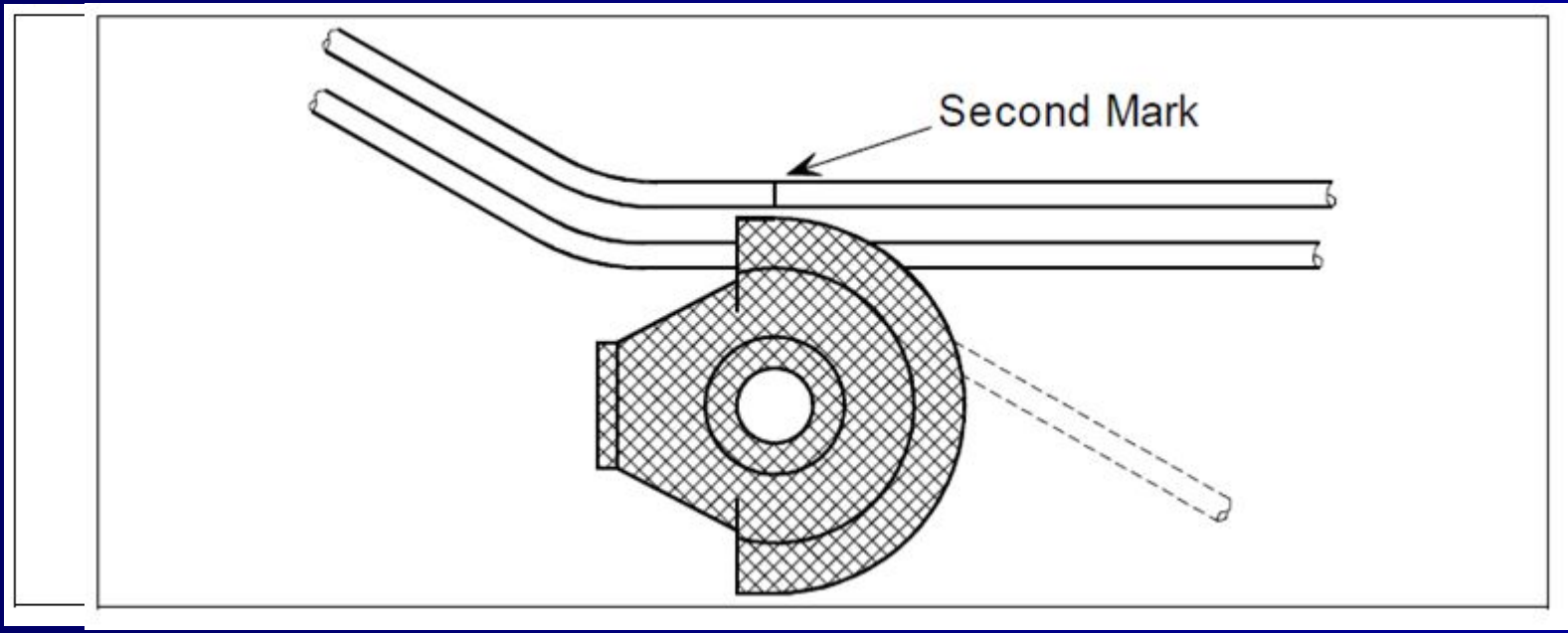
Eg: Height x 2 = X = 10x2=20

The 30^0 set is positioned differently from the 90^0 where the mark is placed inline with the centre of the forming wheel, then bent to the 30^0 stop.





The work piece is then placed upside down in the machine pointing in the same direction with the second mark in line with the centre making sure that the piece is straight and parallel to the edge.



Bending Methods

30º bends are popular for making offsets, because the cosecant of 30º is 2. Also, It is easier to pull wire through a conduit with 30º bends than it is for a conduit with 45º or 60º bends. 45º or 60º bends are sometimes used if the engineer has to bend a large offset in a short distance.

Tools & Methods

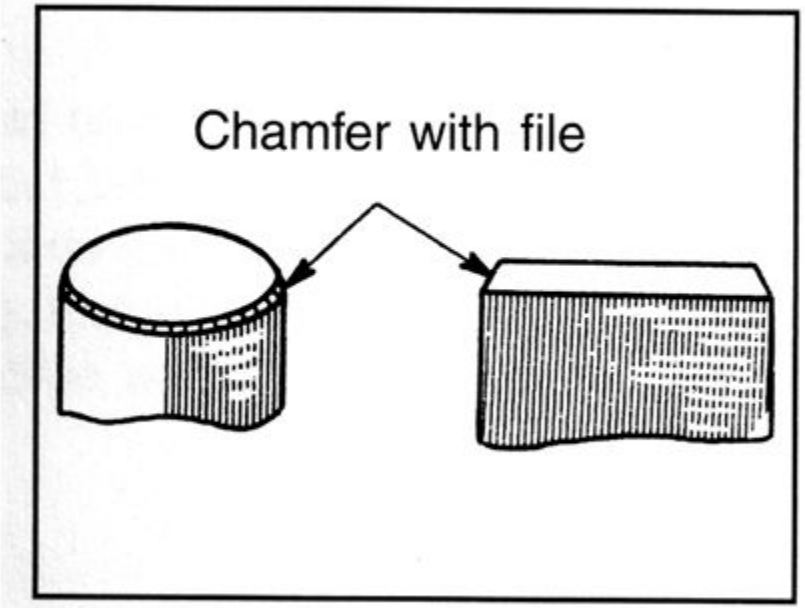
Of course there are a number of methods and tools available to aid the installation of conduit but the only real way is to practice with the tools and methods that suit you.

THREADING METAL CONDUIT

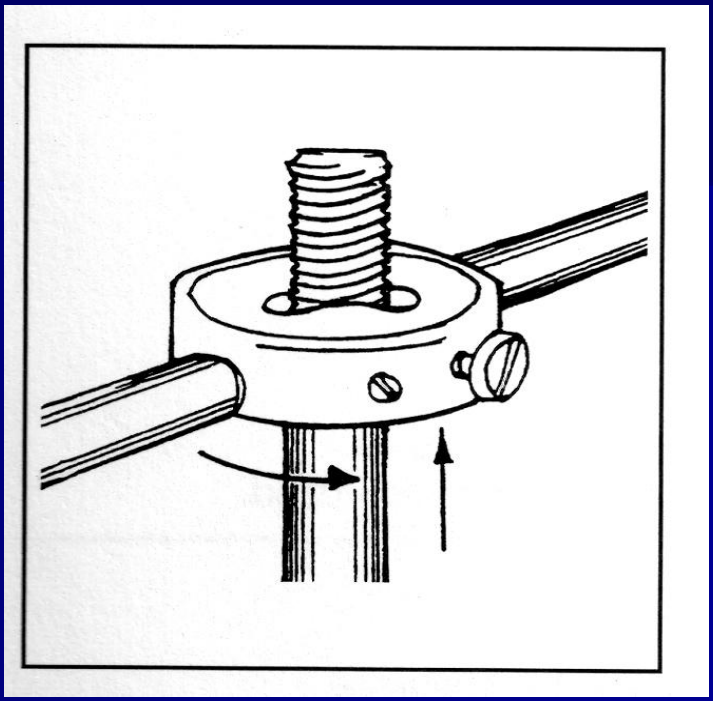
Cut the conduit SQUARE using a hacksaw.

Use a file to ensure squareness and deburr.

Chamfer the end to ensure a good start to the thread.



Using a stock and die, keep it square to the end of the tube and begin to cut the thread.

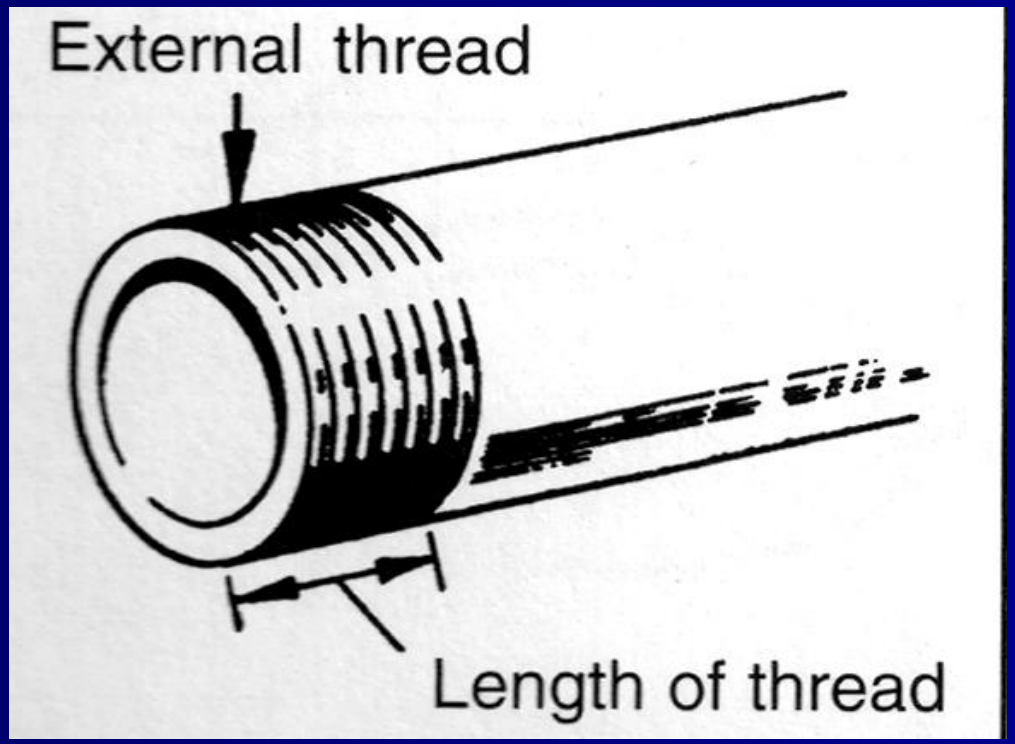


Ensure a suitable cutting compound is used which will ensure minimum effort to cut the thread and avoid damage to the die.

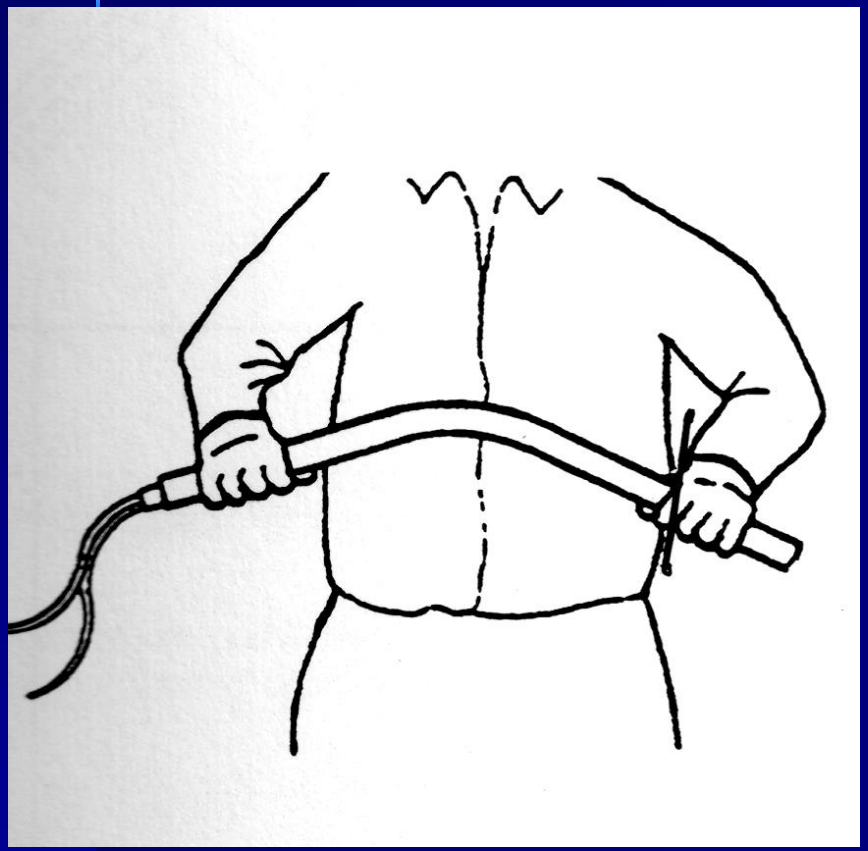
Reverse the die every 2/3 turns to clear swarf and maintain a good cut.

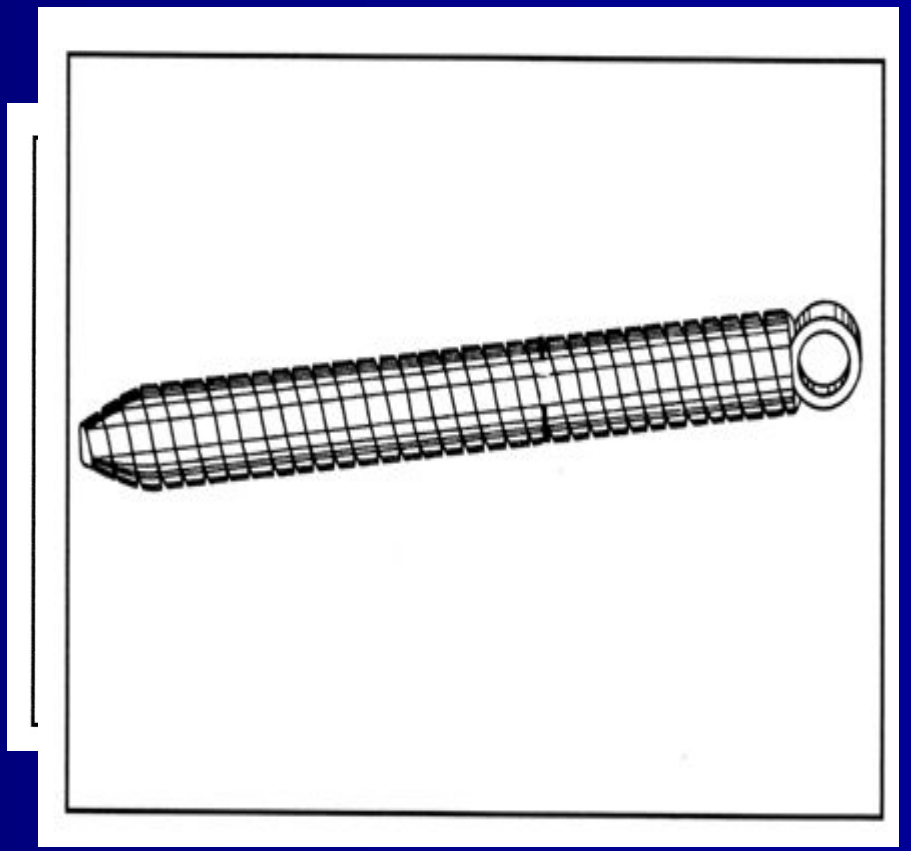
When complete, clean the thread and deburr. Keep fingers away from sharp edges.

Do not cut too much thread as it will be unsightly and require painting to protect the bare steel. As a general rule one full thread protruding from the die indicates the cut thread is deep enough.



Bending PVC Conduit





USING PVC CONDUIT

This should be cut in the same manner as for steel, though a cleaner more square cut can be achieved with a pipe cutter. Conduit is then bent by hand, using a bending spring.

This is passed inside the conduit and prevents it from collapsing and forming a kink as it is bent, plastic conduit will need to be bent past the bend angle to allow for the elasticity in the plastic

In cold weather it may be necessary to warm the conduit to aid bending.

When selecting the spring remember – black marked springs are for metal and green marked springs are for plastic. DO NOT mix the two.

DO NOT use a spring with no string attached to the end – you need to able to pull the spring out when the conduit is bent.

The fittings for plastic are generally the same as for steel but instead of threading the PVC an adhesive compound is used.

When using adhesives ALWAYS read the instructions and comply with relevant COSHH regulations.

Always use in a well ventilated space.

Avoid contact with eyes and skin.