Stakes and their uses

Objectives: At the end of this lesson you shall be able to
- **state what is a stake**
- **state the different types of stakes and their uses.**

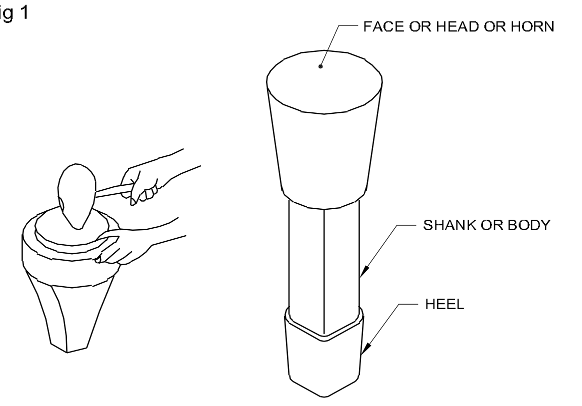
Stakes are the sheet metal workers anvils used for bending, seaming or forming. They actually work as supporting tools as well as forming tools.

Stakes are made in different shapes and sizes to suit the types of operations for which machines are not readily available or readily adaptable.

Some stakes are made of forged mild steel, faced with cast steel. The better class stakes are made either of forged steel or of cast steel.

A stake used in sheet metal working consists of a head (or) a horn. (shank or body and heel) The shanks are designed to fit into a tapered bench socket. (Fig 1)

Fig 1

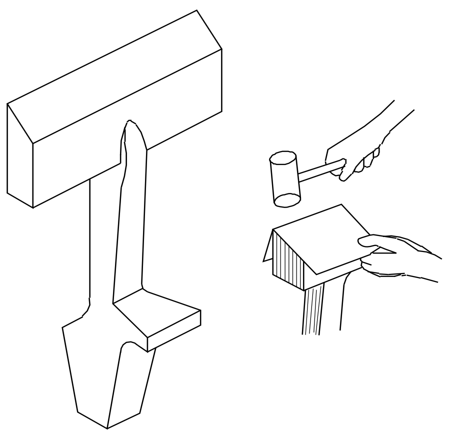


ROUND BOTTOM STAKE

Round bottom stake (Fig 1): It has a round and a concave face head. It is used for hollowing the sheet.

Hatchet stake (Fig 2): The hatchet stake has a sharp, straight edge, bevelled along one side. It is very useful for making sharp bends, folding the edges of sheet metal, forming boxes and pans by hand.

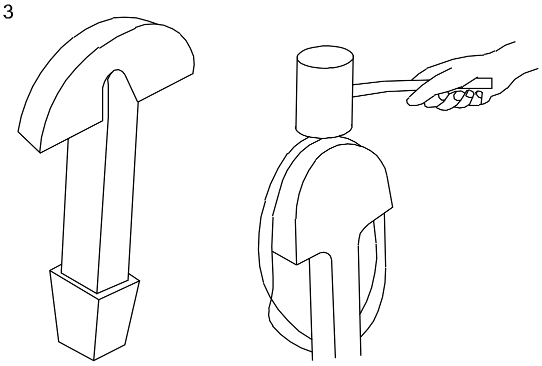
Fig 2



HATCHET STAKE

Half moon stake (Fig 3): This stake has a sharp head in the form of an arc of a circle, bevelled along one side. It is used for turning up flanges on metal discs.

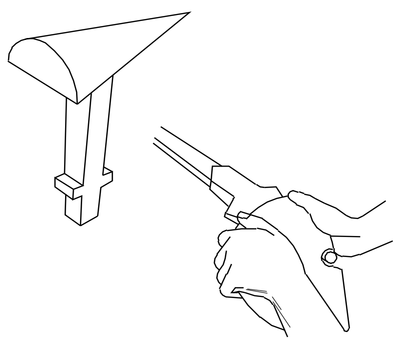
Fig 3



HALF MOON STAKE

Funnel stake (Fig 4): This stake is used when shaping and seaming funnels and tapered articles.

Fig 4



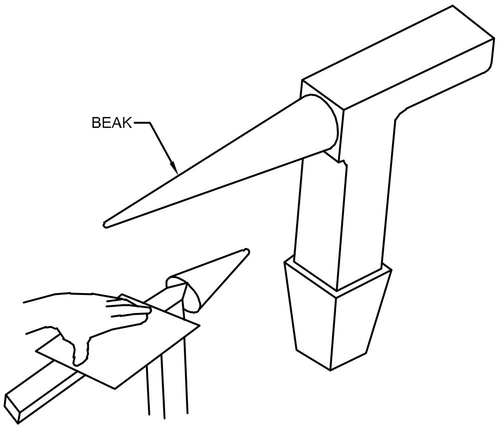
FUNNEL STAKE

Beak or Bick Iron stake (Fig 5): This stake has two horns, one of which is tapered the other is a rectangular shaped anvil. The thick tapered horn or beak is used when making spouts and sharp tapered articles. The anvil may be used for squaring corners, seaming and light riveting.

Creasing Iron (Fig 6): This stake has two rectangular shaped horns, one of which is plain. The other horn contains a series of grooving slots of various sizes. The grooves are used when 'Sinking' a bead on a straight edge of a flat sheet. This is also used when making small diameter tubes with thin gauge metal.

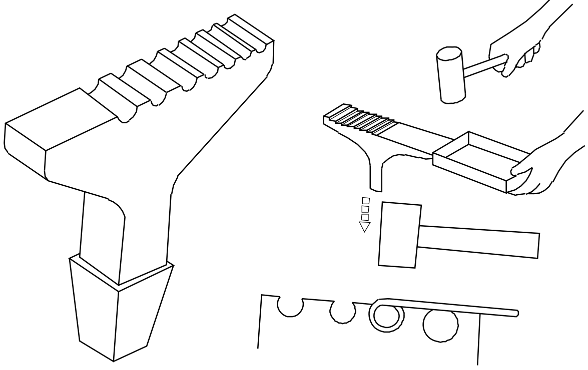
Pipe stake or Square edge stake (Fig 7): This stake has the horn and the shank. The horn is available in two types. one is with flat face as shown in (Fig 7A). Other one is with curved face as shown in (Fig 7B) Flat face horn stake is used to fold the edges, and to turn up straight edges. The

Fig 5



BEAK OR BICKIRON

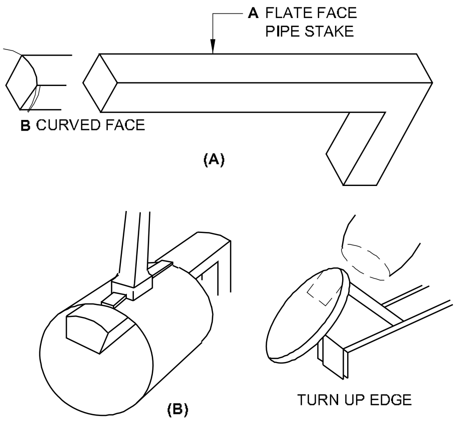
Fig 6



CREASING IRON

curved face horn stake is used to turn circular disc or curved edges and to make knocked up joints.

Fig 7

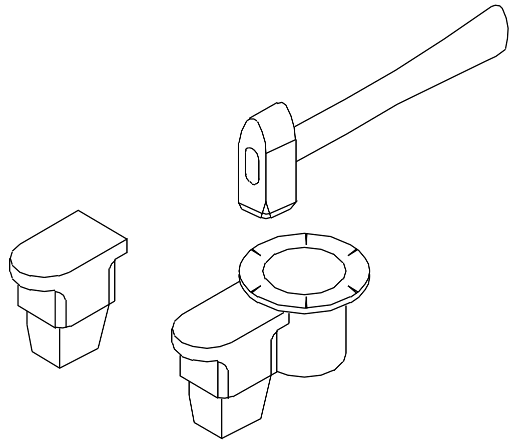


SEAM SETTING

Tinman's Anvil (Fig 8): It is used for planishing all types of flat shaped works. It is highly polished on its working surface.

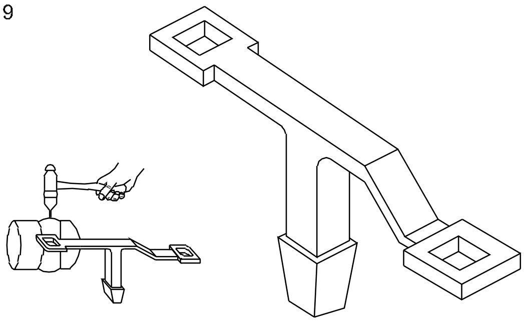
Tinman's Horse (Fig 9): This stake has two arms at its both ends, one of which is usually cranked downwards for clearance purpose. There is a square hole for the reception of a wide variety of heads. (Fig 10)

Fig 8



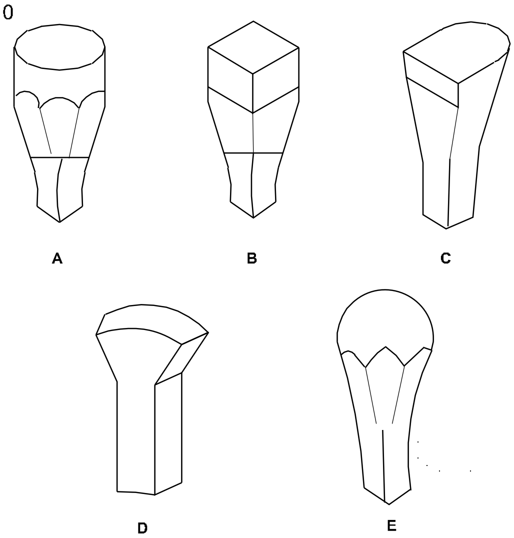
TINMAN'S ANVIL

Fig 9



TINMAN'S HORSE

Fig 10



HEADS

The surface of the stake is important for the workmanship of the finished article. Therefore, care must be taken to avoid any damage to the surface of the stake when centre punching or cutting with a cold chisel.

Apart from these stakes, special types of stakes are also available to suit different types of jobs.

Copper smith stake

Objectives: At the end of this lesson you shall be able to
- **identify a copper smith stake**
- **state the constructional features of a copper smith stake**
- **state the uses of a copper smith stake**
- **state safety, care and maintenance while using a copper smith stake.**

It is not economical to have too many stakes for simple operations in a sheet metal shop.

Hence, an economical way of tooling is adopted and designed by combining two edges of different cross sections on a common head as in Fig 1. This stake is called a copper smith stake or tinman's anvil. It is a very useful stake used in sheet metal work, due to its constructional features.

This stake is used for flattening the surfaces of the sheet metal, bending, flanging, finishing wired edges on both straight and curved edges.

These stakes are made of medium carbon steel and case hardened.

Safety care and maintenance

1 Fix the stake firmly in the bench plate or stake holder to avoid slipping and causing accidents.

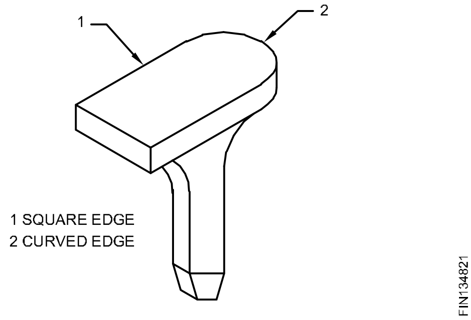
2 Do not use it for heavy work.

3 Do not spoil the surface of the stake by chiseling and punching.

4 Do not spoil the edges by cutting wire or nails on the edges of the stake.

5 Remove and keep it in its place after use.

Fig 1



Bottom round stake

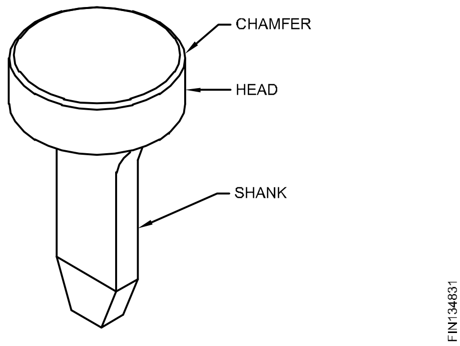
Objectives: At the end of this lesson you shall be able to
- **identify the Round Bottom Stake**
- **state the constructional features of this stake**
- **state the uses of this stake.**

Bottom round stake: This is a very common stake used in a sheet metal shop. This stake is round in shape with a flat face, slightly chamfered to avoid the cracking or tearing of sheets while using it.

It is used for turning edge on circular discs, seaming and fixing bottom to cylindrical parts, making a paned down joint at the bottom of the cylindrical parts. The tail is designed to fit in the square slot made in the work bench or stake holder.

Do not cut wires or nails on the edge of the stake. This will spoil the edge and the same impression will be formed on the sheet or the part formed on it.

Fig 1



Stake holders

Objectives: At the end of this lesson you shall be able to
- **name the different types of stake holders**
- **state the constructional features of stake holders**
- **state the uses of stake holders**
- **state safety, care and maintenance when using stake holders.**

There are three types of stake holders

1 Bench plate

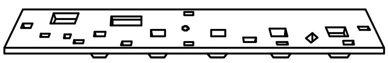
2 Revolving bench plate

3 Universal stake holder

Bench plate: Stakes are held in position while using them by means of a plate which is fastened to the work bench with bolts and nuts. These plates are called bench plates or stake holders.

These bench plates are made of cast iron and are rectangular in shape as in Fig 1. The tapered holes are conveniently arranged so that the shanks of the stakes may be fixed and used in any convenient position. The smaller holes are used to support the bench shears.

Fig 1



BENCH PLATE

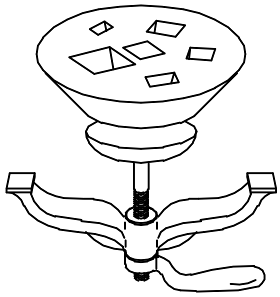
Revolving bench plate: Revolving bench plate consists of a revolving plate with tapered holes to support the shanks of the stakes while using them.

This revolving bench plate can be held in any convenient position by clamping it on to the work bench, with the clamping provision provided on it as in Fig 2.

Universal stake holder: Universal stake holder can be clamped to any desired position on the work bench. So it is preferred by most of the mechanics.

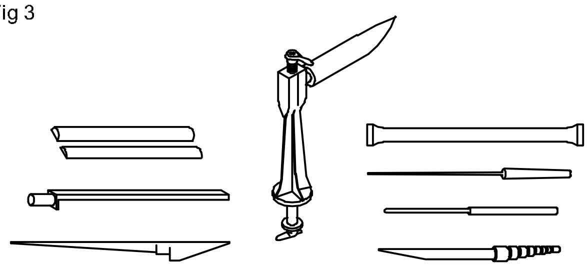
This stake holder is designed with a set of stakes which can be easily fixed on to the stake holder and hence it is termed as universal stake holder set as shown in Fig 3. One stake may be replaced by another very quickly by simply turning the swivel handle and replacing the stake.

Fig 2



REVOLVING BENCH PLATE

Fig 3



UNIVERSAL STAKE HOLDER

When placing an order to purchase this type of stake holder set, we should specify clearly the type of stakes to be supplied along with the stake holder.

Safety, care and maintenance:

- Fix the stake holder firmly on to the work bench.
- Do not use it for very heavy work.
- Do not overtighten the locking arrangements which may spoil the threads on the device.
- Do not place the unnecessary accessories on the work table. Place only the required ones.
- Avoid chiseling or punching on this stake holder.
- Remove and keep it in its place after use.

Sheet metal seams

Objectives: At the end of this lesson you shall be able to
- **state the types of seams.**

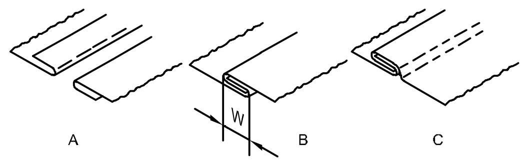
Introduction

In Sheet metal construction, mechanical seams are employed when joining light and medium gauge metal sheets. While fabricating sheet metal articles, the sheet metal worker should be able to select the type of seam that is best suited for the specific job.

Types of seams

1 **Grooved seam :** Grooved seam is most commonly used for joining sheet metal. This seam consists of two folded edges called locks as shown in Fig 1. The edges are hooked together and locked with a hand groover or a grooving machine.

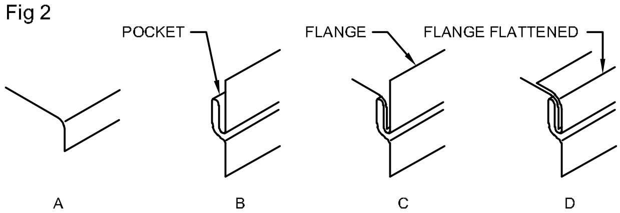
Fig 1



STEPS IN FORMING A GROOVED SEAM.

2 **Pittsburgh seam:** This seam is also called hammer lock or hobolock. This seam is used as a longitudinal corner seam for various types of pipes such as duct work. The single lock is placed in a pocket lock and then the flange is hammered over, step by step as shown in Fig 2.

Fig 2



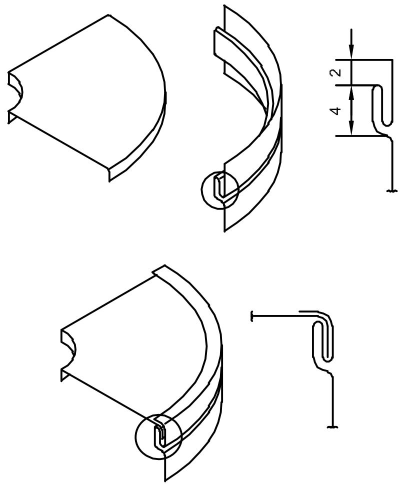
STEPS IN FORMING THE PITTSBURGH SEAM.

The advantage of the Pittsburgh seam is that the single lock can be turned on a curve and the pocket lock can be formed on a flat sheet and rolled to fit the curve as shown in Fig 3. If roll forming machine is not available in shop, Pittsburgh seam is formed on the brake.

3 **Dovetail seam :** This seam is an easy and convenient method of joining flanges to collars. There are three types of dovetail seams - plain dovetail, beaded dovetail and the flange dovetail as shown in Fig 4.

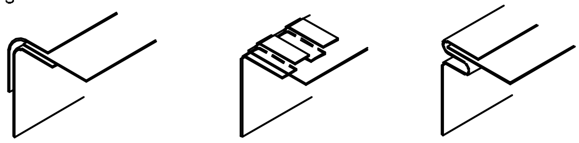
Dovetail seams are used mainly on round or elliptical pipe and rarely on rectangular ducts.

Fig 3



PITTSBURGH SEAMS CAN BE FORMED ON CURVES.

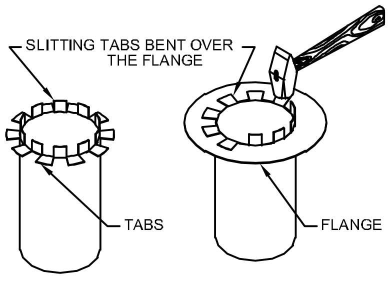
Fig 4



FLANGE DOVETAIL SEAM   PLAIN DOVETAIL SEAM   BEADED DOVETAIL SEAM

(A) **Plain dovetail seam :** It is used when joining a collar to a flange without the use of solder, screws or rivet. It is made by slitting the end of the collar and bending every other tab as shown in Fig 5

Fig 5



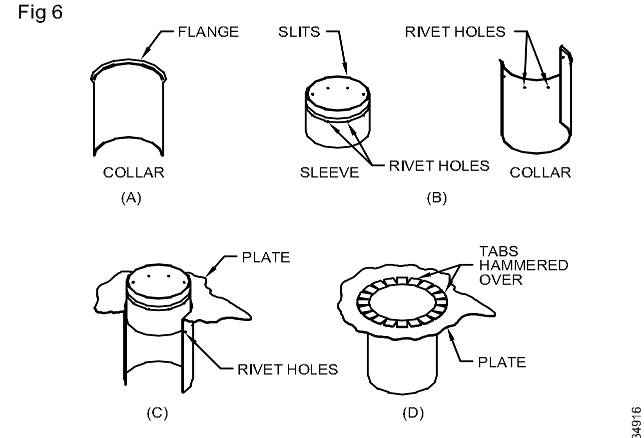
PLAIN DOVETAIL SEAM.

The straight tabs are bent over the part to be joined and the bent tabs act as stops. This seam may be made water tight by soldering around the joint.

(B) Flange dovetail seam

This seam is used where neat appearance and strength are important. The seam shown in Fig 6 is the assembly of a flange type dovetail seam for a cylindrical pipe. It is commonly used where pipes intersect with a metal plate such as furnace flues, ceilings etc. Steps in forming a flange dovetail seam are shown in Fig 6. First, a flange is turned on the collar, next, slits are cut at regular intervals at the end of the sleeve and matching rivet holes are drilled in the sleeve and the collar. The rivet holes are aligned and the rivets are installed and finally the tabs are hammered over to complete the seam.

Fig 6



STEPS IN FORMING A FLANGE DOVETAIL SEAM.

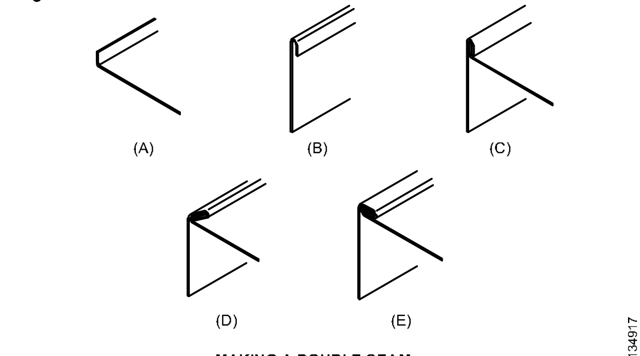
(C) Beaded dovetail seam

This is similar to the plain dovetail seam, except a bead is formed around one end of the cylinder by a beading machine. This bead acts as the stop for the flange to rest upon and the tabs are bent over to hold the flange in the desired place.

4 Double seam

There are two types of double seams. One type is used for making irregular fittings such as square elbows, boxes, offsets, etc. This seam is used on corners and can also be used as a longitudinal seam on small square and rectangular ducts. A double edge is formed and placed over the single edge and the seam is completed step by step as shown in Fig 7.

Fig 7

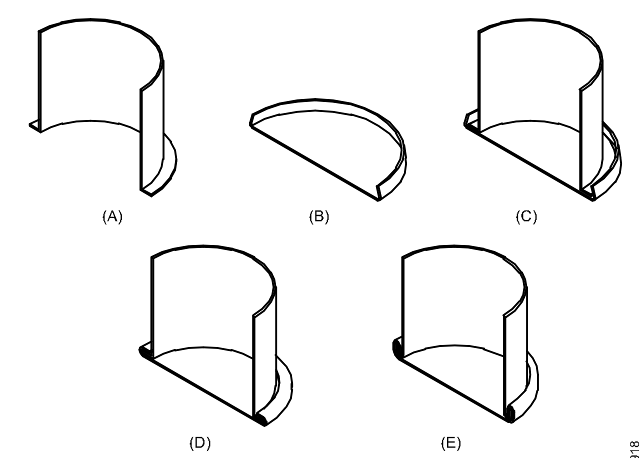


MAKING A DOUBLE SEAM.

The other type is used to fasten bottoms to cylindrically shaped jobs such as pails, tanks etc.

The steps in making this type of double seam is shown in Fig 8, where A is turned on the machine. B is burred on the burring machine. The bottom is snapped on the body as in C and is peened down as in D. Finally the seam is completed by using a mallet as in E. This seam is called Bottom double seam or Knocked up seam.

Fig 8



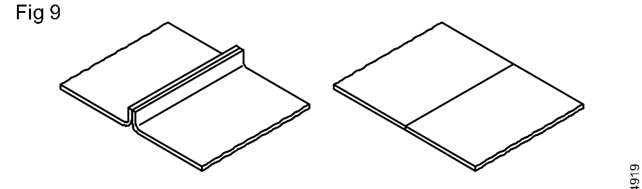
STEPS IN MAKING A BOTTOM DOUBLE SEAM.

If the seam is not turned up, as in D, the seam is called paned down seam.

5 Butt seam

This seam has two pieces butt together and soldered as shown in Fig 9. Figure shows two types of butt seams. One is flanged butt seam and the other one is butt seam.

Fig 9



(A) FLANGE-BUTT SEAM (B) BUTT

6 Lap seam

The lap seam is made by lapping the edge of one piece over the other piece and soldered as shown in Fig 10. Figure shows plain lap, sunk lap, inside lap and outside lap seams.

7 Slip joint seam

This seam is used for a longitudinal corner seam as shown in Fig 11.

The assembly of the seam consists of a single lock A and a double lock B. The single lock is slipped into the double lock C to complete the seam.

Fig 10

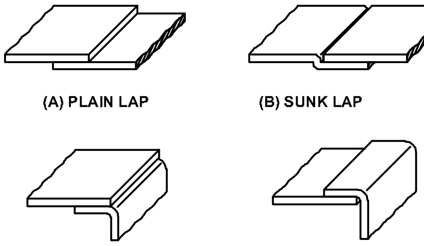
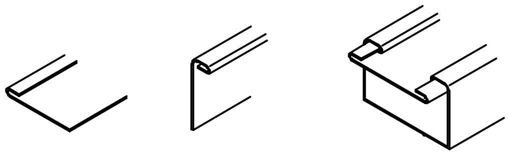


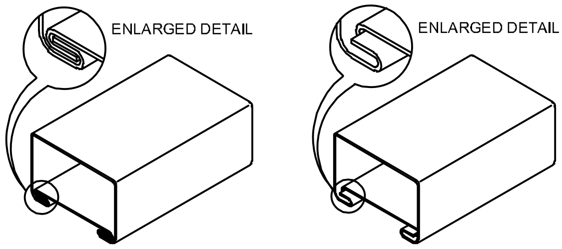
Fig 11



SLIP JOINT SEAM.

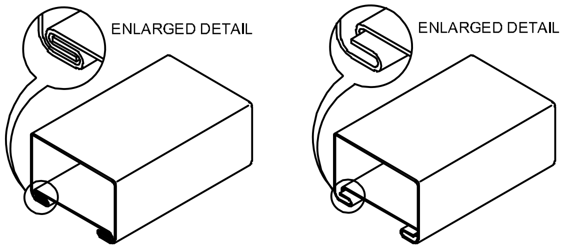
For making pipes with a slip joint seam, proper care should be taken to see that the corners of the metal are squared and the edges are trimmed. The proper slip joint is shown as A and improper as B in Fig 12. If the edges are not trimmed, it will twist the pipe out of shape and may cause the edges of the pipe to be uneven.

Fig 12



PROPER AND IMPROPER JOINING OF SLIP JOINT SEAMS.

Fig 12



PROPER AND IMPROPER JOINING OF SLIP JOINT SEAMS.

Locked grooved joint

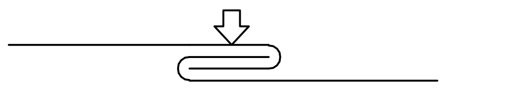
Objectives: At the end of this lesson you shall be able to
- **state the purpose of a joint**
- **state the use of the groover**
- **determine the allowance for the locked grooved joint**
- **know the type of shears**
- **know the uses of shears**
- **know about the shearing force**
- **know the blade clearance for optimum cutting.**

Locked grooved joint: Many methods are employed to join and strengthen the pieces of a sheet metal. One of the common joint is called locked grooved joint.

This is usually done on straight lines. The workpieces to be joined are made in the form of a hook, inserted and locked using a groover.

When they are interlocked and tightened only then it is called a "grooved joint" (Fig 1).

Fig 1



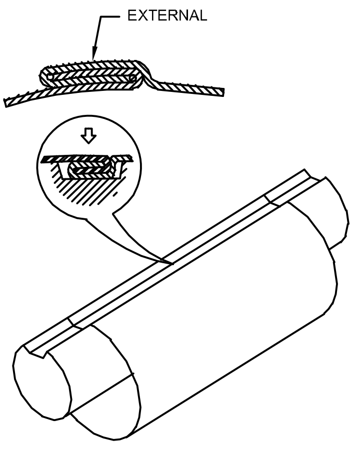
When the grooved joint is clinched down, making one side plane using a groover is called a "Locked grooved joint". (Fig 2)

Fig 2

External and internal locked grooved joints: This joint is used to join the two ends of a sheet metal to form a circular shape in longitudinal direction. When the seam is formed outside as shown in Fig 3 then it is called 'external locked grooved joint'.

If the seam is formed using grooved mandrel then it is called 'Internal locked grooved joint' (Fig 3)

Fig 3

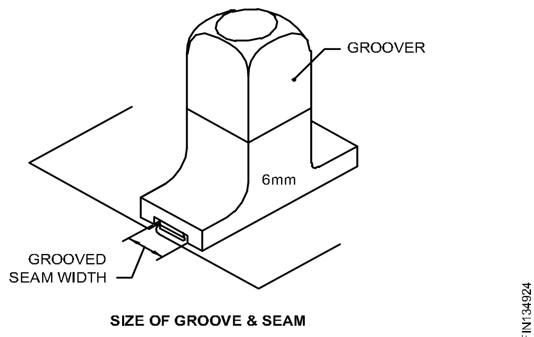


Hand Groover: The hand groover is made up of cast steel and is used to make external locked grooved joint.

A groove is made at the bottom of this tool to the required width and depth.

This has a handle in square or hexagonal shape like chisel to hold. This whole part is hardened and tempered. (Fig 4)

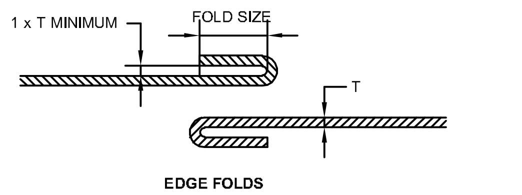
Fig 4



The hand groover is specified according to the size of the groove of the groover.

Locked grooved joint allowance: To arrive the size (width) of the fold to suit a particular groover, subtract the thickness by 3 times from the width of the groove. (Fig 5)

Fig 5



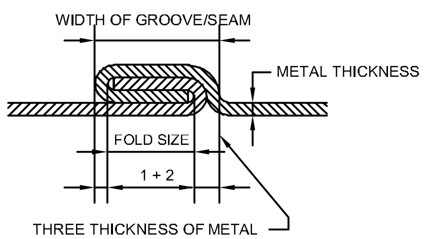
For example, the width of the groover is 6 mm and the sheet thickness is 0.5 mm,

Then the width of the fold

= 6 - (3 x 0.5)

= 4.5 mm (See Fig 6).

Fig 6



Stake joint

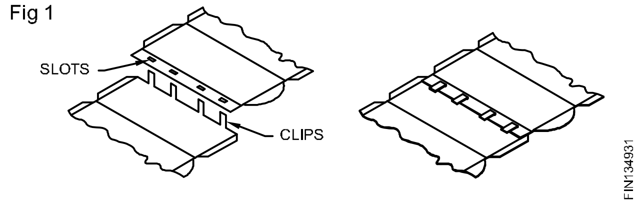
Objectives: At the end of this exercise you shall be able to
- **State the applications of stake joint**
- **state the types of stake joints.**

Stake joint

It is one of the folded joint and is used in light articles such as toys. It is also called as joint.

In this type of joint, clips are cut on one pieces to be jointed. Clips are inserted in slots and folded flat either in one direction or alternate clips are folded in opposite direction. (Fig 1)

Fig 1



Types of stake joint

i Straight stake joint

ii Zigzag stake joint

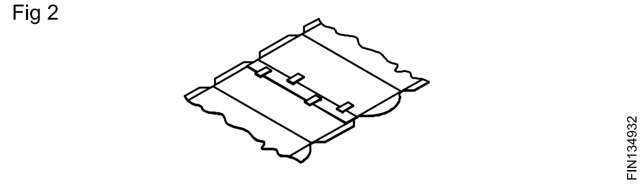
Straight stake joint

In this joint, clips and slots are in a line an the clips are inserted directly, into the slots, folded and smashed in opposite direction. (Fig 1)

Zigzag stake joint

In this joint, clips are inserted in the slots and alternate clips are folded in opposite direction. (Fig 2)

Fig 2



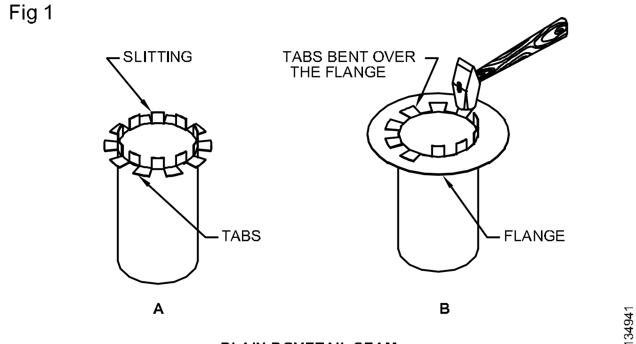
Dovetail seam

Objectives: At the end of this exercise you shall be able to
- **state a dovetail seam**
- **state the uses of a dovetail seam**
- **differentiate between a dovetail seam and a cramped joint.**

Dovetail seam is a very useful joint in sheetmetal fabrication work. The shape of the tabs cut like the tail of a dove. Hence it is called a dovetail seam. It is mostly used to join the bottom to the body of sheet metal articles.

This seam is very useful when joining a collar to a flange without using solder or screws or rivets. This is done by slitting the end of the collar at regular intervals and bending every other tabs as in Fig 1. The bent tabs act as stoppers and the remaining tabs are bent over the plate to be joined as in Fig 1. This joint may be made water tight by soldering if required.

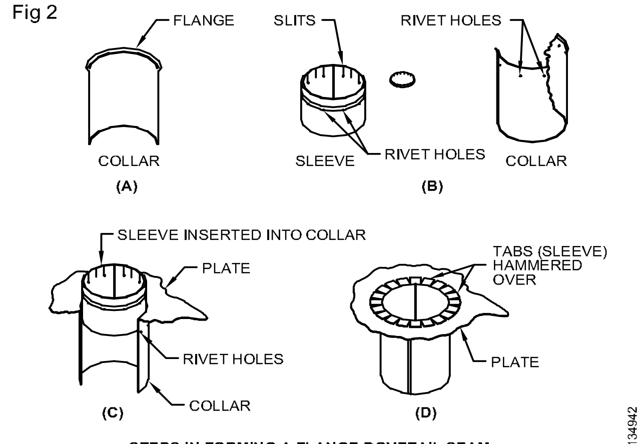
Fig 1



PLAIN DOVETAIL SEAM.

Flange dovetail seam (Fig 2): Fig 2 shows the assembly of a flange dovetail seam for cylindrical pipe. It is commonly used where pipes intersect witha flat metal plate such as furnace constructional works. This is done where extra strength and good apperance is required. First a flange is turned on the collar Fig 2A. Next slits are cut at regular intervals at the end of the sleeve and matching rivet holes are drilled in the collar and sleeves Fig 2B. the plate rests on the collar flange and sleeve is inserted into the collar Fig 2C.the rivet holes are aligned and the assembly is riveted. Finally the tabs are bent over to complete the seam. Fig 2D.

Fig 2



STEPS IN FORMING A FLANGE DOVETAIL SEAM.

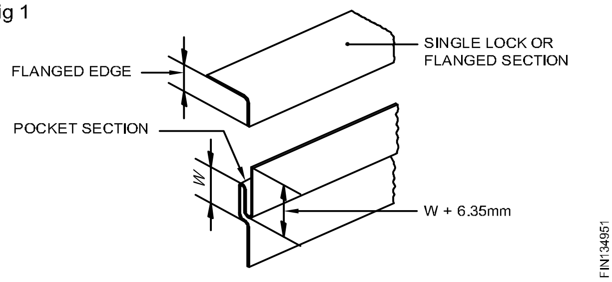
Pittsburg lock

Objectives: At the end of this exercise you shall be able to
- **define the pittsburg seam**
- **state the different types of pittsburg seams**
- **state the uses of pittsburg seams.**

Pittsburg lock is used in Duct work and is formed using folding machine.

It consists of a single lock or flanged section and a pocket lock or pocket section. (Fig 1)

Fig 1



Single lock can be turned on the curve and pocket lock to be formed on a flat sheet and then rolled to fit the curve.

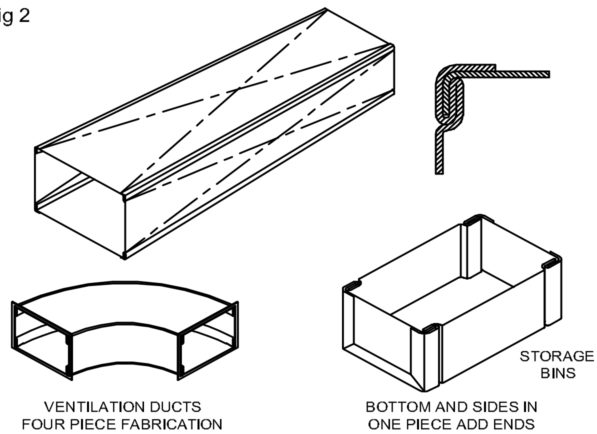
Example: W +W + 6.35mm

The width of the flanged edge is normally made slightly less than the depth of the pocket.

Usually, the allowances for the pocket is between 25 and30 and for the flange is between 6 to 8.

Fig2 shows the applications of pittsburgh lock the seam.

Fig 2



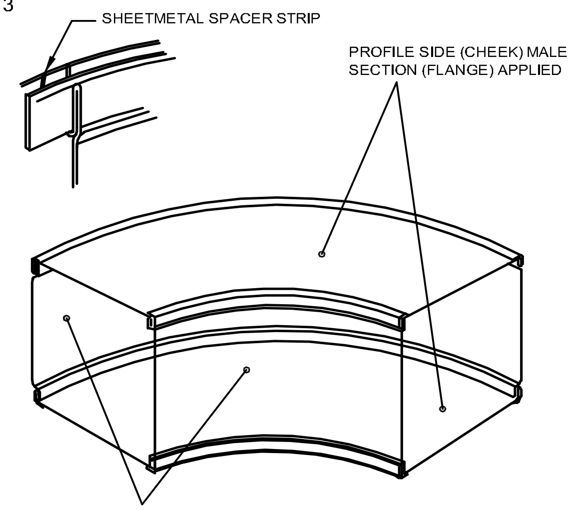
APPLICATIONS PITTSBURGH LOCK SEAM

Pittsburg losk seam applied to curveed work Fig 3

When curved ducts like elbows are to be which incorporate the pittsburgh lock, the female section of the seam is formed prior to curving.

To make correct lock shape, a sheet metal strip spacer is placed in between the first and second layers of the lock. The side is then curved t the shape in curving rolls. The spacing strip is removed before assembling the component.

Fig 3

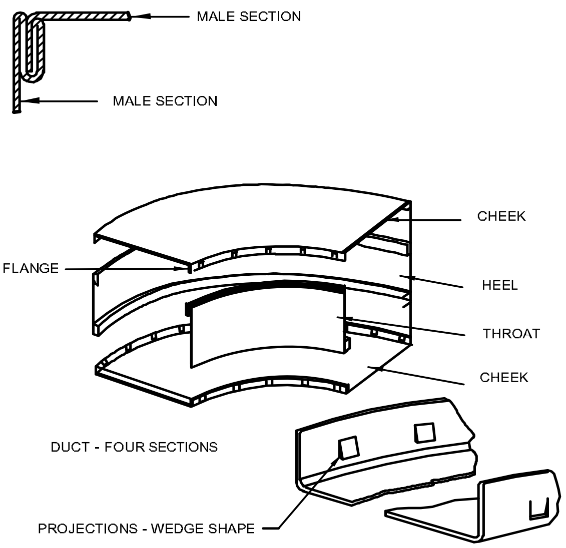


Snap lock seam: Snap lock seam is as role formed seam and is machine similar to pittsburgh lock seam. (Fig 3)

The allowance for this joint depends on the machine setting and is usually 25 to 30mm on the female lock setion and 10mm allowance for the male section.

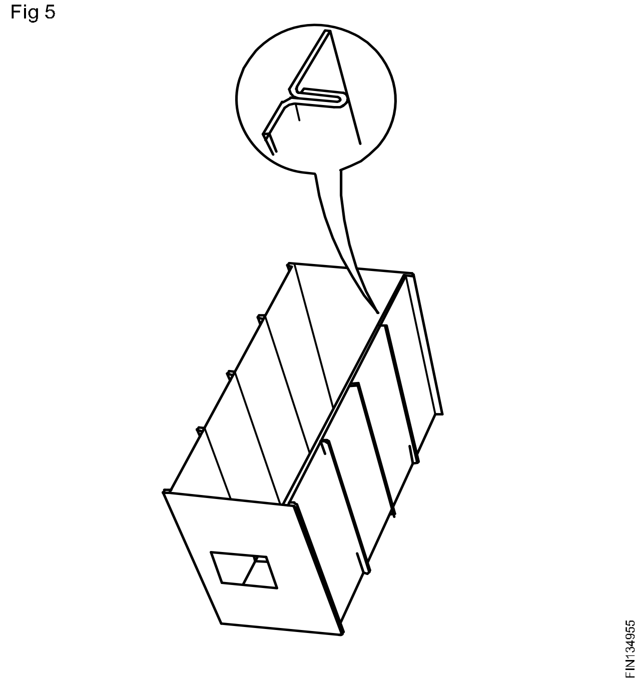
The male section has small wedge shaped projections, punched at regular intervals on the flange as shown in Fig 4. When this flange is pressed into female section, the projections lock under a fold edge. This joint is a longitudinal seam in used in duct work. It is better than Pittsbugh seam because it is heat in a apperances and requires less time in fabrication.

Fig 4



The standing seam (Fig 5): This standing seam is used primarily to join panel section together. by allowing large castings and wall cladding to be made with standard sized sheets.

Fig 5



Strength and rigidly of the panel and the joint design is simple and cost effetive as shown in Fig.

The standing seam has a standing flange section which may be from 25mm to 40mm depending on the length of the seam and thickness of the material. Movement of the seam is areested by button punching, riveting or bolting the flange upstand 50mm from the end of the seam at 150mm intervals. The standing seam can be prepared in a bar folder or by manual folding.

Cleat joints

Description and Allowances: Folded joints are the integral parts of an article and they all considered to be permanent fixtures.

Cleats vary in application and design and commonly made in a barfolding machine. Cleats which are of simle design can be manually folded.

It is a good practice to make a sample of the component to be connected. Determine the size of the cleat.

The drive slip: the drive slip is a simple design consisting of a metal strip formed into a 'C' shaped section as shown in Fig 6. The joint is made by driving the cleat over the folds positioned at each end of the work to be joined. The drive slip is mainly used to join lengths of duct work. the joint is simply made by driving the cleat over the folds on the ends of the jobs as shown in Fig 7.

However, cleat joints consist of a folded cleat section which inter locks with folds on articles to be joined and can be dismantled, if necessary.

Fig 6

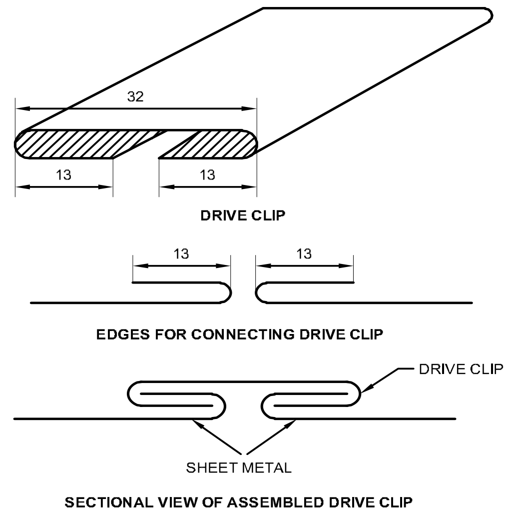
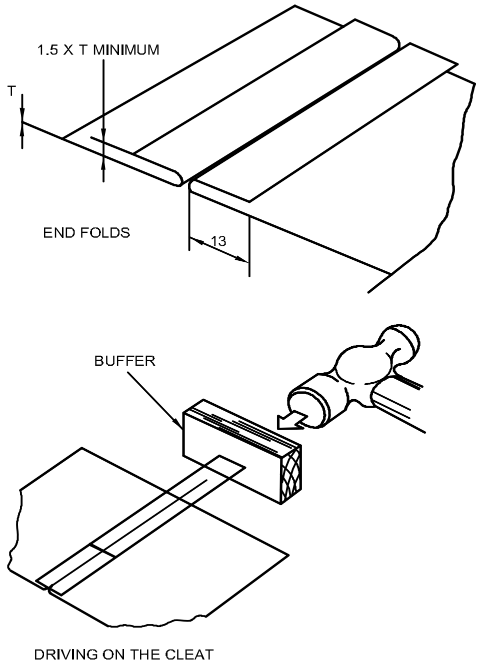


Fig 7



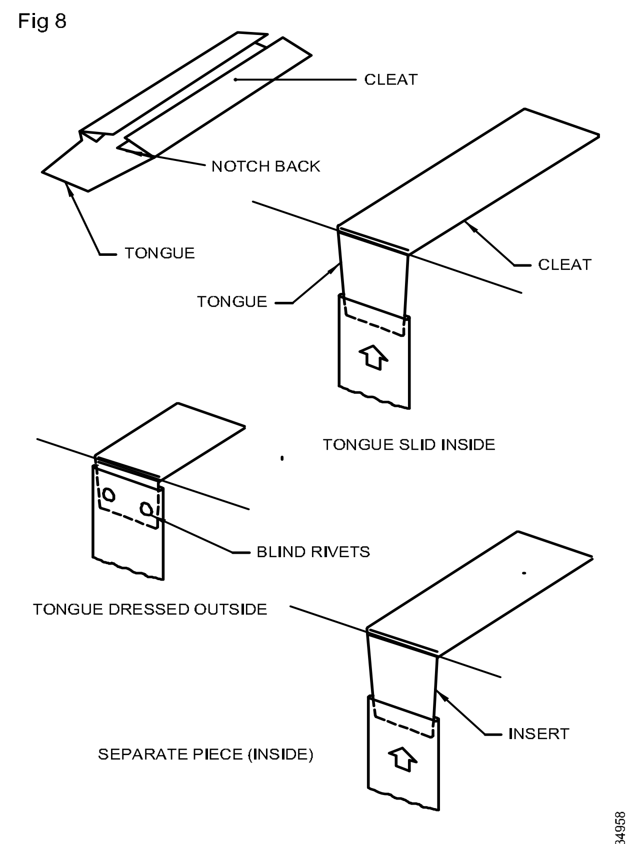
It is a good practice to insert a tongue into the end folds of the abutting cleat. An alternate is to bend the tongue and secure with blind the tongue and secure with blind rivets as shown in Fig 8. A similar corner finish may be done.

Variation of duct end design will provide additional strength as shown in Fig 9. In one example drive slip can be used to connect channel folded ducts ends, which is giving the appearance of a standing.

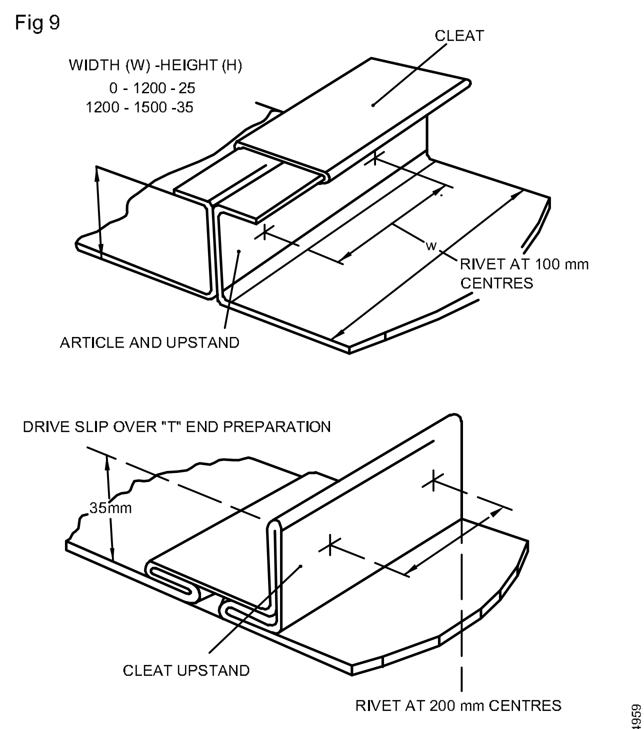
Another example is the modification to a dive slip to include on upstand section.

The Hemmed "S" slip: Used on ducts up to 600 mm in width.

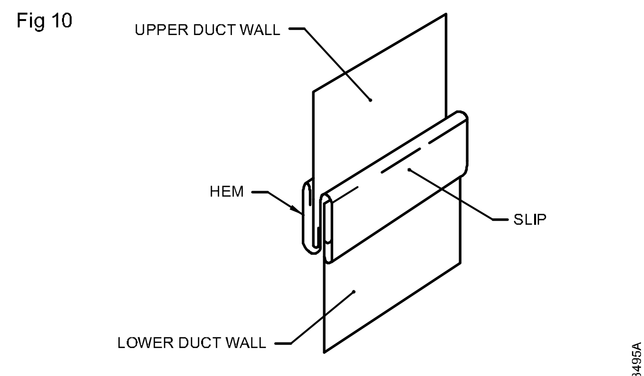
Insert the ends of the duct sections into the open folds of the "S" and secure with rivets at 100 mm intervals as shown in Fig 10.



DRIVE CLEAT CORNER FINISH

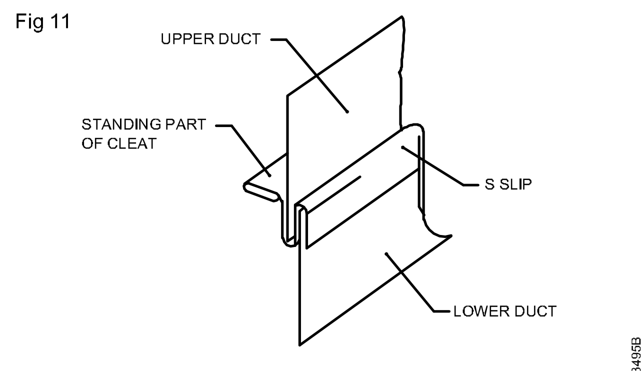


STANDING DRIVE SLIP JOINT DESIGN VARIATION



THE HEMMED 'S' SLIP

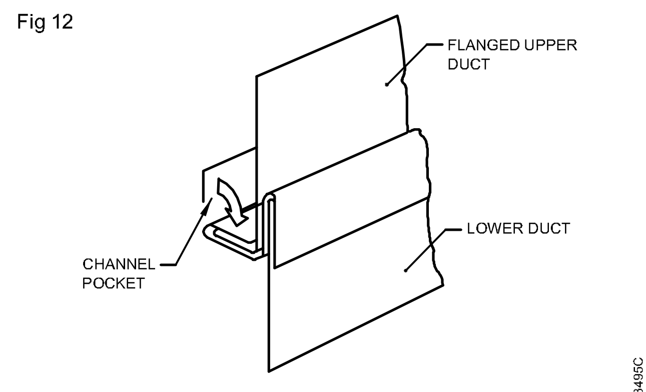
Standing "S" Slip: Used on ducts upto 1200 mm width in made with a 35 mm upstand and 1500 mm wide with stand of 50 mm as shown in Fig 11.



THE STANDING 'S' SLIP

Pocket lock

For using a transverse joint on vertical duct, the cleat slips over the upper edge of the bottom duct and the channel part of the cleat takes the flanged end of the upper duct as shown in fig 12



THE POCKET LOCK

The upstanding fold of the channel is dressed down by hand, commonly at the time of installation.

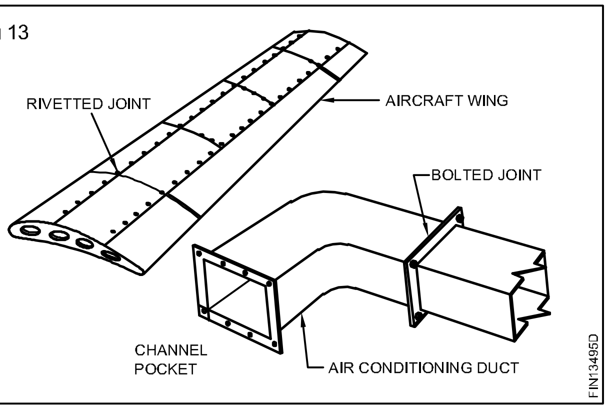
Mechanical fasteners

Introduction

A mechanical fastened joint is one in which two or more sheet metal pieces are held together by a manufactured device.

There are many variety of mechanical fasteners available.The riveted joints in aircraft wing and the joints bolted in air conditioning duct work provide two examples as shown in Fig 13.

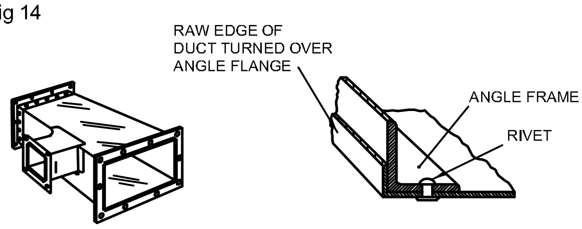
Fig 13



Use of angle stiffeners

Welded angle frames are used as the means of stiffening and supporting rectangular ducts which are used for high velocity systems. They also serve the purpose of joining media when assembling sections together by bolting as shown in (Fig 14)

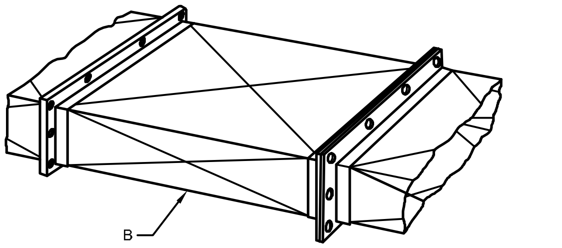
Fig 14



SECTION OF RECTANGULAR DUCTWORK

The large size of square or rectangular ducting tend to drum when the air pressure passing through them varies. To overcome this drum, it isnecessary to keep aadequate stiffening to the walls of ducts, it is necessary to keep aadequate stiffening to the walls of ducts. This can be achieved by the use of swaging but often a diamond break iis used as shown in (Fig 15)

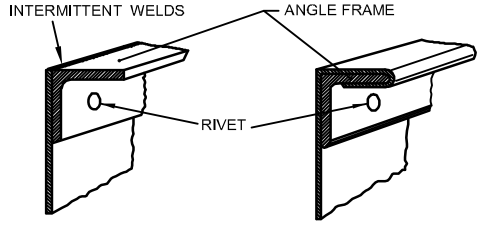
Fig 15



(B) DIAMOND - BREAK STIFFENING OF DUCT WALLS
SLIGHT DIAGONAL FOLD FROM CORNER TO CORNER

Simple angle frames of welded construction may be used for supporting and stiffening the open ends of tanks or bins made from sheet metal. Two methods of attaching the angle frames are shown in (Fig 16)

Fig 16



USE OF ANGLE STIFFENERS

Folding and joining allowances

Objectives: At the end of this lesson you shall be able to
- **state the necessity for providing allowances in sheet metal operations**
- **calculate the allowances for grooved joints**
- **calculate the allowances for dovetail joints**
- **calculate the allowances for paned down and knocked up joints.**

When making self secured joints or seams, it is necessary to provide material for the preparation of the edges and seams, the extra material is called an allowance.

The allowance is necessary for maintaining the correct size of the finished product and for improving the strength at the joints of all edges.

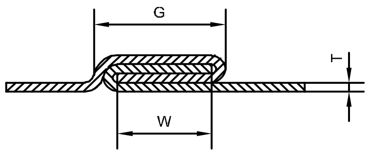
Allowance is also necessary for avoiding cracking or warping, and for obtaining the required finish.

This allowance depends upon the width of the folded edge and the thickness of the metal.

You may neglect the thickness of the metal for thinner sheet of 0.4 mm or less.

Allowance for grooved joints/ seams (Fig 1): If we fold over the edges to width W and form the joint, the final completed width of the joint G will be greater than W. It can seen that the final width of the groove will have a minimum value of W+ 3T, where T represents the metal thickness.

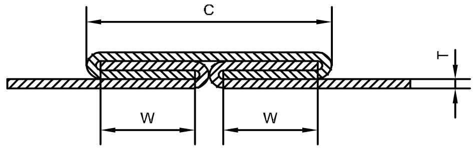
Fig 1



The allowance for a grooved seam is the width of the seam + three times the thickness of the sheet

Allowance for double grooved seam/joint: It will be seen from Fig.2 that the width of the capping strip is equivalent of two times the width of the folded edge plus four times the thickness of the metal size.

Fig 2



The complete allowance for the Double Grooved Seam/ Joint will be four times the width of the folded edge plus four times the thickness of the metal.

Allowance for paned down and knocked-up-joints.

The size of paned down and knocked-up joints is determined by the width of the single folded edge.

'P' represents the size of the paned down joint (Fig 3) and 'K' represents the size of the knocked-up joint. (Fig 4)

Fig 3

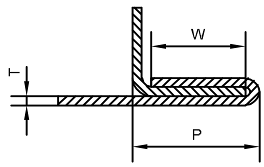
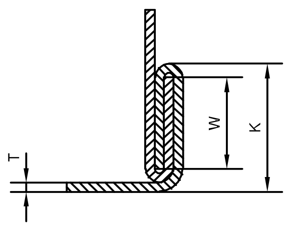


Fig 4



Allowance for P = 2W + 2T

Allowance for K = 2W + 3T

Edge stiffening by wiring

Objectives: At the end of this lesson you shall be able to
- **state what is edge stiffening**
- **state what is the purpose of edge stiffening**
- **state methods of edge stiffening by wiring.**

Edge stiffening: Edge stiffening is the process by which edges of the sheets are made stronger and rigid.

Edge stiffening is done by

1 Wiring
2 Hemming
3 Flanging
4 Curling
5 Beading
6 Gutting
7 Ribbing

Purpose of edge stiffening

1 To give extra strength and rigidity to edges, to prevent it from bending/buckling, damage during handling etc.

2 To avoid sharp edges for safe handling.

3 In addition, this adds to decorative appearance of the sheet metal articles.

Methods of edge stiffening by wiring

1 Solid wiring

2 False wiring

In solid wiring, sheet metal edges are wrapped around the wire and wires are kept permanent in place. This is generally called simple "Wiring".

In false wiring, sheet metal edges are wrapped around the wire, after forming final shape, the wire is removed from the edge to retain it hollow.

If the edge of the sheet metal is straight, the edge formed is called "straight wired edge".

If the edge of the sheet metal is curved, the edge formed is called "curved wired edge".

False wiring cannot be done on curved edges

Wiring allowance

Objectives: At the end of this lesson you shall be able to
- **state what is wiring allowance**
- **determine the wiring allowance.**

Wiring allowance is nothing but the amount of additional length provided on sheet metal to wrap around the wire to make a wired edge.

Wiring allowance is deterined by the following formula.

Wiring allowance = 2.5 x d+t

where

d=dia of wire

t=thickness of sheet metal

If wiring allowance provided is more, then the correct shape of the wire is not formed. If wiring allowance provided is less, the gap is found at the inner side of the edge and the wire can be seen.

Generally, the length of the wire provided is slightly more than the length of the edge. This is required to hold the wire at ends, while forming the edge of the sheet metal around the wire.

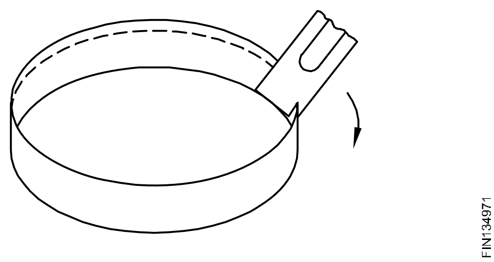
Surplus wire is cut after the wired edge is finished.

Making wired edge along a curved surface by hand process

Objectives: This shall help you to
- **mark the wiring allowance at the curved edge**
- **make a wired edge along a curved surface by hand process**

Mark the wiring allowance at the curved edge to be wired using a gauge with sheet metal as shown in Fig 1.

Fig 1



Flange the edge to be wired using a hatchet stake and a setting hammer, step by step upto 90°. (Fig 2) Then upset the flange to its half the width and make curve on the flange for wiring. (Fig 3)

Fig 2

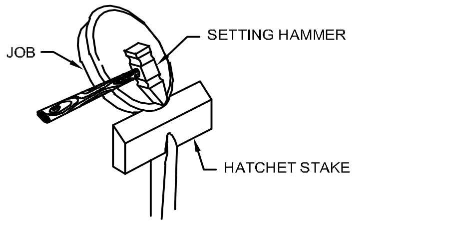
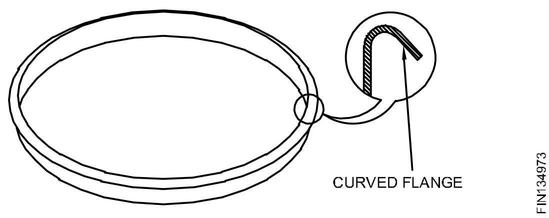


Fig 3

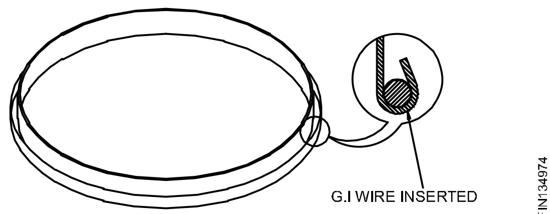


Make a round ring from the given G.I.wire to the required dia. (Fig 3)

The joint of the wire should be opposite to the locked grooved joint.

Place the G.I. Wire ring on the flange. (Fig 4)

Fig 4

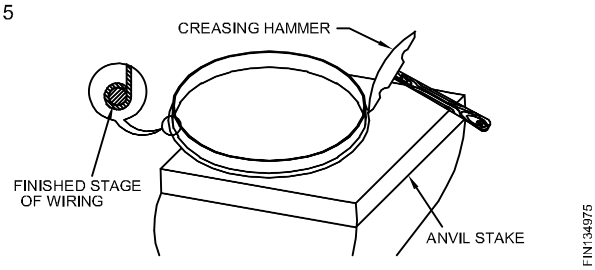


Complete the wiring using a creasing hammer. (Fig 5)

Dress the wiring by using a half moon stake and a mallet.

Redress the trueness of the cylindrical shape by a round mandrel and a mallet.

Fig 5



False wiring

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

- **state what is false wiring**
- **state advantages of false wiring**

False wiring is one of the methods of edge stiffening in which wired edge is formed and fially wire is removed from the edge, to makethe edge hollow.

Advantages of false wiring: In addition to advantages by wiring, false wiring gives following advantages.

1 Cost of the article is reduced.

2 Weight of the article is also reduced.

In sheet metal articles like trunks, boxes etc,. wiring is done only at the corners of the adjacent sides and the remaining portion of the wired edge is kept hollow.

This helps to maintain the sides in position.

Hemming

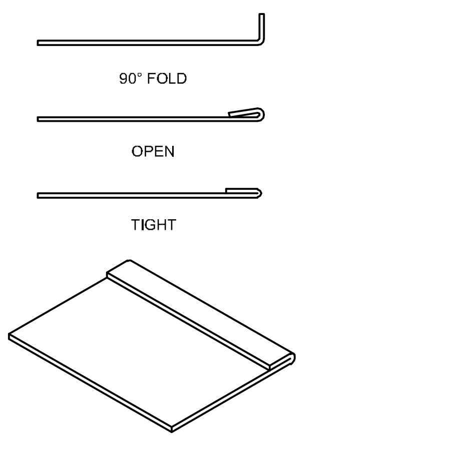
Objectives : At the end of this lesson you shall be able to

- **state the importance of hemming**
- **determine the hemming allowance.**

The sheet metal edges being thin are very unsafe while we handle. They are like knife edge and can cause injuries. Therefore the edges should be made blunt by way of making the edge folded to 180°. Also since the sheet metal is very thin the edges will deflect due to low strength without stiffness.

For the above reasons the edges are hemmed(Fig 1) which will ensure safety, retaining of shape, owning to the stiffness and also enhance good appearance.

Fig 1



SINGLE HEM

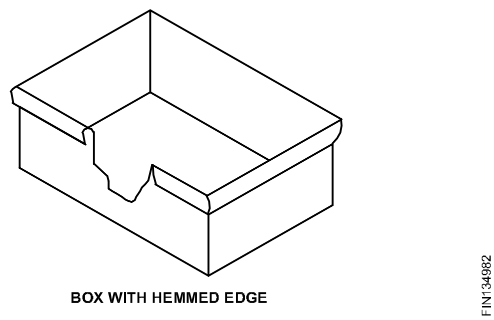
The folded edge will be more strong if it is not completely flattened and a hollow channel is made.

Usually the hemming allowance will be 3 to 4 times the thickness of the sheet to be hemmed, subject to a minimum of 4 M M.

If the hemming widdth is more, wrinkles are formed at the hemmed edges.

A hemmed box is shown in Fig 2 gives good appearance, safe and strong edge.

Fig 2



BOX WITH HEMMED EDGE

Double hemming by Hand Process

Objectives : At the end of this lesson you shall be able to
- **state the purpose of double hemming**
- **give the hemming allowance for the first and second folds.**

Double hemming is done by folding twice. This give more strength, when compared to single hemming. This is done on various sheet metal articles which in square, rectangular objects like trays. (Fig1 & Fig 2)

While doing double hemming, care must be taken making second fold. Angle of folding should be grade increased throughout the length of the fold.

Fig 1

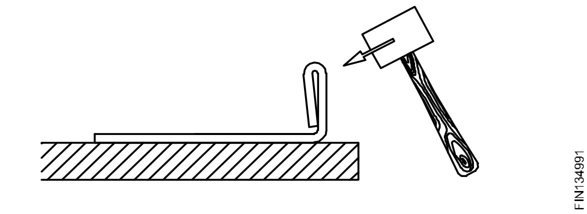
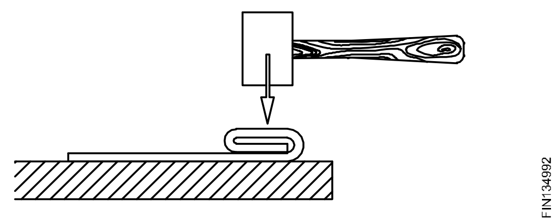


Fig 2



Edge Stiffening

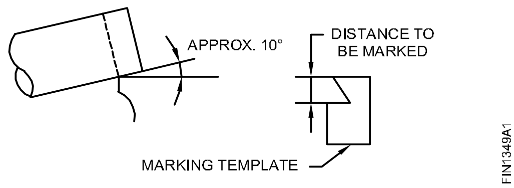
Objectives : At the end of this lesson you shall be able to
- **make a single hemming on a curved edge using anvil stake and setting hammer.**

Mark the hemming allowance on the formed body using a marking template.

Fix the anvil stake on to the vice or bench plate.

Hold the workpiece such that the marked line coincides with the edge of the stake approximately inclined an angle of 10° as shown in Fig 1.

Fig 1



Strike and rotate the workpiece gradually along the marked line to form a small flange using a setting hammer. (Fig 2)

Gradually increase the angle of inclination while forming range as shown in Fig 3.

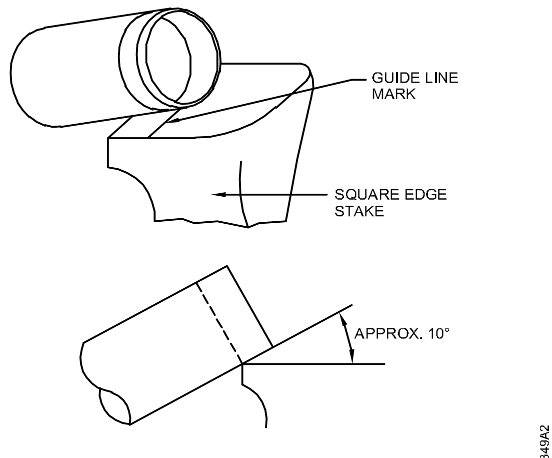
Finish the hemmed edge on a round mandrel stake by a let (Fig 4)

Press the disturbed body of the cyclinder to a round shape using round mandrel stake and a mallet

Check the cylindrical body for roundness and the marketing allowance for flanging.

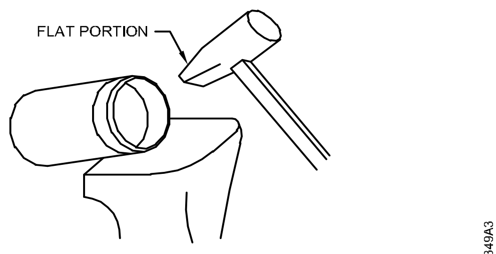
Fix the copper smith stake in the benchvice or bench plate firmly.

Fig 2



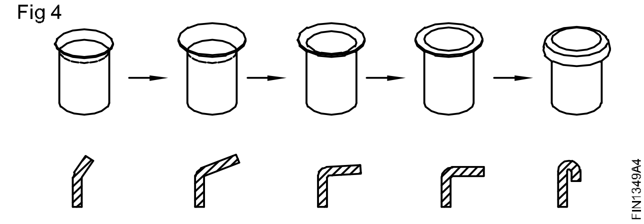
SQUARE EDGE STAKE

Fig 3



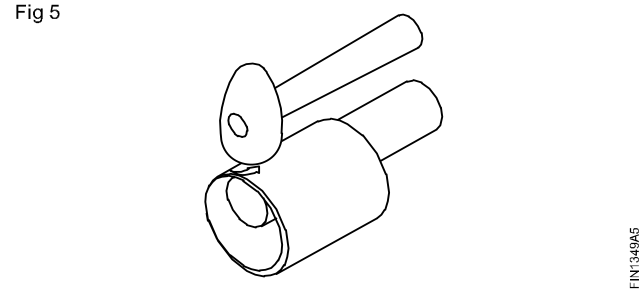
SETTING HAMMER

Fig 4



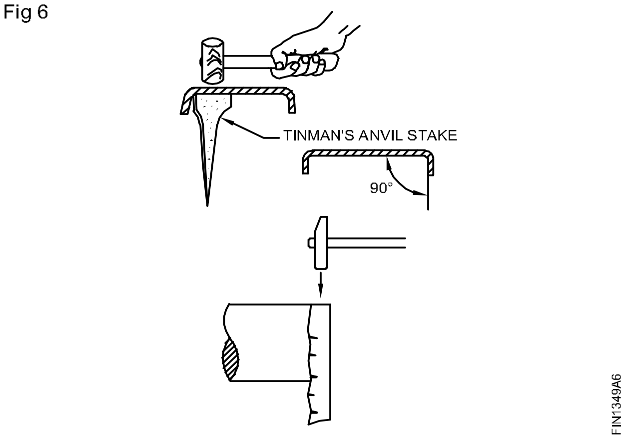
Mark the flanging allowance as guideline on the stake as in Fig 5

Fig 5



Hold the cylinder such that the marked line on the cylinder for flanging, coincides with the straight edge of the stake. (Fig 6)

Fig 6



Position the cylinder as in Figure 1 and strike the metal using the flat face of the finishing hammer.

Rotate the body of the cylinder by one hand.

Strike with finishing hammer to increase the angle of bending gradually as in (Fig 7) till the flange is bent to 90°

Fig 7