PENANG SANGAM HIGH SCHOOL
P.O.BOX 44, RAKIRAKI
WEEK 22 WORKSHEET

Subject: Basic Technology **Year/Level:** 10

Strand	**BT10.6 JOINTS AND PROCESSES**
Sub Strand	BT10.6.1 WOODWORK JOINTS
Content Learning Outcome	BT10.6.1.1 Identify and state the use of complex woodwork joints and develop confidence in skillful construction of the joints incorporated in tasks, projects and other artifacts.

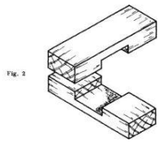
LESSON NOTES

Continued from week 21 Lesson notes….

JOINTS AND PROCESSES

Cross-halved joint

The third halved joint we deal with is the cross-halved joint (Fig. 2). It is used where two members cross each other.



Common Mortise and Tenon joint

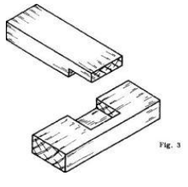
This is one of the most common and strongest forms of framing joint.

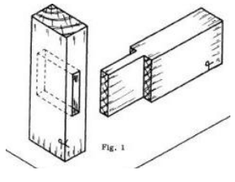
Constructing the joint:

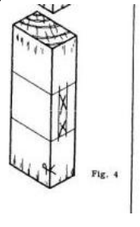
Step 1 - Preparation of timber Prepare the timber using the FEWTEL (Face Side, Face Edge, Gauge for Width, Gauge for Thickness, Shoot the End, Measure the required Length) method.

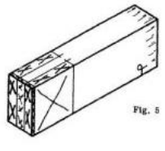
Step 2. Marking out

a) Mark out the position of the mortise and square the lines across the face side and edges, using a try square and pencil (Fig. 2).
b) Mark out the length of the tenon on the other member. Allow 3 mm waste on the end. Square lines all around (Fig. 3).
c) Set a marking gauge to the size of the tenon (one-third of the width of the piece) and mark around the end of the tenon (Fig. 5). Mark the waste.
d) Use the same setting to mark both edges of the mortise and mark the waste (Fig. 4). Do all marking from the face side.
e) Check the marking, using the pieces as a guide by placing them over the marks (compare this sequence to the mortise and tenon for box-like constructions).





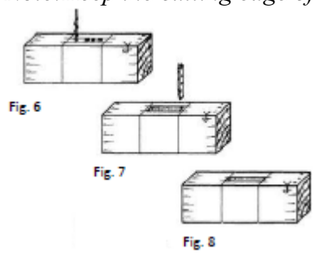




Step 3 - Cutting the mortise

a) Most of the waste may be bored out (Fig. 6). Bore halfway through from both edges. Make sure you keep the brace at a 900 angle to the edge.
b) Chop out the remaining waste, chiseling halfway through from both edges. Leave about 2 mm extra to prevent damage to the sides of the mortise during chiseling (Fig. 7).
c) When most of the waste is out, chisel out the remainder to the line (Fig. 8).

Note:Keep the cutting edge of the chisel



Step 4 - Cutting the tenon

a) Rip the sides of the tenon, sawing on the waste side of the lines(Fig.9)
b) Saw in steps (see tee-halved joint).
c) Carefully saw the shoulders, keeping the saw vertical and on the waste side of the line (Fig. 10 &11).

Step 5 - Assembling the joint

a) Check whether the members fit together (see Assembly section for the mortice and tenon joint for box-like constructions).
b) Clean up inside the joint where it cannot be reached after assembly.
c) Assemble the joint with glue.
d) When it is dry, plane off the waste of the tenon.
e) Clean up the edges and sides with a smoothing plane.

Note:The importance of marking the waste as you mark out the pieces. This cannot be over-emphasized. Most construction mistakes are made by cutting on the wrong side of the line, due to improper marking.

Haunched Mortise and Tenon joint

Another type of mortise and tenon for frame -like constructions is the haunched mortise and tenon joint (Fig. 1). This joint is used where one member meets another at a corner.

The width of the tenon is reduced to 2/3rd of the width of the board and the mortise size is reduced to suit (Fig.1).

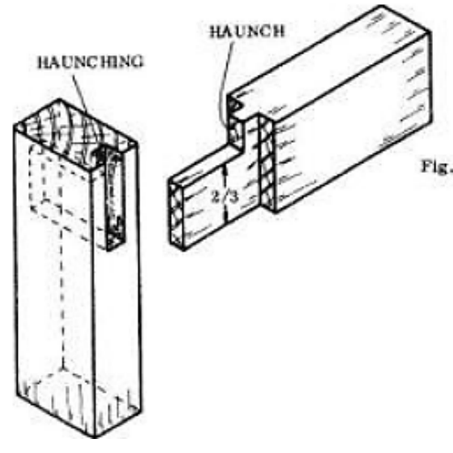


Fig. 1

A haunch is left on the tenon to prevent it from twisting in the mortise. The length of the haunch is equal to the thickness of the tenon and it fits into a recess above the mortise, called the haunching.

Stub Tenon Joint

Where the end grain of the tenon and the opening of the mortise must be hidden, the stub tenon joint is chosen (Fig. 2). in this joint the tenon does not pass through the mortised member, but is stopped inside. The sequence of operations for constructing this joint is the same as for the common mortise and tenon joint. Stub tenons are also used for box-like constructions.

At times a combination of the haunched and stub tenons is required. This is called a haunched stub mortise and tenon joint.

Securing the joints:

(a) Instead of nails to secure mortise and tenon joints, either pegs or wedges can be used.

(b) One or two holes are drilled through the assembled joint and wooden dowels, or pegs, as they are called in this case, are inserted with glue to securely fix the join (fig. 1).

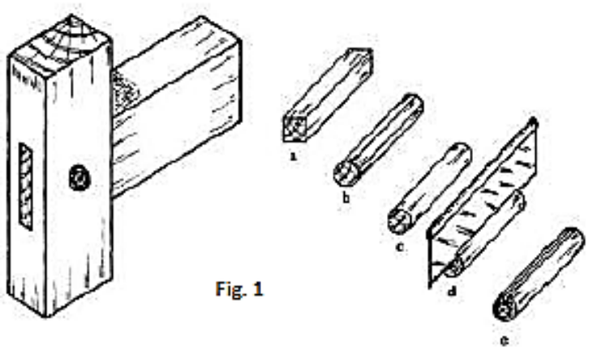


Fig. 1

(c) To make the dowels, plane off the corners of a square piece of hard wood, until the piece is round. When the dowel is cut to length, chamfer the ends and cut a groove along the length to permit air and excess glue to escape (Fig. 1, a - e).

Follow the steps below to secure a joint by means of wedges.

(a) Cut the mortice with an allowance of 2 mm in width, tapering from the outside edge to about 2/3rd of its depth (Fig. 2).

(b) Make cuts in the tenon to receive the wedges.

(c) To prevent splitting of the tenon, drill small holes at the end of each cut.

(d) Cut the wedges from small pieces of waste wood; they should have the same length as the tenon.

Haunched mortise and tenon joints in frame-like constructions should not be wedged, because of the danger of breaking off the small haunch at the corner of the joint. Both wedges and pegs can be used for securing mortise and tenon joints in boxlike constructions.

Constructing the joint: HAUNCHED-CHECK

Step 1 - Preparation of the timber.

Prepare the timber using the **FEWTEL** (Face Side, Face Edge, Gauge for Width, Gauge for Thickness, Shoot the End, Measure the required Length) method.

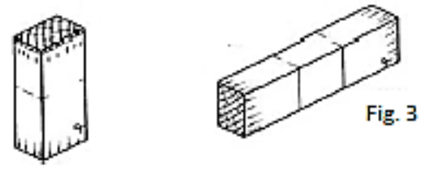


Fig. 3

Step 2 –

Marking out

(a) Mark the position of the pin on one member, making the distance between the shoulders equal to the width of the other piece. Square the lines all around the piece with a try square and pencil (Fig. 2).

(b) Mark the length of the socket (plus 2 mm waste) on the end of the other member, making the length equal to the width of the pin. Square the lines across the face side and on both edges (Fig. 3). Remember to smooth the pieces before using them to mark.

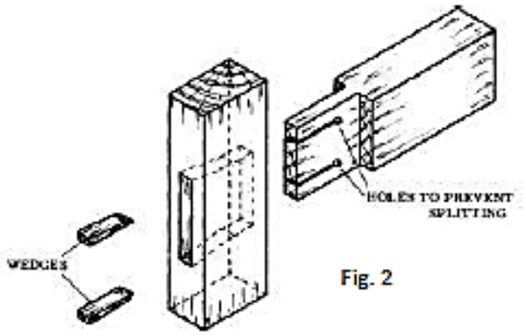


Fig. 2

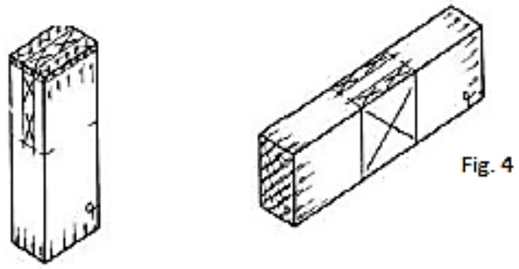


Fig. 4

(c) Set a marking gauge to 1/3rd of the thickness of the member and gauge along both edges of the pin. Use the gauge from the face side only. Mark the waste with small crosses (Fig. 4).

(d) With the same setting on the gauge, mark around the end of the socket. Mark the waste (Fig. 5).

(e) Mark the other side of the socket in the same manner, from the face side, with the gauge set at 2/3rds of the thickness of the piece. If you have a gauge with 2 pins, mark both lines at once.

(f) Check the fitting.

Step 3 - Cutting the pin

(a) Carefully saw the shoulders down to the gauge line, sawing on the waste side of the line (Fig. 6).

(b) Chisel away the waste, chiseling halfway through from both edges (Fig. 7).

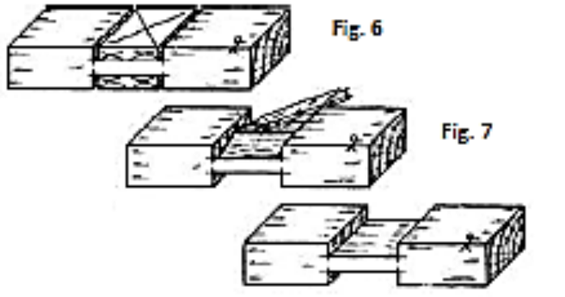


Fig. 6

Fig. 7

Fig. 8

Step 4 - Cutting the socket

(a) Rip the sides of the socket down to the required depth, sawing on the waste side of the lines (Fig. 9). Saw in steps (see Tee-halved joint, cutting the pin.

(b) Chop out the waste with a mortise chisel, chiseling halfway through from both edges (Figs. 10 &11).

Fig. 9

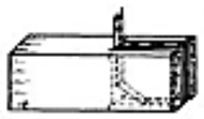


Fig. 10

Step 5 - Assembling the joint

(a) Clean up the inside edges which cannot be reached after the joint is assembled.

(b) Assemble the joint with glue and nails.

(c) When the glue is dry, plane off the waste of the socket.

(d) Clean up the sides and edges with a smoothing plane.

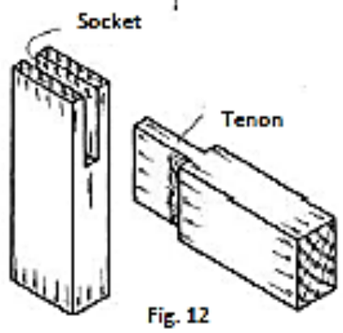


Fig. 12

Corner Bridle Joint

The corner bridle joint is used where members meet to form the corner of a frame. Like the Tee-Bridle, it consists of a pin and a socket (Fig. 12).

The pin is constructed like the tenon in the sequence of operations for the mortise and tenon joint for frame-like constructions. The socket is constructed in the same way as the socket for the tee bridle joint, above.

Widening Joints

Widening joints are joints used to make a single, wide board by joining two or more narrow boards along their length, edge to edge (Fig. 1).

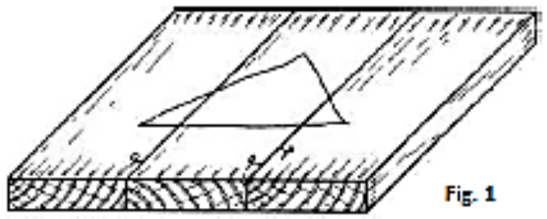


Fig. 1

The boards that will be joined must first be marked. Lay the boards out in the desired position and mark them with a triangular mark over all the boards (Fig. 1). The triangle should point upwards. This mark will help us to keep in mind the position of each board during the steps that follow.

Plain Glued Butt Joint

This is the simplest widening joint (Fig. 2). The edges of the boards are planed perfectly straight and square, and then butted together. The joint is glued and clamped tightly to force out the surplus glue. For narrow pieces this is done with G-clamps. For wider pieces, wooden or metal sash clamps are used.

Dowelled Widening Joint

This joint is similar to the plain glued butt joint, but strength is added by means of cylindrical wooden pins, called dowels. Dowels are made as explained in the section on securing joints. The dowels are then glued into holes in the edge of each board (Fig. 3). The diameter of the dowels should be about one-third of the thickness of the pieces that are being joined.

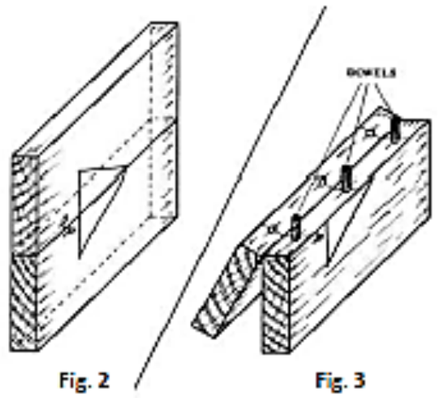


Fig. 2 Fig. 3

The holes should be about as deep as the boards are thick, and they should be slightly countersunk.

Mark out the position of the dowels by putting the boards on top of each other, sides together and marking both edges at the same time. The centre can be marked with a marking gauge, marking from the face side.

Metal or wooden sash clamps are used to press the boards together during gluing.

Rebated Joint

In this widening joint, the edges of the boards are rebated to match each other (Fig. 1). The rebating is done with either an ordinary rebate plane or an adjustable one. This joint is stronger than the plain glued butt joint,

How to plane a rebate with an ordinary rebate plane:

Step 1

Mark the depth and width of the rebate with a marking gauge (Fig. 2).

Step 2

Fix a wooden guide strip along the line that marks the width of the rebate (Fig. 2). The guide strip must be perfectly square and it should be flat.

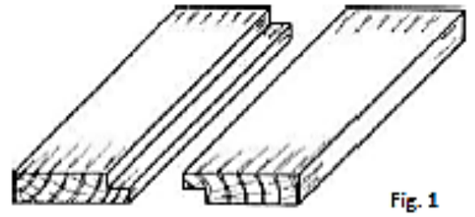


Fig. 1

Step 3

Plane until you reach the line marking the depth of the rebate. Take care that the side of the plane is always against the guide strip, so that the width of the rebate is the same along the whole length.

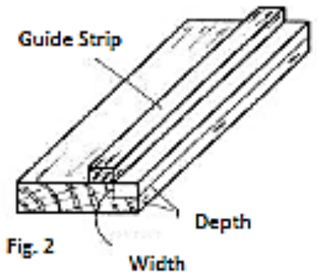


Fig. 2

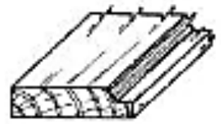


Fig. 3

If you notice that you are planing against the grain, stop just before you reach the required depth and plane from the other direction. This will ensure that the surface of the rebate is smooth.

An important point in planning rebates is setting the plane correctly. The side of the cutting iron that faces the rebate must be set so it is exactly flush with or only slightly coming out at the side of the plane.

STUDENT ACTIVITY

THE END

1. With the help of sketch explain the steps involved in constructing **Common Mortise and Tenon joint.**