COURSE OF TECHNICAL INSTRUCTION

BUILDING CONSTRUCTION

Postmaster-General's Depart

THE AUSTRALIAN POST OFFICE

COURSE OF TECHNICAL INSTRUCTION

Engineering Training Section, Headquarters, Postmaster-General's Department, Melbourne C.2.

BUILDING CONSTRUCTION.

INDEX.

TIMBER TYPES AND USES.

CONTENTS:

1. INTRODUCTION.

1.1 This Paper gives some information about timbers as a background to the other Papers, which give information about tools and building construction. Some knowledge of building construction is essential for technicians and linemen on installation and some other classes of telecommunication work.

2. TIMBER TYPES.

2.1 Australian Timbers. The more common Australian timbers are -

Red Gum. This wood is red, hard and heavy; it is durable when in contact with the ground, and is resistant to some insect pests. It will take heavy weights on the end-grain but not on the cross-grain. Red gum is available in square sections, and is used mainly as stumps or posts, in window-sills, sole plates and steps. It is cut in short lengths.

Jarrah. Jarrah is reddish-brown, heavy and hard; it is durable in contact with the ground, resists some pests and carries heavy weights on both grains. It is available in square sections, planks, scantlings, tongue and groove flooring, and weather-boards.

Hardwood. This name is applied to several varieties of Australian eucalypts, such as red ash, woolly butt, stringybark, mountain ash and messmate. There is a close resemblance between varieties after milling. The colour of hardwood, when newly cut, varies from light oak through shades of yellow, light pink and light brown. When exposed to the weather, it quickly becomes a common grey. The grain is straight, even and tough, which makes hardwood timber of great use in constructional work.

King William Pine (King Billy). This pine is reddish when freshly cut but fades to pale pink after cutting. It is light and not strong, but is easy to work.

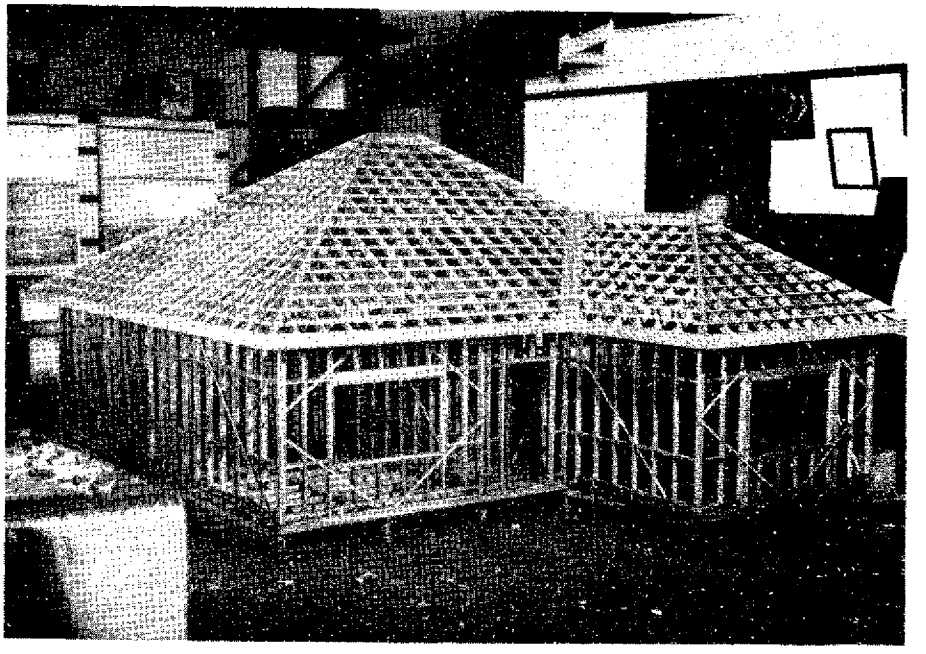
Pinus Radiata. This wood is light yellow with light brown and dark yellow grain and knots. It is light to medium weight.

Huon Pine. A pale yellow wood with close, straight grain. Durable and of an oily character, it is a good turnery wood. Soft and clean cutting, it can be dressed to a fine smooth surface and, though not usually obtained in wide board, it is very suitable for cabinet makers, carcase work, drawer sides and the like. It stains and polishes well.

Hoop Pine and Queensland Kauri. Somewhat similar medium woods, ranging in colour from pale yellow to light brown with clean straight grain and little figure. Useful for all kinds of joinery, shelving, turnery and cabinet making. Good timber for built-in fitments; both will stain and polish.

Queensland Maple. One of the best cabinet making timbers. Pink to rose-red in colour, medium weight and with figure from ripple and ribbon effects. It cleans up well on end-grain, cuts cleanly for joints. Tools required to be very keen to work this timber to advantage.

/TIMBER



TIMBER CONSTRUCTED MODEL HOUSE.

2.2 Imported Timbers. The more common imported timbers are -

Oregon (Douglas Fir). Oregon is yellow to reddish-brown, with growth rings in the grain. It is light, reasonably strong and easy to work.

Red Pine. Red pine is light red to reddish-brown, medium weight. It is not used where strength is required, but is easy to work and durable.

Panama Pine. A South American timber similar to Queensland hoop pine; yellow and close grained, it is suitable for cabinet work. Wide boards are obtainable but are likely to twist.

Baltic Deals. This wood is available in two types, white and red. White deal is pale yellow with light brown knots; red deal is yellow with red and brown knots. Baltic deal is medium weight and is easy to work.

3. ROUGH AND MILLED TIMBER.

3.1 In cutting timber from a log, more consideration is usually given to the amount of timber that can be cut from the log than to the direction of the grain of the timber.

3.2 Timber terms and typical uses for timber are shown in Figs. 1 and 2, and are defined as follows -

Flitches are used for heavy beams in buildings. They are fixed on edge to carry heavy loads.

Big Planks of hardwood or oregon are used for floor joists for the first floor, or for hanging beams that hold up the weight of the ceilings. The ceiling joists are held up to the hanging beams by hanging fillets.

Wide Boards are used for ridges in roof-framing, where they make fixing for the heads of the rafters, enabling the rafters to be spaced out properly and to finish up to the correct height line.

Squares have width and thickness of equal size. They are used as stumps or storey posts to stand upright and support heavy loads.

/Fig. 1.

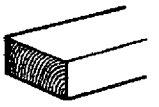
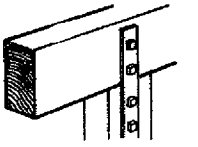
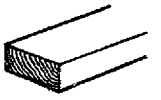
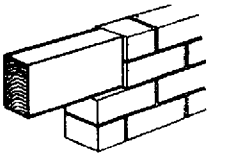
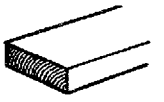
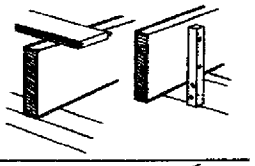
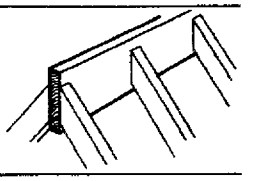
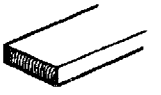
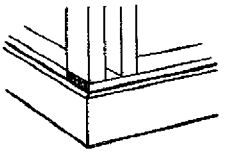
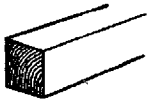
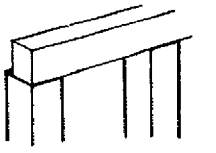
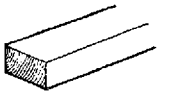
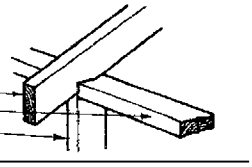
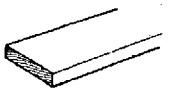
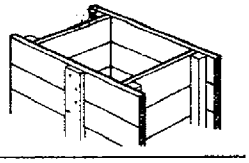
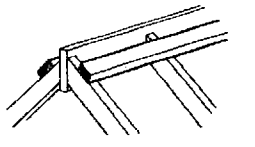
TERM		USE	
FLITCH OVER 4" THICK OVER 6" WIDE		LEVEL BEAM OR BRESSUMMER TO CARRY HEAVY WEIGHTS	
SCANTLING 1½" TO 4" THICK UP TO 6" WIDE		BEAM OVER AN OPENING	
PLANK 1½" TO 4" THICK OVER 6" WIDE		FLOOR JOIST AND HANGING BEAM IN CEILING	
BOARD ¾" TO 1½" THICK OVER 3" WIDE		ROOFING RIDGE	
BOARD ¾" TO 1½" THICK OVER 3" WIDE		WALL PLINTH	
SQUARE FROM 1½" x 1½" UP TO 6" x 6"		STOREY POST OR STUMP	
SCANTLING 1½" TO 4" THICK UNDER 6" WIDE		STRUCTURAL MEMBERS RAFTER PLATE STUD	
BOARD ¾" TO 1½" THICK OVER 3" WIDE		CONCRETE FORM	
BATTEN ⅝" TO 1¼" THICK 1" TO 3" WIDE		ROOF BATTEN	

FIG. 1. TIMBER TERMS AND USES.

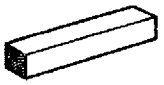
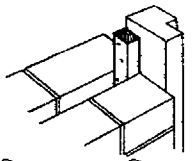
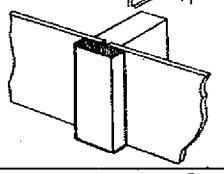
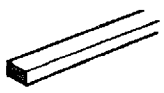
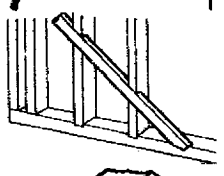
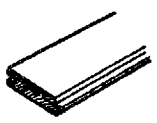
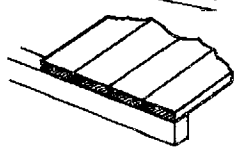
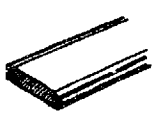
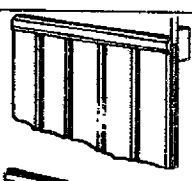
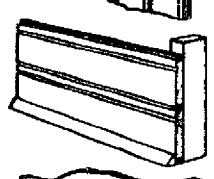
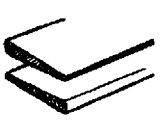
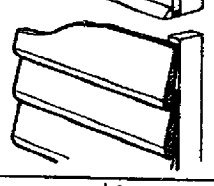
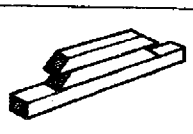
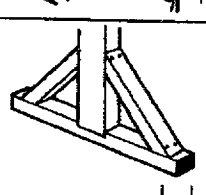
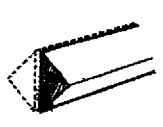
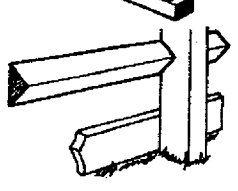
TERM		USE	
OFFCUT MISCELLANEOUS SIZES		FILLET TO HOLD FRAME	
COVER STRIP FROM $1\frac{1}{2}$" x $\frac{3}{8}$" TO 3" x $\frac{3}{4}$" HARDWOOD, RED PINE OR OREGON		COVER STRIP OVER JOINT	
3 PLY $\frac{5}{64}$" TO $\frac{3}{8}$" THICK 4' x 3' TO 7' x 4' PLAIN OR FIGURED		DOOR PANEL	
BATTEN $\frac{5}{8}$" TO $1\frac{1}{4}$" THICK 1" TO 3" WIDE		DIAGONAL BRACE	
$\frac{3}{4}$" FLOORING WIDTH PINUS RADIATA 6" HARDWOOD $4\frac{1}{2}$" JARRAH $3\frac{1}{2}$"		FLOOR COVERING	
T.& G. LINING V JOINTED $\frac{1}{2}$" AND $\frac{5}{8}$" THICK $3\frac{1}{2}$" AND 4" WIDE		WALL DADO	
T & G LINING BEADED $\frac{1}{2}$" THICK 6" WIDE		INTERIOR WALL LINING	
WEATHERBOARDS TAPER $\frac{3}{4}$" TO $\frac{1}{4}$" 7" WIDE		EXTERIOR WALL COVERING	
3"x 2" SOLE & STRUTS OBTAINABLE IN STANDARD SETS		FOOT OF FENCE POST	
ANGLE RAIL 2 OUT OF 4"x4"		FENCING RAIL	

FIG. 2. MORE TERMS AND USES.

Scantling is the name used for timber in a variety of sizes, that is, cut as stock to be used in structural building work. It is sometimes referred to as "quartering." It may be cut from the log or recut from flitches or big squares.

Small Scantlings are used in the wall framing of timber buildings and in the roofs and floor construction of ground floors in residences. The most common width is 4 in. This is one of the standard dimensions in walls, floors and ceilings. The second dimension of the timber section is made thicker or thinner, as the position requires.

Boards of approximately 1 in. thickness have many uses. Large quantities are used in making forms and decking for concrete. Temporary woodwork of this kind is commonly reused several times.

Big Battens are used for holding the heavy gauge nails required when fixing corrugated "roofing," whether iron or cement. A common size is 3 in. x 1½ in. The widest spacing of both the battens and the rafters under them is 3 feet. When the rafters are given wider spacing, the section size of the batten must be increased, and it is then referred to as a purlin, not as a batten.

Small Battens are strong enough to make braces in timber framed walls of residences, as these do not have great heights and widely spaced studs. The braces are usually placed on the outer sides of the walls where they can be easily nailed into the studs and plates when the wall is plumbed in its upright position.

Off Cuts are the small odd size pieces that come off when boards are cut down to size. They make short fillets to fix door and window frames into surrounding brick walls.

Cover Strips may be either square or moulded. They cover the joints in vertical sheeting or other abutting materials.

3.3 Milled Timber. Timber that is specially prepared to shape for a single purpose by machining is commonly referred to as "milled." Most of the timber that is visible when a building is finished has been milled. The important terms and definitions are -

Flooring. Generally dressed on both sides, and the edges are made with tongues and grooves so that when a number are put together they will maintain an even surface.

Tongued and Grooved Lining Boards are sometimes used for interior wall covering, and are more durable than plaster sheets. When fixed vertically, special battens or nogging must be provided for fixing the boards.

Weather-boards are used on walls that are exposed to weather. An overlapping edge allows for swelling and shrinkage.

Sole and Struts are used for fencing work. A set of three pieces, comprising one sole piece and two struts, is necessary for every post in a fence.

3.4 Mouldings are milled to standard shapes and sizes from planks or boards that have been sawn to the regular sizes of 1 in., 1¼ in., 1½ in. and 2 in. They come from the moulding machines in smaller actual dimensions than the original sawn material, but many of them retain the nominal size of the sawn material. With the exception of beads, they commonly finish ⅛ in. less than the nominal size in small mouldings and ¼ in. less in large ones.

The mouldings form finishing pieces in angles around openings in walls, and make dividing pieces between one fitting and another. Typical positions are shown in Fig. 3.

/Fig. 3.

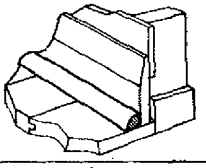
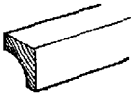
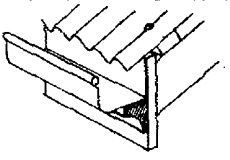
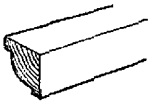
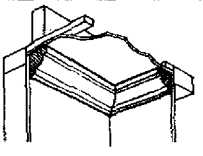
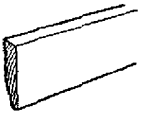
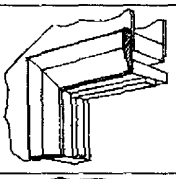
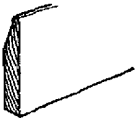
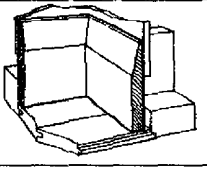
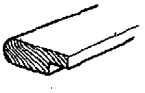
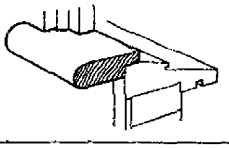
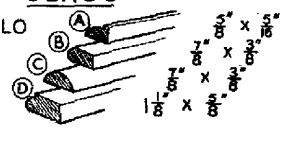
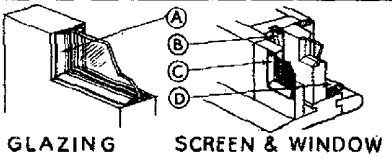
TERM		USE	
QUARTER ROUND FROM $\frac{1}{2}$" TO $2\frac{1}{2}$" RADIUS		JUNCTION OF FLOOR AND WALL	
SCOTIA FROM $\frac{7}{8}$" TO 2"		SEAT FOR SPOUTING	
OVOLO FROM 1" TO 3"		CORNICE AT WALL AND CEILING	
ARCHITRAVE FROM 3" x $\frac{3}{4}$" TO 5" x $1\frac{1}{8}$"		JUNCTION OF WALL AND FRAME	
SKIRTING FROM 4" x $\frac{3}{4}$" TO 7" x $\frac{7}{8}$"		JUNCTION OF FLOOR AND WALL	
WINDOW NOSING FROM 2" x $1\frac{1}{2}$" TO 4" x $1\frac{1}{2}$" TIMBER TO MATCH FRAME		JUNCTION OF SILL AND WALL	
BEADS PART OVOLO PARTING FLY WIRE STAFF		GLAZING SCREEN & WINDOW	

FIG. 3. MOULDINGS AND USES.

The more important mouldings are -

Quarter Round, frequently abbreviated to "quad," is used in angles where a very close joint is difficult to make or to maintain.

Scotia. The scotia moulding is frequently seen in the position shown in Fig. 3. It is nailed in line before the spouting is fixed and guides the fall towards the drainage outlets.

Ovolo moulding resembles quarter round moulding, but has the additional squares at the top and the bottom which make quirk lines to relieve the bold look that a plain round mould gives.

Architraves are moulded in a variety of shapes. The main object in using moulds instead of plain square material around a wall opening is to improve the appearance, and also to remove much of the thickness which is a disadvantage when hinged doors are opened to more than 90°.

Skirting is fixed on the walls close to the floor to give protection to the more fragile plaster sheeting or rendering which would be damaged by continuous knocks from brooms, heels and toes of chair legs and personal footwear.

Bead is the name applied to a thin strip with a rounded edge. Part ovolo beads are used to hold glass in place in doors or windows; their shape is made to match the solid moulded edge on the other side of the rebate. Parting beads keep the top and bottom sashes apart in box frames, and, with the staff beads, they help to form running grooves for the sashes.

END OF PAPER.

HAND TOOLS.

CONTENTS:

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1. INTRODUCTION.

1.1 The actual range and choice of woodwork tools depend mainly upon the type and class of work. The technician and lineman use many hand tools, and should know their proper names, the purpose for which each is used and how they are sharpened and kept in good condition.

1.2 There are still many woodwork operations that must be done by hand. This is partly because it is economical to do small jobs instead of setting up a machine, and because many operations must be carried out away from the shop in which the machines are installed; and also because the machine cannot fit individual parts. To do these jobs it is necessary to know how to use and condition tools.

2. CARE.

2.1 It is important to keep tools correctly sharpened and in good condition. Good workmanship is impossible with blunt or badly sharpened tools or with tools having broken or loose handles.

Cutting edges will lose their keen edges by being brought into contact with metal. It is necessary, therefore, to exercise great care when handling, packing or transporting tools.

Planes and saws should not be used on timber with abrasive material, such as soil, sand, cement and such like, adhering to it. Any timber that is dirty should be well brushed down before use.

When packing tools away, even for a short time, plane irons should be withdrawn from the cutting position and chisels and saws should be kept away from hammers and try squares. Bits for boring should be rolled in a cloth container.

Frequently rub metal parts of tools with heavy lubricating oil or grease, as preventatives against rust.

A reliable first impression of an officer is often gained from the condition of his tools.

3. LAYOUT TOOLS.

3.1 Chalk Line. This is a strong twisted cotton line up to 50 feet long which is wound on a stick or bobbin and, after chalking, is used for marking long straight lines. The method of chalking the line and snapping it is shown in Fig. 1. In doing this, care must be taken to hold the line at the proper tension. When snapping the line, it should be lifted at right angles to the surface and released from the fingers.

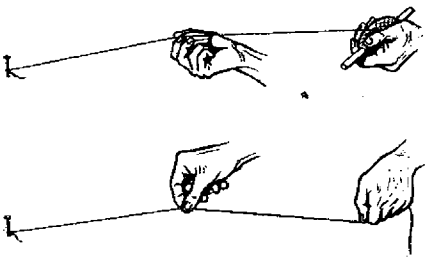


FIG. 1. CHALKING AND SNAPPING THE CHALK LINE.

3.2 Pencil. The carpenter's pencil, shown in Fig. 2a, is made with a large rectangular lead that will stand a great amount of wear. It is obtainable in hard and soft varieties. Hard pencils are used on rough timber where an ordinary lead pencil would quickly break. Soft or ordinary pencils are used for layout work on smooth timber. The method of finger gauging a line for a chamfer is shown in Fig. 2b.

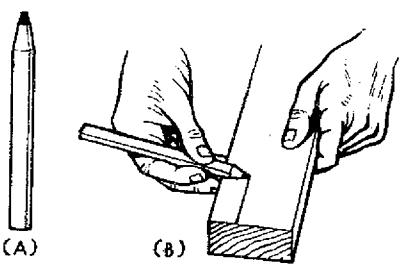


FIG. 2. FINGER GAUGING WITH A CARPENTER'S PENCIL.

3.3 Marking Guage. The marking gauge is used to accurately scratch a line parallel with the edge of a piece of timber. The point of the gauge must be kept sharp and should not project far from the beam which holds it. When using the gauge, mark a gauge line by pushing the gauge along the board so that the pin is visible while it is making the line, as shown in Fig. 3.

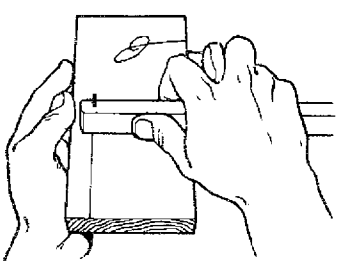


FIG. 3. METHOD OF USING THE MARKING GAUGE.

3.4 Try Square. The try square is used as a layout tool for squaring lines across a piece of timber. Some try squares have a 45° shoulder at the intersection of the handle and blade for marking 45° cuts on boards. Fig. 4 shows an application of the try square in marking duplicate parts.

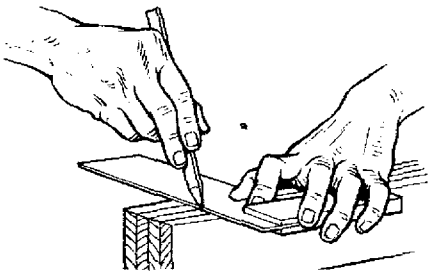


FIG. 4. SQUARING LINES WITH A TRY SQUARE.

4. TESTING TOOLS.

4.1 Try Square. The try square is also used as a testing tool to test the surface of a board for straightness, as shown in Fig. 5a, or to test the edge of a piece of timber to see that it is square, as shown in Fig. 5b.

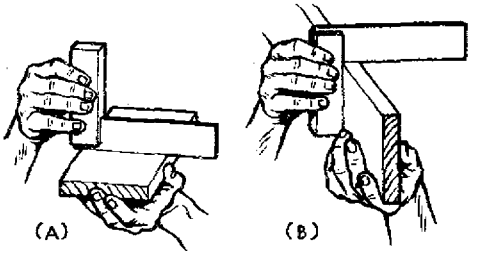


FIG. 5. TESTING FACE AND EDGE WITH A TRY SQUARE.

4.2 Spirit Level. The spirit level operates because an air bubble in the liquid in a glass tube will always rise to the highest point. Lines marked on the tube indicate where the bubble should come to rest.

To check the level, set it up on a firm base with the bubble registering centrally; then reverse the ends of the level when the bubble should again register a central position. Any inaccuracy should be corrected. For a long level line the spirit level is used on a straight edge, as shown in Fig. 6.

FIG. 6. TESTING WITH A SPIRIT LEVEL.

4.3 Plumb-bob and Plumb-rule. The plumb-bob is a tool frequently used to secure a vertical face. The plumb-bob is very heavy and keeps any suspending cord taut and vertical.

/Specially

Specially shaped straight edges are used with the plumb-bob and a line. This tool is then called a plumb-rule. Applications of the plumb-bob and the plumb-rule are shown in Fig. 7.

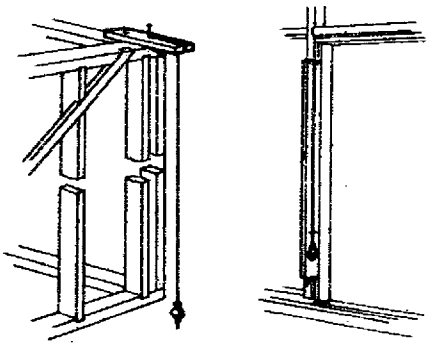


FIG. 7. TESTING WITH PLUMB-BOB AND PLUMB-RULE.

4.4 Line Level. The line level is a short and very light level which has hooks at each end so that it may be hung on a line. It is used to test the approximate levelness of a stretched line for excavation lines and lines of height. The line level is shown in Fig. 8.

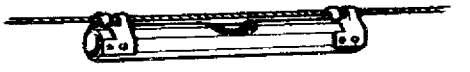


FIG. 8. LINE LEVEL.

5. MEASURING TOOLS.

5.1 Folding Boxwood Rule. The folding rule is used for taking short measurements, as shown in Fig. 9. It can be extended or folded up quickly, and is designed to be carried in a rule pocket. It is made in 2 ft. and 3 ft. lengths, both of which have four folds. Rules are graduated in sixteenths of an inch and figured in inches.

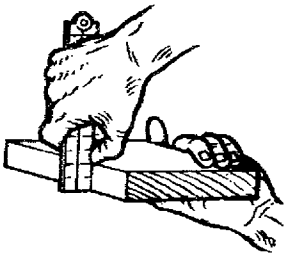


FIG. 9. MEASURING WITH A FOLDING RULE.

5.2 Steel Tape. The steel tape is a flexible ribbon of steel made in 33 ft. and 66 ft. lengths and graduated in feet, inches and eighths of an inch. The unit length of 66 ft. (1 chain) is used because it is a common measurement for a surveyor.

Tapes are also obtainable in woven cotton, but the legibility of their graduations does not remain on them as long as those on a steel tape. Care must be taken to see that steel tapes are not moist when rolled up and are not twisted during use. Two applications of the steel tape are shown in Fig. 10.

/Fig. 10.

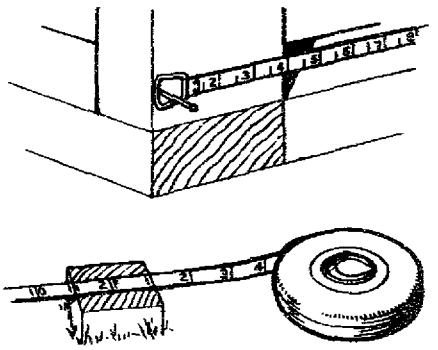


FIG. 10. TWO APPLICATIONS OF THE STEEL TAPE.

5.3 Measuring Rods. Measuring rods are in varying lengths of from 6 ft. to 20 ft., and are graduated in feet and half feet. For smaller graduations a folding rule is used in conjunction. On account of their rigidity, they can be used for heights where tapes would not be applicable. Applications of the use of measuring rods are shown in Fig. 11.

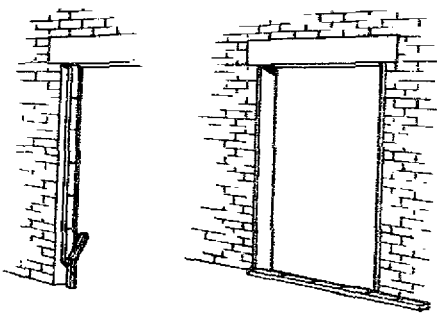
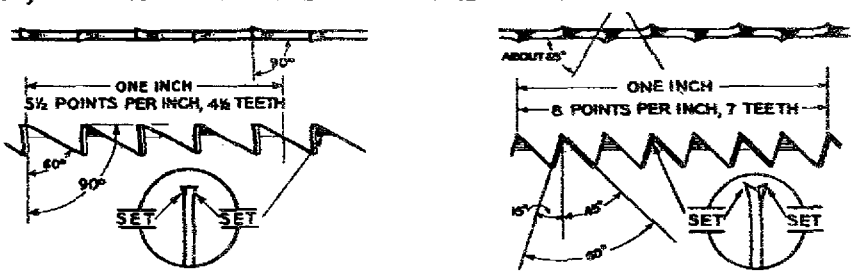


FIG. 11. APPLICATIONS OF MEASURING RODS.

6. HAND-SAWS.

6.1 Saws may be conveniently divided into hand-saws, back-saws and those for cutting curves. There are, however, several features common to all.

The length of a saw is always taken from the actual blade, regardless of the handle. Tooth size is reckoned as so many points to the inch, including those at both ends. Fig. 12 shows the teeth of a rip-saw and a crosscut-saw. It will be seen that the teeth are cut at an angle to the general line of the saw, and that this varies according to the particular type of saw. The lower the angle at which they are inclined, the smoother the finish and slower the cut.



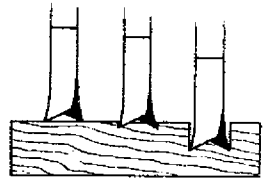
(a) Teeth of Rip-Saw. (b) Teeth of Crosscut-Saw.

FIG. 12. TEETH OF RIP-SAW AND CROSSCUT-SAW.

All teeth, too, have what is known as "set," that is, they are bent over alternately one way and then the other. Thus, they cut a kerf which gives easy clearance to the blade. This set should be kept to a minimum, otherwise the tool removes a great deal of sawdust unnecessarily. In all good hand-saws this detail is helped by the blade being taper ground, being thinner at the back than at the tooth edge. This gives a clearance in itself and makes excessive set unnecessary, except in cutting wet material.

6.2 Rip-Saw. The rip-saw is used for cutting along the grain. It may be 26 in. to 28 in. long with a tooth size of 3 to 5-1/2 points to the inch. One feature in which the rip-saw differs from all other saws is that the teeth are sharpened straight across at right angles to the blade so that the points present a series of chisel-like edges to the wood, as shown in Fig. 13a.

(a) Action of Rip-Saw Teeth.

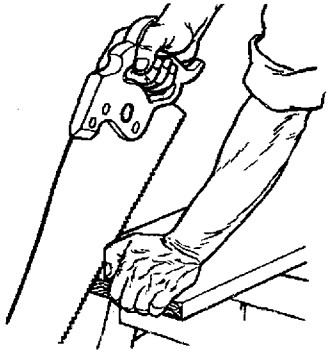


(b) Action of Crosscut-Saw Teeth.

FIG. 13. CUTTING ACTION OF RIP AND CROSSCUT-SAWS.

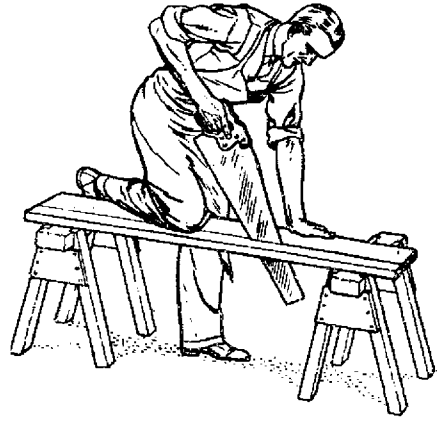
The cut is started with a few short strokes, with the thumb of the left hand leaning against the blade to steady it, as shown in Fig. 14. When a start has been made the saw should be worked with full strokes, the blade being held so that the line of the teeth is at about 60° with the wood, as shown in Fig. 15. Note that the index finger of the right hand points along the blade. This ensures better control over the saw.

Apply more pressure on the downward stroke after the saw is started. Always rip on the waste side of the line, as cutting on the line or against the wrong side of the line will give an incorrect size of finish. Keep the saw in alignment by sighting along it. If the saw tends to bind in the cut, use a wedge to spread out the saw cut. A little wax or oil on the saw blade helps to eliminate friction.



COMMENCING THE CUT WITH A RIP-SAW.

FIG. 14.



RIPPING A BOARD ON SAW STOOLS.

FIG. 15.

When ripping a large board, place it on a saw-horse. Finish ripping the board with short easy strokes and hold the waste side of the board with the left hand to steady it and to prevent splitting.

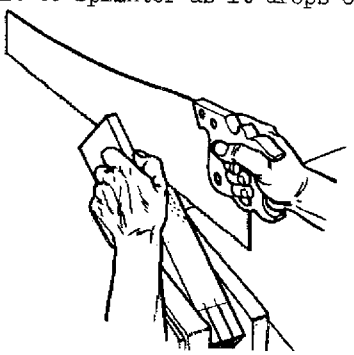
When ripping small size timber, clamp it in the bench vice (see Fig. 16). Adjust

/the

the height of the timber frequently so that the cutting edge of the saw is always near the top of the vice. If the saw cut is made too far above the vice, the timber is liable to chatter and inaccurate cutting will result. Clamp the timber in the vice as often as possible at an angle of approximately 60° and keep the saw running level.

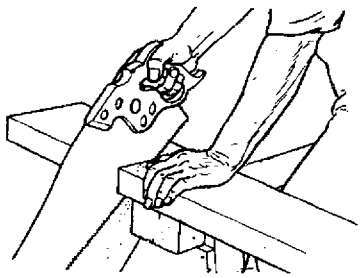
When it is necessary to hold a wide board in the vice and cut across the bench line, keep the heel of the saw lower than the toe to give smooth cutting.

6.3 Crosscut-saw. The crosscut-saw is used for cutting across the grain, as shown in Fig. 17. It may be identified by the knife-like edges of its pointed teeth, which are smaller than the rip-saw. It might be used for ripping, though it is slower cutting for this purpose. The operation of cross-cutting is similar to that of ripping on the saw stools. When the cut is nearly finished, the left hand should be brought over the blade to support the wood otherwise the weight of the projecting piece may cause it to splinter as it drops off.



RIPPING TIMBER HELD IN THE VICE.

FIG. 16.



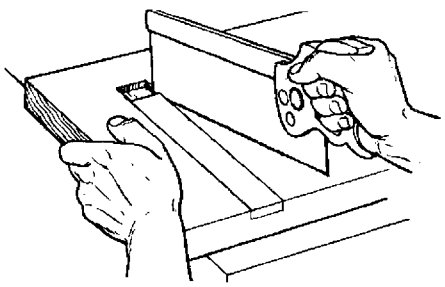
CROSS-CUTTING SCANTLING ON SAW STOOLS.

FIG. 17.

The panel-saw is smaller than the crosscut-saw, usually about 18 in. to 20 in. with 10 to 12 points per inch. It is used for sawing thin timber and smaller work.

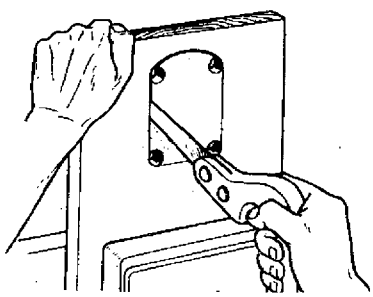
6.4 Back-saws. The stiffening strip of brass or iron gives these saws their name. Their chief use is in cutting joints and in bench work generally. A 12 in. or 14 in. tenon-saw, with 12 to 14 points per inch, and a dovetail saw of 8 in. to 10 in., with 18 to 20 points to the inch, are useful. A bench hook should be used to stop the timber from moving during sawing. The method of using a back-saw to start the cut in a housing joint is shown in Fig. 18.

6.5 Saws for Cutting Curves. The compass or keyhole-saw is used to cut curved and straight holes, as shown in Fig. 19. It is also used for cutting curved outside edges.



CUTTING A HOUSING JOINT WITH A BACK-SAW.

FIG. 18.



CUTTING A HOLE WITH A KEYHOLE-SAW.

FIG. 19.

The coping-saw is used for cutting intricate shaped holes or outside curves in thin timber. The narrow fine-toothed blade is held in a spring steel frame to give it proper tension. The blade may be turned at various angles in relation to the frame.

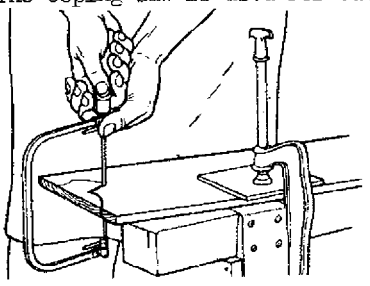


FIG. 20. USING THE COPING-SAW.

One method of using the saw for this work is shown in Fig. 20. The coping-saw is greatly used for sawing the moulded shapes on the ends of scribed or returned mouldings and for removal of waste in dovetails.

7. SETTING AND SHARPENING OF SAWS.

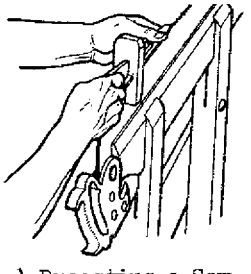
7.1 The setting and sharpening of a hand-saw consists of four operations, breasting, shaping the teeth, setting and filing. These operations should be left to the expert, and are included here as a matter of interest. A saw needs breasting only when the teeth are incorrectly shaped or are uneven. The method of performing this operation is shown in Fig. 21a. Keeping the file level, run it lightly over the tops of the teeth until it cuts off the tops of high teeth and finishes off all the teeth to a slightly curved line.

After a saw is breasted, the gullets will be of unequal depth and the teeth will be of uneven size. File the gullets to equal depth, shaping the front and back of each tooth. Place the file well down in the gullet and file straight across the saw, keeping the file at right angles to the saw blade.

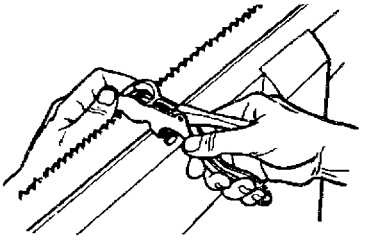
Setting a saw consists of springing over the upper part of each tooth, springing one to the left and the next to the right to make them cut a kerf slightly wider than the thickness of the blade in order to give blade clearance. This is done with an adjustable saw set, as shown in Fig. 21b.

When filing a rip-saw the file is held in a horizontal position at right angles to the blade, as shown in Fig. 21c. File each alternate tooth from one side, reverse the saw and file the remaining teeth from the opposite side.

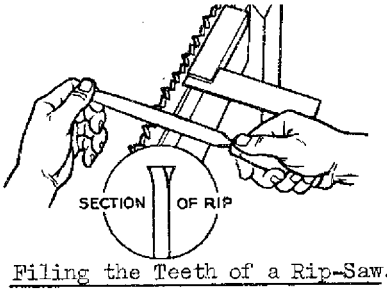
The teeth of a crosscut-saw are bevelled; therefore, to file this saw, the file must be held at an angle to produce this bevel, as shown in Fig. 21d. An angle of 55° to 60° has been found to be most satisfactory for general use. The teeth must be filed alternately from opposite sides.



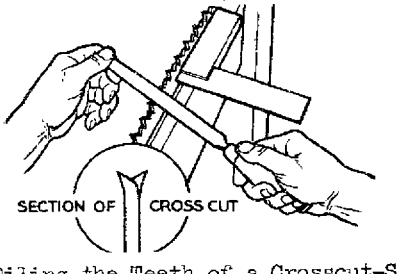
(a) Breasting a Saw.



(b) Setting a Saw with a Saw Set.



(c) Filing the Teeth of a Rip-Saw.



(d) Filing the Teeth of a Crosscut-Saw.

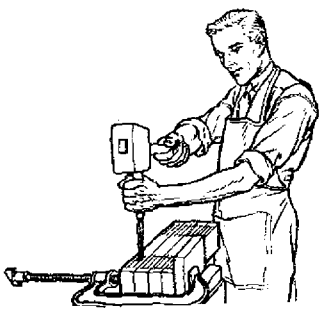
FIG. 21. SETTING AND SHARPENING SAWS.

8. CHISELS.

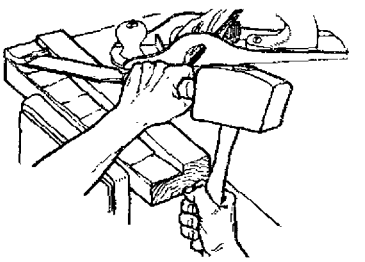
8.1 Chisel blades are made of steel in several shaped sections, and are fitted with wooden handles to suit the work they are designed to do. The size is determined by the width of the blade. The narrowest are 1/16", increasing in sixteenths up to 1/2" and then in eighths up to 1-1/2".

The socket chisel is designed for heavier types of work where it is necessary to use a mallet and force it into the wood, such as for mortising, as shown in Fig. 22a. A conical shaped socket is provided on the handle end of the chisel into which the handle fits.

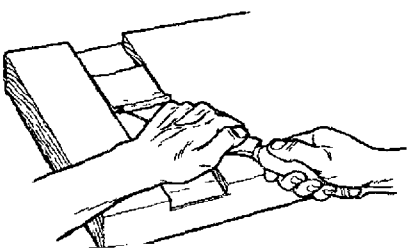
Lighter chisels having shouldered tangs to fit into holes in the wooden handles, and known as firmer chisels, are used for lighter cutting along the grain, as shown in Fig. 22b, or for cutting the waste between saw cuts, as shown in Fig. 22c. Firmer chisels have only one hoop around the handle at the blade end. Registered chisels have iron hoops on both ends of the handle to prevent them from splitting, and so can be used for heavier work.



(a) Using Mortise Chisel.



(b) Firmer Chisel used for Cutting with Grain.



(c) Firmer Chisel used for Trenching.

(d) Paring Chisel used for Horizontal Paring.

FIG. 22. USING CHISELS.

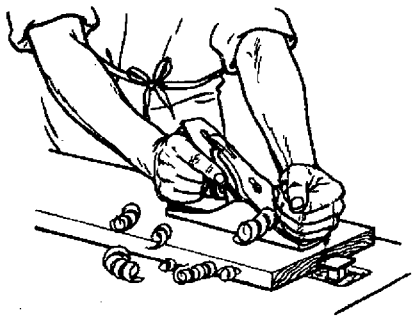
Chisels that have bevelled edges are made of harder tempered steel than those with rectangular blades, and will sharpen up to a very fine edge. They have distinctive octagonal boxwood handles and are classed as paring chisels.

When paring, the left hand guides the chisel while force is applied by the right hand, as shown in Fig. 22d. Take care that the left hand is always behind the cutting edge of the chisel. In vertical paring, the left hand guides the chisel while weight is applied from the shoulder.

9. PLANES.

9.1 The planes in common use are the jack-plane, smoothing-plane and jointer-plane. All are similar in construction but vary in size.

The jack-plane leaves only a medium quality finish and really prepares timber for cleaning by a smoothing-plane. Smoothing-planes are smaller and are used for smoothing level surfaces and for fine work. Iron smoothing-planes are most useful for cleaning faces and edges of timber, as well as the end-grain.



METHOD OF HOLDING SMOOTHING-PLANE.

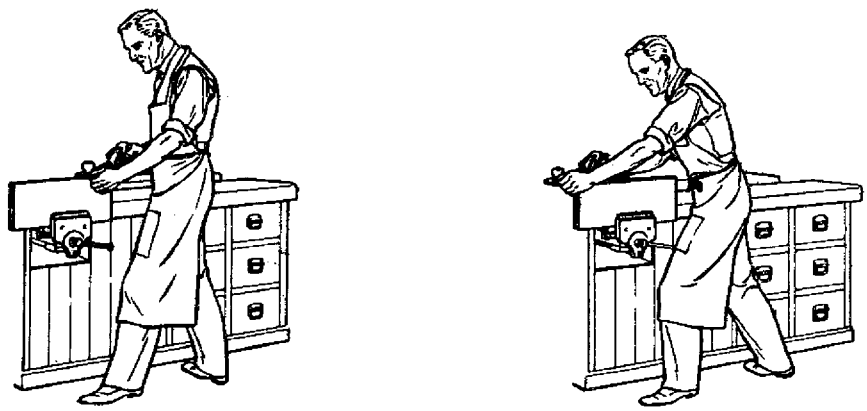
FIG. 23.

A properly adjusted plane should take off a long thin tissue-like shaving. In the case of a wooden plane, careful setting is required. In an iron plane, a brass thumb screw located in front of the handle controls the cutting depth.

The method of holding the plane is shown in Fig. 23. More care is needed to keep the plane level when planing edges or ends of stocks than for a flat surface, as a narrow surface does not give as much support to the sole of the plane.

When possible, plane with the grain. To do this with timber of irregular grain, it may be necessary to plane in one direction at one end of the board and in the opposite direction at the other end.

In starting the stroke, place the pressure on the knob. When the toe and the heel of the plane are in contact with the stock, apply pressure equally on the knob and the handle. At the end of the stroke, apply pressure to the handle.

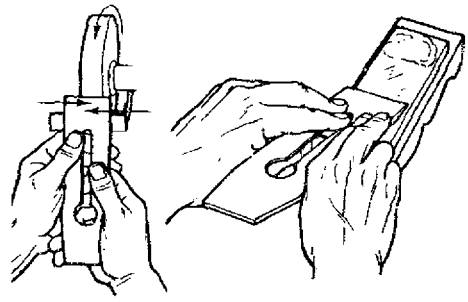


(a) Starting the Stroke. (b) Finishing the Stroke.

FIG. 24. STANCE WHEN PLANING.

10. SHARPENING AND SETTING A PLANE.

10.1 To grind a uniform bevel on a plane iron, move it across the wheel the full width of the iron, as shown in Fig. 25a, using water to keep the edge cool. The grinding angle is about 25° to 30°.



(a) Grinding. (b) Whetting.

GRINDING AND WHETTING PLANE IRON.

FIG. 25.

Whetting the plane iron is the process of putting a keen edge on it by honing. This is done by rubbing the iron over the surface of an oilstone, as shown in Fig. 25b. The whetting angle is 30° to 35°. Use as much of the surface of the stone as possible in order to keep the stone flat. Apply a moderate amount of pressure as the plane iron comes to a keen edge.

Remove the wire edge which has formed on the unbevelled side by holding the plane iron with the unbevelled side absolutely flat on the stone. Move back and forth, using care not to raise the plane iron while in motion, otherwise a bevel will be produced on the flat side. This will allow shavings to collect between the plane iron and the back iron and thus clog the plane. Remove the wire edge during the whetting as often as is desired.

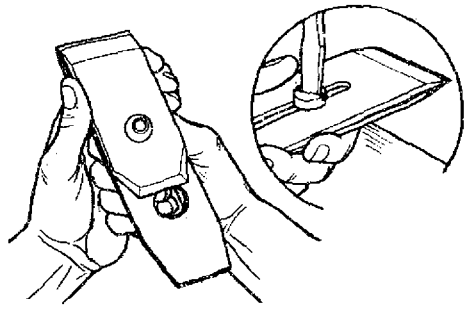
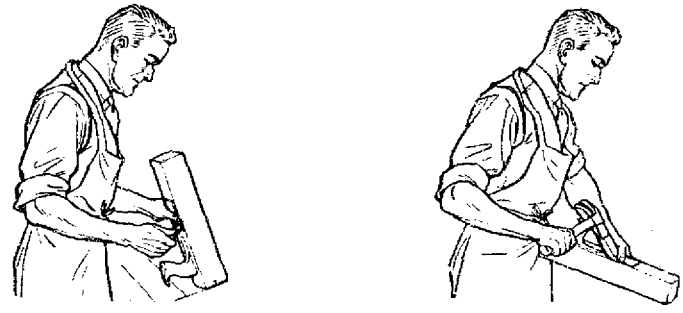


FIG. 26. ADJUSTING THE BACK IRON.

To set the plane, adjust the back iron with the left hand and tighten the screw with the fingers and then with a screw-driver, as shown in Fig. 26. The distance the back iron is set back from the cutting edge depends on the thickness of shaving required. For fine work set it close to the cutting edge, and for coarse work set it back about 1/8th of an inch.

Insert the plane iron in the plane so that it just projects from the sole and hold it with the thumb, as shown in Fig. 27a, then tighten the wedge with the finger and a hammer as shown in Fig. 27b.



(a) Adjusting. (b) Tightening.

FIG. 27. INSERTING THE PLANE IRON.

Fig. 28 shows faults in planes with causes and remedies.

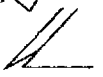
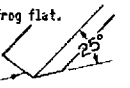
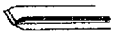
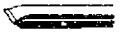
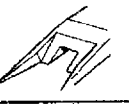
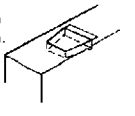
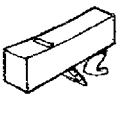
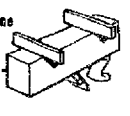
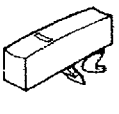
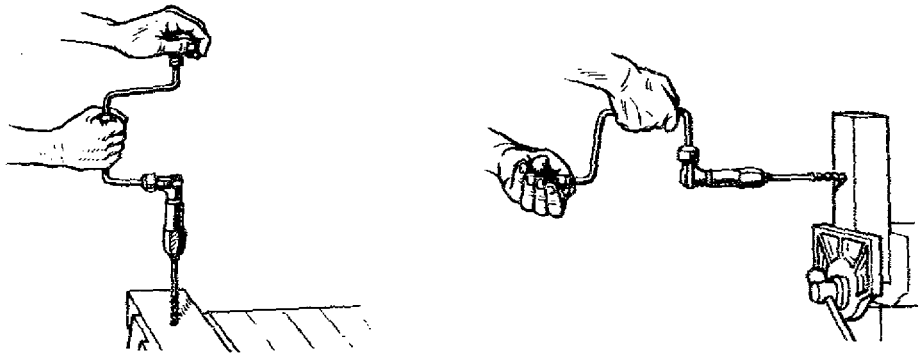
FAULT	CAUSE	REMEDY
CHATTERING	Wedge does not fit properly (especially on a new iron). 	Take shaving from wedge where needed. 
	Cutter does not seat on frog. 	Straighten cutter if necessary or fit leather strip near opening.
	Frog has twist. 	Refit wedge points, or pare frog flat.
	Cutting angle too acute. 	Grinding angle 25°. 
CHOKING	Back iron does not seat properly. 	Whet underside to seat perfectly. 
	Back iron wrong shape. 	What to this shape. 
	Insufficient clearance in escapement. 	Enlarge throat with chisel.
	Wedge points broken or not properly tapered. 	Refit wedge, cut points to correct angle. 
TEARS OUT GRAIN	Back iron not close enough to cutting edge. 	Not more than 1/32" for fine shaving with smoothing plane. 
	Mouth too large.	Fit a new mouth.
WORKS STIFFLY	Back iron too close to cutting edge. 	About 1/32" for smoothing plane and $\frac{1}{8}$" or more for jack plane. 
	Sole needs lubricating.	Linseed oil on felt pad.
DOES NOT WORK TRUE	Sole is hollow. 	True up sole with trying plane (slightly withdraw cutter, keep irons and wedge tight). Test with winding sticks. 
	Sole is round.	
REMOVES ONLY THICK SHAVINGS	Sole out of true. 	True up sole with irons and wedge in position (set cutting edge back in mouth).
	Worn mouth.	

FIG. 28. PLANE FAULTS.

11. BORING TOOLS.

11.1 The brace is the tool which holds and guides bits for boring holes. The ratchet brace permits the boring of a hole where the handle of the brace cannot make a full sweep or revolution. The method of holding the brace for vertical boring is shown in Fig. 29a, and for horizontal boring in Fig. 29b. Four commonly used wood bits are shown in Fig. 30.



(a) Vertical. (b) Horizontal.

FIG. 29. BORING.

11.2 To prevent splintering when boring a board, do not bore all the way through from one side. Bore until the feed screw goes through the board, and then bore from the other side. Another way to prevent splintering is to clamp a piece of wood to the under side of the board to take the thrust of the bit.

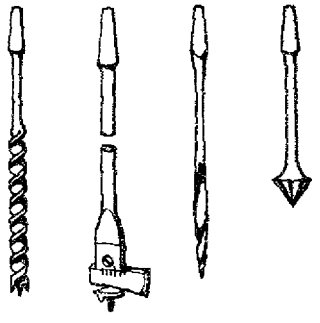


FIG. 30. WOOD BITS.

11.3 The expansive bit has an adjustable cutter and will take the place of several large size bits.

11.4 Gimlet bits are designed to make holes for screws and nails. They have a slim tapered point which leaves a tapered hole suitable for screws. They bore rapidly and leave a fairly smooth hole. In size they range from 1/8 in. to 3/8 in. by thirtyseconds.

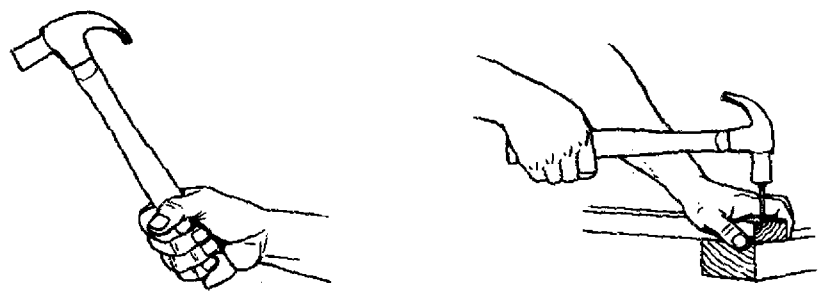
After boring for a short distance they are liable to choke and must be withdrawn and cleaned. It is difficult to remove the point of a broken bit, so care must be exercised in use.

12. HAMMER.

12.1 Wood may be assembled or fastened in place by either face nailing, skew nailing or edge nailing with the aid of a hammer.

To use a hammer, grasp it firmly at the end of the handle as shown in Fig. 31a. Hold the nail between the forefinger and thumb, pointing it in the direction in which it is to be driven, and tap the nail lightly to get it started.

To drive the nail, swing the hammer so that it will hit the nail squarely on the head. After the nail is well started remove the hand and drive the nail home with well-directed blows in alignment with the nail, as shown in Fig. 31b.

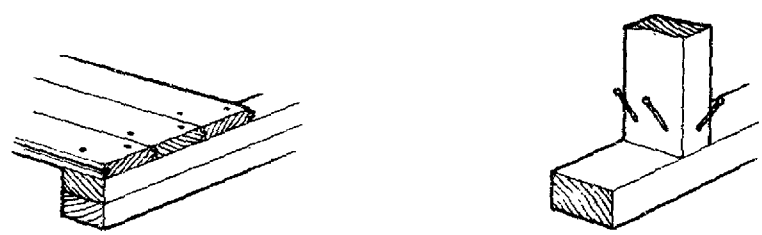


(a) Method of Holding Hammer. (b) How to Drive a Nail.

FIG. 31. HAMMER.

Driving nails at approximately right angles to the surface of a board is called face nailing. Nails should not be driven too close to an edge or end without first boring holes, as there is a danger of splitting the wood. Staggering the nails, as shown in Fig. 32a, is better than driving them along the line of the grain.

12.2 Skew nailing is done by driving the nail at an angle to the face where it meets a sill, as shown in Fig. 32b.



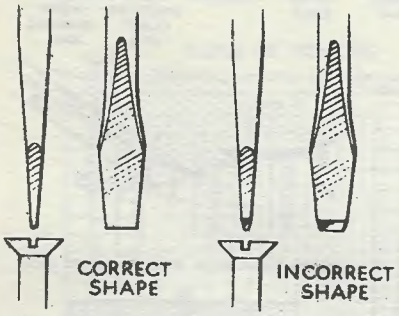
(a) Face Nailing. (b) Skew Nailing.

FIG. 32. METHODS OF NAILING.

13. SCREW-DRIVER.

13.1 Screws are common fasteners used in woodwork. Setting screws requires more time and labour but gives a stronger joint. Another advantage of the screw is the ease of taking apart and reassembling.

Screws may be driven either by a hand screw-driver, a ratchet or spiral ratchet screw-driver or a screw-driver bit in a brace. Always use the longest screw-driver convenient for the work. More power can be applied with a long screw-driver than with a short one, and there is less danger of it slipping from the slot of the screw. The driver should be of correct shape and width, as shown in Fig. 33a. An improperly sharpened driver may slip out of the slot and damage the head of the screw or mar the surface of the wood.



(a) Correct and Incorrect Screw-driver Tips.

(b) Driving Screws with a Hand Screw-driver.

FIG. 33. SCREW-DRIVERS.

13.2 To use a hand screw-driver, hold the handle firmly in the palm of the right hand with the thumb and forefinger pointing along the handle. The left hand should steady the tip and keep it pressed into the slot while renewing a grip on the handle for the next turn, as shown in Fig. 33b. The method of driving a screw with a screw-driver bit and brace is shown in Fig. 34.

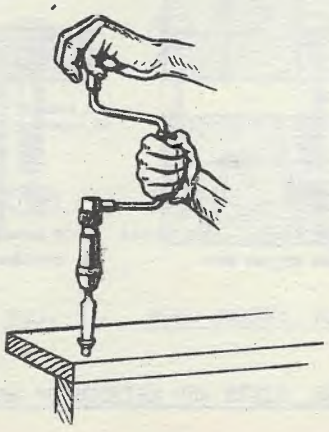
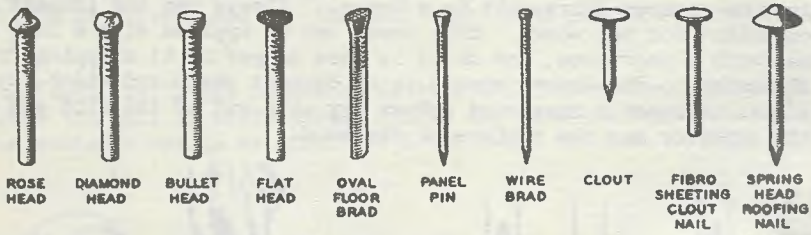


FIG. 34. DRIVING A SCREW WITH A BIT AND BRACE.

14. NAILS, SCREWS, NUTS AND BOLTS.

14.1 Fig. 35 shows types and sizes of nails, method of nailing and other information about nails.



COMMON SIZES OF WIRE NAILS

In wire nails & brads, sizes of sections decrease as gauge figures rise.

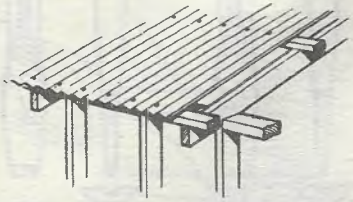
LENGTH	GAUGE													
6"		4												
5"			5											
4"				6	7	8								
3½"					7	8								
3"					7	8	9	10	11	12				
2½"							9	10	11	12				
2¼"	OVAL FLOOR BRADS								11	12				
2"							9	10	11	12	13	14		
1¾"										12	13	14		
1½"										12	13	14	15	16
1¼"											13	14	15	16
1"													14	15	16	
⅞"														16	17

BRADS

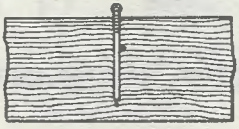
LENGTH	GAUGE				
2"	16				
1¾"	16				
1½"		17			
1¼"		17			
1"		17	18	19	
¾"		17	18	19	
⅝"			18	19	
½"				19	20

CLOUTS

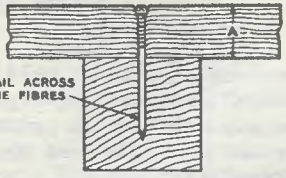
LENGTH	GAUGE			
1½"	10	11	12	
1¼"	10	11	12	
1"		11	12	13
⅞"		11	12	13
¾"				13



SPRING HEAD NAILS IN CORRUGATED IRON



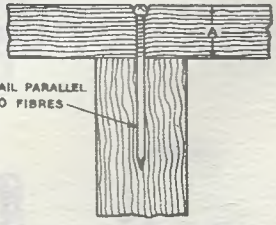
FIBRES GRIP SHAFT OF NAIL



SUITABLE LENGTH NAIL = 2½ A

NAILS CLINCHED

METHOD OF NAILING TO OBTAIN BETTER GRIP



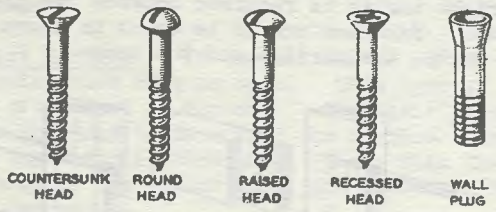
SUITABLE LENGTH NAIL = 3A

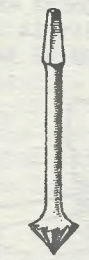
FIG. 35. TYPES, SIZES AND METHODS OF NAILING.

14.2 Fig. 36 shows types and sizes of screws, together with nuts and bolts and other information.

Before a screw is inserted holes should be bored with an auger bit, wood drill or gimlet to receive the screw.

Fig. 36 also shows methods of screwing and other information.

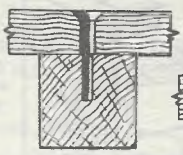


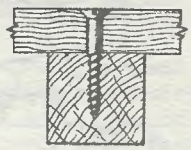


SIZES OF SCREWS

NOTE:- Diameters increase as gauge numbers rise.

LENGTH	NUMBER OF GAUGE																	
¼"	1	2	3	4														
⅜"	1	2	3	4														
½"	1	2	3	4	5	6	7	8										
⅝"	1	2	3	4	5	6	7	8										
¾"		2	3	4	5	6	7	8	9	10	11	12						
⅞"			3	4	5	6	7	8	9	10	11	12	14					
1"				4	5	6	7	8	9	10	11	12	14					
1¼"						6	7	8	9	10	11	12	14					
1½"						6	7	8	9	10	11	12	14					
1¾"								8	10	12	14	16	18					
2"								8	10	12	14	16	18					
2¼"									10	12	14	16	18					
2½"									10	12	14	16	16					
3"									10	12	14	16	18					
3½"										12	14	16	16					
4"											14	16	18	20	22	24		
5"												16	18	24	28			
6"														20	24	28	32	



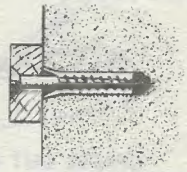


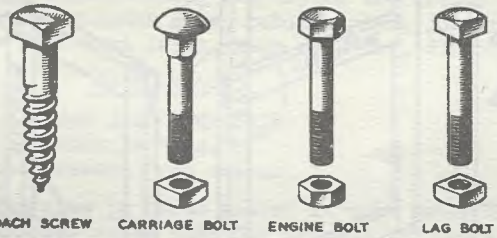
25.

SIZES OF CUP HEAD SCREWS AND BOLTS

DIA.	LENGTH																					
¼ & ¼	1"	1½"	1½"	1¾"	2"	2½"	2½"	2½"	3"	3½"	3½"	3½"	4"	4½"	5"	5½"	6"					
⅜"	1"	1½"	1½"	1¾"	2"	2½"	2½"	2½"	3"	3½"	3½"	3½"	4"	4½"	5"	5½"	6"					
½"	1"	1½"	1½"	1¾"	2"	2½"	2½"	2½"	3"	3½"	3½"	3½"	4"	4½"	5"	5½"	6"	7"	8"	9"	10"	11"	12"
⅝"	1"	1½"	1½"	1¾"	2"	2½"	2½"	2½"	3"	3½"	3½"	3½"	4"	4½"	5"	5½"	6"	7"	8"	9"	10"	11"	12"
¾"	1"	1½"	1½"	1¾"	2"	2½"	2½"	2½"	3"	3½"	3½"	3½"	4"	4½"	5"	5½"	6"	7"	8"	9"	10"	11"	12"
⅞"			1½"	1¾"	2"	2½"	2½"	2½"	3"	3½"	3½"	3½"	4"	4½"	5"	5½"	6"	7"	8"	9"	10"	11"	12"
1"															5"	5½"	6"	7"	8"	9"	10"	11"	12"

Sizes from 12" to 24" long may also be obtained.
Larger sizes must be specially made.





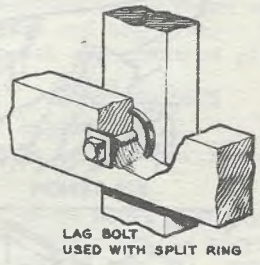


FIG. 36. WOOD SCREWS, NUTS AND BOLTS.

END OF PAPER.

JOINTS, GLUING AND STAINING.

CONTENTS:

1. MORTISE AND TENON JOINTS AND REBATING.

1.1 Where a strong rigid joint at right angles is required between two pieces of wood, the Mortise and Tenon Joint is used. Examples are to be found in doors and windows (see Fig. 1). It consists of two parts, the mortise and the tenon.

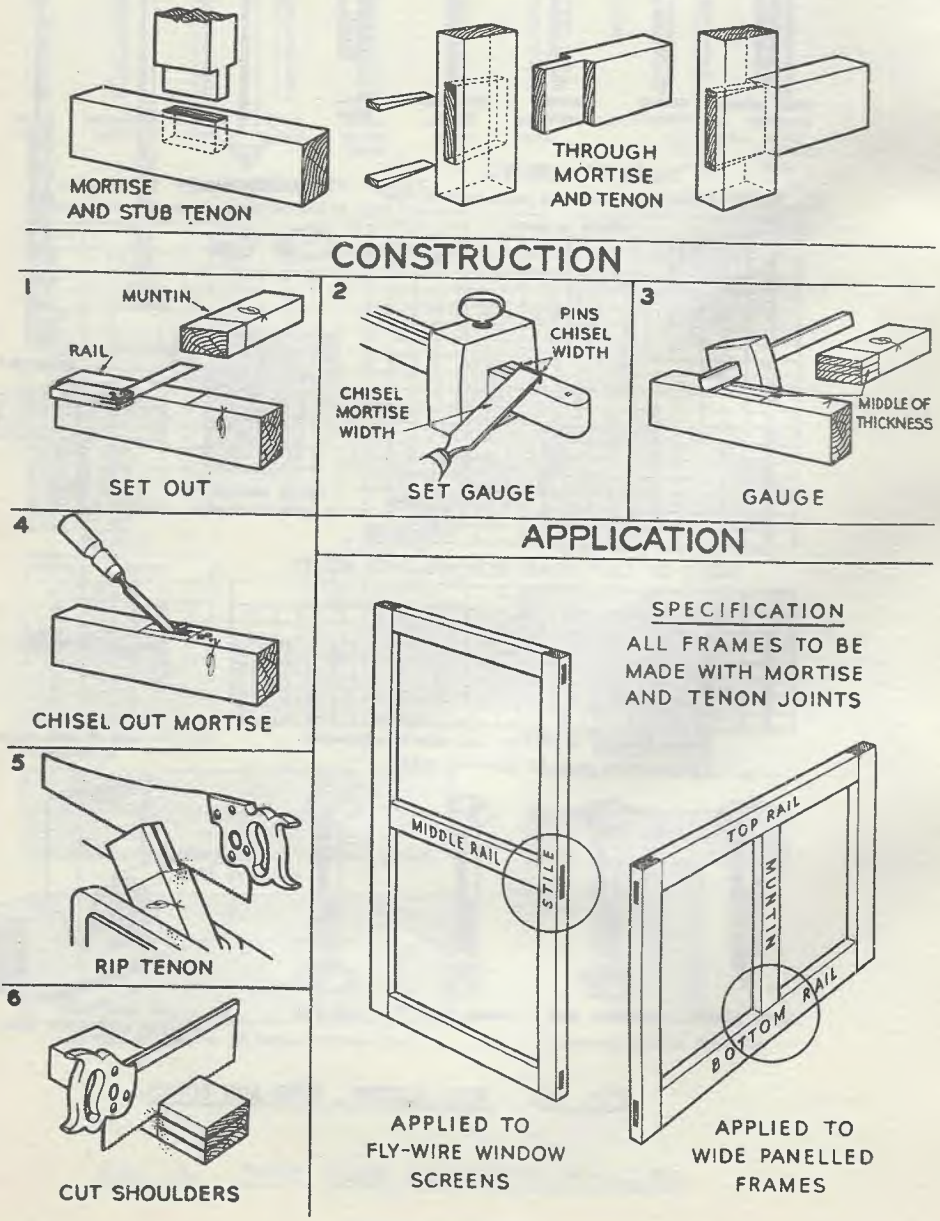


FIG. 1. CONSTRUCTION AND APPLICATION OF MORTISE AND TENON JOINTS.

The mortise is a rectangular slot in the upright into which the tenon is fitted. The tenon is about one-third the thickness of the wood to be mortised. In actual practice the width of the mortise is cut to the size of the chisel nearest the size required, then, of course, the tenon is made to fit accurately to this size. This is done by cutting one-third off each side at the ends across the face of the wood. The length of the tenon depends upon the depth to be mortised.

Stub Tenon. If the mortise does not extend right through the wood, the length of the tenon is 1/8 inch less than the depth of the mortise. This is known as a mortise and stub tenon.

Open Slot Mortise. If the mortise is at the end of the wood, the fourth side of the rectangular slot will be open. This type of joint is known as an Open Slot Mortise, and is often used at corners. The basic principle of a mortise and tenon joint is to replace the wood taken out of the mortise with the tenon, so that a perfectly true and fairly tight fit is obtained. Then, when the glue is applied and the joint completed, the fibres of the timber swell and interlock thus forming a full replacement of the timber removed.

1.2 Rebating. Rebating is used on door-frames, doors, windows or in cases where a raw edge is to be concealed. In appearance it may be likened to a step or ledge in the timber.

Rebating is sometimes used to run a telephone cable (1 pair or 2 pairs) across the floor if the wire is to run in the same direction as the joints in the boards. An easy and convenient method is to take the top half of the groove out. A slot is then left in the board with the tongue of the adjacent board forming the bottom. The work is carried out with a chisel.

Certain types of planes suitable for slotting are used. Before commencing any such work, permission is to be obtained from your supervising officer as well as the subscriber.

Rebating Planes. Modern practice is to purchase timber already dressed and rebated ready for use. It is then cut and fitted or joined according to requirements. For finishing, a rebating plane is often used. It is usually small, can be held and used with one hand, and the sides of the cutting blade are exposed. The main essential is that it is capable of cutting right into the corner of the 90^{o} angle formed by the rebate.

2. GLUING, STAINING AND VARNISHING.

2.1 Gluing. Two main types of glue are in use, viz -

Animal Glue
Casein Glue

Animal Glue is made by cooking hides, bones, skin and trimmings, etc., of animals in water, then concentrating and drying the liquid thus obtained. There are different grades, such as match glue, cabinet glue, joiner's glue and box glue. In each grade there are different forms, such as sheet, diamond, pearl and powdered glue.

Advantages	Disadvantages
High joint strength.	Hot application.
Quick setting.	Little or no water resistance.
Freedom from stain.	

To mix, the glue is first soaked in cold water for 1 to 12 hours, according to grade. One hour is the usual time for diamond and pearl glue, and 10 to 12 hours for sheet glue. The glue is then heated until melted, not to exceed 150^{o} F. Remember excessive heating lowers quality of glue. The glue must be used hot. If too thick, add clean water.

Casein Glue is obtained by the souring of skim milk. After precipitation it is washed, dried and ground. The glue is sold as a dry powder mixed with various chemicals. The glue sets by chemical action as well as absorption of the water. Once set, it cannot be remelted for further use.

/Advantages

Advantages	Disadvantages
High strength.	Tendency to stain some timbers.
Cold application and thus long assembly time.	Slower setting than animal glue, with lack of initial "grip" for joinery work.
Fairly high-water resistance.	

To mix this glue, use cold water and an earthenware or enamel vessel, as the casein glue contains caustic soda. Place about three quarters of the water in the vessel to be used, add glue powder slowly and stir constantly. Never pour water onto the glue powder. As the mixture becomes smooth, add remainder of the water and stir for further 10 to 15 minutes.

Liquid Glues, formerly known as "fish" glues but now mostly same ingredients as "animal" glues. If the glue becomes thick, do not add water but simply place tin in water and heat to correct temperature.

Use of Glue. Joints to be glued must be smooth, accurate and clean. The glue is applied with a brush, and pressure applied as soon as possible by means of presses or clamps. Sufficient glue is used to ensure a slight "squeeze out" when the pressure is applied.

Maintain pressure at least one hour for animal glue and four hours for casein glue, but leave overnight to allow joints to dry and set thoroughly.

2.2 Staining. When new wood is fixed in position, it is usual to give it a coat of stain which contains filling. The shade of the stain will always be lighter than the finished job is required to be. The purpose of the filling in the stain (usually whitening) is to fill the grain of the wood.

The pigments or dyes which form the basis of the stain are available in a number of colours, for example, umber (dark brown), sienna (brownish-yellow), red and yellow ochres or Condy's crystals. They are mixed with the whitening in methylated spirits, oil or water.

After the stain is dry, the surface is smoothed down with fine sandpaper or glass-paper ready for varnishing.

2.3 Varnishing. Varnishes are solutions of natural gums or resins dissolved in spirits or oils. They usually contain no pigments and are comparatively transparent.

Oil Varnishes are made with linseed oil base and, although they are the handiest and most durable, they take longer to dry. This is the only kind of varnish to be used on external woodwork.

Spirit Varnishes are made by using methylated spirits as the solvent. They dry quickly, leaving a hard, brilliant surface, but are more liable to be scratched or easily damaged.

French Polishing. Switchboards and other apparatus enclosed in wood, as used by the Department, are usually french polished. This is done by first staining and filling raw wood and then polishing with shellac dissolved in methylated spirits. The actual polishing is carried out by means of a pad which is kept moistened by dipping in the polish and occasionally adding a few drops of linseed oil to prevent it sticking.

If a polished surface in a subscriber's premises is damaged, it is to be reported to your supervising officer who will have the damage repaired or advise you what to do. If the damage is slight and you are instructed to make good, obtain and apply a colouring agent. If dent is deep, a filling of coloured wax or putty may have to be used. Use plastic wood for splintered or chipped edges. Apply only to the damaged portion, and, when dry, colour and finish off with clear varnish.

END OF PAPER.

DESCRIPTION OF TIMBER FRAMED DWELLING.

CONTENTS:

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1. INTRODUCTION.

1.1 This Paper is intended to impart an elementary knowledge of building construction. This knowledge is necessary in order to install telephone services.

The following points are to be kept in mind when wiring a service.

(i) Use the shortest practicable route.

(ii) Conceal the wiring where possible.

(iii) Don't damage walls, woodwork, doors and other fittings.

(iv) Carry out work in a workmanlike manner and treat the subscriber's property with every care.

When erecting apparatus on walls, it is necessary to understand the meaning of stud centres (D in Fig. 1), single brick and cavity, plastered walls of an unknown construction, nogging pieces, etc.

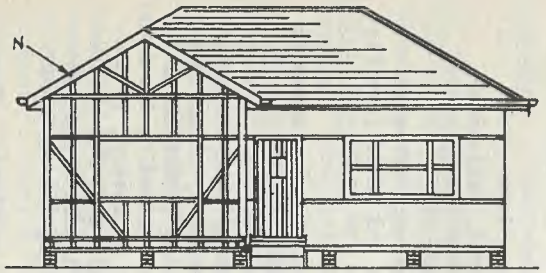
For wiring in ceilings, a knowledge of rafters, purlin, ridge-strut, wall-plate, collar tie and ceiling joint is necessary (see Fig. 1).

For external work, the lineman and technician must possess a knowledge of ridge-fascia-boards, barge-boards, rafters, soffit joists, corner-post and eaves (see Fig. 1).

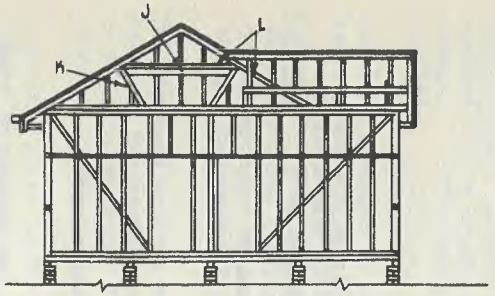
1.2 In order to appreciate building construction, a weather-board structure (as shown in Fig. 1) is considered. The building is carried out in this manner -

Piers. Piers made of wood, concrete or bricks are used. Brick or concrete are generally preferred. The height of the piers is generally governed by local conditions. The method of construction is governed by building rules of the local council. Prior to commencement, plans and specifications are submitted to the local council for approval. The engineer will amend the plans, where necessary, to conform with the council's building rules. Piers are generally laid at 6 ft. centres. Piers should be capped with galvanised iron or lead in order to insulate against dampness and also to block pests, such as white ants, from reaching the woodwork.

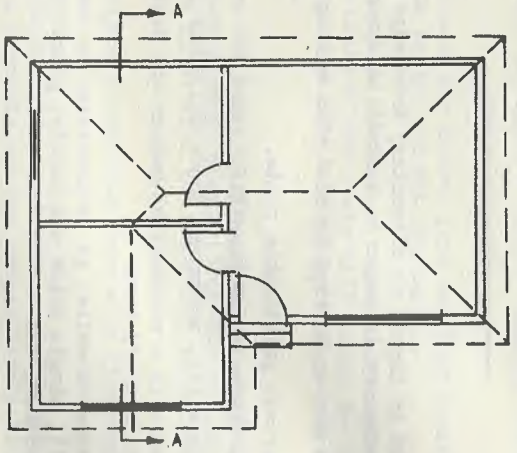
Bearers. Hardwood bearers generally 4 in. x 4 in. are now laid on piers. These are coated with creosote as a protection against pests.



FRONT

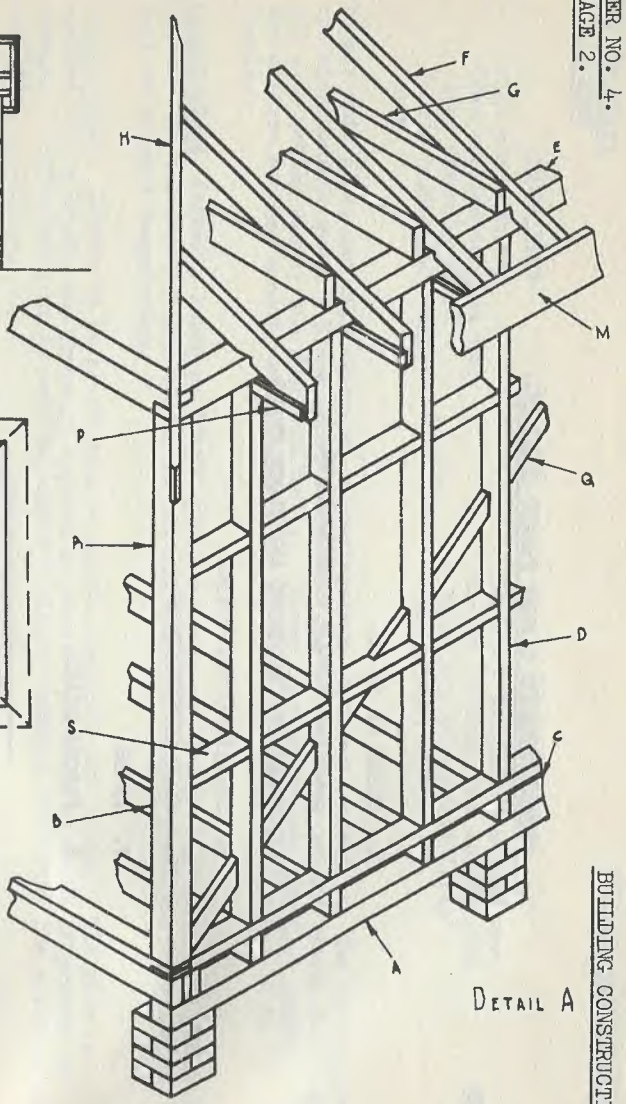


SECTION A-A



PLAN.

		Size	Centre
A	Bearer	4" × 4"	6'0"
B	Floor Joist	4" × 2"	1'6"
C	Vermin Plate	4" × 2"	
D	Stud	4" × 2"	1'6"
E	Wall Plate	4" × 3"	
F	Rafter	4" × 2"	1'6"
G	Ceiling Joist	4" × 2"	1'6"
H	Ridge	9" × 1-1/2"	
J	Purlin	4" × 3"	
K	Strut	4" × 3"	6'0"
L	Collar Tie	4" × 2"	3'0"
M	Fascia Board	8" × 1"	
N	Barge Board	8" × 1"	
P	Soffit Joist	2" × 2"	3'0"
Q	Brace	3" × 1"	
R	Corner Post	4" × 4"	
S	Nogging Piece	4" × 2"	



DETAIL A

Note - (1) Centres shown are usual for fibro exteriors with tile roofs. For galvanised iron roof, centres are usually -

Studs 2'0" Rafters 3'0".

(2) Fibrous plaster inner wall covering is usually fixed to 1-1/2" × 1" battens nailed to studs.

FIG. 1. TIMBER FRAMED DWELLING. TYPICAL STRUCTURAL DETAILS.

Joists. Hardwood 4 in. x 2 in. floor joists are now laid on the bearers at 18 in. centres for studs, and scarfed at the ends to fit snugly at the corners.

Studs. Wall-plate. Corner-posts. The general practice is to build all sides on the ground, then fit studs to vermin and wall-plates and erect in one operation followed by nailing the corner-posts in position. The slots in the wall-plate for studs are also 1/4 in. deep.

Braces. When all wall-frames have been erected, braces are fitted (if not already in position) to correct any sway or movement and also to keep the frame square.

Ceiling Joists. Ceiling joists generally 4 in. x 2 in. are now laid in position at 18 in. centres and are skew-nailed to the wall-plates.

Rafters. Ridge. Rafters, generally 4 in. x 2 in., are cut on the ground. When all rafters have been cut to the correct length and angles, and slotted for the wall-plates, they are nailed in position to the wall-plate and ridge-board.

Collar Ties. Purlin. Struts. Collar ties are now nailed from rafter to rafter to act as a brace or lock. Purlins are nailed on the inside of the line of rafters. The purlins rest on struts which, in turn, rest on the wall-plates or dividing walls. When the weight of the roofing, such as tiles, is distributed over the rafters, the purlins act as a purchase transmitted via the struts to the wall-plates.

Soffit Joists. Fascia-boards. Barge-boards. Are now cut and nailed in position. This completes the erection of the framework. Fixing of roofing, laying of flooring, followed by covering of external and internal walls and ceilings, would be the next stage in construction.

Care should be taken to learn to identify stud centres on finished walls.

Insulation spindles should not be fitted on barge or fascia-boards between rafter and stud centres.

2. TYPES OF WALLS.

33.

2.1 The basic weather-board structure was considered in the previous section. Various types of materials are used for covering the internal and external walls of timber framed construction, as well as weather-board and lining boards. Some of these materials are also used in brick houses, and types of typical walls are described here.

2.2 Brick Walls. The bricks are laid either with cement mortar or mixture of lime mortar and cement mortar generally called "Compo." Cement is always used up to the damp course.

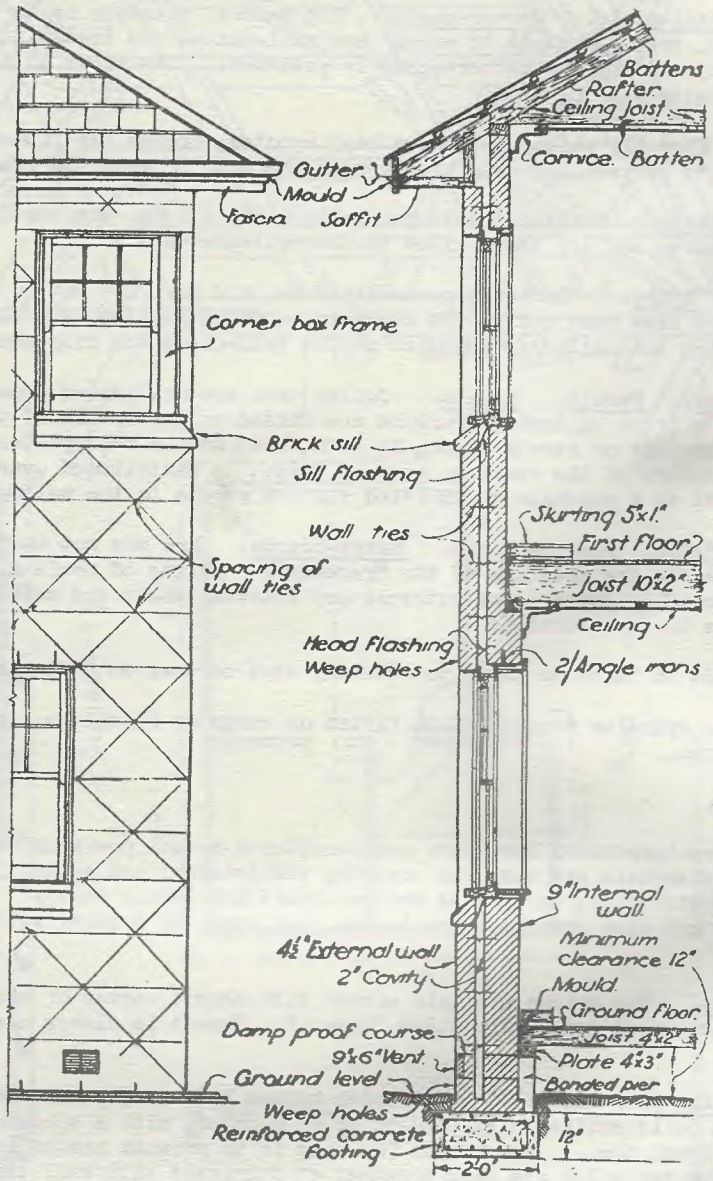
Cavity Walls (see Fig. 2). Most brick houses have cavity brick walls. Two brick walls are built entirely independent of each other, with a space or cavity of two inches between them. The reason for this is to provide insulation from dampness, etc. The two walls are tied together at intervals with wall ties consisting of a loop of galvanised wire shaped like a hair pin. (Width of wall $4\frac{1}{2}$" + 2" + $4\frac{1}{2}$" = 11".)

Solid Walls. A solid brick wall is used for factories, warehouses, etc. In this case there is no cavity, and sometimes three, instead of two, thicknesses of brick are used.

Single Walls. Internal or dividing walls are usually single brick. Terra-cotta, Cinder Concrete Blocks or Coke Breeze are also used in place of single brick walls. Terra-cotta is a hollow block made from baked clay. Cinder concrete or coke breeze is a block formed by a mixture of cement and coke.

Brick Veneer (see Fig. 3). Another form of construction, known as Brick Veneer, consists of a single brick outer wall. The internal construction then follows on the same lines as used for timber framed construction.

/FIG. 2.



CAVITY WALL CONSTRUCTION.

TYPICAL SECTION AND PART ELEVATION OF A TWO STOREY RESIDENCE.

FIG. 2.

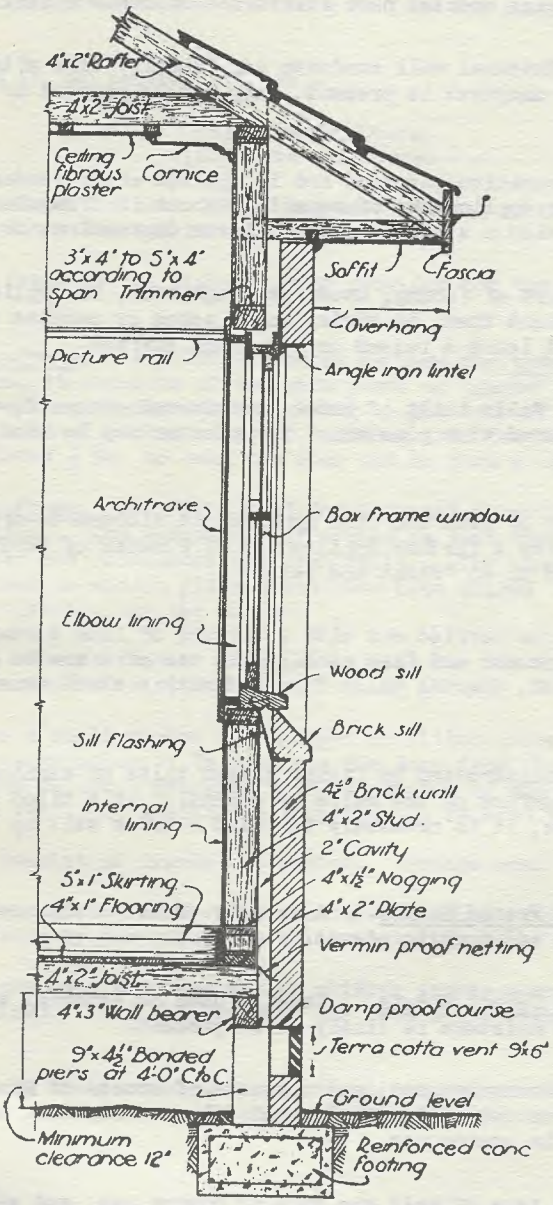


FIG. 3. BRICK VENEER CONSTRUCTION.

2.3 Reinforced Concrete. This is used in many forms in building constructions of all types. The concrete is reinforced with bars or rods of steel. Entire buildings are erected using this material and, although in the past it was mainly confined to large buildings, many modern homes now being erected have reinforced concrete walls.

2.4 Facing External Walls. External wall surfaces are usually left without facing although, for appearance or where dampness is present, they may be painted or rendered with cement mortar.

Stucco Facing is for decorative purposes and is applied after rendering with cement. It consists of a further application of cement or grout in irregular patches, the top surface being smoothed with a straight edge to leave depressions or irregular pattern.

Rough-cast. Another form of facing, known as rough-cast, is applied after first rendering the wall with cement then, by mixing rough ashes or pebbles with cement, a further application will leave a raised uneven rough surface.

2.5 Facing Internal Walls. Walls built of brick, reinforced concrete, terra-cotta or cinder concrete block are rendered with plaster. The plaster may be Lime Mortar or Cement Mortar.

Lime Mortar is a mixture of sand and lime applied and allowed to dry and then finished off to a smooth surface by a further application of Plaster of Paris and Lime Putty. This process is referred to as "float and set."

Cement Mortar rendering is carried out with a mixture of lime mortar to which cement is added, or a mixture of cement and fine sand. The use of a wooden float gives the wall a dull, semi-rough finish, whereas walls finished with a steel trowel have a smooth glazed surface.

Tiled Surface Walls are constructed by fixing glazed tiles of various sizes, colours and patterns to the rough surface of the walls by cement. If a tiled surface is required in a timber framed house, it is necessary to build a brick wall up to the height the tiles are required.

Internal Walls of Timber Framed Houses. A variety of materials are available, and they are nailed to the studs and nogging pieces.

Fibro Cement or Asbestos Cement Sheets. Usually used on external walls, but also used on internal walls where moisture is likely to be present.

Fibrous Plaster is most commonly used, and consists of sheets of Plaster of Paris base reinforced with a fibrous material called sisal fibre. Plywood, masonite, canite and metal sheeting are all in common use.

Lath and Plaster. This type of wall was once in common use, and was made by nailing laths about half an inch apart over the entire surface of the walls and then plastering in the same fashion as with a brick wall. The plaster stayed in place as the inner surface was forced in between and around the edges of the laths. Cow hair was used to act as a binding agent.

3. DOOR AND WINDOW CONSTRUCTION.

3.1 A technician is required to have a knowledge of door and window construction to enable him to run wires into premises and from room to room for purposes of substation installation.

3.2 Doors may be placed in two general classes -

(i) External Doors.
(ii) Internal Doors.

Many varieties are used for both these classes. Wiring is always run through the frames around the doors and not through the doorway.

3.3 Door-frames. The frame is the timber border provided for the fixing and hanging of the door.

(a) External Door-frame. A solid framework is used for external doors. In its simplest form, it consists of two side posts or "jambs" which are tenoned into the "head" or horizontal top member. The ends of the head must project beyond the jambs on either side for building into the brick-work. Jambs and head are rebated $\frac{1}{2}$ in. to take the door and so form a stop.

(b) Internal Door-frame. The frame used for internal doors is often referred to as jamb linings. The essential difference is that they are fixed into position after the brick-work has been built. The usual method of fixing is to nail them to wooden plugs which have been driven into the brick joints after first cleaning out the mortar.

In cheaper classes of work thinner material is used for the linings, with a planted stop $\frac{1}{2}$ in. thick instead of a rebate.

3.4 Transom. Sometimes a small window or fanlight is fitted above the door to allow for extra lighting or ventilation. To separate the door from the fanlight, a horizontal member is introduced called a Transom. It is rebated on the top to receive the bottom rail of the fanlight, whilst the underside is rebated to receive the door.

3.5 Windows. Windows consist of frames and sashes. Frames most commonly used are -

(a) Box Frames are made to receive the counter-balancing weights of the sashes, and are built up by fastening the hollow box-like jambs to a solid sill.

(b) Solid Frames are used for casement or sliding sashes where counter weights are not required. For this reason, the frames are solid like external door-frames.

Sashes. The sash is the part of the window made to receive the glass. Sashes are mortised on the inside edge and rebated on the outside to take the glass and putty.

3.6 Miscellaneous Items.

Architraves. Architraves are used for finishing door and window openings. They cover the irregular spaces between door or window frames and the wall coverings. Designs and dimensions differ to suit various kinds of work. Electric light conduit and switches are often put behind or on architraves round door-frames.

Arch Bars are used over openings in brick-work, such as doors or windows, to support the wall above. For openings up to 4 or 5 feet flat mild steel bars are used, and for openings wider than this size angle irons are used.

/Lintels

Lintels are horizontal members that span openings and support the wall above. Generally, they are constructed of concrete reinforced with mild steel rods and are used instead of arch bars.

Ventilators are used below, as well as above, flooring level, but the reason for their use remains the same, that is, to allow a free flow of air. Ventilators, or air bricks as they are sometimes called, below floor level provide adequate ventilation in areas under floors which otherwise would be completely sealed off, and also allow air to flow into the cavity.

Above the floor, the ventilators in the external wall complete the air circulation system through the cavity. They also allow air into the rooms by means of ventilators in the interior wall, which really consist of an opening the size of two bricks with a fancy grille over it. They form a convenient means of access to a house, in many cases, for underground cable work or the lead-in from aerial wires.

Cavity. Cavity walls, as mentioned earlier, are two $4\frac{1}{2}$ in. walls with a space of 2 inches between known as the cavity.

A convenient method of concealing wiring in a brick building of this type is to run the wiring through the cavity. Care must be taken to avoid wall ties.

Wall Ties are used to tie the two walls together. They are usually set about three feet apart and staggered every fourth course of bricks, and consist of galvanised (8 gauge) wire (copper near the sea).

It is important to keep wall ties clear, as otherwise moisture will penetrate to the inside wall.

Damp Course. A damp course is provided to prevent dampness rising from the ground by capillary action. Usually sheet-lead is used, but slate and other waterproof materials will be found in some courses. It is always placed horizontally in the wall below the lowest floor timbers. Damp courses are also used over exposed door and window openings and in chimneys to prevent dampness running down by gravitation. In these positions it is usually referred to as "flashing." The important part about damp courses is never to fracture them in working on a building, as this would permit the entry of dampness.

4. TERMS FOR FLOORING AND FLOOR TRAPS.

4.1 Girders are generally referred to as principal beams. They are used to support walls, roofs and floors. Modern practice is to use steel girders in place of heavy wooden ones as they have much greater strength for less cross-sectional area.

4.2 Beams are large, long, squared lengths of timber. They are used with or in place of girders where less strength is required to support roofs, floors or openings over doorways and windows.

4.3 Joists are used to support the flooring or sub-flooring. Usually they are wood so that wooden flooring can be nailed to them, or light steel where concrete is used.

4.4 Tongued and Grooved Plank Flooring. Narrow boards of long length are used to prevent shrinkage. The edges are tongued and grooved so that when the floor is laid an even surface is maintained.

For secret nailing a special milled flooring is used, and each board is nailed on the tongue before the next board is placed in position.

4.5 Concrete Floors above ground level are usually made of concrete slabs laid on light steel joists. The cracks between joints are filled with bitumen; the reason for not using a solid floor all in one piece is to allow for expansion and contraction.

4.6 Wood Block Flooring, sometimes known as Parquetry, is placed over the concrete floor. It is kept in position by sticking with bitumen. If tongued and grooved flooring were laid over concrete, wooden joists would have to be used for nailing down. This type of construction using concrete sub-flooring will be found in fireproof buildings.

5. CEILING CONSTRUCTION.

5.1 Wood Joists. In both brick and timber-framed building constructions, the ceilings are nearly always supported by the ceiling joists. These are 4 in. x 2 in. wood, spanning the room with the ends resting on the wall-plates and spaced 18 in apart.

In fixing fibrous plaster sheets, the ceiling joists are first covered with 2 in. x 1 in. battens spaced to suit the size and shape of the sheets nailed to them.

5.2 Fibrous Plaster. The fibrous plaster sheeting used for ceilings is made in the same way as that used for wall covering, that is, pre-cast in sheets of various dimensions to suit requirements. After fixing in position with galvanised clouts, the joints are stopped and finished off flush. The joint between ceiling and wall is generally a cornice or decorative half-round border of the same material as the ceiling.

5.3 Lath and Plaster. In the same manner as walls are sometimes constructed by using laths rendered with plaster, so in these cases the ceilings would also be of the same construction. Laths approximately $1\frac{1}{2}$ in. wide, 1/4 in. thick and 4 ft. 6 in. long are fixed to the joists and, when the plaster is rendered over them, the spaces in between are filled with the plaster and around the edges to the back. This foundation is being superseded by the use of metal lathing, that is, expanded metal sheeting, etc.

5.4 Concrete Slabs. In fireproof buildings or buildings of all concrete construction, the ceiling will be formed by the bottom of the floor above, or the roof of a single-storey building is sometimes concrete. Where the under surface is flat, it is generally rendered with plaster in the same manner as brick walls to finish the surface of the ceiling.

6. ROOF CONSTRUCTION.

6.1 The term "roof" describes the part of a structure intended to cover and give protection to the lower part of the building. It consists of the supporting framework and the actual roofing materials.

Timber is the most commonly used material for the framework in the construction of residential roofs (see Figs. 1 and 4).

39.

6.2 Wall-plates are the lengths of timber on the top of the walls to which the rafters are attached.

Span is the horizontal distance between wall-plates.

Common Rafters are the roof timbers which form the principal framework of the slopes of the roof. They support battens, etc., which carry the roof covering.

Pitch is the term used to describe the slope of the roof. Usual pitch for tiled roof is 30° or 1/3 pitch.

Ridge is the length of timber at the apex of the roof where the common rafters butt together.

Eaves are the lower edges of the roof surface which project beyond the face of the wall.

Fascia-boards cover the end of the rafters or the ends of the ceiling joists and wall-plates.

Ceiling Joists carry the ceiling and also form a tie between the feet of the rafters; their ends rest on the wall-plates.

/Collar

Collar Ties are used to connect two rafters near their approximate centres.

Struts are used to support purlins and rafters.

Purlins support the rafters at intermediate distances between the wall-plate and the ridge. They are analogous to bearers in a floor.

Gables are the perpendicular ends of a pitched roof.

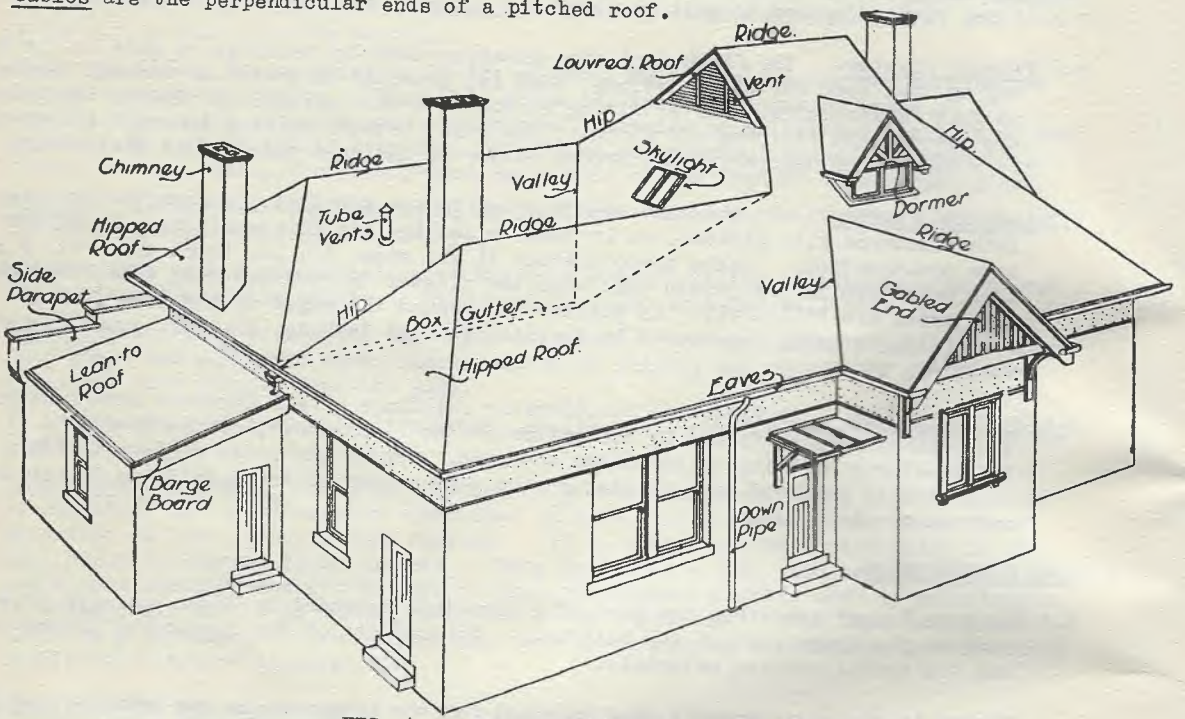


FIG. 4. TERMS APPLIED TO ROOFS.

Roofing materials in common use are -

(i) Roofing tiles.
(ii) Corrugated galvanised iron.
(iii) Corrugated asbestos cement sheets.

Roof Battens of 2 in. x 1 in. are fixed to all rafters and spaced approximately 13½ in. apart for tiles. For iron and asbestos, the battens used are 3 in. x 1½ in. and spaced approximately 36 in. apart.

6.3 Tile Roofing used now is mostly terra-cotta. Each tile is approximately 16-3/4 in. x 10 in. in size and locks into the other in a straight horizontal line. Each alternate tile is tied down to the roof battens on which it rests with copper wire. Hip and ridge capping, apex caps, etc., are used to complete the work. They are bedded in 3 to 1 cement mortar and faced with mortar coloured to suit the roof.

Corrugated Iron Roofs are still used in country districts where they serve as a catchment area for rain water. The iron has the advantage of being light, cheap and easily handled and fixed but does not resist temperature change, heat and cold both passing readily through it.

In fixing roof iron, a side lap of one and a half corrugations is usual and end lap 6 to 9 inches. It is secured by special spring-headed nails or screws and lead washers made for the purpose.

/Corrugated

Corrugated Fibro or Asbestos Cement. In recent years, corrugated fibro cement roofing has largely superseded galvanised iron. Although more expensive initially its maintenance cost is very low, especially for factory or warehouse type of building. Sheets are made in small or large corrugations, and special cuts are necessary where laps occur.

6.4 Steel and Concrete Beams. In larger types of buildings, structural steel and reinformed concrete beams are to be found supporting a flat concrete roof. In this type of construction, provision is made for expansion and contraction by joints in the concrete filled with pitch. A covering of malthoid or other bitumenous impregnated felt is often laid over the concrete for water-proofing purposes.

7. EAVES.

7.1 Open Type. The ends of the rafters usually project over the wall-plate about 18 in. to give protection to the exterior walls. These overhanging eaves may be open or boxed. In the open type, the projecting portion of the rafters should be dressed and lined on the top or underside with fibre cement sheeting or tongued and grooved lining boards. Bird wire should also be fitted between the rafters. Alternatively, a fascia-board may be scribed and fitted to the rafters.

Boxed Eaves. In this type, the lining underneath is horizontal and fixed to the soffit joist which is built up to provide a support for the lining.

8. FASCIA-BOARD.

8.1 Generally, the fascia-board is fixed horizontally to the ends of the rafters and has a rebate on the inner side into which the edges of the fibro lining fits if fibro cement is used.

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END OF PAPER.

MISCELLANEOUS NOTES.

CONTENTS:

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1. METHOD OF REMOVING AND REPLACING BRICKS.

1.1 Use of Mortar. Where it becomes necessary to remove a brick from a wall care must be exercised, and Form S.E. 80 must be signed by the subscriber. If the wall is not plastered on either side, the work is straightforward but, on a plastered wall, the brick would have to be located. The first step is to locate the joints. This is done by using a fine pricker to penetrate the plaster, and the difference between the hard surface of the brick and the mortar in the joints is easily felt. Once the joint is located, try either side to decide whether it is a vertical or horizontal joint. Then, knowing the dimensions of the brick, 9 in. x 3 in., it is possible to outline the brick and the mortar around it by further use of the pricker. Prick not more than 5 in. in one direction then proceed in the opposite direction, and the vertical seam should be located in a 9-1/4 in. movement. The next step is to scrape out the mortar. A hack-saw blade could be used if the mortar is very soft, but the correct tool for all this type of work is the carpenter's plugging chisel. This chisel has a wide thin blade designed to fit into the joints.

After removing the mortar all around the brick to the full depth of 4-3/8 in., the brick will be loose and can be manoeuvred out.

The brick is replaced as follows -

(i) Clean away all mortar so as to leave the faces of the bricks clean.

(ii) Moisten with water all the surfaces, including the brick to be replaced.

(iii) Apply ready-mixed mortar to the bottom of the hole in the wall and to the two ends of the brick.

(iv) Ease the brick back into position until flush with the wall.

(v) Work a little mortar in the top of the brick and finish all joints neatly.

If the wall is plastered, the mortar could be used over the face of the brick to raise the surface to approximately 1/8 in. of the finished plaster and left rough, then, when set, a layer of plaster of paris applied over the surface in order to restore the wall to its original state.

1.2 Repairs to Walls. Technicians generally should not "make good" any disfigurement to wall surfaces, providing the damage is not greater than is reasonable to fix securely the equipment when installed. If requested by the subscriber to make good, the above should be explained courteously.

If a service is to be cancelled or removed, and the damage behind the backboard is considerable, the technician may leave the backboard in position. If this is not satisfactory the technician should make good, if possible. If it is not possible to make good, he should report to his supervising officer and inform the subscriber of his intention.

2. FLOOR COVERINGS AND METHODS OF ATTACHMENT TO FLOOR.

2.1 On substation installation work it may be necessary for a technician to lift floor coverings. A knowledge of various types of coverings in use, and the methods of attaching each type to the floor, will facilitate the work. Also, when certain precautions are observed no damage should result when work involving floor coverings is carried out.

2.2 Linoleum is a floor covering made with a canvas-like base, and the surface is hardened or oxidised linseed oil. Sometimes powdered cork is added. In most cases, it is attached to the floor with tacks.

To raise the linoleum, first remove the tacks. This can be done by inserting the point of a screw-driver under the head of the tack and levering. When all the tacks have been removed, the linoleum may be rolled up from the edge. The larger the roll the less danger of cracking the surface and, for this reason, the linoleum should not be folded.

This method applies also to other types of linoleum made from a felt base impregnated with tar with a printed or painted surface, or floor coverings made from rubber, etc.

Floor coverings may be stuck down with various preparations made for this purpose. These may be raised by finding a free edge and inserting a screw-driver or other flat-edged instrument and gently levering from underneath while pulling with the other hand.

2.3 Carpets, Body Carpets, Feltex, Etc. These coverings are woven or machine produced from wool. An underfelt of cow hair is often used to create thickness. On wooden floors the method of attachment is by tacks, and a screw-driver may be used to lever them out.

2.4 Concrete Floors. In certain fireproof buildings having all concrete floors with carpet or similar floor coverings, the method of attachment is to first insert wooden plugs into the concrete and then fasten down the covering by means of large-headed tacks.

2.5 Wiring Through a Carpet. If it should be necessary to pass wiring through a carpet, a hole can easily be made by using a pointed instrument, such as a pencil, to poke a hole between the weave. A hole should not be cut if it can be avoided. In all cases, the consent of the subscriber must be obtained before making the hole.

2.6 Wiring Beneath a Floor Covering. If a telephone were required on a table in the centre of a room, the cable could be run under the floor covering provided the covering were thick, otherwise this type of installation should be avoided unless it is possible to wire underneath the floor or use a special wire which is available for use under floor coverings.

The essential part where any work is concerned involving floor coverings is to raise only just as much as is necessary to perform the work required. Be careful to do the least amount of damage and then restore everything as near the original condition as possible.

/3.

3. CUTTING TRAPS IN FLOORS.

3.1 A trap in a floor is used to facilitate drawing a cable into position by means of a "fish wire." The wiring, if possible, should be brought in from such a position that, when drawing the cable, it will run parallel to the floor joists, thus eliminating any obstruction. If the cable were running across floor joists, each joist would have to be grooved.

In cases where the removal of a floor board or number of boards between two floor joists is necessary, proceed as follows -

Locate the joists by checking the position of the nail lines on the flooring. As the nailing will be in the approximate centre of the joist, measure to the approximate edge of the joist (assuming joist to be normal width of 2 in.) and drill a series of holes close together across the board to be removed. A small chisel is then employed to cut through portion of the drilling to provide access for a hacksaw blade. Saw a board across and, with the chisel, cut a start in the grooving along the board. Insert the blade and saw the board's length. Repeat drilling process at the opposite end and saw across and down the other side. The board may then be lifted out. To replace the board, nail or screw a hardwood strip (approximately 2 in. x 2 in. in the cross-section and of sufficient length to overlap the board each side of the opening) to each floor joist with the surface flush with the under surface of the flooring. Replace the floor board and secure same to the hardwood strip with screws (see Fig. 1).

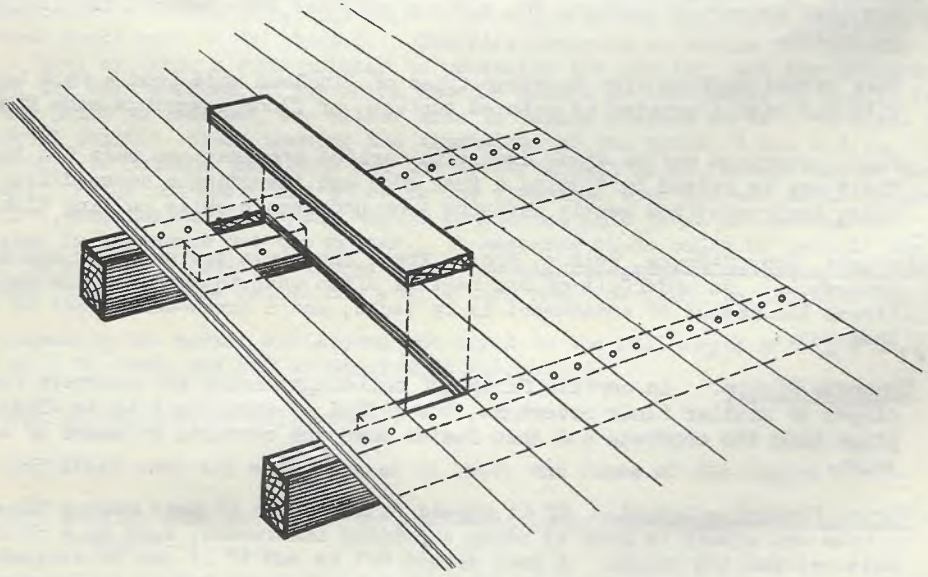


FIG. 1. FLOOR TRAP.

To remove a number of boards, saw across and around the section in the foregoing manner and increase the length of the support accordingly.

Where a floor board is required to be removed and extends over a number of floor joists, punch securing nails through the board and saw the board on each side to eliminate the tongue and grooves. The board may split if this is not done. Remove board and, when replacing, secure with wood screws.

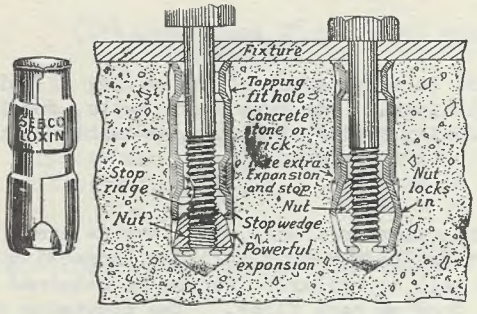
During building operations, arrangements are usually made with the carpenter to provide the necessary traps.

4. USE OF RAG BOLTS AND LOXINS.

4.1 Rag Bolts and Loxins are used where it becomes necessary to anchor apparatus, fittings, etc., to concrete.

4.2 The Rag Bolt in appearance resembles an ordinary nut and bolt except that the head is replaced by a square stepped end tapered in such a fashion that, when pressure is applied, it remains firmly in the concrete where it has been embedded.

4.3 The Loxin consists of a nut fitted into a metal sleeve. It is shaped in such a way that, when it is placed in the hole in the concrete, any pressure applied by screwing in the bolt will draw the nut into the sleeve. The sleeve then expands and locks against the side of the hole. The hole must be carefully drilled to ensure an initial tight fit.



LOXINS USED TO SECURE FIXTURE.

The main difference between rag bolts and loxins is that, with the rag bolt the nut is on the external surface but, with the loxin, the nut is embedded in the concrete.

4.4 Use of Star Drill. Holes may be drilled in concrete by using "Sebco" or Star Drills. Various sizes of both are available. The star drill is so called because of the shape of its cutting point. Four channels or grooves run towards the point for clearance purposes, and the raised edges of the grooves terminate at the point at right angles, forming a star. In use, the drill is held right at the top between the thumb and curved fingers and driven in by well-directed blows from the hammer swung from the shoulder. It is essential that the striking surface or face of the hammer should be clean and square, and that the head of the chisel be hit squarely. After each blow, the drill must be rotated 1/4 to 1/2 a turn and the hole cleaned out frequently.

4.5 Use of Cold Chisel. Where a channel is required to be cut across a concrete floor for wiring purposes, a cold chisel is used; these are made in various sizes.

The chisel is loosely gripped at the top and inclined to the required angle for the cut. The head must be hit squarely by the hammer and the eyes kept on the cutting edge for guidance.

Before commencing the channel, always mark with two lines the width of the channel to be cut so that the finished job will be straight and true along the sides and have an even bottom.

4.6 Making Good. After the wiring has been placed in the channel, it can be filled to the surface with any available sealing compound of a bituminous base as used in Departmental work.

Where it is required to fill the channel again with concrete to restore the surface, the wire must be protected by first placing a conduit or water pipe in the channel through which to run the wire. This is necessary in order to protect the wiring from contact with the cement and for replacement purposes.

/5.

5. DISTRIBUTION OF WIRING USING SKIRTING, PICTURE-MOULDING, WALL CHASES, RISER SHAFTS, FLOOR CONDUITS AND DUCTS.

5.1 Skirtings are base members fitted round the wall and consist of long lengths of timber varying in width, but specially milled for the job, to provide a finish between the wall and floor. In timber-framed houses they are nailed to the studs. In brick construction they are nailed to flat wooden plugs driven into the wall joints.

Picture-moulding, or china rails, are fixed to the walls in the same manner as skirting, generally at a height level with the top of the door frame or above it. In substation premises the skirting, picture-moulding or architraves are the most convenient places to run wiring.

Wall Chases. It is becoming the practice to make provision for wiring of telephone services during construction of large buildings. For runs along walls, special picture-moulding is sometimes used or a cavity is left behind a removable skirting or moulding higher up the wall.

Riser Shafts. For wiring or cabling from floor to floor, riser shafts are often provided. They are made by leaving vertical cavities in walls or supporting pillars, sometimes by building a false front on a wall or pillar. Access is obtained by removable fronts or in large shafts by a door on each floor. The provision of a wooden running board is made to facilitate the securing of cables.

Floor Conduits and Ducts. Under-floor distribution is often required for telephones at points not adjacent to walls or where continuous runs on walls cannot be made.

Suitable types of under-floor runs are seamless steel conduits, fibre ducts (half round) or steel ducts (rectangular or D shaped).

For drawing-in cables, draw wires are used and Draw Boxes are located at suitable points in the system and at terminal boxes. Various types of outlets are used, according to requirements regarding position of services and types of system used.

6. FACTORY WIRING.

6.1 Factory wiring is carried out in a similar manner to other forms of installation, except that appearance and concealment of wiring is not so important. On exposed woodwork, staples may be used to secure wiring and, for large cables, suitable flat clips or conduit clips held by clouts or screws.

In a large workshop or factory, it is often necessary to carry wiring along wooden principals, tie-beams, posts supporting roof, etc., among machinery.

The technician should not submit himself to danger due to moving shafting, belts, etc., but should arrange to have the machinery stopped. If this is not possible, the work should be done outside normal working hours when the machinery is not in use.

/6.2

6.2 Wiring on Steel Girders. Avoid running wiring along steel girders, if possible, but if there is no alternative, use one of the following methods -

(i) Request the subscriber to secure a running strip of wood to the girder and fix wiring, etc., thereto.

(ii) Small button insulators can be tied to the girder and wiring secured thereto.

(iii) Drill and tap girder to take metal screws and clips.

(iv) Clear face of girder at appropriate intervals and sweat flat metal clip thereto.

Modern methods of wiring endeavour to eliminate running cable in contact with cement surfaces because of chemical action on the sheath of the cable, and also runs in contact with steel, etc., because of the possibility of electrolysis.

7. WIRING IN ADVANCE OF BUILDING COMPLETION.

7.1 When commencing work on an "advanced wiring" job, the location of protective apparatus, instruments, etc., should be first determined. The wiring should not be done prior to the completion of the roof and exterior walls, but preferably within a few days before the commencement of plastering or similar operations. Where possible, the wiring should be installed so that it can be replaced if defective.

In a timber-framed structure, the wiring should be run along the ceiling members and then down the space between the studs formed by the wall coverings. In brick structures, if the vertical run down from the ceiling is to be plastered over, the wiring should be in flat or oval conduit secured by flat clips. In all cases, precautions must be taken to protect the wire. Any lengths should be coiled up and protected with a piece of hessian, and wiring should not be installed where there is a risk of its being damaged before the completion of the building.

8. FURTHER REFERENCES.

8.1 Further information about the wiring and installation of apparatus is in the booklets "Facilities for Telephones in Buildings" and "Installation Circular No. 4."

END OF PAPER.