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## 16. WOODWORK

### 16.1 INTRODUCTION

#### 16.1.1 DEFINITION

Woodwork is the process of converting timber into a desired shape and erecting it into its final position. It is mostly carpenter's and joiner's work.

#### 16.1.2 CARPENTER'S WORK

Carpenter's work includes all work on timber used in roofs, floors, verandas, staircases, doors and windows, frames, bridges, centering, shores, struts, large gates, and generally all wood work of which the scantling exceeds three-quarters of an inch, except in case of battens used in roof trellis-works which is specially mould or carved.

When the thickness of carpenter's work does not exceed two inches but its width exceeds twice the thickness, it is called "planking".

#### 16.1.3 JOINER'S WORK

Joiner's work includes furniture, doors and windows, turned and carved, on moulded work of all kinds.

### 16.2 SCOPE

The scope of work includes providing all labor materials, plants, equipment, accessories and services to complete the fabrication and installation of wood work consisting of but no limited to doors, windows, ventilators, gates, trusses stairs and all related work as specified and shown on drawings as approved by the Engineer-in-Charge.

### 16.3 MATERIALS

#### 16.3.1 TIMBER

##### 16.3.1.1 SOURCE:

Timber to be used for woodwork shall consist of deodar wood, shisham and kail wood as specified and shall be procured from an approved source. Brief description in their respect is as under;

Description	Uses
<p><b>SHISHAM</b> Weighs about 49 lbs, per cubic foot. It is a large tree of plain areas as well as the Sub-Himalayas forests growing at the altitude of about 3000 feet or less. Its sapwood is pale brownish white and heartwood is golden brown to dark brown with deeper brown streaks. The wood is dull with interlocked grain and medium coarse texture. It is easy to season but hard to work. It keeps its shape well if properly seasoned and takes on fine finish</p>	<p>It is chiefly used for flooring paneling furniture, sports goods, turnery and wheel-work; when peeled it can be made into beautifully grained plywood panels.</p>
<p><b>DEODAR</b> Weight about 35 lbs per cubic foot. It is the most important soft wood of Pakistan found in the Himalyan ranges between 4000 to 7000 elevations. It is yellowish brown in colour. Its heartwood is strong and durable due to natural preservatives in it. It is easy to season and work and retains its shape well.</p>	<p>Being light and moderately strong, it is used for structure work, railway carriage wagons, planking, shingles, pattern making and cheap furniture etc.</p>

<p><b>KAIL</b></p> <p>An evergreen tree, moderately hard, durable and close-grained. It is found in the Himalayas. Weights about 32 lbs per cubic foot.</p>	<p>It is used for furniture house building and railway sleepers, etc.</p>
<p><b>FIR, PALUDAR, PARTAL</b></p> <p>An evergreen tree having light and soft wood with an average weight of 30 lbs per cubic foot (air dry) occurs naturally in North Western hilly areas from 2000 to 3000m elevation.</p>	<p>It is used for railway sleepers, planking for floors, ceiling, cheap type door and windows, house construction and paper pulp etc.</p>
<p><b>CHIR, CHILL</b></p> <p>An evergreen tree having durability when placed under cover but non-durable in exposed conditions. An average weight of 38 lbs per cubic foot (air dry) occurs naturally in North Western hilly areas from 450 to 2400 meter elevation.</p>	<p>It is used in building construction, roofing and flooring, furniture making and also used for fuel wood.</p>

**16.3.1.2 QUALITY:**

**General**

- i) Timber shall be of good quality in accordance with the requirements of BS:1186, felled not less than two years before use for carpentry and four years for joinery and shall be properly seasoned.
- ii) Timber shall be uniform in texture, straight in fiber, free from open shakes, bore holes, fungus attack, rots, dots, decay, warp, twist, spring or crook and all other defects and blemishes.

**Sapwood:**

- iii) Sapwood shall not be permissible in hard wood thresholds and projecting window sills.
- iv) Sapwood shall not be permissible in hard wood joinery unless properly treated with a suitable preservative as approved by the Engineer-in-Charge..
- v) In soft wood joinery which is ordered as 'selected for staining' discolored sap wood shall not be permissible in surfaces which are intended to receive the final decoration.
- vi) In all other uses sap wood including discolored sap wood if sound shall be permitted.

**Knots:**

- vii) Exposed surfaces of hard wood sills shall be free from knots other than isolated sound tight knots not exceeding ¾ inches in diameter.
- viii) In joinery which is ordered as 'Selected for staining' all surfaces intended to receive final decoration shall be free from knots.
- ix) Glazing bars shall be free from all knots other than sound knots appearing on one surface only and not exceeding ¾" diameter in the web and ½" diameter elsewhere.
- x) Loose or decayed dead knots shall not be permissible in any joinery and shall be cut out and plugged properly.
- xi) In all other cases sound and tight knots including knot clusters which appear on any surface shall be permitted subject to a maximum of:
  - a) One live knot measuring 1 ½" to 2" across the major diameter per 2 feet length, i.e. a Max of four 2" knots per 8 feet length and five such knots in 10 feet length. (Smaller live knots shall be

tolerated provided they are not so numerous or on ground as to affect unduly the strength of the sawn out turn there-from).

- b) One dead knot measuring  $\frac{1}{2}$ " to 1" across the major diameter per 3 feet length, i.e. three such knots per nine feet length and four such knots in twelve feet length (Dead knots below  $\frac{1}{2}$ " diameter shall, however, be considered as negligible).

#### **Shakes**

- xii) Straight splits or shakes shall be permissible upto a total for both ends of  $\frac{1}{2}$  inch per foot of length at the time of passing.
- xiii) Timber shall not be spongy or in brittle condition.

#### **Storage**

Timber shall be stacked on a raised wooden or paved platform to eliminate chances of white ant attack. It shall be stacked under a proper shelter where maximum aeration is possible without subjecting it to the direct sun, rain or other weathering agents.

### **16.3.1.3 LOGS END SQUARES**

#### **Source**

Logs or Squares shall be obtained from an approved source.

#### **Size**

- i) Round logs shall not be of size less than 10 feet in length and 60 inches in girth.
- ii) Logs shall not be longer than 35 feet in length. Tapered logs shall not be less than 54 inches in girth at the small end.
- iii) Squares shall be of the size not less than 10 feet in length and 15"x15" in cross section.

#### **Quality**

Logs or squares shall conform to the specifications for Timber, Clause 16.3.1.

### **16.3.1.4 SEASONING**

- i) General

The object of seasoning timber is either to expel or to dry up the sap remaining in it, which otherwise putrefies and causes decay. The seasoned timber does not decay, or warp or bend due to temperature variations as in case of moist timber. The seasoned timber works easily under the saw and its shape and dimensions do not change with variations in temperature or with age. The seasoning also increases the strength of timber. The timber for carpentry is well seasoned when it has lost its weight by 1/5th. Timber for joinery is fit when it loses about 1/3<sup>rd</sup> of its weight after felling.

- ii) Method of Seasoning

Wood can be seasoned in drying kilns or by air seasoning. Kiln seasoning though very helpful in our country, where the high humidity during certain part of the year, precludes effective air seasoning.

- iii) Air Seasoning

For air seasoning there are two important points to be attended to. First is the proper piling and stacking of timber and the second is the protection of wood from rain, sun and hot wind.

The wood pile should be on proper foundation of wood, masonry or concrete. Concrete or brickwork foundations are the best. One square foot pillars at 4 to 5 feet intervals and rising 1 foot above the level of the ground will do. The distance between the two rows of pillars forming the two sides of the stack should also be 4 to 5 feet. For protection against termites, termite guards are provided near the top of the pillars, with a bend down edges protruding all round.

The orientation of the stack foundation is also a matter of considerable importance. Generally, the length of the pile should be in the same direction as the prevailing dry wind. The main force of the hot dry wind is then met by the sides of the crossers and only one end of the planks is exposed to heat. Piling of timber is to be done in a systematic manner. Lack of care in proper piling results in wastage of timber through crack warp, rot, stain and termite attack. All these can be avoided with a little extra expense or trouble. Other important factor is protection of the stack from hot wind, sun and rain. The direct rays of the scorching sun can cause very rapid drying of wood on the exposed surfaces and consequent splitting and cracking.

Timber can be classified into six categories based on the seasoning behavior. They are;

- 1) Very easy to season but require quick seasoning,
- 2) Easy to season,
- 3) Season well with care,
- 4) Crack in seasoning and so difficult to season,
- 5) Season well but take a long time to season and
- 6) Crack badly in seasoning. In the para 16.3.1.1 giving individual description of wood of the seasoning behavior has been stated based on the above classification.

Timbers which crack in seasoning and so are difficult to season or crack badly in seasoning, should be dried so as to prevent rapid drying. Timbers which season well with care, or season well but take a long time to season, should be seasoned in shades open on the north with a sufficient overhang so that the pile is protected from the rain. In case of timbers which are easy to season or very easy to season but require quick seasoning, it is necessary, that the timber should be piled under a good weather-proof roof but the sides should be always exposed to air and the sun. In the cases of timbers which require quick seasoning it is a good practice to stand the planks up on the ends against a horizontal support for a week or two after conversion to prevent formation of mould and staining. After a short period of vertical stacking the plans should be piled horizontally as described.

### **16.3.2 PLYWOOD AND VENEER**

#### **a) Plywood**

Plywood shall be an assembled product made up of plies and adhesives, the chief characteristic being the crossed plies which distribute the longitudinal wood strength. The term plywood in general sense shall include similar products such as laminated board, block board and batten board. Plywood shall conform to BS1455 whereas laminated, block and batten boards to BS 3444.

Three ply constructions shall include a "face" a "back" and a core or inner ply. Multi-ply shall include a face, a back and a core of three or more inner plies. With very few exceptions the grain of each veneer in the core shall run at right angles to that of the veneers on either side of it.

The construction of plywood may be balanced with an odd number of veneers arranged symmetrically or unbalanced. The tendency of the finished board to distort shall be reduced by adopting a balanced construction.

Plywood according to BS1455 shall be classified into two main types, viz interior and resin bonded.

Interior type plywood shall be suitable for most interior work including wall paneling, subflooring, kitchen filaments, and any location where resistance to moisture is not required. Adhesive used shall include casein, soya, blood albumen and animal glues as well as synthetic resin extended with other substances.

Synthetic resin bonded plywood shall have a much greater resistance to moisture. The more resistant types shall be suitable for external wall sheathing, shop front fascias, sign boards, shuttering and form work for concrete and for any purpose where it may be exposed to moisture. Adhesives used shall include urea, melamine phenol and resorcinol formaldehyde (arranged in order of increasing moisture resistance).

b) **Veneers**

Grade I Veneer shall be of one piece of firm smoothly cut veneer. The veneers shall be free from knots, worm and beetle holes, splits, dots, glue-stains, filling or In laying of any kind or other defects. No end joints shall be permissible.

Grade II Veneer shall present a solid surface free from open defects. Veneer may be in one or two pieces.

Veneers when jointed need not necessarily be matched for color or be of equal width. A few sound knots shall be permitted with occasional minor discoloration and slight glue stains, isolated pin holes not along the plane of the veneer.

Grade I veneered plywood shall only be used if not specified otherwise.

Grade II shall be used if specified and where subsequent painting and/or veneering is intended.

c) **Laminated Veneered Board**

It shall be built-up board, with narrow strip 3 to 7 mm wide, faced both sides with either one or two veneers from 1.2 mm to 3.7 mm thick. Where single or double face veneers are used, the grain shall usually run at right angles to the grain of the core strip. This type of board, conforming to B.S. 3444 and of a thickness between 13 mm to 25 mm, shall be the base for the highest class of veneered wood.

d) **Block Veneered Board**

Block board conforming to B.S. 3444 shall be of similar construction as of laminated board but the core shall be built-up of blocks up-to 25 mm wide. It shall be used as a base for veneering and for painted work.

e) **Fiber Building & Chip Board**

The term "board" in general sense shall include fiber building boards and the chip boards(or particle boards). The fiber building boards shall include hard boards, insulation boards and straw boards.

**A. FIBER-BUILDING BOARDS**

i) **Hard Board**

Mass per unit volume of hard boards shall range from 480 to 800 Kg per cubic meter and shall be classified according to this density (mass per unit volume). Tempered hard board/standard hard board shall be treated to increase hardness and resistance to water.

ii) **Insulation Board**

Insulation board shall have maximum density of 400 Kg/Cu meter, minimum thickness of 11 mm and maximum thermal conductivity (K) of 0.45. Insulation boards classified as homogeneous laminated, bitumen bonded, bitumen impregnated and acoustic shall have good qualities of thermal insulation and sound absorption. Acoustic boards shall be of low density and specially designed (Often with perforated surface) to increase sound absorption.



iii) **Straw Board**

Straw boards shall be made of straw compressed and formed into slabs 50 mm thick by heat and pressure and with proprietary paper glued to the sides. Edges too shall be bound with paper. The slabs shall be fairly stiff and shall have thermal conductivity (k) of 0.6.

**B. CHIP BOARD (Particle Board)**

Chip boards shall be made of wood particles in the form of chips or shavings of a controlled size combined with a thermo setting synthetic resin glue binder and formed into panels under the influence of mechanical pressure and heat. The process of adhesion shall be controlled resulting in a variety of boards with different but predictable physical properties. Chip Board, if specified, shall be used in sheathing, flooring and sub-flooring, wall paneling, partitions, shelves, furniture and veneered boards. It should not be affected dimensionally by changes in atmospheric humidity, though in wet conditions it shall have a limited resistance to moisture.

The surface finish of standard boards shall be comparatively rough and to support a good quality paint or varnish finish it shall require sanding and filling. Special grade of the board which have a paper surface permanently bonded to the board during manufacture shall be used for painting.

Chip boards shall be classified in grades of high, medium and low density mainly in thickness of 13 mm and 19 mm. The density range of this board is from 480 to 800 Kg per cubic meter as under:

High Density (HDF)	:	Above 800 kg/m <sup>3</sup>
Light (LDF)	:	Below 650 kg/m <sup>3</sup>
Ultra-Light (ULDF)	:	Below 550 kg/m <sup>3</sup>

Due to variation between brands, the weight of chipboard is not constantly proportional to thickness. Typical weights, based on standard chipboard with average density 750 kg/m<sup>3</sup>, are:

Thickness		Mass Per Unit Area
13.0mm	:	9 kg/m <sup>2</sup>
16.0mm	:	11.0 kg/m <sup>2</sup>
19.0 mm	:	14.0 kg/m <sup>2</sup>

Chipboard is available in an extensive range of thicknesses, i.e. 1.8mm to 60mm. The most common sheet sizes are: widths 1220mm, 1525mm and 1850mm and in lengths upto 3660mm.

**16.3.3 ADHESIVES**

For joinery work, animal glues complying with B.S:745 or synthetic resin adhesive complying with B.S:1204 shall be used. For flush doors and other forms of construction that rely mainly upon the adhesive, and particularly where exposure conditions are severe and prolonged dampness is likely to occur, one of the more moisture resistant adhesive shall be employed, the choice depending upon the severity of the conditions to which the work will be exposed.

**16.3.4 HARDWARE**

a) Nails and Screws

For joining work, wire nails oval, chequered head, lost head round or panel-pins complying with BS:1202, or wood screws in accordance with BS: 1210 shall be used. The gauge of nail or screw used shall be suited to the woods being fixed and to which a fixing is being made, and

the length shall be such as will give a sufficiently strong and secure fixing. CP:112 shall be followed which gives relationship between gauge amount of penetration and strength. All nails and screws used with reactive timber (becoming stained and disfigured by reaction with ferrous metals) shall be of non-ferrous metals or shall be given protective coating before use if the woodwork is likely to be subjected to moist conditions, e.g. external doors.

b) **Finish Hardware**

Hinges, tower bolts, handles, locks catchers, stoppers, railings, supports, appurtenances, fixings, fittings and all other items metallic, plastic or wooden considered as finish hardware shall be as shown on the Drawings or required in the Specifications and approved by the Engineer-in-Charge for the specific job.

**16.4 WORKMANSHIP**

**A. GENERAL**

- i) All workmanship shall be of the best type and all joints shall fit accurately without wedging or filling. After the wood work has been erected, the contractor shall, if any undue shrinkage or bad workmanship is discovered, forthwith correct the defect without any extra charge.
- ii) All Woodwork shall be fitted, hung and trimmed as indicated on the Drawings. One sample of each fitting to be used, shall be deposited by the contractor in the office of the Engineer-in-Charge. Hinges shall be counter sunk into the frames. The recess to be cut to the exact size and depth of the hinge. No subsequent packing shall be allowed. Brass screws shall be used with brass fittings unless otherwise specified. Hardware shall be fixed as specified in the Drawings. Locks and other hardware items shall be fixed at heights as shown on the Drawings or as directed by the Engineer-in-Charge.
- iii) Items of hardware specified in the Drawings shall be carefully fitted and securely attached on completion of the work. Hardware shall be demonstrated to work freely, keys shall be fitted into their respective locks, and upon acceptance of the work, keys shall be tagged and delivered in duplicate to the Engineer-in-Charge.
- iv) All wood work shall be neatly and truly finished to the exact dimensions specified.

**B. JOINTS**

Unless otherwise specified all joints shall be simple ten on and mortise joints with the end of the ten-ons exposed to view. All mortise and ten-on joints or scarf's shall fit truly and fully without filling. Where specified in the case of special 'high class joinery the end of the ten-on shall not show. Joints shall be painted with specified lead paint before the frames are put together. Glue shall not be used in joints which are exposed to weather and in such exposed work any hard stopping shall be done with tight driven plugs.

**C. SCREWS AND NAILS**

All nails and screws shall be of an approved type. Holes of correct size shall be drilled before inserting screws. Hammer shall not be used at all for driving in or starting the screws. All screws shall be dipped in oil before they are inserted in the wood. The heads of nails or screws shall be sunk and puttied or dealt with as directed by the Engineer-In-charge.

**D. WOOD TO BE COVERED IN GROUNDS OR WALL**

The contractor shall give at least 7 days' notice to the Engineer-in-charge in writing, when any timber is to be covered in the ground, or in the walls of a building, or otherwise. Failing this the Engineer-in-charge may order it to be uncovered at the contractor's expense, or measure and pay for only so much as is uncovered.

**E. FIXING**

All wood work shall be fixed in accordance with the drawings or the instructions of the Engineer-in-charge.

**F. BEARING**

All beams and girders shall be bedded on plates with not less than 9 inches bearing. All joists shall bear not less than 4-1/2 " inches on wall plates, and every purlin or batten supported on a wall shall have a bearing in the direction of its length equal to its own depth subject to a minimum of 4" inches.

**G. AIR SPACE**

An air space of quarter of an inch shall be left along sides of battens and other wood work buried in masonry or brickwork.

**H. PRESERVATIVES**

All portions of timber built into or against or close to masonry or concrete, and all junctions or rafters, purlins, beams and wall plates shall be given two coats of hot solignum, creosote or other wood preservative approved by the Engineer-In-Charge.

**I. PLANKS**

All scantling planks etc. shall be sawn straight and shall have uniform thickness. They shall be sawn in the direction of the grain and shall have full measurement from end to end. All planks and scantlings shall be sawn 1/16 inch in excess of actual measurement to allow planning. They shall be supplied with straight square edge, or rebated, ploughed, tongued or dwelled, as may be directed.

**J. CHIMNEY FLUE**

As a precaution against fire no wood work shall be fixed within 2 feet of the interior face of a chimney flue.

**K. WOOD FOR USE**

Unless otherwise specified the wood used in construction or joinery work shall be conform with the applicable provisions of Sub-Section 16.3.

**L. RESPONSIBILITY OF CONTRACTOR AFTER FIXING**

The contractor shall be responsible for the easing or otherwise of all doors etc. and the closing down of all open joints which may occur within six months of the completion of the work or as specified in the contract and which in the opinion of Engineer-in-charge required attention. Should any shrinkage or warping occur or any other defects appear in the joiner's work before the end of the specified period, such defective work shall be taken down and replaced to the Engineer-in-Charge satisfaction and any other work disturbed shall be made good at the Contractor's expense.

**16.5 DOORS AND WINDOWS (GENERAL)**

**16.5.1 QUALITY**

Unless otherwise specified timber shall conform to specifications as mentioned under 16.3.1.

**16.5.2 WORKMANSHIP**

Unless otherwise specified the workmanship for doors and windows shall conform to the provisions under clause 16.4 - Woodwork (General) in all respects, except those specified hereunder.

**16.5.3 SIZE OF DOOR AND WINDOWS**

The size of doors and windows shall be as specified.

**16.5.4 SECTION FITTING**

Unless otherwise specified or directed the particulars and dimensions of chowkats for doors and windows together with their fittings and furniture shall be as specified on drawings or as existing at site for repair works.

**16.5.5 CHOWKAT FRAMING AND CORNERS**

Chowkats shall be properly framed and mortised together. Door and Window chowkats shall have 4-1/2 inches wide horns left on the heads (also on sills where these are provided) or the corners of the chowkats bound with 2-1/4 inches by 1/10 inch Iron straps bent into a right angle having legs of a length equal to the depth of the chowkat and fixed with four screws of 2 inches each. The cost of horns or straps is included in the rate. Unless otherwise specified, the latter method shall be adopted.

**16.5.6 REBATES**

Chowkats shall have a rebate cut to receive the leaves. The rebate shall be 1/2 inch deep and its width shall be equal to the thickness of the leaf. The other side shall be finished with a bead and quirk; or other simple moulding, unless wire gauze is to be fitted. Where the plaster butts against the chowkat 1/2 inch deep rebate with a slight cut back shall be given, to serve, as key to the plaster.

**16.5.7 POSITION OF CHOWKATS IN JAMBS**

Unless otherwise specified, doors and windows opening to another room, to a corridor or verandah shall have the chowkats so fixed that they project 3/8 of an inch from the plastered face of the wall.

The plaster shall stop against the chowkat which shall have the rebate mentioned in the above paragraph as key for the plaster.

Other doors and windows shall be set back 4-1/2 inches from the face of the wall.

**16.5.8 CHOWKAT TO BE READY BEFORE STARTING SUPERSTRUCTURE**

No chowkat shall be painted or fixed before the Engineer-In-charge has inspected and approved it. All chowkats shall be ready before the work reaches the sill level so that they can be built in as brickwork or masonry proceeds.

**16.5.9 CHOWKAT PAINTING WITH PRESERVATIVES**

Before fixing, chowkat shall have the side in contact with the brickwork or masonry painted with two coats of hot solignum, creosote, coal tar or other wood preservatives approved by the Engineer-in-Charge. If doors and windows are to be subsequently painted, the priming coat shall be painted on the chowkats before they are fixed.

**16.5.10 HOLD FAST**

Chowkats shall be secured to the brickwork or masonry by hold fasts which shall be built into the wall with specified mortar. Hold fasts shall be made 1 1/2 x 1/4 inches flat steel patti bent over at both ends leaving 13 3/4 inches clear length between bends one bend shall have two screwed holes to which the chowkat is secured by bolt 1/2 inch in diameter. The head of the bolt shall be sunk into the chowkats and the hole plugged with wood. Where the chowkats are fixed at the extreme edges of the Jambs, the hold fasts shall be worked or bent as directed by the Engineer-in-charge. The number of hold fasts to each chowkat shall be as indicated on drawings. The feet of the chowkat shall, in this case, rest on the damp-proof course or floor as the case may be.

#### **16.5.11 SEASONING**

All door and window leaves shall be cut out and framed together, as soon as possible after the commencement of the work, and stacked in the shade to season. They shall not be wedged and glued for four months where possible and where the contract time permits. If it is not possible, they shall be wedged and glued just prior to being hung. Before final gluing, all portions in which defects appear shall be replaced.

#### **16.5.12 METHODS OF FRAMING LEAVES**

All stiles and rails shall be properly and accurately mortised and tenoned. The thickness of the tenon shall not exceed one-fourth the thickness of the plank and the width shall not exceed five times the thickness. All rails over 7 inches in depth shall have double tenons. All tenons shall pass completely through stiles and shall be secured by 3/8 inch hard wood or bamboo pins. All rails shall be haunched to the depth of groove for panels.

#### **16.5.13 GLUING**

All tenons at the final assembly of the doors shall be glued and wedged at top and bottom of the tenon with glued wedges. Immediately after gluing, the frames shall be tightly clamped and so left till the glue has set.

#### **16.5.14 HINGES**

Unless otherwise specified, leaves shall be hung on hinges of the size and the number specified. These hinges are to be of an approved type and quality. They shall be counter sunk into the chowkat as well as to the leaf the recesses being cut to the exact size and depth of the hinge, no subsequent packing shall be allowed. Two inch screws shall be used with 5 inches to 6 inches hinges and 1 ½ inches for smaller sizes.

#### **16.5.15 FITTING**

The Contractor shall deposit in the office of the Engineer-in-Charge one sample of each fitting to be used in the work. Unless otherwise specified, fittings shall be of the number size and type as specified.

#### **16.5.16 SPECIAL DOOR FURNITURE**

Where special ironmongery or door furniture is required, it shall be supplied by the department, or provided by the contractor at an extra cost. The cost of fixing or mounting such special furniture shall, however, be included in the rate.

#### **16.5.17 SCREWS**

Screws of such diameter shall be used as to fill completely the holes and cups in the fittings which they secure, and shall be oiled before being inserted. Unless the head can be counter-sunk flush with the fittings, round headed screws shall be used. Brass fittings of specified type shall be secured with brass screws.

#### **16.5.18 CHOCKS**

Hinged chocks shall invariably be fitted to all doors and windows to keep them open. Chocks shall be of hardwood and swung on 3 inches butt hinges and shall act on a sheet metal protector fixed to the door stile

#### **16.5.19 STOPS**

Wooden stops of a size suitable for the leaf concerned shall be fixed to the door or window chowkats to prevent the leaf from damaging the plaster of the jamb when fully opened.

## **16.6 PANELLED AND GLAZED DOORS AND WINDOWS**

### **16.6.1 DESIGN**

Unless otherwise specified the panelled and glazed doors shall conform to the drawings.

### **16.6.2 QUALITY OF TIMBER**

Unless otherwise specified or directed by the Engineer-in-Charge the wood shall conform to specifications as mentioned above in 16.3.1.

### **16.6.3 DOOR FRAME**

- a) The members shall be joined with close fitting mortise and tenon joints which shall be further pinned with corrosion resisting metal pins of not less than 8 mm (5/16"inch) diameter or with hard wood pins whose diameter shall not be less than 10 mm(3/8" inch). The framing shall be such as to ensure complete rigidity throughout.
- b) The entire surface of frame coming in contact with masonry shall be treated with a preservative of an approved type and quality.
- c) The frame shall be fixed to the masonry with at least four hold fasts. Two additional hold fasts shall be used if the chowkat is without a sill.

### **16.6.4 SHUTTER FRAME**

The stiles and rails of the frame shall be mortised and tenoned together. The thickness of each tenon shall be approximately 1/3 rd the thickness of the rail and the width of each tenon shall not exceed 5 times its own thickness.

### **16.6.5 PANEL**

- a) Panels shall be made of solid wood or hard board or water resistant plywood or veneer having both sides properly finished. They shall be truly cut and framed into rebates to a depth not less than 3/8 inch. Their thickness shall not be less than 7.5 mm (5/16 inch) panels shall be in one piece up to 12 inches clear in case of deodar and 18 inches clear in case of teak. In the larger sizes they shall be jointed, but the joints shall be glued and dowelled together to prevent all possibilities of its opening out afterwards.
- b) Panels shall be absolutely smooth so that no marks are visible. Unless otherwise specified, panels shall be splayed and fielded on both sides and the arrises of the frame receiving the panels finished with a simple mould.

### **16.6.6 SASH BARS**

Sash bars shall be of the same thickness on the leaf and shall be 1 inch to 1-1/4 inch wide, according to the size of the doors, and shall be twice moulded and twice rebated and mitred on the outside. The size of the rebate shall be 3/8 inch x1/2 inch to receive the glass and its fixing.

### **16.6.7 GLAZING**

All glazing shall be done in accordance with the provision of clause 16.14 for glazing. If specified, the doors and windows of bedrooms shall be glazed with blind glass up to full eye level. The glass panels of appropriate sizes shall be fitted into (3/8 inch) rebates and shall be retained in position with a thin layer of putty which shall be covered with wood beading.

## **16.7 FRAMED AND BRACED DOORS AND WINDOWS**

### **16.7.1 FRAME OF LEAF**

Framed and braced doors shall consist of two stiles, three rails and two braces forming the frame of each leaf to which the battens (planks) shall be fixed. In case of doors opening outside, where it is necessary to admit light, the Engineer-in-Charge may direct the addition of a frieze rail. In this case the space between the frieze rail and the top rail shall be glazed by the contractor without any extra charge.

**16.7.2 FRAMING AND BRACING**

The framing shall be made with mortise and tenon joints as per Specification No. 16.4. The top rail (or frieze rail when the door has been glazed) and bottom rails shall be chamfered or stop chamfered. The exposed edges of stiles and rails shall be chamfered or stop chamfered. Unless otherwise specified framing and batten shall be of the sizes as shown on drawings.

**16.7.3 BATTEN**

Batten shall butt into rebates in the top (or frieze) rail and the bottom rail and shall pass over the braces and the lock rail. Batten shall not be more than 5 inches wide and shall all be parallel and uniform in width. The joints shall be ploughed and tongued and finished with a bead and quirk on the outside. Battens shall be secured with two screws at each end and with one screw over each brace and the lockrail.

**16.7.4 OTHER RESPECT**

A framed and braced door/window shall conform to the provisions of Clause 16.5 In all respects.

**16.8 LEDGED AND BRACED DOOR AND WINDOWS**

**16.8.1 FRAME OF LEAF**

Ledged and braced door leaf shall be formed with battens secured to three ledges, with two braces between the ledges. Windows shall have only two ledges and one brace.

The top edges and ends of ledges and braces shall be chamfered. Battens (planks) shall have rebated joints finished with a "V" on one side and shall be of uniform width of not more than 5 inches. The battens shall be screwed, with two screws at each end and one over each brace and the middle ledge. The size of ledges, braces and battens shall be as shown on drawings.

**16.8.2 DOUBLE LEAVES**

In the case of double doors a 3" x 1" cover bar shall be screwed on to the edge of one leaf so as to make it a master leaf.

**16.8.3 HANGING**

The chowkat shall be rebated to a depth equal to the full thickness of the door, i.e the batten plus ledges. The doors shall be hung with the battens inside and the ledges outside. Hinges shall be fixed to the ledges.

**16.8.4 OTHER RESPECT**

In all other respect it shall conform to provisions of clause 16.5 for Doors and Windows (General).

**16.9 LEDGED DOORS AND WINDOWS**

**16.9.1 FRAME OF LEAF**

Ledged type also called country doors and windows, shall be formed by fixing battens on to three ledges. The battens shall be of uniform width, not more than 9 inches, and shall have rebated joints. The thickness of battens and the size of ledges shall be as specified on drawings.

**16.9.2 ERECTION**

Country doors shall be hung on pivot with the battens outside and ledges inside

**16.9.3 OTHER RESPECTS**

In all other respect the ledged doors and windows shall conform to the Specifications No.16.8 for Ledged, Braced and Battened Doors

## **16.10 WIRE GAUZED DOORS**

### **16.10.1 MATERIAL**

Unless otherwise specified leaves of wire gauze doors shall be made from deodar, irrespective of the wood used in making the chowkat or the other leaves hung from the same chowkat.

### **16.10.2 CHOWKAT**

Wire gauzed door shall normally be hung on the same chowkat as other doors, and the rate shall include the provision of extra depth in the chowkat to take the rebate for the wire gauze leaf. Where wire gauze doors are hung on a separate chowkat a special rate shall be settled.

### **16.10.3 WIRE GAUZE**

Unless otherwise specified, wire gauze shall be of best quality and uniformly woven wire webbing 12 x 12 meshes to the square inch made from 22 gauge galvanized iron wire. All wire gauze panels shall be in one piece, on joints being allowed in the gauze.

Whereas specified expanded metal or plastic or aluminum wire mesh could be used.

### **16.10.4 FIXING**

Wire gauze shall be fixed to the frame of the leaf after being stretched from out to out of rebate and nailed down taut by nails spaced at not more than 2 inches and then fixed that by a fillet of  $\frac{3}{4}$  inch x  $\frac{3}{4}$  inch screwed into a rebate of that size. The screws shall not be less than 1-1/4 inches in length, nor spaced further than 9 inches. All exposed arises of the fillet shall be finished with a small neat mould.

### **16.10.5 SPRING HINGES**

Unless otherwise specified all wire gauze doors shall be hung on self-closing spring hinges which shall be of an approved quality.

### **16.10.6 DOUBLE DOORS TO PROJECT**

All double leaf wire gauze doors shall close with the meeting stiles butting, against each other, a felt being fixed to one leaf to close the joint. The leaves shall close to such an extent that the junction projects from the face of the chowkat, the protection being one inch for each foot width of leaf. The top of the chowkat (and sill when it has been provided) shall be enlarged to a corresponding wedge shape, the cost of this being included in the rate.

### **16.10.7 MATCHING INNER LEAVES**

Unless otherwise specified the width and position of lock and bottom rails on wire gauze doors shall be the same type as those of the other leaves hung on the same chowkat.

## **16.11 WIRE GAUZED WINDOWS**

Where moveable wire gauze flaps or leaves are provided to windows, the provisions of Clause 16.10 for wire gauzed doors shall be followed with the following modifications.

Wire gauze windows shall not be provided with springs or spring hinges.

Double hung wire gauze windows shall close flush with the chowkat without the meeting stiles projecting in any way. Unless otherwise specified wire gauzed windows shall open outwards and shall be provided with hinged chocks to keep them in the open position, and with stops to prevent damage to plaster.

## **16.12 CLERESTORY WINDOWS**

### **16.12.1 CHOWKAT**

Unless otherwise specified the chowkat of clerestory windows shall be so fixed as to project  $\frac{3}{8}$ " inch from the inner face of the wall.

### **16.12.2 CLEAT**

Unless otherwise specified brass cleats of the slanting single button type approved by the Engineer-in-Charge shall be fixed by two brass screws to the polished wooden teak blocks with



chamfered edges. The wooden blocks shall 2" x 3-½"x ¾" and shall be firmly fixed to the wall by means of plugs and screws of an approved type.

#### **16.12.3 LEAVES**

The leaves shall be hung 1 inch off centre so as to make them self-closing. In order to open them, a cord (stout, non-twisting picture cord) shall be provided with a hard wood weight at one end (to keep the cord in position over the cleat).

#### **16.12.4 OTHER RESPECT**

In all other respects it shall conform to the provisions of Clause 16.6.

#### **16.13 FIXED WIRE GAUZE**

##### **16.13.1 WIRE GAUZE**

Unless otherwise specified, the wire gauze shall be of an approved quality, uniformly woven, wire webbing of 12x12 meshes to a square inch made from 22 gauge galvanized Iron wire. All panels shall be in one piece and no joints shall be allowed in the gauze. Where specified aluminium or expanded metal wire gauze shall be used.

##### **16.13.2 METHODS OF FIXING**

Wire gauze shall be fixed to the outside of the chowkat. This shall be drawn taut to the full width of the chowkat and nailed down by nails spaced not more than 2 inches and a cover strip, ¾ inch in thickness and of the same width as the chowkat so as to seem a part of the chowkat, bed all round with 1-¼ inches screws fixed not more than 9" inches apart.

##### **16.13.3 ALTERNATE FINISHING**

If specially required by the Engineer-In-charge, the wire gauze shall be fixed to the chowkat by a fillet, ¾ inch x ¾ inch, screwed into a rebate of the same size. The wire gauze shall be stretched taut and nailed down by nails spaced not more than 2 inches to the chowkat, and then the fillet screwed down with one-inch screws spaced not more than 9" inches apart.,

##### **16.13.4 FINISHING RATE**

Exposed arises shall be finished with a small but neat mould in each case. The rate shall be the same for either method of fixing.

#### **16.14 GLAZING**

##### **16.14.1 GLASS THICKNESS AND QUALITY**

Unless otherwise specified, all glass shall be flat sheet glass of fine quality known as "seconds". Glass shall be of the following weights per square foot for the various sizes mentioned below:-

- Not exceeding 12"x14" - 16 oz (about 1/14" thick)
- Exceeding 12"x14" but not exceeding 24"x24"-21 oz (1/10" thick)
- Exceeding 24"x24" but not exceeding 30"x30" -26 oz (1/9" thick)
- Exceeding 30"x30" but not exceeding 36"x36"-32 oz (1/7" thick)
- Exceeding 36"x36" plate glass- (1/4" thick)

Glass shall be free from specks, bubbles, distortion and flaws of every kind, and shall be properly cut to fit the rebates, so as to leave a uniform space of 1/16 inch all-round the panes between the edge of the glass and the rebate.

##### **16.14.2 PUTTY (METHOD OF PREPARING)**

Putty shall be prepared from pure raw linseed oil and best whiting, specially dry and ground fine to pass a sieve of 45x45 meshes to a square inch. The two shall be well mixed by hand and kneaded into a stiff paste. It shall then be left for 12 hours and worked up in small pieces till it becomes quite smooth. If the putty becomes dry; it shall be restored by heating and working it up again while hot. Where the rebate is small a little white lead shall be added in making the putty. Putty required for glazing large panes or for bedding plate glass shall be

made with a mixture of linseed oil and tallow with whiting so as to make it pliable and capable of standing expansion of the panes. Where required, putty shall be coloured to match the wood work.

**16.14.3 PAINTING OR PRIMING REBATES**

If rebates have not been painted, they shall be well primed with boiled linseed oil to prevent the wood from drawing oil out of the putty. Putty shall be painted at the same time and the same number of coats as wood work.

**16.14.4 FIXING GLASS WITH PUTTY**

Each pane of glass shall be bedded on a thin layer of putty called "back putty" and secured into position with proper glazing springs or nail. "Front Putty" shall then be applied chamfered and finished off neatly so as to ensure that the depth of the putty is exactly equal to the rebate.

**16.14.5 FIXING GLASS WITH WOOD FILLETS**

In the case of all panes exceeding 12 inches in width, front putty shall not be used but the glass secured with fillets of wood, without extra charge. The fillets shall be plain or moulded and of a size depending on the type of door being glazed. The glass shall be protected from contact with the wood by putty made with tallow to act as a cushion.

**16.14.6 BLIND GLASS**

Where blind glass is fixed the frosted face shall be away from the putty.

**16.14.7 PUTTY (COMING OFF)**

All glass that has been fixed by the contractor shall if it becomes loose during the period specified in the contract, be re-fixed and puttied by him at his own expense.

**16.14.8 CLEANING AND FINISHING**

No glazing shall be considered complete until all paint and other stains have been removed from the surface of the glass. Glass shall be cleaned and polished with pads of damp newspaper, and then with a clean dry soft cloth. Cleaning shall be done by two men working on opposite sides of the same pane at the same time. The contractor shall make good all glass broken by his workers while cleaning the glass. On completion of the work all doors and windows shall be cleaned, damaged putty or glazing repaired and the whole work left perfect with a workmanlike finish.

**16.15 MISCELLANEOUS**

The miscellaneous items for the woodwork consist of but not limited to;

- Curtain rods rails and accessories
- Window stays
- Door Holders, Door locks, Door springs, Finger Plates
- Sliding bolts, Tower bolts, Door handles Brass plates

All procurements and installations shall be made as specified and as approved by the Engineer-in-Charge.

**16.16 WOODEN STAIRS**

**16.16.1 GENERAL**

The wooden stairs shall be constructed where specified according to drawings with deodar wood complying with the provisions of Clause 16.3.1.

**16.16.2 WORKMANSHIP**

The quality of materials and workmanship shall conform with the provision of Clauses 16.3 & 16.4 or as specified.

The glazing where specified shall conform with the provisions of Clause 16.14.

The stairs shall be firmly anchored at floor and with walls as specified.

**16.17 WOODEN ROOF**

The wooden roofs shall be constructed according to Drawings and as specified. The timber and materials shall conform to the provisions of Clause 16.3. The work shall be carried out in accordance with Clause 16.4. The roofing work shall comply with applicable provisions of Section 13 – Roofing.

**16.18 SOUND PROOFING**

- i) Where specified shutter and frames of the doors, windows shall be affixed with sound proofing material sheets. The sound proofing sheets shall include cork sheet, rubber sheet and namdaas specified.
- ii) The sheets shall be cut precisely for the size of panels and frames on which they are to be affixed. The cut sheets shall be neatly fixed on the surface by means of screws/adhesive specified in Clause 16.3 as approved by Engineer-in-Charge.

**16.19 WALL LINING**

Specified timber shall be used, and it shall be sawn in the direction of the grains. Sawing shall be truly straight and square. The timber shall be planed smooth and accurate to the full dimensions, rebates, roundings, and mouldings as shown in the drawings made, before assembly. Patching or plugging of, any kind shall not be permitted except as provided.

**16.19.1 GROUNDS**

Grounds shall be provided where so specified. These shall consist of first class hard wood plugs or

the class of wood used for fabricating the frames, of trapezoidal shape having base of 50 × 50 mm and top 35 × 35 mm with depth of 5.0 cm and embedded in the wall with cement mortar 1:3 (1 cement: 3 fine sand) and batten of first class hard wood or as specified of size 50 × 25 mm or as specified, fixed over the plugs with 50 mm long wood screws. The plugs shall be spaced at 45 to 60 centimeters centre to centre, depending upon the nature of work. The battens shall be painted with priming coat, of approved wood primer before fixing.

**16.19.2 PANELLING**

**16.19.2.1 MATERIAL**

This paneling shall be decorative or non-decorative (Paintable) type as per design and thickness specified by the Engineer-in-Charge, of 2nd class teak wood, or graded wood pre-laminated particle board or as specified in item.

**16.19.2.2 ORNAMENTAL WORK**

The ornamental wood work shall be painted on the back with priming coat of approved wood primer before fixing the same to the grounds with screws, which shall be sunk into the wood work and their tops covered with putty. The ornamental work shall be made true and accurate to the dimensions shown in the working drawings. The fixing shall be done true to lines and levels. The planks for wall lining shall be tongued and grooved, unless otherwise specified.

**16.20 MEASUREMENT AND PAYMENT**

**16.20.1 COMPOSITE RATE**

The measurement and payment for the items of the work of Brickwork hereof shall be made corresponding to the applicable CSR items as provided in Contract Agreement and shall constitute full compensation, for procurement, transportation, performance in all respects and completion of work as specified including the site clearance as approved by the Engineer-in-Charge.

### **16.20.2 LABOUR RATE**

The measurement and payment for the items of the work of Brickwork hereof shall be made corresponding to applicable CSR item as provided in Contract Agreement and shall constitute full compensation for procurement transportation, performance in all respects and completion of work as specified including site clearance, as approved by the Engineer-in-Charge except the cost of materials to be provided by Department at designated location as defined in the Contract Agreement.

### **16.20.3 QUANTIFICATION**

The unit of measurement shall be measured as mentioned below in accordance with corresponding CSR items.

1. For Volumetric items, the unit of measurement shall be cubic meter or cubic foot. Following items of CSR are measured in the above mentioned criteria;  
Item No.: 16-1 to 16-6 and 16-82
2. Following items shall be measured as %age increase;  
Item No.: 16-87
3. For surface area items, the quantity of work shall be measured by surface area. The unit of measurement shall be Square meter or Square foot. Following item of CSR are measured according to this criteria;  
Item No.: 16-7 to 16-43,16-48, 16-50 to 16-53, 16-55 to 16-58, 16-85 and 16-86
4. For linear items, the quantity of work shall be measured linearly along centre line of structure. The unit of measurement shall be running meter or running foot. Following items of CSR are measured according to this criteria;  
Item No.: 16-44 to 16-47,16-49,16-54,16-59 to 16-61 and 16-71
5. The following items shall be measured as Each  
Item No.: 16-62 to 16-70,16-72 to 16-81,16-83 and 16-84