

**PAKAGE 8A**

**INTERIOR TENDER FOR NALANDA PHASE 1  
FOR  
NALANDA UNIVERSITY, AT RAJGIR, BIHAR.**



**TECHNICAL SPECIFICATIONS  
(INTERIOR WORKS)**

**Item No. 1.**

**Wooden Slats Wall Panelling**

**Supply & installation of wall panelling made of pinewood E1 grade fiberboard, melamine/veneer laminated finish, groove perforated L32-2 - (2mm grooves @ 32mm centers), backlined with Sound texblack acoustical fleece, tongue-groove edge for a seamless look, 5-test fire retardant grade/ Non FR, Acoustics NRC 0.65- 0.75 (For E300\* Mounting), size 128x2440x16mm, volume density of base board 800 - 830 Kg/m<sup>3</sup>, 10-10.5Kgs/m<sup>2</sup> (L32), installed by using Strut framework system. Slats to be backed with Synthethik PF 10x25 adhered to wall with stick .The Panneling shall be finished as per the drawings and to the satisfaction of the Engineer in Charge. All the support system shall be as per the Approved make list and the suspension system shall be got approved before starting installation at site.**

**Materials:**

The material shall be High density fiber board slats having the total width of 128 mm with thickness of 16 mm. Each individual smaller division should be at least 28 mm with perforation in the gap between. The Wooden Slats perforated wall paneling shall have width of 128mm, thickness of 15mm and length 2440 mm or as required by the Architect/ engineer In Charge, made of a high density fiber board with minimum 830 Kg/M<sup>3</sup> density substrate with a wood veneer as per the approved species from available option and a melamine balancing layer on the reverse side. The boards shall have a special perforation pattern where the visible surface has a "Helmholtz" fluted perforation of 2mm width and 14mm of visible panel each. The panels shall provide a fire reaction of Class of 1 as per Part 7 of BS 476. The edges of the panels shall be "tongue-and-grooved" to receive special clips for installation.

**Fixing**

All the support system shall be as per the Approved make list and the suspension system shall be got approved before starting installation at site. The panels shall be mounted on special aluminum splines using clips provided by Manufacturer and approved by the Architect/ Engineer-in-Charge. All the support system shall be as per the Approved make list and the suspension system shall be got approved before starting installation at site. No supporting system shall be visible outside as the system is held back with a tongue and groove method.

**Measurements**

Length and breadth shall be measured correct to a cm. Areas shall be worked out to nearest 0.01 sqm. The superficial area of the finished work shall be measured in square meters.

No deduction in measurements shall be made for openings of areas up to 40 square decimeter. Nothing extra shall be payable either for any extra material or labour involved in forming such openings.

**Rate**

Rate shall be for per square meter of panel including material, labor, tools and tackles required to complete the work as per the drawing and the satisfaction of Engineer in Charge.

**Item No. 2.**

**Providing and fixing mineral fibre false ceiling tiles at all heights of size 595X595mm of approved texture, design and pattern. The tiles should have Humidity Resistance (RH) of 99%, Light Reflectance > 85%, Thermal Conductivity  $k = 0.052 - 0.057$  w/m K, Fire Performance as per (BS 476 pt - 6 &7) in true horizontal level suspended on interlocking T-Grid of hot dipped all round galvanized iron section of 0.33 mm thick (galvanized @120 gsm ) comprising of main T runners of 15x32 mm of length 3000 mm, cross T of size 15x32mm of length 1200 mm and secondary intermediate cross T of size 15x32 mm of length 600 mm to form grid module of size 600x600 mm suspended from ceiling using galvanized mild steel item (galvanised @80gsm) 50 mm long 8mm outer diameter M-6 dash fasteners, 6 mm diameter fully threaded hanger rod upto 1000 mm length and L-shape level adjuster of size 85x25x2 mm, spaced at 1200 mm centre to centre along main 'T'. The system should rest on periphery walls /partitions with the help of GI perimeter wall angle of size 24x24X3000 mm made of 0.40 mm thick sheet, to be fixed to the wall with help of plastic rawl plug at 450 mm centre to centre & 40 mm long dry wall S.S. screws. The exposed bottom portion of all T-sections used in false ceiling support system shall be pre-painted with polyester baked paint, for all heights. The work shall be carried out as per specifications, drawings and as per directions of the engineer-in-charge.**

**With 16 mm thick beveled tegular mineral fibre false ceiling tile (NRC 0.55 to 0.6)**

**Material:**

The material shall be mineral fibre false ceiling tiles at all heights of size 595X595mm of approved texture, design and pattern. The tiles should have Humidity Resistance (RH) of 99%, Light Reflectance > 85%, Thermal Conductivity  $k = 0.052 - 0.057$  w/m K, Fire Performance as per (BS 476 pt - 6 &7). The tiles shall have Beveled Tegular edges.

**Fixing**

The False ceiling shall be fixed in in true horizontal level suspended on interlocking T-Grid of hot dipped all round galvanized iron section of 0.33 mm thick (galvanized @120 gsm ) comprising of main T runners of 15x32 mm of length 3000 mm, cross T of size 15x32mm of length 1200 mm and secondary intermediate cross T of size 15x32 mm of length 600 mm to form grid module of size 600x600 mm suspended from ceiling using galvanized mild steel item (galvanised @80gsm) 50 mm long 8mm outer diameter M-6 dash fasteners, 6 mm diameter fully threaded hanger rod upto 1000 mm length and L-shape

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level adjuster of size 85x25x2 mm, spaced at 1200 mm centre to centre along main 'T'. The system should rest on periphery walls /partitions with the help of GI perimeter wall angle of size 24x24X3000 mm made of 0.40 mm thick sheet, to be fixed to the wall with help of plastic rawl plug at 450 mm centre to centre & 40 mm long dry wall S.S. screws. The exposed bottom portion of all T-sections used in false ceiling support system shall be prepainted with polyester baked paint, for all heights. The work shall be carried out as per specifications, drawings and as per directions of the engineer-in-charge.

### Measurement and Rate

Measurement shall be for per square meter of false ceiling installed. Length and breadth shall be measured correct to a cm. Areas shall be worked out to nearest 0.01 sqm. The superficial area of the finished work shall be measured in square meters.

No deduction in measurements shall be made for openings of areas up to 40 square decimeter. Nothing extra shall be payable either for any extra material or labour involved in forming such openings.

### Rate

The rate shall include the cost of all materials and labour involved in all the operations described above. Rate shall be for per square meter of false ceiling installed.

### Item No. 3.

**Supply and Installation of , square edge, Mineral fibre core ceiling tiles of size 595x595x15mm having volume density 270 kgs/m<sup>3</sup>, weight 4kg/m<sup>2</sup> which is suspended by using 0.3mm thick metal grid system.**

**Tiles should have humidity resistance of 95% RH, NRC 0.5- 0.57(For E600 Mounting), Fire Resistance Class 1(UK) as per drawing, complete with powdered coated, hot dipped galvanized steel grid suspension system, as per manufacturers' specifications. The Panelling shall be finished as per the drawings and to the satisfaction of the Engineer in Charge. All the support system shall be as per the Approved make list and the suspension system shall be got approved before starting installation at site.**

Relevant specifications shall be followed as per item number 2. Skelet TrelisT15 metal grid system of 595x595 mm module includes Skelet WA15W30 wall angle with unequal flanges of 15/19mm, length 3000mm, fixed along the perimeter of walls with the help of nylon sleeves and suitable fasteners at 300mm centers. Then suspend the Skelet MT15W36 MainT with flange width 15mm, height 32mm and length 3600mm, from the soffit slab with help of soffit cleat and wire rod with leveling spring clip at 1200mm centres. Skelet CT15W12 CrossT with flange width 15mm, height 26mm and length 1200mm is interlocked into the pre-cut slots in the Main T15 at 600mm centers in the perpendicular direction to the Main T15. Finally Skelet CT15W06 CrossT with flange width 15mm, height 26mm and length 600mm are interlocked into the pre-cut slots in the CT15W12 CrossT in direction parallel to the Main T15 to result in 600x600mm module. Sisoli Savana square edge of size 595x595x15mm shall be placed into the grid size of 600x600mm.

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## Technical Parameters

- Fire (Class)– 1/A
- Acoustics – NRC 0.57(For E600 Mounting)
- Thermal conductivity (W/mk)- na
- Climate (°C, RH) – 50,95
- Light (%) – 85
- Green (VoC, RC%) –Low, 63

## Measurements

Length and breadth shall be measured correct to a cm. Areas shall be worked out to nearest 0.01 sqm. The superficial area of the finished work shall be measured in square meters.

No deduction in measurements shall be made for openings of areas up to 40 square decimeter. Nothing extra shall be payable either for any extra material or labour involved in forming such openings.

## Rate

The rate shall include the cost of all materials and labour involved in all the operations described above

## Item No. 4.

**Providing and fixing GI Clip in Metal Ceiling System of 600x600 mm module which includes providing and fixing 'C' wall angle of size 20x30x20mm made of 0.5mm thick pre painted steel along the perimeter of the room with help of nylon sleeves and wooden screws at 300mm center to centre, suspending the main C carrier of size 10x38x10mm made of G.I steel 0.7 mm thick from the soffit with help of soffit cleat 37x27x25x1.6 mm, rawl plugs of size 38x12 mm and C carrier suspension clip and main carrier bracket at 1000mm c/c Inverted triangle shaped Spring Tee having height of 24 mm and width of 34mm made of GI steel 0.45 mm thick is then fixed to the main 'C' carrier and in direction perpendicular to it at 600mm centers with help of suspension brackets. Wherever the main C carrier and spring T have to join, C carrier and spring T connectors have to be used. All sections to be galvanized @ 120 gms/sqm (both side inclusive) Fixing with clip intiles into spring 'T' with : GI Metal Ceiling Clip in plain Beveled edge global white color tiles of size 600x600 and 0.5mm thick with 25mm height, made of G I sheet having galvanizing of 100 gms/sqm (both sides inclusive) and 20% perforation area with 1.8mm dia holes and having NRC of 0.5, electro statically polyester powder coated of thickness 60 microns (minimum), including factory painted after bending and perforation.**

Relevant specifications shall be followed as per CPWD specifications for DSR item number 12.52.1. In addition, the following specifications shall also be followed:

### 1 Materials

As per selection by architect or client

### 2 Installation

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The G.I. frame and board partitions shall be fixed as per nomenclature of the item and directions of Engineer-in-Charge.

### **3 Jointing & Finishing**

Joints of the boards are finished with specially formulated Jointing compound and fibre tape to provide seamless finish. Board surface can be decorated with any type of paint, wall paper, wood veneer & hard laminates. Services should be incorporated before commencement of board fixing.

### **4 Fitting and Fixtures**

It is easy and simple to attach different fittings to wall panelling boards. Inclined nails can be fixed to the boards itself for light materials. For heavier materials the fastening should be centered on internal stud work or steel or wood frame behind the boards, fixed before boarding. Services should be incorporated before commencement of board fixing.

### **5 Tolerance**

Tolerance in dimensions shall be + 5 mm.

### **6 Measurements**

6.1 Length and breadth of superficial area of the finished work shall be measured correct to a cm. Area shall be calculated in square meter correct to two places of decimal. No deduction will be made of openings of areas upto 0.40 sqm nor shall extra payment be made either for any extra material or labour involved in forming such openings.

6.2 For openings exceeding 0.40 sqm. in area, deduction in measurements shall be made but extra will be payable for any extra material or labour involved in making such openings.

### **7 Rate**

The rate shall include the cost of all materials and labour involved in all the operations described above including all scaffolding, staging etc.

### **Item No. 5.**

**Providing and Fixing 15 mm thick densified tegular edged eco-friendly light weight calcium silicate false ceiling tiles of approved texture of size 595 x 595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanised steel sections (galvanising @ 120 grams per sqm including both side) consisting of main 'T' runner suitably spaced at joints to get required length and of size 24x38 mm made from 0.33 mm thick (minimum) sheet, spaced 1200 mm centre to centre, and cross "T" of size 24x28 mm made out of 0.33 mm (Minimum) sheet, 1200 mm long spaced between main'T' at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross 'T' of length 600 mm and size 24 x28 mm made of 0.33 mm thick (Minimum) sheet to be inter locked at middle of the 1200x 600 mm panel to form grid of size 600x600 mm, resting on periphery walls /partitions on a Perimeter wall angle pre-coated steel of size(24x24X3000 mm made of 0.40 mm thick (minimum)**

**sheet with the help of rawl plugs at 450 mm centre to centre with 25 mm long dry wall screws @ 230 mm interval and laying 15 mm thick densified edges**

**calcium silicate ceiling tiles of approved texture in the grid, including, cutting/ making opening "for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever required. Main 'T' runners to be suspended from ceiling using G.I. slotted cleats of size 25x35x1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm long dash fasteners, 4 mm G.I. adjustable rods with galvanised steel level clips of size 85 x 30 x 0.8 mm, spaced at 1200 mm centre to centre along main 'T', bottom exposed with 24 mm of all T sections shall be pre-painted with polyester baked paint, for all heights, as per specifications, drawings and as directed by Engineer-in-Charge.**

**Note :- Only calcium silicate false ceiling area will be measured from wall to wall. No deduction shall be made for exposed frames/ opening (cut outs) having area less than 0.30 sqm. The calcium silicate ceiling tile shall have NRC value of 0.50 (Minimum), light reflection > 85%, non- combustible as per B.S. 476 part IV, 100% humidity resistance and also having thermal conductivity <0.043 w/mK.**

Relevant specifications shall be followed as per CPWD specifications for DSR item number 12.53. In addition, the following specifications shall also be followed:

### **1. Scope**

False ceiling 15 mm thick densified tegular edged eco-friendly light weight calcium silicate false ceiling tiles of approved texture of size 595 x 595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanised steel sections (galvanising @ 120 grams per sqm including both side) consisting of main 'T' runner suitably spaced at joints to get required length and of size 24x38 mm made from 0.33 mm thick (minimum) sheet, spaced 1200 mm centre to centre, and cross "T" of size 24x28 mm made out of 0.33 mm (Minimum) sheet, 1200 mm long spaced between main 'T' at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross 'T' of length 600 mm and size 24 x28 mm made of 0.33 mm thick (Minimum) sheet to be inter locked at middle of the 1200x600 mm panel to form grid of size 600x600 mm, resting on periphery walls /partitions on a Perimeter wall angle pre-coated steel of size(24x24X3000 mm made of 0.40 mm thick (minimum)

sheet with the help of rawl plugs at 450 mm centre to centre with 25 mm long dry wall screws @ 230 mm interval and laying 15 mm thick densified edges calcium silicate ceiling tiles of approved texture in the grid, including, cutting/ making opening "for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever required. Main 'T' runners to be suspended from ceiling using G.I. slotted cleats of size 25x35x1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm long dash fasteners, 4 mm G.I. adjustable rods with galvanised steel level clips of size 85 x 30 x 0.8 mm, spaced at 1200 mm centre to centre along main 'T', bottom exposed with 24 mm of all T sections shall be pre-painted with polyester baked paint, for all heights, as per specifications, drawings and as directed by Engineer-in-Charge.

Note :- Only calcium silicate false ceiling area will be measured from wall to wall. No deduction shall be made for exposed frames/ opening (cut outs) having area less than 0.30 sqm. The calcium silicate ceiling tile shall have NRC value of 0.50 (Minimum), light reflection > 85%, non- combustible as per B.S. 476 part IV, 100% humidity resistance and also having thermal conductivity <0.043 w/mK.

## **2. Measurements**

Length and breadth of the false ceiling shall be measured correct to a cm and the surface area worked out in square metre of the finished work.

## **3. Rate**

The rate shall include the cost of all materials and labour required in providing false ceiling.

### **Item No. 6.**

**Providing & fixing false ceiling at all height including providing & fixing of framework made of special section, power pressed from M.S. sheets and galvanised with zinc coating of 120 gms/ sqm (both side inclusive) as per IS : 277 and consisting of angle cleat of size 25mm wide x 1.6mm thick with flanges of 27mm and 37mm, at 1200mm c/c, one flange fixed to the ceiling with dash fastener 12.5mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25 x10 x0.50mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I chanel 45 x15 x 0.90mm running at the spacing of 1200 mm c/c, to which the ceiling section 0.5mm thick**

**bottom wedge of 80mm with tapered flanges of 26 mm each having lips of 10.5mm, at 450mm c/c, shall be fixed in a direction perpendicular to G.I intermediate channel with connecting clip made out of 2.64mm dia x 230mm long G.I wire at every junction, including fixing perimeter channels 0.50mm thick 27mm high having flanges of 20mm and 30mm long, the perimeter of ceiling fixed to wall/ partitions with the help of Rawl plugs at 450mm centre, with 25mm long dry wall screws @ 230mm interval, including fixing of Calcium Silicate Board to ceiling section and perimeter channels with the help of dry wall screws of size 3.5 x25mm at 230mm c/c, including jointing & finishing to a flush finish of tapered and square edges of the board with recommended jointing compounds, jointing tapes, finishing with jointing compounds in three layers covering up to 150mm on both sides of joints and two coats of primer suitable for boards, all as per manufacture's specification and also including the cost of making opening for light fittings, grills, diffusers, cut outs made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in charge but excluding the cost of painting with:**

**(a) 12.5 mm thick tapered edge gypsum fire resistant board conforming to IS: 2095- Part I**

Relevant specifications shall be followed as per CPWD specifications for DSR item number 12.45.2. In addition, the following specifications shall also be followed:

Shop drawings to be submitted and approval from Design Consultant to be taken by Contractor before execution.

### **1 Material**

**(i) Gypsum Board conforming to IS 2095 (Pt.-I)**

These boards shall be stored flat in a covered clean and dry place. Different sizes and types of each of these boards shall be stacked separately.

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The board shall be stacked on a flat platform on which a wooden frame shall be constructed with 50 mm x 25 mm battens in such a way that it will give support to all four edges and corners of the boards with intermediate battens placed at suitable intervals to avoid warping.

The boards shall be stacked in a solid block in a clear vertical alignment. The top sheet of each stack shall be suitably weighed down to prevent warping wherever necessary.

The boards shall be unloaded and stacked with utmost care avoiding damage to the corners and surface. In case of decorative plywood and decorative boards, the surfaces of which are likely to get damaged by dragging one sheet over another it is advisable that these are lifted as far as possible in pairs facing each other.

### **2 Frame**

Frame of the section specified in the description of the relevant item or as directed by the Engineer-in-Charge shall be provided. The width of the scantlings provided shall be sufficient to provide a minimum nailing surface of 50 mm. The longitudinal and header scantlings shall be so arranged that (a) the boards can be fixed to form the panel arrangements required as per drawings or as directed by the Engineer-in-Charge (b) the longitudinal scantling to which the boards are mainly fixed are spaced at 30 to 45 cm centers, the actual spacing selected depending on the width of the cut board in the panel arrangement, (c) all edges of the cut board units are supported either on the longitudinal scantlings or on the header scantlings or on both.

The frame shall be given two coats of approved preservative paint (to be paid for separately) before the board is nailed on. M.S. angles or other sections shall be used for suspending the frame and will be paid for separately.

Where the joints in the board are to be covered with beadings the frames should allow 3 to 6 mm for space between boards.

The frame and painting thereof shall be paid for separately unless specifically included in the description of the ceiling item.

The bottom surface of the frame shall be checked and corrected to true planes and slopes.

Framing to be used should be from Saint Gobain/Lafarge or Jindal

### **3 Nails or Screws**

The sheets shall be fixed to the frame scantling with G.I. headless nails 2.24 mm dia or screws as specified when the joints are to be left exposed. Where the joints will be covered with beadings, the sheets are to be fixed to the frames scantlings with G.I. felt headed (clout) nails 2.5 mm dia or screws as specified. The length of the nails or screws shall generally be equal to thickness of sheet plus 25 mm so that their grip on the framing members will not be less than 25 mm.

### **4 Fixing**

The boards shall be laid with lengths parallel to all joints centered over the framing members. Where joints are to be covered, the boards may be spaced 3 to 6 mm apart

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

as described in the respective manufacturers' specifications. Where joints are to be left exposed the sheets shall be butt laid with their edges abutting in moderate contact, but without having to force them into place. The boards shall be supported and held tight to the frame with timber pieces the later being moved outwards as the nailing proceeds. The boards are first nailed to the intermediate framing member proceeding from the center of the board outwards, the edges being nailed or screwed last.

Where the joints are to be left exposed, the outer rows of nails or screws are placed at 10 cm centers and about 12 mm from the edge of the sheet. In the rows in the middle of the sheets, the nails or screws are placed 20 cm apart. The nails or screws should be counter sunk in the underside of board with a suitable punch. Care shall be taken in driving the nails or screws so that the sheets are not marked by hammer blows.

Where the joints are to be covered with beadings, felt headed (clout) nails shall be used instead of nails without head. The spacing of the nails in the interior rows in boards shall be the same as in the preceding para. In the outer rows at edges to be covered by beadings, the nails will be spaced at 20 cm centers in each row with the nails staggered. The beadings will then be fixed over the sheets with screws at 20 cm centers in each row with the screws in the two rows staggered and passing through beading, sheet and framing so that ultimately the spacing of the fixing (nails and screws taken together) in each row will be at 10 cm centers so far as the sheets and frames are concerned.

### **5 Finishing**

The exposed side of the board shall be truly level and plane without any local bulges or sags. The joints shall be truly parallel and/or perpendicular to the walls. The width of joints shall be uniform. Care shall be taken to see that the uniformity of colour of the sheets is not spoilt during the fixing operations.

Where the joints are required to be covered, beadings of size, pattern and material as approved by Engineer-in-charge be fixed with screws.

The ceiling shall be treated with painting if so required but such surface treatment will be paid for separately, unless specifically included in the description of the ceiling item.

### **6. Measurements**

Length and breadth shall be measured correct to a cm. Areas shall be worked out to nearest 0.01 sqm. The superficial area of the finished work ceiling shall be measured in square meters.

No deduction in measurements shall be made for openings of areas up to 40 square decimeter. Nothing extra shall be payable either for any extra material or labour involved in forming such openings. For openings exceeding 0.40 sqm in area, deductions in measurements for the full opening will be made and in such case any labour involved in making these openings shall be paid for separately in running meters.

Wooden ceiling of boardings fixed to curve surfaces in narrow widths shall be measured and paid for separately and shall include making the joints to proper splay.

Circular cutting and waste shall be measured and paid for separately in running meters

### **7 Rate**

The rate shall include the cost of all materials and labour involved in all the operations described above.

#### **Item No. 7.**

**Providing and supplying Steel Writing Board for writing purpose using marker pen. Medium Density Fibre (MDF) Board to be covered with electrogalvanized steel sheet conforming to IS: 277-2003(Reaffirmed 2007),Amdts.1&2, of 0.3 to 0.4 mm thickness on the front and with sheet of 0.25 mm to 0.03 mm thickness on the back side of MDF Board. Writing top surface of White Boards to receive e3 vitreous Enamelled coating of 0.11 mm min thickness on top. Galvanising on All other surfaces of Sheet steel to be of 0.03 mm min. thickness. The top surface of Writing board shall be free from waviness and shall show no scratches when HB to 3H pencils are used for writing. The surface shall show excellent erasability when the specified writing medium is used. It should be possible to fully erase the marking of permanent marker pens using methanol, without adversely affecting the e3 vitreous coating in any manner.**

**The core material shall be 9 mm thick MDF board having Bulk Density of 750 kg per cubic metre and Grade-1 as per IS: 12406-2003 Edition 2.2. Both the top and the backing sheet shall be properly fixed with the MDF board using suitable adhesive with mechanical press to avoid any moisture absorption.**

**The Writing board will be fixed to walls with the help of suitable size Stainless steel screws and wooden/PVC rowl plugs with teak wood framing of 65 mm x 50 mm size on the periphery and 30 mm x 50 mm wide stiffeners on the backside.**

#### **1. General**

The core material shall be 9 mm thick MDF board having Bulk Density of 750 kg per cubic meter and Grade-1 as per IS: 12406-2003 Edition 2.2. Both the top and the backing sheet shall be properly fixed with the MDF board using suitable adhesive with mechanical press to avoid any moisture absorption.

The Writing board will be fixed to walls with the help of suitable size Stainless steel screws and wooden/PVC rawl plugs with teak wood framing of 65 mm x 50 mm size on the periphery and 30 mm x 50 mm wide stiffeners on the backside.

#### **2. Measurement**

Surface area of blinds should be measured in square meters correct to two places of decimal. Nothing extra shall be paid. Cost shall include motors for operating the blinds.

#### **3. Rate**

The rate shall include the cost of all materials and labor involved in all the operations described above.

Shop drawings to be submitted and approval from Design Consultant to be taken by Contractor before execution.

**Item No. 8.**

**Supply and Installation of Tack board acoustical panels, hardened square edge, FR grade NRC fabric (colour choice), wrapped on encapsulated glass fibre core panels made from size 600x1200x25mm, volume density 100-120Kgs/m<sup>3</sup>, weight 3.0kg/m<sup>2</sup> installed by using Strut Impale Clip. Panels should have Acoustics – NRC 0.9 (For D50 Mounting), Fire Resistance Class 1(UK) as per manufacturer specifications. The Panelling shall be finished as per the drawings and to the satisfaction of the Engineer in Charge. All the support system shall be as per the Approved make list shall be got approved before starting installation at site.**

**1.0 General**

Tack board made of Fabric: Fine Jute Fabric of Color as approved during sampling on the front side. Thickness: of Jute Fabric 1±0.1 mm. The top surface should be smooth, finish, without any wrinkles, fungus proof, terminate proof & eye catching. The color should not fade even if the Tack board is fixed in direct sunlight position. Soft Board: Thickness: 12.00 mm. thick Density of Soft board should be 2.5 kg/m<sup>2</sup>. Linear expansion/ contraction in range 33% to 90% RH @ 200 C: % max. 0.5. The core material is soft board. The board should be soft, resilient, light colored sheet material of approved make. Soft board with 12 mm thick beading on each side should be fixed to backside plywood with adhesive. Back Side plywood: The Backside of the Tack board to be supported with 12.00 mm thick marine plywood confirming to IS 710 of approved make

**2. Fixing**

Tack board to be fixed to wall, /partition with suitable size SS Screws or 3M or equivalent two way adhesive tape in such a way that screws are not visible from the front side of Tack board

**3. Measurement**

Surface/usable area of boards should be measured in square meters correct to two places of decimal. Nothing extra shall be paid.

**4. Rate**

The rate shall include the cost of all materials and labor involved in all the operations described above.

Shop drawings to be submitted and approval from Design Consultant to be taken by Contractor before execution.

**Item No. 9.**

**Tack Board Panel –**

**Supplying and fixing Tack board in line and level as per architectural drawing and as directed by engineer in charge. Tack board made of Fabric: Fine Jute Fabric of Color as approved during sampling on the front side. Thickness: of Jute Fabric 1±0.1 mm. The top surface should be smooth, finish, without any wrinkles, fungus proof, terminate proof & eye catching. The color should not fade even if the Tack board is fixed in direct sunlight position. Soft Board: Thickness: 12.00**

**mm. thick Density of Soft board should be 2.5 kg/m<sup>2</sup>. Linear expansion/ contraction in range 33% to 90% RH @ 200 C: % max. 0.5. The core material is soft board. The board should be soft, resilient, light colored sheet material of approved make. Soft board with 12 mm thick beading on each side should be fixed to backside plywood with adhesive. Back Side plywood: The Backside of the Tack board to be supported with 12.00 mm thick marine plywood confirming to IS 710 of approved make. The plywood will be fixed to walls with the help of suitable size Stainless steel screws and wooden/PVC rowl plugs with teak wood support for levelling.**

**Tack board with plywood to be fixed to wall/partition with suitable size SS Screws or equivalent Two way adhesive tape or with adhesive in such a way that screws are not visible from the front side of Tack board as per drawing and as directed by engineer in charge.**

### **1. General**

Tack board made of Fabric: Fine Jute Fabric of Color as approved during sampling on the front side. Thickness: of Jute Fabric 1±0.1 mm. The top surface should be smooth, finish, without any wrinkles, fungus proof, terminate proof & eye catching. The color should not fade even if the Tack board is fixed in direct sunlight position. Soft Board: Thickness: 12.00 mm. thick Density of Soft board should be 2.5 kg/m<sup>2</sup>. Linear expansion/ contraction in range 33% to 90% RH @ 200 C: % max. 0.5. The core material is soft board. The board should be soft, resilient, light colored sheet material of approved make. Soft board with 12 mm thick beading on each side should be fixed to backside plywood with adhesive. Back Side plywood: The Backside of the Tack board to be supported with 12.00 mm thick marine plywood confirming to IS 710 of approved make

### **2. Fixing**

Tack board to be fixed to wall, /partition with suitable size SS Screws or 3M or equivalent two way adhesive tape in such a way that screws are not visible from the front side of Tack board

### **3. Measurement**

Surface/usable area of boards should be measured in square meters correct to two places of decimal. Nothing extra shall be paid.

### **4. Rate**

The rate shall include the cost of all materials and labor involved in all the operations described above.

Shop drawings to be submitted and approval from Design Consultant to be taken by Contractor before execution.

### **Item No. 10.**

**Providing & Fixing premium quality Manually operated Roller blinds with Solar protection fabric of high tenacity Polyester Yarn with PVC Coating & Grey Backing, & offer 100% blackout / heat radiance. Fabric shall have GREENGUARD (Gold) Indoor Air Quality & Children & School Certified.**

**Weight: 300 to 350 g/m<sup>2</sup> (+/-5%), Thickness: 0.47 to 0.55 mm (+/-5%), Fabric Openness Factor: 0%, Tensile Strength (Warp/Weft): 160/170 daN / 5cm, Tearing Strength (Warp/Weft): 11/13 daN, Solar Transmission- 0%, Solar Reflectance 25-69%, Solar Absorption 28-31%, Fungistatic Treatment: Degree 0, Excellent (EN ISO 846-A).**

**Roller Tube shall be of extruded Aluminium alloy 38mm O.D (or as per system dimension) with a minimum wall thickness of 1.0mm duly anodised for long life. Clutch shall be wrap spring design with high strength fibreglass reinforced polyester assembly and high carbon steel springs to transmit motion from driving to driven members of clutch mechanism. Clutch shall operate by directionally with the use of an endless beaded chain. Clutch mechanism shall be crash proof, prevent slippage and shall raise and lower smoothly to any desired height. Clutch shall never need adjustment. Idler shall be of high strength fibreglass reinforced polyester, consisting of an outside sleeve and centre shaft. Sleeve shall provide bearing surface for roller tube and rotate freely on centre shaft, providing smooth, quiet and long wearing operation. Brackets shall be of tomised steel powder coated to give superior finish. Bracket shall accommodate overhead, side or face mounting with clutch assembly on either end of the roller. Bottom of the blind shall be provided with aluminium tube powder coated in a colour matching to the fabric. The fabric shall be enclosed in the suitably created pocket along with the tube. The tube shall be closed from sides with end caps to give a neat look.**

### **1. Scope:**

The item shall be executed as per the item description. All the materials used shall be as per the approved make list. Each Curtain shall be provided with individual control rope or shall be motorised as per final design.

### **2. Measurement**

Surface area of blinds should be measured in square meters correct to two places of decimal. Nothing extra shall be paid. Cost shall include all the accessories required to operate the blinds.

### **3. Rate**

The rate shall include the cost of all materials and labour involved in all the operations described above.

Shop drawings to be submitted and approval from Design Consultant to be taken by Contractor before execution.

### **Item No. 11.**

**Providing & Fixing premium quality Manually operated Roller blinds with Solar protection fabric of high tenacity Polyester Yarn with PVC Coating & Aluminium Backing, & Fungistatic Treatment and should block the light flux & offer elimination of glare and sunlight / heat radiance. Fabric shall have visible light & solar properties & GREENGUARD (Gold) Indoor Air Quality & Children & School Certified.**

**Fabric of the Blind : Composition: 39% Polyester / 61% PVC with Aluminium Backing.**

**Weight: 290 to 320 g/m<sup>2</sup> (+/-5%), Thickness: 0.32 mm (+/-5%), Fabric Openness Factor: 3% to 5%, Tensile Strength (Warp/Weft): 160/170 daN / 5cm, Tearing Strength (Warp/Weft): 11/13 daN, Backing: Aluminium Backing,. Fungi static Treatment: Degree 0, Excellent (EN ISO 846-A) Fire Retardancy:B-s<sub>2</sub>,d<sub>0</sub>/EN 13501-1, CLASS A/ASTM E84.**

**Roller Tube shall be of extruded Aluminium alloy 38mm O.D (or as per system dimension) with a minimum wall thickness of 1.0mm duly anodised for long life. Clutch shall be wrap spring design with high strength fibreglass reinforced polyester assembly and high carbon steelsprings to transmit motion from driving to driven members of clutch mechanism. Clutch shall operate by directionally with the use of an endless beaded chain. Clutch mechanism shall be crash proof, prevent slippage and shall raise and lower smoothly to any desired height. Clutch shall never need adjustment. Idler shall be of high strength fibreglass reinforced polyester, consisting of an outside sleeve and centre shaft. Sleeve shall provide bearing surface for roller tube and rotate freely on centre shaft, providing smooth, quiet and long wearing operation. Brackets shall be of tomised steel powder coated to give superior finish. Bracket shall accommodate overhead, side or face mounting with clutch assembly on either end of the roller. Bottom of the blind shall be provided with aluminium tube powder coated in a colour matching to the fabric. The fabric shall be enclosed in the suitably created pocket along with the tube. The tube shall be closed from sides with end caps to give a neat look.**

### **1. Scope:**

The item shall be executed as per the item description. All the materials used shall be as per the approved make list. Each Curtain shall be provided with individual control rope.

### **2. Measurement**

Surface area of blinds should be measured in square meters correct to two places of decimal. Nothing extra shall be paid. Cost shall include all the accessories required to operate the blinds.

### **3. Rate**

The rate shall include the cost of all materials and labour involved in all the operations described above.

Shop drawings to be submitted and approval from Design Consultant to be taken by Contractor before execution.

### **Item No. 12.**

**Providing & Fixing premium quality Manually operated Roller blinds with Prestressed Micro-Aerated Solar protection fabric of high tenacity Polyester Yarn with PVC Coating & Fungistatic Treatment and should block the light flux & offer elimination of glare and sunlight.**

**Fabric for Blinds: Composition: 40% Polyester / 60% PVC, Weight:400 g/m<sup>2</sup> (+/-5%), Thickness:0.45 mm (+/-5%), Fabric Openness Factor: 3% , Tensile Strength (Warp/Weft): 220/220 daN / 5cm, Tearing Strength (Warp/Weft): 30/25 daN, Fire Retardancy:M2 (NFP92-507)- Roller Tube shall be of extruded Aluminium alloy 38mm O.D (or as per system dimension) with a minimum wall thickness of 1.0mm duly anodised for long life. Clutch shall be wrap spring design with high strength fibreglass reinforced polyester assembly and high carbon steel springs to transmit motion from driving to driven members of clutch mechanism. Clutch shall operate by directionally with the use of an endless beaded chain. Clutch mechanism shall be crash proof, prevent slippage and shall raise and lower smoothly to any desired height. Clutch shall never need adjustment. Idler shall be of high strength fibreglass reinforced polyester, consisting of an outside sleeve and centre shaft. Sleeve shall provide bearing surface for roller tube and rotate freely on centre shaft, providing smooth, quiet and long wearing operation. Brackets shall be of tomised steel powder coated to give superior finish. Bracket shall accommodate overhead, side or face mounting with clutch assembly on either end of the roller. Bottom of the blind shall be provided with aluminium tube powder coated in a colour matching to the fabric. The fabric shall be enclosed in the suitably created pocket along with the tube. The tube shall be closed from sides with end caps to give a neat look.**

### **1. Scope:**

The item shall be executed as per the item description. All the materials used shall be as per the approved make list. Each Curtain shall be provided with individual control rope.

### **2. Measurement**

Surface area of blinds should be measured in square meters correct to two places of decimal. Nothing extra shall be paid. Cost shall include all the accessories required to operate the blinds.

### **3. Rate**

The rate shall include the cost of all materials and labour involved in all the operations described above.

Shop drawings to be submitted and approval from Design Consultant to be taken by Contractor before execution.

### **Item No. 13.**

**Providing and fixing Motor for Motor operated blinds with remote over manually operated blinds of above items.**

**Motor for the motorized Operation of the blinds to confirm the following requirements: Rated Torque 6NM, RPM 28, Protection IP 44 and above, Rated Voltage 230 mm with suitable Remote to operate up to 4 nos. Motorised blind in a single room**

**The clutch is of wrap spring design. High carbon steel springs are provided to transmit motion from driving to driven members of clutch mechanism. Clutch is operated directionally by the use of Remote Transmission Service type Motor**

**with Remote control. Clutch never needs any adjustment. The Idler is of high strength reinforced plastic, consisting of a centre shaft. The idler is mounted on the heavy quality bracket (to Take the load of Blinds, Ideler and the Motor Mechanism) by using a plastic lock. The metal sleeve inside the plastic lock provides bearing surface for the centre shaft, which rotates freely, providing smooth, quiet and long wearing operation in a roller tube of 32mm (OD) (depending upon the size) aluminium extruded grooved tube made of alloy T6063 weighing 0.27kg/m. Control unit and Idler are fixed to the either ends of the tube comprising Roller Head Rail which is made of aluminium extruded rail Power coated in white. Control unit and Idler are mounted on the Head rail with powder coated M.S. brackets The fabric of the blind is fitted to the tube with heavy duty adhesive tape. Bottom rail is an aluminium extruded rail with a groove for fixing the fabric and powder coated in white. It is fixed to the bottom of the fabric and the purpose of it is, to keep the fabric in tension and straight. The fabric is fitted to the tube using plastic insert. The end caps of the tube are ABS. The size of rail shall be 21mm (OD) made of Alloy HE 9 WP weighing 0.17kg/m. The fabric shall be attached to the roller tube with high quality self-adhesive tape. . Operational action shall be smooth and upto the satisfaction and as per direction of engineer in charge .**

**1. Scope:**

The item shall be executed as per the item description. All the materials used shall be as per the approved make list. Each Curtain shall be provided with individual control rope.

**2. Measurement**

Motor calculating per nos. Nothing extra shall be paid. Cost shall include all the accessories required to operate the blinds.

**3. Rate**

The rate shall include the cost of all materials and labour involved in all the operations described above.

Shop drawings to be submitted and approval from Design Consultant to be taken by Contractor before execution.

**Item No. 14.**

**Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete.**

**(a) Hot finished welded type tubes**

**1.1 Structural Steel Tube**

These shall be of:

1. Hot finished welded (HFW) type, or
2. Hot finished seamless (HFS) type, or

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

3. Electric resistance or induction butt welded (ERW), having carbon content less than 0.03 percent, yield stress of 21.5 kg/mm<sup>2</sup> (YST 210) type.

Conforming to the requirement of IS 1161. The steel tubes when analysed in accordance with the method specified in IS 228 shall show not more than 0.06 percent sulphur, and not more than 0.06 per cent phosphorous.

Tubes shall be designated by their nominal bore. These shall be light, medium or heavy as specified depending upon the wall thickness. The standard size and weights of tubes are listed in Appendix C. Hollow sections shall be as per IS 4923.

Tubes shall be clean finished and reasonably free from scale. They shall be free from cracks, surface flaws, laminations and other defects. The ends shall be cut clean and square with axis of tube, unless otherwise specified.

### 1.2 Minimum Thickness of Metals

Wall thickness of tubes used for construction exposed to weather shall be not less than 4 mm and for construction not exposed to weather it shall be not less than 3.2 mm where structures are not readily accessible for maintenance, the minimum thickness shall be 5 mm.

### 1.3 Fabrication

1.3.1 The component parts of the structure shall be assembled in such a manner that they are neither twisted nor otherwise damaged and be so prepared that the specified cambers, if any, are, maintained. The tubular steel work shall be painted with one coat of approved steel primer after fabrication. All fabrication and welding is to be done in an approved workshop. The joint details shall be generally as per S.P-38 of B.I.S publication.

1.3.2 Straightening : All material before being assembled shall be straightened, if necessary, unless required to be of curvilinear form and shall be free from twist.

1.3.3 Bolting : Washers shall be specially shaped where necessary, or other means, used to give the nuts and the heads of bolts a satisfactory bearing.

In all cases, where the full area of the bolts is to be developed, the threaded portion of the bolt shall not be within the thickness of the parts bolted together and washers of appropriate thickness shall be provided to allow the nuts to be completely tightened.

1.3.4 Welding : Where welding is adopted, it shall be as per IS 816.

1.3.5 Caps and Bases for Columns : The ends of all the tubes, for columns transmitting loads through the ends, should be true and square to the axis of the tubes and should be provided with a cap or base accurately fitted to the end of the tube and screwed, welded or shrunk on. The cap or base plate should be true and square to the axis of the column.

1.3.6 Sealing of Tubes : When the end of a tube is not automatically sealed by virtue of its connection by welding to another member the end shall be properly and completely sealed. Before sealing, the inside of the tubes should be dry and free from loose scale.

1.3.7 Flattened Ends : In tubular construction the ends of tubes may be flattened or otherwise formed to provide for welded. Riveted or bolted connections provide that the methods adopted for such flattening do not injure the material. The change of sections shall be gradual.

### 1.4 Hoisting and Erection

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

Tubular trusses shall be hoisted and erected in position carefully, without damage to themselves, other structure, equipment and injury to workman.

The method of hoisting and erection proposed to be adopted shall be got approved from the Engineer-in-charge. The contractor shall however be fully responsible, for the work being carried out in a safe and proper manner without unduly stressing the various members. Proper equipment such as derricks, lifting tackles, winches, ropes etc. shall be used.

### 1.5 Measurements

The work as fixed in place shall be measured in running metres correct to a centimetre on their weights calculated on the basis of standard tables correct to the nearest kilogram unless otherwise specified.

Weight of cleats, brackets, packing pieces bolts nuts, washers distance pieces separators diaphragm gussets (taking overall square dimensions) fish plates, etc. shall be added to the weight of respective items unless otherwise specified. No deduction shall be made for skew cuts.

### 1.6 Rate

The rate shall include the cost of labour and materials involved in all the operations described above including application of one coat of approved steel primer, i.e. red oxide zinc chrome primer conforming to IS 2074.

### **Item No. 15.**

**Steel work welded in built up sections/ framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.**

**In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works**

Items specification as per above items

### **Item No. 16.**

**Providing and fixing aluminum work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminum sections shall be smooth, rust free, straight, mitered and jointed mechanically wherever required including cleat angle, Aluminum snap beading for glazing / paneling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge.(glazing and paneling paid separately) .Anodized aluminum (anodized transparent or dyed to required shade according to IS:1868, Minimum anodic coating of grade AC 15)**

**(a) For fixed portion**

### **1. Scope:**

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

Aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitered and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / panelling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge.(glazing and paneling paid separately) .Anodized aluminium (anodized transparent or dyed to required shade according to IS:1868, Minimum anodic coating of grade AC 15)

### **2. Measurement**

Installation of material measure in Kg. as per drawing nothing extra shall be paid. Cost shall include all the accessories required.

### **3. Rate**

The rate shall include the cost of all materials and labour involved in all the operations described above.

#### **Item No. 17.**

**Providing and fixing of wood work in frames of doors, windows, clerestory windows, partitions and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia & length**

**(a) : Second class teak wood.**

#### **1. General**

Timber for door, window and ventilators frames shall be as specified finished dimensions in drawing and as directed by engineer in charge. Timber shall be sawn in the direction of the grains. All members of a frame shall be of the same species of timber and shall be straight without any warp or bow. Frames shall have smooth, well-planed (wrought) surfaces except the surfaces touching the walls, lintels, sill etc., which may be left clean sawn. Rebates rounding or moulding shall be done before the members are jointed into frames. The depth of the rebate for housing the shutters shall be 15 mm, and the width of the rebates shall be equal to the thickness of the shutters. A tolerance of  $\pm 2$  mm shall be permitted in the specified finished dimensions of timber sections in frames.

#### **2 Joints**

The Jamb posts shall be through tenoned in to the mortise of the transoms to the full thickness of the transoms and the thickness of the tenon shall be not less than 2.5 cm. The tenons shall closely fit into the mortise without any

wedging or filling. The contact surface of tenon and mortise before putting together shall be glued with polyvinyl acetate dispersion based adhesive conforming to IS 4835 or adhesive conforming IS 851 and pinned with 10 mm dia hard wood dowels, or bamboo pins or star shaped metal pins. The joints shall be at right angles when checked from the inside surfaces of the respective members. The joints shall be pressed in position as per drawing and as directed by engineer in charge. Each assembled door frame shall be fitted with a temporary stretcher and a temporary diagonal brace on the rebated faces.

#### **3 Fixing of Frames**

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

The frames shall be got approved by the Engineer-in-Charge before being painted, oiled or otherwise treated and before fixing in position. The surface of the frames abutting masonry or concrete and the portions of the frames embedded in floors shall be given a coating of coal tar. Frames shall be fixed to the abutting masonry or concrete with holdfasts or metallic fasteners as specified. After fixing, the jamb posts of the frames shall be plugged suitably and finished neat. Vertical members of the door frames shall be embedded in the floor for the full thickness of the floor finish and shall be suitably strutted and wedged in order to prevent warping during construction. A minimum of three hold fasts shall be fixed on each side of door and window frames one at centre point and other two at 30 cm from the top and bottom of the frames. In case of window and ventilator frames of less than 1 m in height two hold fasts shall be fixed on each side at quarter point of the frames. Hold fasts and metallic fasteners shall be measured and paid for separately.

### **4 Measurements**

Wood work wrought, framed and fixed shall be measured for finished dimension without any allowance for the wastage or for dimensions beyond specified dimension. However, in case of members having moldings, rounding's or rebates and members of circular or varying sections, finished dimensions shall be taken as the sides of the smallest square or rectangle from which such a section can be cut. Length of each member shall be measured over all to the nearest cm so as to include projection for tenons. Width and thickness shall be measured to the nearest mm and the quantity shall be worked out in unit of upto three places of decimal.

### **5 Rate**

The rate shall include the cost of material and labour involved in all the operations described above except the hold fasts or metallic fasteners which will be paid for separately.

### **Item No. 18.**

**Providing wood work in frames of Partitions with Glass/Wooden panels/Plywood Panels/gypsum board. Wooden members are to be fixed to cover the M.S./Aluminium sections of the main partition frames from all sides as per the detailed drawings including fixing the wooden members with necessary screws, nuts, bolts etc. Wooden members of Shutters frame if any and wooden beadings for fixing Glass panels, wooden panels, and plywood panels of the partition with wooden members of the frames will also be paid under this same item. The work to be carried out as per the detailed drawings and as directed by Engineer In charge.**

#### **(a) : Second class teak wood**

##### **1. General**

Timber for door, window and ventilators frames shall be as specified finished dimensions in drawing and as directed by engineer in charge. Timber shall be sawn in the direction of the grains. All members of a frame shall be of the same species of timber and shall be straight without any warp or bow. Frames shall have smooth, well-planed (wrought) surfaces except the surfaces touching the walls, lintels, sill etc., which may be left clean sawn. Rebates rounding or moulding shall be done before the members are jointed into frames. The depth of the rebate for housing the shutters shall be 15 mm, and the

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

width of the rebates shall be equal to the thickness of the shutters. A tolerance of  $\pm 2$  mm shall be permitted in the specified finished dimensions of timber sections in frames.

### **2 Joints**

The Jamb posts shall be through tenoned in to the mortise of the transoms to the full thickness of the transoms and the thickness of the tenon shall be not less than 2.5 cm. The tenons shall closely fit into the mortise without any

wedging or filling. The contact surface of tenon and mortise before putting together shall be glued with polyvinyl acetate dispersion based adhesive conforming to IS 4835 or adhesive conforming IS 851 and pinned with 10 mm dia hard wood dowels, or bamboo pins or star shaped metal pins. The joints shall be at right angles when checked from the inside surfaces of the respective members. The joints shall be pressed in position as per drawing and as directed by engineer in charge. Each assembled door frame shall be fitted with a temporary stretcher and a temporary diagonal brace on the rebated faces.

### **3 Fixing of Frames**

The frames shall be got approved by the Engineer-in-Charge before being painted, oiled or otherwise treated and before fixing in position. The surface of the frames abutting masonry or concrete and the portions of the frames embedded in floors shall be given a coating of coal tar. Frames shall be fixed to the abutting masonry or concrete with holdfasts or metallic fasteners as specified. After fixing, the jamb posts of the frames shall be plugged suitably and finished neat. Vertical members of the door frames shall be embedded in the floor for the full thickness of the floor finish and shall be suitably strutted and wedged in order to prevent warping during construction. A minimum of three hold fasts shall be fixed on each side of door and window frames one at centre point and other two at 30 cm from the top and bottom of the frames. In case of window and ventilator frames of less than 1 m in height two hold fasts shall be fixed on each side at quarter point of the frames. Hold fasts and metallic fasteners shall be measured and paid for separately.

### **4 Measurements**

Wood work wrought, framed and fixed shall be measured for finished dimension without any allowance for the wastage or for dimensions beyond specified dimension. However, in case of members having moldings, rounding's or rebates and members of circular or varying sections, finished dimensions shall be taken as the sides of the smallest square or rectangle from which such a section can be cut. Length of each member shall be measured over all to the nearest cm so as to include projection for tenons. Width and thickness shall be measured to the nearest mm and the quantity shall be worked out in unit of upto three places of decimal.

### **5 Rate**

The rate shall include the cost of material and labour involved in all the operations described above except the hold fasts or metallic fasteners which will be paid for separately.

### **Item No. 19.**

**Extra rate over second class teak wood for providing and fixing first class Burma teak wood instead of second class teak wood as required as per drawing and as directed by engineer in charge.**

## 1 Measurements

As per mention above items

## 2 Rate

Only extra rate to be provided of base rate items. The rate shall include the cost of material and labour involved in all the operations described above.

### Item No. 20.

**Providing and fixing paneled or paneled and glazed shutters for doors, windows and clerestory windows, including ISI marked M.S. pressed butt hinges bright finished of required size with necessary screws, excluding paneling which will be paid for separately, all complete as per direction of Engineer-in-charge.**

#### **(a) : Second class teak wood 35 mm thick shutters**

Paneled or glazed shutters for doors, windows, ventilators and cupboards shall be constructed in the form of timber frame work of stiles and rails with panel inserts of timber, plywood, block board, veneered particle board, fibre board wire gauze or float glass. The shutters may be single or multi paneled, as shown in the drawings or as directed by the Engineer-in-Charge. Timber for frame work, material for panel inserts and thickness of shutters shall be as specified. All members of the shutters shall be straight without any warp or bow and shall have smooth well planed face at right angles to each other.

Any warp or bow shall not exceed 1.5 mm for door shutter and 1 mm for window and ventilator shutters The right angle for the shutter shall be checked by measuring the diagonals and the difference between the two diagonals should not be more than 3 mm. Generally paneled glazed or paneled and glazed shutter shall conform to IS 1003 (Pt. 1 & 2).

## 1 Frame Work

1.1 Timber for stiles and rails shall be of the same species and shall be sawn in the directions of grains. Sawing shall be truly straight and square. The timber shall be planed smooth and accurate to the required dimensions. The stiles and rails shall be joined to each other by plain or haunched mortise and tenon joints and the rails shall be inserted 25 mm short of the width of the stiles. The bottom rails shall have double tenon joints and for other rails single tenon joints shall be provided. The lock rails of door shutter shall have its centre line at a height of 800 mm from the bottom of the shutters unless otherwise specified. The thickness of each tenon shall be approximately one-third the finished thickness of the members and the width of each tenon shall not exceed three times its thickness.

1.2 Gluing of Joints : The contact surfaces of tenon and mortise shall be treated, before putting together, with bulk type synthetic resin adhesive conforming to IS 851 suitable for construction in wood or synthetic resin adhesive (Phenolic and aminoplastic) conforming to IS 848 or polyvinyl acetate dispersion based adhesives conforming to IS 4835 and pinned with 10 mm dia hardwood dowels or bamboopins or star shaped metal pins; after the frames are put together and pressed in position by means of press.

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1.3 Stiles and bottom rail shall be made out of one piece of timber only. Intermediate rail exceeding 200 mm in width may be of one or more pieces of timber. The width of each piece shall be not less than 75 mm. Where more than one piece of timber is used for rails, they shall be joined with a continuous tongued and grooved joint glued together and reinforced with metal dowels at regular intervals not exceeding 200 mm.

### 2 Measurements

Framework of Shutters : The overall length and width of the framework of the shutters shall be measured nearest to a cm in fixed position (overlaps not to be measured in case of double leaved shutters) and the area calculated in square metres correct to two places of decimal. No deduction shall be made to form panel openings or louvers. No extra payments shall be made for shape, joints and labour involved in all operations described above.

### 3 Rate

Rate includes the cost of materials and labour involved in all the operations described above. The framework and panelling of each type or glazed panels shall be paid separately. The rate for framework includes the cost of hinges and necessary screws as specified description. However, extra shall be paid for providing moulded beading where specified. Nothing extra shall be paid for plain beading.

#### Item No. 21.

**Providing and fixing paneling or paneling and glazing in paneled or paneled and glazed shutters for doors, windows and clerestory windows (Area of opening for panel inserts excluding portion inside grooves or rebates to be measured). Paneling for paneled or paneled and glazed shutters 25 mm to 40 mm thick :**

#### (a) Second class teak wood

##### 1 Door Shutters

1.1 Finished dimensions and tolerances of components of door shutters has been given in Table 5 below.

TABLE 5

Dimensions and Tolerances of Components of Door Shutters

Sr. No.	Description	Width	Thickness
	mm	mm	mm
			A DOOR SHUTTERS
(a)	Vertical Stile, top and freeze rail	100 + 3	35 + 1 or 40 + 1
(b)	Lock rail	50 + 3	35 + 1 or 40 + 1
(c)	Bottom rail	200 + 3	35 + 1 or 40 + 1
(d)	Muntin	100 + 3	35 + 1 or 40 + 1
(e)	Glazing bar	40 + 3	35 + 1 or 40 + 1

1.2 Size and Types : Size and types of the timber panels and glazed shutters shall generally conform to modular sizes specified in Table 6 below.

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

TABLE 6

Dimension of Door Shutters

Sl. No.	Designation of Doors	Width mm	Height mm
(1)	(2)	(3)	(4)
(i)	8DS 20	700	1905 (1945 )
(ii)	8DS 21	700	2005 (2045)
(iii)	9DS 20	800	1905 (1945)
(iv)	9DS 21	800	2005 (2045)
(v)	10 DS 20	900	1905 (1945)
(vi)	10 DS 21	900	2005 (2045)
(vii)	12 DT 20	11001)	1905 (1945)
(viii)	12 DT 21	11001)	2005 (2045)

Notes :

(1) The designation refers to modular sizes of door openings. First number stands for width and the last for height in modules (M = 100 mm). Alphabet D refers to doors, 'S' to single and 'T' to double leaf shutter.

(2) Standard sizes of door frames are covered in IS 4021 and IS 4351.

(3) The standard widths and heights for panel doors are arrived at as shown in Fig. 6 of IS 1003 (Pt. 1).

In case the modular height is taken from the finished floor level, the height of the door shall be the one given in bracket. In the case of double leave shutters, the rebate in the shutter shall be as given in 6.15 of IS 1003 (Pt. 1).

1.3 Window and Ventilator Shutters : Window and ventilator shutters shall conform to IS 1003 (Part 2).

1.3.1 Dimensional Sizes and Tolerances : The finished dimensions and tolerances of different component shall be as given in Table 7 below .

TABLE 7

Dimensions and Tolerances of Components of Window and Ventilator Shutters

Description of components	Window Shutters		Ventilator Shutters	
	Width mm	Thickness mm	Width mm	Thickness mm
Stiles and rails	100 ± 3	25 ± 1	80 ± 3	20 ± 1
		30 ± 1		22.5 ± 1
				25 ± 1
				27.5 ± 1
Munting	100 ± 3	25 ± 1	60 ± 3	30 ± 1
		30 ± 1		-do-

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Glazing bars	40 ± 1	25 ± 1	40 ± 1	-do-
		30 ± 1		

1.3.2 Designation : Window and ventilator shutters shall be designated by symbols denoting the width, type and height of window and ventilators in following manner.

(a) Width : It shall be indicated by the number of modules in the width of opening

(b) It shall be indicated by the following letters of alphabet:

W-window, V- Ventilator , S-Single shutter, T-Double shutter

(c) Height : It shall be indicated by the number of modules in the height of opening.

Example : 10 WT 12 would mean a window shutter suitable for a double shutter window of 10 modules width and 12 modules height.

12 V 6 would mean ventilator shutter suitable for a ventilator of 12 modules width and 6 modules height.

1.3.3 Sizes : Sizes of window and ventilator shutters shall generally conform to the modular sizes specified in Tables 8 and 9 respectively. These sizes are derived after allowing the thickness of the frame and a margin of 5 mm all round based on 100 mm module. However sizes of shutters should be as per issued detailed drawings.

1.3.4 Tolerances on the overall dimensions of window and ventilator shutter shall be + 3 mm.

TABLE 8

Dimensions of Timber Window Shutters

Designation	Width mm	Height mm
(1)	(2)	(3)
6 WS 12	500	1100
10WT 12	460	1100
12 WT 12	560	1100
6 WS 13	500	1200
10 WT 13	460	1200
12 WT 13	560	1200

TABLE 9

Dimensions of Timber Ventilator Shutters

Designation	Width mm	Height mm
(1)	(2)	(3)
6 V 6	500	500
10 V 6	900	500
12 V 6	1100	500

2 Mounting and glazing bars where required shall be stubtenoned to the maximum depth which the size of the member would permit or to a depth of 25 mm whichever is less.

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

Unless otherwise specified the finished dimensions of the components of frame work of shutters shall be as given in Table 7. The tolerance on width of styles and rail shall be  $\pm 3$  mm. The tolerance in thickness will be  $\pm 1$  mm. The thickness of all components of frame work shall be the same as the thickness of the shutter. Tolerance on over all dimensions of the shutter shall be  $\pm 3$  mm.

### 3 Rebating

The shutters shall be single-leaf or double leaved as shown in the drawings or as directed by the Engineer-in-Charge. In case of double leaved shutters, the meeting of the stiles shall be rebated by one- third the thickness of the shutter. The rebating shall be either splayed or square.

### 4 Panelling

The panel inserts shall be either framed into the grooves or housed in the rebate of stiles and rails. Timber, plywood, and particle board panels as given in sub head and shall be fixed only with grooves. The depth of the groove shall be 12 mm and its width shall accommodate the panel inserts such that the faces are closely fitted to the sides of the groove. Panel inserts shall be framed into the grooves of stiles and rails to the full depth of the groove leaving space of 1.5 mm. Width and depth of the rebate shall be equal to half the thickness of stiles and rails. Glass panels, asbestos panels wire gauze panels and panel inserts of cupboard shutters shall be housed in the rebates of stiles and rails.

4.1 Timber Panels : Timber panels shall be preferably made of timber of large width; the minimum width and thickness of the panel shall be 100 mm, and 15 mm respectively. When made from more than one piece, the pieces shall be jointed with a continuous tongued and grooved joint glued together and reinforced with headless nails at regular intervals not exceeding 100 mm. Depth and thickness of such joint shall be equal to one-third of thickness of panel. The panels shall be designed such that no single panel exceeds 0.5 square metre in area. The grains of timber panels shall run along the longer dimensions of the panels. All panels shall be of the same species of timber unless otherwise specified.

4.2 Plywood Panels : Plywood boards used for panelling of shutters shall be BWP type or grade as specified. Each panels shall be a single piece of thickness, 9 mm for two or more panel construction and 12 mm thickness for single panel construction unless otherwise specified.

4.3 Veneered Particle Board Panels : Veneered Particle board used for panelling of shutters shall be Exterior Grade bonded with BWP type synthetic resin adhesive as specified. Each panel shall be a single piece of thickness 12 mm unless otherwise specified.

4.4 Fiber Board Panels : Fiber board used for panelling of shutters shall be Exterior Grade bonded with BWP type synthetic resin adhesive Each fiber board panel shall be a single piece unless otherwise specified.

4.5 Wire Gauze Panels: Wire Gauze used for panelling of shutters shall be woven with 0.63 mm dia galvanized mild steel wire to form average aperture size of 1.40 mm as specified. Wire gauze shall be securely housed into the rebates of stiles and rails by giving right angles bend turned back and fixed by means of suitable staples at intervals of 75 mm and over this wooden beading shall be fixed. The space between the rebate and the beading shall be fixed with putty to give a neat finish. Each wire gauze panel shall be a single piece, and the panels shall be so designed that no single panels exceeds 0.5 sqm in

area. However, care shall be taken to prevent sagging of wire gauge, of panel by providing and fixing 20 x 20 mm square or equivalent beading to the external face to the required patterns as decided by the Engineer-in-Charge.

4.6 Glass Panels : Glass panelling (Glazing) shall be done as specified. Glazing in the shutters of doors, windows and ventilators of bath, WC and Lavatories shall be provided with frosted glass the weight of which shall be not less than 13 kg/sqm. Frosted glass panes shall be fixed with frosted face on the inside. Glass panels shall be fixed by providing a thin layer of putty conforming to IS 419 applied between glass pane and all along the length of the rebate and also between glass panes and wooden beading.

4.7 Putty can be prepared by mixing one part of white lead with three parts of finely powdered chalk and then adding boiled linseed oil to the mixture to form a stiff paste and adding varnish to the paste at the rate of 1 litre of varnish to 18 kg of paste. Fixing of glass panes without beading shall not be permitted. Glazing shall be done after the shutters have been primed and prepared for painting, so that wood may not draw oil out of putty.

4.8 Finish : Panels of shutters shall be flat and well sanded to a smooth and level surface.

### 5 Beading

Beadings in paneled shutter shall be provided where specified in drawings or directed by the Engineer-in-Charge. Each length of beading shall be single piece. Joints at the corners shall be mitered and exposed edges shall be rounded. Beading shall be fixed with headless nails at 75 mm intervals. For external shutters, the beading shall be fixed on the outside face.

### 6 Machine/Factory made Shutters

Machine made shutters, where specified, shall be procured from an approved factory. For machine made shutters, operations like sawing, planning, making tongue and tenons, cutting grooves, mortises and rebates, drilling holes and pressing of joints shall be done by suitable machines. Machines made shutters shall be brought to the site fully assembled but without any priming coat. Panel inserts of sheet glass and wire gauze may, however, be fixed at site.

### 7 Fixing of Shutters

For side hung shutters of height upto 1.2 m, each leaf shall be hung on two hinges at quarter points and for shutter of height more than 1.2 m, each leaf shall be hung on three hinges one at the centre and the other two at 200 mm from the top and bottom of the shutters. Top hung and bottom hung shutters shall be hung on two hinges fixed at quarter points of top rail or bottom rail. Centre hung shutter shall be suspended on a suitable pivot in the centre of the frame. Size and type of hinges and pivots shall be as specified. Flap of hinges shall be neatly counter sunk into the recesses cut to the exact dimensions of flap. Screws for fixing the hinges shall be screwed in with screw driver and not hammered in. Unless otherwise specified, shutters of height more than 1.2 m shall be hung on butt hinges of size 100 mm and for all other shutters of lesser height butt hinges of size 75 mm shall be used. For shutter of more than 40 mm thickness butt hinges of size 125 x 90 x 4 mm shall be used. Continuous (piano) hinges shall be used for fixing cup-board shutters where specified.

### 8 Fittings

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

Fittings shall be provided as per schedule of fittings or as per drawing or as decided by Engineer-in-Charge. Appendix H gives for guidance the schedule of fittings and screws usually provided. Cost of providing and fixing shutter shall include cost of hinges and necessary screws for fixing the same. All other fittings shall be paid for separately. The fittings shall conform to specifications. Where the fittings are stipulated to be supplied by the client free of cost, screws for fixing these fittings shall be provided by contractor and nothing extra shall be paid for the same.

### 9 Wooden Cleats and Blocks

Wooden cleats and blocks shall be fixed to doors and windows as directed by Engineer-in-Charge, as per size and shape approved by him. These are included in the cost of providing and fixing the shutters.

### 10 Measurements

For paneling of each type or for glazed panel length and width of opening for panels inserts or glazed panels shall be measured correct to a cm before fixing the beading and the area shall be calculated to the nearest 0.01 sq.m. The portions of the panel inserts or glazed panel inside the grooves or rebates shall not be measured for payment.

### 11 Rate

Rate includes the cost of materials and labour involved in all the operations described above. The framework and paneling of each type or glazed panels shall be paid separately.

### **Item No. 22.**

#### **(b) Fly proof stainless steel grade 304 wire gauge with 0.5 mm dia. wire and 1.4 mm wide aperture with matching wood beading**

The relevant specification of above item shall be followed except that the work is to be done in panels of covering of Fly proof stainless steel grade 304 wire gauge with 0.5 mm dia etc.

### **Item No. 23.**

**Providing and fixing ISI marked flush door shutters conforming to IS : 2202 (Part I) non-decorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters, lipping with 2nd class teak wood/savan wood battens 25 mm minimum depth on all edges of flush door shutters :**

#### **(a) : 35 mm thick excluding ISI marked Stainless Steel butt hinges with necessary screws**

Flush door shutters shall have a solid core and may be of the decorative or non-decorative (Paintable type as per IS 2202 (Part I). Nominal thickness of shutters may be 35 mm. Thickness and type of shutters shall be as specified.

#### 1. General

Width and height of the shutters shall be as shown in the drawings or as indicated by the Engineer- in-Charge. All four edges of the shutters shall be square. The shutter shall be

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

free from twist or warp in its plane. The moisture content in timbers used in the manufacture of flush door shutters shall be not more than 12 per cent when tested according to IS 1708.

### **2 Core**

The core of the flush door shutters shall be a block board having wooden strips held in a frame constructed of stiles and rails. Each stile and rail shall be a single piece without any joint. The width of the stiles and rails including lipping, where provided shall not be less than 45 mm and not more than 75 mm. The width of each wooden strip shall not exceed 30 mm. Stiles, rails and wooden strips forming the core of a shutter shall be of equal and uniform thickness. Wooden strips shall be parallel to the stiles.

End joints of the pieces of wooden strips of small lengths shall be staggered. In a shutter, stiles and rails shall be of one species of timber. Wooden strips shall also be of one species only but it may or may not be of the same species as that of the stiles and rails. Any species of timber may be used for core of flush door. However, any non-coniferous (Hard wood) timber shall be used for stiles, rails and lipping.

### **3 Face Panel**

The face panel shall be formed by gluing, by the hot-press process on both faces of the core, either plywood or cross-bands and face veneers. The thickness of the cross bands as such or in the plywood shall be between 1.0 mm and 3.0 mm. The thickness of the face veneers as such or in the plywood shall be between 0.5 mm and 1.5 mm for commercial veneers and between 0.4 mm and 1.0 mm for decorative veneers, provided that the combined thickness of both is not less than 2.2 mm. The direction of the veneers adjacent to the core shall be at right angles to the direction of the wooden strips. Finished faces shall be sanded to smooth even texture. Commercial face veneers shall conform to marine grade plywood and decorative face veneers shall conform to type I decorative plywood in IS 1328.

### **4 Lipping**

Lipping, where specified, shall be provided internally on all edges of the shutters. Lipping shall be done with battens of first class hardwood or as specified of depth not less than 25 mm. For double leaved shutters, depth of the lipping at meeting of stiles shall be not less than 35 mm. Joints shall not be permitted in the lipping. If required groove shall be made in lipping as per drawing or as directed by engineer in charge.

### **5 Rebating**

In the case of double leaves shutters the meeting of stiles shall be rebated by 8 mm to 10 mm. The rebating shall be either splayed or square type as shown in drawing where lipping is provided. The depth of lipping at the meeting of stiles shall not be less than 30 mm.

### **6 Opening for Glazing**

When required by the purchaser opening for glazing shall be provided and unless otherwise specified the opening for glazing shall be 250 mm in height and 150 mm or 200 mm in width unless directed otherwise. The bottom of the opening shall be at a height of 1.4 m from the bottom of the shutter. Opening for glazing shall be lipped internally with wooden batten of width not less than 25 mm. Opening for glazing shall be provided where specified or shown in the drawing.

### 7 Venetian Opening

Where specified the height of the venetian opening shall be 350 mm from the bottom of the shutter. The width of the opening shall be as directed but shall provide for a clear space of 75 mm between the edge of the door and venetian opening but in no case the opening shall extend beyond the stiles of the shutter. The top edge of the opening shall be lipped internally with wooden battens of width not less than 25 mm. Venetian opening shall be provided where specified or shown in the drawing.

### 8 Tolerance

Tolerance on width and height shall be + 3 mm and tolerance on nominal thickness shall be  $\pm 1.2$  mm. The thickness of the door shutter shall be uniform throughout with a permissible variation of not more than 0.8 mm when measured at any two points.

### 9 Adhesive

Adhesive used for bonding various components of flush door shutters namely, core, core frame, lipping, cross-bands, face veneers, plywood etc. and for bonding plywood shall conform to BWP type, phenol formaldehyde synthetic resin adhesive conforming to IS 848.

### 10 Tests

Samples of flush door shutters shall be subjected to the following tests:

- (a) End Immersion Test
- (b) Knife Test
- (c) Glue Adhesion Test

One end of each sample shutter shall be tested for End Immersion Test. Two specimens of 150 x150 mm size shall be cut from the two corners at the other end of each sample shutter for carrying out Glue Adhesion Test. Knife Test shall be done on the remaining portion of each sample shutter. Test shall be done as laid down in Appendix F

### 11 Sample Size

Shutters of decorative and non-decorative type from each manufacturer, irrespective of their thickness, shall be grouped separately and each group shall constitute a lot. The number of shutters (sample size) to be selected at random from each lot for testing shall be as specified in Table 10. If the total number of shutters of each type in a work (and not the lot) is less than twenty five, testing may be done at the discretion of the Engineer-in-Charge and in such cases extra payment shall be made for the sample shutter provided the sample does not fail in any of the test specified in 10 below.

For knife test, glue adhesive test, slamming test, the end immersion test, the number of shutters shall be as per col. 4 of Table 10.

TABLE 10

Sample Size and Criteria for Conformity

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

Lot Size	Sample Size	Permissible no of defective	Sub. Sample size
(1)	(2)	(3)	(4)
Upto 26 to 50	8	0	1
51 – 100	13	1	2
101 – 150	20	1	2
151 – 300	32	1	3
301 – 500	50	2	4
501 and above	80	2	5

### 12 Criteria for Conformity

All the sample shutters when tested shall satisfy the requirements of the tests laid down in Appendix F. The lot shall be declared as conforming to the requirements when numbers of defective sample does not exceed the permissible number given in col. 3 of Table 10. If the number of sample shutters found unsatisfactory for a test is one, twice the number of samples initially tested shall be selected and tested for the test. All sample shutters so tested shall satisfy the requirement of the test. If the number of samples found unsatisfactory for a test is two or more, the entire lot shall be considered unsatisfactory.

### 13 Fixing

This shall be as specified in 7 above.

### 14 Measurements

Length and width of the shutters shall be measured to the nearest cm in closed position covering the rebates of the frames but excluding the gap between the shutter and the frame. Overlap of two shutters shall not be measured.

All work shall be measured net as fixed and area calculated in square metres to nearest two places of decimal. No deduction shall be made for providing venetian opening and opening for glazing.

### 15 Rates

The rate includes the cost of material and labour involved in all the operations described above. Extra rate shall be payable for providing rebates in double leaved shutters. Glazing when provided shall be measured & paid for separately.

### Item No. 24.

**Providing and fixing 25 mm thick calibrated BWP plywood confirming to IS 710 with necessary fixing arrangement including adhesive, nails, screws etc. all complete, as per approved drawings and as per direction of engineer in charge.**

**For wooden paneling, partitions, wardrobes, cabinets, band, patta, benches, Tables, modesty panels etc.**

#### 1 Installation

The wooden frame, Wardrobe, Cabinets in kitchen and bath rooms, Panelling, Benches, Modesty Panels, and wooden partitions shall be fixed as per nomenclature of the item, as per the detailed drawings and directions of Engineer-in-Charge.

## **2 Jointing & Finishing**

Joints of the boards are finished with specially formulated Jointing compound and fiber tape to provide seamless finish. Board surface can be decorated with any type of paint, wall paper, wood veneer & hard laminates. Services should be incorporated before commencement of board fixing.

## **3 Fitting and Fixtures**

It is easy and simple to attach different fittings to wall paneling boards. Inclined nails can be fixed to the boards itself for light materials. For heavier materials the fastening should be centered on internal stud work or steel or wood frame behind the boards, fixed before boarding. Services should be incorporated before commencement of board fixing.

## **4 Tolerance**

Tolerance in dimensions shall be + 5 mm.

## **5 Measurements**

Length and breadth of superficial area of the finished work shall be measured correct to a cm. Area shall be calculated in square meter correct to two places of decimal. No deduction will be made of openings of areas up to 0.40 sqm nor shall extra payment be made either for any extra material or labour involved in forming such openings. For openings exceeding 0.40 sqm. In area, deduction in measurements shall be made but extra will be payable for any extra material or labour involved in making such openings.

## **6 Rate**

The rate shall include the cost of all materials and labour involved in all the operations described above.

### **Item No. 25.**

**Providing and fixing 18 mm thick calibrated BWP plywood confirming to IS 710 with necessary fixing arrangement including adhesive, nails, screws etc. all complete, as per approved drawings and as per direction of engineer in charge.**

**For wooden panelling, partitions, wardrobes, cabinets, band, patta, benches, Tables, modesty panels etc.**

Relevant specifications shall be followed as per item number 24 except that 18 mm thick Calibrated BWP plywood confirming to IS 710 shall be used. Rate shall be for per Square meter.

### **Item No. 26.**

**Providing and fixing 12 mm thick calibrated BWP plywood confirming to IS 710 with necessary fixing arrangement including adhesive, nails, screws etc. all complete, as per approved drawings and as per direction of engineer in charge.**

**For wooden panelling, partitions, wardrobes, cabinets, band, patta, benches, Tables, modesty panels etc.**

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

Relevant specifications shall be followed as per item number 24 except that 12 mm thick Calibrated BWP plywood confirming to IS 710 shall be used. Rate shall be for per Square meter.

### **Item No. 27.**

**Providing and fixing 8 mm thick calibrated BWP plywood confirming to IS 710 with necessary fixing arrangement including adhesive, nails, screws etc. all complete, as per approved drawings and as per direction of engineer in charge.**

**For wooden panelling, partitions, wardrobes, cabinets, band, patta, benches, Tables, modesty panels etc.**

Relevant specifications shall be followed as per item number 24 except that 8 mm thick Calibrated BWP plywood confirming to IS 710 shall be used. Rate shall be for per Square meter.

### **Item No. 28.**

**Providing and fixing 6 mm thick calibrated BWP plywood confirming to IS 710 with necessary fixing arrangement including adhesive, nails, screws etc. all complete, as per approved drawings and as per direction of engineer in charge.**

**For wooden panelling, partitions, wardrobes, cabinets, band, patta, benches, Tables, modesty panels etc.**

Relevant specifications shall be followed as per item number 24 except that 6 mm thick Calibrated BWP plywood confirming to IS 710 shall be used. Rate shall be for per Square meter.

### **Item No. 29.**

**Providing and fixing 12.5 mm thick fire rated gypsum board conforming to IS: 2095: part I with necessary fixing arrangement including adhesive, nails, screws etc. all complete, as per approved drawings and as per direction of engineer in charge.**

**For wooden panelling, partitions, wardrobes, cabinets, band, patta, benches, Tables, modesty panels etc.**

### **Material**

The material shall conform to IS: 2849.

### **Laying**

(i) Panels are stored in a dry place and water should not come in contact with panels during or after construction. If the panels get wet, they should be dried before use.

(ii) The floor should be perfectly level before laying the first course. All panels must be properly aligned to the plumb. Successive layer of panels must be alternatively staggered so that vertical joints are not in the same line.

(iii) The recommended quantity of Gypsum Bonding Plaster must be used for joints and filling the grooves made for conduits, pipelines, etc. Excess Bonding Plaster must be scooped and removed, so that the joints and the places where the grooves are filled in are flush and even.

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

(iv) The walls should be dry and sanding done properly especially at joints before the primer is applied so that the surface is even and joints will not be visible after painting. Avoid chasing with chisel and hammer. Use electrical saw or grooving tools for conducting etc.

(v) The recommended span of walls is maximum 6 meters and maximum height is 4.5 meters.

(vi) Gypsum panel can easily be cut with coarse tooth hand saw, electric jigsaw, etc. The panels can be cut, sawn, drilled, milled or dowelled on the job. For concealed piping and conduit, the depth of groove should not exceed 50 mm. Hammer and chisel techniques to form chases must be avoided.

(vii) Sanding: This application is to make the surface level without undulations. To make the gypsum wall surface level (in particular at joints, where there is excess bonding plaster), do sanding with sand paper at joints and other places, wherever you find uneven surface, otherwise joints will be visible after painting. It is important to sand all joints uniformly.

### Measurements

The length and height shall be measured correct to a cm. Area shall be calculated in square meters correct to two place of decimal.

### Rate

The rate shall include the cost of materials and labour involved in all the operations described above.

### Item No. 30.

**Providing & fixing 40 mm thk resin bonded glass wool (48 kg/m<sup>3</sup> density) packed in to Polythene bags in cavity held on 28Gx12, GI wire netting as per drawings, and as per direction of engineer-in-charge.**

With Resin Bonded Fibre Glass Wool (Bonded Mineral Wool)

### Material

The material shall be mineral wool made from rock slag or glass processed from a molten state into fibrous form and shall be bonded with a suitable binder. Bonded mineral wool shall conform to specifications of group I of IS 8183.

Dimensions: The bonded mineral wool shall be supplied in width of 50, 60, 75 and 100 cms, and length of 100, 120 and 140 cms and the thickness of the bonded mineral wool shall be 25, 40, 50, 65 or 75 mm.

### Tolerances

For width and length, the dimensional tolerances of the bonded mineral wool slabs shall be  $-\frac{1}{2}\%$ . For nominal thickness in the range 25 to 75 mm the tolerance shall be -2 mm. An excess, in all dimensions is permitted.

Requirements for Fibre Glass Wool

**TABLE 12.11**

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

Sr.no	Characteristics	Group I	Test Reference
1.	Bulk density	12 to 15 kg/cum	IS 3144
2.	Recovery after compression	not less than 90% of original thickness	Annex. A of IS 8183
3.	Shot content max	500 micron - 5% 250 micron - 15%	IS 3144
4.	Moisture content and absorption	not more than 2%	IS 3144
5.	Incombustibility	Incombustible	IS 3144
6.	Thermal conductivity deg. C at mean temperature 50 deg.C	0.49 mw/ cm°C	IS 3346
7.	Sulphur content	Not more than 0.6%	IS 3144

### General

Bonded mineral wool insulation can be either laid over false ceiling or alternatively it can be fixed to the ceiling when the space above false ceiling is being used for carrying return air. In the first case the bonded mineral wool can either be fixed with suitable adhesive to the false ceiling board or else it can simply be rolled over the suspended false ceiling. In the second case when space above false ceiling is to be used for carrying return air 1.5" x 1.5" slotted angle (3" length) shall be fixed to the ceiling by means of rawl plugs at 2'0" spacing. Draw 14 gauge tie wires from the slots. Make a mat of mineral wool insulation backed with scrim cloth with a light coating of Plaster of Paris or polythene faced hessian and 24g x 1" wire mesh netting. The joints of wire netting should be butted and tightly laced down with G.I. wire. Stretch the mat tightly across the angles holding it in place by means of tie wires.

### Measurements

Length and breadth of the roofing insulation shall be measured correct to a cm and the surface area worked out in square metre of the finished work. No deduction shall be made for openings of areas upto 40 square decimetre. No extra payment will be made for any extra material or labour involved in forming such openings. For openings exceeding 40 square decimetre in area, deduction for the full opening will be made, but no extra will be paid for any extra material or labour involved in forming such openings. Boarding fixed to curved surfaces in narrow widths shall be measured and paid for separately. Circular cutting and waste shall be measured and paid for separately in running metres.

### Rate

The rate shall include the cost of all materials and labour required in providing bonded mineral wool.

### Item No. 31.

**Providing and fixing 8 mm thick exterior grade non asbestos heavy duty fiber cement board with necessary fixing arrangement and screws etc. all complete , as per approved drawings and as per direction of engineer in charge.**

Fibre boards shall be of medium density cement board reinforced with wood fibre and shall be of external grade capable to, produced by fiberizing steamed wood under pressure, blended with adhesive and wax and formed into solid panels under controlled conditions of heat and pressure as per IS 14862. Fibre cement board should be of minimum density 1300kg/ m<sup>3</sup> (±50) and comply to ASTM C 1185 and ISO 8336 part (E) for confirming durability properties and BS 476 – part 5, 6 & 7, Thermal conductivity should be minimum 0.15 W/m<sup>2</sup>°K and PH value should be in the range of 7 – 8

### **Adhesive**

The adhesive used for bonding shall be BWP type synthetic resin conforming to IS 848.

### **Thickness**

Fibre boards are available in thickness 6, 9, 12, 15, 18, 22, 25, 30, 35 & 40 mm. The tolerance in thickness shall be ± 0.3 mm. Thickness of fibre boards and adhesive used for bonding shall be as per manufacturers standards and shall be as per relevant IS Codes. Unless otherwise stated, exterior grade fibre boards bonded with BWP type synthetic resin adhesive shall be used.

### **Fixing**

The fibre cement board shall be fixed on the structure using self tacking screws. The screws shall be of approved make and shall be SDST screws of stainless steel.

### **Measurement**

Measurement shall be for per square meter of board installed.

### **Rate**

Rate shall be for per square meter of board installed including the cost of screws, tools, tackles, labour and scaffolding.

### **Item No. 32.**

**Providing and fixing 6 mm thick exterior grade non asbestos heavy duty fiber cement board with necessary fixing arrangement and screws etc. all complete, as per approved drawings and as per direction of engineer in charge.**

Relevant specification shall be followed as per Item Number 31 except that 6 mm Exterior grade non asbestos cement board as per BOQ description.

### **Item No. 33.**

**Providing and fixing PVC ABS edge beading 2 mm thick / second class teakwood beading 12 mm thick with necessary fixing arrangement and screws etc. all complete, as per approved drawings and as per direction of engineer in charge for various thickness of plywood for wardrobes, cabinets, partitions etc.**

### **Beading**

Beadings in panelled shutter and other places shall be provided where specified in architectural drawings or directed by the Engineer-in-Charge. Each length of beading shall be single piece. Joints at the corners shall be mitred and exposed edges shall be rounded. Beading shall be fixed with headless nails at 75 mm intervals. For external shutters, the beading shall be fixed on the outside face.

**Item No. 34.**

**Providing & fixing to wall band up to 300 mm wide made from 12 mm thick marine plywood conforming to IS: 710 finishing with 4 mm veneer and second class teak wood beading, back side supporting second class teakwood Patti 48 X 48 mm top and bottom with necessary fixing arrangement and screws etc. all complete, as per drawing and as directed by engineer- in- charge.**

**1. General**

All the items to be used shall be as per the approved make list. The wooden band shall be done at site as per the item description and the good for construction drawings. The work shall include all the items mentioned in the item description.

**2. Measurement and Rates**

Measurement shall be per running meter of the band. The rate shall be inclusive of all materials, screws, adhesives, nails, labour, tools and tackles required to complete the work as per the drawings and to the satisfaction of the Engineer in Charge.

**Item No. 35.**

**Providing & fixing to wall band up to 300 mm wide made from exterior Grade-I MDF Board 18 mm thick confirming to IS:12406 with second class teak wood beading and back side supporting second class teakwood patti 48x48 mm top and bottom with necessary fixing arrangement and screws etc. all complete as per drawing and as directed by engineer- in- charge.**

**1. General**

All the items to be used shall be as per the approved make list. The wooden band shall be done at site as per the item description and the good for construction drawings. The work shall include all the items mentioned in the item description.

**2. Measurement and Rates**

Measurement shall be per running meter of the band. The rate shall be inclusive of all materials, labour, screws, adhesives, nails, tools and tackles required to complete the work as per the drawings and to the satisfaction of the Engineer in Charge.

**Item No. 36.**

**Providing & fixing C shaped pelmet up to 200 mm made wide from 18 mm thick marine plywood conforming to IS: 710 finishing front side with 4 mm thick veneer and second class teak wood beading ,back side supporting to wall with necessary fixing arrangement and screws etc. all complete, as per drawing and as directed by engineer- in- charge.**

**1. General**

All the items to be used shall be as per the approved make list. The C shape pelmet shall be done at site as per the item description and the good for construction drawings. The work shall include all the items mentioned in the item description.

**2. Measurement and Rates**

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

Measurement shall be per square meter of the pelmet. The rate shall be inclusive of all materials, labour, tools and tackles required to complete the work as per the drawings and to the satisfaction of the Engineer in Charge.

### **Item No. 37.**

**Providing & Fixing decorative high pressure laminated sheet of plain / wood grain in gloss / matt / suede finish with high density protective surface layer and reverse side of adhesive bonding quality conforming to IS : 2046 Type S, including cost of adhesive of approved quality.**

#### **a) 1.0 mm thick on one side only**

##### **1 Scope:**

Decorative thermosetting synthetic resin bonded laminated sheets shall generally conform to IS 2046. This material is intended for interior use and is not intended for load bearing applications. The decorative high pressure laminated sheet of plain / wood grain in gloss / matt / suede finish or as approved by authority.

##### **2. Material**

A sheet consisting of layers of fibrous sheet material ( for example, paper ) impregnated with thermosetting resins and bonded together by means of heat a pressure of not less than 7 MPa ( 1 MPa = 1 MN/m<sup>2</sup> ), the outer layer or layers on one or both sides having decorative colours or designs. Decorative high-pressure laminated sheet (HPL) as defined this standard is made from core layers impregnated with phenolic and/or amino plastic resins and a surface layer or layers impregnated with amino plastic resins (mainly melamine resins).

##### **3 Requirements:**

When inspected in daylight (or D 65 standard illuminant and again under a tungsten illuminant) there shall be no significant difference between a standard agreed by the supplier and the specimen under test.

Having only one side bearing decorative surface the other side being roughened or given an appropriate treatment to promote adhesion to the base. This type shall generally be used, unless specified otherwise.

No requirements for nominal thickness are specified for individual types of materials listed in Table 7, however, variations from the nominal thickness supplies shall at no point exceed the limits shown in Table 5 of code.

Thickness shall be measured using a ratchet-type micrometer or dial gauge indicator having two flat parallel measuring surfaces of diameter at least 6 mm and capable of being read to 0.01 mm. When the thickness of a decorative laminated sheet is being measured, the two surfaces shall exert a pressure of 10 to 100 kPa upon each other

The specimen shall be the sheet under test, as received. After checking the gauge for accuracy the thickness of the sheet shall be determined to the nearest 0.02 mtn. It is recommended that the thickness should be measured at a minimum of four points and at a distance of at least 20 mm from the edge of the sheet.

##### **4 Appearance**

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

The following inspection requirements are intended as a general guide, indicating the minimum acceptable quality for laminates supplies as full size sheets. Cut-to-size panels and certain applications involving full size sheets may call for special quality requirements which can be negotiated between the supplier and the purchaser; in such cases the following requirements may be used as a basis for discussion. It should be noted that only a small percentage of sheets in a batch should be of the minimum acceptable quality.

### Surface defects

When inspected for surface appearances under standardized conditions of lighting and viewing at a distance half of the levels prescribe.

### Edge defects

Visual defects (for example, moisture marks, lack of gloss, etc) can be present on all four edges of the laminate provided that the defect free length and width are not more than 20 mm shorter than the nominal length and width.

### Broken corners

One broken corner of <30 mm or two broken corners of <15 mm are allowed. These values refer to the distance between the original corner and the fracture line. Slight chatter marks are allowed.

### Warping

The flatness of laminates is dependent on atmospheric conditions within the storage area. Provided that the laminates are stored in the conditions recommended by the manufacturer, they shall not show a departure of the surface from a straightedge of 1 mm length in any position, of more than the limits listed in Table 6 when the laminate is laid concave side up on a flat surface of every property for which a value of requirement is specified in 5. TWO methods of test are given for the measurement of dimensional stability, impact resistance, and resistance to colour changes in artificial light, formability and resistance to cigarette bunts. When there is a choice of method, material satisfying the requirements of either method shall be deemed to comply with the specification for that property; however, the choice Of method may be agreed between the interested parties available at the manufacturer's end. The method searched shall be stated in the test report.

Length and Width of u Full-Size Laminate The laminate shall be of the nominal size with a tolerance of +-10 mm.

Straightness of Edges: The edges shall be straight within a tolerance of 1.5 mm per meter length of the edge. The edge being measured shall be at least as long as the 1 nun straightedge.

Square ness of the Laminates: The panel shall be rectangular within a tolerance of 1.5 mm per meter length of the edge. The edge being measured shall be at least as long as the 1 m straightedge.

Other Properties: when tested by the appropriate methods, the properties for each type of material shall satisfy the requirements listed in Tables 1 and 7.

COMPLIANCE: In order to comply with the requirements of this standard, materials of each type shall meet the requirements of every property for which a value of requirement is specified in 5. TWO methods of test are given for the measurement of dimensional

stability, impact resistance, resistance to colour changes in artificial light, formability and resistance to cigarette burns. When there is a choice of method, material satisfying the requirements of either method shall be deemed to comply with the specification for that property; however, the choice of method may be agreed between the interested parties available at the manufacturer's end. The method selected shall be stated in the test report.

### **5. Packing & Marking**

**Packing:** The material shall be supplied in packages as agreed to between the purchaser and the supplier.

**Marking:** The consignment shall be marked suitably with the following information:

- a) Indication of the source of manufacture and recognized trade mark, if any;
- b) Type and class of the material;
- c) Month and year of manufacture; and
- d) Batch number and code number.

**BIS Certification Marking** The product may also be marked with the Standard Mark.

The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 19% and the Rules and Regulations made thereunder. The details of conditions under which the license for the Use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

### **6 Laying:**

Laminate is easy to clean and relatively durable, although, being plastic, it can melt if exposed to excessive heat. Laminate comes in many styles and can be cut using ordinary saws, making its installation a great do it yourself project. A matte finish will hide wear and tear better than a glossy laminate, which is easily scratched, but may require more cleaning. A matte finish will hide wear and tear better than a glossy laminate, which is easily scratched, but may require more cleaning.

**Preparing the laminate:**

Lightly sand the surface on which you will install the sheet. Sand the surface to create a rough surface for solid adherence, and wipe away sawdust with a tack cloth or damp. If the surface is covered by paint or varnish, you should sand thoroughly to remove it using coarse or medium coarse sandpaper.

Measure the length and width of the areas where you will install sheet. Use a tape measure to get an accurate measurement of each dimension of the area. If you are installing a full countertop and your walls are not at perfect right angles, you should scribe the sheet first. See Troubleshooting for more information.

Place the sheet on a flat, stable surface. This should be large enough to keep the sheet steady while cutting. Use scrap plywood or similar material that you don't mind damaging with the saw. Don't use concrete or another surface that will damage the saw blade. Mark the measurements on the back of the Formica sheet, adding 1 inch (2.5 cm) to each measurement. Draw your cut lines onto the laminate at the increased measurement, which ensures you don't waste a large piece of laminate due to cutting too small a piece.

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

Apply masking tape along the lines. This makes it easier to see where to cut, while also reducing the risk of chips. You can also apply additional tape to the surface beneath the sheet to protect it, but you shouldn't cut over a surface you want to keep presentable.

Cut the Formica along straight lines. Ideally, you should use a circular saw, saber saw, back saw, table saw, or laminate shears. A handsaw with at least 10 teeth per inch (4 per cm) will also work, but may be tedious for larger jobs. Use a metal straightedge to ensure a straight cut. If your installation place is curved, you'll need to use a jigsaw or laminate router to make these finer adjustments.

Installing the Formica:

If you are installing laminate on a countertop or other surface with edges, begin with the edge pieces. If you cut them from the laminate yourself, apply the contact cement with a brush or roller to both surfaces. Allow it to set until it feels tacky, according to the manufacturer's directions.

If you are using pre-glued end caps, all you need to do is heat a clothes iron, place the laminate against the edge, and iron back and forth. Let sit for one minute and gently tap it along its length with a rubber mallet or shoe heel. You can now skip to trim the edge strip.

When you are sure you have it placed properly, press it to the surface. Once the two surfaces come into contact, the contact cement is already bonded to 50% or more of its final strength.

Push a dry roller back and forth across the laminate to adhere it completely and to remove air from between the laminate and the surface.

Use a fine file to remove the excess material, applying pressure only on the up strokes. You may use a laminate trimmer or router instead, but if you do you should lubricate the edge with petroleum jelly (Vaseline) first. This minimizes the chance of breakage.

Use a carbide drill bit when trimming laminate. Before continuing, protect your finished edges while you install the remainder of the laminate sheet. Allow it to set according to manufacturer's instructions. As a general rule, the contact cement should be left until it becomes tacky and dry to the touch, but no longer.

Align the laminate as accurately as you can, then continue to adjust it as you move from one end of the surface to the other. Shift the dowels out of the way once you've aligned each section, then press it down to adhere it to the surface. Push a roller across the sheet to eliminate air pockets and strengthen the contact bond. Use a flush trim carbide drill bit. Stop frequently to allow the router to cool, as the laminate will melt if exposed to high heat. Use a fine wood file to methodically file down the sharp edge of the laminate. File downward at an angle along the entire edge.

### **6 Measurement:**

Length and breadth of superficial area of the finished work shall be measured correct to a cm.

Measurement shall be per square meter.

### **7 Rate:**

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

The rate shall include the cost of all materials and labour involved in all the operations described above.

### **Item No. 38.**

**Providing and fixing 4 mm thick divine teak quarter cut Veneer conforming to IS: 1328 (type-1) with second class teak wood beading of approved colour, texture sample as approved and as per direction of engineer in charge.**

#### **1. Veneered Decorative Plywood**

Decorative plywood shall be of two grades namely BWR and MR Decorative Plywood shall be of two types. Type I and type 2 and shall conform to IS 1328.

1 Requirement of Type-I Veneered decorative plywood shall be as under:

(a) Open slits checks or open joints not more than 150 mm in length and 0.5 mm in width shall be permissible provided the same are rectified with a veneer insert bounded with synthetic resin adhesive, as the case may be and further provided that the insert matches with the surrounding veneer in colour as well as figure.

(b) The decorative veneered surface shall be free from torn grain, dead knots discolourisation and sapwood.

(c) The decorative veneered surface shall be selected for figure, texture, colour and grain etc. It shall be free from all manufacturing and wood defects except to the Engineer-in-charge permitted under para 9.2.8.1(a). All veneers shall be matched or mismatched to achieve a decorative effect in colour figure and grain.

#### **2 Adhesive**

The adhesive for bonding veneers shall be MR and BWR type synthetic resin adhesive conforming to IS 848 for MR and BWR grade veneered decorative plywood respectively.

#### **3 Dimensions and Tolerances:**

3.1 The dimensions of plywood boards shall be as follows:

2400 mm x 1200 mm 2100 mm x 900 mm

2100 mm x 1200 mm 1800 mm x 900 mm

1800 mm x 1200 mm

3.2 Thickness: The thickness of plywood board shall be 3 mm, 4 mm, 6 mm, 9 mm, 12 mm, 19 mm and 25 mm.

Note: Any other dimensions (length, width and thickness) as agreed to between the manufacturer and the purchaser may also be used.

3.3 Tolerances: Tolerances on the nominal sizes of finished boards shall be as follows:

Dimension Tolerance

Length +6 mm

- 0

Width +3 mm

-0 mm

Thickness:

(i) Less than 6 mm + 10 per cent

(ii) 6 mm and above + 5 per cent

Edge straightness 2 mm per 1000 mm

Or 0.2 per cent

Squareness 2 mm per 1000 mm

Or 0.2 per cent

Note : Edge straightness and squareness shall be tested as per Appendix I.

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#### **4 Finish**

The decorative plywood shall be uniform in thickness within the tolerances limits specified. The ends shall be trimmed straight and square edge straightness and squareness when tested as per Appendix I shall be within the tolerance specified in 1.3.3.

#### **5 Sampling and Criteria for Conformity**

The method for drawing representative samples and criteria for conformity shall be as per IS 7638.

#### **6 Tests**

Boards shall be subjected to following tests :

(i) Moisture content: Decorative veneered plywood of either type when tested in accordance with IS

1734 (Pt. I) shall have a moisture content not less than 5 per cent and not more than 15 per cent.

(ii) Water Resistance Test : Three test specimen of size 250 mm x 100 mm shall be prepared for each of the boards selected and submerged in water at 62 +2o C for a period of 3 hours and dried for 8 hours at a temperature of 65 + 2oC and then followed by two more cycles of soaking and drying under same conditions described above. Decorative Veneered plywood of either type shall not show delamination or blister formation.

#### **7 Marking**

Each plywood board shall be legibly and indelibly marked or stamped with the following on the face of board near one corner.

(a) Indication of the source of manufacture

(b) Year of manufacture

(c) Batch no.

(d) Type of plywood

(e) Criteria for which the plywood has been labelled as ECO mark

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The decorative veneered plywood may also be marked with standard BIS certification mark.

### Item No. 39.

**Providing and fixing Wooden Grill louvers made from second class teak wooden Patti 40 x12 mm at center to center distance of 40 mm fixed to 50x20 mm wooden frame with necessary fixing arrangement and screws etc. all complete, at required location in frames/shutters of door/windows as per drawing and as directed by engineer in charge.**

#### 1 Measurement:

Length and breadth of superficial area of the finished work shall be measured correct to a cm. Measurement shall be per square meter.

#### 2 Rate:

The rate shall include the cost of all materials and labour involved in all the operations described above.

### Item No. 40.

**Providing and fixing glazing in door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket /teakwood beading etc. complete as per the architectural drawings and the directions of Engineer-in-charge.**

**(a)With float glass panes of 8.0 mm thickness**

#### Float Glass

The glass shall be clear float glass and should be approved by the Engineer in Charge. It shall be clear, float transparent and free from cracks subject to allowable defects. The float glass shall conform to the IS 14900.

#### Thickness

The thickness of float glass shall depend on the size of panel. The tolerance in thickness shall be as under:

Nominal Thickness (in mm )	Tolerance (in mm )
4.0	± 0.3
5.0	± 0.3
6.0	± 0.3
8.0	± 0.6

#### Allowable Defects

The allowable defects shall be as per Table 21.3 below:

TABLE 21.3

Sr. No.	Defects	Central	Outer	Remarks
1.	Gaseous inclusion. Max size, mm	3.0	6.0	Separated by at least 30.0 cm

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2.	Opaque gaseous inclusion. Max size. Mm	3.0	6.0	Separated by at least 60.0 cm
3.	Knots, dirt and stones, Max size. Mm	1.0	1.0	Separated by at least 30.0 cm
4.	Scratches, Rubs and Crush	Faint	Light	Separated by at least 30.0 cm
5.	Bow, percent. Max	0.5	0.5	See 21.2.4.3
6.	Reams, Strings and lines	Light	Light	See 21.2.4.4
7.	Waviness	Nil	Nil	See 21.2.4.5
8.	Sulphur stains	Nil	Nil	
9.	Corner breakage and chip	Not more than nominal thickness of float glass		

Allowable Cluster of Defects: The allowable cluster of defects mentioned under Sl. No. 1, 2 & 3 of Table 21.3 shall be as per IS 14900.

### Tests

#### Thickness

The thickness of float glass shall be measured with micrometers or a caliper which is graduated to 0.01 mm or with a measuring instrument having an equivalent capacity.

#### Scratches, Rubs and Crush

Place the sample of float glass in a vertical position approximately 50 cm from the viewer's position and look through it using either day light without direct sunlight or a background light suitable for observing each type of defect.

Intensity of Scratches, Rubs, Crush	Intensity Distance Limit
Faint	Shall not be detectable beyond 50 cm
Light	Detectable between 50-100 cm and not beyond 100 cm

#### Bow

Depending on the side on which bow is present, stand the sample vertically on a wooden plank. Stretch a thread edge to edge. Measure the longest perpendicular. Distance from the thread to the surface of float glass facing the thread and express it as percentage of the length of float glass from edge along the thread.

#### Reams, Strings and Lines

Focus a light projector with a 500 W lamp and an objective lens with an approximate 5 cm aperture and about 30 cm focal length on a flat white projection screen placed about 760 cm from the light source in a dark room. Place the float glass in a vertical position parallel to the screen between the light and the screen. Move the glass slowly towards the screen

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

with a vertical oscillating motion. The shadowgraph read out is the distance at which the distortion just blends with the general shadow of the glass on the screen.

TABLE 21.4

Intensity of Reams, Strings and Lines	Intensity Distance Limit
Light	7.5 cm
Medium	5.0 cm
Heavy	2.5 cm

Perspective Distortion: When tested as per test procedure described below it shall not give distorted vision of straight stripe pattern.

### **Test Procedure for Perspective Distortion**

Perspective distortion shall be examined by looking through the specimen glass which may be placed at about 4.5 m distance in such a direction that the incident angle to it is 50 degree (4 mm or above) and by observing a screen set up perpendicularly to the line of vision about 4.5 m further ahead of the specimen over the total width of about middle part of the specimen from the horizontal direction. The specimen glass shall be kept with the drawn direction at manufacture vertical and, on the surface of the screen, the strip pattern of white and black parallel straight lines of 25 mm width and inclined 45 degrees from the vertical shall be provided and its surface shall be luster less.

### **Item No. 41.**

**Providing and fixing glazing in door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket /teakwood beading etc. complete as per the architectural drawings and the directions of Engineer-in-charge .**

**(b)With float glass panes of 5.0 to 6.0 mm thickness**

Relevant Specification as per item no 41.

### **Item No. 42.**

**Providing and fixing glazing in door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket /teakwood beading etc. complete as per the architectural drawings and the directions of Engineer-in-charge .**

**(c )With float glass panes of 12.0 mm thickness**

Relevant Specification as per item no 41.

### **Item No. 43.**

**Extra rate over for providing and fixing toughened glass panes instead of plain float glass as per drawing and as directed by engineer in charge.**

### **1 Material**

Toughened or tempered glass is a type of safety glass processed by controlled thermal or chemical treatments to increase its strength compared with normal glass. Tempering puts the outer surfaces into compression and the interior into tension. Such stresses cause the glass, when broken, to crumble into small granular chunks instead of splintering into

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

jagged shards as plate glass (a.k.a. annealed glass) does. The granular chunks are less likely to cause injury.

Toughened glass is physically and thermally stronger than normal glass.[1] The greater contraction of the inner layer during manufacturing induces compressive stresses in the surface of the glass balanced by tensile stresses in the body of the glass. For glass to be considered toughened, this compressive stress on the surface of the glass should be a minimum of 69 mega pascals (10,000 psi). For it to be considered safety glass, the surface compressive stress should exceed 100 mega pascals (15,000 psi). As a result of the increased surface stress, if the glass is ever broken it only breaks into small circular pieces as opposed to sharp jagged shards. This characteristic makes tempered glass safe for high-pressure and explosion proof applications

It is this compressive stress that gives the toughened glass increased strength. This is because annealed glass, which has almost no internal stress, usually forms microscopic surface cracks, and any applied tension gets magnified at the surface, reducing the applied tension needed to propagate the crack. Once it starts propagating, tension gets magnified even more easily, causing it to propagate at the speed of sound in the material. Consequently, annealed glass is fragile and breaks into irregular and sharp pieces.[3] Any cutting or grinding must be done prior to tempering. Cutting, grinding, and sharp impacts after tempering will cause the glass to fracture.

Toughened glass can be made from annealed glass via a thermal tempering process. The glass is placed onto a roller table, taking it through a furnace that heats it well above its transition temperature of 564 °C (1,047 °F) to around 620 °C (1,148 °F). An alternative chemical toughening process involves forcing a surface layer of glass at least 0.1 mm thick into compression by ion exchange of the sodium ions in the glass surface with potassium ions (which are 30% larger), by immersion of the glass into a bath of molten potassium nitrate. Chemical toughening results in increased toughness compared with thermal toughening and can be applied to glass objects of complex shapes

### **2. Laying**

Glass shall be fixed in proper line and level with first/second class teakwood beading as per specified thickness and as directed. Surrounding gap should be watertight with silicone sealant or as specified.

### **3 Measurement**

Length and breadth of superficial area of the finished work shall be measured correct to a cm. Measurement shall be per square meter.

### **4 Rate**

The rate shall include the cost of all the materials, labours involved in all the operations as described in nomenclature of item and particular specification.

### **Item No. 44.**

**Extra rate over for providing and fixing frosted/ribbed glass panes instead of plain float glass as per drawing and as directed by engineer in charge.**

**Measurements**

Length and breadth of superficial area of the finished work shall be measured correct to a cm. Measurement shall be per square meter.

**Rate**

The rate shall include the cost of all the materials, labours involved in all the operations as described in nomenclature of item and particular specification.

**Item No. 45.**

**Extra for providing and fixing translucent polyester film on glass over plain float glass to give it a look as required as per drawing and as directed by engineer in charge.**

**Measurements**

Length and breadth of superficial area of the finished work shall be measured correct to a cm. Measurement shall be per square meter.

**Rate**

The rate shall include the cost of all the materials, labours involved in all the operations as described in nomenclature of item and particular specification.

**Item No. 46.**

**Extra rate over above item for providing single glazing 8.0 mm thick clear cosmos (ET 125) of saint gobain or equivalent approved make instead of 8.0 mm thick plain float glass having properties like light transmission 28%, external reflection 28%, internal reflection 9%, 28%, solar factor 0.3, shading coefficient 0.34, U value (W/Sqm-k) 3.9 Light as per drawing and as directed by Engineer-in-Charge.**

Relevant specification shall be followed as per item number 44. Rate shall be for per sqm of glass. The Glass shall be low e glass with solar reflective coating equivalent to Saint Gobain ET-125 series.

**Item No. 47.**

**Providing and fixing laminated glass 6 mm clear+ 1.52 mm pvb+ 6mm toughned glass as per drawing and as directed by Engineer-in-Charge.**

Laminated glass is a safety and security glass that is made by sandwiching a laminated sheet between two pieces of glass. The laminated sheet is usually polyvinyl butryl (PVB) sheet. The PVB sheet in the middle of the glass helps in sticking the glass pieces to it when the glass is broken. The laminated glass is designed to prevent it from shattering into pieces and thus ensures safety.

Laminated glass is made by sandwiching PVB sheet between two panes of glass. They are sealed by a series of pressure rollers and then autoclaved. During the manufacturing process of laminated glass, mechanical and chemical bonding is developed between the

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

PVB sheet and the glass. The adhesive nature of PVB creates the mechanical bond and the hydrogen bonding between PVB and glass is the reason for chemical bonding. Because of the chemical bonding of PVB with glass, even when there is any breakage, the laminated glass remains intact.

The laminated glass shall be made of inner glass of 6 mm clear with 1.52 mm PVB layer and outer 6 mm layer of toughened glass. The Glass should of full size that shall be installed in the skylight areas as per the execution drawing.

### Measurements

Length and breadth of superficial area of the finished work shall be measured correct to a cm. Measurement shall be per square meter.

### Rate

The rate shall include the cost of all the materials, labours involved in all the operations as described in nomenclature of item and particular specification.

### Item No. 48.

**Providing and fixing PVC Acoustic & smoke seal to protect rebated timber frame 12 mm profile RP 120 Raven make or equivalent as per drawing and as directed by engineer in charge.**

The PVC acoustic and smoke seal shall be co-extruded PVC seal and shall have self-adhesive backing tape provided inbuilt. The PVC used shall be flexible flame retardant PVC. The seal shall be provided to all the corners of the door frame at the hinges and rebates so that progression of sound and smoke can be limited.

The rate shall be for per running meter of seal installed.

### Item No. 49.

**Providing and fixing EPDM perimeter Bulb type of seal self -adhesive for Gaps as per drawing and as directed by engineer in charge.**

The EPDM Gaskets shall be of size and profile as shown in drawings and as called for, to render the glazing, doors, windows, ventilators etc. air and water tight. Samples of gaskets shall be submitted for approval and the EPDM gasket approved by Engineer-in-Charge shall only be used. The contractor shall submit documentary proof of using the above material in the work to the entire satisfaction of Engineer-in- Charge.

The EPDM gasket shall meet the requirements as given in Table 21.5 below:

TABLE 21.5

Sr. No.	Description	Standard Follow	Specification
1	Tensile strength Kg.f/cm <sup>2</sup>	ASTM-D 412	70 Min.
2	Elongation at break %	ASTM-D 412	250 Min.
3	Modulus 100% Kgf/cm <sup>2</sup>	ASTM-D 412	22 Min.

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4	Compression set % at 0o CC 22 Hrs.	ASTM-D 395	50 Max.
5	Ozone resistance	ASTM-D 1149	No Visible Cracks

### **Item No. 50.**

**Providing and fixing expose type Elite brush seal sweeper gasket Enviro make or equivalent as per drawing and as directed by engineer in charge.**

Relevant specifications of item no 40 shall be followed. Door Bottom Sweeps are used to seal the gap at the bottom of your door to prevent infiltration of sound, light, drafts, insects, moisture, smoke or fire.

The brush seal sweeper gasket shall be having nylon brush and shall be encased in aluminium casing as per manufacturers specifications and shall be installed to the bottom of the door.

Rate shall be for per running meter brush seal gasket installed.

### **Item No. 51.**

**Providing and fixing acoustical Automatic door bottom seal RP8si seal of raven make or equivalent as per drawing and as directed by engineer in charge.**

The Automatic Door Bottom should utilizes a flat spring mechanism, which activates when closing the door, lowering a neoprene seal insert against the floor or threshold to create a sound seal. These are for use on the push side of the door. The frame compresses a protruding hinge-side "plunger" as the door closes, to activate the spring. The Automatic Door Bottom then drops a seal in a scissor-like motion from the hinge side, adjusting to the floor from a pivoting point. As the neoprene seal compresses, it forms a tight, secure seal against the saddle or floor. The sweep retracts automatically as the door opens.

These seals shall be provided to the bottom of the doors as mentioned in the drawings and shall be concealed in to the door frame.

Rate shall be for per running meter of bottom seal installed.

### **Item No. 52.**

**Providing and fixing Galvanized M.S. sheet 0.5 mm thick pressed channel section of size as per drawing and as directed by engineer in charge.**

### **Item No. 53.**

**Providing and fixing 5 mm thick mirror of superior glass (of approved quality) and of required shape and size fixed with teakwood/savan wood beading or with adhesive or with two way tape (3M or equivalent Quality) on to backing Ply wood (paid separately)and fixed to wall/partition with wooden cleats with C.P. brass screws and washers complete.**

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The mirror shall be of the approved make and superior quality. The Mirror shall be installed on the surface with adhesive or two way tape of 3M or equivalent quality. Mirror shall be installed on 6 mm plywood backing and shall be provided with teak wood lipping as per the drawing.

### Measurement:

Length and breadth of superficial area of the finished work shall be measured correct to a cm. Area shall be calculated in square meter correct to two places of decimal.

### Rate

The rate shall include the cost of all materials and labour involved in all the operations described above.

### Item No. 54.

**Providing and fixing Silver Color Coated Door Closer made of High Quality aluminium extruded section body tubular type universal hydraulic door closer (having brand logo with ISI, IS : 3564, embossed on the body, door weight upto 80 kg , with double speed adjustment, Rack and pinion should be manufactured from steel alloy duly machined and heat-treated, suitable for right-hand and left hand door application, with necessary accessories and screws etc. complete as per drawing and as directed by engineer-in -charge.**

**1** These shall be made of aluminium alloy/zinc alloy and of shape and pattern as approved by the Engineer-in-Charge.

**2** These shall generally conform to IS Specifications for door closers (Hydraulically regulated) IS 3564.

**3** Aluminium alloy door closer shall be anodized and the anodic coating shall not be less than grade AC 15 of IS 1868. All dents, burrs and sharp edges shall be removed from various components and they shall be pickled, scrubbed and rinsed to remove grease, rust, scale or any other foreign elements. After pickling, all the M.S. parts shall be given phosphate treatment in accordance with IS 3618.

### **4 Sampling and Criteria for Conformity**

All the door closer of the same nominal size and shape and from the same batch of manufacture, in one consignment shall constitute a lot. The number of door closers to be taken at random from a lot shall depend upon the size of the lot. (Table 20). The sample shall be tested for construction, finish, dimensions, interchangeability of parts and performance in accordance of Table 20. Any door closer failing in any one or more of these characteristics shall be considered as defective. If in the first sample, the number of defective door closer is less than or equal to corresponding acceptance number, the lot shall be declared as conforming to the requirement of these characteristics. If the number of defective door closer is greater than or equal to the rejection number, the acceptance number but less than the rejection number, lot shall be deemed as not meeting with requirements of these characteristics. If the number of defectives is greater than the acceptance number, but less than the rejection number, a second sample of the size equivalent to that of the first shall be taken to determine the conformity or otherwise of the lot. The number of defective door closers found in the first and the second sample shall be combined and if the combined number of defective thus obtained is less than or equal to the corresponding acceptance number, the lot shall be declared as conforming to the requirements of these characteristics.

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Endurance Test- Two door closer in case of lot size 280 or less and five door closers in case of lot size more than 280 shall be selected from those already found satisfactory. These door closers shall be tested for the endurance test.

If all the door closers tested for endurance test satisfy the requirement of this standard, the lot shall be deemed as having satisfied the requirements of endurance test, otherwise not.

TABLE 20

No. of door closers in the lot	Sample	Sample size	Cumulative sample size	Acceptance Number	Rejection Number
up to 50	First	8	8	0	2
	Second	8	16	1	2
51 to 90	First	13	13	0	2
	Second	13	26	1	2

### 5 Performance Requirements

After being fitted in its position when the door is opened through 90°, the same should swing back to angle of 20° ± 5° with nominal speed but thereafter, the speed should get automatically retarded and in case of doors with latches, it should be so regulated that in its final position the door smoothly negotiates with the latch.

### 6 Measurement:

The door closer as describe in item shall be measured in numbers.

### 7 Rate:

The rate shall include the cost of all materials and labor involved in all the operations described above.

### Item No. 55.

**Providing & Fixing S.S. 316 Grade Fire resistance BSEN 1634:1:2000 Certified & Mechanically tested BSEN 1935:2002 Satin Finish S.S. 316 Grade 4 ball bearings Hinges approximate size 102mm X 76mm X 3 mm minimum Weight 260 gm of approved make with AISI 316 Grade ball Bearing S.S. Pin, Cap, and with necessary S.S. Self Tapping Phillips Cross Head Screws etc. complete as per drawing and as directed by engineer-in -charge.**

Butt Hinges

These shall be of the following types according to the material used.

(a) Stainless steel 316 garde butt hinges.

Stainless steel 316 garde butt hinges: These shall be manufactured from S.S. 316 sheet as per specified thickness.

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These shall be well made and shall be free from flaws and defects of all kinds. All hinges shall be cut clean and square and all sharp edges and corners shall be removed. These shall generally conform to IS 12817.

Hinge Pin: Hinge pin shall be made of mild steel wire. It shall fit inside the knuckles firmly and riveted head shall be well formed so as not to allow any play or shake, and shall allow easy movement of the hinge, but shall not cause looseness.

Knuckles: The number of knuckles in the hinges of different sizes shall be as per IS 12817. The size of knuckles shall be straight and at right angle to the flap. The movement of the hinges shall be free and easy and working shall not have any play or shake.

Screw Holes: The screw holes shall be clean and counter sunk. These shall be suitable for countersunk head wood screws and of the specified size for different types, and sizes of hinges. The size of the holes shall be such that when it is counter sunk it shall be able to accommodate the full depth of counter sunk head of the wood screws. The nos. of screw holes shall as specified in IS 12817.

Sampling and Criteria for Conformity: The number of butt hinges to be selected from a lot shall be depend on size of lot and shall be in accordance with Table 9.11 below. Butt hinges for testing shall be selected at random from at least 10 per cent of the randomly selected packages subjected to minimum of three equal number of hinges being selected from each package. All butt hinges selected shall be checked for dimensions and tolerance requirements. Defects in manufacture and finish shall also be checked and lot shall be considered conforming to the requirement of this specifications, if the number of defective hinges among those tested does not exceed the corresponding number given in Table 9.11.

TABLE 9.11

Scale of Sampling and Criteria for Conformity

SR. No.	Lot size	Sample Size	Permissible No. of Defective hinges
1	2	3	4
1.	Upto 150	5	0
2.	151 to 300	20	1
3.	301 to 500	32	2
4.	501 to 1000	50	3
5.	1001 and above	80	5

Sampling and Criteria for Conformity: The number of butt hinges to be selected from a lot shall depend on the size of lot and shall be in accordance with Table 9.12. Butt hinges for testing shall be taken at random from at least 10 per cent of the package subject to a minimum of three, equal number of hinges being selected from each package. All butt hinges selected from the lot shall be checked for dimensional and tolerance requirements. Defects in manufacture and finish shall also be checked. A lot shall be considered conforming to the requirements of this specification if the number of defective hinges among those tested does not exceed the corresponding number given in Table 9.12.

TABLE 9.12 Scale of Sampling and Criteria for Conformity

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Sl. No.	Lot size	Sample size	Permissible No. of defective hinges
1	Upto 200	15	0
2	201 to 300	20	1
3	301 to 500	30	2
4	501 to 800	40	2
5	801 and above	55	3

Note: Any hinge which fails to satisfy the requirements of any one or more of the characteristics shall be considered as defective hinge.

### Rate

Rate includes the cost of materials and labour involved in all the operations described above. The framework and panelling of each type or glazed panels shall be paid separately. The rate for framework includes the cost of hinges and necessary screws as specified description. However, extra shall be paid for providing moulded beading where specified. Nothing extra shall be paid for plain beading.

### Item No. 56.

**Providing & Fixing S.S. 316 Grade Satin Finish Fire resistance BSEN 1634:1:2000 Certified & Mechanically tested BSEN 1935:2002 Hinges without bearings approximate size 76mm X 65mm X 2 mm minimum weight 100 gm of approved make with AISI 316 Grade S.S. Pin, Cap, and with necessary S.S. Self Tapping Phillips Cross Head Screws etc. complete as specified as per drawing and as directed by engineer-in -charge.**

The relevant specification shall be followed as per the above mentioned item of hinges except that the size of hinges should be taken 76 mm X 65 mm X 2 mm instead of 102 mm X 76 mm X 3 mm.

### Item No. 57.

**Providing & Fixing S.S. 304 Grade Stainless Steel Satin Finish Round Tower bolt of overall length (excluding Bracket) 300 mm and inner bolt of dia meter 10mm and outer barrel dia meter 15 mm, minimum weight 430 gm. of approved make with necessary Nickel Plated Screws complete as per specified as per drawing and directed by Engineer in charge.**

Fitting shall be of stainless steel SS 304 grade or as specified. These shall be well made, reasonably smooth, and free from sharp edges and corners, flaws and other defects. Screw holes shall be counter sunk to suit the head of specified wood screws.

The fittings generally used for different type of doors and windows as specified. The fittings to be actually provided in a particular work shall, however, be decided by the Engineer-in-Charge.

Screws used for fittings shall be of chromium plated brass screws or stainless steel screws.

Fittings shall be fixed in proper position as shown in the drawings or as directed by the Engineer-in- Charge. These shall be truly vertical or horizontal as the case may be. Screws

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shall be driven home with screw driver and not hammered in. Recesses shall be cut to the exact size and depth for the counter sunking of hinges.

Tower bolts shall be well made and shall be free from defects. The bolts shall be finished to the correct shape and shall have a smooth action. All tower bolts made with sheet of 1.2 mm thickness and above shall have counter sunk screw holes to suit counter sunk head of wood screws. All sharp edges and corners shall be removed and finished smooth.

The height of knob of tower bolt when the door, window etc. is in closed position from the floor level shall be not more than 1.9 metre.

The knobs of stainless steel tower bolts shall be cast and the bolt fixed with knob, steel spring and ball shall be provided between the bolt and the barrel.

Sampling and Criteria for Conformity: It shall be same as specified in above.

The Stainless steel tower bolts as per manufacture's standard and fixed to door as per drawing and as directed by engineer in charge.

### Measurement

The Stainless steel tower bolts as describe in item shall be measured in numbers.

### Rate

The rate shall include the cost of all materials and labour involved in all the operations described above

### Item No. 58.

**Providing & Fixing Fire resistance BSEN 1634:1:2000 Certified & mechanically tested BSEN 1906:2010 Pair of AISI S.S. 316 Grade Satin Finish hollow Pipe or solid design Mortise Handle with the minimum weight 930 grm with S.S. 316 Grade euro profile escutcheons key hole for Mortise Pin Cylinder, high grade brass bushing for extra fixing strength for intensive use of door with back to back fixing screws system. of approved make with both side active mortise handle and spindle, High Quality Stainless Steel Wood Screws (8 PCS.) for minimum door thickness 30 mm as per drawing and as directed by engineer in charge. The Inner and Outer Rose of Mortise handle and Escutcheons must be of AISI 316 grade only.**

Fitting shall be of stainless steel SS 304 grade or as specified. These shall be well made, reasonably smooth, and free from sharp edges and corners, flaws and other defects. Screw holes shall be counter sunk to suit the head of specified wood screws.

The fittings generally used for different type of doors and windows as specified. The fittings to be actually provided in a particular work shall, however, be decided by the Engineer-in-Charge.

Screws used for fittings shall be of chromium plated brass screws or stainless steel screws.

Fittings shall be fixed in proper position as shown in the drawings or as directed by the Engineer-in- Charge. These shall be truly vertical or horizontal as the case may be. Screws shall be driven home with screw driver and not hammered in. Recesses shall be cut to the exact size and depth for the counter sunking of hinges.

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This is a mortice lock having a single spring bolt withdrawn from the outside by using the key and from inside by key and with an arrangement.

The Stainless steel Mortice Handle as per manufacture's standard and fixed to door as per drawing and as directed by engineer in charge.

### **Measurement:**

The Stainless steel tower bolts as describe in item shall be measured in numbers.

### **Rate:**

The rate shall include the cost of all materials and labour involved in all the operations described above

### **Item No. 59.**

**Providing & Fixing Satin Finish Double Door Lock body , 26 mm brass latch. 52 mm lock with Back Set centre of approximate size 85 X 45 mm, of approved make, minimum Weight 0.880 grm suitable for minimum 30 mm thick Double Door Shutter with necessary fixing screw as specified as per drawing and as per directed by engineer in charge.**

The Stainless steel Latch and lock, as per manufacture's standard and fixed to door as per drawing and as directed by engineer in charge.

### **Measurement:**

The latch and lock as describe in item shall be measured in numbers.

### **Rate:**

The rate shall include the cost of all materials and labour involved in all the operations described above

### **Item No. 60.**

**Providing & Fixing Fire resistance BSEN 1634:1:2000 Certified Satin Finish Single door Mortise Lock body approximate size of back set 50 mm X 85 mm, with 52 mm Lock and 26 mm brass latch , Stainless steel main & Strike plate & including back to back fixing feature suitable for minimum door thickness 30 mm Single door shutter with necessary fixing screw as per specified as per directed by engineer in charge.**

The Stainless Latch and lock, as per manufacture's standard and fixed to door as per drawing and as directed by engineer in charge.

### **Measurement:**

The latch and lock as describe in item shall be measured in numbers.

### **Rate:**

The rate shall include the cost of all materials and labour involved in all the operations described above.

### **Item No. 61.**

**Providing & Fixing Satin Finish 6 pin Mechanism, high Quality brass body Mortise Pin Cylinder with 5 high accuracy Computerized Dotted keys of approved make one side key & one side knob suitable for minimum door thickness 30 mm with necessary Fixing Screw as specified and as per drawing and as per directed by engineer in charge.**

The Cylinder lock, as per manufacture's standard and fixed to door as per drawing and as directed by engineer in charge.

This is a Cylinder lock having a single spring bolt withdrawn from the outside by using the key and from inside by Knob with an arrangement.

**Measurement:**

The Cylinder lock as describe in item shall be measured in numbers.

**Rate:**

The rate shall include the cost of all materials and labour involved in all the operations described above

**Item No. 62.**

**Providing & Fixing Fire resistance BSEN 1634:1:2000 Certified Satin Finish Secure Standard 5 pin Mechanism Mortise Pin Cylinder with both Side Keys, with 5 nos high accuracy Brass keys of approved make suitable for minimum door thickness 30 mm with necessary fixing screw as per specified and as per drawing and as per directed by engineer in charge.**

The Cylinder lock, as per manufacture's standard and fixed to door as per drawing and as directed by engineer in charge.

This is a Cylinder lock having a single spring bolt withdrawn from the outside by using the key and from inside by Knob with an arrangement.

**Measurement:**

The Cylinder lock as describe in item shall be measured in numbers.

**Rate:**

The rate shall include the cost of all materials and labour involved in all the operations described above.

**Item No. 63.**

**Providing & Fixing Satin Finish S.S. Door Magnet length of 75 mm of approved make, minimum Weight 150 grm with necessary nickel plated screw complete, as specified, as per drawing and as directed by engineer in charge.**

Fitting shall be of stainless steel SS 304 grade or as specified. These shall be well made, reasonably smooth, and free from sharp edges and corners, flaws and other defects. Screw holes shall be counter sunk to suit the head of specified wood screws.

The fittings generally used for different type of doors and windows as specified. The fittings to be actually provided in a particular work shall, however, be decided by the Engineer-in-Charge.

Screws used for fittings shall be of chromium plated brass screws or stainless steel screws.

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Fittings shall be fixed in proper position as shown in the drawings or as directed by the Engineer-in- Charge. These shall be truly vertical or horizontal as the case may be. Screws shall be driven home with screw driver and not hammered in. Recesses shall be cut to the exact size and depth for the counter sunking of hinges.

This shall be made of cast brass of overall size as specified and shall have rubber cushion. The shape and pattern of stopper shall be approved by the Engineer-in-Charge. It shall be of brass finished bright, chromium plated or oxidized or as specified. The size of magnetic door stopper shall be determined by the length of its plate. It shall be well made and shall have four counter sunk holes for fixing the door stoppers to the wall by means of wood screws. The body for housing of the door stopper shall be cast in one piece and it shall be fixed to the cover plate by means of brass or mild steel screws and cover plate shall be SS finish. The spring shall be fixed firmly to the pin. Tongue which would be pressed while closing or opening of the door shall be connected to the lower part by means of copper pin. On the extreme end a rubber piece shall be attached to absorb shock. All parts of the door stopper shall be of good workmanship and finish, burrs and sharp edges removed. It shall be free from surface and casting defects.

### **Measurement:**

The Stainless steel magnetic door stopper as describe in item shall be measured in numbers.

### **Rate:**

The rate shall include the cost of all materials and labour involved in all the operations described above.

### **Item No. 64.**

**Providing & Fixing high Quality Zinc Material Door Stopper length of 150 mm including Rubber of approved make minimum Weight 260 grm with necessary Screws etc. complete as specified, as per drawing as directed by engineer-in-charge.**

Fitting shall be of stainless steel SS 304 grade or as specified. These shall be well made, reasonably smooth, and free from sharp edges and corners, flaws and other defects. Screw holes shall be counter sunk to suit the head of specified wood screws.

The fittings generally used for different type of doors and windows as specified. The fittings to be actually provided in a particular work shall, however, be decided by the Engineer-in-Charge.

Screws used for fittings shall be of chromium plated brass screws or stainless steel screws.

Fittings shall be fixed in proper position as shown in the drawings or as directed by the Engineer-in- Charge. These shall be truly vertical or horizontal as the case may be. Screws shall be driven home with screw driver and not hammered in. Recesses shall be cut to the exact size and depth for the counter sunking of hinges.

This shall be made of cast brass of overall size as specified and shall have rubber cushion. The shape and pattern of stopper shall be approved by the Engineer-in-Charge. It shall be of brass finished bright, chromium plated or oxidized or as specified. The size of magnetic door stopper shall be determined by the length of its plate. It shall be well made and shall have four counter sunk holes for fixing the door stoppers to the wall by means

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of wood screws. The body for housing of the door stopper shall be cast in one piece and it shall be fixed to the cover plate by means of brass or mild steel screws and cover plate shall be SS finish. The spring shall be fixed firmly to the pin. Tongue which would be pressed while closing or opening of the door shall be connected to the lower part by means of copper pin. On the extreme end a rubber piece shall be attached to absorb shock. All parts of the door stopper shall be of good workmanship and finish, burrs and sharp edges removed. It shall be free from surface and casting defects

### **Measurement:**

The Stainless steel door mounted door stopper as describe in item shall be measured in numbers.

### **Rate:**

The rate shall include the cost of all materials and labour involved in all the operations described above.

### **Item No. 65.**

**Providing & Fixing Stainless Steel S.S. 316 Grade C Shaped Handles in Satin Finish, 10 mm dia and centre to centre minimum 96mm size, minimum weight 94 grm with necessary screws etc. complete of approved make as per drawing and as directed by engineer-in-charge.**

Fitting shall be of stainless steel SS 304 grade or as specified. These shall be well made, reasonably smooth, and free from sharp edges and corners, flaws and other defects. Screw holes shall be counter sunk to suit the head of specified wood screws.

The fittings generally used for different type of doors and windows as specified. The fittings to be actually provided in a particular work shall, however, be decided by the Engineer-in-Charge.

Screws used for fittings shall be of chromium plated brass screws or stainless steel screws.

Fittings shall be fixed in proper position as shown in the drawings or as directed by the Engineer-in- Charge. These shall be truly vertical or horizontal as the case may be. Screws shall be driven home with screw driver and not hammered in. Recesses shall be cut to the exact size and depth for the counter sinking of hinges.

This shall be made of cast brass of overall size as specified and shall have rubber cushion. The shape and pattern of stopper shall be approved by the Engineer-in-Charge. It shall be of brass finished bright, chromium plated or oxidized or as specified. The size of magnetic door stopper shall be determined by the length of its plate. It shall be well made and shall have four counter sunk holes for fixing the door stoppers to the wall by means of wood screws. The body for housing of the door stopper shall be cast in one piece and it shall be fixed to the cover plate by means of brass or mild steel screws and cover plate shall be SS finish. The spring shall be fixed firmly to the pin. Tongue which would be pressed while closing or opening of the door shall be connected to the lower part by means of copper pin. On the extreme end a rubber piece shall be attached to absorb shock. All parts of the door stopper shall be of good workmanship and finish, burrs and sharp edges removed. It shall be free from surface and casting defects

Sampling and Criteria for Conformity : The number of floor door stoppers to be selected from each lot shall depend on the size of the lot and shall be in accordance with col. 1 and

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2 of Table 9.17. These stoppers shall be selected at random from at least 10 percent of the randomly selected packages subject to a maximum of three equal number of stoppers being selected from each such package.

All the floor stoppers selected shall be checked for dimensional requirement, material, manufacture and finish. Any of door stopper which fails to satisfy any one or more of these requirement shall be considered as defective door stopper.

A lot shall be considered as conforming to the requirements of this specifications if the number of defective floor door stoppers among these tested does not exceed the corresponding number given in col. 3 of Table 17. Otherwise it shall be considered as not conformity to the requirements of this specification.

**TABLE 17**

**Scale of Sampling and Criteria for Conformity**

Lot Size	Sample Size	Permissible number of defective floor Door stoppers
(1)	(2)	(3)
Upto 100	5	0
101 to 300	0	1
301 to 500	32	2
501 to 1000	50	3
1001 and above	80	5

### **Measurement:**

The Stainless steel floor mounted door buffer as describe in item shall be measured in numbers.

### **Rate:**

The rate shall include the cost of all materials and labour involved in all the operations described above.

### **Item No. 66.**

**Providing & Fixing S.S. 304 Grade Stainless Steel Satin Finish Round Tower bolt of overall length (excluding Bracket) 100 mm and inner bolt of dia meter 10mm and outer barrel dia meter 15 mm, minimum weight 150 gm of approved make with necessary nickel Plated Screws complete as per specified as per drawing and directed by Engineer in charge.**

The relevant specifications shall be same as 300 mm round tower bolt mentioned above except that length and weight shall be as per manufacture's standard and fixed to door as per drawing and as directed by engineer in charge.

### **Measurement:**

The Stainless steel tower bolts as describe in item shall be measured in numbers.

### **Rate:**

The rate shall include the cost of all materials and labour involved in all the operations described above

**Item No. 67.**

**Providing & Fixing AISI S.S. 316 Grade Solid Window Casement stay/adjustor with minimum weight 280 grm of size diameter 14 mm, length 200 mm with necessary fixing screws as specified as per drawing & as directed by engineer-in-charge.**

The relevant specifications shall be as per manufacture's standard and fixed to window as per drawing and as directed by engineer in charge.

**Measurement:**

The Stainless steel window casement as describe in item shall be measured in numbers.

**Rate:**

The rate shall include the cost of all materials and labour involved in all the operations described above.

**Item No. 68.**

**Providing and fixing Satin Finish soft closing Clip on hinges of M.S.materials, Opening Angle should be 110 Degree or as required of Approved makes for cupboard shutters, kichen cabinets etc. with necessary concealed SS Screws complete, as spcified in drawing and as approved by Engineer in charge.**

**General:**

The Clip on hinges shall be soft closing type and shall be made with MS material and coated with High Quality Nickle coating as per manufactures specifications. The Hinges shall be of the approved makes as specified in Approved make list. The hinges shall be installed on to the cabinet using CP brass wood screws.

**Measurement:**

Measurement shall be of per Number of hinge installed.

**Rate:**

Rate shall include all material, labour, tools and tackles required to complete the work as per item description.

**Item No. 69.**

**Providing and Fixing Stainless Steel S.S. 304 Grade multipurpose Cabinet / Wardrobe Lock heavy duty for minimum 25 mm Door thickness with keys of approved make with necessary screws etc. complete as approved drawing and as per direction of Engineer in charge.**

**General**

The lock shall be of makes from approved make list. The lock shall be suitable to fix in the Wardrobe shutter. The lock Plate shall be fixed on to the second shutter. The lock should be supplied with minimum 3 sets of keys

**Measurement:**

Measurement shall be of per Lock installed.

**Rate:**

Rate shall include all material, labour, tools and tackles required to complete the work as per item description.

**Item No. 70.**

**Providing and Fixing Stainless Steel S.S. 304 Grade multipurpose Drawer Lock heavy duty with key of approved make with necessary screws etc. complete as approved drawing and as per direction of Engineer in charge.**

**General**

The lock shall be of makes from approved make list. The lock shall be suitable to fix in the Drawer. The lock should be supplied with minimum 3 sets of keys

**Measurement:**

Measurement shall be of per Lock installed.

**Rate:**

Rate shall include all material, labour, tools and tackles required to complete the work as per item description.

**Item No. 71.**

**Providing and fixing Corrosion Resistance Premium Quality Zinc coated Drawer Channel pair 500mm long, heavy duty Metal Body & Precision Ball Bearings for higher Durability with necessary screws etc. complete as per directions of Engineer-in-charge.**

**General:**

The Drawer channels shall be corrosion resistant and with premium quality zinc coating. The length of the channel shall be 500mm. The channels shall be of the approved makes as specified in Approved make list. The channels shall be installed on to the cabinet using CP brass screws.

The channel shall have heavy duty Metal body sliding on precision ball bearings of high durability.

**Measurement:**

Measurement shall be of per Pair installed.

**Rate:**

Rate shall include all material, labor, tools and tackles required to complete the work as per item description.

**Item No. 72.**

**Providing and fixing aluminium Grip profile handle with necessary screws etc. complete as approved drawing and as per direction of Engineer in charge.**

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### General:

The Grip Profile shall be of Aluminum and of thickness suitable to fix on to the shutters of kitchen cabinets. The width of the profile shall match to the thickness of the cabinet shutter.

The profile shall be fixed to the shutter as per the methodology specified by the manufacturer with adhesive or CP screw. Screw should not be visible if used.

### Measurement:

Measurement shall be of per running meter length installed.

### Rate:

Rate shall include all material, labor, tools and tackles required to complete the work as per item description.

### Item No. 73.

**Providing and fixing brass handle 80 MM X 50 MM X 4 MM thick as per design with necessary brass screws etc. complete as approved drawing and as per direction of Engineer in charge.**

Relevant specifications shall be followed as per item number 66 except that brass handles of the size mentioned in BOQ shall be installed as per the drawing.

### Item No. 74.

**Providing and fixing brass handle 130 MM X 50 MM X 4 MM thick as per design with necessary brass screws etc. complete as approved drawing and as per direction of Engineer in charge.**

Relevant specifications shall be followed as per item number 66 except that brass handles of the size mentioned in BOQ shall be installed as per the drawing.

### Item No. 75.

**Providing and fixing Plastic Wardrobe Magnet Catcher of approved make with necessary screws etc. complete as approved drawing and as per direction of Engineer in charge.**

For shutter shall be of the size as per required of KICH/ENOX/HAFELE or equivalent brands make with necessary concealed size complete, as specified in drawing and as approved by Engineer in charge.

### Item No. 76.

**Providing and fixing carbon steel galvanized (minimum coating 5 micron) dash fastener of 10 mm dia double threaded 6.8 grade (yield strength 480 N/mm<sup>2</sup>), counter sunk head, comprising of 10 mm dia polyamide PA 6 grade sleeve, including drilling of hole in frame, concrete/ masonry, etc. as per direction of Engineer-in-charge.**

**(a) 10 x 60 mm**

Relevant specifications shall be followed as per DSR Item no 10.27.1

**Item No. 77.**

**Providing and fixing Aluminium slotted channel with fixing arrangements with necessary screws etc. complete as approved drawing and as per direction of Engineer in charge.**

The slotted channel shall be in aluminium material and shall be extruded aluminium channel. The channel shall be double slotted and shall be with aluminium cleats to hold the storage at place. The cleats shall be L shaped and shall have teeth's that can lock on to the slotted channel. The Channel shall be installed such that It is flushed with the partition surface and is not protruding outside. The channel should have necessary fixing arrangement to the wall and shall be fixed with SS SFST screws.

The cleat shall be fixed on to the storages using SDST screws as per the drawing.

Rate shall be for per running meter of slotted channel installed including the cost of cleats, screws, tools, tackles, labour etc...



**Item No. 78.**

**Filling the gap in between frame & adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete. Up to 5mm depth and 5 mm width**

**SEALANT**

The sealants of approved grade and colour shall only be used. The silicone for perimeter joints (between Aluminium section and RCC/Stone masonry) shall be of make approved by the Engineer in Charge.)

**Method of Application**

**Surface Preparation**

Clean all joints and glazing pockets by removing all foreign matter and contaminants such as grease, oil, dust, water, frost, surface dirt, old sealants or glazing compounds and protective coatings.

**Masking**

Areas adjacent to joints shall be masked to ensure neat sealant lines. Masking tape shall not be allowed to touch clean surfaces to which the silicone sealant is to adhere. Tooling

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shall be completed in one continuous stroke immediately after sealant application and before a skin forms and masking shall be removed immediately after tooling.

### **Application**

Install backer rod of appropriate size and apply silicone sealant in a continuous operation using a positive pressure adequate to properly fill and seal the joint. The silicone sealant shall be tooled with light pressure to spread the sealant against backing material and the joint surfaces before a skin forms. A tool with convex profile shall be used to keep the sealant within the joint. Soap or water shall not be used as a tooling aid. Remove masking tape as soon as silicone joint is tooled.

### **Tolerance**

A tolerance of + 3 mm shall be allowed in the width of silicone joints. The depth of the joints at throat shall not be less than 6 mm.

### **Item No. 79.**

**Providing and applying white cement based putty of average thickness 1 mm, of approved brand and manufacturer, over the plastered/Gypsum or any other wall/ ceiling surface as required to prepare the surface even and smooth complete.**

#### **1 Materials**

Cement based putty of approved brand and manufacture shall be used. Only ready mixed putty as received from the manufacturer without any admixture shall be used.

#### **2 Commencing Work**

Cement based putty shall not be started until the Engineer-in-Charge has inspected the items of work to be painted, satisfied himself about their proper quality and given his approval to commence the painting work. Cement based putty shall generally be taken in hand after practically finishing all other building work. The rooms should be thoroughly swept out and the entire building cleaned up, at least one day in advance of the Putty work being started.

#### **3 Preparation of Surface**

The surface shall be thoroughly cleaned and dusted off. All rust, dirt, scales, smoke splashes, mortar droppings and grease shall be thoroughly removed before painting is started. The prepared surface shall have received the approval of the Engineer-in-Charge after inspection, before painting is commenced.

#### **4 Application**

Before starting painting work order to achieve a superior finished surface, putty/ paste fillers shall be used on, all surfaces to be painted to fill pores, dents etc. The putty/paste fillers shall be approved quality and manufacture and shall be applied to the surface with a knife or other sharp edged tool after the priming coat as well after each under coat. The surface, after filling with putty/paste filler, shall be rubbed down with fine paper and dusted off before the application of the subsequent coat. Paste wood filler when set shall

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be wiped across the grain of the wood and then with the grain to secure a clean surface. Surface to be stained shall be covered with a uniform coat of stain wiped off if required. Each coat shall be allowed to dry completely and lightly rubbed with fine grade pumice stone sand paper before next coat is applied. Each coat shall vary in shade and well approved to Engineer in charge.

**5** The specifications in respect of scaffolding, protective measures, measurements and rate shall be as described in painting.

### **Item No. 80.**

**Applying priming coats with primer of approved brand and manufacture, having low VOC (Volatile Organic Compound ) content With ready mixed pink or grey primer on wood work (hard and soft wood) having VOC content less than 50 grams/ litre**

### **Material**

The primer shall be ready mixed primer of approved brand and manufacture.

Cement primer coat is used as a base coat on wall finish of cement, lime or lime cement plaster or on non-asbestos cement surfaces before oil emulsion distemper Paints are applied on them. The cement primer is composed of a medium and pigment which are resistant to the alkalies present in the cement, lime or lime cement in wall finish and provides a barrier for the protection of subsequent coats of oil emulsion distemper Paints.

Wood work primer be prepared from a mixture of red lead, white lead and double boiled linseed oil in the ratio of 0.7 kg : 0.7 kg : 1 litre.

Steel work primer be prepared from a mixture of red lead, raw linseed oil and turpentine in the ratio of 2.8 kg : 1 litre : 1 litre.

Primer coat shall be preferably applied by brushing and not by spraying. Hurried priming shall be avoided particularly on absorbent surfaces. New plaster patches in old work should also be treated with cement primer before applying oil emulsion Paints etc

Primer for plaster/wood work/Iron & Steel/Aluminium surfaces shall be as specified below in Table:

Sr.no	Surfaces	Prime to be used
1.	Wood work ( hard and soft wood)	Pink conforming to IS 3536
2.	Resinour wood and plywood	Aluminium primer conforming to IS 3585
3.	(A) Aluminium and light alloys	Zinc chromate primer conforming to IS 104
	(B) Iron, Steel and Galvanized steel	Red Oxide Zinc chromate Primer conforming IS 2074
4.	Cement/Conc/RCC/brick work, Plastered surfaces, non-asbestos surfaces to receive Oil bound distemper or Paint finish.	Cement primer conforming to IS 109

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The specifications for the base vehicle and thinner for mixed on site primer shall be as follows:

(a) White Lead : The White lead shall be pure and free from adulterants like barium sulphate and whiting. It shall conform to IS 103.

(b) Red Lead : This shall be in powder form and shall be pure and free from adulterants like brick dust etc. It shall conform to IS 102.

(c) Raw Linseed Oil : Raw linseed oil shall be lightly viscous but clear and of yellowish colour with light brown tinge. Its specific gravity at a temperature of 30 degree C shall be between 0.923 and 0.928.

Note : The oil shall be mellow and sweet to the taste with very little smell. The oil shall be of sufficiently matured quality. Oil turbid or thick, with acid and bitter taste and rancid odour and which remains sticky for a considerable time shall be rejected. The oil shall conform in all respects to IS 75. The oil shall be of approved brand and manufacture.

(d) Double Boiled Linseed Oil : This shall be more viscous than the raw oil, have a deeper colour and specific gravity between 0.931 and 0.945 at a temperature of 30 degree C. It shall dry with a glossy surface. It shall conform in all respects to IS 77. The oil shall be of approved brand and manufacture.

Turpentine : Mineral turpentine i.e. petroleum distillate which has the same rate of evaporation as vegetable turpentine (distillate product of oleoresin of conifers) shall be used. It shall have no grease or other residue when allowed to evaporate. It shall conform to IS 533.

All the above materials shall be of approved manufacture and brought to site in their original packing in sealed condition.

### **1 Scaffolding**

1.1 Wherever scaffolding is necessary, it shall be erected on double supports tied together by horizontal pieces, over which scaffolding planks shall be fixed. No ballies, bamboos or planks shall rest on or touch the surface which is being white washed.

1.2 For all exposed brick work or tile work, double scaffolding having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed.

Note : In case of special type of brick work, scaffolding shall be got approved from Engineer-in-Charge in advance.

1.3 Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damage or scratches to walls.

### **2 Preparation of the Surface**

The surface shall be thoroughly cleaned of dust, old white or colour wash by washing and scrubbing. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of paris mixed with water on the entire surface including filling up the undulations and then sand papering the same after it is dry.

## 2.1 Wooden Surface

The wood work to be painted shall be dry and free from moisture.

The surface shall be thoroughly cleaned. All unevenness shall be rubbed down smooth with sand paper and shall be well dusted. Knots, if any shall be covered with preparation of red lead made by grinding red lead in water and mixing with strong glue sized and used hot. Appropriate filler material conforming to IS 345 with same shade as Paint shall be used where specified. The surface treated for knotting shall be dry before Paint is applied. After obtaining approval of Engineer-in-Charge for wood work, the priming coat shall be applied before the wood work is fixed in position. After the priming coat is applied, the holes and indentation on the surface shall be stopped with glazier's putty or wood putty. Stopping shall not be done before the priming coat is applied as the wood will absorb the oil in stopping and the latter is therefore liable to crack.

## 2.2 Iron & Steel Surface :

All rust and scales shall be removed by scrapping or by brushing with steel wire brushes. Hard skin of oxide formed on the surface of wrought iron during rolling which becomes loose by rusting, shall be removed.

All dust and dirt shall be thoroughly wiped away from the surface.

If the surface is wet, it shall be dried before priming coat is undertaken.

Treatment on Steel for Aggressive Environment

A second coat of ready mixed red oxide zinc chromate primer may be applied where considered necessary in aggressive environment such as near Industrial Establishment and Coastal regions where the steel members are prone to corrosion. The second coat (which shall be paid for separately) is to be applied after placing the member in position and just before applying Paint. The second coat of primer is not necessary in case of painting with synthetic enamel Paint as it is applied over an under coat of ordinary Paint.

## 2.3 Plastered Surface

The surface shall ordinarily not be painted until it has dried completely. Trial patches of primer shall be laid at intervals and where drying is satisfactory, painting shall then be taken in hand. Before primer is applied, holes and undulations, shall be filled up with plaster of paris and rubbed smooth.

## 3 Application

The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours, before oil emulsion Paint is applied.

## 4 Protective Measures

Doors, windows, floors, articles of furniture etc. and such other parts of the building not to be cement painted, shall be protected from being splashed upon. Splashing and droppings, if any shall be removed by the contractor at his own cost and the surfaces cleaned. Damages if any to furniture or fittings and fixtures shall be recoverable from the contractor.

## **5 Measurements**

5.1 Length and breadth shall be measured correct to a cm. and area shall be calculated in sqm correct to two places of decimals.

5.2 Measurements for Jambs, Soffits and Fills etc. for openings shall be as described above.

## **6 Rate**

The rate shall include all material and labour involved in all the operations described above with tools and scaffolding.

### **Item No. 81.**

**Applying priming coats with primer of approved brand and manufacture, having low VOC (Volatile Organic Compound) content with water thinnable cement primer on wall, ceiling and partitions surface having VOC content less than 50 grams/litre**

Relevant Specification for above item NO 80.

### **Item No. 82.**

**Painting with premium acrylic emulsion paint of interior grade, having VOC (Volatile Organic Compound ) content less than 50 grams/ litre of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour. Two coats**

#### **1 Materials**

Paints, oils, varnishes etc. of approved brand and manufacture shall be used. Only ready mixed Paint (Interior grade) as received from the manufacturer without any admixture shall be used.

If for any reason, thinning is necessary in case of ready mixed Paint, the brand of thinner recommended by the manufacturer or as instructed by the Engineer-in-Charge shall be used.

Approved Paints, oil or varnishes shall be brought to the site of work by the contractor in their original containers in sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the contractor and the Engineer-in-Charge. The empties shall not be removed from the site of work, till the relevant item of work has been completed and permission obtained from the Engineer-in-Charge.

#### **2 Commencing Work**

Painting shall not be started until the Engineer-in-Charge has inspected the items of work to be painted, satisfied himself about their proper quality and given his approval to commence the painting work. Painting of external surface should not be done in adverse weather condition like hail storm and dust storm.

Painting, except the priming coat, shall generally be taken in hand after practically finishing all other building work.

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The rooms should be thoroughly swept out and the entire building cleaned up, at least one day in advance of the Paint work being started.

### **3 Preparation of Surface**

The surface shall be thoroughly cleaned and dusted off. All rust, dirt, scales, smoke splashes, mortar droppings and grease shall be thoroughly removed before painting is started. The prepared surface shall have received the approval of the Engineer-in-Charge after inspection, before painting is commenced.

### **4 Application**

4.1 Before pouring into smaller containers for use, the Paint shall be stirred thoroughly in its containers, when applying also, the Paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform.

4.2 The painting shall be laid on evenly and smoothly by means of crossing and laying off, the latter in the direction of the grains of wood. The crossing and laying off consists of covering the area over with Paint, brushing the surface hard for the first time over and then brushing alternately in opposite direction, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

4.3 Where so stipulated, the painting shall be done by spraying. Spray machine used may be (a) high pressure (small air aperture) type, or (b) a low pressure (large air gap) type, depending on the nature and location of work to be carried out. Skilled and experienced workmen shall be employed for this class of work. Paints used shall be brought to the requisite consistency by adding a suitable thinner.

4.4 Spraying should be done only when dry condition prevails. Each coat shall be allowed to dry out thoroughly and rubbed smooth before the next coat is applied. This should be facilitated by thorough ventilation. Each coat except the last coat, shall be lightly rubbed down with sand paper or fine pumice stone and cleaned off dust before the next coat is laid.

4.5 No left over Paint shall be put back into the stock tins. When not in use, the containers shall be kept properly closed.

4.6 No hair marks from the brush or clogging of Paint puddles in the corners of panels, angles of mouldings etc. shall be left on the work.

4.7 In painting doors and windows, the putty round the glass panes must also be painted but care must be taken to see that no Paint stains etc. are left on the glass. Tops of shutters and surfaces in similar hidden locations shall not be left out in painting. However, bottom edge of the shutters where the painting is not practically possible, need not be done nor any deduction on this account will be done but two coats of primer of approved make shall be done on the bottom edge before fixing the shutters.

### **5 Brushes and Containers**

After work, the brushes shall be completely cleaned of Paint and linseed oil by rinsing with turpentine. A brush in which Paint has dried up is ruined and shall on no account be used for painting work. The containers when not in use, shall be kept closed and free from air so that Paint does not thicken and also shall be kept safe from dust. When the Paint has

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

been used, the containers shall be washed with turpentine and wiped dry with soft clean cloth, so that they are clean, and can be used again.

### 6 Measurements

6.1 The length and breadth shall be measured correct to a cm. The area shall be calculated in sqm (correct to two places of decimal), except otherwise stated.

6.2 Small articles not exceeding 10 sq. decimetre (0.1 sqm) of painted surfaces where not in conjunction with similar painted work shall be enumerated.

6.3 Painting up to 10 cm in width or in girth and not in conjunction with similar painted work shall be given in running meters and shall include cutting to line where so required.

Note : Components of trusses, compound girders, stanchions, lattices and similar work shall, however, be given in sq. meters irrespective of the size or girth of members. Priming coat of painting shall be included in the work of fabrication.

6.4 In measuring painting, varnishing, oiling etc. of joinery and steel work etc. The coefficients as indicated in following tables shall be used to obtain the area payable. The coefficients shall be applied to the areas measured flat and not girthed.

#### TABLE

##### Equivalent Plain Areas of Uneven Surface

##### I. Wood work doors, windows Etc.

1. Panelled or framed and braced Measured flat (not girthed including) 1.30 (for each side)

doors, windows etc.

2. Ledged and battened or ledged, Chowkhat or frame, Edges, chocks, - do  
- battened and braced doors, cleats, etc. shall be deemed to be

windows etc. included in the item.

3. Flush doors etc. -do- 1.20 (for each side)

4. Part panelled and part glazed or -do- 1.00 (for each side)

gauzed doors, window etc. (Excluding painting of

wire gauze portion)

5. Fully glazed or gauzed doors, -do- 0.80 (for each side)

windows etc. (Excluding painting of wire gauze portion)

6. Fully venetioned or louvered -do- 1.80 (for each side)

doors, windows etc.

7. Trellis (or Jaffri) work one way or Measured flat overall, no deduction 2 (for painting all over)

two way shall be made for open spaces, sup- porting members shall not be mea- sured separately

8. Carved or enriched work Measured flat 2 (for each side)

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

9. Weather boarding Measured flat (not girthed supporting frame work shall not be measured separately) 1.20 (for each side)
10. Wood shingle roofing Measured flat (not girthed) 1.10 (for each side)
11. Boarding with cover fillets and match boarding Measured flat (not girthed) 1.05 (for each side)
12. Tile and slate battening Measured flat overall no deductions shall be made for open spaces all over) 0.80 (for painting)

### II. Steel work doors, windows Etc.

13. Plain sheeted steel doors or windows including frame edges etc. Measured flat (not girthed) 1.10 (for each side)
14. Fully glazed or gauzed steel doors and windows (excluding painting of wire gauze portion) -do- 0.50 (for each side)
15. Partly panelled and partly glazed or gauzed doors and windows (excluding painting of wire gauze portion) -do- 0.80 (for each side)
16. Corrugated sheeted steel doors or windows -do- 1.25 (for each side)
17. Collapsible gates Measured flat all over) 1.50 (for painting)
18. Rolling shutters of interlocked laths over; jamb guides, bottom rails and locking arrangement etc. shall be included in the item (top cover shall be measured separately) Measured flat (size of opening) all 1.10 (for each side)

### III. General

19. Expanded metal, hard drawn Measured flat overall; no deduction all over) 1 (for Paint)

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

steel wire fabric of approved shall be made for open spaces; quality, grill works and gratings supporting members shall not be in guard bars, balustrades, railing measured separately

partitions and MS Bars in windows frames.

20. Open palisade fencing and -do- 1 (for Paint all over)

gates including standards, (see note No. 12)

braces, rails stays etc. in timber or steel

21. Corrugated iron sheeting in -do- Measured flat (not girthed) 1.14 (for each side)

roofs, side cladding etc.

22. AC corrugated sheeting in roofs, -do- 1.20 (for each side)

side cladding etc.

23. AC semi corrugated sheeting in

roofs, side cladding etc. or -do- 1.10 (for each side) Nainital pattern using plain sheets

24. Wire gauze shutters including -do- 1.00 (for each side)

painting of wire gauze

### Explanatory Notes for Table

(1) Measurements for doors windows etc., shall be taken flat (and not girthed) over all including chowkhuts or frames, where provided. Where Chowkhuts or frames are not provided, the shutter measurements shall be taken.

(2) Where doors, windows etc., are of composite types other than those included in Table 1 the different portion shall be measured separately with their appropriate coefficients, the centre line of the common rail being taken as the dividing line between the two portions.

(3) The coefficients for door and windows shall apply irrespective of the size of frames and shutter members.

(4) In case steel frames are used the area of doors, windows shutters shall be measured flat excluding frames.

(5) When the two faces of a door, window etc. are to be treated with different specified finishes, measurable under separate items, the edges of frames and shutters shall be treated with the one or the other type of finish as ordered by the Engineer-in-Charge and measurement of this will be deemed to be included in the measurement of the face treated with that finish.

(6) In the case where shutters are fixed on both faces of the frames, the measurement for the doorframe and shutter on one face shall be taken in the manner already

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

described, while the additional shutter on the other face will be measured for the shutter only excluding the frame.

(7) Where shutters are provided with clearance at top or/and bottom each exceeding 15 cm height, such openings shall be deducted from the overall measurements and relevant coefficient shall be applied to obtain the area payable.

(8) Collapsible gates shall be measured for width from outside to outside of gate in its expanded position and for height from bottom to top of channel verticals. No separate measurements shall be taken for the top and bottom guide rails rollers, fittings etc.

(9) Coefficients for sliding doors shall be the same as for normal types of doors in the table.

Measurements shall be taken outside to outside of shutters, and no separate measurements shall be taken for the painting guide rails, rollers, fittings etc.

(10) Measurements of painting as above shall be deemed to include painting all iron fittings in the same or different shade for which no extra will be paid.

(11) The measurements of guard bars, expanded metal, hard drawn steel wire fabric of approved quality, grill work and gratings, when fixed in frame work, painting of which is once measured elsewhere shall be taken exclusive of the frames. In other cases the measurements shall be taken inclusive of the frames.

(12) For painting open palisade fencing and gates etc., the height shall be measured from the bottom of the lowest rail, if the palisades do not go below it, (or from the lower end of the palisades, if they project below the lowest rail), upto the top of rails or palisades whichever are higher, but not up to the top of standards when the latter are higher than the top rails or the palisades.

6.5 Width of moulded work of all other kinds, as in hand rails, cornices, architraves shall be measured by girth.

6.6 For trusses, compound girders, stanchions, lattice girders, and similar work, actual areas will be measured in sq. meter and no extra shall be paid for painting on bolt heads, nuts, washers etc. even when they are picked out in a different tint to the adjacent work.

6.7 Painting of rain water, soil, waste, vent and water pipes etc. shall be measured in running meters of the particular diameter of the pipe concerned. Painting of specials such as bends, heads, branches, junctions, shoes, etc. shall be included in the length and no separate measurements shall be taken for these or for painting brackets, clamps etc.

6.8 Measurements of wall surfaces and wood and other work not referred to already shall be recorded as per actual.

6.9 Flag staffs, steel chimneys, aerial masts, spires and other such objects requiring special scaffolding shall be measured separately.

### **7 Precautions**

All furnitures, fixtures, glazing, floors etc. shall be protected by covering and stains, smears, splashings, if any shall be removed and any damages done shall be made good by the contractor at his cost.

WALL PAINTING WITH ACRELIC PLASTIC EMULSION PAINT

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

0.1 The plastic emulsion Paint is not suitable for application on external, wood and iron surface and surfaces which are liable to heavy condensation. These Paints are to be used on internal surfaces except wooden and steel.

0.2 Plastic Emulsion Paint as per IS 5411 of approved brand and manufacture and of the required shade shall be used.

0.3 Painting on New Surface

0.3.1 The wall surface shall be prepared as specified above.

0.3.2 Application : The number of coats shall be as stipulated in the item. The Paint will be applied in the usual manner with brush, spray or roller. The Paint dries by evaporation of the water content and as soon as the water has evaporated the film gets hard and the next coat can be applied. The time of drying varies from one hour on absorbent surfaces to 2 to 3 hours on non-absorbent surfaces.

The thinning of emulsion is to be done with water and not with turpentine. Thinning with water will be particularly required for the under coat which is applied on the absorbent surface. The quantity of water to be added shall be as per manufacturer's instructions.

The surface on finishing shall present a flat velvety smooth finish. If necessary more coats will be applied till the surface presents a uniform appearance.

### 0.3.3 Precautions

(a) Old brushes if they are to be used with emulsion Paints, should be completely dried of turpentine or oil Paints by washing in warm soap water. Brushes should be quickly washed in water immediately after use and kept immersed in water during break periods to prevent the Paint from hardening on the brush.

(b) In the preparation of wall for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes etc.

(c) Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.

(d) Washing of surfaces treated with emulsion Paints shall not be done within 3 to 4 weeks of application.

0.3.4 Other details shall be as specified above as they are applicable.

## 8 Rate

Rates shall include cost of all labour and materials involved in all the operations described above with tools and scaffolding.

### Item No. 83.

**Painting with synthetic enamel paint, having VOC (Volatile Organic Compound) content less than 150 grams/ litre, of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour.**

**Two coats**

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

Synthetic Enamel Paint (conforming to IS 2933) of approved brand and manufacture and of the required colour shall be used for the top coat and an undercoat of ordinary Paint of shade to match the top coat as recommended by the same manufacturer as far the top coat shall be used.

Preparation of surface shall be as specified in above.

### **1 Application:**

The number of coats including the undercoat shall be as stipulated in the item.

(a) Under Coat : One coat of the specified ordinary Paint of shade suited to the shade of the top

coat, shall be applied and allowed to dry overnight. It shall be rubbed next day with the finest grade of wet abrasive paper to ensure a smooth and even surface, free from brush marks and all loose particles dusted off.

(b) Top Coat : Top coats of synthetic enamel Paint of desired shade shall be applied after the undercoat is thoroughly dry. Additional finishing coats shall be applied if found necessary to ensure properly uniform glossy surface.

Measurement and rate shall be same as painting work mentioned above except that syntactic enamel paint shall be measured and paid for separately

### **2 Rate**

Rates shall include cost of all labour and materials involved in all the operations described above with tools and scaffolding.

### **Item No. 84.**

**Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work**

### **1 Material**

Epoxy Paint shall be (conforming to IS 2339) of approved brand and manufacture. The Paint comes in compact dual container with the paste and the medium separately. The two shall be mixed together to proper consistency before use.

### **2 Preparation of Surface**

All rust and scales shall be removed by scraping or brushing with steel wire brushes and then smoothed with sand paper. The surface shall be thoroughly cleaned of dust.

### **3 Application**

The number of coats to be applied shall be as given in the item. Each coat shall be allowed to dry for 24 hours and lightly rubbed down with fine grade sand paper and dusted off before the next coat is applied. The finished surface shall present an even and uniform appearance.

As paste is likely to settle in the container, care shall be taken to frequently stir the Paint during used. Also the Paint shall be applied and laid off quickly, as surface is otherwise not easily finished.

Other details, measurements and rates shall be as specified in painting.

**Item No. 85.**

**Providing and applying two coats of fire retardant paint on cleaned wood / ply / steel surface @ 3.5 sqm per litre per coat including preparation of base surface as per recommendations of manufacturer to make the surface fire retardant.**

**1 Material**

fire retardant Paint shall be of approved brand and manufacture. The Paint comes in compact dual container with the paste and the medium separately.

The two shall be mixed together to proper consistency before use.

**2 Preparation of Surface**

All rust and scales shall be removed by scraping or brushing with steel wire brushes and then smoothed with sand paper. The surface shall be thoroughly cleaned of dust.

**3 Application**

The number of coats to be applied shall be as given in the item. Each coat shall be allowed to dry for 24 hours and lightly rubbed down with fine grade sand paper and dusted off before the next coat is applied. The finished surface shall present an even and uniform appearance.

As paste is likely to settle in the container, care shall be taken to frequently stir the Paint during used. Also the Paint shall be applied and laid off quickly, as surface is otherwise not easily finished.

Other details, measurements and rates shall be as specified in painting.

**Item No. 86.**

**Providing and applying Melamine polishing with "Asian paints Melamine Gold" or "Timber tone Melamine" of ICI Dulux or "Wudfin of Pidilite Industries Limited", on wood & veneer works (two or more coats) including preparation of surface and staining to the approved colour and shade as per the manufacturers specifications including scaffolding, curing, cleaning the surfaces and other incidental work to be done etc. complete at all floors for any height as directed by engineer in charge.**

**Material:**

The melamine polish is two component acid catalyzed wood finish shall be of best quality and make such as Asian Paints, Nerolac, Burger or equivalent, as approved. It shall give silken, smooth finish. It offers excellent non yellowing and stain resistant property. The Melamine polish shall have shade and shine, either Mat or glossy. It shall be two component polish consisting of a base and hardener. It shall be capable of protecting wood from moisture, heat, cold, scratches, stains, cigarette burns etc. It shall be applied using brush or spray gun. It shall require lesser time to dry and there shall be no cracks or

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

peeling of the polish. There shall not be any undulation on the finished surface nor cracks at joints. It shall be durable and flexible to absorb cracks. It shall have resistant to scrubs, light rays, heat etc.

Preparation of Surface: The surface shall be cleaned. All unevenness shall be rubbed down smooth with sand and well dusted. Knots if visible shall be covered with a preparation of red lead and glue size laid on while hot. Holes and indentations on the surface shall be stopped with glazier's putty. The surface shall then be given a coat of wood filler made by mixing whiting (ground chalk) in methylated spirit at the rate of 1.5 Kg of whiting per liter of spirit. The surface shall again be rubbed

down perfectly smooth with glass paper and wiped clean.

**Application:** The number of coats of polish to be applied shall be as described in the item. A pad of woolen cloth covered by a fine cloth shall be used to apply the polish. The pad shall be moistened with the polish and rubbed hard on the wood, in a series of overlapping circles applying the mixture sparingly but uniformly over the entire area to give an even level surface. A trace of linseed oil on the face of the pad facilitates this operation. Sand the surface with the emery paper no 180, apply wood filler and allow it to dry for 2-3 hours. Again sand the surface with the emery paper no 180, apply melamine sealer and allow it to dry for 2-3 hours. Sand the surface with the emery paper no 320, wipe off the dust and dirt. Apply melamine polish mat or gloss as required two or three coat and finishing with spray coat.

**Measurement** shall be per Sqm and rate shall be inclusive of all material, labour, tools and tackles required to complete the work as per the item description and to the satisfaction of Engineer-In-Charge.

### **Item No. 87.**

**Varnishing with varnish of approved brand and manufacture: Two or more coats of glue sizing with copal varnish over an under coat of flatting varnish**

Relevant Specification above item

### **Item No. 88.**

**Providing & laying 2.0/2.5 mm thick approved Linoleum Flooring as per EN 548, made up of 97% natural raw materials and out of which 70% should be rapidly re-newable. The product must have natural & permanent bacteriostatic property even against MRSA bacteria as per manufacturer's specifications and the independent test reports for the same must be submitted by the manufacturer. The product must be approved by TERI- GRIHA (Green Rating for Integrated Habitat Assessment). It is compulsory to use multi-coloured welding rods similar to the shade and texture of the floor to complement the floor colour of the flooring material. The joints between 2 rolls should be welded using a hot air welding gun. The product will have UV curved Top shield-2 comprising of 2 layers, top coating of primer and acrylic to provide better performance. This coating should be resistant to Betadine stains. Acoustical impact noise reduction as per EN150717- 2- 4 dB ,Indentation Residual as per EN-ISO 24343-1 :**

**0.15mm. The product should be SMART Platinum Certified ((Sustainable Materials Rating Technology)by USA.**

**The product should carry third-party, independent, Life Cycle Analysis (multi-attribute) to show its environmental footprint from Cradle to Grave.Flooring should be done as per manufacturers specifications and as directed by engineer in charge.**

### **Material**

The material shall be laying 2.0/2.5 mm thick approved Linoleum Flooring as per EN 548, made up of 97% natural raw materials and out of which 70% should be rapidly renewable. The product must have natural & permanent bacteriostatic property even against MRSA bacteria as per manufacturer's specifications and the independent test reports for the same must be submitted by the manufacturer. The product must be approved by TERI-GRIHA (Green Rating for Integrated Habitat Assessment).

### **Fixing and Workmanship**

The Flooring shall be laid with linoleim in roll form. ). It is compulsory to use multi-coloured welding rods similar to the shade and texture of the floor to complement the floor colour of the flooring material. The joints between 2 rolls should be welded using a hot air welding gun. The product will have UV curved Top shield-2 comprising of 2 layers, top coating of primer and acrylic to provide better performance. This coating should be resistant to Betadine stains. The floor should be laid on existing hard floor surface which should be true to level. The Contractor should check the floors for any undulation and shall lay an under-layer if necessary to make the floor even before installation of linoleum floor

### **Rate and Measurement**

Measurement and rate shall be for per square meter of flooring installed including all material, labour, tools and tackles etc complete.

### **Item No. 89.**

**Providing and Fixing of Flocked Carpet rolls flooring having a density of 70 mn fibres of nylons 6.6 per sqm firmly anchored into a waterproof backing and having an average recycled content of 20%. The carpet must inhibit the growth of Bacteria and Fungi. The Carpet must be Zero Emission carpet (Emission below detection limit after 28 days in accordance to ISO 16000-9 requirements). Fire Test EN-13501, Appearance Retention Hexapod ISO 140-8, Friction Slip resistance Test EN 14041 Class DS, Sanitized anti- microbial treatment with resilient water proof backing. The carpet should be anti stactic and thickness shall be 4.3 mm/ with approximate weight of 1.8 kg/ sqm. The carpet should be a acoustical property Impact sound  $L_w = 20$  dB, Sound absorption = 0.10, as per ISO 354. The rate shall be inclusive of fixing at site as per the drawings and direction of Engineer in charge complete in all respect.**

## 1. General

The Flocked Carpet rolls flooring having a density of 70 mn fibres of nylons 6.6 per sqm firmly anchored into a waterproof backing and having an average recycled content of 20%. The carpet must inhibit the growth of Bacteria and Fungi. The Carpet must be Zero Emission carpet (Emission below detection limit after 28 days in accordance to ISO 16000-9 requirements). Fire Test EN-13501, Appearance Retention Hexapod ISO 140-8, Friction Slip resistance Test EN 14041 Class DS, Sanitized anti- microbial treatment with resilient water proof backing. The carpet should be anti stactic and thickness shall be 4.3 mm with approximate weight of 1.8 kg/ sqm

## 2. Fixing:

The carpet shall be laid and fixed on pre-leveled IPS flooring or any other flooring. The carpet shall be stuck on to the floor using suitable adhesive of approved brand.

## 3. Measurement

Surface area of the laid carpet surface should be measured in square meters correct to two places of decimal. Nothing extra shall be paid.

## 4. Rate

Rates shall include cost of all labour and materials involved in all the operations described above with tools and scaffolding.

### Item No. 90.

**Providing and fixing 25 mm wooden planking, tongued and grooved in flooring, including fixing with iron screws complete with, Second class teak wood supporting structure as required on stage including Providing and fixing 6 mm to 12 mm thick High Density polyurethane foam having density of approx. 90 kg/cum. fixed to Ply wood sheet or Concrete floor with suitable adhesive to act as couchining foam below the wooden flooring.**

Providing and fixing 25 mm wooden planking, tongued and grooved in flooring, including fixing with Galvanized iron screws complete with, Second class teak wood on stage in 330 seater class room-

Planking to be fixed over Shock Absorbent foam over Water MR grade Plywood conforming to IS 710 of necessary thickness and Teak wood wooden framing. Cost of Foam, Plywood and Teak wood framing will be paid under relevant items.

#### **(a) Second class teak wood**

Seasoning and Preservation

All timber used for timber floors shall be thoroughly seasoned in accordance with IS 1141. After seasoning the timber shall be treated with preservative in accordance with IS 401. Seasoning and preservative treatment shall be paid for separately unless otherwise specifically included in the description of the item of flooring.

Supporting Joists

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

Main beams and joists of the class of wood sections specified in the description of the item for beams and joists, or as instructed by the Engineer-in-Charge shall be fixed in position to dead levels.

The width of the joints shall not be less than 50 mm. The arrangement and spacing of beams joists etc. shall be as per design furnished.

### **Boards**

It shall be of the class of timber and thickness specified in the description of the item. The timber shall be as specified. Only selected boards of uniform width shall be used. Unless otherwise specified or shown in the drawings, the width of boards selected shall not be less than 100 mm nor more than 150 mm. The same width of boards shall not be maintained throughout except where the width of the room is not an exact multiple of the boards. In the latter case, the difference shall be equally adjusted between the two end boards (adjacent to walls). The length of the boards shall not exceed 3 meter anywhere. Ordinarily, the minimum length of boards shall be such that the boards shall rest at least on three supports, except where otherwise required by the pattern specified in the drawings or as directed by the Engineer-in-Charge.

The boards shall be planed true on the top face only unless otherwise specified in the description of the item. Where the bottom face is exposed and it is also required to be planed, then such planning shall be paid for extra.

Unless otherwise described in the item, the longitudinal joints of planks shall be tongued and grooved to a minimum depth of 12 mm while the heading joints shall be of the square butt type and shall occur over the center line of the supporting joists. Heading joints in adjacent boards shall be placed over the same joists.

### **Iron Screws**

Iron screws shall be of the slotted counter sunk head type, of length not less than the thickness of planks plus 25 mm, subject to a minimum of 40 mm, and of designation No. 9 conforming to IS 451.

### **Fixing**

The Planks will be fixed over shock absorbent foam of required thickness over a plywood sheet fixed to wooden framing. The joists of the wooden framing on which the planks shall be fixed shall be checked and corrected to levels. The end boards shall be accurately fixed with the sides parallel and close to the walls. Each adjoining board shall be carefully jointed and shall be tightened in position and screwed. For fixing the boards to the joists, two screws shall be used at each end of the boards and one screw at each of the intermediate joists in a zig zag manner. The screws shall be countersunk and screw holes filled with approved stopping.

The junction between timber flooring and adjacent flooring shall be formed by inserting a metal strip (brass or aluminum) at the junction. The metal strip shall be fixed to the end of the planks by screws.

The strips shall be paid for extra.

The flooring shall be truly level and plane. The joints shall be truly parallel and or perpendicular to the walls, unless otherwise specified. The floor shall be planned in both directions and made perfectly even, true and smooth.

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

### Finishing

The surface of the floor shall be bees waxed or finished otherwise as directed by the Engineer-in-Charge. The lower face shall be painted or treated with wood preservative as directed. The finishing shall be paid for separately unless specifically included in description of the flooring item.

### Measurements

Length and breadth of superficial area of the finished work shall be measured correct to a cm. The area shall be calculated in square meter correct to two places of decimal. No deduction shall be made nor extra paid for voids not exceeding 0.20 square meter. Deductions for ends of dissimilar materials or other articles embedded shall not be made for areas not exceeding 0.10 square meter. The rate includes the cost of all materials, equipment, labour, carting, loading & unloading, removal of debris to local specified within the site, involved in all the operations described above.

Shop drawings to be submitted and approval from Design Consultant to be taken by Contractor before execution.

Providing and fixing 6 mm to 12 mm thick High Density polyurethane foam having density of approx. 90 kg/cum. fixed to Ply wood sheet or Concrete floor with suitable adhesive to act as cushioning foam below the wooden flooring.

### **Item No. 91.**

**Providing and fixing Engineered wooden skirting 2400x80x20 mm up to 3 mm top layer, core layer pine wood oak london of Mikasa or equivalent with necessary T- profile and reducer fixing with underlayer 2 mm thick High Density polyurethane foam and 2 mm thick rubber sheet as per manufactureres specifications and as directed by engineer in charge.**

Relevant specifications shall be followed as per item number 90 except that the wood shall be used in Skirting. Rate shall be for per RMT.

### **Item No. 92.**

**Providing and fixing Bamboo wood Tile Flooring 14mm thick of minimum size Providing & fixing in position Phenol bonded Bamboo wood flooring with planks of sizes 14mm thick, 1800mm length (minimum) and 130 mm wide(minimum), in approved colour, texture and finish, having Performance Appraisal Certificate (PAC) issued by Building Materials & Technology Promotion Council (BMTPC). The flooring shall be fixed with tongue and groove interlocking system, with underlayment of 4mm thick expanded poly ethylene foam sheets having density 40kg/cum, over prepared surface with necessary quarter round planks of size 1900mm x 18mm and door reducer of size 1900mm x 44mm, wherever required. The bomboowood planks shall have minimum density of 1000 Kg/cum & minimum Hardness 1000 Kgf. with Eco friendly UV coating, all complete as per direction of Engineer in-charge.**

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

Relevant specifications shall be followed as per item number 90 except that the Bamboo Wood Plant flooring shall be installed. Rate shall be for per Square meter.

### **Item No. 93.**

**Providing & fixing in position Phenol bonded Bamboo wood in wall skirting with planks of sizes 14mm thick, 1900mm length (minimum) and 85mm wide(minimum), in approved colour, texture and finish, having Performance Appraisal Certificate (PAC) issued by Building Materials & Technology Promotion Council (BMTPC). The skirting shall be fixed with SS screws & rawl plugs, over underlayment of 4mm thick, expanded poly ethylene foam sheets having 40kg/cum density over prepared surface. The bamboo wood planks shall have minimum density of 1000 Kg/cum & minimum Hardness 1000 Kgf. with Eco friendly UV coating, all complete as per direction of Engineer in-charge.**

Relevant specifications shall be followed as per item number 90 except that the wood shall be used in Skirting. Rate shall be for per RMT.

### **Item No. 94.**

**Providing and fixing removable raised / false access flooring 600 mm Finished Floor Height (FFH) with system and its components of approved make for different plenum height with possible height adjustment upto 50 mm, comprising of modular load bearing floor panels supported on G.I. rectangular stinger frame work and G.I. Pedestal etc. all complete, as per the architectural drawings, as specified and as directed by Engineer-in-charge consisting of**

**a) Providing at required spacing to form modular framework, pedestals made out of GI tube of thickness minimum 2 mm and 25 mm outer diameter, fully welded on to the G.I. Base plate of size 100mm x 100mm x 3mm at the bottom of the pedestal tube, G.I. pedestal head of size 75mmx75mmx3 mm welded with GI fully threaded stud 16mm outer diameter with two GI Check nuts screwed on the stud for level adjustment upto 50mm, locking and stabilizing the pedestal head in position at the required level. The pedestals shall be fixed to the subfloor (base) through base plate using epoxy based adhesive of approved make or the machine screw with rawl plug.**

**b) Stringers system in all steel construction hot dipped galvanized of rectangular size 570x20x30x0.80mm thick having holes at both ends for securing the stringers on to the pedestal head using fully threaded screws ensuring maximum lateral stability in all directions, the grid formed by the pedestal and stringer assembly shall receive the floor panel, this system shall provide adequate solid, rigid support for access floor panel, the system shall provide a minimum clear uninterrupted clearance between the bottom of the floor for electrical conduits and wiring etc. all complete as per the architectural drawings, as specified and as directed by the Engineer-in-charge.**

**c) Providing and fixing Access Floor panel of 600x600x32 mm medium grade Filled Steel anti static high pressure Lamination of 800H grade (FS800H). Access Floor panel shall be steel welded construction with an enclosed bottom pan with uniform pattern of 64 hemispherical cones. The top and bottom plates of Steel**

**Gauges: top 0.6 mm and bottom 0.7 mm fused spot welded together (minimum 64 welds in each dome and 20 welds along each flange). The panel should be corrosion resistant epoxy coated for lifetime rust protection and cavity formed by the top and bottom plate is filled with Pyrogrip non-combustible Portland cementitious core mixed with lightweight foaming compound. The access floor shall be factory finished with Anti-static High Pressure laminate with Non Warp technology upto 1mm thickness for superior adhesion and Surface flatness within 0.75mm. The panel is to withstand a Concentrated Load of 363 kgs applied on area 25mm x 25mm without collapse in the centre of the panel which is placed on four steel blocks. The panel will withstand and Uniformly Distributed Load (UDL) minimum 1250 kg/sqm and, an impact load of 50kg all complete as per the approved manufacturers specification and as per the direction of Engineer-in-charge. All specification must be printed on the side of the panel to ensure the quality of the product.**

### **Material**

Access Floor panel of 600x600x32 mm medium grade Filled Steel anti static high pressure Lamination of 800H grade (FS800H). Access Floor panel shall be steel welded construction with an enclosed bottom pan with uniform pattern of 64 hemispherical cones. The top and bottom plates of Steel Gauges: top 0.6 mm and bottom 0.7 mm fused spot welded together (minimum 64 welds in each dome and 20 welds along each flange). The panel should be corrosion resistant epoxy coated for lifetime rust protection and cavity formed by the top and bottom plate is filled with Pyrogrip non-combustible Portland cementitious core mixed with lightweight foaming compound. The access floor shall be factory finished with Anti-static High Pressure laminate with Non Warp technology upto 1mm thickness for superior adhesion and Surface flatness within 0.75mm. The panel is to withstand a Concentrated Load of 363 kgs applied on area 25mm x 25mm without collapse in the centre of the panel which is placed on four steel blocks. The panel will withstand and Uniformly Distributed Load (UDL) minimum 1250 kg/sqm and, an impact load of 50kg

### **Workmanship and Installation**

The access flooring system shall be installed with the Finished floor height of 600 mm. Steps of uniform riser of 150 mm and 300 mm tread shall be provided near the entrance door to climb on to the floor. Also the steps shall not be protruding out from the overall flooring boundary.

The Access floor panels shall be installed on GI Pedestals and stringers. The pedestals shall be made out of GI tube of thickness minimum 2 mm and 25 mm outer diameter, fully welded on to the G.I. Base plate of size 100mm x 100mm x 3mm at the bottom of the pedestal tube, G.I. pedestal head of size 75mmx75mmx3 mm welded with GI fully threaded stud 16mm outer diameter with two GI Check nuts screwed on the stud for level adjustment upto 50mm, locking and stabilizing the pedestal head in position at the required level. The pedestals shall be fixed to the subfloor (base) through base plate using epoxy based adhesive of approved make or the machine screw with rawl plug.

The Stringers system shall be in all steel construction hot dipped galvanized of rectangular size 570x20x30x0.80mm thick having holes at both ends for securing the stringers on to the pedestal head using fully threaded screws ensuring maximum lateral stability in all

directions, the grid formed by the pedestal and stringer assembly shall receive the floor panel, this system shall provide adequate solid, rigid support for access floor panel, the system shall provide a minimum clear uninterrupted clearance between the bottom of the floor for electrical conduits and wiring etc. all complete as per the architectural drawings, as specified and as directed by the Engineer-in-charge

### **Measurement and Rate:**

Measurement shall be for per sqm of flooring installed. Only the installed floor area shall be measured. Any cut-out to be provided in the floor shall be provided while installation. Such Cut-out areas shall be measured as per standard measurement practices as provided in CPWD Specifications.

Rate shall be for per square meter of Access Floor Installed.

### **Item No. 95.**

**Making core cutting for up to 100 mm dia in RCC slab/wall/beam up to 350 mm wide (length of Core cutting) and finishing complete as per detailed drawing and as directed by engineer in charge.**

The work include making core in the wall, slab or beam as per drawing for 100 mm dia and 350 mm depth using Core cutting machine including all labour, tools tackles etc.. The rate shall be for per number of Core made as per drawing.

### **Item No. 96.**

**Dismantling tile work in floors and roofs laid in cement mortar including stacking material within 50 metres lead. For thickness of tiles 10 mm to 25 mm**

### **DISMANTLING AND DEMOLISHING**

#### **TERMINOLOGY**

(i) Dismantling: The term 'Dismantling' implies carefully separating the parts without damage and removing. This may consist of dismantling one or more parts of the building as specified or shown on the drawings.

(ii) Demolition: The term 'Demolition' implies breaking up. This shall consist of demolishing whole or part of work including all relevant items as specified or shown on the drawings.

#### **GENERAL**

This chapter relates to buildings only.

### **Precautions**

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

All materials obtained from dismantling or demolition shall be the property of the Government unless otherwise specified and shall be kept in safe custody until they are handed over to the Engineer-in-Charge/ authorized representative.

The demolition shall always be well planned before hand and shall generally be done in reverse order of the one in which the structure was constructed. The operations shall be got approved from the Engineer-in-Charge before starting the work.

Due care shall be taken to maintain the safety measures prescribed in IS 4130.

Necessary propping, shoring and or under pinning shall be provided to ensure the safety of the adjoining work or property before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damage is caused to the adjoining work or property. Wherever specified, temporary enclosures or partitions and necessary scaffolding with suitable double scaffolding and proper cloth covering shall also be provided, as directed by the Engineer-in-Charge.

Necessary precautions shall be taken to keep noise and dust nuisance to the minimum. All work needs to be done under the direction of Engineer-in-Charge. Helmets, goggle, safety belts etc. should be used whenever required and as directed by the Engineer-in-Charge.

The demolition work shall be proceeded with in such a way that it causes the least damage and nuisance to the adjoining building and the public.

Dismantling shall be done in a systematic manner. All materials which are likely to be damaged by dropping from a height or by demolishing roofs, masonry etc. shall be carefully removed first. Chisels and cutters may be used carefully as directed. The dismantled articles shall be removed manually or otherwise, lowered to the ground (and not thrown) and then properly stacked as directed by the Engineer-in-Charge.

Where existing fixing is done by nails, screws, bolts, rivets, etc., dismantling shall be done by taking out the fixing with proper tools and not by tearing or ripping off.

Any serviceable material, obtained during dismantling or demolition, shall be separated out and stacked properly as directed by the Engineer-in-Charge within a lead of 50 metres. All unserviceable materials, rubbish etc. shall be disposed off as directed by the Engineer-in-Charge.

The contractor shall maintain/disconnect existing services, whether temporary or permanent, where required by the Engineer-in-Charge.

No demolition work should be carried out at night especially when the building or structure to be demolished is in an inhabited area.

Screens shall be placed where necessary to prevent injuries due to falling pieces.

Water may be used to reduce dust while tearing down plaster from brick work.

Safety belts shall be used by labourers while working at higher level to prevent falling from the structure.

First-aid equipment shall be got available at all demolition works of any magnitude.

### **RECOMMENDATIONS FOR DEMOLITION OF CERTAIN SPECIAL TYPES AND ELEMENTS OF**

### **STRUCTURES**

## Roof Trusses

If a building has a pitched roof, the roof structure should be removed to wall plate level by hand method. Sufficient purlins and bracing should be retained to ensure stability of the remaining roof trusses while each individual truss is removed progressively.

Temporary bracing should be added, where necessary, to maintain stability. The end frame opposite to the end where dismantling is commenced, or a convenient intermediate frame should be independently and securely guyed in both directions before work starts.

On no account should the bottom tie of roof trusses be cut until the principal rafters are prevented from making outward movement.

## Heavy Floor Beams

Heavy bulks of timber and steel beams should be supported before cutting at the extremities and should then be lowered to a safe working place.

## Jack Arches

Where tie rods are present between main supporting beams, these should not be cut until after the arch or series of arches in the floor have been removed. Particular care should be exercised and full examination of this type of structure undertaken before demolition is commenced (see Fig. 15.1). The floor should be demolished in strips parallel to the span of the arch. rings (at right angles to the main floor beams).

## Brick Arches

Expert advice should be obtained and at all stages of the demolition, the closest supervision should be given by persons fully experienced and conversant in the type of work to ensure that the structure is stable at all times.

As much dead load as possible may be removed provided it does not interfere with the stability of the main arch rings but it should be noted that the load-carrying capacity of many old arches relies on the filling between the spandrels. On no account should the restraining influence of the abutments be removed before the dead load of the spandrel fill and the arch rings are removed.

The normal sequence of demolition is as shown in Fig. 15.2-A, namely:

- (a) Remove spandrel in filling down to the springing line,
- (b) Remove the arch. rings and
- (c) Remove the abutment.

Special temporary support shall be provided in the case of skew bridges.

A single span arch. can be demolished by hand by cutting narrow segments progressively from each springing parallel to the span of the arch until the width of the arch has been reduced to a minimum which can then be collapsed (see Fig. 15.2B).

Where it is impossible to allow debris to fall to the ground below, centering designed to carry the load should be erected and the arch demolished progressively. The design of the centering should make appropriate allowance for impact.

Where deliberate collapse is feasible the crown may be broken by the demolition ball method working progressively from edges to the centre (see Fig. 15.2C).

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

Collapse of the structure can be effected in one action by the use of explosives. Charges should be inserted into boreholes drilled in both arch and abutments. This method is the most effective for demolition of tall viaducts.

In multi-span arches before individual spans are removed, lateral restraint should be provided at the springing level. Demolition may then proceed as for a single span, care being taken to demolish the spandrels down to the springing line as the work proceeds (see Fig. 15.2D). Where explosives are used it is preferable to ensure the collapse of the whole structure in one operation to obviate the chance of leaving unstable portions standing.

### **Cantilevers (Not part of a Framed Structure)**

A cantilever type of construction depends for its stability on the super imposed structure. Canopies, cornices, staircases and balconies should be demolished or supported before the tailing down load is removed.

### **In-situ Reinforced Concrete**

Before commencing demolition, the nature and condition of the concrete, the condition and position of reinforcement, and the possibility of lack of continuity of reinforcement should be ascertained.

Attention should be paid to the principles of the structural design to determine which parts of the structure depend on each other to maintain overall stability.

Demolition should be commenced by removing partitions and external non-load bearing cladding. It should be noted that in some buildings the frame may rely on the panel walls for stability.

Where hard demolition methods are to be used, the following procedures should be used.

#### **(a) Reinforced Concrete Beams**

For beams, a supporting rope should be attached to the beam. Then the concrete should be removed from both ends by pneumatic drill and the reinforcement exposed. The reinforcement should then be cut in such a way as to allow the beam to be lowered under control to the floor (see Fig. 15.3A).

#### **(b) Reinforced Concrete Columns**

For columns, the reinforcement should be exposed at the base after restraining wire guy ropes have been placed round the member at the top. The reinforcement should then be cut in such a way as to allow the column to be pulled down to the floor under control. (see Fig. 15.3B for sequence of operations).

#### **(c) Reinforced Concrete Walls**

Reinforced concrete walls should be cut into strips and demolished as for columns (Fig. 15.3C).

## **MEASUREMENTS**

All work shall be measured net in the decimal system, as fixed in its place, subject to the following limits, unless otherwise stated hereinafter.

(a) Dimensions shall be measured correct to a cm.

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

(b) Areas shall be worked out in sqm correct to two places of decimal.

(c) Cubical contents shall be worked out to the nearest 0.01 cum.

Parts of work required to be dismantled and those required to be demolished shall be measured separately.

Measurements of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed.

Specifications for deduction for voids, openings etc. shall be on the same basis as that adopted for new construction of the work.

Work executed in the following conditions shall be measured separately.

(a) Work in or under water and/or liquid mud

(b) Work in or under foul position.

### **Roofs**

(i) Roof coverings generally including battens boarding, mats, bamboo jaffari or other subsidiary supports shall be measured in square metres except lead sheet roof covering which shall be measured in quintals (15.2.3) and stone slab roof covering which shall be measured in cubic metres.

(ii) Ridges, hips and valleys shall be girthed and included with the roof area. Corrugated or semi corrugated surfaces shall be measured flat and not girthed.

(iii) Mud phuska on roofs shall be measured in cubic metres.

(iv) Lead sheets in roofs shall be measured in quintals and hips, valleys, flashings, lining to gutter etc. shall be included in this weight.

(v) R.B. or R.C.C. roofs shall be measured as specified in 15.3.11.

(vi) Supporting members, such as rafters, purlins, beams joists, trusses etc. of wood shall be measured in cubic metres and steel or iron sections, in quintals.

### **Ceiling**

(i) The stripping of ceilings shall be measured in square metres.

(ii) Dismantling of supporting joists, beams, etc. shall be measured in cubic metres or in quintals as specified in 15.3.6(vi).

(iii) Height above floor level, if it exceeds 3.5 m shall be paid for separately.

### **Flooring and Pavings**

Dismantling of floors (except concrete and brick floors) shall be measured in square metres.

Supports such as joints, beams etc. if any shall be measured as per 15.3.6(vi). Concrete and bricks paving shall be measured as per 15.3.9.

### **Concrete and Brick Roofs and Suspended Floors**

Demolition of floors and roofs of concrete or brick shall be measured in cubic metres. Beams cantilevers or other subsidiary supports of similar materials, shall be included in

the item. In measuring thickness of roofs provide with water proofing treatments with bitumen felts, the thickness of water proofing treatment shall be ignored.

### **Walls and Piers**

- (i) Taking down walls and independent piers or columns of brick, stone or concrete shall be measured, in cubic metres. All copings, corbels, cornices and other projections shall be included with the wall measurements.
- (ii) In measuring thickness of plastered walls, the thickness of plaster shall be ignored.
- (iii) Ashlar face stones, dressed stone work, pre-cast concrete articles, etc. if required to be taken down intact shall be so stated and measured separately in cubic metres.
- (iv) Cleaning bricks stacking for measurements including all extra handling and removal and disposing off the rubbish as stated shall be enumerated in thousand of cleaned bricks.
- (v) Cleaning stone obtained from demolished/dismantling stone masonry of any description including ashlar facing dressed stone work, stone slabs or flagging and pre-cast concrete blocks including all extra handling and disposing off the rubbish as stated shall be measured in cubic metres of cleaned stone.
- (vi) Honey comb works or cavity walls of bricks stone or concrete shall be measured as solid.

### **Reinforced Concrete and Brick Work**

Reinforced concrete structures and reinforced brick roofs and walls shall be measured in cubic metres and if reinforcement is required to be salvaged, it shall be so stated. Where reinforcement is required to be separated, scraped and cleaned, the work shall be measured separately in quintal of salvaged steel.

### **Partitions, Trellis Work etc.**

Partitions or light walls, of lath and plaster, trellis work, expanded metal, thin concrete or terracotta slabs and other similar materials including frame work if any shall be measured in square metres stating the over all thickness.

### **Wood Work**

All wood work including karries average 40 sq cm or over in section, shall be measured in cubic metres, while that under 40 sq cm in section, in running metres. Ballies shall be measured in running metres.

Boarding including wooden chajjas and sun shades along with supports shall be measured in square metres in its plane.

### **Steel and Iron Work**

- (i) All steel and iron work shall be measured in quintals. The weight shall be computed from standard tables unless the actual weight can readily be determined.
- (ii) Riveted work, where rivets are required to be cut, shall be measured separately.
- (iii) Marking of structural steel required to be re-erected shall be measured separately.
- (iv) In framed steel items, the weight or any covering material or filling such as iron sheets and expanded metal shall be included in the weight of the main article unless such covering is not ordered to be taken out separately.

## **Doors and Windows**

Dismantling of doors, windows, clerestory windows, ventilators etc. (wood or metal) whether done separately or along with removal of wall by making recess in the wall shall be enumerated. Those exceeding 3 sqm each in area shall be measured separately. The item shall include removal of chowkhats architraves, holdfasts and other attachments.

If only shutters are to be taken out it shall be measured separately.

## **Pipes and Sewer Lines**

(i) Water pipe lines including rain water pipes with clamps and specials, sewer lines (salt glazed ware or concrete) etc. shall be described by their diameter and length measured in running metres inclusive of joints.

(ii) If the joints, special and fittings etc. are required to be separated, it shall be so stated and enumerated.

(iii) Pucca drains shall be measured under relevant items.

(iv) Valve cistern, public fountain platform, fire hydrants, etc. shall be enumerated.

(v) Manholes and inspection chambers shall be enumerated stating the size and depth of manhole/inspection chamber. They shall be classified into different groups depending upon the depth, in unit of half and one metre depth. The depth of the manhole shall be the distance between the top of manhole cover and invert level of the drain.

(vi) Ventilating shafts, gully traps, flushing cisterns and other appurtenant items of work shall be enumerated.

## **Posts or Struts**

Posts or struts (wood, steel or RCC) section including taking out embedded portion shall be measured in running metres.

## **Fencing Wire Mesh**

Wire mesh fencing of any type with frame shall be measured in square metres.

## **Glazing**

Taking out any portion of serviceable glass except polished plate, from old sashes, skylights, etc. (any thickness, weight or size) raking out old putty, etc. shall be measured in square metres. Irregular circular panes shall be measured as rectangle or square enveloping the same. The width and height being measured correct to the nearest 0.5 cm.

## **Road Work**

(i) Different types of road surfaces shall be measured separately.

(ii.) Road surfaces metalling or soling (base) shall be measured in square metres.

(iii) Concrete paving shall be measured as in 15.3.8 or 15.3.9 as the case may be.

## **RATES**

The rate shall include the cost of all labour involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable material properly and disposing off unserviceable material

within a distance of 50 metres. The rate shall also include for temporary shoring for the safety of portions not required to be pulled down, or of adjoining property, and providing temporary enclosures or partitions, where considered necessary.

**Item No. 97.**

**Dismantling stone slab flooring laid in cement mortar including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.**

Relevant Specification shall be followed as per item number 95.

**Item No. 98.**

**Kota stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand):**

**a) 25 mm thick**

**Kota Stone Slabs**

The slabs shall be of selected quality, hard, sound, dense and homogeneous in texture free from cracks, decay, weathering and flaws. They shall be hand or machine cut to the requisite thickness. They shall be of the colour indicated in the drawings or as instructed by the Engineer-in-Charge.

The slabs shall have the top (exposed) face polished before being brought to site, unless otherwise specified. The slabs shall conform to the size required. Before starting the work the contractor shall get the samples of slabs approved by the Engineer-in-Charge.

**Dressing**

Every slab shall be cut to the required size and shape and fine chisel dressed on the sides to the full depth so that a straight edge laid along the side of the stone shall be in full contact with it. The sides (edges) shall be table rubbed with coarse sand or machine rubbed before paving. All angles and edges of the slabs shall be true, square and free from chippings and the surface shall be true and plane.

The thickness of the slab after it is dressed shall be 20, 25, 30 or 40 mm as specified in the description of the item. Tolerance of  $\pm 2$  mm shall be allowed for the thickness. In respect of length and breadth of slabs Tolerance of  $\pm 5$  mm for hand cut slabs and  $\pm 2$  mm for machine cut slabs shall be allowed.

**Laying**

Base concrete or the RCC slab on which the slabs are to be laid shall be cleaned, wetted and mopped. The bedding for the slabs shall be with cement mortar 1:4 (1 cement : 4 coarse sand) or as given in the description of the item.

The average thickness of the bedding mortar under the slab shall be 20 mm and the thickness at any place under the slab shall be not less than 12 mm.

The slabs shall be laid in the following manner:

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

Mortar of the specified mix shall be spread under the area of each slab, roughly to the average thickness specified in the item. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped with wooden mallet and brought to level with the adjoining slabs. It shall be lifted and laid aside. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows. The mortar is allowed to harden a bit and cement slurry of honey like consistency shall be spread over the same at the rate of 4.4 kg of cement per sqm. The edges of the slab already paved shall be buttered with grey or white cement with or without admixture of pigment to match the shade of the marble slabs as given in the description of the item.

The slab to be paved shall then be lowered gently back in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slabs with as fine a joint as possible. Subsequent slabs shall be laid in the same manner. After each slab has been laid, surplus cement on the surface of the slabs shall be cleaned off. The flooring shall be cured for a minimum period of seven days. The surface of the flooring as laid shall be true to levels, and, slopes as instructed by the Engineer-in-Charge. Joint thickness shall not be more than 1 mm.

Due care shall be taken to match the grains of slabs which shall be selected judiciously having uniform pattern of Veins/streaks or as directed by the Engineer-in-Charge.

The slabs shall be matched as shown in drawings or as instructed by the Engineer-in-Charge.

Slabs which are fixed in the floor adjoining the wall shall enter not less than 12 mm under the plaster skirting or dado. The junction between wall plaster and floor shall be finished neatly and without waviness.

Marble slabs flooring shall also be laid in combination with other stones and/or in simple regular pattern/design as described in item of work and/or drawing.

### **Polishing and Finishing**

Slight unevenness at the meeting edges of slabs shall then be removed by fine chiselling and finished in the same manner as specified in 11.10.3 except that cement slurry with or without pigments shall not be applied on the surface before each polishing.

### **Measurements**

Marble stone flooring with different kind of marble shall be measured separately and in square metre correct to two places of decimal. Length and breadth shall be measured correct to a cm before laying skirting, dado or wall plaster. No deduction shall be made nor extra paid for voids not exceeding 0.20 square metre. Deductions for ends of dissimilar materials or other articles embedded shall not be made for areas not exceeding 0.10 square metre. Nothing extra shall be paid for laying the floor at different levels in the same room. Steps and treads of stairs paved with marble stone slabs shall also be measured under the item of Marble Stone flooring. Extra shall, however, be paid for such areas where the width of treads does not exceed 30 cm. Nosing for treads shall be measured in running metre and paid for extra. The width of treads shall be measured from the outer edge of the nosing, as laid, before providing the riser.

### **Rate**

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

The rate shall include the cost of all materials and labour involved in all the operations described above. However, extra shall be paid for making special type of pattern/design/flowers as per drawings.

No deductions shall be made in rate even if flooring is done without any pattern/design.

### **Item No. 99.**

**Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete.**

#### **(a) : Size of Tile 600x600 mm**

Vitrified Tiles

The tiles shall be of approved make and shall generally conform to IS 15622. They shall be flat, and true to shape and free from blisters crazing, chips, welts, crawling or other imperfections detracting from their appearance. The tiles shall be tested as per IS 13630.

Classification and Characteristics of pressed vitrified tiles shall be as per IS 13712.

The tiles shall be square or rectangular of nominal size. Table 12 of IS 15622 give the preferred sizes. Thickness shall be specified by the manufacturer. It includes the profiles on the visible face and on the rear side.

Manufacturer/supplier and party shall choose the work size of tiles in order to allow a nominal joint width upto 2mm for unrectified floor tiles and upto 1mm for rectified floor tiles. The joint in case of spacer lug tile shall be as per spacer. The tiles shall conform to table 10 of IS 15622 with water absorption 3 to 6%

(Group BII).

#### **Preparation of Surface and Laying**

Base concrete or the RCC slab on which the tiles are to be laid shall be cleaned, wetted and mopped. The bedding for the tile shall be with cement mortar 1:4 (1 cement : 4 coarse sand) or as specified. The average thickness of the bedding shall be 20 mm or as specified while the thickness under any portion of the tiles shall not be less than 10 mm.

Mortar shall be spread, tamped and corrected to proper levels and allowed to harden sufficiently to offer a fairly rigid cushion for the tiles to be set and to enable the mason to place wooden plank across and squat on it.

Over this mortar bedding neat grey cement slurry of honey like consistency shall be spread at the rate of 3.3 kg of cement per square metre over an area upto one square metre. Tiles shall be soaked in water washed clean and shall be fixed in this grout one after another, each tile gently being tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. The joints shall be kept as thin as possible and in straight lines or to suit the required pattern.

The surface of the flooring during laying shall be frequently checked with a straight edge about 2 m long, so as to obtain a true surface with the required slope. In bath, toilet W.C.

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

kitchen and balcony / verandah flooring, suitable tile drop or as shown in drawing will be given in addition to required slope to avoid spread of water. Further tile drop will also be provided near floor trap.

Where full size tiles cannot be fixed these shall be cut (sawn) to the required size, and their edge rubbed smooth to ensure straight and true joints.

Tiles which are fixed in the floor adjoining the wall shall enter not less than 10 mm under the plaster, skirting or dado.

After tiles have been laid surplus cement slurry shall be cleaned off.

### **Pointing and Finishing**

The joints shall be cleaned off the grey cement slurry with wire/coir brush or trowel to a depth of 2 mm to 3 mm and all dust and loose mortar removed. Joints shall then be flush pointed with white cement added with pigment if required to match the colour of tiles. Where spacer lug tiles are provided, the half the depth of joint shall be filled with polysulphide or as specified on top with under filling with cement grout without the lugs remaining exposed. The floor shall then be kept wet for 7 days. After curing, the surface shall be washed and finished clean. The finished floor shall not sound hollow when tapped with a wooden mallet.

### **Measurements**

Length and breadth shall be measured correct to a cm before laying skirting, dado or wall plaster and the area calculated in square metre correct to two places of decimal. Where coves are used at the junctions, the length and breadth shall be measured between the lower edges of the coves.

No deduction shall be made nor extra paid for voids not exceeding 0.20 square metre. Deductions for ends of dissimilar materials or other articles embedded shall not be made for areas not exceeding 0.10 square metre.

Areas, where glazed tiles or different types of decorative tiles are used will be measured separately.

### **Rate**

The rate for flooring shall include the cost of all materials and labour involved in all the operations described above, For tiles of sizes upto 0.16 sqm. unless otherwise specified in the description of the item. Nothing extra shall be paid for the use of cut (sawn) tiles in the work.

Extra over and above the normal rate for white tiles shall be paid where coloured or any other type of decorative tiles have been used.

### **Item No. 100.**

**Installation, testing and commissioning of pre-wired, fluorescent fitting / compact fluorescent fitting of all types, complete with all accessories and tube/lamp etc. directly on ceiling/ wall, including connections with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable and earthing etc. as required.**

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

Relevant specifications shall be followed as per E&M DSR item number 1.41

### **Item No. 101.**

**Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc. as required.**

**100 mm width X 50 mm depth X 1.6 mm thickness**

### **Scope**

The scope of work shall include:

1. Supplying, laying, testing and commissioning of cable trays and its allied accessories.
2. Handling, loading, unloading and storage of cable trays
3. Civil works associated with the said job.

### **Definitions**

The definitions shall be as per NEMA-VE-2

Accessory: Components used to supplement the function of a straight section or fitting. Examples include, but are not limited to, dropout, cover, conduit adapter, hold-down device, and divider cable tray support.

Span: The distance between the centerlines of supports.

Cable tray system: A section or assembly of sections, and associated fittings, forming a mechanical system used to support cables and raceways.

Channel cable tray: A fabricated structure consisting of a one-piece ventilated- or solid-bottom channel section.

Connector: A component that joins any combination of cable tray straight sections and fittings.

### **Codes & Standards**

The contractor is required to follow all relevant IS and IEC codes as per latest amendments, however in particular following codes may be applied in addition.

1. NEMA VE-2 -2013
2. IS 1079 - Cable trays and their accessories
3. NEC- 2008 - National electrical code.
4. NBC-2016 - National building code.
5. IER-1956: Indian electricity rules.
6. IEA-2007: Indian electricity act 2007
8. Any other local bye-law or supply company norm as applicable.

### **Service conditions**

**System particulars**

- a. System voltage - 415/230 V for AC
- b. Frequency- 50Hz  $\pm$ 3% for AC cables
- c. No. of phases- 3 for AC
- d. System neutral- Solidly earthed
- e. Short circuit rating - As per system fault level

Tropical conditions

- a. Ambient temperature: 50 degree celsius
- b. Relative humidity (avg.) : 60
- c. Isokeraunic level: 33
- d. Seismic Zone: Zone-4
- e. Climate type : hot and humid

The climatic conditions are prone to wide variations in ambient conditions and hence the equipment shall be of suitable design to work satisfactorily under these conditions.

Tolerances and creepage distance

Tolerances (on all the dimensions) and creepage distances shall be in accordance with provisions made in the relevant Indian/IEC/BIS standards and in these specifications. Otherwise the same will be governed by good engineering practice in conformity with required quality of the product.

**Specifications Perforated cable tray**

Cable tray system shall comprise of hot dip galvanized G.I cable trays, with galvanizing thickness of 65 micron and standard length of 2.5 meters made out of 2 mm thick perforated sheet metal for cable trays which are 600mm wide and above and 1.6mm thick for cable trays whose width is below 600mm.

The construction of the cable trays shall be as per the approved GA drawing from Vendor.

The construction of cable tray shall follow NEMA standards.

The cable trays shall be hot dip galvanized with perforations not more than 17.5% and factory fabricated out of G.I., angle iron, tee, bends, sections, flats and perforated sheet for different loads.

All accessories shall follow NEMA VE-2 standards

**Installation, testing and commissioning**

The Complete installation of cable trays shall be in accordance with NEMA VE-2 standards.

Before installing cable in the cable tray, examine cable paths to ensure all areas are free of debris that may interfere with cable installation.

Cable tray should never be used as a walkway.

## DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.

Most cable installations require the use of cable pulling tools. On horizontal straight runs, cables generally ride on rollers mounted in or on cable trays.

These rollers should be properly spaced, depending on the size and weight of the cable, to prevent the cable from sagging and dragging in the cable tray during the pull.

Cable manufacturer shall be contacted for information regarding proper roller spacing. Cables may be fastened to the cable tray by means of cable clamps or cable ties. Generally, cables shall be fastened every 450 mm (18 in) on vertical runs.

Although not required by the NEC, single conductor cables can be fastened on horizontal runs to maintain spacing and ensure that the cable is confined within the cable fill area.

When using cable clamps, the clamps should be sized correctly and tightened only enough to secure the cable without indenting the jacket.

The same precaution should be observed with cable ties, and they should be applied with a pressure limiting device.

Extremely long vertical drops introduce a new set of issues requiring special consideration.

The weight per meter (foot) of the cable multiplied by the number of meters (feet) in the vertical drop, in many cases, exceeds the load carrying capacity of the cable tray component. The one or two rungs supporting this weight are likely to be damaged, and the vertical load could exceed the allowable cable tension.

The cable weight should be supported in such a manner as to prevent damage to the cable tray or cable during this type of installation.

As the cable is installed, intermediate supports should be installed on the vertical drop to break the cable load into segments supported at multiple places.

Once the cable is installed in an open cable tray system, care must be taken to protect the exposed cables from falling objects or debris that could cause damage to the cable.

In areas where the cable tray is to be covered, covers should be installed as soon as possible. Temporary protection for the cables and cable tray can be constructed of available wood or metal materials until the risk of damage has passed.

Complete installation shall be in accordance with seismic requirements.

### **Item No. 102.**

**Supply and installation of Signage plate for Cabin/Class room/Meeting Rooms Names of Size 300 mm x 120mm x 1.5 mm in SS 304 Matt finish having Letters engraved in the SS plate in Black vinyl steam pressed to get a clean finish and having font size of name atleast 20 mm and font size of designation 16 mm fixed on to the wall or Door surface with high quality adhesive tape of 3M or equivalent complete to the satisfaction of Engineer In Charge.**

The Signage plate shall be for Cabin/ Classrooms/ Meeting rooms and other such office spaces. The signage shall be installed on to the wall or door surface using high quality two sided adhesive tape of 3M or equivalent. The plate shall be in SS 304 and the name shall be engraved in to the plate and then filled with Black Vinyl which shall be steam pressed in to the engraved portion to give a finished and clean look. No air bubbles shall be there

## **DEVELOPMENT OF PERMANENT CAMPUS OF NU RAJGIR.**

in the pressed vinyl sheet. The plate shall be made as per the drawings released for execution.

The rate shall be for per number of plate.

### **Item No. 103.**

**Supply and installation of Signage plate for Toilets (Male/Female/Divyang/Pantry) of Size 120 mm x 120mm x 1.5 mm in SS 304 Matt finish having Letters engraved in the SS plate in Black vinyl steam pressed to get a clean finish and having font size of name atleast 30 mm fixed on to the wall or Door surface with high quality adhesive tape of 3M or equivalent complete to the satisfaction of Engineer In Charge.**

Relevant specifications shall be used as per item number 100.

### **Item No. 104.**

**Supply and installation of Signage plate for FIRE EXIT SIGNAGE of Size 300 mm x 120mm x 1.5 mm in SS 304 Matt finish having Letters engraved in the SS plate in Black vinyl steam pressed to get a clean finish and having font size of name atleast 40 mm fixed on to the wall or Door surface with high quality adhesive tape of 3M or equivalent complete to the satisfaction of Engineer In Charge.**

Relevant specifications shall be used as per item number 100.

### **Item No. 105.**

**Supply and installation of Directional Signage plate ( Arrows) of Size 120 mm x 120mm x 1.5 mm in SS 304 Matt finish having Letters engraved in the SS plate in Black vinyl steam pressed to get a clean finish and having Arrow Size 100 mm x 75 mm fixed on to the wall or Door surface with high quality adhesive tape of 3M or equivalent complete to the satisfaction of Engineer In Charge.**

Relevant specifications shall be used as per item number 100.