



TITLE:  
**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005  
VOLUME - II B  
SECTION - D | SUB-SECTION – D5  
REV.NO. 00 DATE 03/10/2017  
SHEET 1 OF 15

## **VOLUME: II B**

### **SECTION - D**

#### **SUB-SECTION – D5**

### **METAL DOORS, WINDOWS, VENTILATORS, LOUVERS ETC.**

**SPECIFICATION NO. PE-TS-999-600-C005**



**Bharat Heavy Electricals Limited**  
**Project Engineering Management**  
**PPEI Building, Power Sector,**  
**Plot No. 25, Sector 16A,**  
**Noida (U.P.)-201301**



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REV.NO. 00 DATE 03/10/2017  
SHEET 2 OF 15

## C O N T E N T

CLAUSE NO.	DESCRIPTION	SHEET NO.
1.00.00	SCOPE	3
2.00.00	INSTALLATION	3
3.00.00	ACCEPTANCE CRITERIA	8
4.00.00	INFORMATION TO BE SUBMITTED	9
5.00.00	I.S. CODES	10
6.00.00	RATES AND MEASUREMENTS	10

### ATTACHMENT

ANNEXURE – A	SCHEDULE OF FIXTURES	12
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TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION - D5

REV.NO. 00 DATE 03/10/2017

SHEET 3 OF 15

**METAL DOORS, WINDOWS, VENTILATORS, LOUVERS ETC.**

**1.00.00 SCOPE**

This section covers supplying and/or erecting and installing of all metal doors, windows, ventilators, louvers, glazed partitions, etc. The scope of work shall also include the assembly and erection of all doors, windows, louvers, glazed partitions, etc. Supplying and/or fixing of all door and window accessories and hardware are also included in the scope.

**2.00.00 INSTALLATION**

**2.01.00 Materials**

Steel sections used for fabrication of doors, windows etc. shall be standard rolled steel sections specified in IS: 1038 and IS: 1361 or as specified.

Steel sheets for frames, shutters, louver blades etc. shall be of gauge mentioned in drawings and schedules.

Aluminium sections for fabricating doors, windows, partitions etc. shall be extruded sections conforming to IS:733 or IS:1285 or as manufactured by Indian Aluminium Company Limited or approved equivalent. Aluminium door, windows and ventilator shall be fabricated as per IS:1948 and IS:1949. The alloy used shall conform to IS Designation HE 9-WP of IS: 733.

Hardware and fixtures shall be as specified and the best quality from approved manufacturers shall only be used. The tenderer shall specifically state the particular manufacturer's materials he proposes to use. Improper alignment or faulty operation due to inadequate strength of hardware or fixture shall entirely be the Contractor's responsibility.

All hardware and fixtures shall be able to withstand repeated use. Door closures shall conform to IS: 3564 and shall be suitable for doors weighing 61-80 Kg. unless otherwise stated. Each closer shall be guaranteed against manufacturing defect for one year and any defect found within this period shall be rectified or shall be replaced free of charge. Concealed door closers shall be either floor mounted or transom mounted, suitable for installation with metal doors. It shall conform to the performance Requirements and endurance test stated in IS: 3564 - Appendix-A. The Contractor shall submit samples of each type of hardware to the Engineer. The approved samples shall be retained by the Engineer for comparison of bulk supply. The samples shall be returned to the Contractor towards end for incorporation in the job. The mastic for caulking shall be of best quality from a manufacturer approved by, the Engineer. In general, mastic for fixing of metals frames shall be as per IS: 1081 or as approved by the Engineer.



TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION - D5

REV.NO. 00 DATE 03/10/2017

SHEET 4 OF 15

**2.02.00 Fabrication**

**2.02.01 Steel Doors, Windows, Ventilators, louvers etc.**

a) Door Frames

Frames shall be fabricated from 16 gage(G) sheets. They shall, be mortised, reinforced, drilled, and tapped for hinge lock and bolt strikes. Where necessary, frames shall be reinforced for door closers. Welded construction with mitered Corners shall be used. Rubber door silencers shall be furnished for the striking jamb. Loose "T" masonry anchors shall be provided. Frames shall finish flush with floor and adjustable floor anchors shall be installed. Frames shall be brought to site with floor ties/weather bars installed in, place.

b) Double Plate Flush Door Shutters

Door shutters shall be 45 mm thick, completely flush design and shall comprise of the outer sheets or 18 G steel sheets, rigidly connected and reinforced inside with continuous vertical 20 G stiffeners, spot welded in position at not more than 150 mm on centres.

Both edges of doors shall be joined and reinforced full height by steel channels placed immediately inside and welded to the door faces. Top and bottom of doors shall be reinforced horizontally as shown on drawing by steel channels running full width of door. Doors shall not have more than 2.5 mm clearance at jambs and heads, shall have proper level on lock stiles and rails to operate without binding, and shall be reinforced at corners to prevent sagging or twisting. Pairs or double doors shall have meeting-stile edges bevelled or rebated. Where shown on drawing, or called for in the schedule of items, the doors shall be sound deadened by filling the inside voids with mineral wool or other suitable approved materials.

Doors shall be mortised, reinforced, drilled, and tapped in shop for hinges, locks, and bolts. They shall also be reinforced for closers, push-plates, and other surface hardware's where necessary. Any drilling and tapping required for surface hardware shall be done at site. Where shown drawing, provision shall be made for fixing glazing, vision panels, louvers etc. glazing mouldings shall be of 18 G steel or extruded aluminium sections and suitable for fixing 6 mm. glass. Louvers blades shall be V or Z shaped and made out of 16 G sheets.



TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
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SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION - D5

REV.NO. 00 DATE 03/10/2017

SHEET 5 OF 15

c) Single Sheet Door Shutters

Single sheet doors shall be made from best quality 18 G mild steel sheets, and shall present a flush surface on the outside. The inside shall be stiffened with semi tubular edge and central stiffening rail, which shall convey the lock and other fixture. The frames shall be made from best quality, 16 G mild steel sheets.

Wherever required, provisions for fixing glass panes, louvers etc. shall be made.

The manufacturing shall be done as specified in 2.02.01 (b) "Double Plate Flush Door Shutters."

d) Sliding Door

Sliding doors shall be either double plate or single plate Construction made out of 18-gauge steel sheets with adequate stiffeners. The contractor shall specify the weight of the door in his shop and submit the manufacturer's catalogue of the sliding gear he proposes to use. Where called for the Contractor shall make provision for openings to the door for monorail beams. Doors shall close positively to exclude rainwater from seeping in. When called for, sliding doors shall withstand specified wind loads without buckling or jamming. The door shall slide freely under all ambient conditions.

e) Door Threshold

Door threshold shall be provided. Doors without threshold shall have bottom tie of approved type.

f) Steel Windows, Sashes, and Ventilators etc.

These shall conform in all respects to IS: 1038 and IS: 1361 latest editions. The details as called for in the above codes shall be applicable for coupling mullions, transoms, weather bars, and pivot arrangements for ventilators, etc. or as called for. All welds shall be dressed flush on all exposed and contact surfaces. Where composite unit openings are required the individual window units shall be joined together with requisite transoms and mullions. All windows shall be outside glazed, fixed with putty or metal glazing beads as specified. Where aluminium glazing beads are specified, they shall be extruded aluminium channel 9.5 mm x 9.5 mm x 1.6 mm (Jindal Section No. 2209) unless otherwise shown on drawings. Aluminium beads shall be given one coat of zinc chromate primer before fixing to windows.



TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION - D5

REV.NO. 00 DATE 03/10/2017

SHEET 6 OF 15

**2.02.02****Aluminium Door, Windows, and Frames**

Extruded sections shall have a minimum 3 mm wall thickness. All sections shall be approved by the Engineer before fabrication is taken up. Doors frames, mullions, transom etc. shall be anodized in a bath of sulphuric acid to provide a clear coating of minimum 15-micron thickness. The anodized materials shall then be sealed by immersing in boiling water for 15 minutes. A protective transparent Coating shall be applied to the sections before shipment from the factory.

All work shall be fitted and shop assembled to a first class job, and ready for erection. Shop joints shall be made to hair lines and then welded or braced by such method as will produce a uniform colour throughout the work. Work on the above, other than described, shall be carefully fitted and assembled with neat joints with concealed fasteners. Wherever possible, joints shall be made in concealed locations and on edges of doors. Field connections of all work may be made with concealed screws or other approved type of fasteners. Glazing beads shall be snap fit type without visible screws and shall be of sizes to accommodate 6 mm thick glazing. All work shall be adequately braced and reinforced as necessary for strength and rigidity.

**2.03.00****Shop Coat or Paint**

The shop Paint for steel doors, windows etc. shall be best lead or zinc chromate primer paint from, approved manufacturer. All surfaces shall be thoroughly cleaned of rust, grease, loose mill scales etc. and given one coat of shop paint. Portions like mullions, transoms etc. that will be inaccessible after assembly of units shall be given an extra coat of paint before assembly.

Where called for, all steel doors, windows, etc. shall be hot dip galvanized to give a coating weight of 1½ - 2 oz. per sqft. One coat zinc chromate primer coat shall then be applied as shop paint.

Portions of aluminium frame, which come in contact with masonry construction shall be (before shipment from workshop) protected with a heavy coat of alkali resistant paint. Aluminium coming in contact with other incompatible metals shall be coated with zinc chromate primer.

**2.04.00****Handling & Storage of Fabricated Material**

All metal doors, windows, etc. shall be packed and crated properly before dispatch, to ensure that there will be no damage to the fabricated materials. Loading into wagons and trucks shall be done with all care to ensure safe arrival of materials at site in undamaged condition.



TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION - D5

REV.NO. 00 DATE 03/10/2017

SHEET 7 OF 15

When taking delivery of items supplied by Owner, the Contractor shall satisfy himself that the items supplied are up to the specified standard. Any defect detected shall promptly be brought to the notice of the Engineer.

All metal doors, windows etc. shall be stored under cover in a way to prevent damage or distortion. Special care shall be taken to prevent staining of aluminium products by rust, mortar etc.

**2.05.00**

**Assembly & Erection at Site**

In general, the fixing of steel doors, windows, ventilators, louvers, etc. shall conform to IS: 1081. The Contractor shall assemble and install all steel doors, windows, sashes, fixed metal louvers, etc. including transoms and mullions for composite units in respective places, keening proper "Lines and levels", and in approved workmanlike manner, to give trouble free and leak-proof installations. Installation shall be done according to instructions of the manufacturer, and/or as approved by the Engineer. If required by the Engineer, the installation shall have to be carried out under the supervision of the manufacturer's staff. The Contractor shall take all precaution against damage of the components during installation. Necessary holes, chases, etc. required for fixing shall be made by the Contractor and made good again as per original, after installation, without any extra charge.

After installation of steel doors, windows, etc. all abrasions to shop-coat of paint shall be retouched and made good the same quality of paint used in shop coat.

All coupling mullions, transoms, frames, etc. in contact with adjacent steel and other members, shall be well bedded in mastic. The Contractor shall bring to the site the cement in original sealed containers of manufacturer and shall apply it as per the instruction. For all frames supplied by either the owner or the Contractor, mastic shall be supplied by the Contractor and caulking done properly as per drawings, specifications and as per instructions of the Engineer.

Door shutters, partitions hardware fixtures etc. shall be fixed only after major equipments have been installed in rooms.

Wherever required, nylon cords of approved quality shall be supplied along with pivoted sashes and shall be of adequate length to terminate one meters from the floor. Loose ends of cords shall end in metal or plastic pull as approved by the Engineer.



TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION - D5

REV.NO. 00 DATE 03/10/2017

SHEET 8 OF 15

**2.06.0 Fire proof Door**

Fire proof doors shall be provided at all fire exit points as specified and also to restrict the spread of fire within buildings whether from internal fire or from external fire. The construction details of door shall conform to the requirements stipulated in IS:3614 (Part-1). Doors shall comply with the testing requirement mentioned in IS:3614 (Part-2). The doors shall be approved by Tariff Advisory Committee and shall have minimum 2 hrs. fire rating.

Metal covered (on both sides) Doors having insulating core filled up with mineral wool shall be used at all fire exit points and shall open outside.

All necessary accessories and hardware shall also be supplied along with doors. Fire proof door shall be provided with zinc silicate primer (minimum DFT 75 micron) after blast cleaning the surface to near white metal surface and shall be finished painted with epoxy based painting.

**3.00.00 ACCEPTANCE CRITERIA**

**3.01.00 For fabricated Items**

- a) Overall dimensions shall be within  $\pm 1.5$  mm of the size shown on drawings.
- b) Mullions, transoms etc. shall be in one length and permissible deviations from straightness shall be limited to  $\pm 1.5$  mm from the axis of the member.
- c) Door and window shutters shall operate without jamming. The clearance at head and jamb for door shutters shall not exceed 1.5 mm for double leaf doors; the gap at the meeting stiles shall not be more than 1.5 mm.
- d) Door leaves shall be undercut where shown on drawings.
- e) Doors, windows, frames, etc. shall be on a true plane, free from warp or buckle.
- f) All welds shall be dressed flush on exposed and contact surfaces.
- g) Correctness of location and smoothness of operations of all shop installed hardware and fixtures
- h) Provision for hardware and fixtures to be installed at site.
- i) Glazing beads shall be cut with mitered corners.
- j) Glazing clips, fixing devices etc. shall be supplied in adequate numbers.





TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION - D5

REV.NO. 00 DATE 03/10/2017

SHEET 9 OF 15

k) Shop coats shall be properly applied.

l) Exposed aluminum surfaces shall be free from scratches, stains, and discoloration. Anodized surfaces shall present a uniform and pleasing look.

**3.02.00 For installed Items**

- a) Installations shall be at correct location, elevation and in general, on a true vertical plane.
- b) Fixing details shall be strictly as shown on drawings.
- c) Assembly of composite units shall be strictly, as per drawings with mastic caulking of transoms and mullions, gaskets, weather strips etc. complete.
- d) All frames on external walls shall be mastic caulked to prevent leakage through joint between frames and masonry.
- e) All openable section shall operate smoothly without jamming.
- f) Locks, fasteners etc. shall be engage positively. Key shall, be non-interchangeable.
- g) Cutting to concrete or masonry shall be made good and all abrasions to shop paint shall be touched up with paint of same quality as shop paint.
- h) Aluminium doors, windows, etc. shall be free from scratches stain or discoloration.

**4.00.00 INFORMATION TO BE SUBMITTED**

**4.01.00 With Tender**

- a) Names of manufacturers for Doors, windows etc.
- b) Manufacturer's catalogue for all hardware and fixtures proposed to be used.

**4.02.00 After Award**

- a) Before starting fabrication of all metal doors, windows, etc. the Contractor shall submit detailed fabrication drawings to the Engineer for approval. The fabrication shall be started only after approval of drawings.



**TITLE:**  
**TECHNICAL SPECIFICATION  
 FOR METAL DOORS, WINDOWS,  
 VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005  
 VOLUME - II B  
 SECTION - D | SUB-SECTION – D5  
 REV.NO. 00 DATE 03/10/2017  
 SHEET 10 OF 15

- b) He shall submit a programme of work to be done for the approval of the Engineer.
- c) Before bulk supply, he shall submit for the approval of the Engineer samples of all bought out items and samples of each type of fabricated items. The samples shall be retained by the Engineer for comparison of bulk supply and returned to the Contractor towards the end for final incorporation in the job.

**5.00.00 IS CODES**

All work shall be carried out as per this specification and shall conform to the latest revision and/or replacements of the following or any other Indian Standard (IS) Codes, unless specified otherwise. In case any particular aspect of work is not specifically covered by Indian Standard Codes, any other standard practice, as may be specified by the Engineer, shall be followed.

Specification for Wrought Aluminium and Aluminium Alloy bars, rods and sections (for general engineering purpose)	-	IS: 733
Specification for Wrought Aluminium and Aluminium Alloy, extruded round tube, hollow section (for general engineering purpose)	-	IS: 1285
Steel doors, windows, and ventilators	-	IS: 1038
Steel windows for industrial, building	-	IS: 1361
Aluminium doors windows, and ventilators	-	IS: 1948
Aluminium windows for industrial buildings	-	IS: 1949
Steel doorframes	-	IS: 4351
Code of practice for fixing and glazing of Metal (steel and aluminium) doors, windows and Ventilators.	-	IS: 1081
Specification for Fire-check Doors – Part 1: Plate, Metal covered and Rolling type	-	IS: 3614
Hot Rolled Steel Sections for Doors, Windows and Ventilators – Specification	-	IS: 7452



TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION – D5

REV.NO. 00 DATE 03/10/2017

SHEET 11 OF 15

**6.00.00 RATES AND MEASUREMENT**

**6.01.00 Rates**

Rates shall be applicable of all elevation. Rates shall include preparation of working drawings (if required), supply of material, fixtures, gaskets, erection of unit, caulking and jamming of frames, including cutting/drilling/welding, grouting, grinding, making good of the structure for installing the unit etc. complete as per “Schedule of Items”.

Rates shall also include cost of surface preparation, application of primer, enamel painting or anodizing as applicable.

Rate for fire proof door is inclusive of providing insulation core, primer, shop painting (epoxy based), all hardware as specified in Schedule of items.

**6.02.00 Measurement**

Supply and installation of doors, windows, and ventilators shall be measured in Sqm or Kg as per BOQ item. If measured in sqm, it shall be for net outer to outer (excluding frame) area of doors, windows, and ventilators of each type used as described in “Schedule of Items”. Frame for steel or aluminum shall be measured in Kgs. Wooden frames shall be measured in Cum. Measurement for aluminum partition frames shall be in Kg. Paneling and glazing shall be paid separately if not covered in BOQ item description.

Measurement for fire proof door shall be in Sqm in net area outer to outer of the door.



TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION - D5

REV.NO. 00 DATE 03/10/2017

SHEET 12 OF 15

ANNEXURE-A

**SCHEDULE OF FIXTURES**

**A. TIMBER DOORS**

1. For single leaf panel/flush doors

- i) 100 mm brass butt hinges with screws - 3 Nos.
- ii) 150 mm brass tower bolts with screws - 1 No.
- iii) 100 mm x 225 mm clear plastic push  
Plate with counter sunk brass screws - 1 No.
- iv) 30 mm brass ring pull handle with  
Plates and screws - 1 No.
- v) 150 mm brass coat hook with screws - 1 No.

vi) Heavy duty, cylinder looks on active leaf - for flush door. For door-closure, see "Door Schedule".

**B. ALUMINIUM DOORS**

1. For double leaf door

- i) Concealed hanging arrangement for door leaves.
- ii) Concealed two points bolt encasing simultaneously at head and threshold on inactive leaf, operable from inside.
- iii) Heavy duty, cylinder look on active leaf.
- iv) Pull handle of approved design on both leaves.
- v) Doors stops for both leaves.
- vi) Overhead door closure for both leaves.



TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION - D5

REV.NO. 00 DATE 03/10/2017

SHEET 13 OF 15

ANNEXURE-A

**C. STEEL DOORS AND WINDOWS**

**1. Doors**

a) Double leaf doors

- i) 100 mm butt hinges - 3 Nos. on each leaf.
- ii) 300 mm aluminum tower bolt - 2 Nos. (top and bottom)  
On inside of inactive  
Leaf. 1. No. (Top only)  
On inside active leaf.
- iii) 200 mm anodized aluminum  
pull handle - 1 No. of each leaf.
- iv) Door stop of approved design - 1 No. of each leaf.

NOTE: For locks, door closure and threshold, see "Door Schedule".

b) Single leaf doors

- i) 100 mm butt hinges - 3 Nos.
- ii) 300 mm aluminum tower bolt - 2 Nos. top & bottom of Inside  
face
- iii) 200mm anodised aluminum  
Pull handle - 1 No.
- iv) Door stop of approved design - 1 No.

NOTE: For locks, door closures and threshold, see "Door Schedule".

**2. Windows, Ventilators, etc.**

a) Side Hung Windows

- i) Hinges - As per standard Practice of the  
Manufacturer, but minimum two  
hinges Per leaf.
- ii) 12" peg stays - 1 No. per leaf



TITLE:

**TECHNICAL SPECIFICATION  
FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION – D5

REV.NO. 00 DATE 03/10/2017

SHEET 14 OF 15

**ANNEXURE-A**

iii) 2 point handles - 1 No. per leaf

**b) Top Hung Ventilators (Projecting Out)**

i) Hinges - As per standard Practice of the  
Manufacturer, but minimum two  
hinges Per leaf.

ii) Adjustable sliding fabrication  
assembles - 2 Nos. per leaf.

iii) 2 point handles - 1 No. per leaf.

**c) Bottom Hung Ventilators (Projecting in)**

i) Hinges - As per standard Practice of the  
Manufacturer, but minimum two  
hinges Per leaf.

ii) Concealed side arms for  
opening adjustment. - 2 Nos. per leaf.

iii) Spring Catch - 1 No. per leaf.



TITLE:

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FOR METAL DOORS, WINDOWS,  
VENTILATORS, LOUVERS ETC.**

SPECIFICATION NO. PE-TS-999-600-C005

VOLUME - II B

SECTION - D | SUB-SECTION – D5

REV.NO. 00 DATE 03/10/2017

SHEET 15 OF 15

**ANNEXURE-A**

**D. ALUMINIUM WINDOW, VENTILATORS, ETC.**

(As per IS-1948 latest editions)

**a) Side Hung Windows**

- i) Hinges - As per standard Practice of the Manufacturer, but minimum two hinges Per leaf.
- ii) 300 mm peg stays - 1 No per leaf
- iii) 2 point handles - 1 No per leaf

**b) Top Hung Ventilators (Projecting out)**

- i) Hinges - As per standard Practice of the Manufacturer, but minimum two hinges Per leaf.
- ii) Adjustable sliding fabrication assemblies - 2 Nos. per leaf
- iii) 2 Point handles - 1 No. per leaf

**c) Bottom Hung Ventilation & (Projecting In)**

- i) Hinges - As per standard Practice of the Manufacturer, but minimum two hinges Per leaf.
- ii) Concealed side arms for opening adjustment - 2 Nos. per leaf
- iii) Spring Catch - 1 No. per leaf