GENERAL TECHNICAL SPECIFICATIONS

FOR BUILDING WORKS

Name of Work- Construction of Prayer Hall in Primary School at Village Nana Zinzuda Ta. Savarkundla Dist. Amreli

કામનું નામ

Deputy Executive Engineer
Panchayat R.&B. Sub Division
SAVARKUNDLA

Name of Work :- Construction of Prayer Hall in Primary School at Village Nana Zinzuda Ta. Savarkundla Dist. Amreli

SPECIFICATIONS

Item No.	Item of work	Item No.	Page No.
	General Technical Specifications	Attached	
1	Dismentaling the existing structure including removing and stacking the dismentelled materials as and where directed. (A) R.C.C. work	Attached	
2	Providing and laying ordinary cement concrete1:1.5:3 (1cement,1.5sand, 3 gradedstone aggregates 20 mm.Nominal size) and finishing smooth with curing etc. complete including the cost of formwork but excluding the cost of reinforcement of R.C.C. work in Column (iii) Having cross-sectional area more than 0.085 Sq.M. and up to 0.12Sq.M.	Attached	
3	Providing & laying C.C. 1:11/2:3 (1 cement ,11/2 course sand,3 graded stone agg.of 20 mm nominal size) and finishing smooth with curring etc. comp. incl. the cost of formwork but excl. the cost of reinforcement for R.C.C. work in. (A) Beam :- Having cross sectional Area 0.085 to 0.12 Sqm.upto floor all level	Attached	
4	Brickwork using common burnt clay building brick shaving crushing strength not less than 35 Kg/Sqcm. in super structure Upto floor two level in cement mortar 1:6(1 Cement ; 6 Fine sand)	Attached	
5	Providing & laying ordinary C.C. 1:1 1/2:3 (1 cement ,1 1/2 course sand, 3 graded stone agg. of 20 mm nominal size)and for R.C.C. LINTELS incl. Finishing smooth with curring of formwork but excl. the cost of reinforcement.for upto Floor all level.	Attached	
6	Providing & laying cement concrete 1:11/2:3 (1 cement ,11/2 course sand,3graded stone agg.of 20 mm nominal size) for rein-forcement concrete CHHAJJAS not exceeding 10cm. thickness upto floor two level incl. finishing the exposed surface with C.M. 1:3 (1 cement ,3 fine sand) to give a smooth and ever surface, centering, formwork and curring comp.Excl. the cost of reinforcement.above plinth Upto floor all level.	Attached	
7	Providing & laying ordinary cement concrete1:11/2:3 (1 cement ,11/2 course sand,3 graded stone agg.of 20 mm nominal size) exposed work with curring etc.comp. incl. the cost of formwork but excluding the cost of reinforce ment for R.C.C. work in. SLAB :- having more then 10cm. and end upto 13cm. thickness.upto floor all level	Attached	
8	Thermo Mechanically treated bar F.F.415 Steel reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor all level.	Attached	
9	Providing fixing of Polished Kotah stone frame for Doors & wIndows of 15cmx4 cm. Size including necessary holdfasts, holes for fixtures and fastenings incl. all labour & materials etc. comp	Attached	
10	Providing 15mmthick cement plaster in single coat on fair side of Brick/concrete walls for interior plastering upto floor two level and finished even and smooth in (I)cement mortar 1:3 (1 cement:3 sand) .Upto floor all level	Attached	
11	Providing 10 mmthick cement plaster in single coat on fair side of Brick/concrete walls for interior plastering upto floor two level and finished even and smooth in (I)cement mortar 1:3 (1 cement:3 sand) .Upto floor two level finished even & Smooth with floating coat of neat cement slurry.	Attached	
12	Providing and fixing 35mm. Thick Panelled,glazed orPanelled and glazed shutters for doors,windows andclearstory windows including anodised alluminiumbutt hinges with necessary screws and Indian TeakWood shutters with-(B) Partical board panells.12mm. thick including applying primer and two coats of oil painting etc. complete	Attached	
13	Providing and fixing window having extruded aluminum Colour anodized section frame main outer size 127mm x 38.10mm x 1.35mm @wt. 1.384kg/m, horizontal Four track member size 122.20mm x 31.75mm x 1.10mm@ wt 1.205 kg/m, vertical member of size 122.20mm x 31.75mm x 1.50mm @1.398 kg/mt with sliding shutters of horizontal member size 40mm x 18mm x 1.29mm@ 0.456kg/mt ,vertical member of size 40mm x 18mm x 1.29mm @ 0.456 kg/mt with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc complete for window.	Attached	

Item No.	Item of work	Item No.	Page No.
14	Finishing wall with weather proof exterior emulsion paint on wall surface(two coats) to give an required shape even shade after thoroughly brushing the surface to rempve all dirt, and remains of loose powdered materials etc complete.	Attached	
15	Distempering (Two coats) with oil bound distemper of approved brand and manufacture and of required shade on wall surface to give an even shade over and including a priming coat with distemper primer of approved brand and manufacture after thoroughly brushing the surface free from mortar dropping and other foreign matter and also including preparing the surface even and papered smooth	Attached	

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SPECIFICATIONS OF MATERIALS

1.1 Water shall not be salty brackish and shall be clean, reasonably clear and free objectionable quantities of silt and traces of oil injurious alkalies, salts, organic matter and other deleterious material which will either weaken the mortar of concrete or cause efflorescence or attack the steel in R.C.C. Container For transport, storage and handling of water shall be clean Water shall conform to the standard specified in I.S. :456-1978.

1.2 If required by the Engineer in charge it shall be tested by comparison with distilled water Comparison shall be made by means of standard cement tests for soundness time of setting ad mortar strength as specified in I.S. 269-1976. Any indication of unsoundness, charge in time of setting by 30 minutes or more or decrease of more than 10 per cent in strength of mortar pre appeared with water sample when compared with results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

1.3 Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during curing of those which produce objectionable stains of their unsightly deposits o concrete or mortar surfaces

1.4 Hard and bitter water shall not be used for curing

1.5 Potable water will generally found suitable curing mortar or concrete.

M-2 Lime.

2.1 Lime shall be hydraulic lime as per (I.S. 712-1973)Necessary tests shall be carried out as per I.S. 6932(parts I to X)1973.

2.2 The following field tests are to be carried out :

(1) A very rough idea can be formed about the type of lime by its visual examination i.e. fat lime bears pure white color, lime in for of porous lumps of dirty white color indicates quick lime and solid lumps are the un-burnt lime stone.

(2) Acid tests for determining the carbonate content in lime Excessive amount of impurities and rough determination of class of lime.

2.3 Storage shall comply with I.S. 712-1973. The slaked lime, if

stored shall be kept in a weather proof and damp-proof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged in any way shall be rejected and all rejected materials shall be removed from site of work.

2.4 Field testing shall be done according to I.S.1624-1974 to show the acceptability of materials.

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M-3 Cement.

3.1 Cement shall be ordinary Portland slag cement as per I.S. 269-1976 OR Portland slag cement as per I.S. 455-1976.

M-4 White Cement.

4.1 The white cement shall conform to I.S. 8042-E-1978.

M-5. Colored Cement

5.1 Colored cement shall be with white of grey Portland cement as specified in the item of the work.

5.2 The pigments used for colored cement shall be of approved quality and shall not exceed 10% of cement used in the mix. The mixture of pigment and cement shall be properly ground to have a uniform color and shade.

5.3 The pigments shall have such properties as to provide for durability under exposure to sunlight and weather. The pigment shall have the property such that it is neither affected by the cement nor detrimental to it.

M-6 Sand.

6.1 Sand shall be natural sand, clean, well graded, hard strong, durable and gritty particles free injurious amounts of dust, clay kankar nodules, soft or flaky particles shall, alkali salts organic matter, loam, mica or other deleterious substances and shall be got approved from the Engineer-in-Charge. The sand shall not contain more than 8 percent of silt as determined by field test. If necessary the sand shall be washed to make it clean.

6.2 Coarse Sand : The fineness modulus of coarse sand shall not be les than 2.5 and shall not exceed 3.0. The sieve analysis of coarse shall be as under :

I.S. Designation	Sieve passing sieve	Percentage by weight Designation	I.S. Sieve percentage by weight passing sieve.
4.75 mm.	100	600 Micron	30-100
2.36 mm.	90 to 100	300 Micron	5-70
1.18 mm.	70 to 100	150 Micron	0-50

6.3 Fine Sand :

The fineness modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as under :

I.S. Designation	Sieve passing sieve	Percentage by weight Designation	I.S. Sieve percentage by weight passing sieve.
4.75 mm.	100	600 Micron	40-85
2.36 mm.	100	300 Micron	5-50
1.18 mm.	75 - 100	150 Micron	0-10

M-7 Stone Dust

7.1 This shall be obtained from crushing hard black trap of equivalent. It shall not contain more than 8 % of silt as determined by field test will measuring cylinder. The method of determining silt contents by fields test is given as under.

7.2 A sample of stone dust to be tested shall be placed without drying in 200 mm. measuring cylinder. The quality of the sample shall be such that it fills the cylinder up to 100 mm. mark. The clean water shall be added up to 150 mm. mark. The mixture shall be stirred vigorously and the content allowed to settle for 3 hours.

7.3 The height of silt visible as settled layer above the stone dust shall e expressed as percentage of the height of the stone dust below. The stone dust containing more than 8 % silt shall be washed so as to bring the content within the allowable limit.

7.4 The fineness modules of stone shall not be less than 1.80.

M-8 Stone Grit.

8.1 Grit shall consist of crushed or broken stone and be hard, strong, dense, durable, clean of proper gradation and free from skin or coating likely to prevent proper adhesion of mortar. Grit shall generally be cubical in shape and as far as possible flakey elongated pieces shall be avoided. It shall generally comply with the provisions of I.S. 383-1970. unless special stone of particular quarries is mentioned grit shall be obtained from the bet black trap or equivalent hard stone as approved by the Engineer in charge. The grit shall have not deleterious with cement.

8.2 The grit shall conform to the following gradation as per sieve analysis :

I.S. Designation	Percentage by weight passing sieve.	I.S. Sieve Designation	Percentage by weight passing sieve.
12.50 mm.	100	600 Micron	0-20 %
10.00 mm.	85 - 100	300 Micron	0-25

8.3 The crushing strength of grit will be such as to allow the concrete in which it used to build up the specified strength of concrete.

8.4 The necessary tests for rit shall be carried out as per the requirements of I.S.2386-(PARTS-I TO VIII)1963, as per instructions of the Engineer in charge. The necessity of test will be decided by the Engineer in charge.

M-9 Cinder

9.1 Cinder is well burnt furnace residue which has been fused or sintered into lumps of varying sizes.

9.2 Cinder aggregates shall e well burnt furnace residue obtained from furnace using coal fuel only it shall be sound clean and free from clay, dirt, ash or other deleterious matter.

9.3 The average grading for cinder aggregates shall be as mentioned below :

I.S. Sieve Designation	Percentage passing sieve.	I.S. Sieve Designation	Percentage passing
20.00 mm.	100	4.75 mm.	70%
10.00 mm.	86	2.36 mm.	52%

M-10 Lime Mortar

10.1 Lime : Lime shall conform to specification M-2 Water shall conform to specification M-1 Sand. Sand shall conform to specification M-6.

10.2 Proportion of Mix :

10.2.1. Motor shall consist of such proportions of slaked lime and sand s may be specified I item. The slaked lime & sand shall be measured by volume.

10.3 **Preparation of mortar**

10.3.1 Lime mortar shall be prepared by wet process as per I.S. 1625-1971. Power driven mill shall be used for preparation of lime mortar. The slaked lime shall be placed in the mill in an even layer and ground for 180 revolutions with a sufficient water. Water shall be added as required during grinding (care being taken not to add more water) that will bring the mixed material to a consistency of stiff past. Thoroughly wetted sand shall the be added evenly and the mixture ground for another 180 revolutions.

10.4 Storage :

10.4.1 Mortar shall always be kept damp, protected from sun and rain till used up, covering it by tarpaulin or open sheds.

10.5 Use :

10.5.1. All mortar shall be used as soon as possible after grinding. It should be used on the day on which it prepared. But in no case mortar made earlier than 36 hours shall be permitted for use.

M-11 Cement Mortar

11.1 Water shall conform to specification M-1 Cement. Cement shall conform to specifications M-3 sand. Sand shall conform M-6.

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11.3 Proportion of Mortar :

11.3.1. In hand mixed mortar, cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogeneous, mixture of uniform color is obtained. Mixing platform shall be so arranged that no deleterious extraneous material shall get mixed with mortar or mortar shall flow out. While mixing the water shall be gradually added and thoroughly mixed to from a stiff plastic mass of uniform color so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed.

11.3.2 The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 min.

M-12 Stone Coarse Aggregate For Nominal mix Concrete.

12.1 Coarse aggregate shall be of machine crushed stone of black trap or equivalent and be hard strong dense, durable clean and free from skin and coating likely to prevent proper adhesion of mortar.

12.2 The aggregate shall generally be cudical in shape. Unless special stones of particular quarries are mentioned aggregates shall be machine crushed from the best black trap or equivalent hard stone as approved. Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement and ordinary reinforced cement concrete shall generally be as per the table given below. However, in case of reinforced cement concrete the maximum limit may be restricted to 6mm. less than the minimum lateral clear distance between bars or 6mm. less than cover whichever is smaller.

TABLE

I.S. Sieve Designations	Percentage passing for single Sized aggregates of Nominal size			I.S. Sieve Designation	Percentage passing for single Sized aggregates of Nominal size		
	40 mm.	20 mm.	16		40 mm.	20 mm.	16
	-	-	-	12.5 mm.	-	-	-
80 mm.	100	-	-	10 mm.	0.5	0.2	0.3
63 mm.	85-100	100	-	4.75 mm.	-	0.5	0.5
40 mm.	0-20	85-100	100	2.35 mm.	-	-	-
20 mm.		85-100			mm.		
16 mm.	mm.						

Note : This percentage may be varied some what by the Engineer in charge when considered necessary for obtaining better density and strength of concrete.

12.3 The grading test shall be taken in the beginning and at the change of source of materials. The necessary tests. Indicating I.S.:383-1970 and 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates. if the aggregates are covered with dust, they shall be washed with water to make them clean.

M-13 Black Trap or Equivalent Hard Stone Coarse

13.1 Aggregates For Design Mix Concrete : Coarse aggregate shall be of machine crushed stone of black trap of equivalent hard stone and be hard, strong, dense, durable, clean and free from kin and coating likely to prevent proper adhesion of mortar.

13.2 The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best, black trap or equivalent hard stones as approved. Aggregate shall have no deleterious with cement.

13.3 The necessary tests indicated in I.S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability of the material.

13.4 If aggregate is covered with dust it shall be washed with water to make clean.

M-14 Brick Bats Aggregates :

14.1 Brick bat aggregate shall be broken from well burnt or slightly over burnt and dense bricks. It shall be homogeneous in texture, roughly cubical in shape, clean and free from dirt of any other foreign material. The brick bats shall be of 40mm. 50 mm. size unless otherwise specified in the item. The under burnt of over burnt brick bats shall not be allowed.

14.2 The brick bats shall be measured by suitable boxes or as directed.

M-15 Bricks

15.1 The bricks shall be hand or machine moulded and made from suitable soils and kiln burnt. They shall be free from cracks and flaws and modules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform color.

The bricks shall be moulded with a frog of 100 mm. x 40 mm. and 10 mm. to 20mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.

15.2 The size of modular bricks shall be 190 mm. x 90 mm. x 90 mm.

15.3 The size of conventional bricks shall be as under :

(9" x 4 3/8" x 2 ¾")225 x 110 x 75 mm.

15.4 Only bricks of one standard size shall be used on one week. The following tolerance shall be permitted in the conventional size adopted in a particular work. Length + 1/8" (3.0 mm) Width + 1/16" (1.50 mm.) Height + 1/16" (1.50 mm.)

15.5 The crushing strength of the bricks shall not be less than 35 kg/sq. cm. The average water absorption shall not be more than 20 percent by weight Necessary tests for crushing strength and water absorption etc. shall be carried out as per I.S. 3495 (Part-I to IV)-1976.

M-16 Stone.

16.1 The stone shall be of the specified variety such as Granite/Trap Stone/Quartzite or any other type of good hard stones. The stones shall be only from defects like cavities, cracks, sand holes, flaws injurious veins, patches of loose or soft materials and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of day weight. When tested in accordance with I.S. 1124-1974. The minimum crushing strength of stone shall be 200 Kg./Sq. Cm. unless otherwise, specified.

16.2 The sample of the stone to be used shall be got approved before the work is started.

16.3 The khanki facing stone shall be dressed y chisel as specified in the item for khanki facing required shape and size. The face of the stone shall be so dressed that the bushing on the exposed face shall not project by more than 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface.

M-17 Laterite Stone.

17.1 Laterite stone shall be obtained from the approved quarry. It shall be compacted in texture sound, durable and free from soft patch. It shall have minimum crushing strength of 100 Kg./Sq. Cm. in its dry condition. It shall not absorb water more than 20% of its own weight, when immersed for 24 hours in water after quarrying, the stone shall be allowed to weather for some time before using in work.

17.2 The stone shall be dressed into regular rectangular blocks so that all faces are free from waviness and unevenness, and the edges true and square.

17.3 Those types of stone in which white clay occurs should not be used.

17.4 Special corner stones shall be provided where so directed.

M-18 Mild Steel Bars

18.1 Mild steel bars reinforcement for R.C.C. work shall conform I.S. 432(Part-II)1966 and shall be of tested quality. It shall also comply with relevant part of I.S. 456-1978.

18.2 All the reinforcement shall be clean and free from dirt, paint, grease, mill scale or loose or thick rust at the time of placing.

18.3 For the purpose of payment, the bar shall be measured correct up to 10 mm. length and weight payable worked out at the rate specified below.

1.	6 mm.	0.22 Kg./Rmt.	8.	20 mm.	2.47 Kg./Rmt.
2.	8 mm.	0.39 Kg./Rmt.	9.	22 mm.	2.98 Kg./Rmt.
3.	10 mm.	0.62 Kg./Rmt.	10.	25 mm.	3.85 Kg./Rmt.
4.	12 mm.	0.89 Kg./Rmt.	11.	28 mm.	4.83 Kg./Rmt.
5.	14 mm.	1.21 Kg./Rmt.	12.	32 mm.	6.31 Kg./Rmt.
6.	16 mm.	1.58 Kg./Rmt.	13.	36 mm.	7.99 Kg./Rmt.
7.	18 mm.	2.00 Kg./Rmt.	14.	40 mm.	9.86 Kg./Rmt.

M-19 High Yield Strength Deformed Bars

19.1 High yield strength steel deformed bars shall be either cold twisted other rolled and shall conform to I.S. 1786-1966 and I.S. 1139-1966 respectively.

19.2 Other provisions and requirements shall conform to specification No. M-18 for Mild Steel Bars.

M-20 High Tensile Steel Wires.

20.1 The high tensile wires for use in prestressed concrete work shall conform to I.S. 2090-1962.

20.2 The tensile strength of the high tensile steel bars shall be as specified in the item. In absence of the given strength the minimum strength shall be taken as per para 6-1 of the I.S. 1785-1962. Testing shall be done as per I.S. requirements.

20.3 The high tensile steel shall be free from loose mill scale, rust, oil, grease, or any other harmful matter. Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through a pressure box containing Carborundum.

20.4 The high tensile wire shall be obtained from manufactures in coils having diameter not less then 350 times the diameter of wire itself so that wire springs back straight on being uncoiled.

M-21 Mild Steel Binding Wire

21.1 The mild steel wire shall e of 1.63 mm. or 1.22 mm. (16 to 18 gauge) diameter and shall conform t I.S. 280-1972,

21.2 The use of black wire will be permitted for binding reinforcement bars. It shall be free from rust, oil paint, grease, loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar.

M-22 Structural Steel

22.1 All structural steel shall conform to I.S. 226-1985. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defect affecting the strength and durability. River bars shall conform to I.S. :1148-1973.

22.2 When the steel is supplied by the Contractor test certificate of the manufacturer shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

M-23. Galvanized Iron Sheets

23.1. The galvanized iron sheets shall be plain or corrugated sheets of gauges as specified in item. The G. I. Sheets shall conform to I.S. 277-1977. The sheets shall be undamaged in carriage and handling either by rubbing off of zinc coating or otherwise. The shall have clean and bright surface and shall be free from dents, bends, holes, rust white powdery deposit.

23.2. The length and width of G.I. sheets shall be as directed as per site condition.

M-23.A : G.I. Valleys gutter, ridges

23.A.2. Valleys gutters and flashings shall also be of galvanized sheet of thickness as specified in item. Valleys shall be 900 mm. wide overall and flashing shall be 380 mm. wide overall. They shall be bent to the required shape without damage to the sheet in the process of bending.

M-24. Asbestos Cement Sheets

24.1. Asbestos cement sheets plain, corrugated of semi corrugated shall conform to I.S. 459-1970. The thickness of the sheets shall be as specified in the tem. The sheets shall be free from all defects such as cracks, holes, deformities chipped edges or otherwise damaged.

24.2. Ridges & Hips :

24.2.1. Ridges and hips shall be of same thickness as that of A.C. sheets. The types, of ridges shall be suitable for the type of sheets and location.

24.2.2. Other accessories to be used in roof such as flashing pieces eaves filler pieces, valley gutters, northern light and ventilator curves, barge boards etc. shall be of standard manufacture and shall be suitable for the type of sheets and location.

M-25. Manglore Pattern Roof Tiles

25.1. The Mangalore pattern tiles shall conform to I.S. 654-1972 for Class AA or Class A type as specified in item. Samples of the tiles to be provided shall be got approved from the Engineer-in-Charge. Necessary tests shall be carried out as directed.

M-26. Shuttering.

26.1. The shuttering shall be either of wooden planking of 30 mm. minimum thickness with or without steel lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical ballies properly cross braced together so as to make the centering rigid. In places of bullie props, brick pillar of adequate section built in mud mortar may be used.

26.2. The form work shall be sufficient strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men work in over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall permit leakage of cement grout.

26.3. If at any stage of work during or after placing concrete in the structure the form work sags or bulges out beyond the required shape of the structure. The concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete from work shall b got inspected by and got approved form the Engineer in charge, before the reinforcement bars are placed in position.

26.4. The props shall consist to bullies having 100 mm. min. diameter measured at mid length and 80 mm. at thin end shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm. thick and min. bearing area of 0.10 sq. m. laid on sufficiently hard base.

26.5. Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jet king the concrete.

26.6. The timber used in shuttering shall not be dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planed on the sides and the surface coming in contact with concrete. Wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.

26.7. As far as practicable clambs shall be used to hold the forms together and use of nails and spikes avoided.

26.8. The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacture may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface under no circumstances black or burnt oil shall be permitted.

26.9. The shuttering for beams and slabs shall have camber of 4 mm. per meter (1 in 250) or as directed by the Engineer in charge so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be 1/50 of the projected length or as directed by the Engineer in charge.

M-27. Expansion Joints- Pre-molded filler

27.1. The item provides for expansion joints filler shall not get deformed or broken by twisting bending or other handling when exposed to atmospheric condition. Pieces roof joints filler that have been damaged shall be rejected.

27.3. Thickness of the pre-molded joints filler shall be 25 mm. unless otherwise specified.

27.4. Pre-molded bituminous joints filler shall conform to I.S. 1838-1961.

M-28. Expansion joints-copper strips and hold fasts

28.1. The item provide for expansion joints in R.C.C. frame structure for internal joints, as well as exposed joints, with the use of pre-molded bituminous joints filler.

28.2. Copper sheet shall be of 1.25 mm. width and or 1.25 mm. width and the "U" shape in the middle. Copper strip shall have holdfast of 3mm. diameter copper rod fixed to the plate soldered on strip at intervals of about 30 cm. r as shown in the drawing or as directed. The width of each flange (horizontal side) of the copper plate to be embedded in the concrete work shall be 25 mm depth of "U" to be provided in the expansion joint, in the copper plate shall be of 25 mm.

M-29. Teak wood

29.1. The teak wood shall be of good quality as required for the item to be executed. When the kind of wood is not specially mentioned, good Indian teak wood as approved shall be used.

29.2. Teak wood shall generally be free from large, lose dead or cluster knots flaws shakes, warps, twists, bends or any other defects. It shall generally be uniform in substance and of straight fibers as far as possible. It hall be free from not decay, harmful fungi and other defects of harmful nature which will affect the strength, durability or its usefulness for the purpose for which it is required. The color shall be uniform as far as possible. Any effort like paining using any adhesive materials made to hide the defects shall render the pieces liable to rejection by the Engineer in charge.

29.3. All scantlings, planks etc., shall be sawn in straight lines and planes in the direction of grains and of uniform thickness.

29.4. The tolerances in the dimensions shall be allowed at the rates of 1.5 mm. per face to be planed.

29.5. First class teak wood shall have no individual hard and sound knots, more than 6 sq. cm in size and the aggregate area of such knots shall not be more than 1 % of area of piece. The timber shall be closed grained.

29.6. Second Class Teak Wood :

29.6.1. No individual hard and sound knots shall be more than 15 sq. cms. in size and aggregates area of such knots shall be not exceed 2 % of the area of piece.

M-29. A Non-teak wood :

The non teak wood shall be chemically treated, seasoned as per I.S. Specifications and of good quality. The type of wood shall be got approved before collecting the same on site Fabrication of wooden members shall be started only after approval.

For this purpose wood of Bio, kalai, Sires Saded Behda, Jamun, Sisoo will be used for door where as only Kalai, Sires, Halda, Kalam etc. will be permitted for shutters after proper seasoning and chemical treatment.

The non teak wood shall be free from large, loose dead of cluster knots, flows, shakes, warps, bends or any other defects. Its shall be uniform in substance and of straight fibers as far as possible. It shall be free from rots, decay, harmful fungi and other defects of nature which will effect the strength, durability or its usefulness for the purpose for which it is required. The color of wood shall be uniform as far as possible. The scantalings planks etc. shall be saw in straight lines and planes in the direction of grain and of uniform thickness. The department will use the Agency to produce certificate from Forest Department in event of dispute and the decision of the department shall be final and binding to the contractor. The tolerance in the dimension shall be allowed at 1.5 mm. per face to be planed.

M-30. Wooden flush door shutters (solid core)

30.1. The solid core type flush door shutters shall be of decorative or non decorative type as specified in the drawing. The size and thickness of the shutter shall be as specified in drawings or as directed. The timber species for core shall be as specified in drawings or as directed. The timber species for core shall be used as per I.S. 2202(Part-1)1980. The timber shall be free from decay and insect attack, knots and knot holes less than half the width of cross section of the members in which they occur may be permitted. Pitch pockets, pitch streaks and harmless pin holes shall be permissible except in the exposed edges of the core members. The commercial plywood cross-bands shall conform to I.S. 303-1275.

30.2. The face panel of the shutters shall be formed by gluing by the the hot press process on both faced the core with either plywood or cross-bands and face veneers. The hopping rebating opening of glazing venation etc., shall be provided if specified in the drawing.

30.3. All edges of the door shutters shall be square. The shutters shall be free from twist or warp in its plane. Both faces of the shutters shall be sand papered to smooth even texture.

30.4. The shutters shall be tested for-

(1) End immersion test : The test shall be carried out as per I.S. 2202-(Part-1)1980. There shall be not delamination at the end of the test.

(2) Knife Test : The face panel when tested in accordance with I.S. 1659-1979 shall pass the test.

(3) Glue adhesion test : The flush door shall be tested for glue adhesive testi in accordance with I.S. 2202(part-1)1980. The shutters shall be considered to have passed the test if no delamination occurs in the glue lines in the plywood and if no single delamination more than 80 mm. in length and more than 3 mm. in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured corner shall be measured continuously around the corner. Delamination at the knots, knot hole and other permissible wood defects shall not be considered in assessing the sample.

Deputy Executive Engineer
Panchayat R.&B. Sub Division
SAVARKUNDLA

30.5. The tolerance in size of slid core type flush door shall be as under :

In Nominal thickness ±1.2 mm. In Nominal height ± 3 mm.

30.6. The thickness of the shutter shall be uniform throughout with a permissible variation of not more than 0.8 mm. when measured at any two points.

M-31. Aluminum doors, windows ventilators

31.1. Aluminum alloy used in the manufacture of extruded window sections shall conform to I.S. DESIGNATION HEA-WP of I.S. 733-1975 and also to I.S. Designation WVG-WP of I.S. 1285-1975. The section shall be as specified in the drawing and design. The fabrication shall be done as directed.

31.2. The hinges shall be cast or extruded aluminum hinges of same type as in window but of larger size.

31.3. The hinges shall normally be of 50 mm. projecting type Non-projecting type of hinges may also be used if directed. The handles of door shall be of specified design. A suitable lock for the door operable either from outside or inside shall be provided in double shutter door, the first closing shutter shall have concealed aluminum alloy bolt at top and bottom.

M-32.Rolling Shutters

32.1. The rolling shutters shall conform to I.S. 6248-1979. Rolling shutters shall be supplied of specified type with accessories. The size of the rolling shutters shall be specified in the drawings. The shutters shall be specified in the drawings. The shutters shall be constructed with interlocking path sections formed from cold rolled steel strips not less than 0.9 mm. thick and 80 mm. wide for shutters up to 3.5 m. width not less than 1.25 mm. thick and 80 mm. wide for shutters 3.5 m. in width and above unless otherwise specified.

32.2. Guide channels shall be of mild steel deep channel section and of rolled pressed or built up (fabricated)joinless construction. The thickness of sheet used shall not be less than 3.15 mm.

32.3. Hood covers shall be made of M.S. Sheets not less than 0.90 mm. thick. For shutters having width 3.5 Meter and above, the thickness of M.S. sheet for the hood cover shall not be less than 1.25 mm.

32.4. The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire of strip of adequate strength to balance the shutters in all position. The spring pipe shaft etc. shall be supported on strong M.S. of malleable C.I. brackets. The brackets shall be fixed on or under the lintel as specified with crawl plugs and screws bolts etc.

32.5. The rolling shutters shall be of self rolling up to 8 sq. m. clear area without ball bearing and up to 12 sq. m clear area with ball bearing. If the rolling shutters are of larger, then gear operated type shutters shall be used.

32.6. The locking arrangement shall be provided at the bottom of shutter at both ends. The shutters shall be opened from outside.

32.7. The shutters shall be completed with door suspension shafts, looking arrangements pulling hooks, handles and other accessories.

M-33.Collapsible Steel Gate

33.1. The collapsible steel gate shall be in one or two leaves and size as per approved drawings or as specified. The gate shall be fabricated from best quality mild steel channels, flates etc. Either steel pulleys or ball bearings shall be provided in every double channel. Unless otherwise specified the particulars of collapsible gate shall be as under. :

(a) Pickets : These shall be of 20 mm. M.S. channels of heavy sections unless otherwise shown on drawings. The distance centre to centre of pickets shall be 12 cms. with an opening or 10 cms.

(b) Pivoted M.S. flats shall be 20 mm. x 6 mm.

(c) Top and bottom guides shall be from tee or flat iron of approved size.

(d) The fittings like stoppers fixing, locking cleats, brass handles and cast iron rollers shall be of approved design and size.

M-34. Welded Steel Wire Fabric

34.1. Welded steel wire fabric for general purpose shall be manufactured from cold drawn steel wire. "as draw" or galvanized steel conforming to I.S. 226-1975. With longitudinal and transverse wire securely connected at every intersection by a process of electrical resistance welding and conforming to I.S. 4948-1974. It shall be fabricated and finished in workmanlike manner and shall be free from injurious defects and shall be rust proof. The type of mesh shall be oblong or square as directed. The mesh sizes and sizes if wire for square as well as oblong welded steel wire fabric shall be as directed. The steel wire fabric in panels shall be in one whole piece I earth panel as far as stock sizes permit.

M-37. Plywood

37.1. The plywood for general purpose shall conform I.S. 303-1975.

Plywood is made by cementing together then boars or sheets of wood into panels. There are always an odd number of layers 3,5,7,9, ply etc. The plies are placed so that grain of each layer is at right angles to the grain in the adjacent layer.

37.2. The chief advantages of plywood over a single board of the same thickness is the more uniform strength of the plywood, along the length and width of the plywood and greater resistance to cracking and splitting with change in moisture content.

37.3. Usually synthetic resins are used to gling, phenolic regions are usually cured in a hot press which compresses and simultaneously heats the plies between hot plates which maintain a temperature of 90 degree C to 140 degree C and a pressure of 11 to 14 kg./sq. Cm. on the wood. The time of heating may be anything from 2 to 60 minutes depending upon thickness.

37.4. When water glue are used the wood absorbs so much water that the finished plywood must be dried carefully. When synthetic rsigns are used as adhesive the finished plywood must be exposed to an atmosphere of controlled humidity until the proper amount of moisture has been absorbed.

37.5. According to I.S. 303-1975 the plywood for general purpose shall be of the grades namely BWR and CWR, depending up to the adhesives used for bonding the veneers, and it will be further classified into six types namely AA,AB, AC,BB, BC and CC based on the quality of the two faces each face being of three kinds namely A, B & C after pressing, the finished plywood should be reconditioned to a moisture content not less than 8 percent and not more than 16 %.

37.6. Thickness of plywood Boards

TABLE

Board	Thickness	Board	Thickness	Board	Thickness	Board	Thickness
3 ply.	3 mm.	5 ply	5 mm.	7 ply	9 mm.	9 ply	16 mm.
	4 mm.		6 mm.		13 mm.		19 mm.
	5 mm.		7 mm.		16 mm.	11 ply.	19 mm.
	6 mm.		8 mm.	9 ply.	13 mm.		25 mm.

M-38. Glass.

38.1. All glass shall be of the be if quality, free from specks, bubbles, smokes veins, air holes blister, and other defects. The kind of glass to be used shall be as mentioned in the item or specification or in the special provision or as shown in detailed drawings. Thickness of glass panes shall be uniform. The specifications for different kinds of glass shall be as under.

Deputy Executive Engineer
Panchayat R.&B. Sub Division
SAVARKUNDLA

38.2. Sheet Glass

38.2.1. In absence of any specified thickness or weight in the item or detailed specifications of the item of work, sheet glass shall be weighing 7.5 Kg/Sq. m. for panes up to 600 mm. x 600mm.

38.2.2. For panes larger than 600 mm. x 600 mm. and up to 800 mm. x 800 mm. the glass weighing not less than 8.75 Kg/Sq. m. shall be used for bigger panes up to 900 mm. x 900 mm. glass weighing not less than 8.75 Kg./Sq. m. shall be used. For bigger panes up to 900 mm. x 900 mm. glass weighing not less than 11.25 Kg. / Sq. m. shall be used

38.2.3. Sheet glass shall be patent flattened glass of best quality and for glazing and framing purposes shall conform to I.S. 1762-1960. Sheet glass of the specified colors shall be used. If so shown, on detailed drawings or so specified. For important buildings and for panes with any dimension over 900 mm. plate glass of specified thickness shall be used.

38.3. Plate Glass :

38.3.1. When plate glass is specified it shall be "polished patent plate glass" of best quality. It shall have both the surface ground flat and parallel and polished to obtain clear undisturbed vision and reflection. The plate glass shall be of the thickness mentioned in the item or as shown in the detailed drawing or as specified. In absence of any specified thickness, the thickness of plate glass to be supplied shall be 6 mm. and a tolerance of 0.20 mm shall be admissible.

38.4. Obscured Glass :

38.4.1. This type f glass transmits light so that vision is partially or almost completely obscured. Glass shall be plain rolled, figured, ribbed of fluted or frosted glass as may be specified as required. The thickness and type of glass shall be as per details on drawings or as specified or as directed.

38.5. Wired Glass:

38.5.1. Glass shall be with wire netting embedded in a sheet of planet glass. Electrical welded 13 mm. Georgian square mesh shall be used. Thickness of glass shall not be less than 6 mm. Wired glass shall be of type and thickness as specified.

M-39. Acrylic Sheets

39.1. Acrylic sheets shall be of thickness as specified in the item and of an specified shape and size as the case may be panels may be flat or curved. It should be light in weight. It shall be colorless or colored or opaque as specified in the item. Colorless sheet shall be as transparent as the finest optical glass. Its light transmission rate shall be about 95 % Transparency shall not be affected for the sheets of larger thickness. It shall be extremely resistant to sunlight weather and low temperatures.

It shall not sow any significant yellowing or change in physical properties or loss of light transmission over a longer period of use. The sheet shall be impact resistant also sheets should be of such quality that they can be cut bent jointed as desired. Solution for the joints shall be used as per the requirement of manufacturer.

M-40. Particle board

40.1. The particle boards used for face panels shall of best quality free from any defects. The particle boards shall be made with phenomaldehyde adhesive. The particle boards shall conform I.S. 3087-1965 "Specification for wood particle board for general purpose". The size and the thickness shall be as indicated.

M-41. Expanded polystyrene or framed sty roper slabs.

41.1. The expanded polystyrene ceiling boards and tiles shall be of approved make and shall be of sizes, thickness, finish and color as indicated. It shall be of high density and suitable for use as insulating material. The insulating material shall be like slab of thermo Cole etc.

M-42. Resign bonded fiber glass

42.1. Resign bonded fiber glass tiles or rolls shall be of approved make and shall be of sizes thickness, and finish as indicated.

42.2. For test of Mineral wool thermal insulation Blanket I.S. 3144-1965 shall be **followed.**

42.3. Insulation wool blanket shall be with the following coverings on one or both sides as indicated. :

(1) Bituminised hessain Kraft paper suitable for use in position where moisture has to be excluded.

(2) Hessian cloth or Kraft paper, for keeping out dust.

(3) G. I. wire netting, suitable for sources to be plastered over.

M-43. Fixture and fastenings

43.1. General :

43.1.1. The fixtures and fastenings, that is butt hinges tee and strap **hinges steel door bolts, tower bolts, door latch, bath room latch, handles, door** stopper, casement window fasteners, casement stays and ventilators catch shall be made of the metal as specified in the item or its specification.

Deputy Executive Engineer
Panchayat R.&B. Sub Division
SAVARKUNDLA

43.1.2. They shall be of iron, brass, aluminum chromium plated iron, chromium plated brass copper oxidized iron, copper oxidized brass or anodized aluminum as specified.

43.1.3. The fixtures shall be heavy medium or light type. The fixtures and fastenings shall be smooth finished and shall be such as will ensure ease of operations.

43.1.4. The samples of fixtures and fastenings shall be got approved as regards, quality and shape before providing them in position.

43.1.5. Brass and anodized aluminum fixtures and fastenings shall be bright finished.

43.2. Holdfasts :

43.2.1. Holdfasts shall be mad from mild steel flat 30 cm. length and one of the holdfasts shall be bent at right angle and two nos. of 6 mm. diameter holes, shall be made in it for fixing it to the frame with screws. At the other end, the holdfast shall be 'forked and bent at right angles in opposite directions.

43.3. Butt hinges :

43.3.1. Railway standard heavy type butt hinges shall be used when so specified.

43.3.2. Tee and strap hinges shall be manufactured from M.S. Sheet.

43.4. Steel door bolts (Aldrops):

43.4.1. The aldrops as specified in the item shall be used and shall be got approved.

43.5. Tower bolts (Barrel Type):

43.5.1. Tower bolts as specified in the item shall be used and shall be got approved.

43.6. Door Latch :

43.6.1. The size of door latch shall be taken as the length of latch.

43.7. Bathroom Latch :

43.7.1. Bathroom latch shall be similar to tower bolt.

43.8. Handle : The size of the handles shall be determined by the inside grip length of the handles. Handles shall have a base plate of length 50 mm. more than the size of the handle.

43.9. Door Catch :

43.9.1. Door catch shall be fixed at a height of about 900 mm. from the floor level such that one part of the catch is fitted on the inside of the shutter and the other part is fixed in the wall with necessary wooden plug arrangements for appropriate fixity. The catch shall be fixed 20 mm. inside the face of the door for easy operation of catch.

43.10. Door Stoppers :

43.10.1. Door stoppers shall be either floor door stopper type or door catch type. Floor stopper shall be of overall size as specified and shall have a rubber cushion.

43.11. Wooden Door Stop with hinges :

43.11.1. Wooden door stop of size 100 mm. x 60 mm. x 40 mm. shall be fixed on the door frame with a hinges of 75 mm. size and at a height of 900 mm. from the floor level. The wooden door stop shall be provided with 3 coats of approved oil paint.

43.12. Casement Window Fastener :

43.12.1. Casement window fastener for single leaf window shutter shall be left or right handled as directed.

43.13. Casement stays (Straight Ped Stay):

43.13.1. The stays shall be made from a channel section having three holes at appropriate position so that the window can be opened either fully or partially as directed. Size of the stay shall be 250 mm. to 300 mm. as directed.

43.14. Ventilator Catch :

43.14.1. The pattern and shape of the catch shall be as approved.

43.15. Pivot :

43.15.1. The base and socket plate shall be made from minimum 3 mm. thick plate and projected pivot shall not be less than 12 mm. diameter and 12 mm. length and shall be firmly riveted to the base plate in case of iron pivot and in single piece plate in the case of brass pivot.

M-44. Paints :

44.1. (A) Oil paints :

44.1.1. Oil paints shall be of the specified color and as approved. The ready mixed paints shall only be used. However, if ready mixed paint of specified shade or tint is not available white ready mixed paint with approved Steiner will be allowed. In such a case, the contractor shall ensure that the shade of the paint so allowed shall be uniform.

44.1.2. All the paints shall meet with the following general requirements :

(i) Paints shall not show excessive setting in a freshly opened ful can and shall easily be redispressed with a paddle to a smooth homogeneous state. The paint shall show no curding, livering, caking or color separation and shall be free from lumps and skins.

(ii) The paint shall not skin within 48 hours in a three quarters filled closed container.

(iv) The paint shall dry to a smooth uniform finish free from roughness, grit unevenness and other imperfections.

44.1.3. Ready mixed paint shall be used exactly as received from the manufacturers and generally according to their instructions and without any admixtures whatsoever.

44.2. (B) Enamel paints :

44.2.1. The enamel paint shall satisfy in general requirements in specification of oil paints. Enamel paint shall conform to I.S. 2933-1975.

M-45. French Polish

45.1. The French polish of required tint and shade shall be prepared with the below mentioned ingredients and other necessary materials.

(i) Denatured spirit of approved quality (ii) Chandras (iii) Pigment.

45.2. The French polish so prepared shall conform to I.S. :348-1968.

M-46. Marble chips for marble mosaic terrazzo

46.1. The marble chips shall be of approved quality and shades. It shall be hard, sound, dense and homogeneous in texture with crystalline and coarse grains. It shall be uniform in color and free from stains cracks, decay and weathering.

46.2. The size of various colors of marble chips ranging from the smallest up to 20 mm shall be used where the thickness of top wearing layer is 6 mm. size. The marble chips of approved quality and colors only as per grading as decided by the Engineer-in-charge shall be used for marble mosaic tiles or works.

46.3. The marble chips shall be machine crushed. They shall be free from foreign matter, dust etc. Except as above, the chips shall conform to I.S. 2114-1962.

M-47. Flooring Tiles.

47.1.(A) Plain Cement tiles :

47.1.1. The plain cement tiles shall be of general purpose type. These are the tiles in the manufacture of which no pigments are used. Cement used in the manufacture of tiles shall be as per Indian Standards.

47.1.2. The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During manufacture the tiles shall be subjected to pressure of not less than 140 Kg. /Sq. Cm.

The proportion of cement to aggregate in the backing of the tiles shall be not less than 1 :3 by weight. The wearing face, through the tiles are of plain cement, shall be provided with stone chips of 1 to 2 mm. size. The proportions of cement to aggregate in the wearing layer of the tiles shall be three parts of cement to one parts of chips by weight. The minimum thickness of wearing layer shall be 3 mm. The color and texture of wearing layer shall be uniform throughout its face and thickness. On removal from mold, the tiles and shall be kept in moist condition continuously at least for seven days and subsequently, if necessary, for such long period as would ensure their conformity to requirements of I.S. 1237-1980 regarding strength resistance to wear and water absorption.

47.1.3. The wearing face of the tiles shall be plane, free from projections, depressions and cracks and shall be reasonably parallel to the back face of the tile. All angles shall be right angle and all edges shall be sharp and true.

47.1.4. The size of tiles generally be square shapes 24.85 Cm. x 24.85 Cm. or 25 Cm. x 25 Cm. The thickness of tiles shall be 20 mm.

47.1.5. Tolerance of length and breadth shall be ±1 mm. tolerance of thickness shall be ±5mm.

47.1.6. the tiles shall satisfy the tests as regards transverse strength resistance to wear and water absorption as per I.S. 1237-1980.

47.2.(B) Plain Colored Tiles :

47.2.1. The tiles shall have the same specification as for plain cement tiles as per (A) above expect that they shall have a plain wearing surface wherein pigments are used. They shall conform the I.S. 1237-1980.

47.2.2. The pigments used for coloring cement shall not exceed 10 % by weight of cement uses in the mix. The pigments, synthetic or otherwise, used for coloring tiles shall have permanent color and shall not contain materials detrimental to concrete.

47.2.3. The color of the tiles shall be specified in the item or as directed.

47.3.(C) Marble mosaic tiles :

47.3.1. These tiles have same specification as per plain cement tiles except the requirements as stated below.

47.3.2. The marble mosaic tiles shall conform to I.S. 1237-1980. The wearing face of the tiles mechanically ground and filled. The wearing face of tiles shall be free from projections depressions and cracks and shall be reasonably parallel to the back face of the tiles. All angles shall be right angles and all edges shall be sharp and true.

47.3.3. Chips used in the tiles be from smallest up to 20 mm. size. The minimum thickness of wearing layer of tiles shall be 6 mm. For pattern of chips to be had on the wearing face, a few samples with or without their full size photographs as directed shall be approved by the Engineer In Charge for approval.

47.3.4. Any particular samples if found suitable shall be approved by the Engineer in charge or he may ask for a few more samples to be presented. The samples shall have to be made by the contractor till a suitable sample is finally approved for use in the work. The contractor shall ensure that the tiles supplied for the work shall be in conformity with the approved sample only, in terms of its dimensions, thickness of backing layer and wearing surface, materials, ingredients, color, shade, chips, distribution etc. required.

47.3.5. The tiles shall be prepared form cement conforming to Indian Standards or colored Portland cement generally depending upon the color of tiles to be used or as directed.

47.4.(D) Chequered Tiles :

47.4.1. Chequered tiles shall be plain cement tiles or marble mosaic tiles. The former shall have the same specification as per (A) above and the latter as per marble mosaic tiles as per (C) except as mentioned below.

47.4.2. The tiles shall be of nominal size 250 mm. x 250 mm. or as specified. The center to center distance of chequer shall not be less than 25 mm. and not more than 50 mm. The overall thickness of the tile shall be 22 mm.

47.4.3. The grooves in the chequers shall be uniform and straight. The depth of the grooves shall not be less than 3 mm. The chequered tiles shall be plain colored or mosaic as specified. The thickness of the upper layer measured from the top of the chequers shall not be less than 6 mm. The tiles shall be given the first grinding with machine before delivery to site.

47.4.4. Tiles shall conform or relevant I.S. 1237-1980.

47.5.(E) Chequered Tiles For Stair Cases :

47.5.1. The requirements of these tiles shall be the same as chequered tiles as per (D) above except following respects :

(1) The length of a tile including note shall be 300 mm. (2) The minimum thickness shall be 28 mm. (3) The nosing shall have also the same wearing layer as at the top. (4) The nosing edge shall be rounded. (5) The front portion of the tile for a minimum length of 75 mm. from and including the nosing shall have grooves running parallel to nosing and at centers not exceeding 25 mm. Beyond that the tiles shall have normal chequer pattern.

M-48. Rough Kotah Stone

48.1. The kotah stones shall be hard even sound and regular in shape and generally uniform in color. The color of the stone shall generally be green. Brown colored shall not be allowed for use. They shall be without any soft veins, cranks of flaws.

48.2. The size of the stones to be used for flooring shall be of size 600 mm. x 600 mm. and/or size 600 mm. x 40 mm. as directed. However smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be as specified.

48.3. Tolerance of minus 30 mm. on accounts of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be ± 3 mm.

48.4. The edge of stones shall be truly chiseled and table rubbed with coarse sand before paving. All angles and edges of the stones of shall be true, square and free from chipping and surface shall be true and plain.

48.5. When machine cut edges are specified, the exposed and the edges at joints shall be machine cut. The thickness of the exposed machine cut edges shall be uniform.

M-49. Polished Kotah Stones

49.1. Polished Kotah stone shall have the same specification as per rough kotah stone except as mentioned below.

49.2. The stones shall have machine polished surface. When brought on site, the stones shall be single polished or double polished depending upon its use. The stones for paving shall generally be single polished. The stones to be used for dedo, skirting, sink, veneering, sills, steps etc. where machine polishing after the stones are fixed in situ is not possible shall be double polished.

M-50. Dholpur Stone Slab

50.1. Dholpur stone slab shall be of best quality as approved by the Engineer in charge. The stone slab shall be without any veins, cracks and flaws. The stone slab shall be even sound and durable regular in shapes and of uniform color.

50.2. The size of the stone shall be a specified in the item or detailed drawing or as approved by the Engineer-in-charge. The thickness of the stone shall be as specified in the item of work with the permissible tolerance of ±2 mm. The provision in respect of polishing as for polished kotah stone shall apply to polished Dholpur stone also. All angles and edges of the face of the stone slab shall be fine chiseled or polished as specified in the Item of work and all the four edges shall be machine cut. All angles and edges of the stone slab shall be true and plane.

50.3. The sample of stone shall be got approved by the Engineer in Charge for a particular work. It shall be ensured that the stones to be used in a particular work shall not differ much in shade or tint from the approved sample.

M-51 Marble Slab

51.1. Marble slab shall be white or of other and of best quality as approved by the Engineer in charge.

51.2. Slabs shall be hard, close, uniform and homogeneous in texture. They shall have even crystalline grain and free from defects and cracks. The surface shall be machine polished to an even and perfect plane surface and edges machine cut true and square. The rear face shall be rough to provide key for the mortar.

51.3. Marble slabs with natural veins, if selected shall have to be laid as per the pattern given by the Engineer in charge. Size of the slab shall be minimum. 460 mm. x 450 mm.and preferably 600 mm. x 600 mm. However smaller sizes will be allowed to be used to the extent of maintaining required pattern.

51.4. The slab shall not be thinner than the specified thickness at its thinnest part A few specimen of finished slab to be used shall be deposited by the Contractor in the officer for reference.

51.5. Except as above the marble slab shall conform to I.S. 1130-1969.

M-52 Granite Stone slab

52.1. Granite shall be of approved color and quality. The stone shall be hard, even sound and regular in shape and generally uniform in color. It shall be without any soft veins, cracks of flaws.

52.2. The thickness of the stone shall be specified in items.

52.3. All exposed faces shall be double polished to tender truly smooth and even reflecting surface. The exposed edges and corners shall be rounded off as directed. The exposed edges shall be machine cut and shall have uniform thickness.

M-53. P.V.C. Flooring

53.1. P.V.C. sheets for P.V.C. floor covering shall be of homogeneous flexible type conforming to I.S. 3462-1966. The PVC covering shall neither develop any toxic effect while put to use not shall give off any disagreeable odor.

53.2. Thickness of flexible type covering tiles shall be as specified in the description of the item.

53.3. The flexible type shall be backed with Hessian or other woven fabric. The following tolerances shall be applicable on the nominal dimensions of the rolls or tiles.

(a) Thickness ±0.15 mm.

(b) Length or Width

(1) 300 mm. Sqr. Tiles ±0.20 mm. (3) 900 mm. Sqr. Tiles ±0.60 mm.

(2) 600 mm. Sqr. tiles ±0.40 mm. (4) Sheets and roll ±0.10 mm.

53.4. Adhesive :

53.4.1. The adhesive for PVC flooring shall be of the type and make recommended by the manufactures of PVC sheets/tiles.

M-54. Facing Tiles

54.1. The facing tiles (burnt clay facing bricks) shall be free from cracks and nodules of free lime. They shall be thoroughly burnt and shall have plane rectangular faces with parallel sides and sharp straight right angle faces. The texture of the finished surface that will be exposed when in place shall conform to an approved sample consisting not less than for stretcher bricks each representing the texture desired. The facing tiles shall have a pleasing appearance, sufficient resistance to penetration by rain and greater durability than common bricks. The tiles shall conform to I.S. 2691-1972.

54.2. The standard size of facing brick tiles shall be 19 x 9 x 4 cms. The facing brick tiles shall be provided with frog which shall conform to I.S. 11077-1976.

54.3. The permissible tolerance in dimensions specified above shall be as follows.

Size	Tolerance for	
	1 st. class Brick	2 nd. class Brick
Length	±6 mm.	±10 mm.
Width	±3 mm.	±7 mm.
Height	±1.5 mm.	±3 mm.

The tolerance for distortion or war page of face or individual brick from a plane surface and from straight line respectively shall be as follows :

Facing dimensions	Permissible tolerance.
Max. below 19 cms.	Max 2.5 mm.
-Do- above 19 mm.	Max 3.0 mm.

54.5. The average compressive strength obtained as a sample of five tiles when wetted in accordance with the procedure laid as per I.S. 1077-1976 shall be not less than 175 Kg./Sq. Cm.

54.6. The average water absorption for five bricks tiles shall not exceed 12 percent of average weight of brick before testing. The absorption for each individual bricks shall not exceed 25%

54.7. The brick tiles when tested in accordance with I.S. 1077-1976 the rate of efflorescence shall not be more than "Slightly effloresced".

M-55. White glazed tiles

55.1. The tiles shall be of best quality as approved by the engineer in charge. They shall be flat and true to shape. They shall be free from cracks, crazing sports, chipped edges and corners. The glazing shall be of uniform shade.

55.2. The tiles shall be nominal size of 150 mm. x 150 mm. unless otherwise specified. The maximum variation the stated sizes. Other than the thickness of tile shall be ±1.5 mm. The thickness of tile shall be 6 mm. Except as above the tiles shall conform to I.S. 1977-1970.

M-56 Galvanized iron pipes and fittings

56.1. Galvanized iron pipes shall be of the medium type and or required diameter and shall comply with I.S. 1239-1979. The specified diameter of the pipes shall refer to the inside diameter of the bore. Clamps, screw and all galvanized iron fittings shall be of the standard 'R' or equivalent make.

M-57. Bib cock and stop cock

57.1. A bib cock is a draw off tap with a horizontal inlet and free outlet. A stop cock is a valve with a suitable means of connection for insertion in a pipe line for controlling or stopping the flow.

57.2. They shall be of screw down type and or brass chromium plated and of diameter as specified in the description of the item. They shall conform to I.S. 781-1977 and they shall be of best Indian make. They shall be polished bright.

57.3. The minimum finished weight of bib cock and stop cock shall be as given below :

Diameter	Bib cock	Stop cock	Diameter	Bib cock	Stop cock
15 mm.	0.25 Kg.	0.25 Kg.	6 mm.	0.40 Kg.	0.40 Kg.
20 mm.	0.30 Kg.	0.35 Kg.	6 mm.	0.75 Kg.	0.75Kg.

M-58. Gun metal wheel valve

58.1. The gun metal wheel valve shall be of approved quality. These shall be of gun metal fitted with wheel and shall be of gate valve opening full way and of the size as specified. These shall conform to I.S. 778-1971.

M-59. White glazed porcelain wash basin

59.1. Wash basin shall be of white porcelain first quality best Indian make and it shall conform to I.S. 2556(Part-IV)-1972 and I.S. 771-1979. The size of the wash basin shall be as specified in the item. Wash basin shall be of one piece construction with continued over flow arrangements. All internal angles shall be designed so as to facilitate cleaning. Wash basin shall have single tap hole or two holes as specified. Each basin shall have a circular waste hole which is either riveted or beveled internally with 65 mm. diameter at to and 10 mm. depth to suit the waste fitting. The necessary stud slot to receive the bracket on the under side of the basin shall be provided. Basin shall have an internal soap holder recess which shall fully drain into the bowl.

59.2. White glazed pedestal of the quality and color a that to the basin shall be provided where specified in the item. It shall be completely recessed at the back for reception of supply and wash pipe. It shall be capable of supporting the basin rigidly and adequately and shall be so designed as to make the height from floor to floor top of the rim of basin 750 mm. to 800 mm. as directed.

M-60. European type water closet/with low flushing.

60.1. The European type water closet shall be white glazed porcelain first quality and shall be of wash down type conforming to I.S. 2556-1973 and I.S. 771-1979.

60.2. 'S' trap shall be provided as required with water seal not than 50 mm. The solid plastic seat and cover shall be of best Indian make conforming to I.S 2548-1980. They shall be made of molded synthetic materials which shall be tough and hard with high resistance to solvents and shall be free from blisters and surface defects and shall have chromium plated brass hinges and rubber buffer of suitable size.

M-61.Orissa type water closet

61.1. The Specification of Orrissa type white glazed water closet of first quality shall conform to I.S. 2256(Part-III)-1981 and relevant specification of Indian type water closet except that pan will be with the integral squattig pan of size 580 mm. x 440 mm. with raised foot rest.

M-62. Indian type water closet

62.1. The Indian type white glazed water closet of first quality shall be of size as specified I the item and conforming to I.S. 771-1979 and I.S. 2556-(Part-II)1981. Each pan shall have integral flushing. It shall have an inlet at black an or front for connecting flush pipes as directed. The inside of the bottom of the pan shall have sufficient slope from the front towards the outlet and surface shall be uniform and smooth. Pan shall be provided with 100 mm. diameter 'p' or 's' trap with approximately 50 mm. Water seal and 50 mm. diameter vent horn.

M-63. Glazed Earthen Ware Sink

63.1. The glazed earthen ware sink shall be of specified size, color and quality. They sink shall conform to I.S. 771(part-II)1979. The brackets for sinks shall conform to I.S. 775-1970.

63.2. The pipes shall conform to I.S. 1239-(part-I)1973 and I.S. 404-1962 for steel and lead pipes respectively 32 mm. brass waste coupling of standard pattern with brass chain and rubble plug shall be provided with sink.

M-64.Glazed earthen ware Lipped type flat back urinal/corner type urinal

64.1. The lipped type urinal shall be flat back or corner type as specified in the item and shall conform to I.S. 771-1979. It shall be of best Indian make and size as specified and approved by the Engineer in charge. The flat back of corner type urinal must of 1st quality free from any defects, cracks etc.

M-65. Low level Enemal flushing tank

65.1. The low level enemal flushing tank shall be of 15 litres capacity. It shall conform I.S. 774-1971. The flushing cistern shall be of best quality and free from any defects. The flushing tank shall have outlet 32 mm. diameter. The outlet shall be connected with W.C. pan by lead pipe or P.V.C. as specified. The flushing tank shall be provided with inlet and outlet for fixing G.I. inlet pipes and over flow pipes. The flushing cistern shall be provided with chromium plated handle for flushing. The flushing tank shall be provided with bracket of cast iron so that it can be fixed on wall at specified height. The brackets shall conform to I.S. 775-1970.

M-66.Cast iron flushing cistern.

66.1. The cast iron flushing cistern shall be of 15 liters capacity. It shall conform to I.S. 774-1971. The flushing cistern shall be of best quality and free from any defects. The flushing cistern shall have outlet of 32 mm. dia. The lead pipe shall conform to I.S. 404(part-I)-1962. For fixing G.I. inlet pipes and overflow pipe 20 mm. dia. inlet and outlet shall be provided. The flushing cistern shall be provided with galvanized iron chain and pull of sufficient length and shall be got approved from the Engineer in charge. The cast iron flushing cistern shall be painted with one coat of anti corrosive paint and two coats of paints. The flushing cistern shall be fixed on two C.I. brackets. The C.I. brackets shall conform to I.S. 775-1970.

M-67. Flush cock.

67.1. Half turn flush cock (Heavy weight) shall be of gun metal chromium plated of dia. as specified in the description of the item. The flush cock shall conform to relevant Indian Standard.

M-68. Cast iron pipes and fittings.

68.1. All soil, water, vent and antisyphonage pipes and fitting shall conform to I.S. 1729-1964. The pipes shall have spigot and socket ends with head on spigot end. The pipes and fitting shall be true to shape smooth, cylindrical, their inner and outer surfaces being as nearly as practicable concetric. They shall be sound and nicely cast and shall be free from cracks, laps, pinholes or the imperfection and shall be neatly dressed and carefully fetteled.

68.2. The end of pipes and fittings shall be reasonable sqr. to their axis.

68.3. The sand of cast iron pipes shall be of the diameter as specified in the description and shall be in length of 1.5 M., 1.8 m. including socket ends of the pipe unless shorter lengths are either specified or required at junctions etc. The pipes and fittings shall be supplied without ears unless specified or directed otherwise.

68.4. Tolerances :

68.4.1. The Standard weight and thickness of pipes shall be as shown in the following table.
A tolerance up to -10% may however be allowed against these standard weights.

Sr. No.	Nominal dia of bore	Thickness	Overall 1.5 m. long	Weight of pipe 1.8 m. long.	Excluding ears 2 m. long.
1.	75 mm.	5.0 mm.	12.38 Kg.	16.52 Kg.	18.37 Kg.
2.	100 mm.	5.0 mm.	18.44 Kg.	21.67 Kg.	24.15 Kg.

68.4.2. A tolerance up to 15 % in thickness and 20 mm. length will be allowed. For fittings tolerance in lengths shall be plus 25 mm. and minus 10 mm.

68.4.3. The thickness of fittings and their socket and spigot dimensions shall conform to the thickness and dimensions specified for the corresponding sizes of straight pipes. The tolerance in weights and thickness shall be the same as straight pipes.

M-69. Nanhi Trap

69.1. Nahni trap shall be of cast iron and shall be free from propority or other defects which affect serviceability. The thickness of the base metal shall not be less than 6.5 mm. The surface shall be smooth and free from craze, chips and other flaws or any other kind of defects which affect serviceability. The size of nahni trap shall be specified and shall be of self cleaning design.

69.2. The nahni trap shall be of quality approved by the Engineer in charge and shall generally conform to the relevant Indian Standards.

69.3. The Nahni trap provide shall be with deep seal, min. 50 mm. except at places where trap with deep seal can not be accommodated. The cover shall be cast iron perforated cover shall be provided on the trap of appropriate size.

M-70. Gully Trap

70.1. Gully trap shall conform to I.S. 651-1980. It shall be one free from defects such as fire cracks or hair cracks. The glaze of the traps shall be free from crazing. They shall give a sharp clear note when struck with light hammer. There shall be no broken blisters.

70.2. The size of the gully trap shall be as specified in the item

70.3. Each gully trap shall have one C.I. grating of square size corresponding to the dimensions, of inlet of gully trap. It will also have a water tight C.I. cover with frame inside dimensions 300 mm. x 300 mm. the cover with frame inside dimensions 300 mm. x 300 mm. the cover and weighing not less than 4.53 Kg. and the frame not less than 2.72 Kg. The grating cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

M-71.Glazed Stone Ware pipe and Fittings

71.1. The pipes and fittings shall be of best quality as approved by the Engineer in charge. The pipe shall be of best quality manufactured from stone-ware of fire clay, salt glazed thoroughly burnt through the whole thickness, of a close even texture, free from air blows, fire blisters, cracks and other imperfections, which affect the serviceability. The inner and outer surfaces shall be smooth and perfectly glazed. The pipe shall be capable to withstand pressures or 1.5 M. lead without showing sign of leakage. The thickness of the wall shall not be less than $1/12^{th}$ of the internal dia. The depth of socket shall not be less than 38 mm. The socket shall be sufficiently large to allow a join of 6 mm. around the pipe.

71.2. The pipes shall generally conform to relevant I.S. 651-1980.

M-72. Wall Peg Rail

72.1. The aluminum wall peg rail shall have three aluminum pegs approved quality and size. It shall be fixed on teakwood plank of size 450 mm. x 75 mm. x 20 mm. The teakwood shall be French polished or oil painted as specified.

M-73. G.I. Water Spot

73.1. The G.I. pipes of 40 mm. dia. shall be of medium quality and specials shall be of 'R' brand or a equivalent brand of best approved quality.

73.2. The pipe shall have length as required for the thickness of will in which it is **fixed, and at outside end tee and bend cut at half the length shall be provided** and at other end coupling shall be provided to have better fixing. The water spout shall be provided as per detailed drawing or as directed.

M-74 Asbestos Cement pipe(A.C. pipe)

74.1. The asbestos cement pipe of diameter as specified in the description of the item shall conform to I.S. 1626-1980. Special like bends, shoes, cowls etc. shall conform to relevant Indian Standards. The interior of pipe shall have its smooth finish, regular, surface and regular internal dia. The tolerance in all dimensions shall be as I.S. 1626-(part-I)1980.

M-75. Cyrdon Ball valve

75.1. Ball valve of screwed type including polythene float and necessary level etc. shall be of the size as mentioned in the description of item and shall conform to I.S. 1703-1977.

M-76. Bitumen Felt For Water proofing And Damp Proofing

76.1. Bitumen felt shall be on the fibre bases and shall be of type 2 self finished felt grade 2 and shall conform to I.S. 1322-1970.

M-77. Selected Earth.

77.1. The selected earth shall be that obtained from excavated material or shall have to be brought from outside as indicated in the items. If item does not indicate anything the selected earth shall have to be brought from outside.

77.2. The selected earth shall be good yellow soil and shall be got approved from the Engineer in Charge. In no case black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and trees from all rubbish and perishable materials, stones or brick bats. The clods shall be broken to a size of 50 mm. or less. Contractor shall make his own arrangement at his own cost for land for borrowing selected earth. The stacking of material shall be done as directed by the Engineer in charge in such a way not to interfere with any constructional activities and in proper stacks.

77.3. When excavated material is to be used, only selected stuff got approved from the Engineer in charge shall be used. It shall be stacked separately and shall comply with all the requirements of selected earth mentioned above.

M-78 Barbed Wire

78.1. The barbed wire shall be of galvanized steel and it shall generally conform to I.S. 278-1978. The barbed wire shall be of type I whose nominal diameter for line wire shall be 2.5 mm. and point wire 2.24 mm. The nominal distance between two barbs shall be 75 mm. unless otherwise specified in the item. The barbed wire shall be formed by twisting together two line wires. One containing the barbs. The size of the line and point wires and barb spacing shall be as specified above. The permissible deviation from the nominal diameter of the line wire and point wire shall not exceed ±0.08 mm.

78.2. The barbs shall carry four points and shall be formed by twisting two point wires, each two turns, lightly round one line wire, making altogether four complete turns. The barbs shall have a length of not less than 13 mm. and not more than 18 mm. The point shall be sharp and cut at an angle not greater than 35 degree of the axis of the wire forming the barbs.

78.3. The line and point wires shall be circular in section, free from scale and other defects and shall be uniformly galvanized. The line wire shall be in continuous length and shall not contain any welds other than those in the rod before it is drawn. The distance between two successive splices shall not be less than meters.

78.4. The lengths per 100 Kg. of barbed wire I.S. type-I shall be as under.

Nominal 1000 meter Minimum 934 Meter Max. 1066 M.

SPECIFICATIONS

Item No.01 Dismentaling the existing structure including removing and stacking the dismentelled materials as and where directed. (A) R.C.C. work

202. DISMANTLING CULVERTS, SMALL BRIDGES, PAVEMENTS AND OTHER STRUCTURES

202.1. Scope

This work shall consist of removing, as hereinafter setforth, existing culverts, bridges, pavement, kerbs and other structures, like, railings, fences, utility services, manholes, catch basins, inlets etc., which are in place but interfere with the new construction or are not suitable to remain in place. It shall include salvaging and disposing of the resulting materials and backfilling the resulting trenches and pits.

Existing culverts, bridges, pavement and other structures which are within the road land and which are designated for removal, shall be removed upto the limits and extent specified in the drawings or as directed by the Engineer.

Dismantling and removal operations shall be carried out preferably with locally available tools and equipments and in such a manner as to leave undisturbed adjacent pavement, structures and any other work to be left in place. Use of specialized tools and equipments by the agency shall be incidental to this item.

All operations necessary for the removal of any existing structure which endanger new construction shall be completed prior to the start of new work.

202.2. Dismantling Culverts and Small Bridges

The structures shall be dismantled carefully and the resulting materials so removed as not to cause any damage to the serviceable materials to be salvaged, the part of the structure to be retained and any other properties or structures or utilities nearby.

Unless otherwise specified, the superstructure portion of culverts/bridges shall be entirely removed and other parts removed below the ground level or as necessary depending upon the interference they cause to the new construction. Removal of

overlying or adjacent material, if required in connection with the dismantling of the structures, shall be incidental to this item.

Where existing culverts/bridges are to be widened / strengthened or otherwise incorporated in the new work, only such part or parts of the existing structure shall be removed as are necessary for execution of work shown in drawings to provide a proper connection to the new work. The connecting edges shall be cut, chipped and trimmed to the required lines and grade without weakening or damaging any part of the structure to be retained. Due care should be taken to ensure that reinforcing bars which are to be left in place so as to project into the new work as dowels or ties are not damaged during removal of concrete and protected against rusting or corrosion.

Pipe culverts shall be carefully removed in such a manner as to avoid damage to the pipes.

Steel structures shall be carefully dismantled in such a manner as to avoid damage to members thereof, if the structure is to be removed in a condition suitable for re-erection as specified in the drawings or directed by the Engineer. All members shall be match marked with white lead paint by the Contractor before dismantling. All loose parts like pins, nuts, loose plates, etc. shall be securely wired to adjacent members or packed in boxes with proper markings for the ease of identification at the time of re-erection of the structure at later stage.

Timber structures shall be removed in such a manner as to avoid damage to such timber or lumber as is designated by the Engineer to be salvaged after joint inspection by the Engineer and the Contractor or their authorized representatives.

202.3. Dismantling Pavement and Other Structures

In removing pavements, kerbs, gutters, and other structures, like, railings, fences, manholes, catch basins, inlets, etc. where portions of the existing construction are to be left in the finished work, the same shall be removed to an existing joint or cut and chipped to a true line with a face perpendicular to the surface of the existing structure. Sufficient removal shall be made to provide for proper grades and connections with the new work as directed by the Engineer.

Concrete pavements, base courses in carriageway and shoulders, etc. designated for removal shall be broken to pieces and stock piled at designated

locations or as directed by the Engineer, if the material is to be used later or otherwise, the Contractor shall arrange for disposal as stipulated in Clause 202.5.

202.4. Backfilling

Holes and depressions caused by dismantling operations shall be backfilled with excavated or other approved materials and compacted to required density conforming to these specifications, or as directed by the Engineer.

202.5 Disposal of Materials

All materials, obtained by dismantling, shall be the property of Government. Unless otherwise specified, materials having any salvage value shall be placed in neat stacks of like materials within the right-of-way, as directed by the Engineer with all lifts and upto a lead of 1000 m.

Pipe of culverts which are removed shall be cleaned and neatly piled on the right-of-way at spots designated by the Engineer with all lifts and lead upto 1000 m.

Structural steel removed from old structures shall, unless otherwise specified be stored in a neat and presentable manner in blocks at locations suitable for loading.

Timber or lumber salvaged from old structures shall have all nails and bolts removed therefrom and shall be stored in neat piles in locations suitable for loading in the right-of-way.

All materials obtained from dismantling operations which cannot be used or auctioned shall be disposed off as directed by the Engineer with all lifts and upto a lead of 1000 m.

202.6. Acceptance

Acceptance of dismantling and removal of salvaged material shall be based on visual inspection of the work and backfilling and compaction shall comply the tests specified for such work in these Specifications.

202.7. Measurements for Payment

The work of dismantling structures shall be paid for in units indicated below by taking measurements before and after, as applicable:

(i)	Dismantling brick/stone masonry/concrete (Plain and reinforced)	cu.m.
(ii)	Dismantling flexible and cement concrete pavement	cu.m.
(iii)	Dismantling steel structures	tonne
(iv)	Dismantling pipes, guard rails, kerbs, gutters and fencing	Linear m
(v)	Utility services	Nos./linear m

202.8. Rate

The Contract unit rates for the various items of dismantling including utility services shall be paid in full for carrying out the required operations including all labour, materials tools, equipment, safeguards and incidental expenditure for the satisfactory completion of the work. These rates will also include excavation and backfilling where necessary to the required compaction and for handling, salvaging, piling and disposing of the dismantled materials within all lifts and upto a lead of 1000 m.

Item No.02 Providing and laying ordinary cement concrete1:1.5:3 (1cement,1.5sand, 3 gradedstone aggregates 20 mm.Nominal size) and finishing smooth with curing etc. complete including the cost of formwork but excluding the cost of reinforcement of R.C.C. work in Column (iii) Having cross-sectional area more than 0.085 Sq.M. and up to 0.12Sq.M.

1.0. Materials

Water shall conform to M-1, cement shall conform to M-3, sand shall conform to M-6, Grit shall conform to M-8, Graded stone aggregate 20 mm. nominal size shall conform to M-12.

2.0. General

2.1. The concrete mix is not required to be designed by preliminary testes. The proportion of the concrete mix shall be 1:2:4(1 cement : 2 coarse sand : 4 graded stones aggregate 20 mm. nominal size) by volume concrete shall have exposed concrete surface or as specified in the item.

2.2. The designation ordinary M-100, M-150, M-200, M-250 specified as per I.S. correspond approximate to 1:3:6, 1:2:4, 1:1 ½ : 3 and 1:1:2 nominal mix of ordinary concrete by volume respectively..

2.3. The ingredients required for ordinary concrete containing one bag of cement of 50 kg. by weight (0.0342 Cu. M.) for different proportions of mix shall be as under.

Grade of concrete.	Total quantity of dry aggregate by volume per 50 kgs. Of cement to be taken as the sum of individual volume of fine	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 kgs. Of cement maximum.

	and coarse aggregates, maximum		
1	2	3	4
M-100(1:3:6)	300 Liters	Generally 1 :2 for line aggregate	34 Liters
M-150(1:2:4)	220 Liters	To coarse aggregateby vol.	32 Liters
M-200(1 :1 ½ 3)		160 but subject to an upper limit	30 Liters
M-250(1:1:2)	100 Liters	Of 1 :1 ½ and lower limit	1:327 Liters

2.4. The water cement ratios shall not be more than specified in the above table. The cement content of mix specified in the table shall be increased if the quantity of water in mix has to be increased to overcome the difficulties of placements and compaction so that the water cement ratio specified in the table is not exceeded.

2.5. Workability of the concrete shall be controlled by maintaining a water cement ratio that is found to give a concrete mix which is just sufficient wet to be placed and compacted without difficulty with the measure available.

2.6. The max. size of course aggregate shall be as large as possible within the limits specified but in no case greater than one forth of the minimum thickness of the member provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

2.7. For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.

2.8. For heavily reinforced concrete members as in the case of ribs of main beams, the nominal max. size of coarse aggregate should usually be restricted to 5 mm. less than the min. clear distance between the main bars, or 5 mm. less than the min. cover to the reinforcement whichever is smaller.

2.9. Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be so important, and the nominal max. size may some times be as great as or greater than min. cover.

2.10. Admixture may be used in concrete only with approval of Engineer in charge based upon the evidence that with passage of time neither the compressive strength of concrete is reduced not are other requisite qualities f concrete and steel impaired by the use of such admixture.

3.0. Workmanship

3.1. Proportioning : Proportioning shall be done by volume, except which shall be measured in item of bags of 50 kg. weight, the volume of one such bag being taken as 0.0342 cu. Meter. Boxes of suitable size shall be used for measuring sand aggregate. The size of boxes (internal)shall be 35x25 cms. And 40cms. Deep while measuring the aggregate and sand the boxes shall be filled without shaking ramming or hammering. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand, allowances for bulk age shall be made.

3.2. Mixing :

3.2.1. For all work, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and so maintained throughout the construction. Measured quantity of aggregate, sand and cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After half

a minute of dry mixing measured quantity of water require for eache batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be continued till materials are uniformly distributed and uniform color of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

3.2.2. When hand mixing is permitted by the Engineer in charge for small jobs or for certain other reasons, it shall be done on the smooth water tight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water flow out. Cement in required number of bags shall be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly be turning over to get a mixture to uniform color. Specified quantity water shall then be added gradually through a rose can and themass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increased by 10 percent above that specified.

3.2.3. Mixers which have been out of use for more than 30 minutes shall thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer in charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

3.3. Consistency :

3.3.1. The degree of consistency which shall depend upon the nature of the work methods of vibration of concrete, shall be determined by regular slum tests in accordance with I.S. 1199-1939. The slump of 10 mm. to 25 mm. shall be adopted when vibrators are used and 80 mm. when vibrators are not used.

3.4. Inspection :

3.4.1. Contractor shall give the Engineer in charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men machinery, materials and for results obtained. Immediately before concreting all form shall be thoroughly cleaned.

3.4.2. Centering design and its erection shall be got approved from the engineer in charge. One carpenter with helper shall invariably by kept present throughout the period of concreting. Movement of labor and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

3.5. Transporting and laying :

3.5.1. The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place. All form work shall be cleaned and made free from sanding water dust, show or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the engineer in charge has been obtained.

3.5.2. Concreting shall proceed continuously over the area between construction joints. Fresh concrete proper contraction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the engineer in charge, concrete shall be deposited in horizontal layers to compacted

depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.

3.5.3. Unless otherwise agreed to by the Engineer in charge concrete shall be dropped in to place from height exceeding 2 meters. When trucking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, the concrete mix itself. The 13 mm. layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all lateness shall be removed by scrubbing the wet surface with wire be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete too be placed on this surface shall not exceed 150 mm. in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.

3.5.4. All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators unless otherwise permitted by the Engineer in charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipemet is always available in the even of breakdowns. Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form and even surface. Compaction shall be completed before the initial setting sats i.e. within 30 min. of addition of water to dry mixture. During compaction it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

3.6. Curing.

Immediately after compaction, concrete weather including rain, running water, shocks vibration traffic rapid temperatures changes, frost and drying out process. It shall be covered with wet sacking has Sian or other similar absorbent material approved, soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

3.7. Sampling and testing of Concrete :

3.7.1. Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days of 28 days as per requirements in accordance with I.S. 526-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Qty. of concrete in the work	No. of Samples	Qty. of concrete in the work	No. of Samples
1-5 cmt.	1	16-30 cmt.	3
6-15 cmt.	2	31-50 cmt.	4
51 and above	4± one additional for each additional 50 mm. or part thereof.		

Note : At least one sample shall be taken from each shift. Ten test specimens shall be made from each sample, five for testing at 7 days and remaining five at 28 days. The samples of concrete shall be taken on each day of concreting as per above frequency. The number of specimens may be suitable increased as deemed necessary by the Engineer

in charge when procedure of test given reveals a poor quality of concrete and in other special cases.

3.7.2. The average of the group of cubes cast for each day shall not be less than the specified cube strength of 150 kg./Cm² at 28 days 20 % of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85 % of the specified strength. If the concrete made in accordance with the proportions given for a particular grade does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however be placed in a higher grade on the ground that the test strength are higher then the min. specified.

FOR CONCRETE WORKS IN BEAM/ COLUMN/ SLAB/ STAIR STINGER ARE TO BE TESTED FOR FOLLOWING TEST IN PRESENCE OF ENGINEER IN CHARGE.

9.11 Rebound hammer test

The rebound hammer of a spring controlled mass that slides on a plunger within a tubular housing. the impact energy required for rebound hammers for different application is given in Table

SI.No.	Application	Approximate Impact Energy Required foe the rebound Hammers (Nm)
i)	For Testing normal weight concrete	2.25
ii)	For Light-weight concrete or small and impact sensitive parts of concrete.	0.75
iii)	For test mass concrete for example in road, air fields pavement and hydraulic structures	30.00

Ultrasonic pulse velocity test (UPV)

The apparatus for Ultrasonic pulse velocity measurement shall consist of following:
a) Electrical pilse generator,
b) Transducer-one pair,
c) Amplifier, and
d) Electronic timing device

Acceptence criteria for concrete quality grading

SI.No.	Pulse velocity by cross probing (kg/Sec)	Cement concrete quality grading
1	Above 4.5	Excellent
2	3.5 to 4.5	Good
3	3.0 to 3.5	Medium
4	Below 3.0	Doubtful

Note: In case of "doubtful" quality it may be necessary to carried out further tests of core test.

Core test

The points from which cores are to be taken and number of cores required shall be at the discretion of the engineer-in-charge and shall be representative of the whole of concrete concerned. In no case, however, shall fewer than three cores be tested.
Cores shall be prepared and tested as described in IS 516.

Concrete in the member represented by a core test shall be considered acceptable if the average equivalent cube strength of the cores is equal to at least 85 percent of the cube strength of the grade of concrete specified for the corresponding age and no individuall core has a strength less than 75 percent.

3.8. Stripping :

3.8.1. The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike the form work. While fixing the time of removal of formwork, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete and of the materials used in the mix. In normal circumstance(generally where temperatures are above 20 º C) and where ordinary concrete is used, forms may be struck after expire or periods specified in item No. 9.1.(A) for respective item of form work.

3.8.2. All formwork shall be removed without causing any shock or vibration as would damage the concrete. Before the soft and struts are removed, the concrete surface shall be gradually exposed, where necessary in order to ascertain that concrete to take stresses due to its own weight uniformly and gradually and uniformly lowered in such a manner as to permit the or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25mm. cover to the finished concrete surface. Where it is intended to reuse the formwork, it shall be cleaned and made good to the satisfaction of the Engineer in charge. After removal of form work and shuttering the Executive Engineer shall inspect the work and satisfy by random checks that concrete produced is of good quality.

3.8.3. Immediately after the removal of forms, all exposed bolts etc. passing through the cement concrete member and used for stuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 m below the surface of the concrete and the resulting holes be filled by cement mortar. All fins caused by form joints all cavities produced by the removal of form tiles and all other holes and depressions, honeycomb spots, broken edges or corners and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar f cement and fine aggregate mixed in proportions used inn the grade of concrete that is being furnished and of as dry consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure through filling in all voids. Surface which are pointed shall be kept moist for period of 25 hours. If rock pockets/honeycombs in the opinion of the Engineer in charge are of such an extent or character as to effect strength of the structure materially of to endanger the life f the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of structure affected.

4.0. Mode of measurement & Payment

4.1. The consolidated cubical contents of concrete work as specified in item shall be measured. NO deduction shall be made for (a) Ends of dis-similar materials such as joints, beams, posts, girders, falters, purling trusses, corbels and steps etc. up to 500 sq. cm. in section.

4.2. The rate includes cost of all materials labor, tools and plant required for mixing, placing in position vibrating and compacting, finishing, as directed, curing and all other incidental expenses for producing center of specified strength. The rate excludes the cost of formwork.

4.3. The rate shall be for a unit of one cubic meter

Item No.03 Providing & laying C.C. 1:11/2:3 (1 cement ,11/2 course sand,3 graded stone agg.of 20 mm nominal size) and finishing smooth with curring etc. comp. incl. the cost of formwork but excl. the cost of reinforcement for R.C.C. work in. (A) Beam :- Having cross sectional Area 0.085 to 0.12 Sqm.upto floor all level

SPECIFICATION SHALL APPLY AS PER ABOVE ITEM NO.02 FOR M-200 BEAM

Item No.04 Brickwork using common burnt clay building brick shaving crushing strength not less than 35 Kg/Sqcm. in super structure Upto floor two level in cement mortar 1:6(1 Cement ; 6 Fine sand)

1.0. Materials

Water shall conform to M-1, Cement shall conform to M-3, sand shall conform to M-6, Brick shall conform to M-15, Cement mortar shall conform to M-11.

1.0. Workmanship

2.1 Proportion :

2.1.1. The proportion of cement mortar shall be 1:6 or 1 : 6 (1 cement : 6 fine sand) by volume.as specified

2.2. Wetting of bricks :

2.2.1. The bricks required for masonry shall be thoroughly wetted with clean water for about two hours before use or as directed. The cessation of bubbles, when the bricks are wetted with water is as indication of through wetting of bricks.

2.3. Laying :

2.3.1. Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete to bond ; closures in such case shall be cut to required size and used near the ends of walls.

2.3.2. A layer of mortar shall be spread on full width for suitable length of the lower course. Each bricks shall first be property bedded and set some by gently tapping with handle of trowel or wooden mallet. Its inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of course the vertical joints shall be fully filled from the top with mortar.

2.3.3. The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate curse shall generally be directly one over the other. The thickness f brick course shall be kept uniform.

2.3.4. The brick shall be laid with frog up wards. A set of tools comprising of wooden straight edges, man son's spirit level, square half meter rub, and pins string and plumb shall be kept on the site of work for frequent checking during the progress of work.

2.3.5. Both the faces of walls of thickness greater than 23 cms. Shall be kept in proper place. All the connected brick work shall be kept not more than one meter over the rest of the work. Where this is not possible, the work shall be raked back according to bond(and not left toothed)at an angle not steeper than 45 degrees.

2.3.6. All futures, pipes, outlets of water, hold fasts of doors and window etc. which are require to be built in wall hall be embedded in cement mortar.

2.4. Joints

2.4.1. Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exposed 12 mm. The face joints shall be raked out as directed by raking tools daily during the progress of work, when the mortar is still in green so as to provide key for plaster of pointing to done.

2.4.2. The face of brick shall be cleaned the very day on which the work is laid and all mortar dropping removed.

2.5. Curing :

2.5.1. Green work shall be protected from rain suitable. Masonry work shall be kept moist on all the faces for a period of seven days. The top of masonry work shall be kept well wetted at the close of the day.

2.6. Preparation of foundation bed :

2.6.1. If the foundation is to be laid directly on the excavated bed, the shall be leveled, cleared of all loose materials, cleaned and wetted before stating masonry, if masonry is to be laid on concrete footing, the top of concrete shall be cleaned and moistened. The contractor shall obtain the engineer's approval for the foundation bed before foundation masonry is started. When pucca flooring is to be provided flush with the top to plinth, the inside plinth offset shall be kept lower than the outside plinth top by the thickness of the flooring.

3.0. Mode of measurement & Payment.

3.1. The measurement of this item shall betaken for the brick masonry fully completed I foundation up to plinth the limiting dimensions not exceeding those shown on the plinths or as directed shall be final. Battered tapered and curved portions shall be measured net.

3.2. No deduction shall be made from the quantity of brick work, for any extra payment made for embedding in masonry of making holes in respect of following items :

(1) Ends of joists, beams, posts, girders, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500 sq. Cm.

(2) Openings not exceeding 1000 Sq. Cm.

(3) Wall plates and bed plates, bearing of slabs, chhajas and the like whose thickness does not exceed 10 Cms. And the bearing does not extend to the full thickness of wall.

(4) Drainage holes, and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.

(5) Iron fixtures, pipes up to 300 m. dia; hold fasts, and doors and windows built into masonry and pipes etc. for concealed wiring.

(6) Forming chases of section not exceeding 350 Sq. Cm. in masonry

3.3. Apertures for fire place shall not be deducted or shall be paid for separately.
3.4. The rate shall be for a unit of one cubic meter.

Item No.05 Providing & laying ordinary C.C. 1:1 1/2:3 (1 cement ,1 1/2 course sand, 3 graded stone agg. of 20 mm nominal size)and for R.C.C. LINTELS incl. Finishing smooth with curring of formwork but excl. the cost of reinforcement.for upto Floor all level.

SPECIFICATION SHALL APPLY AS PER ABOVE ITEM NO.02 FOR M-200 LINTEL

Item No.06 Providing & laying cement concrete 1:11/2:3 (1 cement ,11/2 course sand,3graded stone agg.of 20 mm nominal size) for rein-forcement concrete CHHAJJAS not exceeding 10cm. thickness upto floor two level incl. finishing the exposed surface with C.M. 1:3 (1 cement ,3 fine sand) to give a smooth and ever surface, centering, formwork and curring comp.Excl. the cost of reinforcement.above plinth Upto floor all level.

SPECIFICATION SHALL APPLY AS PER ABOVE ITEM NO.02 FOR M-200 CHHAJJAS

Item No.07 Providing & laying ordinary cement concrete1:11/2:3 (1 cement ,11/2 course sand,3 graded stone agg.of 20 mm nominal size) exposed work with curring etc.comp. incl. the cost of formwork but excluding the cost of reinforce ment for R.C.C. work in. SLAB :- having more then 10cm. and end upto 13cm. thickness.upto floor all level

SPECIFICATION SHALL APPLY AS PER ABOVE ITEM NO.02 FOR M-200 SLAB

Item No.08 Thermo Mechanically treated bar F.F.415 Steel reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor all level.

DESCRIPTION
This work shall consist of furnishing and placing coated or uncoated mild steel or high strength deformed reinforcement bars (un tensioned) of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer.

MATERIALS
Steel for reinforcement shall meet with the requirements of Section 1000.

TABLE 1000 – 3

Grade Designation	Bar type conforming to governing IS Specification	Characteristic Strength Mpa	Elastic Modulus GPa

S 240	IS : 432 Part IMild Steel Bar	240	200
S 415	IS : 1786 High Yield Strength Deformed Bars (HYSD)/TMT	415	200

Reinforcements may be either mild steel/medium tensile steel or high strength deformed bars/ TMT. They may be uncoated or coated with epoxy or with approved protective coatings.

PROTECTION OF REINFORCEMENT

Uncoated reinforcing steel shall be protected from rusting or chloride contamination. Reinforcements shall be free from rust, mortar, loose mill scale, grease, oil or paints. This may be ensured either by using reinforcement fresh from the factory or thoroughly cleaning all reinforcement to remove rust using any suitable method such as sand blasting, mechanical wire brushing, etc., as directed by the Engineer. Reinforcements shall be stored on blocks, racks or platforms and above the ground in a clean and dry condition and shall be suitably marked to facilitate inspection and identification.

Portions of uncoated reinforcing steel and dowels projecting from concrete, shall be protected within one week after initial placing of concrete with a brush coat of neat cement mixed with water to a consistency of thick paint. This coating shall be removed by lightly tapping with a hammer or other tool not more than one week before placing of the adjacent pour of concrete. Coated reinforcing steel shall be protected against damage to the coating. If the coating on the bars is damaged during transportation or handling and cannot be repaired, the same shall be rejected.

BENDING OF REIFORCEMENT

Bar bending schedule shall be furnished by ,the Contractor and got approved by the Engineer before start of work.

Reinforcing steel shall conform to the dimensions and shapes given in the approved Bar BendIng Schedules.

Bars shall be bent cold to the specified shape and dimensions or as directed by the Engineer using a proper bar bender, operated by hand or power to obtain the correct radii of bends and shape.

Bars shall not be bent or straightened in a manner that will damage the parent material or the coating.

Bars bent during transport or handling shall be straightened before being used on work and shall not be heated to facilitate straightening.

PLACING OF REINFORCEMENT

a)The reinforcement cage should generally be fabricated in the yard at ground level and then shifted and placed in position. The reinforcement shall be placed strictly in accordance with the drawings and shall be assembled in position only when the structure is otherwise ready for placing of concrete. Prolonged time gap between assembling of reinforcements and casting of concrete, which may result in rust formation on the surface, shall not be permitted.

b)Reinforcement bars shall be placed accurately in position as shown on the drawings. The bars, crossing one another shall be tied together at every intersection with binding wire (annealed), conforming to IS:280 to make the skeleton of the reinforcement rigid such that the reinforcement does not get displaced during placing of concrete, or any other operation. The diameter of binding wire shall not be less than I mm.

c) Bars shall be kept in position usually by the following methods:

(i) In case of beam and slab construction, industrially produced polymer cover blocks of thickness equal to the specified cover shall be placed between the bars and formwork subject to satisfactory evidence that the polymer composition is not harmful to concrete and reinforcement. Cover blocks made of concrete may be permitted by the Engineer, provided 'they have the same strength and specification as those of the member.

(ii) In case of dowels for columns and walls, the vertical reinforcement shall be kept in position by means of timber templates with slots cut in them accurately, or with cover blocks tied to the reinforcement. Timber templates shall be removed after the concreting has' progressed upto a level just below their location.

(iii) Layers of reinforcements shall be separated by spacer bar at approximately one metre intervals. The minimum diameter of spacer bars shall be 12 nun or equal to maximum size of main reinforcement or maximum size of coarse aggregate, whichever is greater. Horizontal reinforcement shall not be allowed to sag between supports.

(iv) Necessary stays, blocks, metal chairs, spacers, metal hangers, supporting wires etc, or other subsidiary reinforcement shall be provided to fix the reinforcements firmly in its correct position.

(v) Use of pebbles, broken stone, metal pipe, brick, mortar or wooden blocks etc., as devices for positioning reinforcement shall not be permitted.

d) Bars coated with epoxy or any other approved protective coating shall be placed on supports that do not damage the coating. Supports shall be installed in a manner such that planes of weakness are not created in hardened concrete. The coated reinforcing steel shall be held in place by use of plastic or plastic coated binding wires especially manufactured for the purpose. Reference shall be made to Section 1000 for other requirements.

e) Placing and fixing of reinforcement shall be inspected and approved by the Engineer before concrete is deposited.

BAR SPLICES

1. Lapping

All reinforcement shall be furnished in full lengths as indicated on the drawing. No splicing of bars, except where shown on the drawing, will be permitted without approval of the Engineer. The lengths of the splice shall be as indicated on drawing or as approved by the Engineer. Where practicable, overlapping bars shall not touch each other, and shall be kept apart by 25 mm or 1 I/. . times the maximum size of coarse aggregate, whichever is greater. If this is not feasible, overlapping bars shall be bound with annealed steel binding wire, not less than 1 mm diameter and twisted tight in such a manner as to maintain minimum clear cover to the reinforcement from the concrete surface. Lapped splices shall be staggered or located at points, along the span where stresses are low.

2. Welding

.2.1. Splicing by welding of reinforcement will be permitted only if detailed on the drawing or approved by the Engineer. Weld shall develop an ultimate strength equal to or greater than that of the bars connected.

.2.2. While welding may be permitted for mild steel reinforcing bars conforming to IS: 432, welding of deformed bars conforming to IS: 1786 shall in general be prohibited. Welding may be permitted in case of bars of other than S, 240 grade including special welding grade of S 415 grade bars conforming to IS: 1786, for which necessary chemical analysis has been secured and the carbon equivalent (CE) calculated from the chemical composition using the

formula

$$CE = C + \frac{Mn}{6} + \frac{Cr+Mg+V}{5} + \frac{Ni+Cu}{15}$$

is 0.4 or less.

2.3. The method of welding shall conform to IS:2751 and 15:9417 and to any supplemental specifications to the satisfaction of the Engineer. Welding may be carried out by metal arc welding process. Oxy- acetylene welding shall not be permissible. Any other process may be used subject to the approval of the Engineer and necessary additional requirements to ensure satisfactory joint performance. Precautions on over heating, choice of electrode, selection of correct current in arc welding etc., should be strictly observed.

All bars shall be butt welded except for smaller diameter bars (diameter of less than 20 mm) which may be lap welded. Single-V or Double- V butt joints may generally be used. For vertical bars single bevel or double bevel joints may be used.

Welded joints shall be located well away from bends and not less than twice the bar diameter away from a bend.

Generally, shop welding in controlled conditions is to be preferred, where feasible. Site welding where necessary shall, however, be permitted when the facilities, equipment, process, consumables, operators, welding procedure are adequate to produce and maintain uniform quality at par with that attainable in shop welding to the satisfaction of the Engineer.

Joint welding procedures which are to be employed shall invariably be established by a procedure specification. All welders and welding operators to be employed shall have to be qualified by tests prescribed in IS: 2751. Inspection of' welds shall conform to IS: 822 and destructive or non-destructive testing may be undertaken when deemed necessary. Joints with weld defects detected by visual inspection or dimensional check inspection shall not be accepted.

Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding. When welding is done in 2 or 3 stages, previous surface shall be cleaned properly. Bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before carrying out welding. Only competent and experienced welders shall be employed on the work with the approval of the Engineer. No welding shall be done on coated bars.

2.4 M.S. electrodes used for welding shall conform to IS: 814. 1606.2.4. Welded joints shall preferably be located at points where steel will not be subject to more than 75 per cent of the maximum permissible stresses and welds so staggered that at anyone section, not more than 20 per cent of the bars are welded.

2.5. Welded pieces of reinforcement shall be tested. Specimens. shall be taken from the site and the number arid frequency of tests shall be as directed by the Engineer.

3. Mechanical Coupling of Bars

Bars may be joined with approved patented mechanical devices as indicated on the drawing or as approved by the Engineer e.g. by special grade steel sleeves swagged on to bars in end to end contact or by screwed couplers. In case such devices are permitted by the Engineer, they shall develop at least 125 per cent of the characteristic strength of the

reinforcement bar.

TESTING AND ACCEPTANCE

The material shall be tested in accordance with relevant IS specifications and necessary test certificates shall be furnished. Additional tests, if required, will be got carried out by the Contractor at his own cost.

The fabrication, furnishing and placing of reinforcement shall be in accordance with these specifications and shall be checked and accepted by the Engineer.

MEASUREMENTS FOR PAYMENT

Reinforcement shall be measured in length including hooks, if any, separately for different diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.

RATE

The contract unit rate for coated/uncoated reinforcement shall cover the cost of material, fabricating, transporting, storing, bending, placing, binding and fixing in position as shown on the drawings as per these specifications and as directed by the Engineer, including all labour, equipment, supplies, incidentals, sampling, testing and supervision.

The unit late for coated reinforcement shall be deemed to also include cost of all material, labour, tools and plant, royalty, transportation and expertise required to carry out the work. . The rate shall also cover sampling, testing and supervision required for the work.

Item No.09 Providing fixing of Polished Kotah stone frame for Doors & wIndows of 15cmx4 cm. Size including necessary holdfasts, holes for fixtures and fastenings incl. all labour & materials etc. comp

1.0. Materials

Kotah stone in frames shall conform to M-49.

M-49. Polished Kotah Stones

49.1. Polished Kotah stone shall have the same specification as per rough kotah stone except as mentioned below.

49.2. The stones shall have machine polished surface. When brought on site, the stones shall be single polished or double polished depending upon its use. The stones for paving shall generally be single polished. The stones to be used for dedo, skirting, sink, veneering, sills, steps etc. where machine polishing after the stones are fixed in situ is not possible shall be double polished.

2.0. Workmanship

2.1. The item covers the requirement of Kotah stone frames for doors, windows, clerestory windows, their supply and fixing.

2.2. Frames

2.2.1. All members of frames shall be exactly at right angles. The right angle shall be checked from inside surfaces of the frames of the respective members.
2.2.2. All members of frames shall be straight without any warp of bow and shall have smooth surfaces well planed on the three sides exposed at right angles to each other. The surfaces touching the wall may not be planed unless it is required in order to straighten up the member or to obtain the overall sizes within tolerances as specified.
2.2.3. Frame shall have dovetail joins. When clerestory windows included, it shall be provided by having full length one piece post for door or windows and clerestory window extending the frame on top at the head to the required extent. Horns shall not be provided in the head of the frame. When no sills are provided, the vertical posts of the frame in the ground floor shall be embedded in the sill masonry for 10 cm. on upper floors, the vertical posts shall be fixed in the floor or masonry by forming notches 1- mm. deep. Slight adjustment of spacing as necessary shall be done to have the hold fasts in the joints of masonry course. The frame shall be erected in position and held plum with strong support from north sides and built in masonry as it is being built. The transom shall be through tenoned into the mortises of the jamb post to the full width of the jamb post and the thickness of the tenon shall be not less than 15 mm.

2.3. Tolerance :

Unless specially mentioned otherwise tolerance of +1.5mm. shall be allowed for each wrought face.
2.4. The tenons shall be closely fitting into the mortises and suitably pinned with wood dowels not less than 10 mm. dia. Meter. The depth of rebates for housing the shutter shall be as shown in the detailed drawing or as directed.
2.5. The concrete surface of tenon and mortise shall be treated before putting together with an adhesive of approved make.
2.6. Minimum number of three hold fasts shall be fixed on each side of door and windows frames, one at the center point and the other two at 30 mm. from the top and bottom of the frames. In case of windows and ventilators frames. The size of each hold fast shall be 300 x 25 x 6 mm. and of mild steel with split end. The hold fasts shall be fixed with screws to frames.
2.7. Mild steel hold fasts shall be protected with a coating of coal asphalt tar. The surface of frame abutting the masonry or concrete faces shall be properly treated by applying a coat of approved coating.

3.0. Mode of Measurement and payment

3.1. The linear dimensions shall be measured correct up to 1 cm. The quantity shall be worked out correct to places of decimals of cu.m.
3.2. The rate shall be for a unit of One sqm.

Item No.10 Providing 15mmthick cement plaster in single coat on fair side of Brick/concrete walls for interior plastering upto floor two level and finished even and smooth in (I)cement mortar 1:3 (1 cement:3 sand) .Upto floor all level

1.0. Materials

Water shall conform to M-1, The cement mortar of proportion 1 : 3 shall conform to M-13.

2.0. Workmanship

Scaffolding :

Wooden bullies, bamboos, planks trestles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

2.2. Preparation of back ground :

2.2.1. The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, afflorescence and other foreign matter by water or by brushing if it is not hard and by hacking if it hard. In case of concrete surface, if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and the care shall be taken that none of the retarder if left on the surface. Trimming of projections o brick concrete surfaces where necessary shall be carried out to get an even surface.

2.2.2. Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.

2.2.3. The work shall not be soaked but only damped evenly before applying plaster .if the surface becomes dry such area shall moistened again.

2.2.4. For external plaster, pestering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame cladding work are ready and temporary supports of the ceiling resting on the wall of the floor have been removed . Ceiling plaster shall be completed before starting later to walls.

2.3. Application of plaster :

2.3.1. The plaster about 15 x 15 cms. shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally the surface shall be finished off trued with a trowel or wooden float according as a smooth or a smooth or a sandy granular texture is required. Excessive troweling or over working the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.

2.3.2. Cement plaster shall be used within half an hour after addition of water. And mortar or plaster which is partially set shall be rejected and removed forthwith from the site.

2.3.3. In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically. When recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. to any corners or arise. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

2.3.4. Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commences as soon as plaster is hardened sufficient. Soaking of walls shall be avoided side of building in hot air or dry weather shall be used, excessive evaporation on the sunny or windward side of building hot air or dry weather

shall be prevented by hanging matting or gunny bags on the outside of the plaster and keeping them wet.

3.0. Mode of measurements & payment.

3.1. The rate shall include the cost of all materials, labor and scaffolding etc. involved in the operations described under workmanship.

3.2. All plastering shall be measured in square meter unless otherwise specified. Length breadth or height shall be measured correct to a centimeter.

3.3. Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 10 mm. at any point on this surface.

3.4. The item includes plastering up to floor two level.

3.5. The measurement of wall plastering shall be taken between the walls or partition(dimensions before plastering being taken)for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted.

3.6. Soffits of stairs shall be measured as plastering on ceilings, following soffits shall be measured separately.

3.7. For jambs, soffits, sills etc. for openings not exceeding 0.5 sq.mt. each in area for ends of joints beams, posts, girders, steps etc. not exceeding 0.5 sq. mt. each in area and for openings exceeding 0.5 sq. mt. and not exceeding 3.00 sq. mt. in each area deductions and additions shall be made in the following manners.

(a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq. mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, for finish to plaster around ends of joints, beams posts etc.

(b) Deduction for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition shall be made for ravels, jambs, soffits, sills etc. of these openings.

(i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only.

(ii) When two faces of wall are plastered with different types of plasters of if one face is plastered and the other pointed, deductions shall be made from the plaster of pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50 % of area of opening on each face shall be made from areas of plaster and/or pointing as the case may.

3.8. For openings having door frames equal to or projecting beyond the thickness of wall, full deduction for opening shall be made fro each plastered face of the wall.

3.9. In case of openings of area above 3 sq. mt. each deduction shall be made for openings but jambs, soffits sand sills shall be measured.

3.10. The rate shall be for a unit of One sq. meter.

Deputy Executive Engineer
Panchayat R.&B. Sub Division
SAVARKUNDLA

Item No.11 Providing 10 mmthick cement plaster in single coat on fair side of Brick/concrete walls for interior plastering upto floor two level and finished even and smooth in (I)cement mortar 1:3 (1 cement:3 sand) .Upto floor two level finished even & Smooth with floating coat of neat cement slurry.

1.0. Materials

Water shall conform to M-1, The cement mortar of proportion 1 : 3 shall conform to M-13.

2.0. Workmanship

Scaffolding :

Wooden bullies, bamboos, planks trestles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

2.2. Preparation of back ground :

2.2.1. The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing if it is not hard and by hacking if it hard. In case of concrete surface, if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and the care shall be taken that none of the retarder if left on the surface. Trimming of projections o brick concrete surfaces where necessary shall be carried out to get an even surface.

2.2.2. Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.

2.2.3. The work shall not be soaked but only damped evenly before applying plaster .if the surface becomes dry such area shall moistened again.

2.2.4. For external plaster, pestering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame cladding work are ready and temporary supports of the ceiling resting on the wall of the floor have been removed . Ceiling plaster shall be completed before starting later to walls.

2.3. Application of plaster :

2.3.1. The plaster about 15 x 15 cms. shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally the surface shall be finished off trued with a trowel or wooden float according as a smooth or a smooth or a sandy granular texture is required. Excessive troweling or over working the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.

2.3.2. Cement plaster shall be used within half an hour after addition of water. And mortar or plaster which is partially set shall be rejected and removed forthwith from the site.

2.3.3. In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically. When recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at

the end of the day on the body of the wall and nearer than 15 cm. to any corners or arise. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

2.3.4. Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commences as soon as plaster is hardened sufficient. Soaking of walls shall be avoided side of building in hot air or dry weather shall be used, excessive evaporation on the sunny or windward side of building hot air or dry weather shall be prevented by hanging matting or gunny bags on the outside of the plaster and keeping them wet.

3.0. Mode of measurements & payment.

3.1. The rate shall include the cost of all materials, labor and scaffolding etc. involved in the operations described under workmanship.

3.2. All plastering shall be measured in square meter unless otherwise specified. Length breadth or height shall be measured correct to a centimeter.

3.3. Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 10 mm. at any point on this surface.

3.4. The item includes plastering up to floor two level.

3.5. The measurement of wall plastering shall be taken between the walls or partition(dimensions before plastering being taken)for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted.

3.6. Soffits of stairs shall be measured as plastering on ceilings, following soffits shall be measured separately.

3.7. For jambs, soffits, sills etc. for openings not exceeding 0.5 sq.mt. each in area for ends of joints beams, posts, girders, steps etc. not exceeding 0.5 sq. mt. each in area and for openings exceeding 0.5 sq. mt. and not exceeding 3.00 sq. mt. in each area deductions and additions shall be made in the following manners.

(a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq. mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, for finish to plaster around ends of joints, beams posts etc.

(b) Deduction for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition shall be made for ravels, jambs, soffits, sills etc. of these openings.

(i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only.

(ii) When two faces of wall are plastered with different types of plasters of if one face is plastered and the other pointed, deductions shall be made from the plaster of pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50 % of area of opening on each face shall be made from areas of plaster and/or pointing as the case may.

3.8. For openings having door frames equal to or projecting beyond the thickness of wall, full deduction for opening shall be made fro each plastered face of the wall.

3.9. In case of openings of area above 3 sq. mt. each deduction shall be made for openings but jambs, soffits sand sills shall be measured.

3.10. The rate shall be for a unit of One sq. meter.

Extra over item 51 to 65 for finishing with a floating coat of neat cement slurry.

1.0. Materials & Workmanship.

1.1. The relevant specifications of item No. 17.58 and 17.61 shall be followed for materials and workmanship except that this work is only providing smooth cement finish with floating coat of neat cement slurry.

1.2. The coat of cement and fine sand mortar of proportion 1 : 1 (1.5 mm. thick about)shall be applied the plastered surface with a trowel to provide uniform texture while the base coat is till plastic.

1.3. In any continuous face of wall the finishing treatment should be carried out continuously and day to day breaks made to coincide with architectural breaks in order to avoid unsightly junctions.

1.4. Curing : All the plster work shall be kept damp continuously for a period of 7 days.

2.0. Mode of measurement and payment

2.1. The payment shall be made for a unit of 1.0. sq. mt. of work done over an above the finishing of work of base coat.

2.2. The relevant specifications of item of base coat shall be followed for measurements and payment.

2.2. The rate shall be for a unit one sq. meter.

Item No.12 Providing and fixing 35mm. Thick Panelled,glazed orPanelled and glazed shutters for doors,windows andclearstory windows including anodised alluminiumbutt hinges with necessary screws and Indian TeakWood shutters with-(B) Partical board panells.12mm. thick including applying primer and two coats of oil painting etc. complete

1.0. Materials
1.1. Wood in frames shall conform to M-29. 2. Glass shall conform to M-38. 3. Anodized aluminum but hinges shall conform to M-43.
1.0. Materials and workmanship
1.0. The relevant specification of item No. 10.23 shall be followed except that the hinges shall be of black enameled M.S. butt hinges instead of anodized aluminum butt hinges and shutter with (A) Plywood (B) Particle (C)Hard Board panels, (D) Asbestos sheet panels.
2.0. Workmanship
1.0. The item covers the requirement of preparation of shutters for doors, windows, clerestory windows, their supply and fixing.
1.0. Shutters :

2.2.1. Paneled shutters shall be constructed in the form of timber frame work of styles and rails with panel inserted of type as specified in the detailed drawings. Panel shall be fixed by providing grooves in the style and rails. The styles and rails shall be joined to each other by mortise and tenon joints at right angles.
2.2.2. All members of the shutters shall be straight without any warp or bow and shall have smooth, well planed faces at right angles to each other.
2.2.3. The size of styles and rails shall be as per drawings or as directed. Tyles and rails of shutters shall be made of one piece only.

2.0. Timber paneling :

2.3.1. Thickness of the panel shall be as specified in the item as shown in the drawing or as directed. If the panel is made from more than one piece the pieces shall be finished as shown in the detailed drawings and shall be joined with continuous groove with specified size. The end pieces of the panel and the top and bottom of the panel shall be provided with continuous tongue to frame into groove of the frame shutter. An air space of 1.5 mm. shall be left in the groove of frame of shutter while framing the panels in it.
2.3.2. The faces of the panel as well as various pieces of the panel shall be closely fitted to the sizes of the grooves.
2.3.3. Finishing of the corners of raised panel edges shall be done as shown in drawings or as directed.
2.3.4. The thickness specified shall be finished thickness and no tolerance will be permitted.

2.5. Fixture and Fastenings ;

2.5.1. The rate shall include anodized butt hinges including fixing with iron screws. The size and number of hinges shall be as per table given in annexure –1.

3.0. Mode of measurements and payment

3.1. The rate for shutter includes cost of providing block and cleat for keeping the shutter in open position if directed.
3.2. The dimension of the shutter shall be measured clear size of the shutter in close position between the grooves of the frame.
3.3. The rate shall be for a unit of one sq. Meter.

Item No.13 Providing and fixing window having extruded aluminum Colour anodized section frame main outer size 127mm x 38.10mm x 1.35mm @wt. 1.384kg/m, horizontal Four track member size 122.20mm x 31.75mm x 1.10mm@ wt 1.205 kg/m, vertical member of size 122.20mm x 31.75mm x 1.50mm @1.398 kg/mt with sliding shutters of horizontal member size 40mm x 18mm x 1.29mm@ 0.456kg/mt ,vertical member of size 40mm x 18mm x 1.29mm @ 0.456 kg/mt with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc complete for window.

SPECIFICALTION SHALL APPLY AS PER IS;1948 ATTCHED

Deputy Executive Engineer
Panchayat R.&B. Sub Division
SAVARKUNDLA

Item No.14 Finishing wall with weather proof exterior emulsion paint on wall surface(two coats) to give an required shape even shade after thoroughly brushing the surface to rempve all dirt, and remains of loose powdered materials etc complete.

1.0. Materials

1.1. The water shall conform to M-1, Exterior Emulsion weather proofing paint shall conform to I.S. 5410-1969.

2.0. Workmanship.

2.1. Scaffolding : Where scaffolding is required it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be distempered. A properly secured and well tied suspended platform(Joola) may be used for distempering. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. For distempering to ceiling, proper stage scaffolding shall be erected where necessary.

2.2. Preparation of surface :

The relevant specifications of item No. 45 shall be followed except that the word white wash color wash shall be substituted with water proofing Exterior Emulsion paint. The surface shall be thoroughly wetted with clean water before Exterior Emulsion water proofing paint is applied.

2.3. Preparation of paint : Portland Exterior Emulsion paint shall be prepared by adding paint powder to water and stirring to obtain a thick paste, which shall then be diluted to a brush able consistency. Generally, equal volumes of paint powder and water make a satisfactory paint. In all cases, The manufacture's instructions shall be followed. The paint shall be mixed in such quantities as can used up within an hour of mixing as otherwise the mixture will set and thickness, affecting flowing and finish. The lids of Exterior Emulsion paint drums shall be kept tightly when not in use.

2.4. Application of Paint :

2.4.1. No painting shall be done when the paint is likely to be exposed to a temperature of below 7º C within 48 hours after application.

2.4.2. When weather conditions are such as to cause be carried out in the shadow as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.

2.4.3. To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket.

2.4.4. For undecorated surfaces, the surface shall be treated with minimum two coats of water proof Exterior Emulsion paint. Not less than 24 hours shall be allowed between two coats. Next coat shall not be started until the proceeding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the proceeding coat shall be slightly moistened before applying the subsequent coat.

2.4.5. The finished surface shall be even and uniform in shade, without patches, brush masks, paint drops etc.

2.4.6. The Exterior Emulsion paint shall be applied with a brush with relatively short stiff hog or fiber bristles. The paint shall be brushed in uniform thickness and shall be free from excessively heavy brush marks. The lamps shall be brushed out.

2.4.7. Water proof Exterior Emulsion paint shall not be applied on surface already treated with white wash, color wash, distemper dry or oil bound varnishes, paint etc. it shall not be applied on gypsum, wood and metal surfaces.

2.5. Curing : Painted surfaces shall be sprinkled with water two or three times a day. This shall be done between coats and for at least two days following the final coat. The curing shall be started as soon as the point has hardened so as not be damaged by the sprinkling of water say about 12 hours after the application.

2.6. Protective measurements : The surfaces of doors, windows, floors, articles of furniture etc. and such other parts of the buildings as are not to be distempered shall be protected from being splashed upon. Such surfaces shall be cleaned of emulsion splashes if any.

3.0 Mode of measurements & payment

3.1. Finishing wall with weather proof exterior emulsion paint shall be measured under this item.

3.2. All the work shall be measured net in the decimal system, as executed subject to the following limits unless otherwise stated here in after.

(a) Dimensions shall be measured to the nearest 0.01 meter.

(b) Areas shall be worked out to the nearest 0.01 sq. meter.

3.3. No deductions shall be made for openings not exceeding 0.5 sq. mt. each and no addition shall be made for painting to beddings, mouldings, edges, jambs, soffits, sills etc. of such openings.

3.4. In case of fabricated structural steel and iron work, priming coat of paint shall be included with fabrication. In case of trusses if measured in sq.m. compound girders, stanchions, lattices, grader and similar work, actual area shall be measured in sq. m. and extra shall be paid for painting on bolts heads nuts, washers etc. No addition shall be made to the weight calculated for the purpose of measurements of steel and iron works for paint applied on shop or at site.

3.5. The different surfaces shall be grouped into one general item, areas of uneven surface being converted into equivalent plain area in accordance with the table given as per Annexure – II for payment.

3.6. The rate shall be for a unit of one sq. meter.

Item No.15 Distempering (Two coats) with oil bound distemper of approved brand and manufacture and of required shade on wall surface to give an even shade over and including a priming coat with distemper primer of approved brand and manufacture after thoroughly brushing the surface free from mortar dropping and other foreign matter and also including preparing the surface even and papered smooth

1.0. Materials

1.1. Oil bound washable distemper and primer shall be of approved brand and manufacture. The distemper shall be of required color and shade and the same shall conform to I.S. 428-1969.

2.0. Workmanship.

2.1. Scaffolding

Where scaffolding is required it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be distempered. A properly secured and well tied suspended platform(Joola) may be used for distempering. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. For distempering to ceiling, proper stage scaffolding shall be erected where necessary.

2.2. Preparation of surface :

2.2.1. The undecorated surface to be distempered shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for at least 2 months before applications of distemper.

2.2.2. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a line grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is allowed. The surface affected by moulds, moss, fungi, algee linchens, efflorescence etc. shall be treated in accordance with I.S. 2395-(Part-I)1966. Before applying distempering, any unevenness shall be made good by applying putty made of plaster of pairs mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry :

2.3. Priming coat :

2.3.1.A priming coat of distemper primer of approved manufacture and shade shall be applied over the papered surface in case of new work on undecorated surface. If the distemper priming is done after the wall surface dries completely the distemper primer shall be applied.

2.3.2. Application of primer shall be done as under : 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 constitution 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 bound distemper or paint is applied.

2.3.3. Oil bound distemper is not recommended to be applied within six ,months of the completion of wall plaster.

2.4. Preparation of oil bound distemper :

2.4.1. The distemper shall be diluted with water or any other prescribed thinner in manner recommended by the manufacturer only. Sufficient quantity of distemper required for a days work shall be prepared.

2.5. Application of Distemper coat :

2.5.1. For undecorated surfaces, after the primer coat is dried for at least 48 hours, the surface shall be lightly sand papered to make smooth for receiving the distemper, taking care not to rub out priming coat. All loose particles shall be dusted of after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately be vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after a time interval of at least 24 hours between consecutive coats to permit proper drying of the proceeding coat. The finished surface shall be even and inform without patches, brush marks, distemper drops etc.

2.5.2. Sufficient quantity of distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room which can not be completed on the same day.

2.5.3.15 cm. double bristled distemper brush shall be used. After day's work brushed shall be thoroughly washed n hot water with soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

2.6. Protective measurements : The surfaces of doors, windows, floors, articles of furniture etc. and such other parts of the buildings as are not to be distempered shall be protected from being splashed upon. Such surfaces shall be cleaned of distemper splashes if any.

3.0 Mode of measurements & payment

3.1. Priming coat of distemper primer, scraping of surface spoiled by strunk soots, removal of oil and grease spots, treatment for infraction of effloresces., mould moss, fungi, algae and litchen and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.

3.2. All the work shall be measured net in the decimal system as in place subject to the following limit unless otherwise stated hereinafter :

(a) Dimensions shall be measured to the nearest 0.01 m.

(b) Area in individual items shall be worked out to the nearest 0.01 sq. m. All work shall be made for ends of joints, beams posts etc., and openings, not exceeding 0.5 sq. mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for around ends of joints, beams posts etc.

3.3. Deductions of openings exceeding 0.5 sq. mt. but not exceeding 3 sq. m. each shall be made as follows and net addition shall be made for reveals, jambs, soffits etc. of these openings :

(a) When both the faces of wall are provided with same finish, deductions shall be made for one face only.

(b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for doors, windows etc. on which width of reveals is less than that of the other side but no deduction shall be made on the other side. Where the width of reveals on the both the faces of wall are equal, deduction of 50 % of area of opening on each face shall be made from area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveals is equal or more than that on untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

3.4. In case of openings of area exceeding 3 sq. mt. each deduction shall be made for openings but jambs sills and soffits shall be measured.

3.5. No deductions shall be made for attachments such as casings, conduits, pipes, electric wiring and the like.

3.6. Item includes removing nails, making good holes, patches with materials similar in composition of distemper.

3.7. The rate includes cost of all materials, labors, scaffolding, protective measures etc. involved in all the operations described above. This shall also includes conveyances, delivery, handling, unloading, storing work etc.

3.8. The rate shall be for a unit of one sq. meter.

Applying two coats of Birla or Asian acrylic lappy (purty) and two coats of primer of approved brand and manufacture on new wall surface to give an even shade

Materials

1.1. The putty material used shall be of approved brand and manufacture. The putty material shall be required color and shade and the same shall conform to manufacturers specification requirement

2.0. Workmanship.

2.1. Scaffolding : Where scaffolding is required it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be distempered. A properly secured strong and well tied suspended platform(Joolas) may be used for putty. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. For putty to ceiling, proper stage scaffolding shall be erected where necessary.

2.2. Preparation of Surface.

2.2.1. The undecorated surface to be putty shall be thoroughly brushed free from dust, dirt greases, mortar, droppings and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry at least 2 months before application of putty .

2.2.2. All unnecessary nails shall be removed, pitting in plaster shall be made good with plaster of paris, mixed with putty of the color to be used. The surface shall then be rubbed down again with a fine grades and paper and smooth. The surface affected by mould, moss, fung, algee linchens, efflorescence etc. shall be treated in accordance with I.S. 2395(part-I)1966 before applying further course of paint or primer Any unevenness shall be made good by applying putty made of plaster of paris mixed with water on entire surface including filling up the undulations and then sand papering he same after it is dry.

2.3. Putty application procedure :

2.3.1. A coat of putty shall be applied as per manufacturers recommendation and instructions given by Engineer in Charge over the prepared surface in case of new work on undecorated surface. No coat of white washing with lime shall be used as a priming coat over putty surface.

2.3.2. Application of putty shall be done as under :

The putty shall be applied with a sheet platlet on the clean dry and smooth surface. Horizontal storkes 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 marks. It shall be allowed to one coat, then allowed to dry and sand papered grinding the surface to make even & smooth The surface shall be finished as uniformly as possible leaving no marks. It shall be allowed to dry for at least 48 hours before further coat of putty or any surface paint is applied.

3.0 Mode of measurements & payment

3.1. Priming coat , primer, scraping of surface spoiled by smoke soot,removal of oil and grease spots, treatment for infraction of effloresces, mould, moss, fungi, algee and litchens and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.

3.2. All the work shall be measured net in the decimal system as in places subject to the following limit unless otherwise stated here in after :

(a) Dimensions shall be measured to the nearest 0.01 m.

(b) Area in individual items shall be worked out to the nearest 0.01 sq. mt. All work shall be measured in sq. meter. No deductions shall be made for ends of joints, beams, posts etc. of these openings nor for finish around the ends of joints, beams, posts etc.

3.3. Deductions of openings exceeding 0.5 sq. m. but not exceeding 3 sq. m. each shall be made as follows and no addition shall be made for reveal, jambs, soffits etc. of these openings.

(a) When both the faces of walls are provided with the same finish deduction shall be made for one face only.

(b) When each face of wall is provided with different finish, deduction shall be made for that of frame for door, windows etc. on which width of reveal is less than that of the other side no deductions shall be made on the other side. Where the width of reveals on the both the faces of wall equal, deduction of 50 % of area of opening on each face shall be made from area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveals is equal or more than that of untreated side neither deductions nor additions to be made for reveals, jambs sills and soffits shall be measured.

3.4. In case of openings of area exceeding 3 sq. mt. each deduction shall be made for openings, but jambs, sills and soffits shall be measured.

3.5. No deductions shall be made for attachments such as casing, conduits, pipes, electric wiring and the like.

3.6. Item includes removing nails, making good holes, cracks, pathes with materials similar in composition to the distemper.

3.7. The rate includes cost of all materials, labor, scaffolding, protective measures etc. involved in all the operations described above. This shall also include conveyance, delivery, banding, unloading storing etc.

3.8. The rate shall be for a unit of one sq. meter.

************THE END************

Deputy Executive Engineer
Panchayat R.&B. Sub Division
SAVARKUNDLA

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SPECIFICATION FOR ALUMINIUM DOORS, WINDOWS AND VENTILATORS

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR ALUMINIUM DOORS, WINDOWS AND VENTILATORS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 2 November 1961, after the draft finalized by the Doors, Windows and Building Furniture Sectional Committee had been approved by the Building Division Council.

0.2 This Specification is an adjunct to IS: 1038-1957 Specification for Steel Doors, Windows and Ventilators, which covers requirements of steel doors, windows and ventilators for use in buildings. With the increasing use of aluminium alloy extruded sections in the manufacture of aluminium doors, windows and ventilators, it was felt that the requirements of such units be covered in a separate standard.

0.3 The sizes of aluminium doors, windows and ventilators and other requirements and details are identical to those of steel doors, windows and ventilators unless otherwise indicated.

0.4 The Sectional Committee responsible for the preparation of this standard has taken into consideration the views of producers, consumers and technologists and has related the standard to the manufacturing and trade practices followed in the country in this field. Due weightage has also been given to the need for international coordination among standards prevailing in different countries of the world in this field.

0.5 This standard is one of a series of Indian Standards on metal doors and windows. Other standards in the series are:

*IS: 1038-1957 Specification for Steel Doors, Windows and Ventilators
IS: 1081-1960 Code of Practice for Fixing and Glazing of Metal (Steel and Aluminium) Doors, Windows and Ventilators
IS: 1361-1959 Specification for Steel Windows for Industrial Buildings
IS: 1949-1961 Specification for Aluminium Windows for Industrial Buildings

0.6 Wherever a reference to any Indian Standard appears in this specification, it shall be taken as a reference to the latest version of the standard.

0.7 Metric system has been adopted in India and all quantities and dimensions appearing in this standard have been given in this system.

0.8 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS: 2-1960 Rules for Rounding Off Numerical Values (*Revised*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

0.9 This standard is intended chiefly to cover the technical provisions relating to aluminium doors, windows and ventilators, and it does not include all the necessary provisions of a contract.

*Since revised.

1. SCOPE

1.1 This standard covers the requirements regarding material, fabrication and dimensions of aluminium doors, windows and ventilators manufactured from extruded aluminium alloy sections of standard sizes and designs, complete with fittings, ready for being fixed into the buildings. This standard does not cover the requirements for industrial doors, windows and ventilators.

2. TERMINOLOGY

2.1 For the purpose of this standard, the components of doors, windows and ventilators shall be defined as illustrated in Fig. 1.

3. HANDING

3.1 The side-hung opening position of all doors and windows shall be said to be right hand or left hand according to the side on which they are hinged looking from the inside (*see* Fig. 2).

4. STANDARD SIZES, TOLERANCES AND DESIGNATIONS

4.1 Sizes — The types and the overall sizes of aluminium doors, windows and ventilators shall be as given in Fig. 3 (*see* P 4).

4.1.1 The dimensions shown are overall heights and widths to the outside of frames of aluminium doors, windows and ventilators. These sizes are derived after allowing 1·25 cm clearance on all

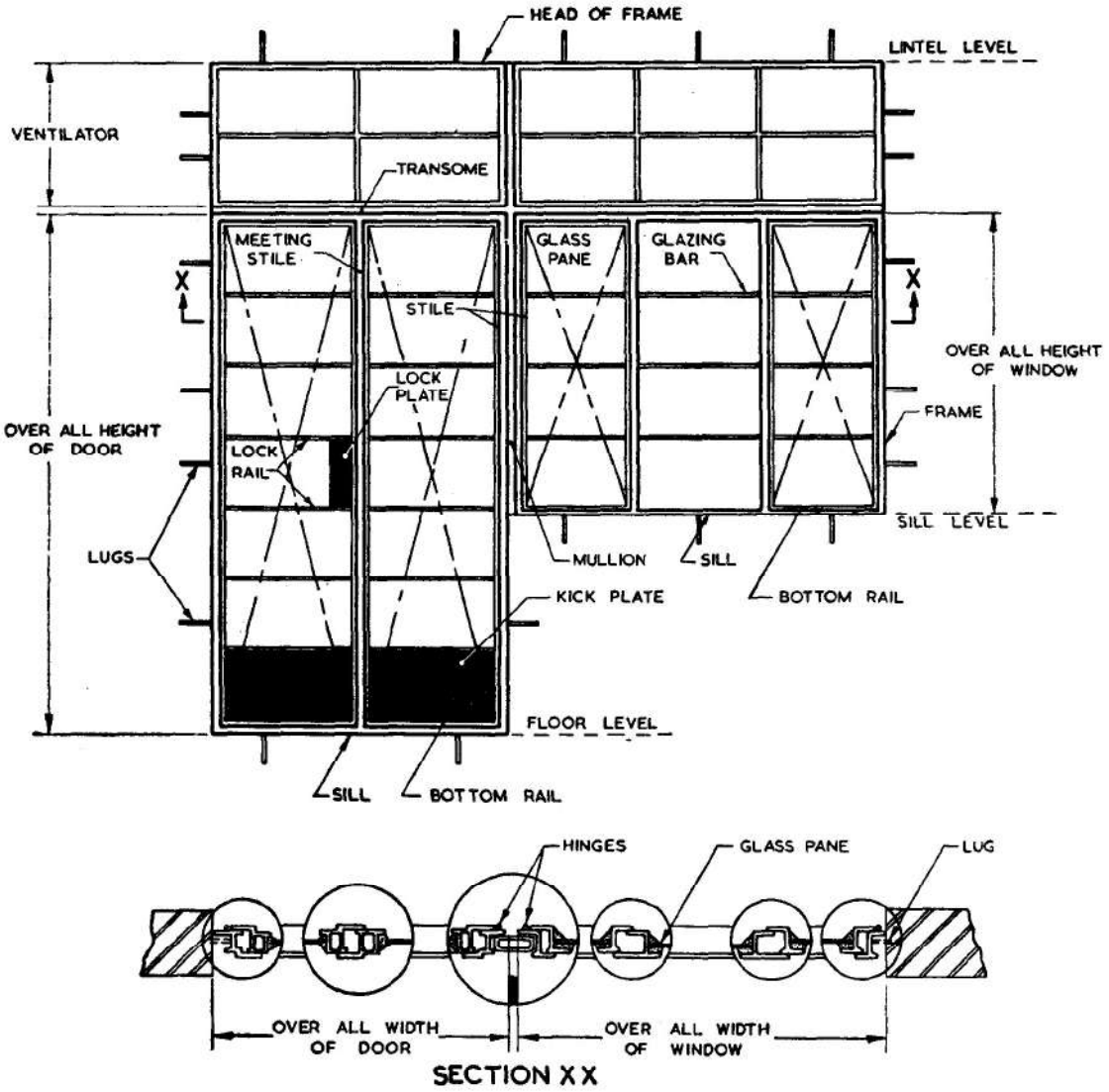


FIG. 1 TERMINOLOGY FOR ALUMINIUM DOORS, WINDOWS AND VENTILATORS

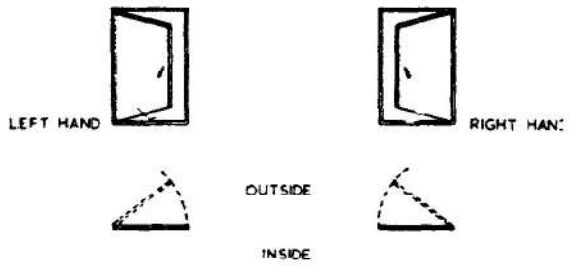


FIG. 2 HANDING OF DOORS AND WINDOWS

the four sides for the purpose of fitting the doors, windows or ventilators into modular openings (*see* Fig. 4 on P 5).

4.2 Tolerances — The sizes for door, window or ventilator frames shall not vary by more than ± 1·5 mm.

4.3 Designation — Doors, windows and ventilators shall be designated by symbols denoting their width, type and height in succession in the following manner:

a) *Width* — It shall be indicated by the number of modules in the width of opening.

b) *Type* — It shall be indicated by the following letters of alphabet:

C = Centre-hung shutters,

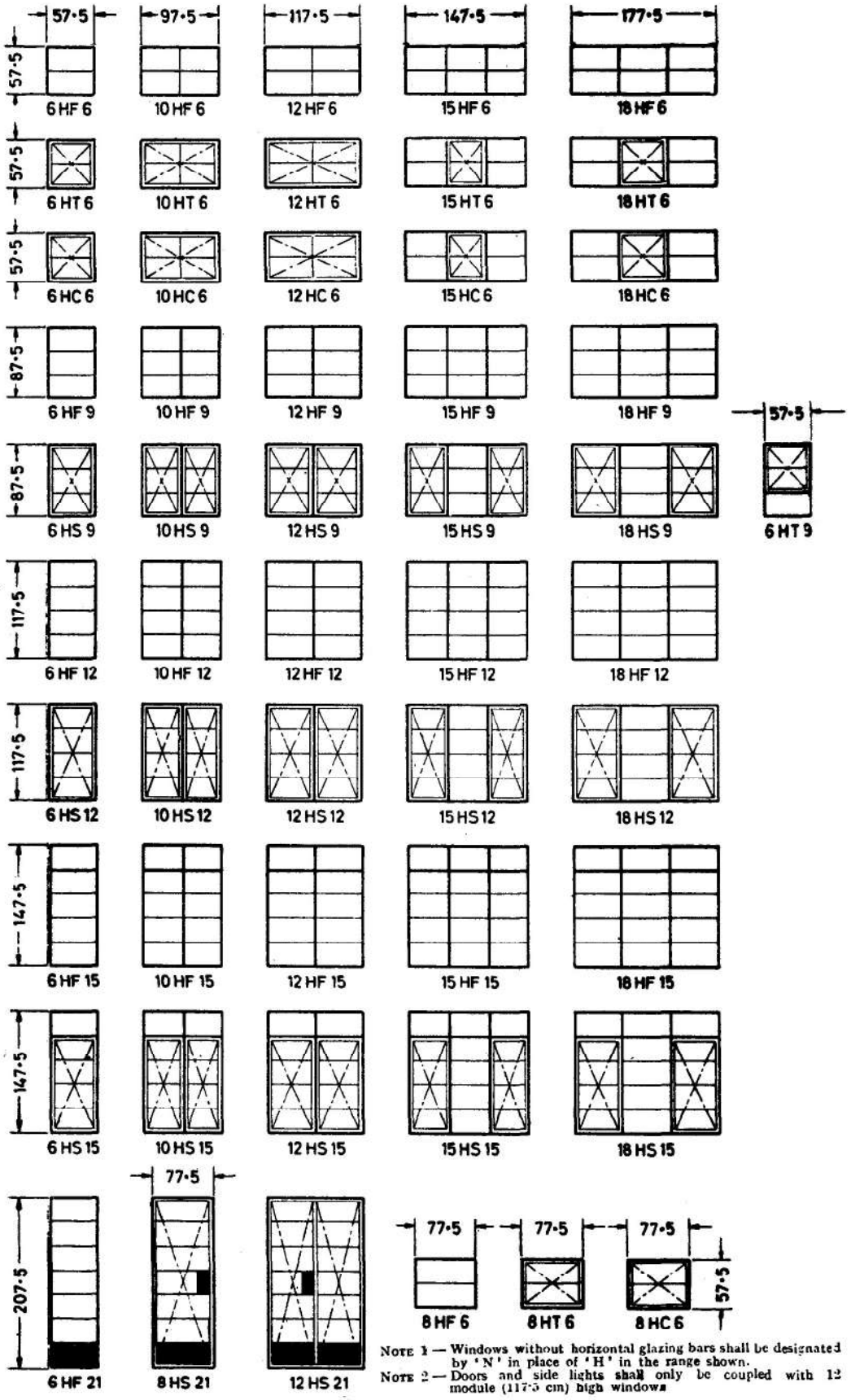
F = Fixed-glass panes,

H = With horizontal glazing bars,

N = Without horizontal glazing bars,

S = Side-hung shutters, and

T = Top-hung shutters.



NOTE 1 — Windows without horizontal glazing bars shall be designated by 'N' in place of 'H' in the range shown.

NOTE 2 — Doors and side lights shall only be coupled with 12 module (117·5 cm) high windows

All dimensions in centimetres.

FIG. 3 TYPES AND SIZE OF ALUMINIUM DOORS, WINDOWS AND VENTILATORS

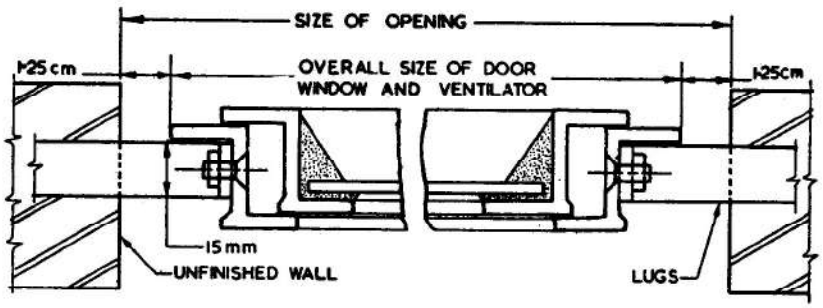


FIG. 4 SIZE OF ALUMINIUM DOORS, WINDOWS OR VENTILATORS IN RELATION TO SIZE OF OPENING

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

Example:

A window of a width of 10 modules (97·5 cm) and height 9 modules (87·5 cm), having horizontal glazing bars and side-hung shutters is designated by 10HS9.

4.3.1 Composite doors, windows or ventilators shall be designated in the following manner:

a) A 12 module wide and 21 module high horizontally glazed side-hung door coupled on its two sides with two side-hung horizontally glazed windows 6 module wide and 12 module high is designated by 6HS12/12HS21/6HS12.

b) Two 10 module wide and 12 module high horizontally glazed side-hung windows coupled side by side with two fixed glass pane ventilators at top, each 10 module wide and 6 module high, is designated by

$$\frac{\text{10HF6/10HF6}}{\text{10HS12/10HS12}}$$

5. MATERIALS

5.1 Aluminium Alloy Extruded Sections

5.1.1 Aluminium alloy used in the manufacture of extruded window sections shall correspond to IS Designation HE9-WP of *IS: 733-1956 Specification for Wrought Aluminium and Aluminium Alloys, Bars, Rods and Sections (For General Engineering Purposes). **Hollow aluminium alloy sections used shall conform to IS Designation HV9-WP of *IS : 1285-1958 Specification for Wrought Aluminium and Aluminium Alloys, Extruded Round Tube and Hollow Sections (For General Engineering Purposes).**

5.1.2 Dimensions and weight per metre run of the extruded sections shall be as given in Fig. 5 (*see* P 6).

5.2 Coupling Sections — Aluminium alloy coupling sections used shall conform to IS Designation HV9-WP of *IS : 1285-1958 Specification for Wrought Aluminium and Aluminium Alloys, Extruded Round Tube and Hollow Sections (For General Engineering Purposes). They shall conform to the dimensions shown in Fig. 5.

5.3 Glass Panes — Glass panes shall weigh at least 7·5 kg/m² and shall be free from flaws, specks, or bubbles. All panes shall have properly squared corners and straight edges. The sizes of the glass panes for use in doors, windows and ventilators shall be as given in Table I.

NOTE — The metal doors and windows industry has followed the practice of the glazing industry in specifying size of glass. Accordingly, in the metal doors and windows, the practice hitherto has been to specify the height first and the width afterwards. In the building industry and in the case of timber doors and windows the practice is to specify width first and height afterwards. The Committee responsible for the preparation of this standard has considered it desirable to unify the practice in this regard and has adopted the building industry practice, that is, to specify width first and height afterwards.

5.4 Screws — Screw threads of machine screws used in the manufacture of aluminium doors, windows and ventilators shall conform to the requirements of *IS: 1362-1959 Dimensions for Screw Threads for General Purposes (Diameter Range 0·25 to 39 mm). Other threads shall be permissible if agreed to between the purchaser and the vendor.

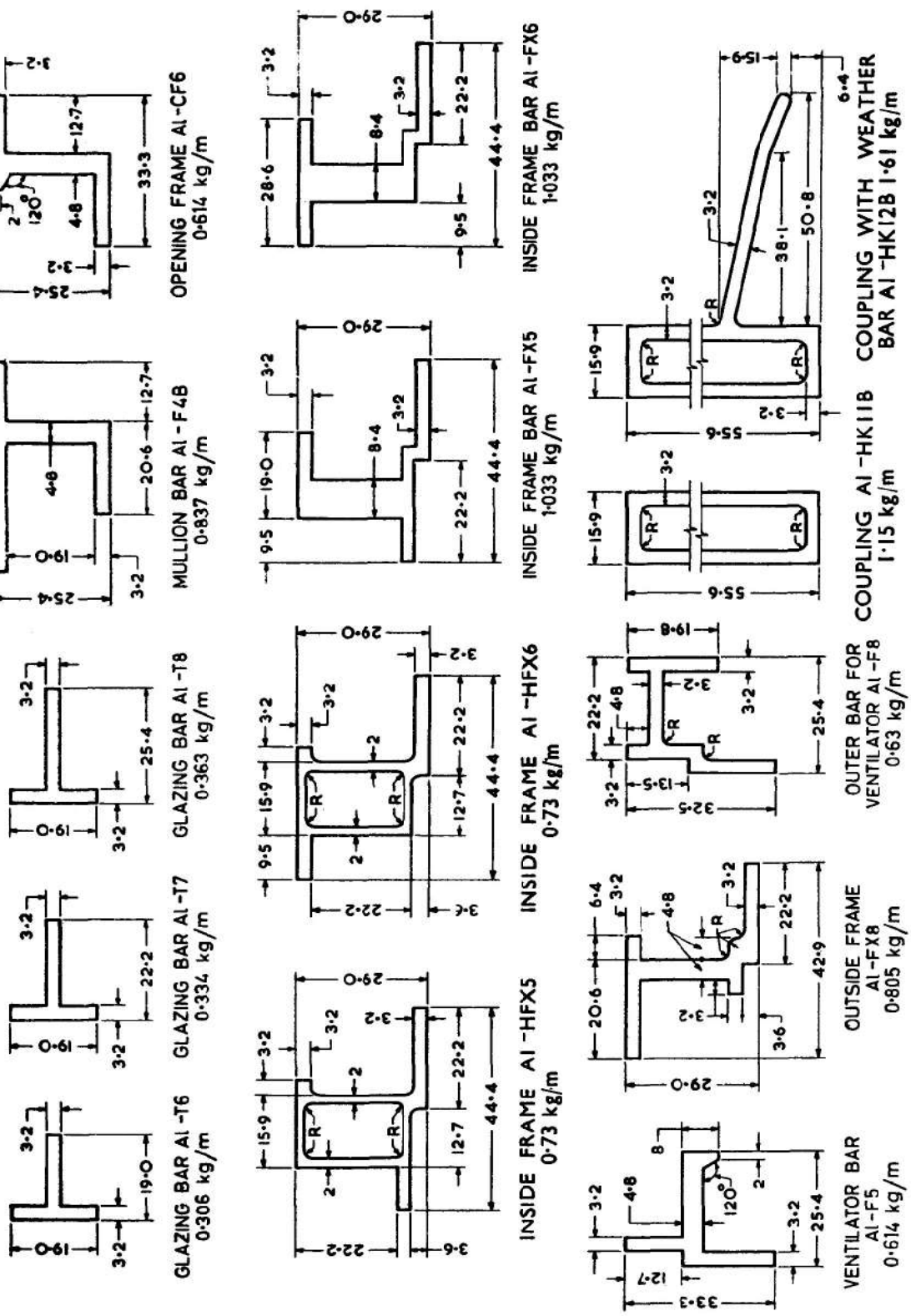
6. FABRICATION

6.1 Frames — Frames shall be square and flat, the corners of the frame being fabricated to a true right angle. Both the fixed and opening frames shall be constructed of sections which have been cut to length, mitred and welded at the corners. Where hollow sections are used with welded joints, argon-arc welding or flash butt welding shall be employed (gas welding or brazing not to be done). Subdividing bars of units shall be tenoned and riveted into the frame.

6.1.1 The location of the parts of the doors, windows and ventilators for which details of fabrication are described under **6.1.2** are indicated in Fig. 6 (*see* P 9).

*Since revised.

*Since revised and withdrawn.



NOTE 1 — All radii $R = 1{\cdot}6$ mm

NOTE 2 — The weights of sections per metre length as indicated are nominal.

All dimensions in millimetres.

FIG. 5 EXTRUDED ALUMINIUM SECTIONS FOR DOORS, WINDOWS AND VENTILATORS

TABLE I GLASS SIZES (CLEARANCE ALLOWED)

(*Clause* 5.3)

Designation	Quantity	Glass Size Width × Height cm
No Glazing Bar Fixed Type		
6NF6	1	53·0 × 53·0
10NF6	2	45·0 × 53·0
12NF6	2	55·0 × 53·0
15NF6	2	45·0 × 53·0
	1	47·5 × 53·0
18NF6	2	55·0 × 53·0
	1	57·5 × 53·0
6NF9	1	53·0 × 83·0
10NF9	2	45·0 × 83·0
12NF9	2	55·0 × 83·0
15NF9	2	45·0 × 83·0
	1	47·5 × 83·0
18NF9	2	55·0 × 83·0
	1	57·5 × 83·0
6NF12	1	53·0 × 113·0
10NF12	2	45·0 × 113·0
12NF12	2	55·0 × 113·0
15NF12	2	45·0 × 113·0
	1	47·5 × 113·0
18NF12	2	55·0 × 113·0
	1	57·5 × 113·0
6NF15	1	53·0 × 27·0
	1	53·0 × 113·0
10NF15	2	45·0 × 27·0
	2	45·0 × 113·0
12NF15	2	55·0 × 27·0
	2	55·0 × 113·0
15NF15	2	45·0 × 27·0
	1	47·5 × 27·0
	2	45·0 × 113·0
	1	47·5 × 113·0
18NF15	2	55·0 × 27·0
	1	57·5 × 27·0
	2	55·0 × 113·0
	1	57·5 × 113·0
8NF6	1	73·0 × 53·0
6NF21	1	53·0 × 84·5
	1	53·0 × 27·5
	1	53·0 × 56·0
No Glazing Bar Top-Hung Type		
6NT6	1	50·0 × 50·0
10NT6	2	44·5 × 50·0
12NT6	2	54·5 × 50·0
15NT6	2	45·0 × 53·0
	1	45·5 × 50·0
18NT6	2	55·0 × 53·0
	1	54·5 × 50·0
8NT6	1	70·0 × 50·0
6NT9	1	50·0 × 51·5
	1	53·0 × 27·5

(*Contd*)

TABLE I GLASS SIZES (CLEARANCE ALLOWED) — *Contd*

Designation	Quantity	Glass Size Width × Height cm
No Glazing Bar Centre-Hung Type		
6NC6	1	46·0 × 46·0
10NC6	2	42·5 × 46·0
12NC6	2	52·5 × 46·0
15NC6	2	45·0 × 53·0
	1	43·5 × 46·0
18NC6	2	55·0 × 53·0
	1	53·5 × 46·0
8NC6	1	66·0 × 46·0
No Glazing Bar Side-Hung Type		
6NS9	1	50·0 × 80·0
10NS9	2	43·5 × 80·0
12NS9	2	52·5 × 80·0
15NS9	2	43·5 × 80·0
	1	47·5 × 83·0
18NS9	2	52·5 × 80·0
	1	57·5 × 83·0
6NS12	1	50·0 × 110·0
10NS12	2	43·5 × 110·0
12NS12	2	52·5 × 110·0
15NS12	2	43·5 × 110·0
	1	47·5 × 113·0
18NS12	2	52·5 × 110·0
	1	57·5 × 113·0
6NS15	1	53·0 × 27·0
	1	50·0 × 110·0
10NS15	2	45·0 × 27·0
	2	43·5 × 110·0
12NS15	2	55·0 × 27·0
	2	52·5 × 110·0
15NS15	2	45·0 × 27·0
	1	47·5 × 27·0
	2	43·5 × 110·0
	1	47·5 × 113·0
18NS15	2	55·0 × 27·0
	1	57·5 × 27·0
	2	52·5 × 110·0
	1	57·5 × 113·0
8NS21	1	66·0 × 81·0
	1	56·0 × 27·5
	1	66·0 × 56·0
12NS21	2	50·5 × 81·0
	2	50·5 × 56·0
	1	50·5 × 27·5
	1	40·5 × 27·5
Horizontal Glazing Bar Fixed Type		
6HF6	2	53·0 × 26·0
10HF6	4	45·0 × 26·0
12HF6	4	55·0 × 26·0
15HF6	4	45·0 × 26·0
	2	47·5 × 26·0

(*Contd*)

TABLE I GLASS SIZES (CLEARANCE ALLOWED) — *Contd*

Designation	Quantity	Glass Size Width × Height cm
Horizontal Glazing Bar Fixed Type		
18HF6	4	55·0 × 26·0
	2	57·5 × 26·0
6HF9	2	53·0 × 27·5
	1	53·0 × 26·0
10HF9	4	45·0 × 27·5
	2	45·0 × 26·0
12HF9	4	55·0 × 27·5
	2	55·0 × 26·0
15HF9	4	45·0 × 27·5
	2	45·0 × 26·0
	2	47·5 × 27·5
	1	47·5 × 26·0
18HF9	4	55·0 × 27·5
	2	55·0 × 26·0
	2	57·5 × 27·5
	1	57·5 × 26·0
6HF12	4	53·0 × 27·5
10HF12	8	45·0 × 27·5
12HF12	8[1]	55·0 × 27·5
15HF12	8	45·0 × 27·5
	4	47·5 × 27·5
18HF12	8	55·0 × 27·5
	4	57·5 × 27·5
6HF15	1	53·0 × 27·0
	4	53·0 × 27·5
10HF15	2	45·0 × 27·0
	8	45·0 × 27·5
12HF15	2	55·0 × 27·0
	8	55·0 × 27·5
15HF15	2	45·0 × 27·0
	1	47·5 × 27·0
	8	45·0 × 27·5
	4	47·5 × 27·5
18HF15	2	55·0 × 27·0
	1	57·5 × 27·0
	8	55·0 × 27·5
	4	57·5 × 27·5
8HF6	2	73·0 × 26·0
6HF21	6	53·0 × 27·5
Horizontal Glazing Bar Top-Hung Type		
6HT6	2	50·0 × 24·5
10HT6	4	44·5 × 24·5
12HT6	4	54·5 × 24·5
15HT6	4	45·0 × 26·0
	2	44·5 × 24·5
18HT6	4	55·0 × 26·0
	2	54·5 × 24·5
6HT9	1	50·0 × 26·0
	1	50·0 × 24·5
	1	53·0 × 27·5
8HT6	2	70·0 × 24·5
6HC6	2	46·0 × 22·5

(Contd)

TABLE I GLASS SIZES (CLEARANCE ALLOWED) — *Contd*

Designation	Quantity	Glass Size Width × Height cm
Horizontal Glazing Bar Top-Hung Type		
10HC6	4	42·5 × 22·5
12HC6	4	52·5 × 22·5
15HC6	4	45·0 × 26·0
	2	43·5 × 22·5
18HC6	4	55·0 × 26·0
	2	53·5 × 22·5
8HC6	2	66·0 × 22·5
Horizontal Glazing Bar Side-Hung Type		
6HS9	3	50·0 × 26·0
10HS9	6	43·5 × 26·0
12HS9	6	52·5 × 26·0
15HS9	6	43·5 × 26·0
	2	47·5 × 27·5
	1	47·5 × 26·0
18HS9	6	52·5 × 26·0
	2	57·5 × 27·5
	1	57·5 × 26·0
6HS12	2	50·0 × 26·0
	2	50·0 × 27·5
10HS12	4	43·5 × 26·0
	4	43·5 × 27·5
12HS12	4	52·5 × 26·0
	4	52·5 × 27·5
15HS12	4	43·5 × 26·0
	4	43·5 × 27·5
	4	47·5 × 27·5
18HS12	4	52·5 × 26·0
	4	52·5 × 27·5
	4	57·5 × 27·5
6HS15	1	53·0 × 27·0
	2	50·0 × 26·0
	2	50·0 × 27·5
10HS15	2	45·0 × 27·0
	4	43·5 × 26·0
	4	43·5 × 27·5
12HS15	2	55·0 × 27·0
	4	52·5 × 26·0
	4	52·5 × 27·5
15HS15	2	45·0 × 27·0
	1	47·5 × 27·0
	4	43·5 × 26·0
	4	43·5 × 27·5
	4	47·5 × 27·5
18HS15	2	55·0 × 27·0
	1	57·5 × 27·0
	4	52·5 × 26·0
	4	52·5 × 27·5
	4	57·5 × 27·5
8HS21	1	66·0 × 24·0
	4	66·0 × 27·5
	1	56·0 × 27·5
12HS21	2	50·5 × 24·0
	9	50·5 × 27·5
	1	40·5 × 27·5

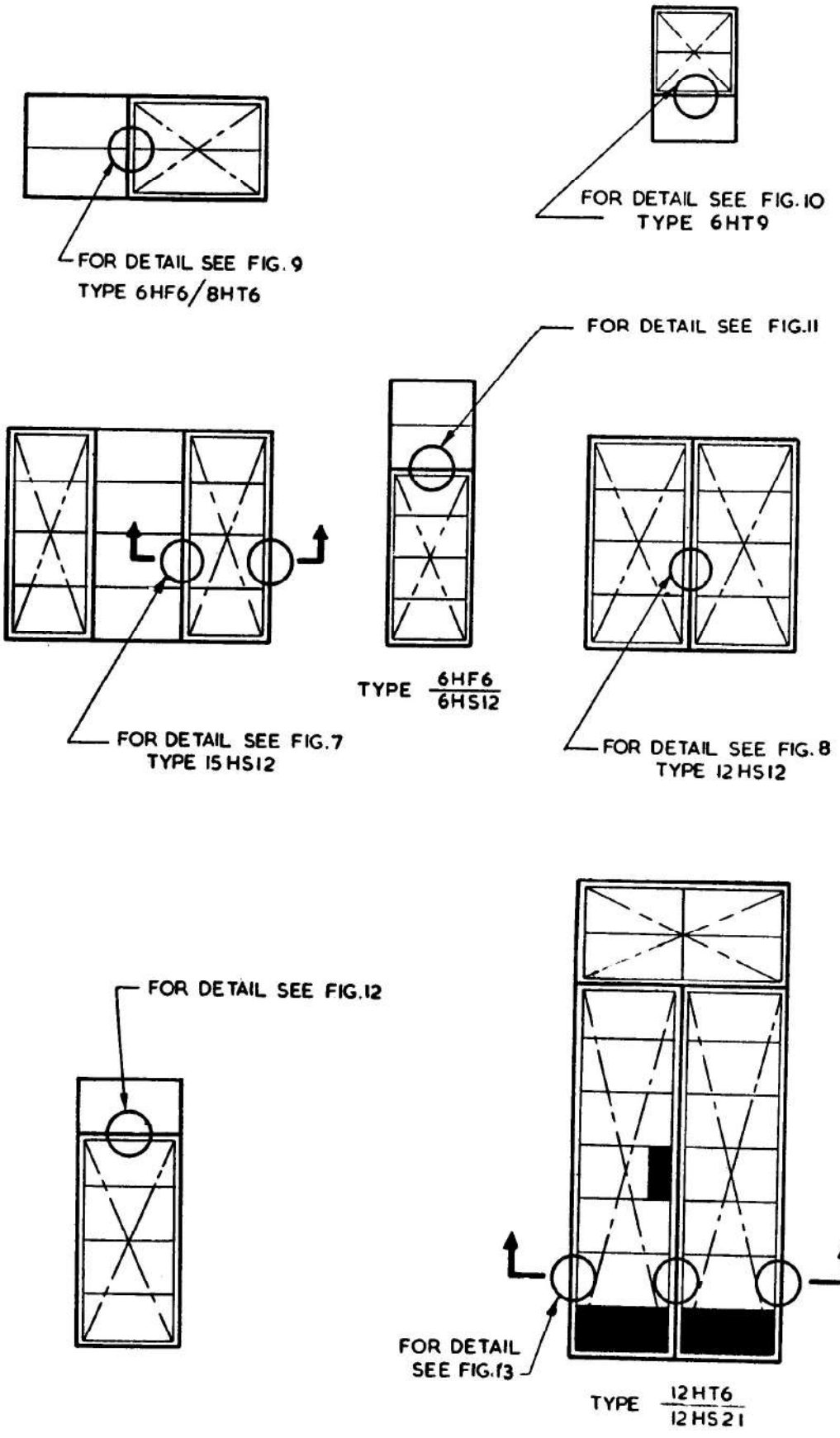


FIG. 6 LOCATION OF PARTS OF ALUMINIUM DOORS, WINDOWS AND VENTILATORS FOR WHICH DETAILS ARE SHOWN

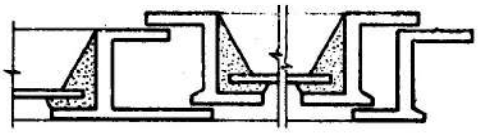


FIG. 7 MULLION WITH FIXED GLASS ON ONE SIDE AND SIDE-HUNG ON OTHER SIDE

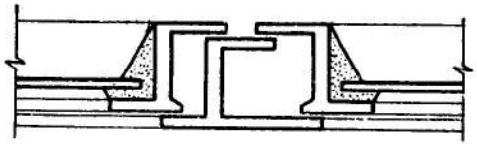


FIG. 8 MULLION WITH SIDE-HUNG SHUTTER BOTH SIDES

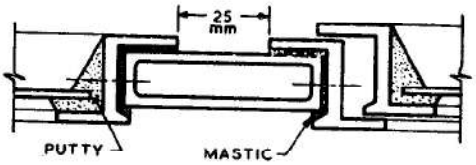


FIG. 9 COUPLING SECTION EXTRUDED FOR COUPLING WINDOWS SIDE BY SIDE

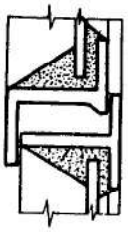


FIG. 10 DETAIL THROUGH BOTTOM OF TOP-HUNG VENTILATOR

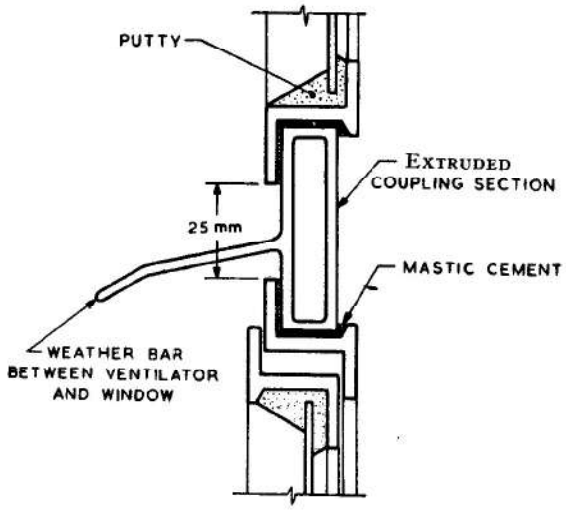


FIG. 11 COUPLING SECTION EXTRUDED HAVING WEATHER BAR FITTED WITH VENTILATORS ON TOP OF WINDOWS

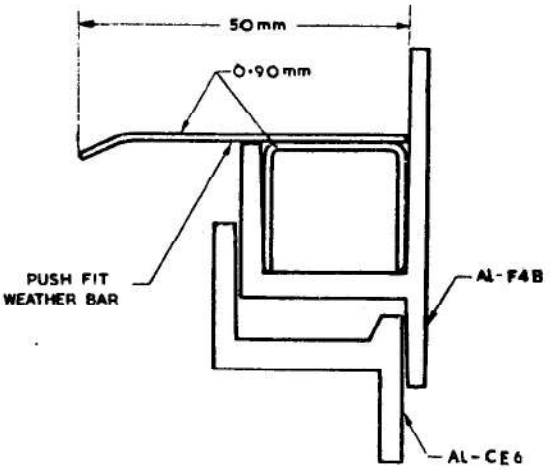


FIG. 12 WEATHER BAR OVER EXTERNAL OPENING SHUTTER WITH FIXED LIGHT ABOVE

6.1.2 Details of construction of doors, windows and ventilators shall be as indicated in Fig. 7 to 13 (*see* P 10 and 11).

6.2 Side-hung Shutters — For fixing aluminium alloy hinges, slots shall be cut in the fixed frame and the hinges inserted inside and may be riveted to the frame. The hinges shall normally be of the projecting type 67 mm wide (*see* Fig. 14). The aluminium alloy for cast hinges shall conform to IS Designation A-5-M of IS : 617-1959 Specification for Aluminium and Aluminium Alloy Ingots and Castings for General Engineering Purposes (*Revised*) and for extruded section of hinges to IS Designation HE10-WP or HE30-WP of *IS : 733-1956 Specification for Wrought Aluminium and Aluminium Alloys, Bars, Rods and Sections (For General Engineering Purposes). The pins for hinges shall be of stainless steel of non-magnetic type or of aluminium alloy HR30. Irrespective of hinges being anodized or not, the aluminium alloy pins shall be anodized to a minimum film thickness of 0·025 mm and shall be sealed with oil, wax or lanolin. Non-projecting types of hinges (*see* Fig. 15) may also be used, where agreed to between the purchaser and the supplier.

6.2.1 Friction hinges may be provided for side-hung shutter windows, in which case peg stay as mentioned under **6.2.3** may not be required. The working principle of the friction hinge is illustrated in Fig. 16 (*see* P. 12).

6.2.2 The handle for side-hung shutters shall be of cast aluminium conforming to IS Designation A-5-M of IS: 617-1959 Specification for Aluminium and Aluminium Alloy Ingots and Castings for General Engineering Purposes (*Revised*) and mounted on a handle plate welded or riveted to the opening frame in such a way that it could be fixed before the shutter is glazed. The handle should have anodized finish with minimum anodic film thickness of 0·015 mm. The handle shall have a two-point nose which shall engage with an aluminium striking plate on

*Since revised.

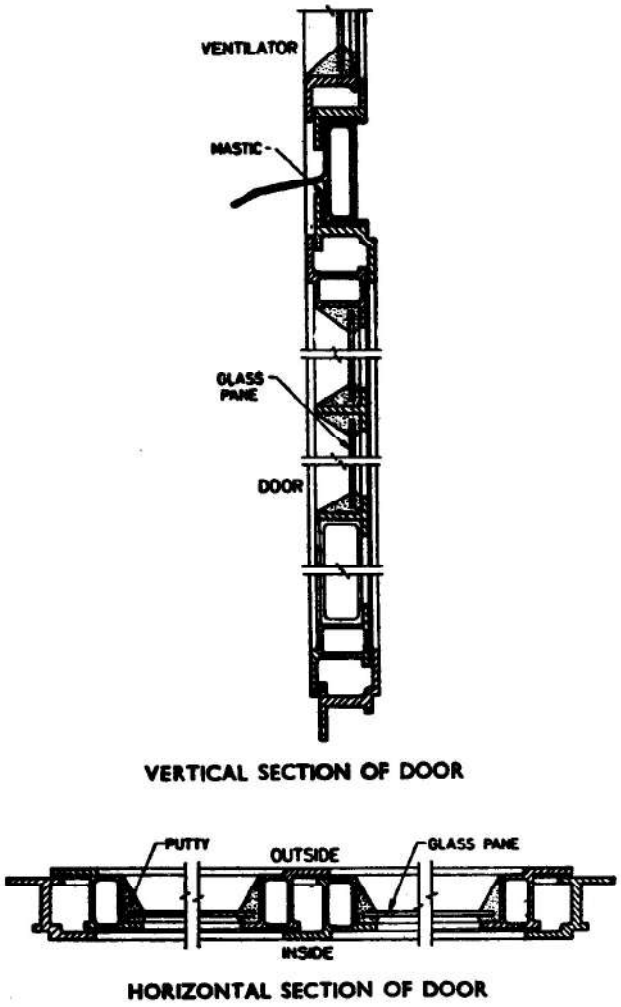


FIG. 13 DETAIL OF ALUMINIUM DOUBLE SHUTTER DOOR

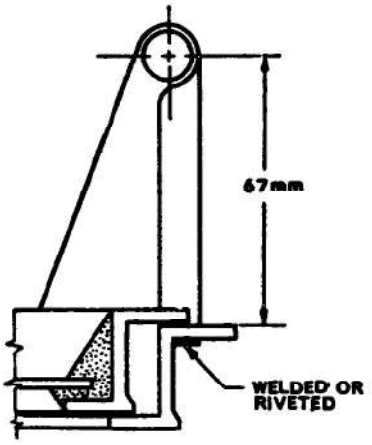


FIG. 14 TYPICAL PROJECTING TYPE HINGE FOR SIDE-HUNG SHUTTER

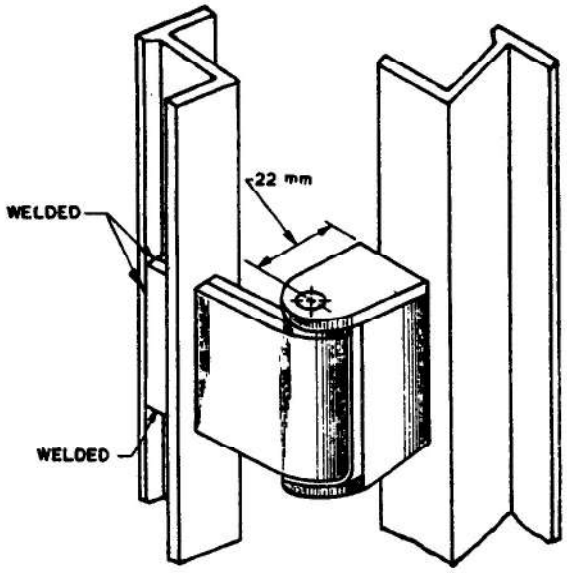


FIG. 15 TYPICAL NON-PROJECTING TYPE HINGE FOR SIDE-HUNG SHUTTER

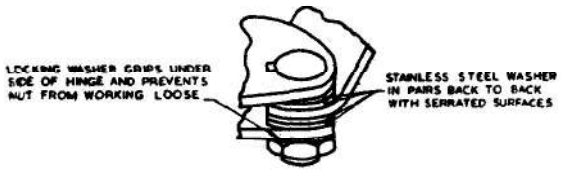
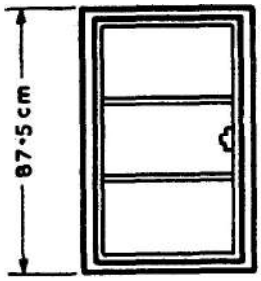


FIG. 16 ILLUSTRATION SHOWING WORKING PRINCIPLE OF FRICTION HINGES



9 MODULE (87·5 cm)
HIGH WINDOWS

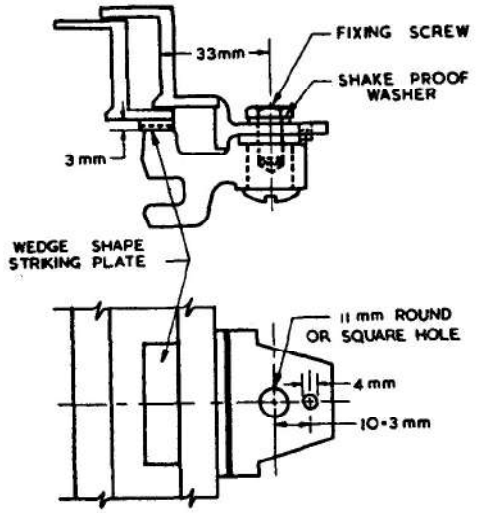
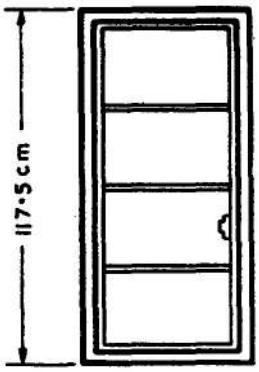


FIG. 17 A TYPICAL HANDLE FOR SIDE-HUNG SHUTTER



12 MODULE (117·5 cm)
HIGH WINDOWS

FIG. 18 POSITION OF HANDLE PLATES IN RELATION TO HEIGHTS OF 'HS' TYPE OF WINDOWS

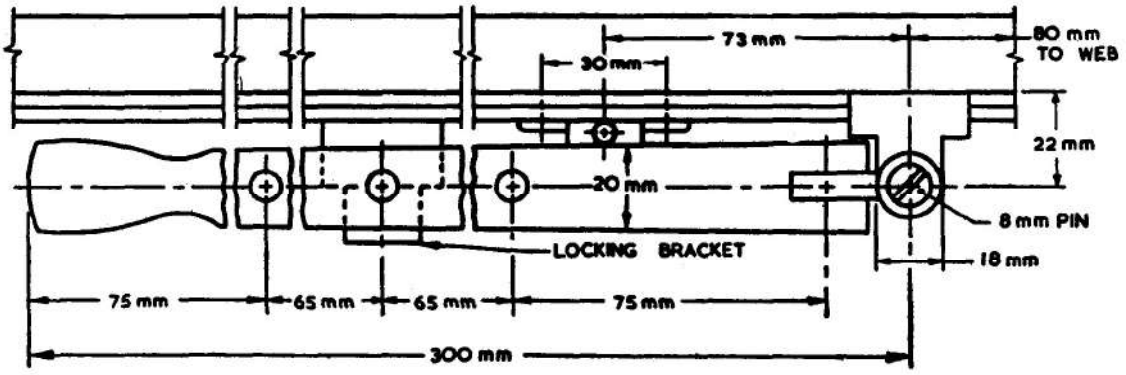


FIG. 19 A TYPICAL PEG STAY FOR SIDE-HUNG SHUTTERS AND TOP-HUNG VENTILATORS

the fixed frame in a slightly open position as well as in a fast position (*see* Fig. 17 on P 12). The height of the handles in each type of side-hung shutters shall be fixed in approximate positions as indicated in Fig. 18 (*see* P 12).

6.2.3 The peg stay shall be either of cast aluminium conforming to IS Designation A-5-M of IS: 617-1959 Specification for Aluminium and Aluminium Alloy Ingots and Castings for General Engineering Purposes (*Revised*), or folded from IS Designation NS4 aluminium alloy sheet conforming to *IS: 737-1955 Specification for Wrought Aluminium and Aluminium Alloys, Sheet and Strip (For General Engineering Purposes). It shall be 300 mm long, complete with peg and lock-

*Second revision in 1974.

ing bracket (*see* Fig. 19 on P 12). The stay shall have holes for keeping the shutter open in three different positions. The peg and locking bracket shall be riveted or welded to the fixed frame.

6.2.4 .Alternatively, and if specifically required by the purchaser, side-hung shutters may be fitted with an internal removable fly screen of 0·375 mm wire and equivalent to IS Sieve 100 in a 0·900 mm aluminium alloy sheet conforming to IS Designation NS3-1/2H of *IS: 737-1955 Specification for Wrought Aluminium and Aluminium Alloys, Sheet and Strip (For General Engineering Purposes), applied to the outer frame of the shutter by cast or extruded

*Second revision in 1974 .

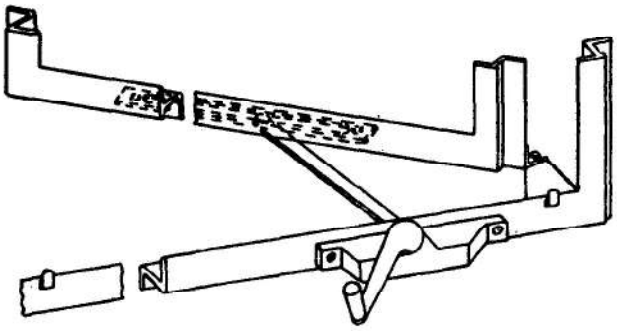


FIG. 21 TYPICAL ROTOR OPERATOR FOR SIDE-HUNG SHUTTERS FITTED WITH FLY SCREEN

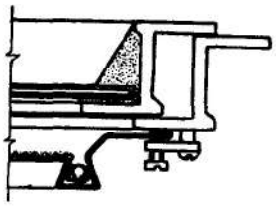


FIG. 20 DETAIL THROUGH JAMB SHOWING TURNBUCKLE

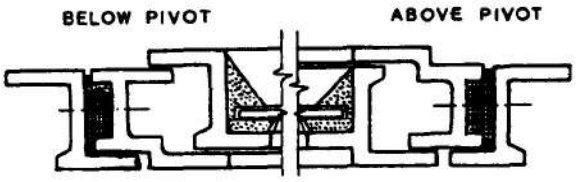


FIG. 22 DETAILS OF HORIZONTAL CENTRE-HUNG VENTILATOR

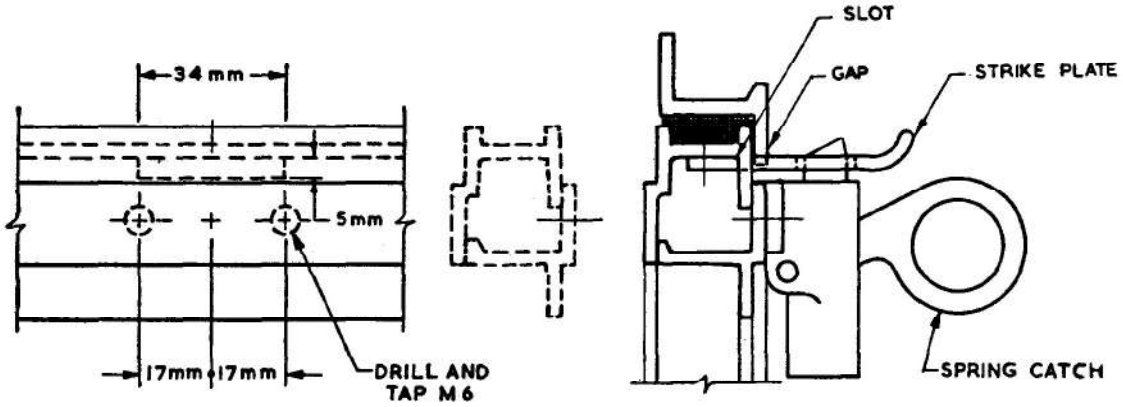


FIG. 23 SPRING CATCH FOR CENTRE-HUNG VENTILATOR

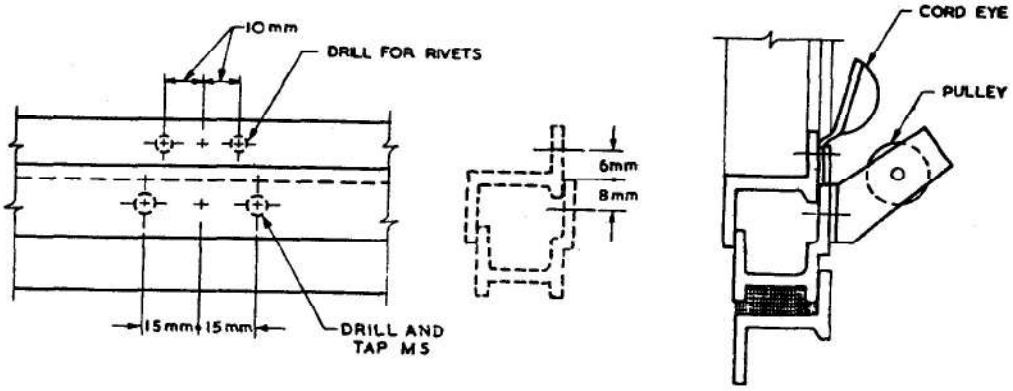


FIG. 24 CORD EYE AND PULLEY ARRANGEMENT FOR CENTRE-HUNG VENTILATOR

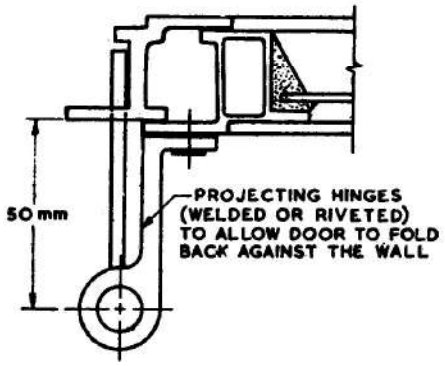


FIG. 25 TYPICAL PROJECTING TYPE HINGE FOR DOOR

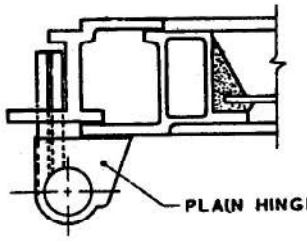


FIG. 26 TYPICAL NON-PROJECTING TYPE HINGE FOR DOOR

aluminium alloy turn-buckle at the jambs (*see* Fig. 20) and by aluminium or plated bronze (gunmetal) shoes at the sill to allow of the screen being readily removed; and with a rotor operator at the sill to permit the operation of the shutter through an angle of 90° (*see* Fig. 21). On fly-screened shutters the peg stay is omitted and the normal handle shall be replaced by a locking handle to hold the shutter in the fast position.

6.3 Top-Hung Ventilators — The aluminium hinges for top-hung ventilators shall be either cast or fabricated out of extruded sections and shall be riveted to the fixed rail after cutting a slot in it. The aluminium alloy for cast hinges shall conform to IS Designation A-5-M of IS: 617-1959 Specification for Aluminium and Aluminium Alloy Ingots and Castings for General Engineering Purposes (*Revised*), and for extruded section of hinge to IS Designation HE10-WP or HE30-WP of *IS : 733-1956 Specification for Wrought Aluminium and Aluminium Alloys, Bars, Rods and Sections (For General Engineering Purposes).

6.3.1 The peg stay shall be 300 mm long as in side-hung shutter (*see* Fig. 19). The locking bracket shall be fixed to the fixed frame.

6.4 Centre-Hung Ventilators — Centre-hung ventilators (*see* Fig. 22) shall be hung on two pairs of cup pivots of aluminium alloy to IS Designation NS-4 of †IS: 737-1955 Specification for Wrought Aluminium and Aluminium Alloys,

*Since revised.
†Second revision in 1974.

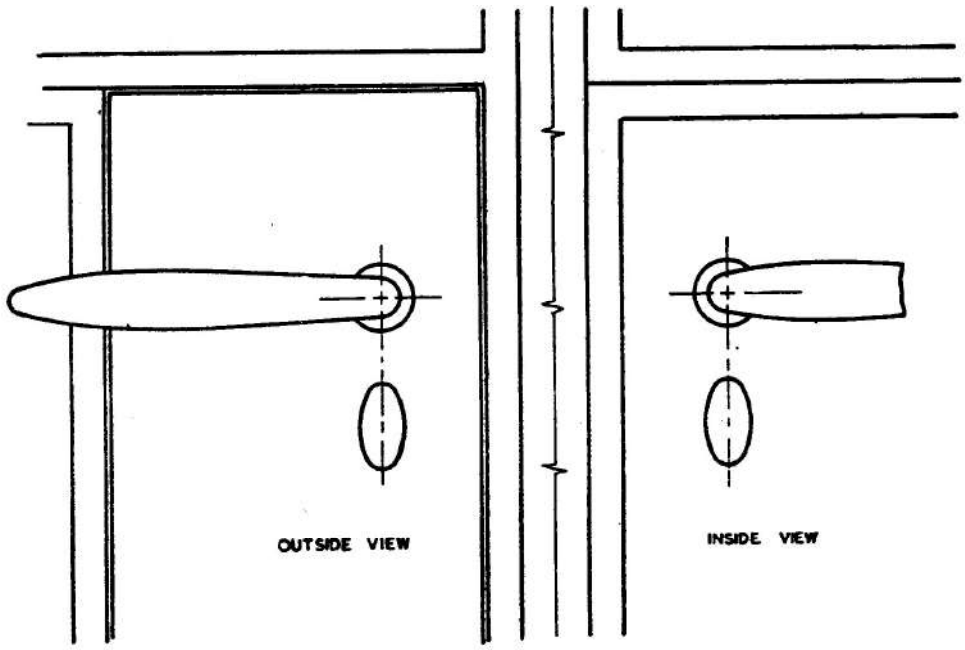


FIG. 27 TYPICAL DOOR HANDLE

Sheet and Strip (For General Engineering Purposes) and IS Designation A-5-M of IS: 617-1959 Specification for Aluminium and Aluminium Alloy Ingots and Castings for General Engineering Purposes (*Revised*) or on brass or bronze cup pivots which should be either chromium or cadmium plated and riveted to the inner and outer frames of the ventilator to permit the ventilator to swing through an angle of approximately 85°. The opening portion of the ventilator shall be so balanced that it remains open at any desired angle under normal weather condition.

6.4.1 Cast aluminium conforming to IS Designation A-5-M of IS: 617-1957 Specification for Aluminium and Aluminium Alloy Ingots and Castings for General Engineering Purposes (*Revised*) or bronze (gunmetal) which shall be either chromium-plated or cadmium-plated spring catch shall be fitted in the centre of the top bar of the ventilator for the operation of the ventilator. This spring catch shall be secured (preferably screwed or riveted) to the frame and shall close into an aluminium catch plate riveted or welded to the outside of the outer ventilator frame bar (*see* Fig. 23).

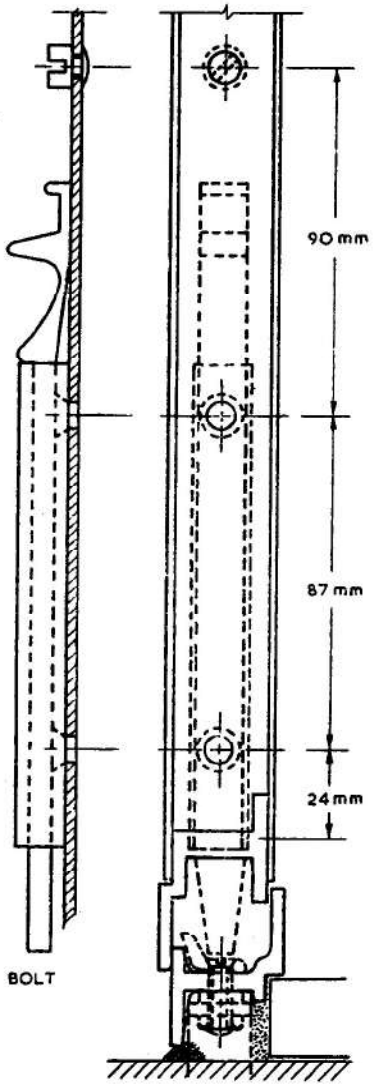


FIG. 28 TYPICAL VERTICAL BOLT FOR DOUBLE SHUTTER DOOR

6.4.2 Aluminium- or cadmium-plated brass cord pulley-wheel in an aluminium bracket shall be fitted at the sill of the ventilator with aluminium or glavanized or cadmium-plated steel screws or, alternatively, welded together with an aluminium cord eye riveted or welded to the bottom inner frame bar of the ventilator in a position corresponding to that of pulley (*see* Fig. 24).

6.5 Doors — The outer fixed frame shall be of section Al-FX8. The shutter frame shall be of either hollow sections Al-HFX5 and Al-HFX6 or of solid sections Al-FX5 and Al-FX6 shown in Fig. 5. Details of construction shall be as shown in Fig. 13.

6.5.1 The kick panels shall be of 1·25 mm aluminium alloy sheet conforming to IS Designation NS3-1/2H of *IS: 737-1955 Specification for Wrought Aluminium and Aluminium Alloys, Sheet and Strip (For General Engineering Purposes) and shall be screwed to the frame and the glazing bar.

6.5.2 *Hinges* — Cast or extruded aluminium alloy hinges for doors shall be of the same type as in the windows but of larger size. The hinges shall normally be of the 50 mm projecting type (*see* Fig. 25). Non-projecting type of hinges (*see* Fig. 26) may also be used.

6.5.3 The handle for doors may be of the design indicated in Fig. 27.

6.5.4 A suitable lock for the door operable either from inside or outside shall be provided.

NOTE — From the point of view of security, the lock which is operable from only one side is better and in the case of such locks, a bolt shall be provided to make them inoperable from the other side.

6.5.5 In double shutter doors the first closing shutter shall have a concealed aluminium alloy bolt at top and bottom (*see* Fig. 28). It shall be so constructed as not to work loose or drop by its own weight.

6.5.6 Single and double shutter doors may be provided with a three-way bolting device (*see* Fig. 29 on P 16). Where this is provided in the case of double shutter door, concealed aluminium bolts may not be provided.

6.6 Composite Units — The doors shall be coupled to windows or side-lights by extruded aluminium sections made from aluminium alloy conforming to IS Designation HE9-WP of †IS: 733-1956 Specification for Wrought Aluminium and Aluminium Alloys, Bars, Rods and Sections (For General Engineering Purposes). The coupling member should comform to the dimensions indicated in Fig. 30 (*see* P 17).

6.7 Weather Bar — Where a coupling member is fitted over an external opening shutter, the coupling member should incorporate an integrally extruded weather bar as indicated in Fig. 5.

*Second revision in 1974.
†Since revised.

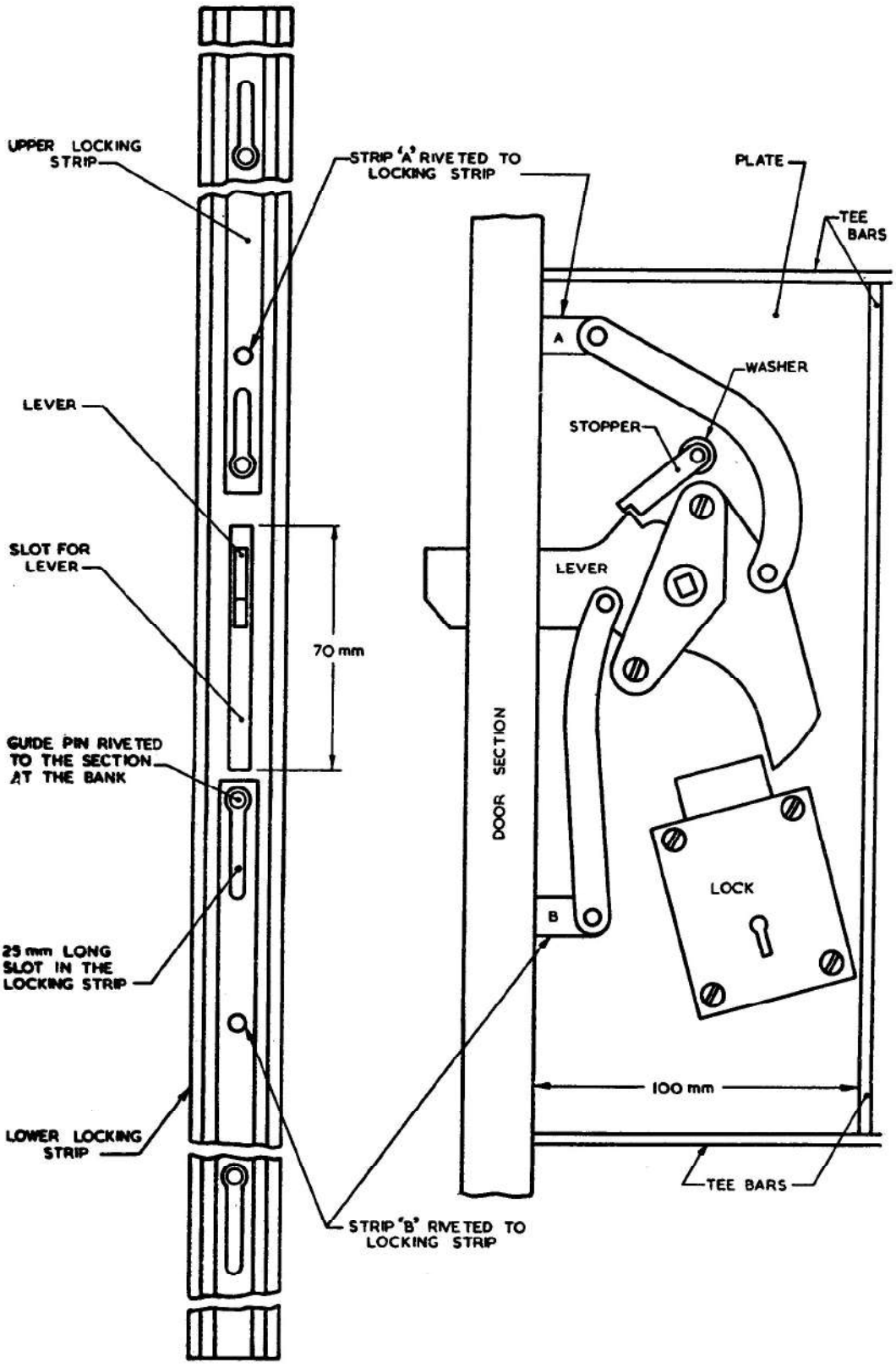


FIG. 29 TYPICAL THREE-WAY BOLTING DEVICE FOR DOORS

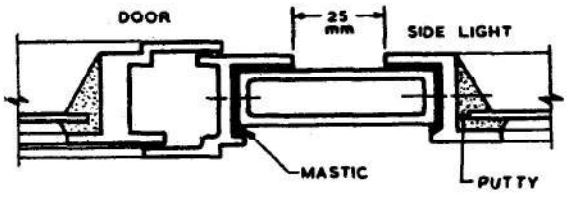
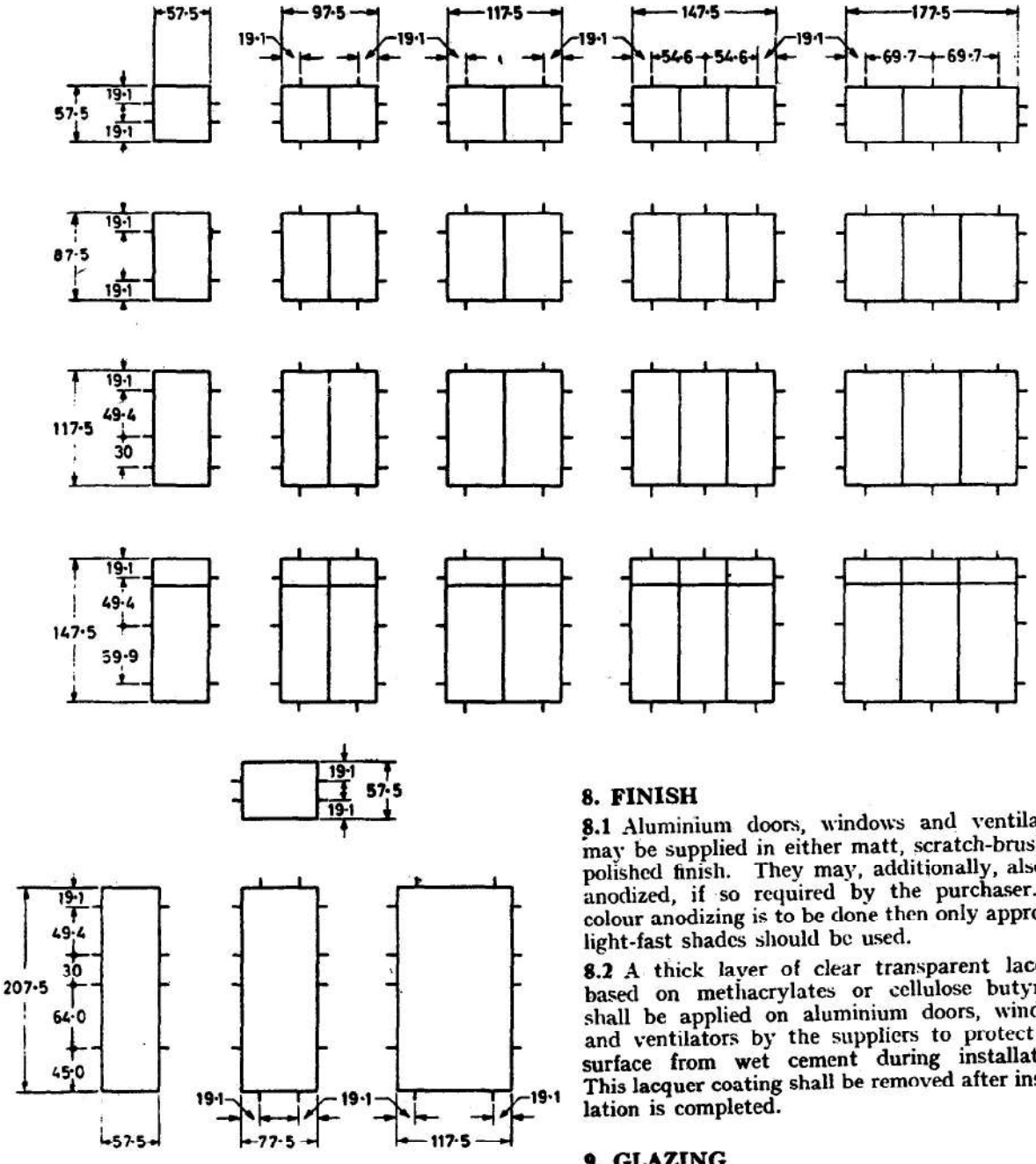


FIG. 30 COUPLING SECTION EXTRUDED FOR COUPLING DOOR TO WINDOW OR SIDE LIGHT

7. POSITION OF BOLTS, FIXING SCREWS AND LUGS

7.1 Outer frames shall be provided with fixing holes centrally in the web of the sections in the position indicated in Fig. 31 (*see* P 17). Moreover, any steel lugs coming in contact with aluminium should be either galvanized or given one coat of bituminous paint.

7.2 The fixing screws and lugs shall be as given in Table II (*see* P 18).



All dimensions in centimetres.

FIG. 31 CHART SHOWING APPROXIMATE POSITIONS OF FIXING HOLES AND NUMBER OF FIXING LUGS

8. FINISH

8.1 Aluminium doors, windows and ventilators may be supplied in either matt, scratch-brush or polished finish. They may, additionally, also be anodized, if so required by the purchaser. If colour anodizing is to be done then only approved light-fast shades should be used.

8.2 A thick layer of clear transparent lacquer based on methacrylates or cellulose butyrate, shall be applied on aluminium doors, windows and ventilators by the suppliers to protect the surface from wet cement during installation. This lacquer coating shall be removed after installation is completed.

9. GLAZING

9.1 Glazing shall be provided on the outside of the frames.

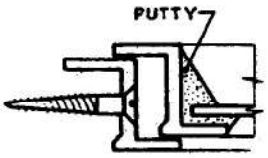
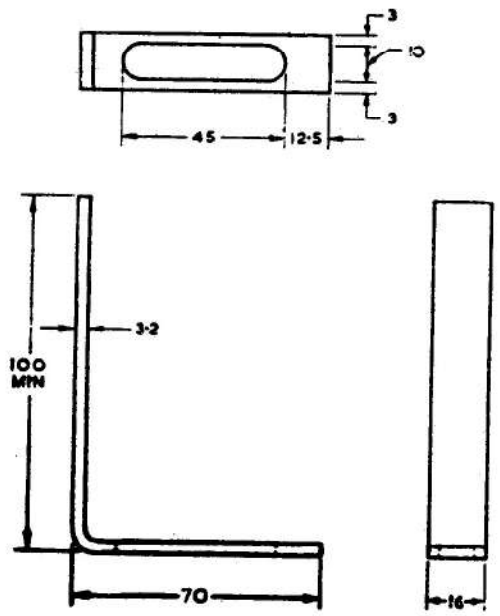
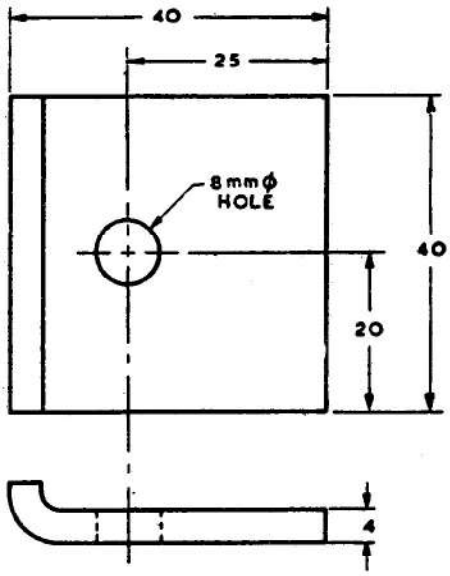


FIG. 32 FIXING SCREW FOR WOODEN FRAMES OR PLUGS IN CONCRETE



All dimensions in millimetres.

FIG. 33 SLOTTED FIXING LUG (FOR BRICKWORK AND MASONRY)



All dimensions in millimetres.

FIG. 34 FIXING CLIP FOR STEEL WORK

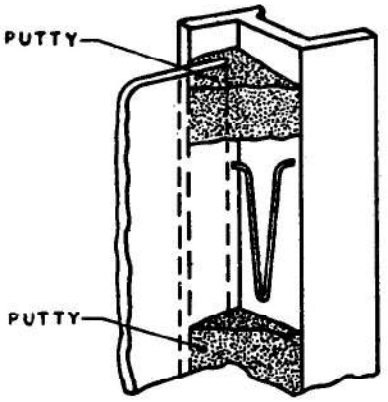


FIG. 35 GLAZING CLIPS

TABLE II FIXING SCREWS AND LUGS

(*Clause* 7.2)

SL NO.	PLACE OF FIXING	SIZE OF SCREW OR LUG
i)	To wooden frames rebated on the outside	30 mm × No. 10 galvanized wood-screws (*see* Fig. 32)
ii)	To plugs in concrete, stone or brick work rebated on the outside	do
iii)	To plugs in concrete, stone or brick work not rebated on the outside (that is plain or square jambs)	45 mm × No. 10 galvanized wood-screws
iv)	Direct to brick work or masonry (that is plain or square jambs)	Slotted steel adjustable lugs (natural finish) not less than 100 × 16 × 3 mm countersunk galvanized machine screws and nuts 19·0 × 6·3 mm (*see* Fig. 33)
v)	To steel work	Standard clips and 8 mm galvanized bolts with hexagonal nuts (*see* Fig. 34)

9.1.1 If required, glazing clips (*see* Fig. 35 on p. 18) may be provided as extra fittings by mutual arrangement between the purchaser and the supplier. Four glazing clips may be provided per glass pane, except for door type 8HS21 where the glazing clips shall be six per glass pane. In case of doors, windows and ventilators without horizontal glazing bars the glazing clips shall be spaced according to the slots in the vertical members, otherwise, the spacing shall be 30 cm.

NOTE — Glazing clips are not usually provided for normal size glass panes. Where large size glass panes are required to be used or where the door or the window is located in heavily exposed situation, holes for glazing clips have to be drilled prior to fabrication and cannot be done at any later stage. Use of glazing clips, where necessary, shall be specified while placing the order.

10. PACKING

10.1 All doors, windows and ventilators shall be

despatched with the opening parts suitably secured to preserve alignment when fixing and glazing.

10.2 Fixing lugs, coupling fittings and all hardware shall be despatched separately.

10.3 Composite windows shall be despatched uncoupled.

11. MARKING

11.1 All doors, windows and ventilators shall be suitably marked on the frames with a mark identifying the manufacturer and the type.

11.1.1 The units may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

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Amendments Issued Since Publication

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