

SPECIFICATION OF MATERIALS

GENERAL

- (1) All materials to be used shall conform to the relevant specifications as per the latest edition of Indian Standard, unless otherwise stated in the detailed specifications of items of work.
- (2) All materials to be used shall be of approved quality & make as per list of approved make attached with the tender documents
- (3) Wherever a reference to any Indian Standard appears in the specification, it shall be taken to mean as a reference to the latest version of the standard.
- (4) The following specifications, standards, and codes are made a part of this specification\Tender document.

Indian Standards : specification for building materials, specification for equipment, method of test, method of measurement of building works ,code of practice for construction , safety code for demolition of building, safety code for scaffolds etc. published by the Bureau of Indian Standards

- (5) The contractor shall invariably carry out Materials & work Tests as specified in the tender document (**B1- Form**) and IS code. However, if the additional tests are required as per the opinion of the Engineer-in-charge, the same shall also have to be carried out. All such tests shall be got carried out in Government or as approved laboratories and cost thereof shall be entirely borne by the contractor. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
- (6) Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.
- (7) Materials, if rejected by the Engineer-in-charge, shall be immediately removed from the site of work. If they are not removed within twenty four hours of receiving such intimation, Engineer-in-charge shall get the same removed at contractor's cost.

The Engineer-in-charge shall dispose off such materials in a manner as he chooses and the contractor shall not entitle to any compensation for the cost of such materials.

- (8) Approval to the samples of various materials given by the Engineer-in-charge will not absolve the contractor from the responsibility of replacing the defective material brought on site of materials used in the work found defective at a later date. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge.
- (9) The contractor shall be responsible for observing the law, rules and regulations imposed under the "Minor Minerals Act " and such officer laws and rules prescribed by Government from time to time.

M-1 Water :

Water shall not be salty or brackish and shall be clean, reasonably clean and free from objectionable quantities of silt and traces of oil and injurious alkalis, organic matter and other deleterious material which will either weaken the mortar or concrete or cause efflorescence or attack the steel in RCC container for transport storage and handling of water shall be clean.

If required by Engineer-in-charge it shall be tested by comparison with detailed water. Comparison shall be made by means of standard cement, tests, soundness, time of setting and mortar strength as specified in IS- 269-1976. Any indication of unsoundness, change in time of setting by 30 minutes or more or decrease of more than 10 percent in strength of mortar, prepared with water sample when compared with the result obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

Water for curing to 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 those produce objectionable stain or other unsightly deposits on concrete or mortar surface. Hard and bitter shall not be used for curing. Potable water will generally be found suitable for curing of mortar or concrete.

M-2 Lime :

Lime shall be hydraulic lime as per I.S. 712-1973. Necessary tests shall be carried out as per IS- 69332 (Part I to X) 1973.

Storage shall comply with I.S. 712-1973. The slacked limes if stored shall be kept in a weather proof and damp- proof shed with impervious floor and sides be protected it against rain, moisture, weather and extraneous materials mixing with it. All limits that have been damaged in any way shall be rejected and all rejected materials shall be removed from site of work.

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

M-3 Cement :

Cement shall be ordinary Portland cement as per I.S. 269-1975.

The contractor shall take every precaution to store the cement properly. So that it is not spoiled by dampness etc. Cement required for use shall be fresh as possible and stored on plank raised 15 to 20 cms above the floor and stacked 30 cms. Away from the wall in suitable closed whether proof godown at the site of work. Cement shall be stored in such a way to allow the removal and use of cement in chronological order on receipt i.e. first received being first used. Not more than 15 bags shall be stacked vertically in one pile and maximum width of the piles should not be more than 3 meters. Any cement which has deteriorated caked or which has been set or partially set shall not be used. When temporarily stored in open for use it shall be kept on a suitable platform and suitably protected as necessary.

Different brands of cement or cement of the same brand from different factories shall be stored in separate groups and shall not be mixed during use. Cement shall be kept in a store under double locking arrangement. A board indicating stock and daily transaction or cement shall be kept in each room of the cement store. Daily account of receipt and use of cement bag shall be maintained by the contractor in the Performa prescribed by the Engineer-in-charge.

The cement shall be measured by one bag for all use in concrete (except otherwise stated) etc. In no case cement shall be measured by boxes or other means for the volumetric proportion of concrete and mortar. For calculation for the proportion, the volume of the cement bag shall be taken as 0.0342 cu.m. (1.20 cf) and measuring of size 30 cms x 30x38 cms for concrete works. If weight batch concrete is to be used, the cement shall have to be used as per actual weight and the contractor shall not be entitled for any compensation for loss in weight due to shifting of bags or on account of any other reasons.

M-4 White cement :

The whole cement shall conform to IS- 8042-E-1076.

M-5 Coloured cement :

Coloured cement shall be with white or grey Portland cement as specified in the item of the work.

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

M-6 Sand :

Sand shall be natural and clean, well graded, hard strong durable and gritty partition free from injurious amount of dust, clay, kankar nodules, or of flaky partition shale alkali, salts, organic matter loam mica or other deleterious substance shall be got approved from the Engineer-in-charge if sand is covered with dust it shall be washed with water to make it clean.

(A) The sand to be used in cement mortar for masonry work and first coat of plaster should generally satisfy the following grading.

I.S. sieve	Percentage by weight passing through.
480	100
230	80-95
120	70-90
60	40-85
30	5-50
15	0-10

(B) The fineness modules shall not exceed 3.0. Sand to be used in cement mortar for stone slab lining work, pointing and second coat of plaster may have the grading.

I.S. sieve	Percentage by weight passing through.
480	100
240	100
120	75-100
60	40-85
30	5-50
15	0-10

The fineness modules shall not exceed 1.6.

(C) Sand to be used for concrete work shall of grades as specified in I.S. 383-1970 with fineness modules varying from 2.6 to 3.6 as per requirement.

The sand shall be stacked carefully on a clean hard surface. Sand of approved quality shall be obtained from approved sources and will be allowed to be used for work.

M-7 Stone Dust :

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

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

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

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

M-8 Black Trap Grit :

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 flaky elongated pieces shall be avoided. It shall generally comply with the provision of IS – 383-1970. Unless special stone of particular quarries are mentioned, aggregate shall be broken from the best black trap stone as approved by the Engineer-in-charge. Stones shall have no deleterious reaction with cement.

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

I.S. sieve designation	Percentage passing for sieve.
12.50 mm	100%
10.00 mm	45-100%
4.75 mm	0-20%
2.36 mm	0-5%

The crushing strength of grit shall be such as to allow the concrete in which to be used to built up the specified strength of concrete.

The necessary test for grit shall be carried out as per the requirement of I.S.- 2386-Part-I to VIII of 1993 or as revised from time to time as per instruction of the Engineer-in-charge.

M-9 Cement Mortar :

Cement : Cement shall conform to specification M-3

Water : Water shall conform to specification M-1

Sand : Sand shall conform to specification M-6.

Proportion of mix :

Cement and sand shall be mixed to specified proportion. Sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 kg/bag of cement being equal to 35 liters or 0.0342 M3. The mortar may be hand mixed or machine mixed as directed by the Engineer-in-charge.

Preparation of mortar:

In hand mixed mortar, cement and sand in the specified proportion 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 colour is obtained. Mixing platform shall be so arranged that no deleterious, extraneous material shall be get mixed with mortar or mortar shall flow out, while mixing the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio may be adopted as directed by the Engineer-in-charge.

The mortar so prepared shall be used within 30 minutes of adding water; only such quality of mortar shall be prepared as can be used within 30 minutes. The mortar remaining unused after that period or mortar which has partially hardened or damaged shall not be re-tempered or remixed. It shall be destroyed or thrown away.

M-10 Black trap stone coarse aggregate for plain and ordinary reinforced concrete.

Coarse aggregate shall be of machine crushed stone of black trap and be hard strong, dense, durable, clean and free in skin and coating likely to prevent proper adhesion of mortar. The aggregate shall generally be cubical in shape. Unless special stones or particular quarries are mentioned, aggregates shall be machine crushed from the best black strap stone as approved by the Engineer-in-charge. Aggregate shall leave no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete 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 6 mm less than the minimum lateral clear distance between bars or 6mm less than the cover which is smaller.

TABLE -1

L.S. sieve designation.	Percentage aggregates 40 mm	Passing for single of nominal size 20 mm	Size 16mm
40mm	85-100	100	100
20mm	0-20	85-100	100
16mm	--	--	--
12.5 mm	--	--	--
10 mm	0-5	0-20	0-30
4.75mm	--	0-5	0-5
2.36 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.

Single size coarse aggregates conforming to the requirements in Table No. 1 above or following nominal size shall be used at site with the other ingredients of concrete as indicated below. The mixing shall be in a mixture or on the platform as directed in case of CC 1:5:10 only. For CC 1:4:8, CC 1:3:6, CC 1:2:4 and CC 1:1^{1/2}:3 mixing with the other ingredient of concrete shall be done in the mixture only except for small works.

- (1) CC 1:5:10 - Nominal size of aggregate 40 mm
- (2) CC 1:3:6 - Nominal size of aggregate 20 / 40 mm
- (3) CC 1:4:8 - Nominal size of aggregate 40 mm
- (4) CC 1:2:4 - Nominal size of aggregate 20 mm
- (5) CC 1:1^{1/2}:3- Nominal size of aggregate 20 mm

The grading test shall be taken in the beginning and at the change at the source of materials. The necessary test indicated in IS 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 to prevent the inter mixing of different aggregates. If the aggregates are covered with the dust, it shall be washed with water to make it clean. The coarse aggregates for plain and reinforced concrete shall be measured by volume in the steel or wooden boxes prepared as per the direction of the Engineer-in-charge.

M-11 Black trap stone coarse aggregates for controlled reinforced concrete:

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

The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregate shall be machine crushed from the best, black trap stone as approved by the Engineer-in-charge. Aggregate shall have no deleterious reaction with cement.

In proportion concrete, the quantity of coarse aggregate shall be determined by weight only. The grading of coarse aggregate shall be controlled by obtaining the aggregate in different size and blending them in the right proportions as per concrete mix design approved by the Engineer-in-charge. The different sizes shall be stocked in separate stock piles. The grading of aggregates shall be checked as frequently as possible. The frequency for verification of the grading shall be as directed by the Engineer-in-charge to ensure that the grading as maintained uniform with that of the samples used in the preliminary tests.

The necessary test indicated in I.S. 383-1976 and I.S. 456-1978 shall have to be carried out to ensure the acceptability of the material.

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

M-12 Brick Bats Aggregate :

Brick aggregates shall be broken from well burnt to 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 to 50mm unless otherwise specified in the item. The under burnt to over burnt brick bats shall not be allowed.

M-13 Bricks / flyash building brick :**(A) First class Bricks :**

The bricks shall be hand or machine moulded and made from suitable soils and klin burnt. They shall be free from cracks and flaws modules of free time. They shall have smooth rectangular faces with sharp corners and shall be of uniform colour. The bricks shall be moulded with a frog of 100mm x 40 mm and 10mm to 20 mm deep on one of the flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.

The size of modular bricks shall be 190mmx90mm x 90mm and shall conform to IS 1077-1976 in respect of tolerance for sub-class "A" bricks.

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 shall be carried out as directed by the Engineer-in-charge.

(B) Second class bricks:

The second class bricks shall be similar to first class bricks except that they may be permitted to have slight distorted and rounded edges provided no difficulty shall arise on this account in laying of uniform courses.

M-14 Mild Steel Bars :

Mild steel bars reinforcement for RCC work shall conform to I.S. 432 1966 and of tested quality. It shall also comply with relevant part of IS 456-1978.

All reinforcement shall be cleaned and free from dirt, oil, paint, grease, mill's make or loose or thick rust at the time of placing.

Reinforcement steel shall be stored such as to avoid distortion and sogs of long length and shall be protected as far as possible from surface deterioration. All bars of the same designation shall be stacked separately as far as possible and distinctly marked. For the purpose of payment the bar shall be measured correct up to 10mm length and weight payable worked out at the rate specified below.

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

M-15 High Yield Strength Steel Deformed Bars/TMT/CRS :

High yield strength steel deformed bars shall be either cold twisted or hot rolled and shall conform to IS 1786-1979 & I.S. 1139-1966 respectively or as revised from time to time.

T.M.T. shall conform to IS 1789-FE415 or as revised from time to time. Approved

make for TMT bar shall be Tata, Shah Alloys, Malhotra, Rajury, Sirhind, Thermax
Corrosion Resistance Steel shall conform to relevant IS code or as revised from time to time.

Other provisions and requirements shall conform to specification No. M -14 for Mild steel bars.

M-16 Mild Steel Binding Wire :

The mild steel wire shall be of 1.63mm or 1.22mm (16 or 18 gauge) diameter and shall conform to IS 280-1978 or as revised from time to time.

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

Storage: The wire coils shall be stored such as to avoid deterioration.

Measurement: No measurement will be taken of the wire used for tying reinforcement bars. The rate for reinforcement steel and its fabrication shall include the cost of binding wire.

M-17 Structural Steel :

All structural steel shall conform to I.S.226-1975 & I.S. 800-1962 or as revised from time to time. The steel shall be free from defects mentioned in I.S. 226-1975 and shall have smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability Rivet bars shall conform to I.S. 1148-1973.

Structural steel shall be stored such as to avoid distortion of section of long length and shall be protected as far as practicable from surface deterioration. It should be so stored and handled that material will not be subject to excessive stress and damages. All deformed structural material will be properly straightened by methods which are not injurious prior or being aid off, punched or otherwise worked in the shop. Sharp kinks and bends shall be caused for rejection.

When the steel is supplied by the contractor test certificate of the manufacturers shall be produced, if so required by the Engineer-in- charge. If further test be necessary, they will be done according to I.S. 226-1975 & I.S. 223-1950 or as revised from time to time.

M-18 Shuttering :

The shuttering shall be either of wooden planking of 30mm minimum thickness with or without steel sheet lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical bellies properly cross braced together so as to make the form work rigid.

The form work shall be sufficiently 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 working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.

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

If wooden props are used, the props shall consist of bellies having 100mm minimum diameter measured at mid length and 80mm at thin end and shall be placed at 1 to 1.20 m. spacing. These shall rest squarely on wooden sole plates 10 mm thick and minimum bearing area of 0.10 sq.m. laid on sufficiently hard base.

Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and casing of shuttering without jarring the concrete.

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

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

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 soap solution or raw linseed oil of approved manufacturer may be applied in place of soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface.

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 cantilever the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

The period that shall elapse after concrete has been laid before easing and removal of centering and shuttering as under taken shall be as follows :

	Part of structure	Period
1	Sides of foundation, columns beams & walls.	34 to 48 hours
2	Undersides of slabs up to 4.5 m span	7 days.
3	-do- above 4.5 m add under side of beams and arches up to 6 m span.	14 days.
4	-do- above 6 m. span and up to 9 m span.	21 days
5	Undersides of beams and arches over 9 m span	28 days
6	Domes: Shall & other structure of special nature.	As per instruction.

Work damaged through premature or careless removal of forms shall be reconstructed. The period for striking the form work shall be 1.5 times more in case of Pozzolona cement if used then that of the ordinary Port land cement and the contractor shall not entitle for any extra claim for the same.

M-19 Expansion Joints, Pre-moulded Filler :

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

Pre-moulded bituminous joint filler i.e. pre-formed strip of expansion joints filler shall not be deformed or broken by twisting bending or other handling when exposed to atmospheric condition. Pieces of joint filler that have been damaged shall be rejected.

Thickness of the pre-moulded joint filler shall be 25mm unless otherwise specified pre-moulded bituminous joints filler shall conform to I.S. 1938-1961 or as revised from time to time.

M-20 Expansion Joints – Copper Strip & Holdfast :

The item provides for expansion joints in R.C.C. frame structure for internal joints as well as for exposed joints with the use of necessary copper strip and hold fasts. Copper sheet shall be of 125 mm thick and 125mm or required width with the “U” shape in the middle. Copper strip shall hold fast of 3mm diameter copper rod fixed to the plaster shoulders on strip at intervals of about 30 or as shown in the drawing or as directed by the Engineer-in-charge. The width of each flange (horizontal side) of the copper plate to be embedded in the concrete work shall be 25mm depth of “U” to be provided in the expansion joint in the copper plate shall be of 25mm.

M-21 Teak Wood :

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 by the Engineer-in-charge shall be used.

Teak wood shall generally free from large, loose, dead or cluster knots, flows, shakes, wraps twists bends or any other defects it shall generally be uniform in sub-stance and of straight fibers as far as possible. It shall be free from root, decay, harmful fungi and other damages of harmful nature which will affect the strength durability or its usefulness for the purpose for which it is required. The colour shall be uniform as far as possible. Any effort like painting using and adhesive or resinous materials, made to hide the defects shall render the pieces liable to rejection by the Engineer-in-charge.

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

The tolerance in the dimensions shall be allowed at the rate of 1.5mm per face to be planned.

M-22 Glass :

All glass shall be of the best quality, free from specks, bubbles, smokes, veins, air holes, blisters and other defects. The kind of glass to be used shall be as mentioned in the item of specification or in the special provisions or as shown in detailed drawings. Thickness of glass panels shall be uniform. The specification of different kind of glass shall be as under:

Sheet Glass :

In absence of any specified thickness or weight in the item of detailed specifications of the item of work sheet glass shall be weighing 7.5 kg/ sq.m. up to 600mm x 600mm.

For panes larger than 600mmx600mm up to 800mmx800mm the glass weighting not less than 8.75 kg /sq.m. shall be used. For bigger panes up to 900mmx900mm glass weighting less than 11.25 kg/ sq.m. shall be used.

Sheet glass shall be patent Battened glass of best quality and for glazing and framing purposes shall conform to IS – 2835-1977. Sheet glass of the specified colour shall be used, if shown on detailed drawings or so specified. For important buildings and for panes with any dimensions 900 plate glass of specified thickness shall be used.

Plate Glass:

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 details drawing or as specified. In absence of any specified thickness, the thickness of plate glass to be supplied shall be 6mm and to tolerance of 0.55 to 0.88 mm shall be admissible.

Obscured Glass:

This type of glass transmits lights so that vision is partially or almost completely, obscured. Glass shall be plain rolled or double rolled, figured, ribbed or fluted, or frosted glass as may be specified or required, the thickness and types of glass shall be as detailed on drawings or as specified or as directed by the Engineer-in-charge.

Wired Glass:

Glass shall be with wire netting embedded in a sheet or plate glass electrically, welded 13mm. Georgian square mesh shall be used. Thickness of glass shall not be less than 6 mm wired glass shall be of type and thickness specified.

M-23 Fixtures & Fastenings :

General:

The fixtures and fastenings that is but things, tee and strap hinges, sliding door bolts, tower bolts, door latch, bathroom latch, handles, door stoppers, casement window fasteners, casement stays and ventilators catch shall be made of the metal as specified in the item or its specifications.

They shall be of iron, brass, aluminum chromium plated iron, chromium plated brass, copper, oxidized iron, copper brass or anodized mat aluminum, stainless steel matt as specified.

The fixtures shall be approved make as per list of approved make attached with the tender document. The fixtures and fastenings shall be smooth finished and shall be such as will ensure ease of operations.

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

Their size shall conform to those prescribed in C-12. In respect of other dimensions not specified they shall conform to relevant I.S.

Hold Fast:

Hold fast shall be made from mild steel flat 50mm length at one end of the hold fast shall be bent at right angle and two Nos. of 6mm diameter holds shall be made in it for fixing it to the frame with screws. At the other end, the hold fast shall be forked and bent at right angles in opposite direction.

Butt Hinges:

Medium type iron butt hinges shall be specified.

Tee and strap hinges shall be manufactured from M.S. sheet as specified in the item.

Sliding Door Bolts (Aldrops)

In case of single leaf door, where iron socket plate or brass or aluminum fixing bolts (for sliding door bolt) cannot be fixed, a hole of suitable size shall be drilled in the door frame and a counter sunk plate not less than 1.5mm thick cut to shape shall be fixed at the face of the holes.

Tower Bolts (Barrel Type)

Mild steel door bolts shall be made in one piece. Knobs of tower bolts shall be cast and knob fixed in the bolt.

Door Latch:

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

Bathroom Latch:

Bathroom latch shall be similar to tower bolt. The size of the handles shall be determined by the inside grip length of the handles.

Door Stoppers:

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

Door Catch:

Door catch shall be fixed at a height of about 900 mm from the floor level such that one part of 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 20mm inside the face of the door for easy operation of catch.

Casement window fastener:

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

Casement stays (straight peg stay):

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.

Pivot:

The base socket plate shall be made from minimum 3 mm thick plate, and protected pivot shall not be less than 12 mm diameter and 12mm length and shall be firmly riveted to the base plate in case of iron pivot. Size of the stay shall be 250mm, 800mm as directed.

M-24

Paints :

(A) Oil Paints :

Oil paints shall be of the specified colour and shade, and approved by the Engineer-in-charge. The ready mixed paints shall be used. However, if it ready mixed paint of specified shade or tint is not available white ready mixed paint with approved strainer shall be allowed in such a case, the contractor shall ensure that the shade of the paints so allowed be uniform.

All the paints shall meet with the following general requirement:

- i) Paints shall not show excessive setting in a freshly opened full can and shall easily be redispersed with a paddle to a smooth homogeneous state. The paint shall show no curdling, levering, cracking or colour separation and shall be free from lumps and skins.
- ii) The paint as received shall brush easily possesses good leveling properties and show no running or sagging tendencies.
- iii) The paint shall not skin within 48 hours in a three quarters filled closed container.

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

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

(B) Enamel Paints:

The enamel paint shall satisfy in general requirements as mentioned in specification of oil paints.

Enamel paint shall conform to IS 2933-1975 or as revised from time to time.

M-25 French Polish :

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

- i) Denatured spirit
- ii) Chandra's.
- iii) Shellac
- iv) Pigment

The French polish so prepared shall conform to I.S. 348-1968 or as revised from time to time.

M-26 Marble Chips for Marble Mosaic Terrazzo :

The marble chips shall be Makrana white or Chittor pink, yellow, green and black , Jaisalmer yellow, Baroda green, Deheradun white, grey (surat) and Alwar black or as specified. It shall be hard, sound, dense and homogeneous in texture with crystalline and coarse grains. It shall be uniform in colour and free from stains cracks, decay and weathering.

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

The marble chips shall be machine crushed. They shall be free from Foreign matters, dust, etc. Except as above the chips shall conform to I.S. 2114-1962 or as revised from time to time.

M-27 Flooring Tiles :

(a) Plain Cement Tiles :

The plain cement tiles shall be of general purpose type. These are the tiles in the manufacture of which no pigments are used.

The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During manufacture tiles shall be subjected to a proportion of not less than 140 kg / sq.mt. 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 aggregates on 1 to 2 mm size. The proportion of cement to be aggregate in wearing layer of the tiles shall be three parts of cement to one part of chips by weight. The minimum thickness of wearing layer shall be 3 mm. The colour and texture of wearing layer shall be uniform through out its face and thickness. On removal from mould, the tiles shall be kept in moist condition continuously at least for seven days and subsequently if necessary, for such period that would ensure their conformity to requirements of

I.S. 1237-1980 regarding resistance to wear and water absorption.

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 tiles. All angles shall be right angles and all edges shall be sharp and true.

The size of tiles shall generally be squared shape size 24.85 cm x 24.85 cm or 25 cm x 25 cm. The thickness of tiles shall be 20 mm.

Tolerance on length and breadth shall be plus or minus one millimeter. Tolerance on thickness shall be plus 5 mm.

The tiles shall satisfy the test as regards transverse strength, resistance to wear and water absorption as per I.S. 1237-1980. Necessary tests shall be got carried out by the contractor.

(B) Plain Coloured Tiles :

These tiles shall have same specification as per plain cement tiles as per (A) above except that they shall have a plain wearing surface wherein pigments are used. They shall conform to IS 1237-1980.

The pigment used for colouring cement shall not exceed 10 percent by weight of cement used in the mix. The pigments, synthetics or otherwise used for colouring tiles shall have permanent colour and shall not contain materials detrimental to concrete.

The colour of the tiles shall be as specified in the item or directed by the Engineer-in-charge.

(C) Marble Mosaic Tiles / Terrazzo tiles :

These tiles shall have the same specifications as per plain cement tiles except that requirements as stated below:

The pigment incorporated in terrazzo shall be of permanent colour and shall conform to requirement mentioned in Appendix-A in I.S. 2114-1962. The marble powder shall passed through I.S. sieve Terrazzo-30. Marble chips shall conform to M-26.

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

Chip used in the tiles shall be up to 6mm sizes. The minimum thickness of wearing layer of tiles shall be 6 mm. For pattern of chips to be had on the wearing face, few samples (with or without their full size photographs as directed by the Engineer-in-charge) shall be presented to the Engineer-in-charge for approval.

Any particular samples, if found suitable shall be approved by the Engineer-in-charge or he may ask for few more samples to be prepared indicating roughly the particular sized chips to be more or less in the sample presented. The sample 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 supplied for the work shall be in conformity with the approved sample only tiles in item of its dimensions thickness of backing layer and wearing surface material ingredients, colour, shade chips distribution etc. required.

The tiles shall be prepared from cement conforming to I.S. or coloured Portland

cement generally depending upon the colour of tiles to be used or as directed.

M-28 Rough Kotah Stone :

(A) Kotah Stones :

The kotah stones shall be hard, even, sound and regular in shape and generally uniform in colour. The colour of the stone shall generally be Green. Brown or yellow coloured, stones shall not be allowed for use. They shall be without any soft veins, cracks or flows.

The sizes of the stones to be used for flooring shall be of size not less than 600mm x 450mm as directed. However, smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be as specified.

(B) Polished Kotah Stones :

Polished kotah stone shall have the same specification as per rough kotah stone as per (A) above except as mentioned below.

The stone shall have machine polished smooth surface. When brought on side, the stone shall be single or double polished depend upon the its use or as described in the item of Schedule "B". The stone for flooring shall generally be single polish. The stone to be used for dedo, skirting, platform, stair case steps etc. shall be double polished & all exposed edges rounded.

M-29 Dholpur Stone Slab :

Dholpur stone slab shall be for 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 shape and of uniform colour.

The size of the stone shall be as 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 plus or minus 2mm. The provisions in respect of polishing as per M-29 (B) of polished kotah stone shall apply to polished Dholpur stone also. All angles and edges of the face of the stone slab shall be file 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 square cut and free from chippings and surface shall be true and plane.

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

M-30 Marble slab :

Marble slabs shall be white or of another colour and of best quality as approved by the Engineer-in-charge.

Slab 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 perfectly plane surface and edges machine cut true and square. The rear face shall be rough enough to provide key for the mortar.

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

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 office for reference.

Except as above, the marble slab shall conform to IS 1130-1969 or as revised from time to time.

M-31 Granite Stone slab :

Granite shall be of approved colour and quality. The stone shall be hard sound, durable, resistant to wear, rectangular or square in shape and as directed by the Engineer-in-charge. Uniformity of size shall generally be maintained for the stones used in any one room. The stone shall be without any soft. Veins, cracks or flaws and shall have uniform colour. They shall have natural surface free from broken flakes on top, and the exposed surface shall be machine polished to a smooth, even and true plane and the edges hand cut and dressed true and square. The evenness of the surface of slabs and edges of the slab shall not be marred by careless dressing or handling and no patching up shall be allowed for the slab. The edges shall be quite straight. The under face may be left as required or rough dressed. Before taking up the work samples of stone slabs, to be used and their dressing and polishing shall be got approved by the Engineers in-charge and will keep them in his office' for reference and the stone slabs to be used shall conform to the approved sample.

The maximum water absorption percentage and minimum compressive strength shall be as given in Table – 1 below:

Table -1

Type of Stone	Maximum Water Absorption percentage by weight	Minimum Compressive strength Kg/Sq. cm
Granite	0.50	1000

Note -1: Test for compressive strength shall be carried out as laid down in IS: 1121(Part1).

Note -2: Test for water absorption shall be carried out as laid down in IS: 1124.

The thickness of the stone shall be as specified in the item.

The Granite stone of approved colour shall be double polished on single or both side as per requirement of items to be executed.

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

M-32 White Washing :

Following materials shall be used for preparing white wash.

1. Fresh burnt white stone or lime.
2. Gum Arabic 2.0 kg / cmt. of lime.
3. Indigo as required.

It shall conform to relevant I.S. specifications.

M-33 Distemper :

Oil bound washable distemper of approved brand and manufacture and colour and shade shall be used. It shall conform to IS 427-1965. Distemper shall be used according to the manufacturer's instructions only.

M-34 White Glazed Tiles :

The tiles shall be of second class quality as approved by the Engineer-in-charge. They shall be flat and true to shape. They shall be free from cracks, crazing spots, chipped, edges and corners. The glazing shall be of uniform shade.

The tiles shall be of nominal size of 150mm x 150mm unless otherwise specified. The maximum variation from the stated sizes, other than the thickness of tiles, shall be plus or minus 1.5mm. The thickness of tiles shall be 6 mm. except as above the tiles shall conform to IS 777-1970.

M-35 Galvanized Iron Pipes & Fitting :

Galvanized Iron pipe shall be of the medium type and of required diameter and shall comply with IS 1239-1979. The specified diameter of the pipes shall refer to the inside diameter of the bore. Clamps, screws, all galvanized iron fittings shall be of the standard "R" or equivalent make. All the pipes and fittings shall have ISI certification mark.

The pipe and fittings shall be smooth, sound, free from any imperfections and neatly dressed. The pipe and fittings shall be able to withstand a safe pressure of 6kg per square centimeter.

M-36 Bib Cock & Stop Cock :

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

They shall be of sPVCcrew down type and of brass chromium plated and of diameter as specified in the description of the item. It shall conform to IS 781-1977 or as revised from time to time and they shall be of best Indian make. They shall be polished bright.

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

Diameter	Bib cock	Stop cock
8 mm	0.25 kg	0.25 kg
10 mm	0.30 kg	0.35 kg
15mm	0.40 kg	0.40 kg
20mm	0.75 kg	0.75 kg

M-37 Gun Metal Wheel valve :

The gun metal wheel valve shall be of approved quality, these shall be of the gun metal fitted with wheel and shall be of gate valve opening full way and of the size as specified. They shall conform to I.S. 778-1980.

M-38 White Glazed Porcelain Wash Basin :

Wash basin shall be of white porcelain of approved quality best Indian make and it shall conform to IS 771-1979 or as revised from time to time. 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 simple tap hole as specified. Each basin shall have a circular waste hole which is either rebated or

leveled internally with 65mm diameter at top 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. Necessary CP brass waste, CP chain, brass CP 15mm dia socket, bottle trap, PVC waste pipe, waste plug and waste couplings shall be provided. The pillar cock for wash basin shall be in conformation with the I.S. 1275-1976 or as revised from time to time. The height from the floor to top of the rim of basin shall be 750 to 800 mm as directed.

M-39 European type water closet:

The European type water closet shall be white glazed porcelain second quality and shall be of wash down type conforming to I.S. 2556-1981 and 771-1979 or as revised from time to time.

“S” trap shall be provided as required with water seal not less than 50 mm. The solid plastic seat and cover shall be of the best Indian make conforming to I.S. 2548-1980 or as revised from time to time. They shall be made of moulded synthetic materials which shall be tough and hard with high resistance to solvents and shall be free from blisters and other surface defects as shall have chromium plated brass hinges and rubber butter four number of suitable size.

M-40 Indian type Water closet :

The Indian type white glazed water closet of second quality shall be of size as specified in the item conforming to IS 771-1979 and I.S. 2556 (Part-II) 16981. Each pan shall have materials flushing ring of suitable type with adequate number of holes around as directed to have satisfactory flushing. It shall also have an inlet or back or front for connecting flush pipe as directed by the Engineer-in-charge. The inside of bottom of pan shall have sufficient slope from the front towards the outlet and surface shall be uniform and smooth.

Pan shall be provided with 100mm diameter “P” or “S” trap with approximately 50mm water seal and 50mm diameter Vent horn.

A pair of white glazed earthen ware rectangular foot rests of minimum size 250mm x 130mm x 20mm shall be provided with the water closet.

M-41 Flush Cock :

Half turn flush cock (Medium weight) shall be of brass chromium plated of diameter as specified in the description of the item. The flush cock shall conform to relevant IS or as revised from time to time.

The flush cock shall be of a make as approved by the Engineer-in-charge.

M-42 Cast Iron Pipes & Fittings :

All soil, waste, vent and anti-symphonize pipes and fittings shall conform to IS 1729-1979 or as revised from time to time. 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 a nearly as practicable concentric. They shall be sound and nicely cast and shall be free from cracks, laps, pin holes or other imperfection and shall be neatly dressed and carefully fettled.

The ends of pipes and fittings shall be reasonable square to their axis.

The sand cast iron pipes shall be of the diameter as specified in the description and shall be in length of 1.5, 1.8m and 2m. including socket ends of pipes unless shorter length either are specified or require at junctions etc. Tee pipes and fittings

shall be supplied without ears unless specified or directed otherwise.

Tolerances:

The standard weights and thickness of pipes shall be as shown in the following table:

A tolerance up to minus 10 percent may however be allowed against these standard weights.

Sr.No.	Nominal dia of bore.	Thickness	Overall weight of pipes excluding ears.		
			1.5 m long	1.8 m long	2 m long
1	75mm	50	13.83 kg	16.52 kg	18.37 kg.
2	100 mm	50 mm	18.14 kg	21.67 kg	24.15 kg.

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

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

M-43 Nahni Trap :

Nahni trap shall be sound and free from porosity or other defect which affects serviceability, the thickness of the base metal shall not be less than 6.5 mm. The surface shall be coated with vitreous enamel thoroughly fused to the cast iron base. The coating shall be adequate even and shall cover the entire surface. The surface shall be glossy, smooth and free from craze, chips and other flows or any other kind of defect which affect serviceability. The size of Nahni trap shall be as specified and shall be self cleansing design.

The Nahni trap shall be of best quality approved by the Engineer-in-charge and shall generally conform to the relevant I.S.

The Nahni trap provided shall be with deep seal, minimum 50mm except at places where trap with deep seal cannot be accommodated. C.I. Jali shall be of appropriate size and quality.

M-44 Gully Trap :

Gully trap shall conform to I.S. 651-1980. These shall be sound, free from visible defects such as fire cracks or hair cracks. The glaze of the traps shall be free from crazing. There shall give a sharp clear tone when struck with light, hammed. There shall be no broken blisters.

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

Each gully trap shall have on CI grating of square size corresponding to the dimensions of inlet of gully trap. It shall also have water tight. C.I. cover with frame inside dimensions 300 mm x 300 mm. The cover weighting 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 scattng facts.

M-45 Glazed Stoneware Pipe & Fittings :

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 stoneware of fire clay,

self glazed thoroughly burnt through out the whole thickness of a close event texture, free from air blows, fire blisters, cracks and other imperfections, which affect the serviceability. The inner and outer surface shall be smooth and perfectly glazed. The thickness of the wall shall not be less than $1/12$ th of the internal dia. The depth of socket should not be less than 38 mm. The socket shall be sufficiently large to allow a joint of 6mm around the pipe.

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

M-46 GI Water Spout :

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

The pipes shall have length as required for thickness and wall in which it is fixed and at the outside end one 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 by the Engineer-in-charge.

M-47 Selected earth / Murrum :

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

The selected earth / Murrum shall be good yellow soil and shall be got approved from the Engineer-in-charge in case black cotton soil or similar greatly expensive and shrinkable soil shall be used. It shall be cleaned and free from all rubbish and perishable materials, stones or bats. The cold shall be broken to a size of 50mm or less. Contractor shall make his own arrangement at his own cost for land for borrowing selected earth / Murrum. The stacking of material shall be done as directed by the Engineer-in-charge in such a way as not to interfere with any construction activities in decent stacks.

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 requirements of selected mentioned in Para 2 above.

M-48 Rolling shutters :

The rolling shutters shall be of approved makes and design and shall be suitable for fixing in position as directed by the Engineer-in-charge.

The shutter shall be built up of inter locking lath section formed from cold rolled strips. The size of different component shall be as per IS 6248-1979.

The cold rolled steel grip shall be rolling shutter lath section conforming to I.S. 4030-1973.

The self coiling type rolling shutter shall be raised lowered manually by means of a pulling applied to the pulling handle fixed on the bottom lock place to the top most position with each.

The thickness of steel sheets from which the lath sections have been rolled shall be not less than 0.9 mm for shutter up to 3.5 m width and not less than 1.2mm. Shutter above 3.5 m width.

The lath section shall be rolled so as to have interlocking curls at bottom edges and a deep corrugation at the centre with a bridge depth of not less than 12 mm for each lath section shall be continuous signal place without any welded points.

The depth and width of guide channel shall be as under :

Clear width of shutter	Min. depth of guide channel.
Up to 3.5 m	65 mm
3.5 to 8 M	75 mm
8 M and above	100 mm

Width of guide channel shall be 25mm for lath section with bridge depth of about 12 mm and 32mm for lath section with bridge depth of about 16 mm. Size of bracket plate for different height of different rolling shutter shall be as follows :

Clear height Mt.	Size of bracket plate minimum mm x mm x mm
Up to 2.3	300x300x3.15
Above 2.3 & up to 2.6 Mt.	325x325x3.15
Above 2.6 & up to 3.00	350x350x3.15
Above 3.0 & up to 3.5	375x375x3.15
Above 3.5 & up to 4.5	400x400x6.00
Above 4.5 & up to 5.5	450x450x6.00
Above 5.5 & up to 6.50	500x500x10.00

Size of shaft pipe shall be as given below :

Width	Size of pipe
Up to 2.0	32mm nominal bore
Up to 3.0 m	40mm nominal bore
Up to 6.00 m	50mm nominal bore

Hood cover shall be made of mild steel not less than 0.9 mm thick.

M-49 Urinal :

Urinal shall be of 2nd class quality white porcelain of approved quality, best Indian make and it shall conform to IS 1556-Part-II 1974 with suitable size of side collar for fixing in position. The size of urinal shall be as specified in the item. Urinal shall be of one piece construction. All internal angles shall be designed so as to facilitate cleaning. Urinal shall have single tap hole as specified. Urinal shall have a circular waste hole which is 65mm dia and 100 mm deep to suit the waste fitting.

Necessary C.P. brass stop cock with PVC connection of specified size shall conform to I.S. 781-1977. Necessary PVC reducer with PVC waste pipe of 25mm dia shall be designed to make height from the floor to the top of the rim of the urinal 550 to 600 mm as directed.

M-50 Wooden flush door shutters (solid Core) :

The solid core type flush door shutters shall be decorative or non-decorative 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 used as per IS- 2202 – (Part-1)

1980. The timber shall be free from decay and insect attack. Knots and know 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.

The face panel of the shutters shall be formed by gluing by the hot press on both faces of 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.

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.

The shutter shall be tested for :

1. **End immersion test** : The test shall be carried out as per IS 2202 (Part-I) 1980. There shall be no delaminating at the end of the test.
2. **Knife Test** : The face panel when tested in accordance with IS 1659-1979 shall be pass the test.
3. **Glue adhesion test** : The flush door shall be tested for glue adhesive test in accordance with I.S. 2202 (Part-I) 1980. The shutters shall be considered to have passed the test if no delaminating occurs in the glue lines in the plywood and if no single delaminating more than 80mm 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. Delaminating at the corner shall be measured continuously around the corner. Delaminating at the knots, knot holes and other permissible wood defects shall not be considered in assessing the sample.

The tolerance in size of solid core type flush door shall be as under :

In normal thickness +/- 1.2mm

In normal height +/- 3mm.

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

M-51 Aluminum doors, windows, ventilators :

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.

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

The hinges shall normally be of 50mm 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 operatable 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-52 Collapsible Steel Gate :

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, flats etc. Either steel pulleys or ball bearings shall be provided in every double channel. Unless otherwise specified the particulars of collapsible gates shall be as under :

- a) Pickets : These shall be of 20mm 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 of 10 cms.
- b) Pivoted M.S. flats shall be 20mm x 6mm.
- c) Top and bottom guides shall be from tee or flat iron of approved size.
- d) The fittings like stoppers, fixing hold fast, locking cleats, brass handles and cast iron rollers shall be of approved design and size.

M-53 Plastic sections for door / window partition etc.

Technical features for plastic section shall be as under :

- i) Material of construction shall be specially formulated PVC compounds.
- ii) **Water absorption:** 0.8% at 100 degree Centigrade in 24 hours thus virtually water and moisture proof.
- iii) **Chemical resistance:** It shall be resistance to acid / alkalis.
- iv) **Fire resistance:** Self-extinguishing classified under first class construction material by insurance companies.
- v) **Termite and Fungal resistance:** Material shall be fully resistance to termite and fungal attack.
- vi) **Thermal conductivity:** Very low thermal conductivity co-efficient varies from 0.015 to 0.016 Kcal / HrmC.
- vii) **Acoustic property:** Max. absorption shall be up to 38%.

M-54 Water Proofing Cement Paint:

Water proofing cement paint of approved shade shall conform to IS-5410-1969 or as revised from time to time. Primer shall be best quality, make and as approved by the Engineer-in-charge. The materials required for work of painting shall be obtained directly from approved manufacturer or approved dealer and brought to the site in maker's drums, keys etc. with seal unbroken.

M-55 STONE FOR BELA MASONRY:

Pucca approved white stone bella of sand of uniform size shall be dressed, earth / murrumy or discolnged or weathered or water worm stone shall not be used. The size of bella stone shall as directed by Engineer to suit the width of wall. Corner stones & quoins shall be of good quality and should be dressed to correct angle. The corner stone shall be got approved before bringing to site.

The stone shall be free from defects like cavity, flaws, sand holes, and veins, patches of soft or loose material. The percentage of water absorption shall generally not exceed 5 % by weight. Generally, the stone shall not contain silica or chert, mica or any other deleterious material like iron oxide organics impurities etc. The crushing strength of bella stone shall not less than 300 Kg/cm². Transverse strength shall not less than 70 Kg/cm².

M-56 Vitrified floor tiles :

Vitrified floor tiles shall be of best quality & approved make as approved by the Engineer. They shall conform to the relevant I.S. codes.

Vitrified tiles using for floor finishing should confirm ISO13006/E176 group B.1.a of international standards and also should confirm of testing methods of norms EN 98.

The vitrified tiles shall be Monolithic and available in smooth, mirror polished and anti-skid finish. Their water absorption rate shall be less than 0.5%. They shall offer hard working and hardwearing floors for public buildings. The tiles shall be of ASTM or DIN standards.

The vitrified tiles shall be extremely strong breaking strength of the tiles being 1600 kg./cm², flexural strength 200 kg. / Cm² and bounding strength of 2500 kg/cm². There shall after good resistance to abrasion i.e. greater than 100. There shall be scratch resistance; their hardness on the Moh's scale shall be min. 7. They shall also to resist thermal shock up to 10 cycles. They shall have a density of 2.2 gm/cc. They shall have 0.6 co-efficient of friction for polished / unpolished surfaces.

M-57 85 mm thick pre-cast Rubber moulded interlock paver concrete block :

The 85 mm thick pre-cast Rubber molded interlock paver concrete block shall be manufactured by electrical hydraulic operated block marking machine. The block should have minimum compression strength of 300 kg. Per sq.cm. The minimum thickness of the pre-cast Rubber molded interlock paver concrete block shall be 85mm and minimum size shall be 300x300mm. The block shall be of approved make & best quality as approved by the Engineer-in-charge. The size, shape, and shade of pre-cast Rubber moulded interlock paver concrete block shall be as approved by the Engineer-in-charge. There shall be true to shape. There shall be free from crack, crazing, and spots etc.

M-58 Acrylic roof Sheets:

Acrylic roof sheets shall be of thickness as specified in the item. The shape and size of sheet shall be as directed. Acrylic roof Sheets may be flat or curved. It should be light in weight. It shall be colourless or coloured or opaque. Colourless 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 show 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. Sheet should be available in complete range of standard transparent, man lucent and opaque colors. Sheets shall be of such quality that they can be cut bent and jointed as desired. Solution for the joints shall be used as per the requirement of manufacturer.

Signature of Bidder

**Executive Engineer
GIDC, Ahmedabad**