RAJKOT MUNICIPAL CORPORATION
SOLID WASTE MANAGEMENT

CONSTRUCTION OF ELEVATED SEMI-CLOSED REFUSE TRANSFER STATION AT MOTAMAVA, RAJKOT
E- TENDER

TENDER NOTICE NO:RMC/SWM/2023-24/34

4th Attempt

VOLUME: III

TECHNICAL SPECIFICATION

TO BE SUBMITTED TO:

Environment Engineer,
RAJKOT MUNICIPAL CORPORATION,
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GUJARAT

RAJKOT MUNICIPAL CORPORATION
SOLID WASTEMANAGEMENT DEPARTMENT
VOLUME-III
TECHNICAL SPECIFICATIONS
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1.GENERAL TECHNICAL SPECIFICATIONS

1. In the specifications, "as directed"/"approved" shall be taken to mean "as directed/ approved" by the Engineer-in-charge.
2. Wherever a reference to any Indian Standard appears in the specifications, it shall be taken to mean as a reference to the late edition of the same in force on the date of agreement.
3. In "Mode of Measurement" in the specifications wherever a dispute arises in the absence of specific mention of a particular point or aspect, the provisions on these particular points or aspects in the relevant Indian Standards shall be referred to.
4. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits:

   i] Length, width and depth (height) ... 0.01 Meter
   ii] Areas ... 0.01 Sq. Mt.
   iii] Cubic Contents ... 0.01 Cu. Mt.

   In recording dimensions of work, the sequence of length, width and height (depth) or thickness shall be followed.
5. The distance which constitutes lead shall be determined along the shortest practical route and not necessarily the route actually taken. The decision of the Engineer-in-charge in this regard shall be taken as final.
6. Where no lead is specified, it shall mean "all leads".
7. Height shall be measured from plinth.
8. Up to "floor level" means actual height of floor (Maxi. 4 M) up to 3 Mts. above plinth level.
9. Definite particulars covered in the items of work, though not mentioned or elucidated in it specifications shall be deemed to be included therein.
10. Reference to specifications of materials as made in the detailed specification of the items of works is in the form of a designation containing the number of the specification of material and prefix `M' e.g. `M-5'.
11. Approval to the samples of various materials given by the Engineer-in-charge shall not absolve the contractor from the responsibility of replacing defective material brought on site or 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.
12. The contract rate of the item of work shall be for the work completed in all respects.
13. No collection of materials shall be made before it is approved by the Engineer-in-charge.
14. Collection of approved materials shall be done at site in a systematic manner. Materials shall be Stored in such a manner so as to prevent damage, deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.
15. Materials, if and when rejected by the Engineer-in-charge shall be immediately removed from the site of work.
16. No materials shall be stored prior to, during and after execution of a structure in such a way so as to cause or lead to damage or overloading of the various components of the structure.
17. All works shall be carried out in a workmanship like manner as per the best techniques for the particular item.
18. All tools, templates, machinery and equipment for correct execution of the work as well as for checking lines, levels, alignment of the works during execution shall be kept in sufficient numbers and in good working condition on the site of the

19. The mode, procedure and manner of execution shall be such that it does not cause damage or over-loading of the various components of the structure during execution or after completion of the structure.
20. Special modes of construction not adopted in general engineering practice, if proposed to be adopted by the Contractor shall be considered only if the contractor provides satisfactory evidence that such special mode of construction is safe, sound and helps in speedy construction and completion of work to the required strength and quality. Acceptance of the same by the Engineer-in-charge shall not, however, absolve the contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of the work.
21. All installations pertaining to water supply and fixtures thereof as well as drainage lines and sanitary fittings shall be deemed to be completed only after giving satisfactory tests by the contractor.
22. The contractor shall be responsible for observing the rules and regulations imposed under the "Minor Minerals Act", and such other laws and rules prescribed by the Government from time to time.
23. All necessary safety measures and precautions (including those laid down in the various relevant Indian Standards) shall be taken to ensure the safety of men, materials and machinery on the works as also of the work itself.
24. The testing charges of all materials shall be borne by the contractor.
25. Approval to any of the executed items for the works done not in any way relieve the contractor of his responsibility for the correctness, soundness and strength of the structure as per the drawings and specifications.
26. The drawings of all the equipments shall be got approved by RMC prior to dispatch.
27. For R.C.C. items, the payment shall be made at 96% of the tender rate when the R.C.C. work is executed. The remaining 4% shall be released after receipt of satisfactory results of the tests which are to be carried out at the end of 28 days.

Signature of the Contractor **Environment Engineer**

Place: **Rajkot Municipal Corporation**

Date:

2.SPECIFICATIONS OF MATERIALS

M-1 WATER:

1.1 Water shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and traces of oil and injurious alkalis salts, organic matter and other deleterious material which will either weaken the mortar or 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 standards specified in I.S. 456 – 2000.

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 and mortar strength as specified in I.S. 12269 – 1989. 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 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 or those which produce objectionable strains or other unsightly deposits on concrete or mortar surfaces.

Hard and bitter water shall not be used for curing.

Portable water shall generally be found suitable for curing mortar or concrete.

M-2 LIME:

2.1 Lime shall be hydraulic lime as per I.S. 712 – 1995. Necessary tests shall be carried out as per I. S. 6932 (Parts I to X) 1995.

2.2 The following field tests for limes are to carried out ---

a) A very rough idea can be formed about the type of lime by its visual examination i.e. fat lime bears pure white colour, lime in form of porous lumps of dirty white colour, indicates quick lime, and solid lumps the unburnt lime stone.

b) 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 – 1995. 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. 162 – 1989 to show the acceptability of materials.

M-3 CEMENT:

3.1 Cement shall be ordinary Portlandcement as per latest revision of I. S. 12269.

M-4 WHITE CEMENTS:

4.1 The white cement shall conform to I. S. 8042 – 1989.

M-5 COLOURED CEMENT:

5.1 Coloured cement shall be with white or gray Portland cement as specified in the Description of work.

5.2 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 pigments shall have such properties as to provide for durability under exposure to sun-light and weather.

5.3 The Pigment shall have the properly such that it is neither affected by the cement not detrimental to it.

M-6 SAND:

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

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

I. S. Sieve Designation	% by weight Passing sieve	I. S. Sieve Designation	% by weight passing sieve
4.75 mm	100	600 Micron	30 – 100
2.36 mm	90 – 100	300 Micron	5 – 70
1.18 mm	70 -100	500 Micron	0 – 60

6.3 Fine sand: The fines modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as under ---

I. S. Sieve Designation	% by weight Passing thru'	I. S. Sieve Designation	% by weight passing thru'
4.75 mm	100	600 Micron	40 – 85
2.36 mm	100	300 Micron	5 – 50
1.18 mm	70 - 100	500 Micron	0 – 10

M-7 STONE DUST:

7.1 This shall be obtained from crushing hard black hard black tray or equivalent; it shall not contain more than 8% of silt as determined by field test with measuring cylinder. The method of determining silt contents by field 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 quantity of the sample shall be such that it files the cylinder up to 100 mm Mark. The clean water shall be added up to 150mm marks. The mixture shall be stirred vigorously and the content allowed settling for 3 hours.

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

7.4 The fineness modulus of stone dust 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 flaky elongated pieces shall be avoided. It shall generally comply with the provisions of I. S. 303 – 1990. Unless a special stone of a particularly quarry is mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious reaction with cement.

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

I. S. Sieve Designation	% Passing thru' sieve	I. S. Sieve Designation	% passing thru' sieve
12.50 mm	100%	4.75 mm	0.20%
10.00 mm	85 – 100%	2.36 mm	0.25%

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

8.4 The necessary tests for grit shall be carried out as per the requirements of I. S. 2338 (PartsI to VIII) 1995, as per instruction of the Engineer-in-charge. The necessity of test will be decided by the Engineering-in-charge.

M-9 CINDER :

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

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

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

20 mm	100
10 mm	86
5.75 mm	70
2.36 mm	52

M-10 LIME MORTAR :

10.1 LIME: Shall conform to specification M-2. WATER: Water shall conform to specification M-1. SAND: Sand shall conform to specification M-6.

10.2 PROPORTION OF MIX: Mortar shall consist of such proportion s of slaked lime and sand as may be specified in the Description. The slaked lime and shall be measured by volume.

10.3 PREPARATION OF MORTAR: 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 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 paste. Thoroughly wetted sand shall then be added evenly and the mixture ground for another 180 revolutions.

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

10.5 USE: All mortar shall be used as soon as possible after grinding. It should be used on the day on which it is 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 shall conform to specification M-3. Sand shall conform to M-6.

11.2 PROPORTION OF MIX: 11.2.1 Cement and sand shall be mixed to specified proportions, sand being measured by measuring boxes. The proportion of cement shall be by volume on the basis of 50 Kg/Bag of cement being equal to 0.0342 Cu.m. The mortar may be hand mixed or machine mixed as directed.

11.3 PREPARATION 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 least3 times or more till a homogeneous mixture of uniform colour 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 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 shall be adopted as directed.

11.4 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 minutes.

M-12 STONE COARSE AGGREGATE FOR NOMINAL MIX CONCRETE:

13.1 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 cubical 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 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 whichever is smaller.

TABLE

I.S. Sieve Designation	Percentage passing for single sized aggregates of Nominal size			I.S. Sieve Designation	Percentage passing for single sized aggregates of Normal Size		
	40 mm	20 mm	16 mm		40 mm	20 mm	16 mm
80 mm	-	-	-	12.5 mm	-	-	-
63 mm	100	-	-	10 mm	0.5	0.20	0.30
40 mm	85-100	100	-	4.75mm	-	0.50	0.50
20 mm	0-20	85-100	100	2.35mm	-	-	-
16 mm	-	-	85-100				

NOTE :- This percentage may be varied somewhat 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 indicated in I. S. 383 - 1990 and I. S. 456 – 2000 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 COURSE:

13.1 Aggregate for Design Mix Concrete: Course aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard, strong, dense, durable, clean and free from skin 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 reaction with cement.

13.3 The necessary tests indicated in I. S. 383 - 1990 and I. S. 456 – 2000 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 it clean.

M-14 BRICKS BATS AGGREGATE:

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

14.2 The bricks bats shall be measured by volume by suitable boxes as directed.

M-15 BRICKS:

15.1 The bricks shall be hand or machine molded and made from suitable soils and kiln burnt. They shall be free from cracks and flaws not nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform colour. The bricks shall be molded with a frog of 100 mm x 40mm and 10mm to 20mm deep on one of its flats sides. The bricks shall not break when dropped on the ground from a height of 600mm.

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

The size of conventional bricks shall be as under --- 225 x 110 x 75mm.

Only bricks of one standard size shall be used on one work. The following tolerances shall be permitted in the conventional size adopted in a particular work.

Length : 3.00 mm
Width : 1.50 mm
Height : 1:50 mm

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% by weight. Necessary tests for crushing strength and water absorption etc. shall be carried out as per I. S. 3495 (Part I to IV) – 1992.

M-15A BURNT CLAY FLY ASH BUILDING BRICKS:

The Burnt Clay Fly Ash building bricks shal1 conform to Grade-5 of IS-13757. The frog of the 80 to100 mm x 40 mm x 10 to 20 mm size.

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

The size of conventional brick shal1 be 230 mm x 110 mm x 70 mm.

Only bricks of one standard size shall used on one work. The following tolerances shall permit in the conventional size adopted in a particular work:

Length : ± 4 mm
Width : ± 2 mm
Height : ± 2 mm

The physical characteristic of bricks shall be as follows,

The minimum compressive strength of Burnt Clay Fly Ash building bricks shall not be less than 70 Kg/Sq-Cm. and the test shall be conform to IS-3495 (Part-1).

The averages water absorption not more than 20 percentages by weight and the test shall conform to IS-3495(Part-3). Sampling of Burnt Clay Fly Ash building bricks and criteria for conformity shall be as per I.S.:5454.

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 obtained only from the approved quarry and shall

be hard, sound durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. and weathered portions and other structural defects or imperfections tending to affect their soundness and strength. The stone with round surface shall not be more than 5% of dry weight. When tested in accordance with I.S. 1134 – 1994. The minimum crushing of the strength of the 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 by chisel as specified in the Description for khanki facing in 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 40mm. 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 LITERATE STONE :

17.1 Literate stone shall be obtained from the approved quarry .It shall compacted in texture, sound, durable and free from soft patches, It shall have a minimum crushing strength of 100 kg / Sq. cm. in its dry condition. It shall not absorb water more 20% of its own weight when immersed for 25 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 rectangular blocks so that all faces are 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 stone's shall be provided where so directed.

M-18 MILD STEEL BARS:

18.1 Mild steel bars reinforcement for R.C.C work shall conform to I.S. 432 – 1995 and shall be of tested quality. It shall also comply with the relevant part of I. S. 456 – 2000.

18.2 All the reinforcement shall be clean and free form 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 as per the rate specified below:

i)	6mm	0.22 Kg / Rmt	viii)	20 mm	2.47 Kg / Rmt
ii)	8mm	0.39 Kg / Rmt	ix)	22 mm	2.98 Kg / Rmt
iii)	10mm	0.62 Kg / Rmt	x)	25 mm	3.85 Kg / Rmt
iv)	12mm	0.89 Kg / Rmt	xi)	28 mm	4.83 Kg / Rmt
v)	14mm	1.21 Kg / Rmt	xii)	32 mm	6.31 Kg / Rmt
vi)	16mm	1.58 Kg / Rmt	xiii)	36 mm	7.99 Kg / Rmt
vii)	18mm	2.00 Kg / Rmt	xiv)	40 mm	9.86 Kg / Rmt

M-19 HIGH YIELD STRENGTH STEEL DEFORMEDBARS:

19.1 High yield strength steel deformed bars shall be Thermo Mechanically Twisted and shall conform to I.S. 1786 – 1985.

19.2 Other provision and requirement 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 shall conform to I.S.2090 – 1962.

20.2 The tensile strength of high tensile steel bars shall be as specified in the Description. In absence of the given strength and minimum strength shall be taken as per Para 6 – 1 of the I.S. 1785 – 1983. 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 than 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 be of 1.63mm or 1.22mm (16 or 18 gauge) diameter and shall conform to I.S. 280 – 1992.

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:

All structural steel shall conform to I.S. 226 – 1975. 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 defects affecting the strength and durability. Rivet bars shall conform to I.S. 1148 – 1992.

When the steel is supplied by the contractor test Certificates of the manufactures shall be obtained according to I.S. 226 – 1975 and other relevant Indian Standards.

M-23 GALVANISED IRON SHEETS:

23.1 The galvanized iron sheets shall be plain or corrugated sheets of gauge as specified in Description. The G. I. Sheets shall conform to I. S. 277 – 1992. The sheets shall be undamaged in carriage and handling either by rubbing off of zinc coating or otherwise. They shall have clean and bright surface and shall be free from dents, bends, holes, rust or 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.1 The G. I.Ridgesand hips shall be of plain galvanized sheets class-3 of the thickness as specified in Description. These shall be 600 mm width and properly bent up shape without damage to the sheets in process of bending.

23-A.2 Valleys gutters and flashings shall be also of galvanized sheet of thickness as specified in Description. Valleys shall be over all. 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 or semi-corrugated shall conform to I. S. 459 - 1992. The thickness of the sheets shall be as specified in the Description. The sheet shall be free from all defects such as cracks, holes, deformities, chipped edges or otherwise damaged.

24.2 Ridges and Hips:

24.2.1 Ridges and hips shall be of same thickness as that if A.C. sheets. The types of ridge shall be suitable for the types of sheets and locations.

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

M-25 MANGALORE PATTERN ROOF TILES:

25.1 The Mangalore pattern tiles shall conform to I.S. 654 – 1992 for Class 'AA' or 'A' type as specified in Description. Samples of the tiles to be proved shall got approved from the Engineer-in-charge. Necessary tests shall be carried out as directed.

M-26 SHUTTERING

The shuttering shall be either of wooden planking of 30mm 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 bracked together so as to make the centering rigid. In places of ballie props, bricks pillar of adequate section built in mud mortar may be used.

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 concrete, live load of men working with it and other incidental load of men working with 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 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 form work shall be got inspected by and approved from the Engineer-in-charge, before the reinforcement bars are placed in position.

The props shall consist of bullies having 100mm minimum diameter measured at mid length and 80mm at thin end and shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 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 wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.

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

As far as practicable, clamps 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

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.

The shuttering for beams and slabs shall have camber of 4mm 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 Engineering-in-charge.

M-27 EXPANSION JOINTS – PREMOULDED FILLER:

27.1 The Description provided for expansion joints in R.C.C. Frame structures for internal joints, as well as exposed joints, with the use of premoulded bituminous joint filler.

27.2 Premoulded bituminous joint filler, i.e. Performed strip of expansion joint filler shall not get deformed or broken by twisting, bending or other handing when exposed to atmospheric condition. Pieces of joint filler that have been damaged shall be rejected.

27.3 Thickness of the pre moulded joint filler shall be 25 mm unless otherwise specified.

27.4 Premoulded bituminous joint filler shall conform be I. S. 1838 – 1961.

M-28 EXPANSION JOINTS - COPPER STRIPS AND HOLD FASTS:

28.1 The Description provides for expansion joints in R.C.C. frame structure for internal joint as well as for exposed joints with the use of necessary copper strip and hold fasts.

28.2 Copper sheet shall be 1.25 mm thick and of 1.25 mm with 'U' shape in the middle, copper strip shall have hold fast of 3 mm diameter copper rod fixed to the plate soldered on strip at intervals of about 30 cm. or 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 Description to be executed. When the kind of wood is not specifically mentioned, good Indian teak wood as approved shall be used.

29.2 Teak wood shall generally be free from large, loose, dead or cluster knots, flaw, warps, twists, shakes, bends or any other defects. It shall generally be uniform in substance and of straight fibers as far as possible. It shall be free from rot, 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 colour shall be uniform as far as possible, any effort like painting, using any adhesive or resinous 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 rate of 1.5 mm per face to be planed

29.5 First Class Teak Wood :

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

Second Class Teak Wood:

No individual hard and sound knots shall be more than 15 sq cm in size and aggregates area of such knots shall 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. Specification and of good quality. The types of wood shall be got approved before collecting the same on site Fabrications 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 frames whereas only Kalai, Siras, Halda, Kalam etc will be permitting for shutters after proper seasoning and chemical treatment.

The non teak wood shall be free large, loose dead of cluster knots, flows, shakes, warps bends, or any other defect. It shall be uniform in substance and of straight fibers as per as possible. It shall be free from rots, decay, harmful fungi and other defects of similar nature which will affect the strength, durability or its usefulness for the purpose for which it is required. The colour of the wood shall be uniform as far as possible. The scantalings, planks etc. shall be sawn in straight lines and planes in the direction of grain and of uniform thickness.

The department will use the agency to produce a certificate from the Forest Department in the event of a dispute and the decision of 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 DOORS HUTTERS (SOILD CORE):

30.1 The solid core type flush door shutters shall be of decorative or non – decorative types as specified in the drawing. The size and thickness of the shatter shall be as specified in drawing s or directed. The timber species for core shall be used as per I.S. 2202 – (Part –I)-1991. 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, pitch streaks an harmless pin holes shall be permissible expect in the exposed edge of the core members. The commercial plywood, cross bands shall conform to I.S. 303 – 1998.

30.2 The face panel of the shutter shall be formed by gluing by the hot press process on both faces of the core with either plywood or cross bands, or face veneers. The lapping, rebating opening of glazing, Venetian 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 plan, both faces of the shutters shall be sand papered to smooth even texture.

The shutters shall be tested for ---

i) End immersion Test: The test shall be carried out as per I.S. 2202 (Part – I) 1991. There shall be no delamination at the end of the test.

ii) Knife Test: The face panel when test in accordance with I.S. 1659 – 1990 shall pass the test.

iii) Glue adhesion Test: the flush door shall be tested for glue adhesive test in accordance with I.S.2202 (Part – I) – 1991. 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 3mm. in depth have occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured continuously around the corner .Delamination at the knots knot, whole and other permissible wood defects shall not be considered in assessing the sample.

30.5 The tolerance in size of solid core type flush door as under: -

In nominal thickness # 1.2 mm. In nominal height # 3 mm. The thickness of the shutters shall be uniform throughout with a permissible variation of not more than 0.8 mm. when measuring at any two points.

M-31 ALUMINIUM DOORS, WINDOWS, VENTIALATORS:

31.1 Aluminum alloy used in the manufacture of extruded window section shall conform to I.S. designation HEA – WP of I.S: 733 – 1991 and also to I.S. Designation WVG – WP of I. S.: 1285 – 1991. The sections shall be as specified the drawing and design. The fabrication shall be done as directed.

31.2 The hinges shall be cast or excluded aluminum hinges of same type as in window but or large 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 shall be provided. In double shutter door, the first closing shall have a concealed aluminum alloy bolt at top and bottom.

M-32 ROLLING SHUTERS:

32.1 The rolling shutters shall conform to I. S. 6248 – 1991.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 constructed with interlocking lath section formed from cold rolled steel strips not less than 0.9 mm thick and 80 mm. wide for shutters 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 channels section and of rolled pressed or built up (fabricated) joint less construction. The thickness of sheet used shall be not less than 3.15 mm.

32.3 Hood covers shall be made of M.S sheets not less than 0.92 mm thick. For shutters having width 3.5 mts. and above, the thickness of M.S. sheet for the hood cover shall 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 wore or strip of adequate strength to balance the shutters in position. The spring pipe shaft etc. shall be supported on strong M. S. or malleable C. I. brackets. The brackets shall be fixed on the or under lintel as specified with rawly Plugs and a screw bolts etc.

32.5 The rolling shutters shall be of self rollingtype up to 8 sq. m. clear area without ball bearing and up to 12 sqm Clear area with ball bearing. If the rolling shutters are of larger then gear operated type shutter 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, locking arrangement, pulling hooks, handles and other accessories.

M-33 COLLAPSIBLE STEEL GATE:

33.1 The collapsible steel 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 bearing shall provide in every double channel. Unless otherwise specified the particulars of collapsible gate shall be as under ---

i) Pickets: These shall be 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 cm.

ii) Pivoted M. S. flats shall be 20 mm. X 6 mm.

iii) Top and bottom guides shall be from toe or flats iron of approved size.

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

M- 34 WELDING STEEL WIRE FABRIC:

34.1 Welding steel wire fabric for general purpose shall be manufactured from cold drawn steel as drawn or galvanized steel conforming to I. S. 266 – 1975 with longitudinal and transverse wire surely 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 workmen like manner and shall be free from injurious defects and shall as ruest proof. The type of mesh shall be oblong or square as directed. The mesh size and sizes of wire for square as well as ablong welded steel wire fabric shall be as directed. The steel wire fabric in panels shall be in one whole piece in each panel as far as stock sizes permit.

M-35 EXPANDED METAL SHEETS:

35. 1 The expanded metal sheets shall be free from flaws, joints, welds, broken, stands, laminations and other harmful surface defects Expanded metal steel sheet shall conform to I.S. 412 – 1992 expects that blank sheets need not be with guaranteed mechanical properties. The size of the diamond mesh of expanded metal and dimension of strands (width and thickness) shall be as specified. The tolerance or nominal weight of expanded metal sheets shall be of + 10 per cent.

35.2 Expands metal in panels shall be in one whole piece in each panel as far as stock sizes permit. The expanded metal sheets shall be coated with suitable protective coating to prevent corrosion.

M-36 MILD STEEL WIRE (Wire Gauze jail) :

36. 1 Mild steel wire may be galvanized, as indicated. All finished steel wire shall be well cleanly drawn to the dimensions and size of wire as specified in Description. The wire shall be sound, free from Slits, surface flaws, rough jagged and imperfect edge and other harmful surface defects and shall conform to I.S. 280 – 1992.

M-37 PLYWOOD:

37.1 The Plywood for general purpose shall conform I.S. 303 – 1998.Plywood is made by cementing together thin boards or sheets of wood into panels. There are always an old number of layers 3, 3, 7, 9, Ply etc. The plies are placed so that the grain of each layer is at right angles to the grain in the adjacent layers.

37.2 The chief advantage 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 slitting with change in moisture content.

37.3 Usually synthetic resins are used for gluing. Phenolic resins 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 resins are used as adhesive the finished plywood must be exposed to atmosphere of controlled humidity until the proper amount of moisture has been absorbed.

37.5 According to I. S : 303 – 1998 the plywood for general purpose shall be three grades namely BWR.WWR and CWR depending upon the adhesives used for bounding 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, and C. After pressing, the finishing plywood should be reconditioned to a moisture content not less than 8 percent and not more than 16 percent .

TABLE

37.6 THICKNESS OF PLYWOOD BOARDS

Board	Thickness	Board	Thickness
3 Ply	3 mm	7 Ply	9 mm
	4 mm		13 mm
	5 mm		16 mm
	6 mm	9 Ply	13 mm
5 Ply	5 mm		16 mm
	6 mm		19 mm
	8 mm	11 Ply	19 mm
	9 mm		22 mm
			25 mm

M- 38 GLASS:

38.1 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 Description or specification or in the special provisions or as shown in detailed drawings. Thickness of glass panes shall be uniform. The specification for different kinds of glass shall be as under -----

38.2 Sheet Glass:

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

38.2.2 For panes larger than 600 mm. x 600 mm. and up to 800 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 glassing and framing purpose shall conform to I. S. 761 – 1993. Sheet glass of the specified colours shall be used, if so shown on detailed drawing or so specified. For important buildings and for panes with any dimensions over 900 mm. Plate glass of specified thickness shall be used.

38.3.0 Plate Glass:

38.3.1 When Plate glass is specified itshall be "Polished Patent Plate Glass" of best quality. It shall have both the surface ground flate and parallel and polished to obtain clear undisturbed vision and reflection. The plate glass shall be of the thickness, mentioned in the Description or as shown in the detailed drawing or as specified. In the 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.

38.4.0 Obscured Glass:

38.4.1 This type of glass transmits light so that vision is partially or almost completely obscured. Glass shall be plain rolled, figured, ribbed or 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.

38.5.0 Wired Glass:

Glass shall be with wire netting embedded in a sheet of plane glass. Electrically 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 beof thickness as specified in the Description and of a specified shape and size as the case may be. Panels may be flats or curved. It should be light in weight. It shall be colourless or coloured or opaque as specified in the Description. 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. Sheets should be available in complete range ofstandard transparent, translucent and opaque colours. Sheets should be available in complete range of standard transparent, translucent and opaque colours. 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 manufacture.

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 Phenolmaldehyde adhesive. The particle boards shall conform to I.S. 3087 – 1990." Specification for wood particle board for general purpose." The size and the thickness of the particle board shall be as specified.

M-41 EXPANDED POLYSTYRENE OR FRAMES STYROPER SLABS:

41.1 The expanded polystyrene ceiling boards and tiles shall be of approved make and shall be of size thickness, finish and colour and indicated. It shall be of high density and suitable for use as insulting material. He insulting material shall be like slab of thermocole etc.

M-42 RESIN BONDED FIBRE GLASS:

42.1 The resin bonded fiber glass tile or rools shall be of approved make and shall be sizes, thickness and finish as indicated.

42.2 For test of material wood thermal insulation blanket I.S. 3144 – 1991 followed.

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

(1) Bituminizedbessian 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 or surfaces to be plastered over.

M-43 FIXTURES & FASTENING:

General ----

i) The fixtures and fastenings, that is, butt, hingers, tee and strap hinges, sliding door bolts, tower bolts, door latch, bath-room latch, handles, door stoppers, casement window fasteners, casement stays and ventilator catch shall be made of the metal as specified in the Description or its specifications.

ii) They shall be of iron, brass, aluminumChromiumplated iron, chromium plated brass, copper oxidized iron, and copper oxidized brass or anodisedaluminum as specified.

iii) The fixtures shall be heavy, medium or light type. The fixtures and fastening shall be smooth finished and shall be such as will ensure ease of operation.

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

v) Brass and anodisedaluminum fixtures and fastenings shall be bright finished.

Hold fasts:

i) Hold fasts shall be made from mild steel flat 30 cm. length and one of the hold fasts shall be bent at right angle and two nos. 6 mm. dia. Holes 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 directions.

Butt Hinges:

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

ii) Tee and strap hinges shall be manufactured from M. S. sheet.

Sliding Door Bolts (Aldrops):

i) The aldrops as specified in the Description shall be used and shall be got approved.

Tower Bolts (Barrel Type)

i) Tower bolts as specified in the Description shall be used and shall be got approved.

Door Latch:

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

Bathroom Latch:

Bathroom latch shall be similar to tower bolt.

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 size of the handle.

Door Stoppers:

i) 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.

Door Catch:

i) 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 other part is fixed in the wall with necessary wooden plug arrangements for appropriate fixate. The catch shall be fixed 20 mm. inside the face of the door for easy operation of catch.

Wooden Door Stop with Hinge:

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

Casement Window Fastener

Casement window fastener for single lead window shutter shall be left or right handed as directed.

Casement Stays (Straigot Peg. Stay):

i) 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.

Ventilator Catch:

i) The Pattern and shape of the catch shall be as approved.

Pivot:

i)The base and socket Plate shall be made minimum 3 mm. thick platesand projected pivot shall not be less than 12 mm. dia. and 12 mm. lengths and shall be firmly riveted to the base plate case of iron pivot and in single piece base in the case of brass pivot.

M-44 PAINTS:

44.1Oil Paints:

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

i) Paint shall not show excessive setting in a freshly opened full can and shall easily be redispressed with paddle to a smooth homogeneous state. The paint shall show no curdling, levering, caking or colour separation and shall be free from lumps and skins.

The paint as received shall brush easily, possess good leveling properties and show no running or sagging tendencies.

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

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

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

44.2 Enamel Paints:

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

M-45 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 of approved quality.
ii) Shellac.
iii) Chandras.
iv) Pigment.

The French polish so prepared shall conform to I. S. 348 – 1991.

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 colour and free strains, cracks, decay and weathering.

46.2 The size of various colours of marble chips ranging from the smallest up to 20 mm. shall be used where the thickness of top wearing layers is 6 mm. in size. The marble ships 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.

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 – 1990.

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 India 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 a pressure of not less than 140 kg./Sq.cm. The proportion ofcement to aggregate in the backing of the tiles shall be not leaner than 1:3 by weight. The wearing face, though the tiles are of plain cement, shallbe provided with stone chips of 1 to 2 mm. size. The proportion of cement to the marble chips aggregate in the 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 throughout 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 long period as would ensure their conformityto requirements of I.S. 1237 – 1990 requiring resistance to wear and water absorption.

47.1.3 The wearing face of the tiles shall be plain, free from projection, depressions and cracks and shall be reasonably parallel to the back face of the tile. All angles shall be right angle and all edge shall be sharps and true.

47.1.4 The tile sizes shall generally be square shape 24.85 cm. X 24 .85 cm. or 25 cm. X 25 cm. The thickness of the tiles shall be 20 mm.

47.1.5 The tolerance of length and breadth shall be plus or minus 1 mm. The tolerance on thickness shall be plus 5 mm.

47.1.6 The tiles shall satisfy the test as regards transverse strength, resistance to wear and water absorption as per I. S. 1237 – 1990.

47.2 B) Plain Coloured Tiles:

47.2.1 These tiles shall have the same specifications as for plain cement tiles as per (A) above except that they shall have a plain wearing surface wherein pigments are used. They shall conform to I.S. 1237 – 1990.

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

The colour of the tiles shall be specified in the Description or as directed.

47.3 C) Marble Mosaic Tiles:

47.3.1 These tile have the same specifications as per plain cement tiles except the requirement as stared below ---

47.3.2 The marble mosaic tiles shall conform to I.S. 1237 – 1990. The wearing face of the tiles shall be mechanically ground and filled. The wearing face of the tiles shall be reasonably parallel to the back face of the tiles. All angles shall b e 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 bad on the wearing face, a few samples with or without their full size photographs as directed shall be presented to the Engineer-in-charge for approval

47.3.4 Any particular sample, if found suitable shall be approved by the Engineer-in-charge, of he may ask for 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 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 approved sample only, in terms of its dimensions, thickness of backing layer and wearing surface, materials, ingredients, colour shade, chips, distribution etc. required.

47.3.5 The tiles shall be prepared from cement conforming to Indian Standards or coloured Portland cement generally depending upon the colour 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 of 250 m. X 250 mm. or as specified. The centreto centre distance of the chequer shall not less than 25mm. and not more than 50mm. The overall thickness to 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 3mm. The chequered tiles shall be plain, coloured or mosaic as specified. The thickness of the upper layer measured from the tops of the chequers shall not be less than 6mm. The tiles shall be given thefirst grinding with machine before delivery to site.

47.4.4 Tiles shall conform to relevant I.S. 1237- 1990.

47.5 E) Chequered Tiles for Staircase:

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

i) The length of a tile including nose shall be 330 mm.

ii) The minimum thickness shall be 28 mm.

iii) The nosing shall have also the same wearing layer at the top.

iv) The nosing edge shall be rounded.

v) 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 KOTASTONE:

48.1 The kota 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 coloured stones of the stone shall generally be green. Brown coloured stones shall not be allowed for use. They shall be without any soft veins, cracks or flaws.

48.2 The sizeofthestones to be used for flooring shall be size 600 mm X 600 mm and/or size 600 mm X 450 mm as directed.. However, smaller sizes will be allowed to be used to the extent of maintaining the required pattern. Thickness shall be as specified.

48.3 Tolerance of minus 30 mm, on account of chisel dressing of edge shall be permitted for length as well as breadth. Tolerance in thickness shall be plus 3mm.

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

48.5 When machine cut edge are specified, the exposed edges 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 Polish kotah stone shall have the same specifications as per rough kotah stone except as mentioned below.

49.2 The stone shall have machine polished smooth 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 dado, skirting, platforms 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 shape and uniform colour.

50.2 The size of the stone shall be as specified in the Description or detailed drawing or as approved by the Engineer-in-charge. The thickness of the stone shall be as specified in the Description of work with the permissible tolerance of plus or minus 2mm. The provisions in respect of polishing as for polished kotah stone shall apply to polished Dholpur stone also. All angles and edge of the face of stone slab shall be fine chiseled or polished as specified in the Description of work and all the four edge shall be machine cut. All eagles and edges of the stone slab shall be true and Plan.

50.3 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 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:

Marble slabs shall be green marble of export quality Kesariyaji green or Udepur Green. Green marble shall not have any colour or ink wash, resin filling, tint, wax coating. The green marble shall be of best quality as approved by the Engineer-in-charge. Slab shall be bard, close, uniform and in texture. They shall also be free defects and cracks. The surface shall be surface and the 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 shall have to be laid as per the pattern given by the Engineer-in-charge. Size of the slabs shall be minimum 900 mm. X 1800 mm. and preferably 1200mm. X 1800 mm. However, smaller sizes 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 slabs shall conform to I.S.1130 – 1993 or as revised from time to time.

M-52 GRANITE STONE SLABS:

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

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

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

M-53 P.V.C FLOORING:

P.V.C. sheets for P.V.C floor covering shall be homogenous flexible type, conforming to I. S. 3462 – 1991.The P.V.C. covering shall neither develop any toxic effect while put to use not shall give off any disagreeable odor.

Thickness of flexible type covering or tiles shall be as specified in the description of the Description.

The flexible type shall be baked with Hessian or other woven fabric. The following tolerance shall be applicable on the nominal dimensions of the sheet of the sheet rolls or tiles:

(a) Thickness + / - 0.15 mm
(b) Length or width
1. 300 mm Square tiles + / - 0.20 mm
2. 600 mm Square tiles + / - 0.40 mm
3. 900 mm Square tiles + / - 0.60 mm
4. Sheets and rolls + / - 0.10 percent.

53.4 Adhesive:

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

M-54 FACTING TILES:

54.1 The facing tiles (burnt clay facing bricks) shall be free from cracks, flaws, and nodules of free lime. They shall be thoroughly burnt and shall have plan rectangular faces with parallel side's 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 four stretcher bricks each representing resistance to penetration by rain and greater durability resistance to penetration by rain and greater durability than common bricks. The tiles shall conform to I.S. 2691 – 1995.

54.2 The standard size of facing brick tiles shall be 19 X 9 X 4 cms. The facing bricks tiles shall be provided with frog which shall conform to I. S. 1077 -1992.

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

Size	Tolerance for	
	1 st Class Brick	2nd Class Brick
19 cm	+ / - 6 mm	+ /- 10 mm
9 cm	+ / - 2 mm	+ /- 7 mm
4 cm	+ /- 1.5 mm	+ /- 3 mm

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

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

54.5 The average compressive strength obtained as a sample of five tiles when tested in accordance's with the procure aid as per I.S. 1077 – 1992 shall be not less than 175 kg/Sq.cm. The average compressive strength of any individual brick shall not less than 160 kg / Sq.cm.

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

54.7 The brick tiles when tested in accordance with I.S. 1077 – 1992 the rate of effloresence 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 glassing shall be of uniform shade.

55.2 The tiles shall be of nominal size of 150 mm. X 150 mm. X 150 mm. unless otherwise specified. The maximum variation from the started sizes, other than the thickness of tile, shall be plus or minus 1.5mm. The thickness of the tile shall be 6mm. except as above the tiles shall conform to I. S. 777 – 1988.

M-56 GALVANISED IRON PIPES AND FITTINGS:

Galvanized iron pipe shall be of the medium type and of required diameter and shall comply with I.S. 1239 – 1990. The specified diameter of the pipes shall refer to the inside diameter of the bore. Clamps, screw and all galvanized iron fittings shall be 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 a free outlet. A stop cock is a value 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 Description. They shall be polished bright.

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

Dia.	Bib Cock	Dia.	Bib Cock	Stop Cock
8 mm	0.25 Kg.	15 mm.	0.40 Kg.	0.40 Kg.
10 mm	0.30 Kg.	20 mm.	0.75 Kg.	0.75 Kg.

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 be of gate valve opening full way and of the size as specified. These shall conform to I. S. 778 – 1990.

M-59 WHITE GLAZED PROCELAIN WASH BASIN:

59.1 Wash basin shall be of white porcelain first quality best India make and it shall conform to I.S. 2556 – (Part – IV) - 1994 and I. S. 771 – 1992. the size of the wash basin shall be as specified in

the Description. The 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 circular waste hole which is either rebated or beveled internally with 65mm. dia at top and 10m.depth to suit the waste fitting. The necessary stud slot to receive the bracket on the underside of the basin shall be provided. Basin shall have an internal so a holder recess which shall fully drain into the bowl.

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

M-60 EUROPEAN TYPE WATER CLOSET / WITH LOW LEVEL FLUSHING

60.1 The European type water closet shall be white glazed conforming to I.S. 2556 – 1994 and I.S. 771 -1692.

60. 2 'S' trap shall be provided as required with water seal not seal not less than 50 mm.

The solid plastic seat and cover shall be of the best Indian make conforming to I.S. 2548 – 1996. 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 and shall have chromium Plated brass hinges and rubber of suitable size.

M-61 ORISSA TYPE WATER CLOSED:

61.1 The specified of Orissa type white glazed water closet of first quality shall conform to I.S. 2556 (Part – III) 1994 and relevant specification of Indian type water closet except that pan will be with the internal squarring pan of size 580 mm x 440 mm. with raised footrest.

M-62 INDIAN TYPE WATER CLOSET:

The India type white glazed water closet of first class quality, size as specified in the Description and conforming to I.S. 772 – 1979. And I. S. 2556 – (Part – II) – 1994. Each pan shall have integral flushing of suitable type with adequate number of holes all around as directed to have satisfactory flushing. It shall also have an inlet at back of front for connecting flush pipe as directed. The inside if the bottom of the pan shall have sufficient slope from the fronts toward the outlet and the 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.

FOOT RESTS:

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

M-63 GLAZED EARTHEN WARE SINK:

The glazed earthenware sink shall be of specified size, colour and quality. The sink shall conform to I.S. 771 – Part II-1992. The brackets for sinks shall conform to I. S. 775 – 1990.
The Pipes shall conform to I. S. 1239 – Part-I-1990 and I. S. 404 – 1962. for steel and lead pipes respectively. 32 mm. brass wastes coupling of standard of pattern with brass chain and rubber plug shall be provided with sink.

M-64 GLAZED EARTHEN WARE LIPPED TYPE FLAT BACK URINAL / CORNER TYPE URINAL :

The lipped type urinal shall be flat back or corner type as specified in the Description and shall conform to I. S. 771 - 1992. It shall be of best Indian make and size as specified and approved by the Engineer-in-charge. The flats back or corner type urinal must be of first class quality, free from any defects, cracks etc.

M-65 LOW LEVEL ENAMEL FLUSHING TANK:

65.1 The low level enamel flushing tank shall be of 15 liters capacity. It shall conform to I.S. 774 - 1990. The flushing cistern shall be of best quality and free form any defects. The flushing tank shall have outlet 32 mm diameters. The outlet shall be connected with W.C. Pan by lead pipe of 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 - 1990. The flushing cistern shall be of best quality free from any defects.

66.2 The flushing cistern shall have outlet of 32 mm. diameter. The outlets shall be connected to end pipe of 32 mm. diameter. The lead pipe shall conform to I.S. 404 (Part – I) 1993. 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 paints the flushing cistern shall be fixed on C.I. brackets. The brackets shall conform to I.S. 775 – 1990.

M-67 FLUSH COCK:

Half turn flush cock (heavyweight) shall be gun metal chromium plated of diameter as specified in the description of the Description. The flush cock shall conform to relevant Indian Standards.

M-68 CAST IRON PIPES AND FITTINGS:

68.1 All soil, waste, vent and antisyphonage pipes and fittings shall conform to I. S.1729 – 1991.The Pipes shall have spigot socket ends with head on spigot end. The pipes and fittings shall be true to shape, smooth, cylindrical their inner and outer surfaces being as nearly as practicable concentric. They shall be sound nicely cast and shall be free from cracks, Laps, pin holes or other imperfection shall be neatly dressed and carefully fettled.

68.2 The end of Pipes and fitting shall be reasonably square to their axis.

68.3 The sand cast iron pipes shall be the diameter as specified in the description and shall be in length of 1.5 M., 1.8 M. & 2.0 M. including socket ends of the pipe unless shorter length are either specified or required at junction etc. The pipes and fittings shall be supplied without ears unless specified or directed otherwise.

68.4 Tolerance: The standard weights and thickness of Pipes shall be as shown in the table below. A tolerance up to minus 10% may however be allowed againstthese standard weights.

Sr. No.	Nominal Dia. Of bore	Overall Thickness	Weight of Pipe Excluding Ears 1.5M.long	1.8M.long	2Mlong
1.	75 mm.	5.0 mm.	12.83 Kg.	16.52 Kg.	18.37 Kg
2.	100 mm.	5.0 mm.	18.14 Kg.	21.67 Kg.	24.15 Kg.
3.	150 mm				
4.	250 mm.				

A tolerance up to minus 15% in thickness and 20 mm. in length will be allowed. For fittings tolerance in lengths shall be plus 25 mm. 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 sizes of straight pipes. The tolerance in weights and thickness shall be the same as for straight pipe

M-68-A P.V.C. Pipes &Fittings:-

1. All soil, waste and vent pipes & fittings shall conform to I.S. 4985 – 1988 & I. S. 13592: 1992. The Pipes are provided with an integral rubber ring type socket at one end while the other end in kept plain, smooth & free from burrs. The pipes and fittings shall be true to shape, smooth &cylidical. They shall be free from cracks, laps, pinholes or other imperfection and shall be nearly dressed and carefully fettled.

2. The P.V.C. Pipes shall be of the diameter as specified in the description and shall be in length of 6.0, 3.0 & 1.8 m including socket ends of the pipe unless shorter length are either specified or required at junction etc. Tolerances on specified length shall be + 10mm and - 0 mm.

3. Rubber real rings for joints Access Doors shall be Manufactured in accordance with IS : 5382 – 1998. There are made out or natural rubber with a shore 'A' hardness of 40 + 5.

   The mean outside diameter, outside at any point and wall thickness manufactured Plain or with socket shall be as shown in the following table:-

   All dimensions in millimeters.

Sr. No.	Nominal / Outside Dia.	Mean outside Diameter.		Outside Diameter at any Point.		Wall thickness	
		Min.	Max.	Min.	Max.	Min.	Max.
1.	75	75.0	75.3	74.1	75.9	3.2	3.8
2.	110	110.0	110.4	108.6	111.4	3.2	3.8

Minimum Wall thickness of sockets on pipes & Dimensions of sliding socket of pipes shall be as shown in following table.

All dimensions in millimeters.

Sr. No.	Nominal /	Minimum wall	Socket	Mean inside Diam. of

	Outside Diameter	thickness of sockets on pipes.		Depth Min.	socket at Mid point.	
		S2,Min.	S3,Min.		Min.	Max.
1.	75	2.9	2.4	40.0	75.1	75.3
2.	110	2.9	2.4	48.0	110.1	110.4

The outside diameter of Pipe shall be obtained by the method given in IS : 12235 (Part – 1) – 1998, wall thickness shall be measured by the method given in IS : 12235 (Part -2) 1998.

The Permissible variation between the mean outside diameter & the nominal outside diameter of a pipe shall be positive in the form + x, where is less than or equal to greater of the following two values.

a) 0.03 mm, and
b) 0.003 X nominal outside diameter- rounded off to the next higher 0.1 mm.

The Permissible variation between the outside diameter at any point (d1) & the nominal outside diameter (de) of a pipe shall not exceed the greater of the following two values.

a) 0.5 mm, and
b) 0.012 de round off to the next higher 0.1

The thickness of fittings and their socket & spigot dimensions shall conform to the thickness and dimensions specified for the corresponding sizes of straight pipes.

M-69 NAHNI TRAP:

Nahni trap shall be of PVC Multi floor Nahni trap and shall be sound and free from porosity 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 cracks, chips and other flaws or any other kind of defects which affect serviceability. The size of nahni trap shall be as specified and shall be of self cleansing design.

The nahni trap shall be of quality approved by the Engineer-in-charge and shall generally conform to the relevant IndiaStandards.

The nahnitrap provided shall be deep seal, minimum 50 mm. except at places where trap with deep seal cannot be accommodated. The cover shall be S.S. jail. Perforated cover shall be provided on the trap of appropriate size

M-70 GULLY TRAP:

Gully trap shall conform to I.S 651 -1992. It shall be sound free from defect such as fire cracks or hair cracks. The glaze of the traps shall be free from crazing they shall given a sharp clear note when struck with light hammer. There shall be no broken blisters.
The size of the gully trap shall be as specified in the Description.

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 300mm. X 300mm. 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 shall be sound and good casting and shall have truly square machined seating faces.

M-71 GLAZED STONE WARE PIPE AND FITTINGS:

The pipes and fitting shall be of best quality as approved by the Engineer-in- charge. The pipe shall be best quality manufactured from stone-ware of fire clay, salt glazed thoroughly burnt though 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 shall be smooth and perfectly glaze. The pipe shall be capable to withstand pressure of 1.5m lead without showing signs 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 joint of 6 mm. around the pipes. The pipes shall generally conform to relevant I. S. 651 – 1992.

M- 72 WALL PEG RAIL:

72.1 The aluminumwall peg rail shall have threealuminum pegs of approved quality and size. It shall be fixed on teakwood plank of size 450 mm. X 7 mm. X 20 mm. the teak wood shall be French polished or oil painted as specified.

M-73 G. I. WATER SPOUT:

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

73.2 The pipe shall have length as required for the thickness of well in which it is fixed, and at the outside end tee and bend cut at half the length shall be provided and at either end coupling shall be provided and they have better fixing. The water spout shall be provided as per detailed drawings 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 Description shall conform to I. S. 1926 – 1980. Special like bends, shoes cowls, etc. shall conform to relevant Indian Standards. The interior of pipe shall have a smooth finish, regular, surface and regular internal diameter. The tolerance in all dimensions shall be as per I. S. 1926 – Part-I- 1980.

M-75 CRYDON BALL VALVE:

Ball valve of screwed type including polythene float and necessary lever etc. shall be of the size as mentioned in the description of Description and shall conform to I.S. 1703 – 1989.

M-76 BITUMEN FELT FOR WATER PROOFING AND DAMP PROOFING

76.1 Bitumen felt shall be the fiber base and shall be of type 2, self finished felt grade -2 and shall conform to I.S. 1322 – 1998.

M-77 SELECED 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 Description. If Description 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 free 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 arrangements at his own costs for land for borrowing selected earth. The stacking of materials shall be done as directed by the Engineer-in- charge in such a way as 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 CRACKSEAL:

Crack seal manufactured byChemistic / Chemisol Indian Ltd., is an acrylic base ready application compound.

M-79 CAST IRON STEPS:

The cast iron steps shall be clean, well-cast and they shall be free from air and sand holes, colds shuts and warping which are likely to impair the utility of the castings. The portion of the step which projects from walls of the manhole shall have a raised required designed above the general plan of the top surface of the step along the edges of the tread to provide adequate non-slip grip. The steps shall be of dimensions 375 mm x 150 mm x 25 mm with necessary holding arrangement and carting minimum weight of 4.5 Kg. confirming to I.S. 5455 – 1992 or its latest version.

The cast iron steps shall be coated with a material having tar base or a place bituminous composition of cashew-nut shall liquid. The coating shall be smooth and tenacious. It shall not flow when exposed to a temperature of 0 degree C.

M-80 VITRIFIED FLOOR TILES:

Vitrified floor ties shall be of the best quality like Granamiteor equivalent as approved by the Architect / Consultant and Engineer-in-charge.

They shall be monolithic and available in smooth, mirror polished and anti-skid finishes, in size 24” x 24”. They shall have a size tolerance of + / - 0.5%, in length and width and + / - 5% in thickness. Allowable warpage shall be + / -0.2%. Allowable squareness wedging shall be + / -0.5%. Their water absorption rate shall be less than 0.5%. They shall offer hard- working and hard-wearing floors for homes, public building, apartments and airports.

They shall be extremely strong, breaking strength of the tile being 1600 Kg/Sq.cm. flexural strength 200 Kg/Sq.cm. and bonding strength of 2500 KG/Sq.cm.The shall offer good resistance to abrasion, i.e. greater than 100. they shall be scratch resistant, their hardness on the Moh’s scale shall be minimum 7. They shall be able to resist thermal shock up to 10 cycles. They shall have bond strength of 2500 Kg/Sq.cm. and shall have 0.60 co-efficient of Friction for the polished / unpolished surfaces. All joints of the slabs shall align in both directions.

M-81 Stainless Steel Railing:

The Stainless Steel railing pipe shall be specified size and quality. The S.S. railing pipe shall conform to steel of grade designation 312 conforming to IS 13983.
The S.S. pipe shall be of 50 mm dia and of 16 gauge (1.62 mm) thickness with S.S. plate of 2.00 mm thickness.

The S.S. rod and flat shall be of steel grade AISI 312.

M-82 ACRYLIC EMULSION PAINTS:

It shall be from ICI, Nerolac, Asian Paints, Berger, as approved by the Engineer in charge and Engineer-in-Charge. It shall conform to the relevant IS codes.

It shall be used on both interiors and exteriors, on all different types of plaster, wooden surfaces, stone, brickwork, asbestos cement sheets, hard and soft boards, etc. It shall render rich smooth finish and shall provide a tough film that forms a suitable protection against all elements.

It shall be water thinnable. It shall require no primer. On a well prepared surface, it shall be applied, after one coat of cement primer, in case it is an interior surface and waterproof cement coating, in case it is an exterior surface. On a new but highly absorbent surface, a thin coat of the same shall be applied by adding two parts of water by volume to two parts of acrylic emulsion by volume. On previously painted surfaces, one coal of the same shall be applied by thinning four parts of the emulsion with one or two parts of water. It shall be applied by brush, roller or spray. It shall have a covering capacity of 25 - 30 S.Mts./Liter, depending on the surface and shade used. It can be washed to remove the day-to-day dirt, after the surface has been painted, minimum for a month.

Frequency of Tests (Civil Works)

Sr. No.	Title		Frequency of Test / Check	Relevant IS Codes
	Soil			IS 2720
	Core cutter test		At every 500 m3. of compacted earth filling for mass filling work	
	Standard Proctor Test		Once for each source of earth	
	Coarse Aggregate / Fine Aggregate			
	Specific gravity		Once or Charge in source	IS 2430 - 1986
	Bulkage of Sand		In monsoon/Rainy season when concreting is done by volumetric batching this test is to be performed daily and necessary Bulkage corrective to be applied	
	Dry/Loose Bulk density		As and when required	
	Silt content in Sand		For each source If the source explored between 501-1500 cum take one gross sample at each 100 cum. If the source explored between 1501-5000 cum, take one gross sample at each 200 cum.	IS 2386
	Aggregate impact value			
	Sieve analysis of aggregate			
	Aggregate crushing value			
	Flakiness Index Thickness Test			
	Bricks			IS 5454-1978
	Visual Check		Total 20 Nos. of Bricks to be selected from three trucks (i.e.; 6 to 7 bricks from each Truck)	
	Dimensioned Check			
	Water absorption		For each source Random 3 Nos. to be tested from 20 Nos. of bricks as selected in 6 (i) & 6(ii)	
	Compressive strength			
	Cement			IS 3535 - 1986
	Fineness of cement		For each batch received at site or and above test certificates from manufacturer/ supplier. Will have to be brought by the contractor.	
	Standard consistency of cement			
	Setting time			
	Compressive strength			
	Soundness			
	Reinforcement Steel			**IS 1786-1985**

Sr. No.	Title	Frequency of Test / Check	Relevant IS Codes
	i. Rolling margin	For bar dia. < 10mm – One sample from each 25 tonne or part thereof For bar dia. 10mm to 16mm – One sample from each 35 tonne or part thereof For bar dia above 16mm – One sample from each 45 tone or part thereof One sample consists of 3 Nos. of bars of at least 0.5m length	
	ii. Tensile Test iii. Elongation iv. Bend – Rebend test	For each lot received at site or and above test certificates from manufacturer/ supplier. Will have to be brought by the contractor.	
	Structural Steel		IS 2062-1992
	i. Rolling Margin	One sample for each 20 MT or part thereof	
	ii. Tensile test iii. Elongation iv. Bend – Rebend test		
7.	**Concrete**		IS 456-2000
	i. Slump Test ii. Compressive strength	For each concrete cube set The cube samples shall be taken for each grade of concrete for following daily concrete quantity	

Qty. of concrete in Cum (Daily)	Number of Samples
1-5	1
6-15	2
16-30	3
31-50	4
51 and above	4 plus one additional for each 50 cum. of concrete

	One sample consists of six nos of cubes. Three for 7 days and three for 28 days strength. However where 7 days strength is not required the sample size may be reduced to three nos of cubes for 28 days strength only. Standard deviation to be taken every month The frequency is to maintain for initial period, till consistent results are obtained. It may be reduced as per engineer in charge's discretion
8. Calibration of test equipment	As per frequency set in Laboratory Manual

Sr. No.	Title		Frequency of Test / Check	Relevant IS Codes
9.	Inspection and test status		Daily	
10.	Control of nonconforming product		On occurrence of Nonconformity	
11.	**Frequency of Tests for road works**			
a	Sand Content		2 tests per 3000 cum of Soil	IS : 2720 (Part 4)
b	Plasticity Test		2 tests per 3000 cum of Soil and each type of soil sample	IS : 2720 (Part 5)
c	Density Test		2 test per 3000 cum of soil and each type of soil sample	IS 2720 (Part 8)
d	Deleterious Content Test		As and when required	Is 2720 (Part 27)
e	Moisture Content Test		1test for every 250 cum of soil	Is 2720 (Part 2)
f	CBR Test		1 test per 3000 cum of soil, on socked and unsoaked sample	IS 2720 (Part 16)

Frequency of Tests for Earth work in Embankment:

Sr. No.	Title		Frequency of Test / Check	Relevant IS Codes
1.	Field density tests either by core cutter method or sand replacement method		every 500 Cmt. of earth placed in the embankment	
			one test for every full or part shift of compaction operations	
			one test for every 50 m length of bund in each layer	
			every 500 sq. meters area of the trimmed slopes	

Frequency of Tests for Prime Coat / Tack Coat:

Sr. No.	Title		Frequency of Test / Check	Relevant IS Codes
1.	Quality of Binder		2 Samples per lot to be subject. some tests as directed by the Engineer	
2.	Binder Temp. for application		At regular close intervals	
3.	Rate of Spread of Binder		2 tests per day	

Frequency of Tests for Dense Bituminous Macadam / Asphalt Concrete:

Sr. No.	Title		Frequency of Test / Check	Relevant IS Codes
1.	Quality of Binder		2 Samples per lot to be subject some tests as directed by the Engineer	
2.	Aggregate Impact Value		1 Test per 50 m3 of Aggregate	
3.	Flakiness Index and Elongation Index		1 Test per 50 m3 of Aggregate	
4.	Stripping Value		Initially One set of 3 representative specimens for each source of supply. Subsequently when warranted by changes in the quality of aggregate.	
5.	Water Absorption of Aggregate		Initially One set of 3 representative specimens for each source of supply. Subsequently when warranted by changes in the quality of aggregate.	
6.	Sand Equivalent Test		As required	
7.	Stone Polishing Value		As required. For Bituminous Concrete	
8.	Mix Grading		One set of test on individual constituents and mixed aggregate from the dryer for each 400 tonnes of mix subject to a minimum of two tests per plant per day.	
9.	Stability of Mix		For each 400 tonnes of mix produced, a set of 3 Marshall specimens to be prepared and tested for stability, flow value, density and void content subject to minimum of 2 sets being tested per plant per day.	
10.	Water Sensitivity of Mix (Retention of Marshall Stability)		As required for bituminous concrete.	
11.	Swell test on the Mix		As required for bituminous concrete.	
12.	Control of Temp. of Binder in boiler, Aggregate in the dryer and Mix at the time of Laying and Rolling		At regular close intervals	
13.	Control of Binder content and		One test for each 400 tonnes of mix subject to a minimum of 2 sets per day per	

Sr. No.	Title		Frequency of Test / Check	Relevant IS Codes
	Gradation in the Mix		plant. Regular control and through checks on the weight of mixed material and layer thickness.	
14.	Rate of Spread of Mixed Material		One test per 250 m2 area.	

Frequency of Tests for Granular Sub Base:

Sr. No.	Title		Frequency of Test / Check	Relevant IS Codes
1.	Gradation		One test per 200 m3	MORT&H
2.	Atterberg limit		One test per 200m3	
3.	Moisture content prior to compaction		One test per 250 m2	
4.	Density of compacted layer		One test per 500 m2	
5.	Deleterious constituents		As directed by engineer in-charge	Is 2720 (Part 27)
6.	C.B.R.		As directed by engineer in-charge	IS 2720 (Part 16)

Frequency of Tests for Wet Mix Macadam:

Sr. No.	Title		Frequency of Test / Check	Relevant IS Codes
1.	Aggregate Impact Value		One test per 200 m3 of aggregate	IS 2386
2.	Grading		One test per 100 m3 of aggregate	MORT&H
3.	Flakiness and Elongation Index		One test per 200 m3 of aggregate	IS 2386
4.	Atterberg limits of portion of aggregate passing 425 micron		One test per 100 m3 of aggregate	

	sieve			
5.	Density of compacted layer		One test per 500 m2	

Frequency of Tests for WaterBound Macadam Sub Base/Base: IS 2386 and MORT &H

Sr. No.	Title		Frequency of Test / Check	Relevant IS Codes
1.	Aggregate Impact Value		One test per 200 m3 of aggregate	
2.	Grading		One test per 100 m3 of aggregate	
3.	Flakiness and Elongation Index		One test per 200 m3 of aggregate	

ALL TESTS SHALL BE CARRIED OUT BY THE CONTRACTOR AT HIS OWN COST.

3. DESCRIPTIONWISE DETAILS TECHNICAL SPECIFICATIONS OF CIVIL WORK

Description no:-1

For Sub Estimate-1A (Item-1 to 5), For Sub Estimate-1B (Item-1 to 5), For Sub Estimate-2A (Item-2 to 6), For Sub Estimate-2B (Item-1 to 6), For Sub Estimate-2C (Item-1 to 2), For Sub Estimate-2D (Item-1 to 3), For Sub Estimate-2E (Item-1), For Sub Estimate-3 (Item-1 to 5), For Sub Estimate-5 (Item-1 to 6), For Sub Estimate-6 (Item-1 to 5), For Sub Estimate-7A (Item- 1 to 6), For Sub Estimate-7B (Item- 23 to 26),For Sub Estimate-9 (Item-1), For Sub Estimate-10 (Item-1 to 5), For Sub Estimate-11 (Item-1 to 5)

Excavation for foundation including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 mt .lead and all lift and watering etc. Complete.
(A) 0 to 1.5mt depth
(B) 1.50 to 3.0 Mt. Depths
(C) 3.0 to 4.50 Mt. Depths

General
Any soil which generally yields to the application of pickaxes and shovels or jumpers or scarifies phawaras rakes or any such implement or organic soil, gravel, silt sand turf loam, clay peat etc. fall under this category.

Clearing the Site
The site on which the structure is to be built shall be cleared, and all obstructions, loose stone, materials and rubbish of all kind, bush wood and trees shall be removed as directed. The materials so obtained shall be the property of the Corporation and shall be conveyed and stacking as directed within 200 Mts. lead. The roots of the trees coming in the sides shall be cut and coated with hot asphalt.

The rate of site clearance is deemed to be included in temperature of earth work for which no extra amount will be paid.

Classification of Excavated Material
Classification: All materials involved in excavation shall be classified by the Engineer in the following manner:
a) Soil, Sand, Murrum etc.:
This shall comprise topsoil, turf, sand, silt, loam, clay, mud, peat, black cottons oil, soft shale or moorum, a mixture of these and similar material which yield to the ordinary application of pick, spade and/or shovel, rake or other ordinary digging equipment. Removal of gravel or any other modular material having dimension in any one direction not exceeding 75 mm shall be deemed to be covered under this category.
b) Ordinary Rock / Soft Rock (not requiring blasting) this shall include:
i) rock types such as laterites, shales and conglomerates, varieties of limestone and sandstone etc., which may be quarried or split with crow bars, also including any rock which in dry state may be hard, requiring blasting but which, when wet, becomes soft and manageable by means other than blasting;
ii) macadam surfaces such as water bound and bitumen/tar bound; soling or roads, paths, etc. and hard core; compact moorum or stabilized soil requiring grafting tool or pick or both and shovel, closely applied; gravel and cobble stone
iii) lime concrete, stone masonry in lime mortar and brick work in lime/cement mortar below ground level, reinforced cement concrete which may be broken up with crow bars or picks and stone masonry in cement mortar below ground level; and

iv) boulders which do not require blasting found lying loose on the surface or embedded in river bed, soil, talus, slope was hand terrace material or dissimilar origin.

Setting Out

After clearing the site, the centre lines will be given the Engineer-in-charge. The contractor shall assume full responsibility for alignment, elevation and dimension of each and every part of the work. The contractor shall supply materials etc. required for setting out the reference material and bench marks and shall maintain them as long as required and directed.

Excavation

The excavation in foundation shall be carried out in traveling and level and shall have the width and depth as shown the drawings or as directed. The contractor shall do the necessary shorting and shuttering at his own cost and as approved by the Engineer-in-charge or his Consultant. The payment for much precautionary measures shall be included in this work. The bottom of the excavated area shall be leveled both longitudinally & transversely as directed by removing and watering as required. No earth filling will be allowed for bring it to level, if by mistake or any other reason or as directed. The extra depth or width shall be made up with concrete of the same proportion as specified for the foundation concrete at the cost of the contractor. The excavation up to 1.5 Mts. depth shall be measured under this Description. The site conditions may require excavation in parts as per schedule of excavation. No extra payment will be claimed for this operation schedule.

Disposal of Excavated Materials:

No materials excavated from the foundation trenches, of whatever kind they be, are to be placed even temporarily up to 1.5 Mts. or at the distance prescribed by the Engineer, from the outer edge of excavation. All materials excavated shall remain the property of the Corporation. Rate of excavation shall include sorting out of useful materials and stacking them separately as directed within the specified lead. Materials suitable and useful for backfilling or other use shall be stacked in convenient places but not in such a way as to obstruct free movement of men, animals and vehicles or encroach upon the area required for constructional purpose. The site shall be left clean of all debris on completion.

Disposal of excavated materials is subject to the following. Unsuitable materials obtained from clearing site and excavation shall be disposed off within a lead of 50 Mts. from the edge of plinth / building line as directed. Useful materials obtained from clearing site & excavation shall be slacked within lead of 50 Mts. beyond the building area as directed. Materials suitable for back-filling shall be stacked at convenient places within a lead of 50 Mts, and will be allowed to be used by the contractor on payment at rates laid down in the contract or if not so laid down, at scheduled rates of the Division or at mutually agreed rates if there are no such rate the schedule of rates.

Mode of Measurement and Payment

The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections by the Engineer-in-charge of as directed. No payment shall made for surplus excavation made excess or above requirements or due to stopping and sloping back as found necessary on account of conditions of soil and requirements of safety or construction schedule requiring excavation to be done in parts.

No extra payment shall be made for temporary pumping of water / sewage due to abnormal adverse conditions / climate.

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

B. 1.5 to 3.0 mt. depth

Workmanship
The relevant specification of Description No. 4(A) shall befollowed except that the excavation work shall be carried out in all sorts of soil with lift 1.5. Mts. to 3.0 Mts.

Mode of Payment
The relevant specification of Description No. 4(A) shall be followed.

The excavation work of lift 1.5 Mts. to 3.0 Mts. shall be measured under this Description.

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

C. 3.0 to 4.5 mt. depth

Workmanship
The relevant specification of Description No. 4(A) shall be followed except that the excavation work shall be carried out in all sorts of soil with lift 3.0. Mts. to 4.5 Mts.

Mode of Payment
The relevant specification of Description No. 4(A) shall be followed.

The excavation work of lift 3.0 Mts. to 4.5 Mts. shall be measured under this Description.

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

Description no:-2

For Sub Estimate-1A (Item-7),For Sub Estimate-2A (Item-7), For Sub Estimate-2B (Item-7), For Sub Estimate-2D (Item-4), For Sub Estimate-3 (Item-6), For Sub Estimate-4 (Item-13), For Sub Estimate-6 (Item-6), For Sub Estimate-7A (Item-7),), For Sub Estimate-7B (Item-28), For Sub Estimate-10 (Item-6), For Sub Estimate-11 (Item-6)

Filling of Plinth with using excavated usefull material partly and remaining murrum to be brought from out side in layer of 0.23 m thick including murrum and sprinkling of water, compaction etc. complete

1.0. Workmanship
1.1. The earth to be used for filling shall be free from salts, organic or other for eignmatter. All clodsofearthshall be broken.
1.2. As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris, brickbats, mortar dropping etc., and filled with earth in layers not exceeding 20 cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid The earth shall be rammed with iron rammers where feasible and with the but ends of crow-bars, where rammer cannot be used.
1.3. The plinth shall be similarly filled with earth in layers not exceeding20 cms. Adequately watered and consolidated by ramming with iron or wooden rammers. When filling reaches finished level the surface all be flooded with water for at least 24hours and allowed to dry and then rammed and consolidated.
1.4. Thefinishedlevel offillingshall bekepttoshapeintendedtobegiven tofloor.

1.5. In case off large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required, shall also be as specified.
1.6. Theexcavatedstuffoftheselectedtypeshallbeallowedtobeusedinfillingthe trenchesand plinth under nocircumstancesblackcottonsoilbeusedforfillingthePlinth.

2.0. Mode of Measurements & Payment
2.1. The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.
2.2. The rate shall be for unit of one cubic meter.
kotar/low lying/borrow pit area of RMC.

Description no:-3

For Sub Estimate-1A (Item-8), For Sub Estimate-2A (Item-8), For Sub Estimate-2E (Item-2), For Sub Estimate-3 (Item-7), For Sub Estimate-4 (Item-7), For Sub Estimate-6 (Item-7), For Sub Estimate-7 (Item-8), For Sub Estimate-7 (Item-28), For Sub Estimate-10 (Item-7), For Sub Estimate-11 (Item-7)

Filling of Plinth in layers of 0.23 m thick including murrum and sprinkling of water, compaction etc. complete

1.0 Material:

1.1. Murrum shall be clean of good binding quality, and of approved quality obtainedfrom approved pots/quarries of disintegrated rocks which contain silicons materials and natural mixture of clay of calcareous origin. The size of Murrum shall not be more than 20 mm. in this case if excavation material is good then 1st priority will be this material use in filling and that rate given as per Item no.02.during excavation the usable material stacking as perinstruction engineer in-charge at the suitable site near the work site, for use in filling.If the earth has to be bought from outside of the site, the rate includes thepurchase cost of the earth, loading and unloading, its carting from outside to site, levy royalty or any other form of taxes as per prevailing rules, screening ifnecessary, spreading in 200mm (6" to 8") layers consolidating with 10 ton roller, if it not possible then through electriccompactorsof adequate capacity. Each layer prior to putting next layers as per theinstructionofengineer.The earth shall be got provided prior to bring on site. The earth shallbe free fromtrees roots, weeds, big stones, and other objectionable materialsliabletodecay.

2.0. Workmanship:

2.1. The murrum or selected soil shall be filled in foundation and plinth in20cms.layersincluding consolidating, ramming, watering, dressing etc. complete.

3.0. Mode of measurement and payment:

3.1. The relevant specifications of the item shall be followed.

3.2. The rate includes cost of collecting and carting murrum/or selected earth of approved quality with all lead and labour required for filling in trenches and plinth.

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

Description no:-4

For Sub Estimate-1A (Item-8), For Sub Estimate-2A (Item-9), For Sub Estimate-2B (Item-9), For Sub Estimate-2C (Item-5), For Sub Estimate-2D (Item-5), For Sub Estimate-3 (Item-8), For Sub Estimate-6 (Item-8), For Sub Estimate-7 (Item-9), For Sub Estimate-7 (Item-29), For Sub Estimate-10 (Item-8), For Sub Estimate-11 (Item-8)

Removal of Excavated Stuff within RMC limit as directed by Engineer-in-Charge

1.0 No materials excavated from foundation trenches of whatever kind they may be, are to be placed even temporarily nearer than 1.5 m or distance prescribed by the engineer from the outer edge of excavation. All materials excavated shall remain the property of Government. Rate for excavation includes sorting out of useful and stacking them separately and as directed within the specified lead. Materials suitable and useful for back filling or other use shall be stacked in convenient place, but not in such a way as to obstruct free movement of men,animalsand vehicles or encroach upon the area required forconstructional purposes.

1.1 The site shall be left clean of all debris or completion.

1.2 Disposal of excavated materials is subject to the following.
Unsuitable materials obtained from clearance, site and excavation shallbe disposed of as directed. Useful materials obtainedfrom clearing siteand excavation shall be stacked within a lead of 500 m as directed. Material suitable for backfilling shall he stacked at convenient places within a lead of 500 m from the site for reuse. Useful stones from rock excavation shall be stacked neatly within a lead of 500m and will beallowed to be used by the contract or on payment at rates laiddowningtheContractor if not so laid down, at scheduledrates of the Division or ataMutually agreed rates if the rear enough rates in the Schedule of rate. All the excavated material shall be deposited at required location in the specification layer within RMC limit.

1.3 The rate shall be given for one cubic meter.

Description no:-5

For Sub Estimate-1A (Item-10,11), For Sub Estimate-2A (Item-10,11,16), For Sub Estimate-2B (Item-10, 11), For Sub Estimate-2C (Item-5), For Sub Estimate-2D (Item-6), For Sub Estimate-2D (Item-8 & 9), For Sub Estimate-2E (Item-9), For Sub Estimate-3 (Item-9,10), For Sub Estimate-4 (Item-14), For Sub Estimate-6 (Item-9, 10), For Sub Estimate-7 (Item-10), For Sub Estimate-7 (Item-30,31), For Sub Estimate-9 (Item-4), For Sub Estimate-10 (Item-9,10), For Sub Estimate-11 (Item-9,10)

Foundation filling with CC work in proportion of 1:2:4 using 1.5 cm to 2.0 cm aggregate including Raming, Curing etc.

Providing and laying cement concrete 1:3:6 (1cement: 3 sand: 6 graded stone aggregates 40 nominal size) and curing complete including cost of formwork in.
(A) Foundation and Plinth

Materials
Water shall conform to M-1. Cement shall conform to M-3 Sand shall conform to M-6. Stone aggregate 40 mm nominal size shall conform to M-12.

Workmanship

General
Before starting concreting the bed of foundation trenches shall be cleared of all loose materials, leveled, Watered and rammed as directed.

Proportion of Mix
The proportion of cement, sand coarse aggregate shall be one part of cement, 3 parts of sand 6 parts of stone aggregate shall be measured by volume.

Mixing
The concrete shall be mixed in a mechanical mixer is the site of work. Hand mixing may however be allowed for smaller quantity of work if approved by Engineer-in-charge. When hand mixing is permitted by the Engineer-in-charge in case of breakdown of machineries and in the interest of the work, it shall be carried out a water tight platform and care shall be taken to ensure thatmixing is continued until the mass is uniform in colour and consistency. However in such case 10% more cement than otherwise required shall have to be used without any extra cost. The mixing in mechanical mixer shall be done for a period 1 ½ to 2 minutes. The quantity of water shall be just sufficient to produce dense concrete of required workability for the purpose.

Transporting and placing the concrete
The concrete shall be handed from the place of mixing to the final position in not more than 15 minutes by the method as directed and shall be placed into its final position, compacted and finished within 30 minutes of mixing with water i.e. before the setting commences

The concrete shall be laid in layers of 15 cms to 20 cms.

Compacting
The concrete shall be rammed with heavy iron rammer and rapidly to get the required compaction and to allow the interstices to be filed with mortar.

Curing
After the final set, the concrete shall be kept continuously wet, if required by pending for a period of not less than 7 days from the date of placement.

Mode of Measurements and Payment
The concrete shall be measured for its length breadth and depth, limiting dimensions to those specified on plan or as directed.

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

<u>Description no:-6</u>

For Sub Estimate-1A (Item-12,13,14,16,17,18,19,20,21), For Sub Estimate-2A (Item-10 to 15) For Sub Estimate-2B (Item-12 to 17), For Sub Estimate-3 (Item- 11 to 19), For Sub Estimate- (Item-8 to 11), For Sub Estimate-6 (Item-11 to 18), For Sub Estimate-7 (Item-12 to 15), For Sub Estimate-7 (Item-32 to 38), For Sub Estimate-9 (Item-5 & 6), For Sub Estimate-10 (Item-11 to 18), For Sub Estimate-11 (Item-11 to 15)

Providing and laying controlled concrete M15, M20, M25, M30 etcand curing complete excluding the cost of form work and reinforcement for reinforced concrete work in: (A) Foundations, footings, base of columns and mass concrete. (B) Walls from top of foundations / level up to floor two levels. (C) slabs, landing shelves, Balconies , Lintels, beams, girders and

cantilever up to floor two level (D) columns, pillars, posts, and struts up to floor two level (E) Staircase up to floor two level (F) Vertical and horizontal fins up to floor two levels.

1.0. Materials:

1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8. Coarse aggregate shall confirm M-12.

2.0Concrete

2.1 General

In concrete grade M15, M20, M25, M30 etc. the number represents the specified characteristic compressive strength of 150 mm cube at 28 days, expressed in N/sq.mm as per IS: 456. Concrete in the works shall be "DESIGN MIX CONCRETE" or "NOMINAL MIX CONCRETE". All concrete works of grade M5, M7.5 and M10 shall be NOMINAL MIX CONCRETE whereas all other grades, M15 and above, shall be DESIGN MIX CONCRETE.

2.2 Design Mix Concrete

(a) Mix Design & Testing

For design mix concrete, the mix shall be designed according to IS: 10262 and SP: 23 to provide the grade of concrete having the required workability and characteristic strength not less than appropriate values given in IS: 456. The design mix shall in addition to such that it is cohesive and does not segregate and should result in dense and durable concrete and also capable of giving the finish as specified. For water retaining structure, the mix shall also result in water tight concrete. The Contractor shall exercise great care while designing the concrete mix and executing the workers to achieve the desired result.

Unless otherwise specially mentioned, the minimum cement content and maximum water cement ratio for Design Mix Concrete shall be as given below:

Grade of Concrete	Minimum cement Content in Kg/Cum ofconcrete	Maximum W/C ratio
M20	360	0.55
M25	380	0.50
M30	400	0.45

The minimum cement content stipulated above shall be adopted irrespective of whether the Contractor achieves the desired strength with less quantity of cement. The CONTRACTOR's quoted rates for concrete shall provide for the above eventuality and nothing extra shall become payable to the CONTRACTOR in this account. Even in the case where the quality of cement required is higher than that specified above to achieve desiredStrength based on an approved mix design, nothing extra shall become payable to the CONTRACTOR.

It shall be the Contractor's sole responsible to carry out the mix designs at his own cost. He shall furnish to the Engineer-in-charge at least 30 days before concreting operations, a statement of proportions proposed to be used for the various concrete mixes ascertained on 150 mm cubes as per IS:516 shall comply with the requirements of IS:456.

Grade ofConcrete	Minimum compressivestrength N/Sq.mm at 7Days.	Specified characteristic compressive strength N/Sq.mm at 28 days
M15	10.00	15.00
M20	13.50	20.00

M25	17.00	25.00
M30	20.00	30.00
M35	23.50	35.00
M40	27.00	40.00

A range of slump which shall generally be used for various types of construction unless otherwise instructed by the Engineer-in-charge is given below:

Structure/Member	**Slump in millimeters**	
	Maximum	**Minimum**
Reinforced foundation walls and footings	75	25
Plain footings, caissons and substructure walls	100	25
Slabs, Beams and reinforced walls Pump &miscellaneous Equipment	75	25
Foundations	100	25
Building Column	50	25
Pavements	50	25
Heavy mass construction	50	25

Batching & Mixing of Concrete

Proportions of aggregates and cement, as decided by the concrete mix design, shall be by weight. There proportions shall be maintained during subsequent concrete batching by means of weigh batchers capable of controlling the weights within one percent of the desired value. Amount of water added shall be such as to produce dense concrete of required consistency, specified strength and satisfactory dense concrete of required consistency, specified strength and satisfactory workability and shall be so adjusted to account for moisture content in the aggregates. Water-cement ratio specified for use by the Engineer-in-charge shall be maintained. Each time the work stops, the mixer shall be cleaned out, and while recommencing, the first batch shall have 10% additional comment to allow for sticking in the drum.
Arrangement should be made by the Contractor to have the cubes tested in an approved laboratory or in field with prior consent of the Engineer-in-charge. Sampling and testing of strength and workability of concrete shall be as per IS: 1199, IS: 516 and IS: 3370.

Ready Mix Concrete
Minimum cement consumption shall be as specified in tender document. However, necessary computer printout for consumption of all materials and admixtures if permitted shall be made available as and when required in any frequencies as directed by Engineer – in-charge.
Necessary slump requirements at the pouring places shall be made available with ready mix concrete. Concrete mix shall be design for 33% higher strength than the grade of concrete specified. The proportions for ingredients chosen shall be such that concrete has adequate workability for condition prevailing on the work in question and can be properly compacted with the means available. Use of cementations material like Fly ash etc. shall not be permissible.
Except where it can be shown to the satisfaction of the Engineer-in-charge that a supply of properly graded aggregate of uniform quality can be maintained till the completion of work, grading of aggregate should be strictly controlled. The different sizes shall be stocked in separate

stock piles. Required quality of material shall be stock-piled several hours, preferably a day, before use. Grading of coarse and fine aggregate shall be checked as frequently as possible, frequency for a given job being determined by the Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the design mix.

The quantity of both cement and aggregate shall be determined by weight. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked.

If is most important to keep the specified water – cement ration constants and its correct value. To this end, the moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates, IS: 2386 (Part-III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates to allow for the variation in weights of aggregates due to variation in their moisture content.

The special Conditions / Specification regarding **Ready Mix Concrete** are as follows. The details like locations, capacity, experience, delivery schedule etc. of the **Ready Mix Concrete** agency shall be submitted by the successfully tenderer for prior approval of theundersigned.

The Ready Mix Concrete shall be conforming to IS: 4926 with its latest amendments. All the responsibility of **Ready Mix Concrete** i.e. procurement for all materials, operation of plant and machinery, transit mixers, pumping machineries relevant piping etc. shall be on the account of the contractor.

The Rajkot Municipal Corporation shall not be held responsible for any delay / damage / loss due to deployment of **Ready Mix Concrete** for this project. The octroy for the **Ready mix Concrete** shall have to be borne by the contractor as per prevailing rates. **Ready Mix Concrete** process shall be fully automatic and computerized.

When a transit mixer is used for transportation of concrete, no extra water should be added to the concrete from elsewhere after initial introduction of mixing water from the batch, except when on arrival at the site of the work, the slump of the concrete is less than that Specified: such additional water to bring the mixer under such pressure and direction of flow that requirements for uniformity are met.

Records and certificates: The contractor shall keep from the manufacture batch records of the quantities by mass of all mixing and of the results of all tests. If required by the Rajkot Municipal Corporation, the contractor shall furnish certificates, at agreed intervals, giving this information.

The contractor shall supply the following information for guidance of the manufacturer:

- The type of cement to be used
- Details Specification of aggregates to be used.
- Type of admixture to be used. If specified.
- Min. acceptable strength
- Slump of concrete or compaction factor
- Ages at which the test cubes or beams are to be tested and the frequency and number of test to be made.
- Any other requirement.

Tolerance: Unless otherwise agreed to between the Rajkot Municipal Corporation (RMC)and the contractor, the concrete shall be deemed to comply with the requirements of this, if these results of testes where applicable lie within the tolerance specified below.

Consistency of workability: The slump average of two tests shall not differ from thespecified value by + 10 mm for a specified slump of 75 mm. The compacting factor averageof two tests shall be within + 0.03 of the value specified. If any other method of determining consistency to be used a suitable tolerance shall be agreed to be between the purchaser and the manufacture. The tests for consistency or workability shall be complete within 15 minutes of the time of receipt of the ready mix concrete at the site.

Aggregate: When tested in accordance with IS 2386 (Part-I) 1963, the quantity of aggregate larger than the max size specified by the purchaser shall not exceed 5% of the qty. of course aggregate and all such pass sieve of next higher size.

2.3 Nominal Mix concrete.

(a) Mix design and testing

Mix design and preliminary test are not necessary for Nominal Mix concrete. However works test shall be carried out as per IS: 456. Proportions for Nominal Mix Concrete and w/c ratio may be adopted as per Table 3 of IS: 456. However it will be the Contractor's role responsibility to adopt appropriate nominal mix proportions to yield the specified strength.

(b) Batching & Mixing of Concrete

Based on the adopted nominal mixes, aggregates shall be measuredbyvolume.However cement shall be by weight only.

2.4 Formwork

Formwork shall be all inclusive and shall consist of but not be limited to shores, bracing's sides of footing , walls, beams and columns, bottom of slabs etc. including ties, anchors, hangers, inserts, false work, wedges etc.

The design and engineering of the formwork as well its construction shall be the responsibility of the Contractor. However, if so desired by the Engineer-in-charge the DRAWING and calculating for the design of the formwork shall be submitted to the Engineer-in-charge for approval.

Formwork shall be designed to fulfill the following requirements:

Sufficiently rigid and tight to prevent loss of grout or mortar from the concrete at all stages and appropriate to the method of placing and compacting. Made of suitable materials.

Capable of providing concrete of the correct shape and surface finish within the specified tolerance limits. Capable of withstanding without deflection the worst combination of self-weight, reinforcement and concrete weight, all loads and dynamics effect arising from construction and compacting activities, wind and weather forces. Capable of easy striking out without shocks, disturbance or damages to the concrete. Soffit forms capable of imparting a camber if required. Soffit forms and supports capable of being left in position if required.Capable of being cleaner and/or coated if necessary immediately prior to casting the concrete; design temporary openings where necessary for these purposes and to facilitate the preparation of construction joints.

The formwork may be of timber, plywood, steel, plastic or concrete depending upon the approval of the Engineer-in-charge. Timber of formwork shall be well seasoned, free sap, shakes, loose knots, worm holes, warps and other surface defects. Joints between formwork and formwork and between formwork and structures shall be sufficiently tight to prevent loss of slurry from concrete, using seals if necessary.

The faces of formwork coming in contact with concrete shall be cleaned and two coats of approved mould oil applied before fixing reinforcement. All rubbish, particularly chippings, sailings, sawdust, wire pieces dust etc. shall be removed from the interior of the forms before the concrete is placed. Where directed, cleaning of forms shall be done by blasting with a jet of compressed air at no extra cost.

Forms intended for reuse shall be treated with care. Forms that have deteriorated shall not be used. Before reuse, all forms shall be thoroughly scraped, cleaned, nails removed, holes suitably plugged, joints repaired and warped lumber replaced to the satisfaction of the Engineer-in-charge. The Contractor shall equip himself with enough shuttering to allow for wastage so as to complete the job in time.

Permanent formwork shall be checked for its durability and compatibility with adjoining concrete before it is used in the structure. It shall be property anchored to the concrete.

Wire ties passing through beams, columns and walls shall not be allowed. In their place bolts passing through sleeves shall be used. Formwork spacers left in situ shall not impair the desired

appearance or durability of the structure by causing spelling, rust staining or allowing the passage of moisture.

For liquid retaining structures, sleeves shall not be provided for through bolts nor shall through bolts be removed if provided. The bolts, in the latter case, shall be cut at 25 mm depth from the surface and the hole made good by cement mortar of the same proportion as the concrete just after striking the formwork.

Where specified all corners and angles exposed in the finished structure shall have chamfers or fillets of 20 mm X 20 mm size.

Form for substructure may be omitted when, in the opinion of the Engineer-in-charge, the open excavation is firm enough (in hard non-porous soils) to act as a form, such excavation shall be larger, as approved by the Engineer-in-charge that required as per DRAWING to compensate for irregularities in excavation.

The Contractor shall provide adequate props carried down to a firm bearing without overloading any of the structure.

The shuttering for beams and slabs shall be so erected that the side shuttering of beams can be removed without disturbing the bottom shuttering .If the shuttering for a column is erected for the full height of the column, one side shall be build up in sections as placing of concrete proceeds or windows left for placing concrete from the side to limit the drop of concrete to 1.0 m or as approved by the Engineer-in-charge. The Contractor shall temporarily and securely fix items to be cast (embodiment's/inserts) in a manner that will not hinder the striking of forms or permit loss of grout.

Formwork showing excessive distortion, during any stage of construction, shall be repositioned and strengthened. Placed concrete affected by faulty formwork, shall be entirely removed and formwork corrected prior to placement of new concrete at Contractor's cost.

The striking time for formwork shall be determined based on the following requirement:

- Development of adequate concrete strength;
- Permissible deflection at time of striking form work;
- Curing procedure employed-its efficiency and effectiveness;
- Subsequent surface treatment to be done;
- Prevention of thermal cracking at re-entrant angles;
- Ambient temperatures;
- Aggressiveness of the environment (unless immediate adequate steps are taken to prevent damage to the concrete).

Under normal circumstances (generally where temperatures are above 20o C) forms may be struck after expiry of the time period given in IS: 456 unless approved otherwise by Engineer-in-charge, it is the Contractor's responsibility to ensure that forms are not struck until the concrete has developed sufficient strength to support itself, does not undergo excessive deformation and resist surface damage and any stresses arising during the construction period.

2.5 Reinforcement Workmanship

Reinforcement bars supplied bent or in coils shall be straightened cold without damage. No bending shall be done when ambient temperature is below 5^{o}C. Local warming may be permitted if steel is kept below 5^{0}C.

All bars shall be accurately bent gradually and according to the size and shapes shown on the DRAWING schedules or a directed by Engineer-in-charge.

Re-bending or straightening incorrectly bent bars shall not be done without the approval of the Engineer-In-Charge.

Reinforcement shall be accurately fixed and maintained firmly in the correct position by the use of blocks, spacers, chairs, binding wire etc. to prevent displacement during placing and compaction of concrete. The tied in place reinforcement shall be approved by the Engineer-in-charge prior to concrete placement. Spacers shall be of such materials and design as

will be durable, not lead to corrosion of the reinforcement and not cause spelling of the concrete cover.
Binding wire shall be 16 gauges soft annealed wire. End of the binding wire shall be bent away from the concrete surface and in no case encroach into the concrete cover. Substitution of reinforcement; laps/splices not shown on Drawing shall be subject to Engineer-in-charge's approval.

2.6 Tolerances
Tolerance for formwork and concrete dimensions shall be as per IS: 456 unless specified otherwise.
Tolerances specified for horizontal or vertical building lines or footings shall not be construed to permit encroachment beyond the legal boundaries.
The formwork shall be designed and constructed to the shapes, lines and dimensions shown on the Drawings within the tolerances given below:

(a)	Deviation from specified dimensions of cross section of columns and beams.	- 6mm
(b)	Deviations from dimensions of footings(tolerances apply to concrete dimensions only not to positioning of vertical reinforcing steel or dowels)	+ 12 mm
1	Dimension in plan	-12mm, +50mm
2	Eccentricity	0.02 times the width ofthe footing in the directionof deviation but not more than 50mm
3	Thickness	+0.05 times the specifiedthickness

2.7 Preparation Prior to Concrete Placement
Before concrete is actually placed in position, the inside of the formwork shall be cleaned and mould oil applied, insert and reinforcement shall be correctly positioned and securely held, necessary openings, pockets, etc. provide.
All arrangements formwork, equipment and proposed procedure, shall be approved by the Engineer-in-charge, Contractor shall maintain separate Pour card for each pour as per the format enclosed.

2.8 Transporting, Placing and Compacting Concrete
Concrete shall be transported from the mixing plant to the formwork with minimum time lapse by methods that shall maintain the required workability and will prevent segregation, loss of any ingredients or ingress of foreign matter or water.
In all cases concrete shall be deposited as nearly as practicable directly in its final position. To avoid segregation, concrete shall not be re-handled or cause to flow. For locations where direct placement is not possible and in narrow forms the Contractor shall provide suitable drops and "Elephant Trunks". Concrete shall not be dropped from a height of more than 1.0 mt. Concrete shall not be placed in flowing water. Under water, concrete shall be placed in position by termites or by pipeline from the mixer and shall never be allowed to fall freely through the water.
While placing concrete the Contractor shall proceeds as specified below and also ensure the following.

- Continuously between construction joints and pre-determined abutments.
- Without disturbance to forms or reinforcement.
- Without disturbance to pies, ducts, fixing and the like to be cast in: ensure that such itemsare securely fixed.

- Ensure that concrete cannot enter open ends of pipes and conduits etc.
- Without dropping in a manner that could cause segregation or shock.
- In deep pours only when the concrete and formwork designed for this purpose and by using suitable chutes or pipes.
- Do not place if the workability is such that full compaction cannot be achieved.
- Without disturbing the unsupported sides of excavations; prevent contamination ofconcrete with earth. Provide sheeting if necessary. In supported excavations, withdraw the lining progressively as concrete is placed.
- If placed directly on to hardcore or any other porous material, dampen the surface to reduce loss of water from the concrete.
- Ensure that there is no damage or displacement to sheet membranes.
- Record the time and location of placing structural concrete.

Concrete shall normally be compacted in its final position within thirty minutes of leaving the mixer. Concrete shall be compacted during placing with approved vibrating equipment without causing segregation until it forms a solid mass free from voids thoroughly worked around reinforcement and embedded fixtures and into all corners of the formwork. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn slowly till air bubbles cease to come to the surface, leaving no voids. When placing concrete in layers advancing horizontally, care shall be taken to ensure adequate vibration blending and melting of the concrete between successive layers. Vibrators shall not be allowed to come in contact with reinforcement, formwork and finished surfaces after start of initial set. Over-vibration shall be avoided.

Concrete may be conveyed and placed by mechanically operated equipment after getting the complete procedure approved by the Engineer-in-charge. The slump shall be held to the minimum necessary for conveying concrete by this method. When concrete is to be pumped, the concrete mix shall be specially designed to suit pumping. Care shall be taken to avoid stoppages in work once pumping has started.

Except when placing with slip forms, each placement of concrete in multiple lift work shall be allowed to set for at least 24 hours after the final set of concrete before the start ofSubsequent placement. Placing shall stop when concrete reaches the top of the opening in walls or bottom surface of slab, in slab and beam construction, and it shall be resumed before concrete takes initial set but not until it has had to settle as approved by the Engineer-in-charge. Concrete shall be protected against damage until final acceptance.

2.9 Mass Concrete Works

Sequence of pouring for mass concrete works shall be as approved by the Engineer-in-charge. The Contractor shall exercise great care to prevent shrinkage cracks and shall monitor the temperature of the placed concrete if directed.

2.10 Curing

Curing and protection shall start immediately after the compaction of the concrete to protect it from:

- Premature drying out, particularly by solar radiation and wind
- Leaching out by rain and flowing water
- Rapid cooling during the first few days after placing.
- High internal thermal gradients.
- Low temperature or frost.
- Vibration and impact which may disrupt the concrete and interfere with its bond to the reinforcement.

All concrete, unless approved otherwise by the Engineer-in-charge shall be cured by use of continuous sprays or pounded water or continuously saturated coverings of sacking, canvas, hessian or other absorbent material for the period of complete hydration with a minimum of 7 days. The quality of curing water shall be the same as that used for mixing.
Where a curing membrane is approved to be used by the Engineer-in-charge, the same shall be of a non-wax bas and shall not impair the concrete finish in any matter. The curing component to be used and shall be applied with spraying equipment capable of a smooth, even textured coat.
Curing may also be done by covering the surface with an impermeable material such as polyethylene, which shall be sealed and fastened.

2.11 Construction Joints and Keys

Construction joints will be shown on the DRAWING or as approved by the Engineer-in-charge. Concrete shall be placed without interruption until completion of work between construction joints. If stopping of concreting becomes unavoidable anywhere, a properly formed, construction joints shall be made with the approval of the Engineer-in-charge.
Dowels for concrete work, not likely to be taken to be taken up in the near future, shall be coated with cement slurry and encased in lean concrete as indicated on the DRAWINGS or as approved by the Engineer-in-charge.
Before resuming concreting on a surface which has not fully hardened, all laitance and loose stone shall be thoroughly removed by wire brushing/hacking and surface washed with high pressure water jet and treated with thin layer of cement slurry for vertical joints and horizontal layers.
When concreting is to be resumed on a surface which has not fully hardened, all laitance shall be removed by wire brushing the surface wetted, free water removed and a coat of cement slurry applied. On this, a layer of concrete not exceeding 150 mm thickness shall be placed and well rammed against the old work. Thereafter work shall proceed in the normal way.

2.12 Foundation Bedding

All earth surfaces upon which or against which concrete is to be placed, shall be well compacted and free from standing water, mud or debris. Soft or spongy areas shall be cleaned out and back filled with either soil-cement mixture, lean concrete or clean sand compacted as approved by the Engineer-in-charge. The surfaces of absorptive soils shall be moistened.
Concrete shall not be deposited on large sloping rock surfaces. The rock shall be cut to form rough steps or benches by picking, barring or wedging. The rock surface shall be kept wet for 2 to 4 hours before concreting.

2.13 Finishes

2.13.1 General

The formwork for concrete works shall be such as to give the finish as specified. The Contractor shall make good any unavoidable defects as approved consistent with the type of concrete and finish specified. Defects due to bad workmanship (e.g. damaged or misaligned forms, defectives or poorly compacted concrete) will not be accepted. The Contractor shall construct the formwork using the correct materials and meet the requirements of the design and to produce finished concrete to required dimension, plumbs, planes and finishes.

13.2 Surface Finish Type F1

The main requirement is that of dense, well compacted concrete. No treatment is required except repair of defective areas filling all form tie holes and cleaning up of loose or adhering debris. For surface below grade which will receive waterproofing treatment the concrete shall be free of surface irregularities which would interfere with proper and effective application of waterproofing material specified for use.

2.13.3 Surface Finish Type F2

The appearance shall be that of a smooth dense, well-compacted concrete showing the slight marks of well fitted shuttering joints. The Contractor shall make good any blemishes.

2.13.4 Surface Finish Type F3

This finish shall give an appearance of smooth, dense, well-compacted concrete with no shutter marks, stain free and with no discoloration, blemishes, arises, air holes etc. Only lined or coated plywood with very tight joints shall be used to achieve this finish. The panel size shall be uniform and as large as practicable. Any minor blemishes that might occur shall be made good by the Contractor.

2.13.5 Integral Cement Finish on Concrete Floor

In all cases where integral cement finish on a concrete floor has been specified, the top layer of concrete shall be screened off to proper level and tamped with tamper having conical projections so that the aggregate shall be forced below the surface. The surface shall be finished with a wooden float and a trowel with pressure. The finish shall be continued till the concrete reaches its initial set. No cement or cement mortar finish shall be provided on the surface. Where specified, a floor hardener as approved by the Engineer-in-charge shall be supplied and used as recommended by the manufacturer.

2.14 Repair and Replacement of Unsatisfactory Concrete

Immediately after the shuttering is removed, all the defective areas such as honeycombed surfaces, rough patches and holes left by form bolts etc. shall be inspected by the Engineer-in-charge who may permit patching of the defective areas or reject the concrete work.

All through holes for shuttering shall be filled for full depth and neatly plugged flush with surface.

Rejected concrete shall be removed and replaced by the Contactor at no additional cost of the Owner.

For patching of defective areas all loose materials shall be removed and the surface shall be prepared as approved by the Engineer-in-charge.

Bonding between hardened and fresh concrete shall be done either by placing cement mortar or by applying epoxy. The decision of the Engineer-in-charge as to the method of repair to be adopted shall be final and binding on the Contractor. The surface shall be saturated with water for 24 hours before patching is done with 1:1 cement sand mortar. The use of epoxy for rebinding fresh concrete shall be carried out as approved by the Engineer-in-charge.

2.15 Vacuum dewatering of Slabs

Where specified floor slabs, either grade or suspended, shall be finished by vacuum dewatering including all operations such as poker vibration, surface vibration, vacuum processing, flatting and toweling as per equipment manufacturer's recommendation. The equipment to be used shall be subject to the Engineer-in-charge.

2.16 Hot Weather Requirements

Concrete during hot weather shall be carried out as per IS: 7861(Part I).

Adequate provisions shall be made lower concrete temperatures which shall not exceed 40oC at the time of placement of fresh concrete.

Where directed by the Engineer-in-charge, the Contractor shall spray non-wax based curing compound on unformed concrete surfaces at no extra costs.

2.17 Cold weather Requirement

Concreting during cold weather shall be carried out as per IS: 7861(Part II).

The ambient temperature during placement and up to final set shall not fall below 5 deg.C.

Approved antifreeze/accelerating additives shall be used where directed.

For major and large scale concreting works the temperature of concrete at times of mixing and placing, the thermal conductivity of the formwork and its insulation and stripped period shall be closely monitored.

2.18 Liquid Retaining Structures

The Contractor shall take special care for concrete for liquid retaining structures, underground structures and those others specifically called for to guarantee the finish and water tightness.

The minimum level of surface finish for liquid retaining structures shall be Type F2.

All such structures shall be hydro-tested.

The Contractor shall make all arrangement for hydro-testing of structure, all arrangements for testing such as temporary bulk heads, pressure gauges, pumps, and pipe lines etc.

The Contractor shall also make all temporary arrangements that may have to be made to ensure stability of the structures during construction.

Any leakage that may occur during the hydro-test or subsequently during the defects liability period or the period for which the structure is guaranteed shall be effectively stopped either by cement/epoxy pressure grouting, grunting or such other methods as may be approved by the Engineer-in-charge. All such rectification shall be done by the CONTRACTOR to the entire satisfaction of the Engineer-in-charge at no extra cost to the OWNER.

2.19 Testing Concrete Structures for Leakage

Hydro-static test for water tightness shall be done at full storage level or soffit of cover slab, as may be directed by the Engineer-in-charge as described below:

In case of structures whose external faces are exposed, such as elevated tanks, the requirements of the test shall be deemed to satisfy if the external forces show no sign off leakage or sweating and remain completely dry during the period of observation of seven days after allowing a seven day period for absorption after filling with water.

In the case of structures whose external faces are buried and are not accessible for inspection, such as underground tanks, the structures shall be filled with water and after the expiry of seven days after the filling; the level of the surface of the water shall be recorded. The level of water shall be recorded again at subsequent intervals of 24 hrs. Over a period of seven days. Backfilling shall be withheld till the tanks are tested .The total drop in surface level over a period for seven days shall be taken as an indication of the water tightness of the structure. The Engineer-in-charge shall decide on the actual permissible nature of this drop in the surface level, taking into account whether the structures are open or closed and the corresponding effect it has on evaporation loses. Unless specified otherwise, a structure whose top is covered shall be deemed to be water tight if the total drop in the surface level over a period of seven days does not exceed 40 mm.

Each compartment/segment of the structure shall be tested individually and then all together.

For structures such as pipes, tunnels etc. the hydrostatic test shall be carried out by filling with water , after curing as specified ,and subjecting to the specified test pressure for specified period .If during this period the loss of water does not exceed the equivalent of the specified rate, the structure shall be considered to have successfully passed the test.

2.20 Optional Tests

If the Engineer-in-charge feels that the materials i.e. cement, sand, coarse aggregates, reinforcement and water are not in accordance with the Specifications or if specified concrete strengths are not obtained, he may order tests to be carried out on these materials in laboratory, to be approved by the Engineer-in-charge as per relevant IS Codes. Contractor shall have to pay for these tests.

In the event of any work being suspected of faulty material or workmanship requiring is removal or if the works cubes do not give the stipulated strengths, the Engineer-in- charge reserves the right to order the Contractor to take out cores and conduct tests on them or do ultrasonic testing or load testing of structure ,etc. The Engineer-in- charge also reserves the right to ask the Contractor to dismantle and re-do such unacceptable work, at no cost to the Owner. Alternately Engineer-in-charge also reserves the right to ask the COTRACTOR to dismantle and re-do such unacceptable work at the cost of CONTRACTOR.

2.21Grouting

2.21.1 Standard Grout

Grout shall be provided as specified on the DRAWINGS.

The proportion of Standard grout shall be such as to produce a flow able mixture consistent with minimum water content and shrinkage. Surfaces to be grouted shall be thoroughly roughened and cleaned. All structural steel elements to be grouted shall be cleaned of oil, grease, dirt etc. The use of hot, strong caustic solution for this purpose will be permitted. Prior to grouting, the hardened concrete shall be saturated with water and just before grouting, water in all pockets shall be removed. Grouting once started shall be done quickly and continuously. Variation in grout mixes and procedures shall be permitted if approved by the Engineer-in-charge. The grout proportions shall be limited as follows.

Sr.No.	Use	GroutThickness	Mix Proportions	W/C Ratio
a)	Fluid mix	Under 25 mm	One part PortlandCement to one partsand	0.44
b)	General mix	25mm and over but less than 50mm	One part Portland cement to two part sand	0.53
c)	Stiff mix	50 mm andover	One part PortlandCement to 3 part sand	0.53

2.21.2Non-Shrink Grout

Non-shrink grout where required shall be provided in strict accordance with the manufacturer's instructions/specifications on the DRAWINGS

General Inspection

All materials, workmanship and finished construction shall be subject to continuous inspection and approval of Engineer-in-charge. Material rejected by Engineer-in- charge, shall be expressly removed from site and shall be replaced by Contractor immediately.

Clean-up

Upon the completion of concrete work, all forms, equipment, construction tools, protective coverings and any debris, scraps of wood, etc. resulting from the work shall be removed and the premises left clean.

Acceptance Criteria

Any concrete work shall satisfy the requirements given below individually and collectively for it to be acceptable.

- Properties of constituent material
- Characteristic compressive strength
- Specified mix proportions
- Minimum cement content
- Maximum free-water/cement ratio
- Workability
- Temperature of fresh concrete
- Density of fully compacted concrete
- Cover to embedded steel
- Curing
- Tolerances in dimension
- Tolerance in levels
- Durability
- Surface finishes

❖ Special requirements such as

a. Water tightness
b. Resistance to aggressive chemicals
c. Resistance to freezing and thawing
d. Very high strength
e. Improved fire resistance
f. Wear resistance
g. Resistance to early thermal cracking

The Engineer-in-charge decision as to the acceptability or otherwise of any concrete work shall be final and binding on the Contractor.
For work not accepted, the Engineer-in-charge may review and decide whether remedial measures are feasible so as to render the work acceptable. The Engineer-in-charge shall in that case direct the Contractor to undertake and execute the remedial measures.
These shall be expeditiously and effectively implemented by the Contractor. Nothing extra shall become payable to the contractor by the Owner for executing the remedial measures.

2.22 Water stops

2.22.1 Material

The material for the PVC water stops shall be a plastic compound with the basic resin of polyvinyl chloride and additional resins, plasticizers, inhibitors, which satisfies the performance characteristics specified below as per IS: 12200. Testing shall be in accordance with IS: 8543.

a)	Tensile strength	3.6 N/Sq.mm minimum
b)	Ultimate elongation	300% minimum
c)	Tear resistance	4.9 N/Sq.mm minimum
d)	Stiffness in flexure	2.46 N/Sq.mm minimum
e)	Accelerated extraction I) Tensile strength II) Ultimate elongation	10.50% N/Sq.mm minimum250% minimum
f)	Effect of Alkali i) Weight increase ii) Weight decrease iii) Hardness change	7 days10% Maximum ±5 points
g)	Effect of Alkali i) Weight increase ii) Weight decrease iii) Dimensions change	28 days0.40% maximum 0.30% maximum±1 %

PVC water stops shall be either of the bar type, serrated with center bulb and grips for use
Within the concrete elements or of the surface (Kicker) type for external use.
PVC water stops shall be of approved manufacture. Samples and the test certificate shall be got approved by the Engineer-in-charge before procurement for incorporation in the works.

2.22.2 Workmanship

Water stops shall be cleaned before placing them in position. Oil or grease shall be removed thoroughly using water and suitable detergents.
Water stops shall be procured in long lengths as manufactured to avoid joints as far as possible. Standard L or T type of intersection pieces shall be procured for use depending on their requirement. Any non-standard junctions shall be made by cutting the pieces to profile for

jointing. Lapping of water stops shall not be permitted. All jointing shall be of fusion welded type as per manufacturer's instructions.
Water stops shall be placed at the correct location/level and suitably supported at intervals with the reinforcement to ensure that it does not deviate from its intended position during concreting and vibrating. Care shall also be taken to ensure that no honey-combing occurs because of the serrations/end grips, by placing concrete with smaller size aggregates in this region. Projecting portions of the water stops embedded in concrete shall be thoroughly cleaned of all mortar/concrete coating before resuming further concreting operations. The projecting water stops shall also be suitably supported at intervals with the reinforcement to maintain its intended position during concreting so as to ensure that it does not bend leading to formation of pockets. In addition, smaller size aggregates shall be used for concreting in this region also.

2.23 Preformed Fillers and Joint Sealing Compound

2.23.1 Materials

Preformed filler for expansion/isolation joints shall be non-extruding and resilient type of bitumen impregnated fibers conforming to IS: 1838(Part I)
Bitumen coat to concrete/masonry surfaces for fixing the preformed bitumen filler strip shall conform to IS: 702. Bitumen primer shall conform to is: 3384
Sealing compound for filling the joints above the preformed bitumen filler shall conform to Grade "A" as per IS: 1834

2.23.2 Workmanship

The thickness of the preformed bitumen filler shall be 25 mm for expansion joints and 50 for isolation joints around foundation supporting rotator equipment. Contractor shall procure the strips of the desired thickness and width in length as manufactured. Assembly of small pieces/thickness of strips to make up the specified size shall not be permitted.
The concrete /masonry surface shall be cleaned free from dust and any loose particles. When the surface is dry, one coat of industrial blown type bitumen of grade 85/25 conforming to IS: 702 shall be applied by brushing at the rate of 1.20Kg/sq.m When the bitumen is still hot the performed bitumen filler shall be pressed at held in position till completely adheres. The surface of the filler against which further concreting/masonry work is to be done shall similarly be applied with one coat of hot bitumen at the rate of 1.20Kg/sq.m.
Sealing compound shall be heated to a pouring consistency for enabling it to run molten in a uniform manner into the joint. Before pouring the sealing compound, the vertical faces of the concrete joint shall be applied hot with a coat of bitumen primer conforming to IS: 3384 in order to improve the adhesive quality of the sealing compound.
Expansion joints between beams/slabs shall be provided with 100 mm wide x 4 mm thick mild steel plate at the soffit of RCC beams/slabs to support and prevent the performed joint fillerd is lodging. This plate shall be welded to an edge angle of IS A 50x50x6 mm/slabs, by intermittent fillet welding. Steel surfaces shall be provided with 2 coats of red oxide zinc chrome primer and 3 coats of synthetic enamel paint finish.
Notes: - Each pour to have separate cards, in triplicate one each for Owner/client, Contractor & site office.
Under remarks indicate deviations from drawings & specifications, congestion in reinforcement if any, unusual occurrences such as failure of equipment's, sinking of supports/Props, heavy rains affecting concreting, poor compaction, improper curing, other deficiencies, observation etc.

2.24 MODE OF MEASUREMENT AND PAYMENT

The unit rate for concrete work under various categories shall be all inclusive and no claims for extra payment on account of such items as leaving holes, embedding inserts, etc. shall be entertained unless separately provided for in the schedule of quantities. No extra claim shall also be entertained due to change in the number, position and / or dimensions of holes, slots or openings, sleeves, inserts or on account of any increased lift, lead of scaffolding etc. All these factors should be taken into consideration while quoting the unit rates. Unless provided for in the

Schedule of Quantities the rates shall also include fixing insets in all concrete work, whenever required.

Payments for concrete will be made on the basis of unit rates quoted for the respective items in the Schedule of Quantities. No deduction in the concrete quantity will be made for reinforcements, inserts etc. and opening less than 0.100 of a sq.m in areas where concrete is measured in sq.m and 0.010 cu.m where concrete is measured in cu.m. Where no such deduction for concrete is made, payment for shuttering work provided for such holes, pockets, etc. will not be made. Similarly the unit rates for concrete work shall be inclusive or exclusive of shuttering as provided for in the Schedule of Quantities.

Payment for beams will be made for the quantity based on the depth being reckoned from the underside of the slabs and length measured as the clear distance between supports. Payment for columns shall be made for the quantity based on height reckoned upto the underside of slab / beams.

The unit rate for precast concrete members shall include formwork, moldings, finishing, hoisting and setting in position including setting mortar, provision of lifting arrangement etc. complete. Reinforcement and inserts shall be measured and paid for separately under respective item rates.

No extra clam for any extra height for shuttering.

Materials:

Water shall conform to M-1. Cement shallconform to M-3. Sand shall conform to M-6, Grit shall conform to M-8. Coarse aggregate conform to M.12

General

The relevant specification of Description No. 13 of ordinary concrete shall be followed except that the concrete mix shall be designed from preliminary tests, the proportioning of cement and aggregates shall be done by weight and necessary precautions shall be taken in the production to ensure that the required work cube strength is attained and maintained. The controlled concrete shall be in grades of M-100, M-150, M-200, M-250, M-300, M-350, M-400 with prefix controlled added to it The letter 'M' refers to mix and numbers specify 28 days work cube compressive strength of 150 mm. cubes of the mix expressed in Kg/Cm^2.

The proportion of cement, sand and coarse aggregates shall be determined by weight. The weight batch machine shall be used for maintaining proper control over the proportion of aggregates as per mix design.

In all case, the 28 days compressive strength specified in above table above be the criteria for acceptance or rejection of the concrete. Where the, strength of a concrete mix as indicated by tests, lies in between the strength of any two grades specified in the above table, such concrete shall be classified in for all purposes as concrete belonging to the lower of the two grades between which its strength lies.

Workmanship:

The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with means available except where it can be shown to the satisfaction of the Engineer-in-charge, that the supply of properly graded aggregate of uniform quality can be maintained till the completion of work. Grading of aggregate shall be controlled by obtaining the coarse aggregates, in different sizes and being them in the right proportions as required. Aggregate of different sizes shall be stocked in separate stock piles. The required quantity of material shall be stock piled several hours, preferably a day before use. The grading of coarse and fine aggregate shall be checked as

frequently as possible, the frequency for a given job being determined by the Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests.

In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement s determined by accepting the maker's weight per bag a reasonable number of bags shall bag shall be weighted separately to check the net weight. Where cement s weighted from bulk stocks at site and not by bags, it shall be weighted separately from the aggregates. Water shall ether be measured by volume in calibrated tanks or weighted. All measuring equipments shall be maintained in clean and serviceable condition. Their accuracy shall be periodically checked.

It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge, according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates I.S. 2389 (Part III) shall be referred to. Suitable adjustment shall also be made in the weights of aggregates due to variation in their moisture content. Minimum quantity of cement to be used in concrete shall not be less than 300 Kg/m^3 in plain concrete and not less than 330 Kg/m^3 in reinforced concrete.
Mode of measurement and payments
The relevant specification Description No. 13 shall be followed except that the controller concrete R.C.C. work for work as specified in term shall be measured under this Description. The rate excludes cost of form work.
The rate shall be for a unit of one cubic meter.

Description no:-7

For Sub Estimate-1A (Item-22), For Sub Estimate-2A (Item-17), For Sub Estimate-2B (Item-18) For Sub Estimate-2D (Item-10), For Sub Estimate-3 (Item-20), For Sub Estimate-4 (Item-12), For Sub Estimate-6 (Item-19), For Sub Estimate-7 (Item-16), For Sub Estimate-7 (Item-40), For Sub Estimate-9 (Item-7), For Sub Estimate-10 (Item-19), For Sub Estimate-11 (Item-16)

Supplying, Cutting, Beding, Binding and Hooking and binding with wire for RCC work Tor steel TMT round bar including all cost (Fe-500/500D)

Materials
Thermo Mechanically Twisted (TMT) steel bars (High yield strength steel deformed bars) shall conform to M-19. Mild steel bars shall conform to M-18; mild steel binding wires shall conform to M-21. The steel shall be of Fe-415 grade of **TATA, SAIL or any approved** Make.

Workmanship
The workshallconsistof furnishing and placing reinforcement to the shape and dimensions shown as on the drawing or as directed.

Steel shall be clean and free rust and loosemill scale at the time of fixing in a positions and subsequent concreting.

Reinforcing steel shall conformaccurately to the dimensions given in the bar bending scheduled shown on relevant drawings. Bars shall be bent cold to specified shape and dimensions or /directed using a proper bar bender, operated by hand or power to attain proper radius of

bends, Bars shall not be bent or straightened in matter that will injure the material. Bars bent during transport of handling shall be straightened before being used on the work. They shall not be heated to facilitate bending. Unless otherwise specified a “type hook at the end bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the bar beyond the end of the curve shall be at least four times the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be takes as the diameter of circle having an equivalent effective area. The hooks shall be suitably excused to prevent any splitting of the concrete.

All the reinforcement bars shall be accurately placed in exact position shown on the drawings, and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm in size and by using stay blocks or metal chair spacers, metal hanger supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of no corrodible material. Wooden and metal supports shall not extent to the surface of concrete except where shown on drawings. Placing bars on layers of freshly laid concrete as the work progress for adjusting bar spacing shall not allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, precast mortar blocks or other approved devices, reinforcement after being placing position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent and displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cove shall be provided as indicated on drawings. All the bars precluding from concrete and to which other areas to be splice and which are likely to be exceeding 10 days shall be protected by a thick cement of neat cement grout.

Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1 mm in such a manner that they do not slip over each other at the time of fixing and concreting.

As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed. When practicable overlapping bars shall not tough each other, but be kept part by 95 mm or 1.25 times the maximum size of the coarse aggregate whichever is greater by concrete between them. Where not feasible, overlapping barsshall be bound with annealed wires, not less than 1 mm thick twisted tight. The overlaps shall be staggered for different bars and located at points along then span where neither shear nor bending moment is maximum.

Whenever indicated on the drawing or desired by the Engineer-in-charge, bars shall be joint by couplings which shall have a cross-section sufficient to transmit the full stresses of bars. The ends of the bars that are joined by coupling shall be up set for sufficient length so not less than the nominal cross- section of the bar. Threads shall be standard threads. Steel for coupling shall conform to IS 226.

When permitted or specified on the drawings, joints of reinforcement. Bars shall butt-weld so as to transmit their full stresses. Welded joints shall preferably be located at points when steel will not be subject to more than more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded. Only electric arc welding a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted . Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done is two or three stages. Provisions surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S.

electrodes used for welding conform to IS 814 weld pieces of reinforcement shall be rested. Specimen shall be taken from the actual site and number and frequency of test shall be as directed.

Colds twisted steel bars shall be used with or without hooks at the ends. Deformed bars without hooks shall, however comply with relevant an charge requirement.

Mode of Measurement and Payment

For the purpose of calculating consumption, wastage shall not be permitted beyond 7 ½ percent. Excess consumption over 7.5% will be charged at penal rate reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling in resorted to, in place of lap joints, such joints shall be measured for payment as equivalent length of overlap as per design requirement.

From the length so measured, the weight of reinforcement shall be calculated in tones on the same basis of as per, M-19 even though steel is supplied to the contractor by the deportment on actual weight. Length shall include hooks at the ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these Descriptions be deemed to be included in the rate for reinforcement.

The rate for reinforcement include cost of steel binding wires its carting from department store so work site, cutting bending placing, binding and fixing in position a shown on the drawings and as directed. It shall also include all devices for keeping reinforcement in approved positions, cost of joining as per approved method and all wastage and spacer bars.

The rate shall be for a unit of one kg.

(B) Extra for additional lift of reinforcement steel for all R.C.C. work above floor two levels.

Materials & Workmanship

The relevant specification of Description, 14 as may be applicable, shall be flowed except that the work shall be carried out above floor two levels for each floor.

Mode of measurement and payments

The relevant specification of Description No. 14 as may be applicable shall be followed except that the work shall be carried out above floor two levels.

The rate shall be for unit of one Kg. per floor.

Description no:-8

For Sub Estimate-1A (Item-23), For Sub Estimate-2A (Item-18), For Sub Estimate-2B (Item-19), For Sub Estimate-D (Item-7), For Sub Estimate-3 (Item-21), For Sub Estimate-6 (Item-22), For Sub Estimate-7 (Item-17), For Sub Estimate-7 (Item-41), For Sub Estimate-10 (Item-20), For Sub Estimate-11 (Item-17)

Brick Masonary work using conventional burnt clay building bricks having crushing strength not less than35 kg/sq cm foundation and plinth and all above in super-sub structure for all for including scaffolding including labour and material costing in cement mortar 1:6(1, cement and 6, fine sand)

Materials
Water shall conform to M-1, Cement shall conform to M-3, Sand shall conform to M-6, Bricks shall conform to M-15, and Cement mortar shall conform to M-11.

Workmanship
Proportion
The Proportion of cement mortar shall be 1:6(1 cement, 6 fines sand) by volume

Wetting of bricks
The bricks required for masonry work 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 an indication of thorough wetting of bricks.

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

A layer of mortar shall be spread on full for suitable length of lower course. Each brick shall first be properly bedded and set home by gently tapping with handle of trowel or wooden mallet. It's 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.

The walls shall be taken up truly in plumb. All courses shall be truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate course shall generally be directly one over the other. The thickness of brick course shall be kept uniform.
The bricks shall be laid with frogs up wards. A set of tools comprising of wooden straight edge, monsoons sprit level, square half meter rub, and pins, strings and plumb shall be kept on the site of works for frequent checking during the progress of works.

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 braked back according to bond (and not left toothed) at an angle not steeper than 45 degrees.

All fixtures, pipes, outlet of water, hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement concrete 1:2:4 (1 Cement : 2 Coarse Sand : 4 coarse aggregate).

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

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

Curing
Green work shall be protected from rain suitably. 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.

Preparation of Foundation Bed
If the foundation is to be laid, directly on the excavated bed, the bed shall be leveled, cleared of all loose materials, cleaned and wetted before starting 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.

Fixtures
The frames of doors, windows, cup-boards etc. shall be housed into the brick works at the correct location and level as directed. The heavy steel doors, window frames etc. shall be built in with brick work, but for ordinary steel doors and windows required opening for frames, hold-fasts etc. shall be left in the wall and frames embedded later on in order to avoid damage to the frames.

Scaffolding
Necessary scaffolding shall be provided. The supports of the scaffolding shall be sound and strong tied together with horizontal pieces, over which the scaffolding plunks shall be fixed. Simple scaffolding shall be allowed normally. In this case scaffolding hole shall rest in whole header horizontal course only. Minimum number of holes shall be left in bricks work for supporting horizontal scaffolding Poles. The contractor is responsible for providing and maintaining sufficiently strong scaffolding so as to withstand all loads likely to come upon it.

Racking out of joints
For the face of brick work, where plastering is to be done, joints shall be raked out a depth not less than thickness of joints. The falls of brick work shall be cleaned and mortar dropping removed on very same way that brick work is laid.

The relevant specifications of Description masonry work to be carried out shall be followed except that this work is for additional of one floor above floor two levels.

Mode of measurements & payment:
The masonry work of G.F. i.e. above plinth level to floor two levels shall be measured and paid under this Description.

Brick work in parapet shall be included in the corresponding masonry Description of storey immediately below the floor above which the parapet is built.

No deductions shall be made from quantity of brick work. No extra payment shall be made for embedding in masonry or making holes in respect of following Descriptions.

Ends of joints, beams, posts, girders, rafters, purlins trusses corbel, steps etc. where cross sectional area does not exceed 500 Sq. Cm.

Opening not exceeding 1000 sq. Cm.

Wall plate, sand bed plates, bearing of slab, chhajjas and like whose thickness does not exceed 10 Cms. And the bearing does not extend the full thickness of wall.

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

Iron fixtures, pipes up to 300 mm. dia. hold fasts of doors, and windows built into masonry and pipes etc. for concealed wiring.

Forming charges of section not exceeding 350 Sq. Cm. in masonry.

Apertures for fire places shall not be deducted nor shall extra labour required to make spaying of Jambs, throating and making trenches over the aperture be paid for separately.

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

Description no:-9

For Sub Estimate-1A (Item-24), For Sub Estimate-3 (Item-22), For Sub Estimate-6 (Item-23), For Sub Estimate-7 (Item-42)

Providing and constructing half brick work using common burnt clay build bricks having crushing strength not less than 35 KG/SQ CM in foundation and plinth and up to floor two level in cement mortar 1:4 (1 cement : 4 fine sand) (B) Conventional

1. Materials
Bricks shall conform toM-15.Water shall conform to M-1.Cement shall conform to M-3.Sand shall conform to M-6.Cement mortar shall conform to M-11.

2. Workmanship
The relevant specifications be followed for bricks, wetting, laying of bricks, joints,curing, shall conformtoItem No.6.19 (A)expect that the bricks tobe used shall be conventional bricks instead of modular bricks.
Cement mortar used in masonry work shall be in proportion of 1part of cement and 4parts of sand by volume. All bricks shall be laid stretcher wise, breaking joints with those in the upper and lowercourses.The wall shall be taken truly plumb. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The bricks shall be laid with frogs up wards. Aset of masons tools shall be maintained on work as required for frequent checking.

3. Mode of measurements and payment
Thelimitingdimensionsshallnotexceedthose shown in the plan or asdirected.Anyworkdoneextraoverspecified dimensions shall be ignored.
The rate shall be for a unit of one square meter.

Description no:-10

For Sub Estimate-1A (Item-26), For Sub Estimate-2B (Item-21), For Sub Estimate-2D (Item-11), For Sub Estimate-3 (Item-23), For Sub Estimate-6 (Item-24), For Sub Estimate-7 (Item-43), For Sub Estimate-10 (Item-21), For Sub Estimate-11 (Item-18)

Cement Plaster Work 1.2 cm average thick using Cement:Mortar in proportion of 1:3 rough cast (without Niru Finishing) for All Floor and for any height.

1.0. Materials:
1.1. Water M-1. The cement mortar of proportion 1:3 shall conform to M-11.

2.0. Workmanship:-

2.1 Scaffolding: Wooden bellies bamboos, planks treadles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plasterwhich shall be independent of the walls.

2.2. Preparation of back-ground:-

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

2.2.2. Racking of joints in case of masonry where necessary shall be allowed to dry out for sufficientperiod before carrying out the plaster work.
2.2.3. The work shall not be soaked but only damped evenly before applying the plaster. If the surfacebecomes dry such area shall be moistened again.
2.2.4. For external plaster, the plastering operation shall be started from top floor and carried downwards.For internal plaster, the plastering operations may be started wherever thebuilding frame and claddingwork are ready and the temporary supporting ceiling resting on the wall of the floor have been removed.Ceiling plaster shall be completed before starting
Plaster 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 2meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be rough cast plastered surface. The mortar shall then be applied in uniform surface slightly morethan the specified thickness then brought to a true surface by working a wooden straight edge reachingacross the gauge with small upward and sideways movement at a time.
2.3.2. Cement plaster shall be used within half an hour after addition of water, Any mortar or plasterwhich is partially set shall be rejected and removed forthwith from the site.
2.3.3. Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall beavoided and only as much water as can be readily absorbed shall be used, excessive evaporation on thesunny or windward side of building in hot air or dry weather shall be prevented by handing mattings orgunny bags on the outside of the plaster and keeping them wet.

3.0. Mode of measurements:-

3.1. The rate shall include the cost of all materials, labour and scaffolding etc. involved in the operationsdescribed under workmanship.
3.2. All plastering shall be measured in square meters unless, otherwise specified. Length breadth orheight 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 inbrick work. Stone work etc. or space between laths. Thickness of plaster shall be average thickness withminimum 10 mm. at any point on this surface.
3.4. This item includes plastering up to floor two level.
3.5. The measurements of wall plastering shall be taken between the walls or partition (dimensions beforeplastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth ofcover of cornices if any shall be deducted.
3.6. Soffits of stairs shall be measured as plastering on ceilings. Flowing soffits shall be measuredseparately.

3.7. For jambs, soffits, sills etc. for openings not exceeding 0.5sq.mt. Each in area for ends of joints,beams, posts, girders, steps, etc. not exceeding 0.5 sq. mt. each area and for openings exceeding 0.5 sq.mt. and not exceeding 3.00sq. mt. in each area deductions and additions shall be made in the followingmanner :
(a) No deductions shall be made for ends of joints, beams posts etc. and openings not exceeding0.5 sq. mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. Of these opening forfinish 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 asfollows and no addition shall be made for reveals, 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 or if one faces is plastered andthe other pointed, deductions shall be made from the plaster or printing 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 madeon the other side. Where width reveals on both faces of all are equal, deductions of 50% of area ofopening on each face shall be made from area of plaster and / or pointing as the case may be.3.8 For openings having door frames equal to projecting beyond the thickness of wall, full deduction foropening shall be made from each plastered face of the wall.

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

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

Description no:-11

For Sub Estimate-1A (Item-27), For Sub Estimate-2A (Item-19), For Sub Estimate-2B (Item-20), For Sub Estimate-3 (Item-24), For Sub Estimate-4 (Item-15), For Sub Estimate-6 (Item-25), For Sub Estimate-7 (Item-18), For Sub Estimate-7 (Item-44), For Sub Estimate-10 (Item-22), For Sub Estimate-11 (Item-19)

20mm thick Sand Face Cement Plaster Work in which 1 plaster in proportion of 1:3 and 2nd plaster in proportion of 1:2 using Cement:Mortar with Spot finishing etc. complete (Note: Before carring out Plaster work on RCC, required tipping work should be carried out as instructed)

Materials:
Water shall conform to M-1. Cement mortar shall conform to M-11.

Workmanship:
The work shall be carried out in the coats. The backing coat (base coat) shall be 12 mm. thick in C.M. 1:3. The relevant specification of Description No. 21 shall be followed except that the thickness of back coat shall be 12 mm. averages and the proportion shall be of cement mortar 1:3 (1 cement: 3 sand). Before the first coat hardens its surface shall be beaten up by edges of wooden tapers and close shall be made on the surface.
The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon the weather conditions. The surface shall not be allowed to dry during this period.

The second coat shall be completed to 8 mm. thickness in C.M. 1:1 as described above, including raising cement facing by applying wooden gutka of the size as directed by Engineer – in – charge

or his consultant. The plaster edge at openings shall be chamfered in second coat. Width of chamfering shall be 10 to 12 mm . The sample of cement face shall be got approved before the work is started. The whole work shall be carried out uniformly as per sample approved.

Curing:
The curing shall be started overnight after finishing of plaster. The plaster shall be kept wet for a period of 7 days. During this period it shall be protected from all damages.

Mode of measurements & payment:
The relevant specifications of Description No.28 shall be followed except that the sand face plaster on outside up to M. above ground level shall be measured under this Description.

The rate shall be for a unit of one Square meter.

Description no:-12

For Sub Estimate-1A (Item-28), For Sub Estimate-2B (Item-23), For Sub Estimate-3 (Item-25), For Sub Estimate-7 (Item-45), For Sub Estimate-10 (Item-23), For Sub Estimate-11 (Item-20)

Applying two coats of Birla (White Cement based) or Asian (acrylic lapy putty) or equivalent & two coats of primer of approved brand and manufacture on new wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other foreign matter and sand papered smooth.

General:
Scope of work includes cleaning off the entire surface, remove all loose particles, dust, scale, smoke,and grease from the surface, sand the surface with Emery paper 180 and wipe clean, applying 2 coats ofwhite Birla putty.

Material:
Acrylic Putty of Approved Make as above or as per vender list.

Workmanship:
The Putty shall be of approved brand (Asian, Birla or other approved).Plaster filler (Birla, Asian Putty) to be used for filling up uneven surfaces, small cracks and holes etc and it should be done asper the manufacturer's standard guide line. The whole process of putty required 3 times and with180 emery paper wipe off 2 time and with 320 emery paper wipe off.

Mode of measurement:
All the measurement shall be taken on net surface area actually painted, deduction will be madefrom the area for fixtures, grills, ventilation, door, window, gap, elect boxes and suchobstructionsnot painted, if they are individually more than 0.05 sq.m.

Rate:
Rate is to include for All materials of putty's, sand paper, emery paper etc with labour required for scaffolding, cleaning off the surfaces, cleaning the site after completion of job, etc as directed by engineer in charge. Rate is for the net surface area of Painted surfaces in Square meter.

Description no:-13

For Sub Estimate-2A (Item-20), For Sub Estimate-2B (Item-22), For Sub Estimate-3 (Item-27), For Sub Estimate-6 (Item-21), For Sub Estimate-7 (Item-47), For Sub Estimate-10 (Item-25)

Decorative Groove Work in Cement Plaster

External Sand Faced Plastering with groove as per given drawing detail etc. of5 to 10, 12 to 25 cm thick in two coats on brick, concrete, parapet wall for exteriorplastering of 12 mm thick backing coat in C.M. 1:3 (1 Cement: 3 Sand) and 8 mm thickfinishing coat of C.M. 1:2 (1 Cement: 2 Sand) and sponge the surface to obtain an evenand granular surface including curing etc. complete as directed by engineer-in-charge/consultant.
The rate shall be for a unit of one Running Meter.

Description no:-14

For Sub Estimate-1A (Item-32), For Sub Estimate-2B (Item-26), For Sub Estimate-3 (Item-28), For Sub Estimate-6 (Item-26)

Supply & fixing of Vitrified flooring work (1st quality)

1.0 Materials: Water shall conform to M-1. Cement mortar shall conform to M-11. Body parking finished Vitrified tile from the list of approved make and of first quality.

1.1 Parking Vitrified floor tiles shall befinish best quality or equivalent, as approved by the Architect and Engineer-in-charge they shall conform to the relevant IS Codes.

1.2 They shall be monolithic and available as approved by Engineer in-charge. They shall have a size tolerance of ± 0.5%, in length and width and ± 5% in thickness. Allowable warp age shall be ± 0.2%. Allowable square ness wedging shall be ± 0.5%. Their water absorption rate shall be less than 0.5%. They shall offer hard-working and hard-wearing floors for homes, public buildings, apartments and airports. The tiles shall be of ASTM or DIN standards.

1.3 They shall be extremely strong, breaking strength of the tile being 1600 Kg/csqm., flexural strength, 200 Kg/$cm^2$and bonding strength of 2500 Kg/csqm. They shall offer good resistance to abrasion, i.e. greater than 100. They shall be scratch resistance; their hardness on the Mohr's scale shall be min. 7. They shall be able to resist thermal shock upto 10 cycles. They shall have bond strength of 2500 Kg/csqm. and shall have a density of greater than 2.2 gm/cc. They shall have 0.60 co-efficient of friction forpolished/unpolished surfaces.

2.0 Workmanship:
2.1 Bedding:
2.1.1 The sub-grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface, as described above, tamped and corrected to desired level and allowed to harden enough to offer a rigid cushion to tiles and to enable the mason to place wooden planks across and squat on it.
2.1.2 The vitrified rough finished tiles shall be laid over a minimum 20 mm. thick cement mortar 1:4 bedding laid to proper slope and level. Fixing of vitrified tile with cement mortar is to be done over 35 to 40 mm thick screed 1:2:4 (1 cement: 2 sand: 4 stone aggregate). Finishing should be done with flush pointing in white cement and pigment with residue and skirting. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of the bedding. The base shall be cleaned and well wetted, before lying. The mortar shall then be spread in thickness not less than 18 mm. at any place and average 25 mm. thick. The proportion of the cement mortar shall be as specified in the item.

2.2 Fixing tiles:

2.2.1The tiles before lying shall be soaked in water for at least two hours. Neat grey cement grout at 3.3 Kg./Cement/m2.of honey-like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall then be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.
2.2.2The tiles shall not have staggered joints. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed, they shall be cut (Sawn) to the required size and the edges rubbed smooth to ensure straight and true joints. The outlets for drainage shall be as per drawing and tile fixing shall be carried out accordingly after laying and testing the drainage lines. After the tiles are laid, the Finishing should be done with flush pointing in white cement and pigment with residue and skirting. The same cement slurry shall then be spread over the whole surface in a thin coat to protect the surface from abrasive damage and to fill up pinholes that may exist on the surface. White cements with or without matching pigment shall be used for pointing the joints. After fixing the tile finally in an even plane the flooring shall be kept wet and allowed to cure undisturbed for 7 days.
2.2.3While lying, any chiseling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size in cm. between plaster and other finishes dado or skirting (if required) shall be provided. Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required shall be provided as per the drawing and design.
2.2.4All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.

2.3 Cleaning:
2.3.1 The surplus cement grout that may have come out of the joints shall be cleared off before it sets. Once the floor has set, it shall be carefully washed and cleaned by oxalic acid and dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.
2.3.2If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.

3.0 Mode of Measurements and Payment:
3.1 The work done shall be measured in sqm. for the visible area of work done in floor. The length and width of the flooring shall be measured between the faces of skirting or dados or plastered face of walls as the case may be. The paving under dado or skirting shall not be measured. No deduction shall be made or extra paid for any opening in the floor of area up to 0.1 sqm nothing extra shall be paid for laying the floors at different levels in the same room. The dado will be measured from the finish floor level to the top of tile fixed.
3.2The rate shall include the cost of all materials (inclusive of all taxes, levies, and delivery at site), labour& sundry involved in all the operations, curing etc complete, at all floors, at height and level, as described above. It shall also include for breakage and wastage. Floating materials and margin of profit shall also be included. All material samples shall be approved by the Architect/Engineer-in-charge before placing orders.
3.3No extra shall be paid for any small quantities like narrow widths, metered& returned ends, rounds & cutting, fixing and making good upto& around pipes, fittings and fixtures etc.
3.4 The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.
3.5 Rate including joints filled with 4mm spacer joint all around and filled with epoxy grout (avg. 4x10 to12 mm) etc. complete as directed by engineer in charge the rate shall be for a unit of one sq.mt.

Description no:-15

For Sub Estimate-1A (Item-33), For Sub Estimate-2B (Item-27),

Supply & fixing of Vitrified for skirting work (1st quality) width upto 10 cm.

Specification for this item shall conform to item no. 45. Except that the whole work is to be carried out by fixing vitrified finish tiles for skirting of 75 to 100 mm high.

Rate shall be for a unit of one Running Meter.

Description no:-16

For Sub Estimate-1A (Item-39), For Sub Estimate-3 (Item-30), For Sub Estimate-3 (Item-30), For Sub Estimate-7 (Item-48), For Sub Estimate-10 (Item-26)

Providing and laying green polished kota stone slab flooring over 20 mm (average) thick base of cement mortar 1:6 (1cement: 6 sand) laid over and joined with grey cement slurry including and polishing etc. complete. (A) 25 mm thick

For cupboard, platform & other works.Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides thus dressed shall have a full contact if a straight edge is laid along. The sides shall be table rubbed with coarse sand before paving. All angles and edges ofthe slabs shall be True Square and free from chippings and giving a plane surface. Thethickness shall be 25 mm. (Average) as specified in this item but not less than 20 mm atany place.

Bedding for the Kota stone slabs shall be of cement mortar 1:6 (1 cement: 6coarse sand) of average thickness 20 mm as given in the description of the item. Subgrade shall be cleaned, wetted and mopped. Mortar of the specified mix and thicknessshall be spread on an area sufficient to receive one Kota stone slab. The slab shall thenbe washed clean before laying. It shall be laid on top pressed, tapped gently to bring it inlevel with the other slabs. It shall then be lifted and laid aside. Top surface of the mortarshall then be corrected by adding fresh mortar at hollows or depressions. The mortarshall then be allowed to harden bit. Over this Surface, cement slurry of honey likeconsistency shall be applied. The slab shall then be gently placed in position and tappedwith wooden I mallet till it is properly bedded in level. With and close to the adjoiningslab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining the wallsshall enter not less than 10 mm. under the plaster, skirting or dado. The junctionbetween wall and floor shall be finished neatly. The finished surface shall be true tolevels and slopes as directed.

The floor shall be kept wet for a minimum period of 7 days so that bedding andjoints set properly.

Polishing shall be normally commenced after 14 days of laying the stone slab.First polishing shall be done with carborundum stones of 120 grade grit fitted in theheavy machine and then deacon polishing shall be done with carborundum stone of 220to 350 grade grit fitted in heavy machine. Water shall be properly used during polishing.

The stone shall then be washed clean with water. When directed by the Engineer-in- charge; wax polish of approved quality shall be applied on the surface with the help ofsoft cloth over a clean and dry surface. Then the polishing machine fitted with bobs shallbe run over it.
The holes required for Nahni traps, pipes and other fittings shall be made withoutany extra cost.

The Kota stone for platform and c.b. shall be supplied and fixed with two sidepolished and the work shall have to be completed as per requirement and instructions ofengineer in-charge.

Mode of measurements & payment
The rate shall include the cost of all materials andLabour involved in all the operations described above. The kota stone shall be measured in square meter.

Description no:-17

For Sub Estimate-1A (Item-34), For Sub Estimate-3 (Item-32), For Sub Estimate-6 (Item-27)

Providing and laying Ceramic tiles 6mm thick in flooring on a bed of 12mm thick cement mortar 1:3 (1-cement : 3-coarse sand) finishing with flush pointing in Colour cement.

Description no:-18

For Sub Estimate-1A (Item-35), For Sub Estimate-3 (Item-33), For Sub Estimate-6 (Item-28)

Supply & Fixing of Glazed tiles (1st Quality) of required size in Cement Roga and joints to be filled with white cement after 12mm rough plaster in proportion of 1:3

The tiles shall be of best quality as approved by the Engineer- in-charge. They shall be float and true to shape. They shall be free from cracks, crazing spots, chipped edges and corners. The glazing shall be of uniform shade.
Variation from the stated sizes, other than the thickness of tile shall be plus or minus1.5 mm. The thickness of tile shall be 6 mm. except as above the tiles shall confirm to I.S. Latest edition.

BEDDING
The sub-grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface tamped and corrected to desired level and allowed to hardenenough to offer a rigid cushion to tiles and to enable the mason to place wooden planksacross and equal on it. The Color glazed tiles shall be laid on cement mortar bedding of 12 mm thick in C.M.1:3 the mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall be cleared andwell wetted. The mortar shall then be spread in thickness not less than 10mm at any place and average 12mm thickness. The proportion of the cement mortar shall be as specified in the item.
Note: Horizontal tiles (Floor Glazed tiles) shall be laid on lime mortar bedding of 10 to 12 mm average in C.M. 1:2. (One portion of lime and two portion of sand)

FIXING TILES
The tiles before lying shall be soaked in water for at least two hours. Neat grey cement grout at 3.3 Kg. / Cement / Sq. Mt. of honey like consistency shall be spread over the mortar bedding as directed. The edges of the tiles are smeared with neat cement slurry.
The tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.

The tiles shall not have staggered joints. The joints shall be true to center line both ways. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed, they shall be cut (Swan) to the required size and the edges rubbed smooth to ensure straight and true joints. The joints shall be filled with grey cement grout with wire brush of trowel to a depth of 5mm and loose material removed. White cement shall be used for pointing the joints. After fixing the tile finally in an even plane the flooring shall be kept wet and allowed to nature undisturbed for 7 days.

CLEANING
The surplus cement grout that may have come out of the joints shall be cleared off before it sets. Once the floor has set, it shall be carefully washed, cleared by dilute acid and dried.
Proper precaution and measures shall be taken to ensure that the tiles are not damaged many ways till the completion of the construction.
The rate for this item will be paid on one square meter basis.

Description no:-19

For Sub Estimate-3 (Item-34), For Sub Estimate-7 (Item-49)

Providing and fixing stone slab with table rubbed, edges rounded and polished of size 90x50 cm deep and 1.8 cm thick, fixed in urinal partitions by cutting a chase of appropriate width with chase cutter and embedding the stone in the chase with epoxy grout or with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm nominal size) as per direction of Engineer-in-charge and finished smooth. Granite Stone of approved shade

As per item BOQ
The rate will be paid for a unit of one square meter basis

Description no:-20

For Sub Estimate-1A (Item-40,41), For Sub Estimate-2B (Item-29), For Sub Estimate-3 (Item-35), For Sub Estimate-6 (Item-29), For Sub Estimate-7 (Item-50) For Sub Estimate-10 (Item-31)

Supply & Fixing of Granite Stone (Telephone Black Color) on wall after rough cast Cement Plaster in proportion of 1:3 and fixing grainage in Cement Paste

Specification for this item shall confirm to item no.50. Except that the whole work is to be carried out by fixing Mirror polished granite stone 18mm thick For Door sill &jams in Single Piece only instead of polished Granite stone dado. Rate including half round molding of edges as directed by engineer in charge Rate shall be for a unit of one Square Meter.

Description no:-21

For Sub Estimate-3 (Item-36), For Sub Estimate-7 (Item-54)

Providing & constructing of Sandwitch type Kitchen Platform of 60cm. width and 80 cm. height with Granite slab (18 to 20mm) on top resting on one side polished kotah stone 25 mm thick top and two 25mm thick polished kotah stone vertical support fixing by making grooves including 75 mm wide facing patti with external edge of the patti shall be finished with Quarter

round molding & mirror polished etc. completed complete as per drawing and specification without stainless steel sink including necessary cutting for sink & making hole for gas pipe and fixing P.V.C. band of 25 mm dia per sink size as directed by an Engineer in charge.

1.0 General:-

The work shall consist of construction of polished Granite stone slabs jointed with shown on the drawings as approved by stainless steel sink. Only trained personnel supervisionsandwich type cooking platform with mirror cement mortar in accordance with the details the engineer in charge having granite top and shall be employed for construction work.

2.0 MATERIAL: GRANITE STONE

2.0 HAND DRESSED MIRROR POLISHED GRANITE STONE

2.1. Granite stone shall be hard even sound, and regular in shape and generally uniform incolour. The colour of the stone shall generally be green, Brown, Black colored shall not be allowed for use. They shall be without any soft veins cranks of flaws

2.2. The size of the stone to be used for flooring shall be of size 600 mm x 600 mm and / orsize 600 mm x 450 mm as directed. However smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be as specified.

2.3. Tolerance of minus 30 mm. on accounts of chisel dressing of edges shall be permittedfor length as well as breadth. Tolerance in thickness shall be +3 mm.

2.4. The edges of stones shall be truly chiseled and table rubbed with coarse sand beforepaving. All angles and edges of the stones of shall be true, square and free chipping and surface shall be true and plain.

2.5. When machine cut edges are specified the exposed and the edges at joints shall bemachine cut the thickness of the exposed machine cut edges shall be uniform.

2.6. The stones shall have machine polished surface. When brought on site, the stonesshall 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 dado, partitions skirting, sink, veneering, sills, steps, etc. where machine polishing after the stones are fixed in situ is not possible shall be double polished.

3.0 Granite Stone Slab

3.1. Granite Stone Slab shall be hard even sound, and regular in shape and thicknessgenerally having uniform approved colour and design. The colour of the stone shall generally be as approved by the engineer-in-charge. They shall be without any soft veins cranks of flaws

3.2. The size of the Granite Stone to be used for top of platform shall be as per detailsshown on the drawings and as directed by the Engineer in charge However smaller sizes will not be allowed, Granite Stone shall be in a single piece only

3.3. Tolerance of minus 30 mm. on accounts of chisel dressing of edges shall be permittedfor length as well as breadth. Tolerance in thickness shall be +3 mm.

3.4. The edges of Granite Stone Slab shall be truly machine cut and machine polished. Allangles and edges shall be true, square and free chipping and surface shall be true and plain.

3.5. When machine cut edges are specified the exposed and the edges at joints shall bemachine cut and machine polished the thickness of the exposed machine cut machine polished edges shall be uniform.

3.6. The stones shall have mirror polished surface. When brought on site, the stones shallbe single polished or double polished depending upon its use. The stones to be used for top slab shall be double polished.

4.0 Workmanship

Mixing of Mortar

4.1. The mixing of mortar shall be done intimately, the operation shall be carried out onclean water tight platform, and cement sand shall be first mixed dry in the required proportion turned over and over backwards and forwards several times till the mixture is of uniform colour Thereafter, minimum quantity of water shall be added to bring the mortar to the consistency of stiff paste. and then the mortar shall be mixed for at least two minutes after addition of water.

4.2 Mortar shall be mixed only in such quantity as required for immediate use. The mix sanwhichhas developed initial set shall not be used. Initial set of mortar with ordinary Portland cement shall normally be considered to have taken place in 30 minutes after mixing.

4.3incase mortar has stiffened during initial setting time because of evaporation of waterthe same can be re tempered by adding water as frequently as needed to restore the requisite consistency, nut this re-tempering shall not be permitted after 30 minutes Mortar un used for more than 30 minutes shall be rejected and removed from site.

4.4. In case of cement mortar, that has suffered because of evaporation of water the sameshall be re-tempered by adding water as frequently as needed to restore the requisite consistency but its re-tempering shall be permitted only within thirty minute from the time of addition to water at the time of initial mixing.

4.5. The mixing shall preferably be done in a mechanical mixer operated manually or bypower Hand mixing can be resorted to as long as uniform density of mix and its strength are assured subject to prior approval of Engineer in charge. Where permitted, specific permission is to be given by the Engineer in charge.

4.6. Cement and sand shall be mixed in specified proportions given in the drawing. Cementshall be proportioned by weight, taking the unit weight of cement as 1.44 toneper cubic meter, Sand shall be proportioned by volume taking into account due allowance for bulking All mortar shall be mixed with a minimum quantity of water to produce desired workability consistence with maximum density of mortar. The mix shall be clean and free from injurious type of soil/acid/alkali/organic matter or deleterious substances.

5.0 Proportion of Mix

5.1. Cement and sand shall be mixed in proportions of 1:4 (1 cement: 4 coarse sand)Cement and sand shall be proportioned by volume after making due allowance for bulking. The require quantity of water shall then be added and the mortar mixed to produce workable consistency. Before mixing platform shall be thoroughly cleaned before changing from one type of cement to another.

5.2. It shall be carried out on a water tight platform and care shall be taken toensurethatmixing is continued until the mass is uniform in colour and consistency.

6.0 Curing:

6.1. Duringhot weather, all finished or partly finished work shall be covered or wetted insuchmanner as will prevent rapid drying of the brick work.

6.2. Green cement work shall be protected from rain suitable. Work shall be kept moist on allthe faces for a period of seven days The Top of masonry work shall be kept well wetted at the close of the day immediately aftercompaction, concrete shall. Be protected against harmful effects of weather, including rain, running water, shocks, vibration, traffic, rapid temperature charges, frost and driving out process shall be covered with wet jute bags or the similar absorbent material approved by the Engineer-in-charge 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. Work over-the foundation concrete may be started after 48 hours of its laying but the curing of concrete shall be continued for a minimum period of 14 days.

6.3 After the final set, the concrete shall be kept continuously wet if required by poundingfor a period of not less than 7 days from the date of placement. Hard and bitter water shall not be used for curing.

7.0 Mode of Measurement &Payment:

7.1. The unit rates and which type platform shall include the cost of all materials required to produce the item of sandwich type platform including granite top and stainless steel sink, tools and plant required for mixing, placing in position, finishing as per direction of the Engineer-in-charge, curing and finishing all other incidental expenses for producing sandwich type platform of specified design to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all scaffolding and forms required for the work.

7.2. The sandwich type platform shall be measured for its **length** and limiting dimensionsto those specified on plan or as directed. The rate shall be for a unit of one square meter.

7.3. The payment will be made on "Running Meter" basis of the finished work.

Description no:-22

For Sub Estimate-1A (Item-42), For Sub Estimate-2B (Item-32), For Sub Estimate-3 (Item-37), For Sub Estimate-6 (Item-30), For Sub Estimate-7 (Item-55), For Sub Estimate-10 (Item-32)

Providing and fixing ISI marked flush door shutters conforming to IS : 2202 (Part I) non-decorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters: 35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws

1.0. Material

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 used as per I.S. Latest edition.

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 care members. The commercial plywood, cross-bands shall conform to I.S: latest edition.

The face panel of the shutters shall be formed by gluing by the hot press process on both faces of the care with either, plywood or cross-bands and face veneers. The lipping, rebating, opening of glazing; Venetian 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 of warp in its plant both faces of the shutters shall be sand papered to smooth even texture.

The shutters shall be tested for

(1) End immersion test: The test shall be carried out as per I.S. latest edition.

There shall be no delamination at the end of the test.

(2) Knife test: The face panel when tested in accordance with I.S. latest edition shall pass the test.

(3) Glue adhesion test:

The flush door shall be tested for glue adhesive test in accordance with I.S.: latest edition. 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 continuously around the corner. Delamination at the knots, knot holes and other permissible wood defects shall not be considered in assessing the sample.

The tolerance in size of solid care type flush door shall be as under:
In Nominal thickness ± 0.5 mm & Nominal height ± 3 mm.
The thickness of the shutter shall be uniform throughout with a permissible variation of not more than 0:5 mm when measured at any two points.
Both Laminated sheet having minimum thickness 1.00 mm of decorative type of approved quality and brand mechanical pressed with approved adhesive.
This Flush shutter must be framed with wooden beading at all four side. wooden beading will painted with two coat of oil paint including primer coat without extra cost.
Door Fixtures

Hinges	- 3 to 4 Nos (IS Marked, 100 mm long, M.S.)
Handel	- 2 Nos (100 mm grip length, S.S.)
Aldrof	- 1 Nos (250 mm long, 16 mm dia bars) in SS
Tadi	- 1 Nos(250 mm long, 10 mm dia bars) in SS
Stopper	- 1 Nos(200 mm long, 8 mm dia bars) in SS
Magnetic stopper	- 1 Nos
Door floor Stopper	- 1 Nos (Double legged) in SS
Eye Piece	- 1 Nos

2.0. Workmanship
The relevant specifications of Item No.10.23 shall be followed except that the shutters be non-decorative type and block board core with face veneer or plywood, with 35 mm thickness. Readymade shutters shall be of correct size and shall fit into the door or other openings without excessive scrapping of edges. Adding of battens etc., to make up to the size shall not be allowed. Flush door other than Kitply/Century/Dura/Everest or Brand included in vender list to be used by the contractor with all data and required test reports.

3.0. Mode of Measurement
The rate shall be for a unit of one Sq meter.
Out to out length & width for shutter panel will be measured in millimeter. No extra length with will measured specified in drawing.

Description no:-23

For Sub Estimate-1A (Item-43), For Sub Estimate-2B (Item-33), For Sub Estimate-3 (Item-38), For Sub Estimate-6 (Item-31), For Sub Estimate-7 (Item-56), For Sub Estimate-10 (Item-33)

Supply & Fixing of Laminates 1mm of Approved Quality

As per item BOQ
The rate will be paid for a unit of one square meter basis

Description no:-24

For Sub Estimate-1A (Item-44), For Sub Estimate-2B (Item-34), For Sub Estimate-3 (Item-39), For Sub Estimate-6 (Item-32), For Sub Estimate-7 (Item-57), For Sub Estimate-10 (Item-34)

Extra rate for Cromium plated brass fittings for Door

As per item BOQ
The rate will be paid for a unit of one square meter basis

Description no:-25

For Sub Estimate-3 (Item-40), For Sub Estimate-6 (Item-34)

Providing and fixing FRP frame size 125x65 mm and 35mm thick FRP shutter with wood grain raised panneled design finish shutter having extra reinforcement on sides & edges in Gel coat finish. The core of the shutter & frame is to be filed up with injected polyurethene foam done in situ alongwith embedded wooden pieces for stiffening & also taking hinges &fintures. The whole FRP frame & shutter is to be water proof weather proof, termite proof & resistance to mild acid/alkali. Rates are to be inclusive of S.S hinges with fastener sleeve &alluminium fixtures & fastenings.

As per item BOQ
The rate will be paid for a unit of one square meter basis

Description no:-26

For Sub Estimate-1A (Item-36), For Sub Estimate-2B (Item-31), For Sub Estimate-3 (Item-41), For Sub Estimate-6 (Item-33), For Sub Estimate-7 (Item-58), For Sub Estimate-10 (Item-27),

Supplying and fixing alluminium frame 62.50 x 25 mm. size and 37.50 x 18mm size shutter with sliding frame 2-track of standard compeny etc. complete

The work shall be carried out as desired in the item as approved Colour anodized Aluminum Section sliding fully glazed windows.

The aluminum tube frame of size 63.50 mm x 38.10 mm x 1.95 mm& frame of size 61.85x 31.75 mm x 1.30 mm shall be used. The aluminum section of frame Colouranodized for shutter shall be of aluminum sliding series section complete with all standard accessories including 5mm thick transparent glass& stainless steel mosquito net for shutters etc.

The windows using section size 40.00 mm x 18 mm x 1.29 mm for shutter frame. The material shall be as per specification book and it shall be of best and approved quality as approved by the Engineer-in-charge. The glazing shall be done by means of P.V.C. rubber glazing gasket. PVC rubber glazing shall be used for operable shutters.

Details of the Colour anodized section to be used as under:
Tube frame of size 63.50 mm x 38.10 mm x 1.95 mmhaving1.094 kg./Rmt. Weight Frame section shall be 61.50 mm x 31.75 mm x 1.50 mm having 0.695 kg./Rmt. weight. Shutter frame section shall be of 40.00 mm x 18 mm x 1.29 mm having 0.456 kg. /Rmt. Weight.Float Glass: 5mm thick transparent glass of copper tint shall be of assorted quality and of standard specification booklet of building work. Necessary glazing clips, rubber packing (silicon packing) shall be of approved quality. Assured glazing patta if any required shall be used & tried.
The fixing of aluminum section frame including intermediate vertical and horizontal member shall be rectangular extruded sections having in built grooves to room glazing. The fixing of section for frame shall be made properly in plumb as directed by the Engineer-in-charge

Necessary aluminum fixtures and fastenings shall be provided of best and approved quality as directed by the Engineer-in-charge.

The rate shall be providing aluminum necessary materials fittings and fixtures, labour for fixing in position, bearing concern of brick masonry to fixing frame of window making good the same. The rate also including necessary all fittings and fixtures etc.

The rate shall be paid on Sq. Meter of the basis of the work done.

Description no:-27

For Sub Estimate-1A (Item-37), For Sub Estimate-3 (Item-42), For Sub Estimate-7 (Item-59),

Providing and fixing standard extruded section of size 63 mm x 38.10 mm x 1.20 mm(jindal section no- 2434 w wt. .643 kg/Rmt.) wthColourAnodiesAlluminium frame for VENTILATION 5 mm thick frosted glass as detail etc. complete for ventilations

1.0 MATERIALS:-

1.1 Aluminum alloy used in the manufactured by the extruded section for Ventilator shall confirm to IS design at ion HFP- WP of IS 733-1973 and also IS designation HFP- WP of IS 1285-1973 aluminum section of approved weight as above mention shall be procured of site. Fabrication shall be done as per drawing or as directed.

Details of the color anodized section to be used as under:

1.1**Frame:** 48 x 24 x 1.35 mm of approved shade (Should be of having Standard weight per Rmt).Louver shall be of heavy duty and Easy operating as Instructed or fixed asInstructed on site as per RequirementAl – binary or equivalent make, Aluminum Handle: 1 No
2.1**Glaze:**5 MM Thick Plain or Frosted or Obstructed one side GLASS with all require rubber gasket including all required materials
Glass: All glass shall be of the best quality free from specks, bubbles, smokes, veins, airholes blisters and other defects. The king of glass to be used shall be mentioned inthe item or specification or in the special provisions or as shown in detaileddrawings. Thickness of glass panes shall be uniform. The specifications or differentkinds of glass shall be as under.
2.2 Necessary fixtures shall be of approved quality.
2.3 Approved glazing patty if any required shall be used and fixed

3. MODE OF MEASUREMENT AND PAYMENT:-

3.1 Measurement shall be recorded on Smt. Basis in length and breadth or height forclear visible area.
3.2 Payment shall be made for a unit of one Sqmt.

Description no:-28

For Sub Estimate-1A (Item-51), For Sub Estimate-2B (Item-30), For Sub Estimate-3 (Item-44), For Sub Estimate-6 (Item-35), For Sub Estimate-7 (Item-21), For Sub Estimate-7 (Item-60), For Sub Estimate-10 (Item-35)

Enemal painting on door/window, iron door, iron grill or woodwork two coat with Primer

1.0. Materials:

1.1. The ready mixed paint, brushing, wood primer pink shall conform to I. S.3536-1966 (Latest edition) .The enamel paint shall conform to M-44 B.

Preparation of Surfaces:
2.2.1. All Steel/wood work shall be dry and free from any foreign matter incidental tobuilding operations. Nails shall be punched well below the surface to provide afirm key for stopping. Moldings shall be carefully smoothened with abrasive paper and projecting fibers shall be removed. Flat portion shall be smoothened off withabrasive paper used across the grain prior to staining and with the grain prior tostaining or if the wood is to be left in its natural colour, wood work which is to bestained maybe smoothened to scraping instead of by glass papering if sorequired.
2.2.2.Any knots, resinous or stricaks or bluefish sap wood that are not largeenough to justify cutting out shall be treated with two coats of pure shella knotting applied thinly and extended about 25 mm. beyond the actual arearequiring treatment.

Application of primer:
2.2.1. The relevant specifications of item No. 19.12 (A) shall be followed forapplication of primer.

2.0 Workmanship:
2.1. General:
2.1.1. The materials required for work of painting work shall be obtained directlyfrom approved manufacturers or approved dealer and brought to the site inmakers drums, kegs etc. with seal unbroken.
2 1.2. All materials not in actual use shall be kept properly protected, lids ofcontainers shall be kept closed and surface of paint in open or partially opencontainers covered with a thin layer of turpentine to prevent formation of skin.The materials which have become stale or flat due to improper and long storageshall not be used. The paint shall be stirred thoroughly inits container beforepouring into small containers. While applying also the paint shall be continuouslystirred in smaller container. No left over paint shall be put back into stock tins.When not in use, the containers shall be kept properly closed.
2.1.3. If for any seasons, thinning is necessary, the brand of thinnerrecommended by the manufacturer shall be used.
2.1.4. The surface to be painted shall be third and grease shall be thoroughly removed before painting is started. Nopainting on exterior or other exposed parts of the work shall be carried out inwet, damp or otherwise unfavorable weather and all the surfaces shall bethoroughly dry before painting work is started.

2.2. Application:
2.2.1. Brushing operations arc to be adjusted to the spreading capacity advisedby the manufacture of particular paint. The paint shall be applied evenly andsmoothly by means of crossing and lying off. The crossing and laying off consistsof covering the area over with paint, brushing the surface hard for the first limeover and then brushing alternately in opposite directions two or three times andthen finally brushing lightly in direction at right angles to the same. In thisprocess, no brush marks shall be left after the laying off is finished. The fullprocess of crossing and laying off will constitute one coat.
2.2.2. Each coat shall be allowed to dry completely and lightly rubbed with veryfine grade of sand paper and loose particles brushed off before next coat isapplied. Each coat shall vary slightly in shade and shall be got approved fromEngineer-in charge before next coat is started.

2.2.3. Each coat except the last cost shall be lightly rubbed down with sand paperof fine pumice stone and cleaned of dust before the next coat is applied. No hairmarks from the brush or clogging of paint puddles in the corners of panels anglesofmoldings etc. shall be left on the work.
2.2.4. Special care shall be taken while painting over bolts, nuts, rivets, overlapsetc. Approved best quality brushes shall be used.

3.0. Mode of measurements & payment:
3.1. The relevant specifications of item shall be followed for mode ofmeasurements and payment. The rate is excluding priming coat.
3.2. The rate shall be for a unit of one sq. meter.

Description no:-29

For Sub Estimate-1A (Item-29), For Sub Estimate-2B (Item-24), For Sub Estimate-3 (Item-45), For Sub Estimate-6 (Item-36), For Sub Estimate-7 (Item-61), For Sub Estimate-10 (Item-29), For Sub Estimate-11 (Item-22)

Plastic Imulsion Paint (Two coats) (Asian Paint, ICI, Dulux, Nerolac, Berger etc. of approved type) (with Prime Coat)

As per item BOQ
The rate will be paid for a unit of one square meter basis

Description no:-30

For Sub Estimate-1A (Item-30), For Sub Estimate-2A (Item-21), For Sub Estimate-3 (Item-46), For Sub Estimate-6 (Item-36), For Sub Estimate-7 (Item-19), For Sub Estimate-7 (Item-62), For Sub Estimate-10 (Item-30)

Apex Color work on Outer side of Wall (Two coats) (with Base Coat)

As per item BOQ
The rate will be paid for a unit of one square meter basis

Description no:-31

For Sub Estimate-1A (Item-46), For Sub Estimate-2B (Item-36), For Sub Estimate-3 (Item-47), For Sub Estimate-7 (Item-20)

Iron work as per drawing and instruction including all

All structural steel shall conform to IS 266 - Latest edition. The steel shall be free fromthe defects mentioned in IS 226 (Latest edition) and shall have a smooth finish. Thematerial shall be free from loose mill scale, rust, pits or other defects affecting thestrength and durability. River bars shall conform to IS 1148 Latest edition.
When the steel is supplied by the contractor, test certificate of the manufacturer shall beobtained according to IS 226 Latest edition and other relevant Indian Standards.The design should be made as per the instructions of engineer-in-charge.

The rateincludes supplying and welding (along with labours), transportation and fixing in positionof the steel work.

The rate shall be for a unit of one Kilogram.

Description no:-32

For Sub Estimate-1A (Item-47), For Sub Estimate-3 (Item-48)

Providing, fabricating, erecting and placing in position stainless steel pipe railing made of Hollow tubes, channels, plates etc. (304 grade) including cutting welding and bolting wherever necessary including accessories fixing hardware. All welded joints to be griended and cleaned and finished as satin finish including buffing. All ss to 304 grade

As per item BOQ
The rate will be paid for a unit of one square meter basis

Description no:-33

For Sub Estimate-2B (Item-37), For Sub Estimate-3 (Item-49), For Sub Estimate-6 (Item-38), For Sub Estimate-7 (Item-63), For Sub Estimate-10 (Item-37)

Providing and laying integral cement based water proofing treatment including preparation of surface as required for treatment of roofs, balconies, terraces etc. consisting of following operations.(a) Applying and grouting slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with proprietary water proofing compound confining to IS 2645 over the R.C.C. slab including cleaning the surface before treatment (b) Laying cement concrete using broken brick bats 25mm to 100mm size with 50% of cement mortar 1:5 (1 cement : 5 coarse sand) proprietary water proofing compound confirming to IS 2645 over 20 mm thick layer of cement mortar 1:5 (1 cement: 5 coarse sand) admixed with admixed with proprietary water proofing compound confirming to IS 2645 to required slope and treating similar surface to adjoined walls up to 300 mm. height including rounding of junctions of walls and slabs.(c) After two days of proper curing, applying a second coat of cement slurry admixed with proprietory water proofing compound conforming to IS:2645.(NOTE;- (1) The Whole work is to be executed through specialized agency with a guarantee of 10 (ten) years given on a prescribed Performa duly stamped. (2) The rate shall include for work at all floors and conducting water proof test as directed.

Materials:
Water shall conform to M-1.
Cement shall conform to M-3.

Workmanship:-
water proofing treatment of required thickness over the roof including 20mm thick cement mortar 1:4 and china Mosaic fitting and finally finishing the surface with white cement slurry and sloping out terrace slabs with following specification laid to required slope not flatter than 1:80(the thickness of water proofing treatment near rainwater outlet or the lowest point of the finished slope shall not be less than 65mm, including treating the vertical surface of the parapet wall upto 30cms.
(1) Applying and grouting a slurry coat of neat cement using 2.75 Kg/sqm. of cement admixed with proprietary water proofing compound conforming to IS-2645 over the RCC slab including cleaning the surface before treatments.

(2) Laying cement concrete using broken brick bats 25mm to 100mm size with 50% of cement mortar 1:5(1-cement;5-coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 over 20mm thick layer of cement mortar of mix 1:4(1-cement;4-coarse sand) admixed with proprietary water proofing compound confirming to IS:2645 to required slope and treating similarly the adjoining walls upto 300mm height including rounding of junctions of walls.
(3) After two days of proper curing applying a second coat of cement slurry admixed with proprietary water proofing compound confirming to IS: 2645.
(4) Finishing the surface with 20mm thick joint less cement mortar of mix 1:4(1-cement;4-coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 and finally finishing the surface with trowel with neat cement slurry and making of 300 x 300mm square.
(5) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing for final test. All above operations to be done in order and as directed and specified by the Engineer in charge.

Mode of measurement & Payment.
The rate shall be for a unit one sq meter

Description no:-34

For Sub Estimate-3 (Item-51)

Supply & Fixing of Stair Hand Railing S.S. Pipe 50mm Dia. Only Single Pipe With fiting comp. as directed by EIC/ consultant.

Providing and fixing in position S.S. hand rail in main stair case, landing, and balconies etc.in 2” (50mm) dia S.S. pipe 1.5mm thk. 304 grade resting on1"(25 mm) S.S. pipe1.5mm thk. 304 grade size S.S.304 grade square bars 10mm, of clear height 90cmsplaced at 30 cm c/c including g making necessary hold fast fixture (10 mm square bars22 cm long) embedded in staircase concrete for resting the S.S 304 grade . verticalsquare bars with holding etc. as per approved design and as required for the workincluding bending hand rail pipe to proper shape in curves with specials etc. complete (Approved Makes Tata/SAIL/Jindal /Essar/Bhushan Steel /Arecelor Mittal). Railing heightis 1 M. Instruction of Engineer in charge has applicable
The rate shall be for a unit of one running meter.

Description no:-35

Demolition including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift.
(1) R.C.C. work

Workmanship
The demolition shall consist of demolition of one or more parts of the building as specified or shown in the drawings. Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant Descriptions as specified or shown in the drawings.

The demolition shall always be planned before hand and shall be done in reverse order of the one in which the structure was constructed. This scheme shall be got approve from the Engineer-in-charge before starting the work. This however will not absolve the contractor from the responsibility of proper and safe demolition.

Necessary dropping, shoring and under pinning shall be provided for the safety of the adjoining work of property. This is to be left intact, before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damage is caused to the adjoining property.

Wherever required, temporary enclosures or partitions shall also be provided. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.

Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. Shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.

All materials obtained from demolition shall be the property of Government unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.

Any serviceable materials obtained during dismantling or demolition shall be separated out and stacked properly as directed with all lead and lift. All unserviceable materials rubbish etc. shall be stacked as directed by Engineer-in-charge.

On completion of work the site shall be cleared of all debris rubbish and cleaned as directed.

Mode of measurements & payments

Measurements of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed. The demolition of lime concrete shall be measured under this Description. Specification for deduction for voids, opening, etc. shall be on same basis as that employed for construction of work.

All work shall be measured in decimal system as fixed in its place subject to the following limits, unless otherwise stated hereinafter: (a) Dimensions shall be measured to the nearest 0.01 mt. (b) Area shall be worked out to the nearest 0.01 sq.mt. (c) Cubical connection shall be worked out to the nearest 0.01 Cu.m.

The rate shall include cost of all labour involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable materials properly and disposing the unserviceable materials with all lead and lift.

The rate also includes for temporary storing for the safety of the portion not required to be pulled down or of adjoining property and providing temporary enclosures or partitions where considered necessary.

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

Description no:-36

Demolition of brick work and stone masonry including stacking of serviceable materials and disposal of unserviceable materials with all lead lift in cement mortar

Workmanship

The relevant specification of Description No. 1 shall be followed except that demolition of Bricks or stone masonry in lime mortar is to be done.

Mode of measurements & payments

The relevant specification of Description No. 1 shall be followed except that the wall and independent piers of columns of brick or stone masonry shall be measured in cubic meters. All copings, corbles, cornics and other projections shall be included with the wall measurements.

In measuring thickness plastered walls, the thickness of plaster shall be included. The unserviceable materials shall be disposed off with all lead and lift. Ashlar face stones dressed stone etc. if required to be taken down in to shall be dismantled and measured separately in cubic meters.

The rate is exclusive of cleaning of bricks or stones. Honey comb works or hollow block walling shall be measured as solid

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

Description no:-37

Boring holes 3.5 mt. deep in ordinary soil (for cast in situ piles) and getting out the soil and disposal of surplus excavated soil as directed within a lead of 50 mt. for following diameter of piles (i) 200 mm (ii) 250 mm (iii) 300 mm.

Workmanship
The ground shall be roughly leveled and after make in to the position of piles the holes shall be bored with as spiral angle to the 3.5 M depth and specified diameter using boring guide.
The bore holes shall be truly vertical and uniform bore thought of specified diameter. After boring to the required depth the bore shall be cleared off the soil and disposal of surplus excavated stuff as directed within a lead of 50 M.

Mode of measurement of payments
The rate for boring holes shall include:
(a) Roughly leveling the ground in position where piles are to be provided.
(b) Making the position of piles by pegs and boring guide and also for shifting of boring guide. Bailing out water, if any with during boring.
(d) Disposal of surplus excavated soil within a lead of 50 M. and
(e) All tools plants, equipment and labour required of satisfactory completion work.

The rate shall be for a unit of one Number

Extra for under reaming inside the bore holes for under reamed piles of following nominal diameter (i) 200 mm (ii) 250 mm (iii) 300 mm.

Workmanship:
The relevant specification of Description No. 5 shall be followed except that after boring to the required depth, the bore shall be enlarges at the bottom by an under reamer 2 to 2 1/2 times the diameter of the bore as directed. It shall be ensured that the bore for the pile shall be enlarged to the correct diameter.

Mode of measurement of payments:
The relevant specification of Description No. 5 shall be followed.

The rate shall be paid extra over and above the rate of Description No. 6 under reaming the piles.

The rate shall be for a unit of one Number.

Description no:-38

For Sub Estimate-2C (Item-4)

Providing and filling in plinth with yellow soil or selected soil in layers of 20 cm in thickness including watering, ramming and consolidation etc. complete.

Material
The Selected soil shall be confirm to M-77 and clean, of good binding quality, and of approved quality obtained from approved Pits / quarries of disintegrated rocks which contain siliceous material and natural mixture of yellow soil.

Workmanship
The Selected soil to be used for filling shall be free from salts, organic or other foreign matter. All cloud of the selected soil shall be broken.

As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris, bricks bats, mortar dropping etc. and filled with the selected soil in layers not exceeding 20 cms. Each layers shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The murrum shall be rammed with iron rammers where feasible and with the butt ends of crowbars, where rammers cannot be used.

The plinth shall be similarly filled with the selected soil in layers not exceeding 20 cms. Adequately watered and consolidated by ramming with iron or wooden rammers. When filling reaches finished level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.

The finished level of filling shall be kept to shape intended to be given to the floor.

In case of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation shall also be as specified.

The excavated stuff of the selected type shall be allowed to be used in filling the trenches and plinth. Under no circumstances black cotton soil shall be used for filing the plinth.

Mode of measurement and payment
The payment shall be made for filing in plinth and trenches. No deduction shall be made for shrinkage of voids if consolidated as instructed above.

The rate includes cost of collecting and carting the selected soil of approved quality with all lead and labour required for filling in trenches s and plinth with consolidation.

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

Description No. 39

For Sub Estimate-3 (Item-26), For Sub Estimate-6 (Item-20), For Sub Estimate-7 (Item-46), For Sub Estimate-10 (Item-24)

Proving throating or plaster drip and moulding it to R.C.C. chhajja etc. complete.

Materials
Water shall conform to M-1. Cement shall conform to M-3 sand conform to M-6. Cement mortar shall conform to M-11.

Workmanship
The work shall be carried out as directed. The proportion of mix for finishing, touching shall be in C.M. 1:2 by volume. Curing shall be done for not less than 7 days. The wok shall be carried out in best workman like manner. The throating or plaster drip and moulding shall be one centimeter in thickness.

Mode of measurement
The rate includes cost of all materials and labour required completes the Description.

The rate shall be for a unit of one R.M.

Description no:-40

For Sub Estimate-7 (Item-11), For Sub Estimate-10 (Item-28), For Sub Estimate-1A (Item-15)

Providing and laying rubble stone soling 230 mm. Thick including hand packing and compacting etc. complete.

Scope
This section of the specification covers the supply and construction of slope protection works with dry black trap rubble pitching, on the embankment slopes & berm as indicated in the construction drawings.

General Requirements
The Contractor shall furnish all labour, equipment and materials required for the complete performance of the work in accordance with the construction drawings and as described herein.

Excavation
Excavation for constructing the pitching shall be done on the slope of the embankment/beam to the required size as indicated in the construction drawings. The bottom and the sides of the excavation shall be compacted well before carrying out the rubble pitching. Before taking up the placing of rubble on embankment slope/ below foundations; surface should be prepared with ramming and watering and has to get checked through concerned site engineers of RMC

Materials
Rubble
The Black Trap Rubble purchased & brought to the site by contractor used for the dry pitching shall be hard, durable rock free from veins, flaws & other defects. The quality & the size of the rubble shall be subject to the approval of the Engineer In Charge. The size of rubble shall be 150-230 mm. Rubbles shall conform to I.S.1597 (part-I). Sample of the stone to be used in the work be got approved from the Engineer In Charge and further quantity shall be collected as per the approved samples only. Stones shall be of uniform texture and colour, hard, durable, tough and free from holes, decay, cracks and other defects. Only approved quality suitable for work shall be

collected on site. Rubbles of undersize or oversize shall not be supplied. Rubble shall be stacked at the place shown in regular stacks of size approved by the Engineer In Charge.

Placing

The Rubble shall be hand packed as directed by Engineer In Charge. This shall be laid closely in position on the sub- grade. All interstices between the stones shall wedge in with smaller stones of suitable size coarse aggregate of size 40 mm & down and sand. The contractor shall ensure tight packing and complete filling of interstices. Such filling shall be carried out simultaneously with the placing in position of stones & shall not lag behind. Small interstices shall be filled with hard clean river sand, well watered& rammed.

Rates and Measurement

Rates

a) The unit rate quoted shall include the cost of providing black trap rubble, transporting to site with loading & unloading, stack measurements etc complete.

b) The unit rate quoted shall include sub- grade preparation, laying rubble stones as per above specifications with interstices filled with smaller stones, sand, etc. It also includes cost of providing & laying as per the specifications wherever specified.

Measurement

Measurement for the pitching shall be for the area pitched in square meters correct up to second place of decimal of the work completed based on profile of the pitching as indicated in the construction drawings.

Description no:-41

For Sub Estimate-1A (Item-25), For Sub Estimate-11 (Item-21)

Providing up to floor two levels precast concrete Ventilation Block as per drawing. 1:2:4 mix (1 cement :2 coarse sand :4 graded stone aggregate) 6 mm nominal size reinforced with 1.6 mm dia mild steel wire including roughening cleaning, fixing and finishing in cement mortar 1:3 and curing complete.
100 mm thick

Materials

Water shall conform to M :1, cement shall conform to M :3, sand shall conform to M :6, mortar shall conform to M :11, aggregate shall conform to M :12, GI wire shall conform to M :21, shuttering shall conform to M :26.

Workmanship

It shall be of cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 6 mm nominal size) reinforced with 1.6 mm dia GI wire, unless otherwise specified. The thickness of jail shall be as specified in the Description. The jail shall be set in position true to line and level before the jambs sills and soffits of the opening are plastered. It shall then be properly cemented with cement mortar 1:3 (1 cement: 3 sand) and rechecked for levels. Finally the jambs sills and soffits shall be plastered gripping the jail uniformly on all sides.

Mode of Measurement and Payment

The rate shall be for a unit of one Square meter

Description no:-42

For Sub Estimate-1A (Item-50)

(A)Steel work riveted in built up sections, framed work including cutting, hoisting fixing in position and applying a priming coat of red lead paint. (A) In beam and joints channels, angles tees, flats with connecting plates or Angles cleats as in main & cross beams. Hop and jack rafters purlins connected to common rafter and the like.

Materials
The structured steel work shall conform to M-22. Red lead paint primer shall conform to I.S. 102-1962

Workmanship
The steel section as specified or required shall be cut square and to correct length as per drawings and design. The cut ends exposed to view shall be finished smooth. No two pieces shall be welded otherwise jointed to make up the required length of member, except as indicated in drawing or as directed. All straightening and shaping to form shall be done by application of pressure and not by hammering. Any bending or cutting shall be carried out in such a manner as not to impair the strength of the metal. All operations shall be done in cold state unless otherwise directed / permitted.

Steel riveted or bolted in built up sections frame work.

The steel structure as shown in the drawings or as per direction of the Engineer-in-charge shall be laid out of level platform to full scale and to full size or in parts. A steel tape shall be used for measurements to ensure maximum accuracy.

Wooden templates 12 mm to 19 mm thick or metal sheet template shall be made to correspond to each connecting gussest plate and rivet holesshall be accurately marked on them and drilled the templates shall be laid on the steel members, and holes of the steel members shall also be marked for cutting the base of steel columns and the position of Anchor bolts shall be carefully set out.

All stiffeners shall be formed by pressure and where practicable, the metal shall not be cut and welded in making thest. In major works or where so specified. Shop drawings giving complete details and information for the fabrication of component parts of the structure, including location type size length and details of rivets, bolts or weld shall be prepared in advance of the actual fabrication and as approved. The drawings shall indicate the shop and field rivets and bolts. The steel members shall be distinctly marked or stencilled with paint with the identification mark as given in the shop drawings.

The bars shall be thickened at the ends, so as to provide for screwed threads and gradually tapered off to meet their normal section.

Great accuracy shall be observed in fabrication of various member, so that these can be assembled without being unduly packed, strained or forced into position and when built up shall be true and free from twists, bniks, buckles or open joints. Before making holes individual members for fabrication, the steel work intended to be riveted or bolted together shall be assembled or clamped properly and tightly so as to ensure close abutting or lapping of the different members. All stiffeners shall bear tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut or dressed true and straight and fitted close together.

Web splic plates and fillers under stiffeners shall be cut to fit witn 3 mm or flange Angles web plates of Girders shall have not cover plates, shall have their ends flush with the top of angles forming the flanges unless otherwise required. The web plates when specified shall have clearance of more than 6 mm.

The erection, clearance for cleared ends of members connecting steel to steel shall preferably be not greater than 1.5 mm. The erection clearance at the ends of beams without web cleats shall not be more than 3 mm. at each end but where for a practical reason greater clearance is necessary, suitably, designed seating shall be provided.

Pins and rollars shall be accurately turned to gauge. These shall be straight and smooth and free from flows. The roller bearing shall be provided with adequate arrangement for holding the girders or truss resting on it. In columns caps and bases, the ends of shafts together with the attached gussets angles channels etc. after riveting to gather shall be accurately mechanized so fabricated and place in position with greater accuracy so that they are not unduly reduced in thickness by machining.

The ends of bearing stiffeners shall be machined or ground to fit tightly both at the top and bottom. All holes shall generally be drilled to the required size and at required size. The holes for rivets and bolts shall be lager by 0.4 to 6 mm than the nominal diameter of rivets or black bolts depending upon the diameter of rivets.

Holes shall have their axis perpendicular to the surface bored through. The drilling or reamering shall be free from butts and the holes should be clean an accurate. Holes for counter shunk bolts shall be made in such a manner that their heads fit flush of rivets turned and fitted bolts and black bolts.

(i) Rivets and turned and fitted bolts shall be used where the connection is such that slip under load has to be avoided.
(ii) Black bolts may be used very sparing where a force is carried through a connection without impact, vibration or reversal of stresses.

Riveting: The parts assembled for riveting shall be in close contact with each other and the bearing stiffeners shall bear tightly both at top and bottom without being drawn or caulked. Members to be riveted shall be properly pinned or bolted and rigid held together while Riveting. Drifting of holes shall not be permitted except to draw the parts together and the drifting tools so used shall have maximum diameter not exceeding the nominal diameter of rivets or bolts. Drifting done during assembling shall not distort the metal or enlarge the holes. The shanks of rivets shall project beyond the plate surface sufficiently so s to fill the hole thoroughly and from the required head after riveting.

The riveting shall be done by hydraulic or pneumatic process. However, where such facilities are not available, hand riveting may be permitted. The rivet shall be heated red hot care being taken to control the temperature of heating so as not to burn the steel. Rivets of diameter less than 10 mm may be fitted cold, Rivets shall be of heat finish with heads full and of equal size. All loose, burnt or badly formed rivets with concentric or deficient heads shall be cut out and replace. The heads of rivets shall be central to shanks and shall grip the assembled members firmly. In cutting out rivets, care shall be taken so as not be injuring the assembled, members caulking or recuppying shall not be permitted.

For testing rivets, hammer weighing approximately 0.25 kg shall be used. Both heads of the rivets shall be tapped; slack rivets will give a hollow sound and a jar.

All rivet heads shall be painted with red lead paint within a week of their fixing.

Bolting all bolt heads and nuts shall be hexagonal and of equal size unless specified otherwise. The screwed heads shall conform to I.S. 1363-1960 and the threaded surface shall not be tapered.

The bolts shall be of such length so as to project two clear threads beyond the nuts when fixed in position and these shall fit in the holes without any shakes. The nut shall be fit in the threaded ends of bolts properly. Where turned and fitted bolts are required to be used in place of rivets they shall be provided with washers not less than 6 mm. thick so that the nut when tightened shall not bear on the unthreaded body of the bolt. Tapered washers shall be provided for all heads and nuts bearing on leveled surfaces. The threaded portion of the bolts shall not be within the thickness of the parts bolted together. The faces of the bolt heads and nuts abutting against steel members shall be machine finished. Where there is a risk of the nut being removed or becoming loose due to vibrators or reversal of stresses, these shall be secured from slackening by the use of locknuts, spring washers, cross cutting or hammering down of threads as directed.

Bolts nuts and washers shall be thoroughly cleaned and dipped in double boiled linseed oil before use. The whole steel work shall be painted with a coat of priming coat of red lead, as per relevant specifications of painting.

Welding shall generally be done by electric process. Gas welding shall be resorted to using oxyacetylene flame with specific approval. Gas welding shall not be permitted for structural steel work.

The work shall be done as shown in the shop drawings which should clearly indicate various details of the joints to be welded shop and site welds as well as type of electrodes to be used. Symbol for welding on plans and shop drawings shall be according to I.S. 813-1961. As far as possible every effort shall be made to limit the welding that must be done after improper welding that is likely to be done due to heights and difficult position on scaffoldings etc.

The welding work shall conform to I.S. 816-1969.

Preparation of surfaces: Surface which are to be welded together shall be free from loose mill scale rust paint grease or other foreign matter. A coating of boiled linseed oil shall be permitted.
Assembly of welding: Before welding is commened, the plates shall first be brought together and firmly clamped or spot welded at specified distance. The temporary connection has to be strong enough to hold the plates accurately in place without displacement.

Precautions: All operations connected with welding and cutting equipment shall conform to safety requirement given in I.S. 818-1968.

The following points shall be borne in mind during the process of welding

(a) Welds shall be made in flat position wherever practicable.
(b) Are length, voltage and smperge shall be suited to the thickness of material, type of groove and other circumstances of the work.
(c) The segements of welding shall be such be considered harmful to the strength shall cut out and rewelded.

The defective welds which shall be considered harmful to the strength shall cut out and rewelded.

Finished welds and adjacent parts shall be protected with clean boilde linseed oil and after all stage has been removed welds and adjacent parts shall be painted after the same are approved. All the members shall be thoroughly cleaned of rust scales, dust etc. and given a priming coat of red lead paint before fixing them in position.

Mode of measurements & payments

The steel work shall be measured in general as under.

(a) All work shall be measured on the basis of finished dimensions as fixed at site and measured net unless specified otherwise.
(b) The weight of steel sections, steel strips in finished work shall be calculated from standard weight on the same basis on which steel is supplied to the Contractor by department or those given in relevant I.S. if steel is arranged by the contractor.
(c) The weight of steel plates and strips shall be taken from relevant I.S. based on 7.85 Kg/Sq. meter for every millimeter sheet thickness if steel is supplied by the contractor; otherwise the weight shall be calculated on the basis on which steel is supplied to the contractor by department.
(d) Unless otherwise specified weight of clearets, brackets, packing pieces, bolts, nuts, washers, distance pieces, separators diapharam gusset (taking over all square dimensions fish plates etc. shall be added to the weight of respective Descriptions.
(e) In riveted work allowances to be made of weight of rivet hands. No deductions shall be made for rivet or bolt holes excluding holes for anchore or holding down bolts.
(f) For forged steel and steel costing, weight shall be calculated on the basis of 7850 kg.cum.
(g) Unless otherwise specified an addition of 2.5 percent of the weight of structure shall be made for shop and site rivet heads in rivettted steel structure.
(h) Unless otherwise specified, no allowance shall be made for the weld metal in case of welded steel structure.
(i) Dimensions other than cross sections and thickness of plates shall be measured to nearest 0.001 m.
(j) Mill tolerance shall be ignored when weight is determined by calculation.

The rate includes cost of all material, labour, erection, hoisting, scaffolding, and protective measure, required for proper completion of the Description of work. This shall also included conveyance and delivery loading, unloading and storing etc. Required for completing the Description described above including necessary wastage involved.

The rate shall be for a unit of Kg

Description no:-43

For Sub Estimate-1A (Item-38), For Sub Estimate-10 (Item-28)

Providing and fixing rolling shutters of approved make made of 80 mm wide M.S. laths inter-locked together through their entire length and jointed together at the ends by end lokes mounted on specially designed pipe shaft with bracked plates, giode channels and arrangements for inside and outside looking with push pull operation complete including the cost of hood cover and spring.
(B) shutter having width above 3.5 meters

Materials:
The rolling shutter shall conform to M-32.

Workmanship:
Brackets shall be fixed on the lintel or under the lintel as specified with raw, plugs, & screws, bolts etc. The shaft along with the spring shaft than be fixed on the brackets.

The lath portion (shutter) shall be laid on ground and the side guide channels shall be bound with ropes etc.

The shutter shall then be placed in position & top fixed with pipe shaft with bolts & nuts.
The side guide channels & cover frames shall then be fixed to the walls through the plate welded to the guides.

These plates & bracket shall be fixed by means of steel screws, bolts & raw plugs concealed in plaster to make their location invisible. Fixing shall be done accurately in workmen like manner that the operation of the shutter is easy & smooth.

Mode of Measurement and Payment:
Clear width & clear height of the opening for the rolling shutter shall be measured correct to mm. The clear distance between the seal & soffit (bottom of lintel) of the opening shall be the clear height.

The area shall be calculated in Square meter Correct to two places of decimal.

The rate shall include the cost of materials &labour involved in all the operation describe above including cost of top cover & spring except ball bearing & mechanical device of chain & crank operation, which shall be paid for separately.

Description no:-44

For Sub Estimate-1A (Item-52)

Providing and laying cement concrete pavement wearing coat 75 mm thick with M20 including floor finishing with a floating of neat cement complete. TREMIX VD SYSTEM including providing and fixing channels as per required levels and slope, leveling poured concrete between channels with Double Beam screed vibrators removing excess water using VD Pump finishing the surface with power trowel and power floater including cutting the groove of size 5mm x 10mm at required distance and providing and filling the same with bitumen as per practices etc. complete at all levels

Materials
Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Stone aggregate 20 mm. nominal size shall conform to M-12.

Cement concrete M20 proportion measured by volume shall conform to relevant specification or grade M20 concrete.

Workmanship
The wearing coat shall consist of providing and laying average 75mm thick RCC M20, HYSD (TMT) reinforcement and filling of joints as shown in detailed drawings.

In preparations of mix specifications given under para of this description, shall be followed It shall be as per IS:1195 & IS:1196..

General

The Contractor shall improve the quality of all concrete floor slabs by placing the concrete according to the Tremix System as indicated on the contract drawings and as specified herein.

Technical Assistance/Training of Labour

During the placement of concrete, the Contractor shall have a minimum of one person present at all times who has been adequately trained by a representative of the equipment manufacturer. This person shall be experienced in the vacuum dewatering process and in the operation of all related equipment and shall direct all concrete dewatering work performed.

The Contractor shall provide the services of a representative from the manufacturer of the vacuum dewatering equipment on site for a period of at least 3working days. The manufacturer's representative shall provide technical assistance for the vacuum dewatering process on the initial 3 days of operation.

Equipment for Compacting, Placing, Vacuum Processing and Finishing of Slab

All process equipment to be used shall be of a design representative of the state of the art, and shall be subject to the approval of the engineer. Equipment shall beTremix or approved equal. System shall have a demonstrated five years history of performing such work. The vacuum pumps shall be able to generate a minimum vacuum of 600mm (24 inches) of mercury (0.80 atmospheres) in actual operation using the maximum number and size of suction mats required for this work.

The Contractor shall have at the job site sufficient equipment (vacuum pumps, mats, filter pads and accessories) to ensure that the vacuum dewatering process continues uninterrupted to completion. Stand by equipment is sometimes required.

Mix Design

The Contractor is responsible for the mix design of the class as called for on the Contract Drawings and must submit the mix proposed for use in the Contract before any work is started. All mix parameters must conform to the values specified.

The Contractors shall utilize a knowledgeable and experienced concrete technician for the design and production of mix (mixes) meeting all the requirements of the specifications. Do not deliver any concrete to the construction site until all the approvals have been obtained.

Quality Control The Contractor has the responsibility for achieving the quality of concrete specified by controlling the concrete mixes, placing, vacuum process finishing and curing. The concrete technician in charge must be present at the site when work is in progress.The Contractor shall be responsible for mix adjustments, performing necessary tests, correcting deficiencies and trouble shooting in general.The Contractor shall be required to maintain control charts showing individual test results for aggregate gradation, slump, and cement content and compressive strength. The engineer will supply data for slump and compressive strength.

Planning of Placing

The Contractors shall submit for review shop drawings for floor slabs detailing the location of all construction joints and the sequence of the slab placement, and manufacturer's literature describing the equipment to be used. In addition to the shop drawings, the Contractor shall indicate the quantity of each piece of dewatering equipment that will be located at the construction site and shall include the dimensions of all suction mats.

Before concreting is started the work should be planned with a view to determine areas to be placed daily, the required amount of equipment, size of vacuum mats, length of vacuum hoses, arrangement of rails, if any, or screeds etc. Crew required for the vacuum process is two men to handle the mats and the pump. Note that placing, vibration, vacuum treatment and floating follow immediately behind each other.

Method Statement

General

The work shall be planned and executed so that there is no delay between the placement, screeding, dewatering and floating of the concrete. Concrete to be vacuum dewatered shall be handed and placed so as to prevent segregation. The concrete shall be internally vibrated prior to screeding.

Leveling

Immediately following placement, the concrete shall be leveled with a vibrating screed running on a true surface, set at the proper elevation required to provide the specified finished elevation. The concrete surface shall be screeded high by 2% of the slab's thickness to compensate for the compaction caused by the vacuum dewatering process. (Slabs to have an aggregate hardener shall have compensation made to maintain elevation). The vibrating screed shall be moved forward as rapidly as proper consolidation allows. The proper surcharge of concrete must be maintained in front of the leading edge of the screed.

Vacuum

Immediately after leveling, the concrete shall be covered with filter pads and suctions mats in strict accordance with the recommendation of the manufacturer to have the slab fully dewatered. The suction mat shall extend 100mm beyond the edge of the filter pad on all sides. The pads shall extend to within 100mm of the edge of concrete slab, and the mats shall cover entire slab. Before connecting the hose on the suction mat to the vacuum pump, the edges of the mat shall be smoothed to enable an airtight seal to be created. A vacuum pump, the edges of the mat shall be smoothed to enable an airtight seal to be created. A vacuum shall then be applied to the mat. After a minute the gauge on the vacuum pump should indicate a minimum vacuum of 0.700 atmospheres (500mm/Hg) and if not, the mat must be checked for leakage. For concrete that dewaters readily the vacuum should then be maintained at 0.70-0.80 atmospheres (500/600mm/Hg) for concrete which dewaters less efficiently the vacuum shall then be reduced to 0.50-0.60 atmospheres 300-400m/Hg). After approximately 10 minutes the vacuum can then be increased to 0.80 atmospheres.

The vacuum shall be maintained for at least 1 minute per cm fied, sufficient moisture shall be maintained to meet manufacturer’s requirements). The suction mats and filter pads shall then be removed and moved to the next section in a leapfrog manner.

Stop the vacuum dewatering when light footprints only are left in the concrete when stepped upon.

Floating

Upon removal of the suction mats and filter pad the concrete surface shall be power-floated without delay until all imprints from the vacuum process are removed. If crusting occurs, the floating operation must be delayed till the concrete carries the machine.

The higher speed is recommended for the floating operation. Two passes with the floating disc should be made in the junction of two mats in order to avoid risk for cracking.

Finishing

The waiting time after the floating operation depends on concrete temperature and humidity and various from 10 minutes to 2 hours.
The trowelling operation cannot take place before the concrete has hardened enough to carry the machine; i.e. the trowelling blades will not leave any marks on the concrete. Repeated trowelling, with intervals between the passes which are adapted to the setting of the concrete, greatly improves the surface characteristics. The surface will be more wear-resistant and less dusty.
At least two passes are recommended for floors which are not to be covered.

Curing
Vacuum dewatered concrete should be cured like any other quality concrete in order to achieve a good final result. Use ponding or wet burlap.

Equipment specifications
Poker/Needle Vibrators: Vibrators with more than 12500 vibrations/minute with drive length exceeding Bay width by at least 1m shall be used.
Surface Vibrators: Double beam Surface Vibrator with beam spacing of 300 mm. Beam Height of 100mm. with Weight not exceeding 15kg / Running meter, Profile: Hollow to avoid loss of vibrations with vibrator unit of 2360 vibrations/min. having adjustable fly weight torque from 1.5 to 5.0kg /cm and adjustable centrifugal force from 1350 to 4600N. The Surface Vibrator will be equipped with suitable arrangement to remove sagging due to self weight and usage related stress fatigue. The surface vibrator will have a travel speed of about 1Rm/min.
Vacuum Pump: The Vacuum Pump shall have a Priming tank with Separate suction and discharge compartment, having special filter arrangements to avoid entry of dirt in the pump body, The pump should run at > 280 RPM and produce vacuum up to 600mm/Hg (-0.70 Atmospheres) An appropriate gauge should be provided to indicate the level of vacuum achieved. A valve to adjust the vacuum will be provided on the vacuum pump to control the vacuum created. The suction and discharge hoses should be provided with leak proof couplings and should be capable to withstand the pressure. The suction hose should also be provided with a valve to prevent backflow of water. The pump shall be capable to dewater concrete surface area of $24m^2$ with single connection and $48m^2$ max. with double connection without any extra modification. The pump unit shall be mounted on a trolley for ease in shifting during the course of work and should be less than 150kg. in weight (DRY) for easy handling and operation.
The suction Mat-Top Cover should be made of calendared PVC/PE Sheet Reinforced with Nylon/PP/LDPE fibers for withstanding the Pressures and provides flexibility for effective sealing to allow for proper vacuum creation. For a mat size of $24m^2$ the centrally Provided Suction net area shall be minimum $0.5m^2$ to evenly distribute the vacuum. This suction net area shall have suitable openings for effective vacuum and will have a set of Nylon wire mesh to create sufficient cross sectional area for water to flow through. The suction pipe fitted on top cover should be fixed with appropriate gaskets to avoid any leakage.

The filter pads should be made from Calendared Plastic Sheets with non-collapsible distance cushions to allow sufficient cross sectional area for effective flow of water. The filter pads shall have markings to indicate overlap distances for ease in usage by labour/operators handling the same.

The finishing Equipment - Skim floaters should not exceed 100 kg/m^2 weight, so as to avoid disturbing the freshly laid dewatered concrete. The machines shall have 2 speeds to regulate the level and quality of finish. The machine should be capable of doing both functions floating and trowelling for faster output and ease of operation. The floating disc

will have a gentle curvature and oscillating motion to achieve better level control and effectively seal the capillary pores of dewatered concrete. The machine should be capable of after grinding hydrated cement to result in improved wear resistance. The trowelling blades should be adjustable in tilt to increase or decrease the contact area of the trailing edge to achieve the desired finish and better abrasion resistance. The machine handles shall be at least 2m in length with arrangements to increase or decrease the height for ease in operation and to allow reaching the concrete surfaces with minimum stepping upon concrete surface.

Quality Control & Testing

Side Form: Side form shall be rigid enough to ensure that it does not Bulge/Collapse during the concreting. The top edge level guide shall be straight to achieve final floors in the level tolerance of + 6mm per 4meters on Transverse or linear directions.

Equipment: The equipment shall be as per equipment manufacturers specifications of Aquarius "Tremix" make or equivalent and shall be in proper working condition. The Authority will have a right to get the same inspected and certified through the manufacturer at any time during the course of work for its performance and genuinely, any cost towards such inspection/certification will be borne by the contractor

The concrete after vacuum dewatering and finishing shall give a minimum increase of 25% in compressive strength - vis a vis to reference concrete and a minimum 50% increase in abrasion resistance vis-a-vis to reference concrete. This may be either checked by cast in situ cubes or by cores taken after 7-14 & 28 days. Depending upon the total volume of work suitable quantities of samples shall be taken and checked. The testing should be a mandatory requirement as the cost paid towards equipment application is solely for the purpose of improved quality. Contractors at their expenses (Refer Annexure - III) will do the entire arrangements for such sampling & testing.

Special Terms & Conditions

The equipment will be Aquarius "Tremix" make or equivalent as per equipment specifications and performance. The Authorities will have the right to get the same inspected and certified through approved certification Agency and the costs of such inspections Certifications will be borne by the Contractor. Any defects found by the Certification Agency will be rectified immediately without which any further work execution will not be allowed. The costs of such rectifications will be borne by the contractor.

Test panel before start of work shall be executed by the Contractor at his own costs and only after satisfactory 7 day results the actual work will be started in case of test panel results not being satisfactory one more chance will be provided before rejection of work / agency.

All test samples for the test panel and actual work - either by way cast in situ cubes or cores will be tested by approved testing authorities only and the costs for such tests will be borne by the contractor.

The necessary arrangements for test samples such as sufficient quantities of cube moulds / core drills etc. etc. will be arranged for by the contractor at his own

The Engineer-in-Charge of site will have the right to demand samples from any working day's concrete at any time and the same will be provided by the Contractor immediately at his own cost.

In case of samples of actual work failing to achieve the demanded results a 30% deduction in case if the failure is up to 25% of specifications and total rejection in case if the failure is more than 25% of specifications of the specific work will be made. In case of rejection/deduction the cost calculation will be on the basis of material cost +

reinforcement cost + equipment operating cost + labour cost (Not on equipment operating + labour only).

Mode of Measurements & Payment

The rate shall include the cost of all materials and labour involved in all the operations described above. No deduction shall be made or extra paid for any opening up to 0.1. sq. mt. In area in the floor, nothing extra shall be paid for laying the floor at different levels in the same room or the courtyard.

The rate shall be for unit of one cubic meter.

Description no:-45

For Sub Estimate-2C (Item-7)

Providing& laying cement concrete M15/1:2:4 (1cement: 2sand: 4 graded stone aggregates 20mm nominal size) finishing smooth etc. complete including the cost of form work (a) Kerbing of Ramp

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.

General

The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1:2:4 (1 cement : 2 coarse sand : 4 grades stone aggregate 10 mm nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the Description.

The design ordinary M-100, M-150, M-200, M-250 specified as per I.S. corresponding approximately No. 1:3:6, 1:2:4, 1 1/2 :3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

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

Work ability of the concrete shall be controlled by maintaining a water cement ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.

The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth 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.

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

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

Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as great as or greater than the minimum cover.

A mixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

Workmanship

Proportioning

Proportioning shall be done by volume, except cement which shall be measured in terms of bags of 50 Kg. weights. 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 the boxes (internal) shall be 35 cms. x 25 cms. and 40 cms. deep while measuring the aggregate and sand the box 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.

Mixing

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 cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After cab out half a minute of dry mixing, measured quantity of water required for each 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 coating of mortar containing its proportionate amount of cement, In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

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 of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing colour. Dry coarse and fine aggregate and cement shall then be mixed by turning over to get a mixture to uniform colour. Special quantity of water shall then be added gradually through a rose-can and the mass turned under over till a mix a required consistency is obtained. In hand mixing quantity of cement shall be increased by 10 percent above that specified.

Mixers which have been out of use for more than 30 minutes shall be 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 or normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

Consistency

The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete shall be determined by regular slump tests in accordance with I.S. 1199-1959. The slump of 10 mm to 25 mm. shall be adopted when vibrators are used and 80 mm. when vibrator is not used.

Inspection

Contractor shall have 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 forms shall be thoroughly cleaned.

Centering design and its erection shall be got approved from the Engineer-in-charge. One carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour 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.

Transporting and laying

The method of transporting and placing concrete shall be as approved. Concrete4 shall be 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 standing water, dust show or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approved of the engineer - in - charge has been obtained.

Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction 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 a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.

Unless otherwise agreed by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters. When trunking or chutes are used they shall be kept close and use 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, thoroughly wetted and covered with a 13 mm. thick layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly shall not exceed 150 mm. in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.

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 equipment is always available in the event 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 an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction it shall be observed that needle vibrator is not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

Curing

Immediately after compaction, concrete shall be protected from weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with net sacking hessian 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. Masonary 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.

Sampling and testing of concrete:

Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 days as per requirement in accordance with I.S. 516-1959. 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 accordance with following:

Table

Qty. of concrete in Cum (Daily)	Number of Samples
1-5	1
6-15	2
16-30	3
31-50	4
51 and above	4 plus one additional for each 50 cum. of concrete

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 the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals as poor quality of concrete and in other special cases.
The average strength 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 than the minimum specified.

Stripping

The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike the form work. While fixing the time for removal of form work. Due consideration shall be given to loan conditions, character of structure, the weather and other condition that influence the setting of concrete and of the materials used in the mix. In normal circumstances (generally where temperatures are above 20 0 C) and where ordinary concrete is used, forms may be struck after expiry of periods specified in Description No 10 for respective Description of form work.

All form work shall be removed without causing any shock or vibration as would damage the concrete, Before the soft it and struts are removed, the concrete surface shall be exposed whether necessary in order to ascertain that the concrete has sufficiently hardened. Centering

shall be gradually and uniformly lowered in such manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, they 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 25 mm. cover to the finished concrete surface. Where it is intended to re-use the form work, 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.

Immediately after the removal of forms all exposed bolts etc. passing thought the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 mm. below the surface of the concrete and the resulting holes be fitted by cement mortar. All fine caused by form joints, all cavities produced by the removal of form ties and all other holes and depression honeycomb spots, broken edges or corners and other defects shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished 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 a period of 24 hours.
If rock pockets / honeycombs in the opinion of the Engineer-in-charge are of such an extent or character as to effect the strength of structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected.

Mode of measurement and payments

The consolidated cubical contents of concrete work as specified in Description shall be measured. The concrete laid in excess of section shown on drawings or as directed shall not be measured. No deduction shall be made for (a) ends of dis-similar materials such as joints, beams, posts, girders, rafters, purlin trusses, corbels and steps etc. up to 500 sq.cm. in section. (b) opening up to 0.1 Sq. M.

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

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

Description no:-46

For Sub Estimate-1A (Item-31)

Providing and applying one coat of epoxy phenolic primer of DFT 50 micron and two coats of epoxy phenolic coating of DFT 100 micron each or any other equivalent epoxy coating system to all concrete surface exposed to atmosphere in ground floor and first floor of RCC Ramp and RCC Platform of the Transfer Station building including cost of material, labour, transportation, scaffolding and preparing the surfaces by cleaning, washing, brushing, sand/grit blasting etc. complete and as directed by engineer-in-charge and as per specification. (Paint shall be confirm to IS - 14209 : 1994 and IS – 14589 : 1999 & relevant IS specification and shall be of standard

manufacturer like Berger, Asian Paint, Shalimar etc. or its equivalent and got approved from engineer-in-charge and to be tested from approved laboratory.)

Material :

Material shall be as per specification given in MORTH 1906 of section 1900, IS - 14209 : 1994, IS – 14589 : 1999 and relevant IS codes. The paint shall be Paint shall be of standard manufacturer like Berger, Asian, Shalimar etc. or its equivalent got approved from engineer-in-charge and tested from approved laboratory got tested from approved laboratory before application.

EPOXY PHENOLIC PRIMER (Requirement as per IS 14589 : 1999 / relevant IS code)

EPOXY PHENOLIC BASED TWO COMPONENT PRIMER

POLYMERIDE CURED CORROSION RESISTANCE EPOXY PRIMER CONTINING ZINC PHOSPHATE PIGMENT AS CORROSION INHIBITING PIGMENT

Recommended Use	Recommended a primer on M.S., Alluminium and GI surface in OEM various fertilizers, refinery, chemical and other plants etc. It is also suitable for direct application on concern TE surface when expose to atmosphere in super structure and sub structure.
Finish	Matt
Theoretical Spreading Rate	09 – 11 sq. mt. / ltr. At 50 micron DFT on smooth and non - absorbent surface.
Drying Time	Touch Dry : 1-1 ½ HRS Dry to handle : 24 HRS Fully cured : 7 days
Shelf Life	9 months of individual component, stored under temperature & pressure condition
Mixing Ratio (By Volume)	Base : Hardener (3:1)
POT Life	6 – 8 HRS at 25 Deg. C.
Application	By brush or airless spray
Thinner	913 epoxy thinner
Indicated film thickness	Wet : 75 – 85 microns Dry : 50 microns
Over coating	Min. : 8 HRS. Max. : 24 HRS.
Application	**New steel :** Blast clean to minimum of Sa 2 ½ Swedish Standard SIS : 05 5900 with surface profile not exceeding 65 microns. **Old steel (maintenance) :** if blasting is not practical, make full use of mechanical tools along with manual chipping and wire brushing to remove loose rust and scale to St. 2 Swedish standard SIS 05 5900 excessive brushing of steel is to be avoided. Thoroughly dust down all surfaces. Remove grease, oil and other contaminants preferably by using our thinner. The surface should be cleaned and dried before application of epoxy phenolic top coat. **Concrete :** New concrete ensure that the concrete is cured for min. 0f 3 months. The surface is to be made rough from algi, bacteria and other contaminants by sand sweeping.

	Old Concrete : Remove all salt deposit from the surface by water jet washing. Light sand blast surface to remove all the loosely bound coating and roughening of firmly adhering coating to ensure the anchorage with recommended system. Ensure all dust/other particles fully removed by suction or air blast. The surface is fully cleaned and dried. In non critical area where blasting is not possible water jet washing and hard wire brushing are minimum requisites.

Please Note : Do not apply when temperature falls down below 10 Deg. C. or rises above 50 Deg. C. and when relative humidity rises above 90% avoid applying during rain, fog or mist.

Sr. No.	Characteristics	Requirement as per IS 14589 : 1999
1	Type	Twp pack epoxy phenolic cured with polyamide resin
2	Mixing Ratio	B : H = 3 : 1 by volume
3	Pot life at 23 c.	6 – 8 HRS
4	DFT WFT	40 – 52 microns by automatic DFT gauge 75 – 85 microns
5	Covering capacity	9 – 11 sq. mt. / ltr.
6	Drying Time	Touch : 1 to 1 ½ Hours Hard : 24 HRS.
7	Flash Pt.	Above 30 Deg. C.
8	Finish	Matt
9	Storage Life	Up to Six months
10	Solvent Resistance Salt Resistance Water Resistance	Very Good Very Good Very Good
11	Temperature Resistance	Continuous : 90 Deg. C. Intermittent : 120 Deg. C.
12	Weather ability	Very Good
13	Flexibility	Good
14	Abrasion Resistance	Good

EPOXY PHENOLIC HIGH BUILD TOP COAT
(Requirement as per IS 14209 : 1994 / relevant IS code)

EPOXY BASED TWO COMPONENT HIGH BUILD TOP COAT

POLYAMIDE CURED HIGH BUILD EPOXY PHENILOC TOP COAT.

Recommended Use	Recommended on structural steel, pipelines, storage tanks etc. suitable for application on concrete walls and columns can be used on submerged steel, pipelines, ballast water tank etc. very useful in chemical plants, fertilizer plants, refineries offshore installation etc. It is also suitable for direct application on concrete surface when exposed to atmosphere in super structure and substructure.
Finish	Semi Glossy
Theoretical Spreading Rate	06 – 08 sq. mt. / ltr. At 100 micron DFT on smooth and non - absorbent surface.

Flash Point	Above 25 Deg. C.
Drying Time	Touch Dry : 3 to 4 HRS Dry to handle : Over night Fully cured : 7 days
Shelf Life	9 months of individual component, stored under temperature & pressure condition
Mixing Ratio (By Volume)	Base : Hardener (3:1)
POT Life	4 – 6 HRS at 25 Deg. C.
Application	By brush or airless spray
Thinner	Epoxy thinner (If required)
Indicated film thickness	Wet : 160 – 170 microns Dry : 100 microns
Over coating	Min. : 24 HRS. Max. : 7 days
Application	**New steel :** Blast clean to minimum of Sa 2 ½ Swedish Standard SIS : 05 5900 with surface profile not exceeding 65 microns. **Old steel (maintenance) :** if blasting is not practical, make full use of mechanical tools along with manual chipping and wire brushing to remove loose rust and scale to St. 2 Swedish standard SIS 05 5900 excessive brushing of steel is to be avoided. Thoroughly dust down all surfaces. Remove grease, oil and other contaminants preferably by using our thinner. The surface should be cleaned and dried before application of epoxy phenolic top coat. **Concrete :** New concrete ensure that the concrete is cured for min. 0f 3 months. The surface is to made rough from algi, bacteria and other contaminants by sand sweeping. **Old Concrete :** Remove all salt deposit from the surface by water jet washing. Light sand blast surface to remove all the loosely bound coating and roughening of firmly adhering coating to ensure the anchorage with recommended system. Ensure all dust/other particles fully removed by suction or air blast. The surface is fully cleaned and dried. In non critical area where blasting is not possible water jet washing and hard wire brushing are minimum requisites.

Please Note : Do not apply when temperature falls down below 10 Deg. C. or rises above 50 Deg. C. and when relative humidity rises above 90% avoid applying during rain, fog or mist.

Sr. No.	Characteristics	Requirement as per IS 14589 : 1999
1	Type	Twp pack epoxy phenolic cured with polyamide resin
2	Mixing Ratio	B : H = 3 : 1 by volume
3	Pot life	4 – 6 HRS
4	DFT WFT	90 – 100 microns by automatic DFT gauge 160 – 170 microns
5	Covering capacity	06 – 08 sq. mt. / ltr.
6	Drying Time	Touch : 3 to 4 Hours Handle : 8 to 10 HRS. Hand : overnight

		Curing Time : 6 – 7 days
7	Flash Pt.	Above 25 Deg. C.
8	Finish	Smooth & Uniform (Semi glossy)
9	Storage Life	Up to 12 months
10	Chemical Resistance	Very Good
11	Temperature Resistance	Continuous: 90 Deg. C. Intermittent: 120 Deg. C.
12	Weather ability	Excellent in combination with suitable primer
13	Flexibility	Good
14	Abrasion Resistance	Very Good

Scaffolding :

Wherever scaffolding is necessary it shall be erected in such a way that as far as possible on part of scaffolding shall rest against the surface to be Epoxy Phenolic primer. A properly secured strong and well tied suspended platform (Zoola) may be used for Epoxy Phenolic primer. Where ladders are used, pieces of old gunny bag shall be used at top and bottom to prevent scratches to the floors and walls. For Epoxy Phenolic primer of coatings proper stage scaffolding shall be erected where necessary

Where possible, double scaffolding shall be used to obviate to subsequent making good of putlog and other break down in the work. Double scaffolding shall be provided having two sets of vertical supports. The supports shall be sound and strong, tile together with horizontal pieces over which scaffolding planks shall be fixed. Holes or any drilling work to the existing bridge structure shall not permit in any case.

Scaffolding shall be checked to make sure that it is suitable and safe. Scaffolding shall be carefully dismantled and removed on completion of the work without damaging the bridge structure, as well as the running traffic.

Preparation of Surface :

Before applying of the primer to the exposed concrete surface the surface shall be thoroughly brushed free from mortar dropping and foreign matter. All loose pieces and scales shall be scraped off and holes and patches area shall be filled up by as suggested by engineer-in-charge. Work of application of primer coat will be allowed after satisfactory completion of this work and its approved by engineer-in-charge.

Application :

Before pouring into small containers for use, the paint shall be stirred thoroughly is its container.
When applying also the paint shall be continuously stirred in the smaller container, so that itsconsistency is kept uniform.
The paint shall be laid on evenly and smoothly by meant of crossing and laying off the crossing and laying off consist of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite direction two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of mouldings etc. shall be left on the work. The full proves of crossing and laying off will constitute one coat.
The paint shall be applied with brush or rollers. For undecorated surfaces, the surface shall be treated with minimum two coats of cement water proofing paint. The second or subsequent coat shall not be started until the preceding coat has become sufficiently hard to resist marking by brush being used.

The surface on finishing shall present a flat velvety smooth finish. It shall be even and uniform inshade without patches, brush marks paint drops etc.

After preparation of surface one coat of epoxy phenolic primer of DFT 50 micron shall be applied. And after the approval of engineer-in-charge two coats of epoxy phenolic of DFT 100 micron shall be applied.

One coat of epoxy phenolic primer of DFT 50 micron shall be allowed to dry before the next coat is applied. Further each coat shall be inspected and approved by the engineer-in-charge before the subsequent coat is applied. The paint shall be applied in such a manner that the concrete surface should be super sent a uniform finish through which the concrete surface / patches do not appear.

Precautions
(a) Old brushes if they are to be used with emulsion paints shall be completely dried of turpentine oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush.
(b) In the preparation of wall for plastic emulsion painting. No oil base putties shall be used in filling cracks holes etc.(c) Splashes on floor etc. shall be cleaned out without delay as they will be difficult to remove after hardening.(d) Washing of surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application.

Protective Measures:
Splashing and droppings, if any shall be removed by the contractor at his own cost and the surface cleared. Damages, if any to existing RCC structure shall be recoverable from the contractor.

MODE OF MEASUREMENT AND PAYMENT:-
The item shall be paid in sq. mt. basis.

Rates :

The rate for this item includes all cost of materials, labour, transportation and preparing of surface by cleaning, washing, brushing, sand / grit blasting, scaffolding at any height etc. complete as directed by engineer-in-charge as per specification. (Paint shall be got tested by approved laboratory.)

The payment shall be made a unit of per Sq.mt. of area worked.

Description no:-47

Supplying approved make window type Air Conditioning machine comprising of hermetically sealed compressor, condensing & evaporating unit, fan/blower motor, thermoset, relay etc. suitable for (B) 1.5 Ton Capacity with remote and conveyance charges local up to 10 KM.and installation charges.

The air condition machine shall comprise of hermetically sealed compressor, condensing and evaporating unit, fan/blower motor, thermostat, relay etc suitable for 1 to 1.5 Ton capacity as specified.

The general and technical specification given in the tender booklet shall be considered as a part of agreement. The material shall be approved as per relevant IS specification and shall be approved by the Electrical Engineer in charge before executing the work.

Description No. 48

Providing & erecting water cooler having storage capacity 150 ltr. & cooling capacity 150 ltr. Per hour @ an ambient temp. of 35 C.. The outlet temp. of the water should drop by 15O C. within a hour, If the water is fed @ 32o.The water cooler should be comprising of hermetically sealed compressor, fan motor, condensing unit, water tank surrounded by evaporating, coil, therinostate, relay etc. complete with necessary inlet & outlet connection.

WATER COOLER-80 TO 150 LITRES CAPACITY:

The water cooler shall be with hermetic sealed type suction cooled compressor with overload protection confirming to IS:10627 (Part-1) 1983.

The water tank of cooler shall be fabricated from S.S. sheet of 0.8mm. minimum thickness as per IS:304 and shall be made by electrically seam welded lap joints. Water tank cover and lid bottom shall be made of 1.25mm. aluminum sheet duly anodized/epoxy painted high impact polystyrene (HIP) of 1.5mm. thickness. Double locking of the lid shall be provided.

The cabinet of the water cooler shall be made of M.S. Sheet of 1.0m. thick. The drain pan of water cooler shall be made of stainless steel sheet of 0.63mm. The drain shall be 'CSR' or 'PSC'. Water cooler shall be installed as per the instruction of in-charge-electrical engineer. Necessary plumbing connection to inlet and outlet of water cooler by using necessary G.I. pipe and fittings, PVC heavy duty connection pipes with male and female screwed nipples etc. shall be done and made waterproof without any leakage.

The general and technical specification given in the tender booklet shall be considered as a part of agreement. The material shall be approved as per relevant IS specification and shall be approved by the Electrical Engineer in charge before executing the work.

Description no:-49

Providing and fixing metal expansion joints as per standard drawing.

EXPANSION JOINTS
General

Expansion Joints shall be constructed according to the details shown on the drawings.

Fabrication
(a) Open Joints.
Open Joints shall be constructed at the locations shown on the drawings using a wood strip, metal plate, or other suitable material, which is subsequently removed. When removing the material, care shall be exercised to avoid chipping or breaking the corners of the concrete. The edge of the concrete at the joints shall be edge finished. Reinforcement shall not extend across on open joint.

(b) Filled Joints.
The filler material shall conform to Clause 2(d) here in below. When preformed filler is shown on the drawings, the, filler shall be placed in correct position before concrete is placed against the filler. The filler material shall form part of the joint and while concreting slab care shall be taken to prevent the former, from being displaced. After the work is completed, the exposed face of

the joint shall be cleaned of all loose material sticking to it.

(c) Steel Work.
Steel Plates, angles, or other structural shapes provided in the expansion joints shall conform to the provisions in relevant 1.5. Specifications. All metallic parts used in fabrication and installation for fixing in devices of the joint shall be accurately shaped to the section indicated and all parts as above said shall be hot-dip galvanized. Positive methods shall be employed in placing the assemblies, to keep them in correct position during the placing of concrete. Care shall be taken to avoid impairment of the clearances in any manner.

(d) Filler Material Expansion Joints.
The material used for filling expansion joint shall be The rate shall include the cost of all material, labour, equipment, galvanizing all metallic elements and other incidental charges for fixing the joints complete in all respects as per these specification and as shown on the drawings.
Measurements of Payment

The expansion joint shall be measured in running meters.

Rates
The rate shall include the cost of all material, labour, equipment, galvanizing all metallic elements and other incidental charges for fixing the joints complete in all respects as per these specification and as shown on the drawings.

Description No. 50

For Sub Estimate-1A (Item-1)

Clearing and grubbing road land including uprooting rank vegetation grass bushes,shrubs,sapling and trees girth up to 300 mm removal of stumps of trees cut earlier and disposal of unserviceable materials (C) By mechanical means in area of light jungle

As per BOQ Specification

Mode of Measurements & Payment

The rate shall before unit of one Hector.

Description No. 51

For Sub Estimate-1A (Item-50), For Sub Estimate-7 (Item-51), For Sub Estimate-7 (Item-35)

Providing and fixing M.S. Grills of required pattern to wooden frames of windows etc. at all floor levels with MS flats at required spacing and frame around square or round bars with round headed bolts and nuts or by screw including Priming coat of Read lead paint etc. complete (A) plain grill for all floors. In windows.

As per BOQ Specification

Mode of Measurements & Payment

The rate shall before unit of one Kg.

Description No. 52

For Sub Estimate-7 (Item-53)

Providing and fixing 30 mm thick factory made PVC rigid foam paneled door shutters manufactured by M/s. Rajshri or equivalent made from M.S. tube of 19 gauge (1.016mm) thickness, size 19 x 19 mm for styles and 15 x 15 mm for top and bottom rails, covered with heat moulded PVC "C" channel of 5 mm thick sheet and 30 x 50 mm wide to from styles and 5 mm thick and 75 mm wide PVC sheet for top rail, lock rail and bottom rail on either side and 5 mm thick, 20 mm wide cross PVC sheet as gap insert for top rail and bottom rail, paneling of 5 mm thick PVC sheet fitted in the M.S. frame welded/ sealed to the style and rails with 5 x 30 mm PVC sheet beading on either side and joined together with solvent cement adhesive etc., completed as per manufacturers specification and direction of Engineer-in-charge fixed to frames with 4 Nos. 125MM Stainless Steel butt hinges with necessary screws. (Cupboard shutters)

As per BOQ Specification

Mode of Measurements & Payment

The rate shall before unit of one Squre Meter.

Description No. 53

For Sub Estimate-9 (Item-2,3)

Construction of granular sub base by providing close graded material mixing in a mechanical plant at OMC, spreading in uniform layers with mortar grader on prepared surface and compaction with vibratory roller to achive the desire density complete

601. DRY LEAN CEMENT CONCRETE (SUB-BASE)
601.1. Scope

601.1.1. The work shall consist of construction of dry lean concrete sub base for cement concrete pavement in accordance with the requirements of these specifications and in conformity with the lines, grades and cross-sections shown on the drawings or as directed by the Engineer. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations, in connection with the work, as approved by the Engineer.

601.1.2. The design parameters of dry lean concrete sub-base, viz., width, thickness, grade of concrete, details of joints, if any, etc. shall be as stipulated in the Contract drawings.

601.2. Materials

601.2.1. Source of Materials: The Contractor shall indicate to the Engineer the source of all materials with relevant test data to be used in the lean concrete work sufficiently in advance and the approval of the Engineer for the same shall be obtained at least 45 days before the scheduled commencement of the work. If the Contractor later proposes to obtain the materials from a different source, he shall notify the Engineer for his approval at least 45 days before such materials are to be used.

601.2.2. Cement: Following types of cement may be used with prior approval of the Engineer :(i) Ordinary Portland Cement IS : 269 If the sub grade is found to consist of soluble sulphates in a concentration more than 0.5 percent, cement used shall be sulphate resistant and shall conform to IS: 6909. Cement to be used may preferably be obtained in bulk form. It shall be stored in

accordance with stipulations contained in Clause 1014 and shall be subjected to acceptance test prior to its immediate use.

601.2.3 Aggregates:

601.2.3.1. Aggregates for lean concrete shall be natural material complying with IS: 383.
The aggregates shall not be alkali reactive. The limits of deleterious materials shall not exceed the equirements set out in IS: 383. In case the Engineer considers that the aggregates are not free from dust, the same may be washed and drained for at least 72 hours before batching, as directed by the Engineer.

601.2.3.2. Coarse aggregate:
Coarse aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone or crushed gravel and shall be divided of pieces of disintegrated stone, soft, flaky, elongated, very angular or splintery pieces. The maximum size of the coarse aggregate shall be 25 mm. The coarse aggregate shall comply with Clause 602.2.4.2

601.2.3.3. Fine aggregate:
The fine aggregate shall consist of clean, natural sand or crushed stone sand or a combination of the two and shall conform to IS : 383. Fine aggregate shall be free from soft particles, clay, shale, loam, cemented particles, mica, organic and other foreign matter. The fine aggregate shall comply with Clause 602.2.4.3

601.2.3.4. The coarse and fine aggregates may be obtained in either of the following manner: (i) In separate nominal sizes of coarse and fine aggregates and mixed together intimately before use. (ii) Separately as 25 mm nominal single size, 12.5 mm nominal size graded aggregates and fine aggregate of crushed stone dust or sand or 3 combination of these two. The material after blending shall conform to the grading as indicated in Table 600-1.
TABLE 600-1 AGGREGATE GRADATION FOR DRY LEAN CONCRETE

Sieve Designation	**Percentage passing the sieve by weight**
26.50 mm	100
19.00 mm	80-100
9.50 mm	55-75
4.75 mm	35-60
600.00 micron	10-35
75.00 micron	0-3

601.2.4. Water:

Water used for mixing and curing of concrete shall be clean and free from injurious amounts of oil, salt, acid, vegetable matter or other substances harmful to the finished concrete. It shall meet the requirements stipulated in IS: 456.

601.2.5. Storage of materials:

All materials shall be stored in accordance with the provisions of Clause 1014 of these specifications and other relevant IS Specifications. All efforts must be made to store the materials in proper places so as to prevent their deterioration or contamination by foreign matter and to ensure their satisfactory quality and fitness for use in the work. The storage place must also permit easy inspection, removal and storage of materials. All such materials even though stored

in approved godown must be subjected to acceptance test immediately prior to their use. The requirement of storage yard specified in Clause 602.2.9 shall also be applicable.

601.3. Proportioning of Materials for the Mix

601.3.1. The mix shall be proportioned with a maximum aggregate cement ratio of 15: 1. The water content shall be adjusted to the optimum as per Clause 601.3.2 for facilitating compaction by rolling. The strength and density requirements of concrete shall be determined in accordance with Clause 601.6 by making trial mixes.

601.3.2. Moisture content:

The right amount of water for the lean concrete in the main work shall be decided so as to ensure full compaction under rolling and shall be assessed at the time of rolling the trial length. Too much water will cause the lean concrete to be heaving up before the wheels and picked up on the wheels of the roller and too little will lead to inadequate compaction, a low in-situ strength and an open-textured surface. The optimum, water content shall be determined and demonstrated by rolling during trial length construction and the optimum moisture content and degree of compaction shall be got approved from the Engineer. While laying in the main work, the lean concrete shall have a moisture content between the optimum and optimum +2 per cent, keeping in view the effectiveness of compaction achieved and to compensate for evaporation losses.

601.3.3. Cement content:

The minimum cement content in the lean concrete shall not be less than **150 kg/cu.m.** If this minimum cement content is not sufficient to produce concrete of the specified strength, it shall be increased as necessary without additional cost compensation to the Contractor.

601.3.4. Concrete strength:

The average compressive strength of each consecutive group of 5 cubes made in accordance with Clause 903.5.1.1 shall not be less than 10 MPa at 7 days. In addition, the minimum compressive strength of any individual cube shall not be less than 7.5 MPa at 7 days. The design mix complying with the above shall be got approved from the Engineer and demonstrated in the trial length construction.

601.4 Sub grade

The sub grade shall conform to the grades and cross sections shown on the drawings and shall be uniformly compacted to the design strength in accordance with these specifications and Specification stipulated in the Contract. The lean concrete sub base shall not be laid on a sub grade softened by rain after its final preparation; surface trenches and soft spots,if any, must be properly back-filled and compacted to avoid any weak or soft spot. As far as possible, the construction traffic shall be avoided on the prepared sub grade. A day before placing of the sub-base, the sub grade surface shall be given a fine spray of water and rolled with one or two passes of a smooth wheeled roller after a lapse of 2-3 hours in order to stabilize loose surface. If Engineer feels it necessary, another fine spray of water may be applied just before placing sub-base.

601.5. Construction

601.5.1. General:

The pace and program of the lean concrete sub-base construction shall be matching suitably with the program of construction of the cement concrete pavement over it. The sub-base shall be overlaid with cement concrete pavement only after 7 days after sub-base construction.

601.5.2. Batching and mixing:

The batching plant shall be capable of proportioning the materials by weight, each type of material being weighed separately in accordance with Clause 602.9.3.2. The cement from the bulk stock shall be weighed separately from the aggregates. The capacity of batching and mixing plant shall be at least 25 per cent higher than the proposed capacity for the laying arrangements. The batching and mixing shall be carried out preferably in a forced action central batching and mixing plant having necessary automatic controls to ensure
accurate proportioning and mixing. Other types of mixers shall be permitted subject to demonstration of their satisfactory performance during the trial length. The type and capacity of the plant shall be got approved by the Engineer before commencement of the trial length. The weighing balances shall be calibrated by weighing the aggregates, cement, water and admixtures physically either by weighing with large weighing machine or in a
weigh bridge. The accuracy of weighing scales of the batching plant shall be within ± 2 percent in the case of aggregates and ±1 per cent in the case of cement and water. The design features of Batching Plant should be such that the shifting operations of the plant will not take very long time when they are to be shifted from place to place with the progress of the work.

601.5.3. Transporting:

Plant mix lean concrete shall be discharged immediately from the mixer, transported directly to the point where it is to be laid and protected from the weather by covering the tippers/ dumpers with tarpaulin during transit. The concrete shall be transported by tipping trucks, sufficient in number to ensure a continuous supply of material to feed the laying equipment to work at a uniform speed and in an uninterrupted manner. The lead of the batching plant to paving site shall be such that the travel time available from mixing to paving
as specified in Clause 601.5.5.2 will be adhered to.

601.5.4. Placing:

Lean concrete shall be laid / placed by a paver. The equipment shall be capable of laying the material in one layer in an even manner without segregation, so that after compaction the total thickness is as specified. The paving machine shall have high amplitude tamping bars to give good initial compaction to the sub-base.
The laying of the two-lane road sub base may be done either in full width or lane by lane. Preferably the lean concrete shall be placed and compacted across the full width of the road, by constructing it in one go or in two lanes running forward simultaneously. Transverse and longitudinal construction joints shall be staggered by 500-1000 mm and 200-400 mm respectively from the corresponding joints in the overlaying concrete slabs.

601.5.5. Compaction
601.5.5.1. The compaction shall be carried out immediately after the material is laid and leveled. In order to ensure thorough compaction which is essential, rolling shall be continued on the full width till there is no further visible movement under the roller and the surface is closed. The minimum dry density obtained shall be 97 per cent of that achieved during the trial length construction vide Clause 601.7. The densities achieved at the edges i.e 0.5 m from the edge shall not be less than 95 per cent of that achieved during the trial construction vide Clause 601.7

601.5.5.2. The spreading, compacting and finishing of the lean concrete shall be carried out as rapidly as possible and the operation shall be so arranged as to ensure that the time between the mixing of the first batch of concrete in any transverse section of the layer and the final finishing of the same shall not exceed 90 minutes when the concrete temperature is above 25 and below 30 degree Celsius and 120 minutes if less than 25 degree Celsius. This period may be reviewed by the Engineer in the light of the results of the trial run but in no case shall it exceed 2 hours. Work shall not proceed when the temperature of the concrete exceeds 30 degree Celsius. If necessary, chilled water or addition of ice may be resorted to for bringing down the temperature. It is desirable to stop concreting when the ambient temperature is above 35°C. After compaction has been completed, roller shall not stand on the compacted surface for the duration of the curing period except during commencement of next day's work near the location where work was terminated the previous day.

601.5.5.3. Double drum smooth-wheeled vibratory rollers of minimum 80 to 100 KN static weights are considered to be suitable for rolling dry lean concrete. In case any other roller is proposed, the same shall be got approved from the Engineer, after demonstrating its performance. The number of passes required to obtain maximum compaction depends on the thickness of the lean concrete, the compatibility of the mix, and the weight and type of the roller etc. and the same as well as the total requirement of rollers for the job shall be determined during trial run by measuring the in-situ density and the scale of the work to be undertaken.

601.5.5.4. In addition to the number of passes required for compaction there shall be a preliminary pass without vibration to bed the lean concrete down and again a final pass without vibration to remove roller marks and to smoothen the surface. Special care and attention shall be exercised during compaction near joints, kerbs, channels, side forms and around gullies and manholes. In case adequate compaction is not achieved by the roller at these points, use of plate vibrator shall be made, if so directed by the Engineer.

601.5.5.5. The final lean concrete surface on completion of compaction and immediately before overlaying shall be well closed, free from movement under roller and free from ridges, low spots, cracks, loose material, pot holes, ruts or other defects. The final surface shall be inspected immediately on completion and all loose, segregated or defective areas shall be corrected by using fresh lean concrete material laid and compacted as per Specification. For repairing honeycombed surface, concrete with aggregates of size 10 mm and below shall be spread and compacted. It is necessary to check the level of the rolled surface for compliance. Any level/thickness deficiency should be corrected after applying concrete with aggregates of size 10 mm and below after roughening the surface. Similarly the surface regularity also should be checked with 3m straight edge. The deficiency should be made up with concrete with aggregates of size 10 mm and below.

601.5.5.6. Segregation of concrete in the dumpers shall be controlled by premixing each fraction of the aggregates before loading in the bin of the batching plant, by moving the dumper back and forth while discharging the mix on it and other means. Even paving operation shall be such that the mix does not segregate.

601.5.6. Joints: Contraction and longitudinal joints shall be provided as per the drawing. At longitudinal or transverse construction joints, unless vertical forms are used, the edge of compacted material shall be cut back to a vertical face where the correct thickness of the properly compacted material has been obtained.

601.5.7. Curing: As soon as the lean concrete surface is compacted, curing shall commence. One of the following two methods shall be adopted: (a) The initial curing shall be done by spraying

with liquid curing compound. The curing compound shall be white pigmented or transparent type with water retention index of 90
per cent when tested in accordance with BS 7542. Curing compound shall be sprayed immediately after rolling is complete. As soon as the curing compound has lost its tackiness, the surface shall be covered with wet hessian for three days. (b) Curing shall be done by covering the surface by gunny bags/hessian, which shall be
kept continuously moist for 7 days by sprinkling water.

601.6. Trial Mixes

The Contractor shall make trial mixes of dry lean concrete with moisture contents like 5.0, 5.5, 6.0, 6.5 and 7.0 per cent using cement content specified and the specified aggregate grading but without violating the requirement of aggregate-cement ratio specified in Clause 601.3.1. Optimum moisture and density shall be established by preparing cubes with varying moisture contents. Compaction of the mix shall be done in three layers with vibratory hammer fitted with a square or rectangular foot as described in Clause 903.5.1.1. After establishing the optimum moisture, a set of six cubes shall be cast at that moisture for the determination of compressive strength on the 3rd and the seventh day. Trial mixes shall be repeated if the strength is not satisfactory either by increasing cement content or using higher grade of cement. After the mix design is approved, the Contractor shall construct a trial section in accordance with Clause 601.7. If during the construction of the trial length, the optimum moisture content determined as above is found to be unsatisfactory, the Contractor may make suitable changes in the moisture content to achieve a satisfactory mix. The cube specimens prepared with the changed moisture content should satisfy the strength requirement. Before production of the mix, natural moisture content of the aggregate should be determined on a day-to-day basis so that the moisture content could be adjusted. The mix finally designed should neither stick to the rollers nor become too dry resulting in ravelling of surface.

601.7. Trial Length

601.7.1. The trial length shall be constructed at least 14 days in advance of the proposed date of commencement of work. At least 30 days prior to the construction of the trial length, the Contractor shall submit for the Engineer's approval a "Method Statement" giving detailed description of the proposed materials, plant, equipment, mix proportion, and procedure for batching, mixing, laying, compaction and other construction procedures. The Engineer shall also approve the location and length of trial construction which shall be a minimum of 60m length and for full width of the pavement. The trial length shall contain die construction of at
least one transverse construction joint involving hardened concrete and freshly laid sub base. The construction of trial length will be repeated till the Contractor proves his ability to satisfactorily construct the sub base.

601.7.2. In order to determine and demonstrate the optimum moisture content which results in the maximum dry density of the mix compacted by the rolling equipment and the minimum cement content that is necessary to achieve the strength stipulated in the drawing, trial mixes shall be prepared as per Clause 601.6.

601.7.3. After the construction of the trial length, the in-situ density of the freshly laid material shall be determined by sand replacement method with 20 cm dia density cone. Three density holes shall be made at locations equally spaced along a diagonal that bisects the trial length; average of these densities shall be determined. These main density holes shall not be made in the strip 50 cm from the edges. The average density obtained from the three samples collected shall be the reference density and is considered as 100 per cent. The field density of regular work will be compared with this reference density in accordance with Clauses 601.5.5.1 and 903.5.1.2.

A few cores may be cut as per the instructions of the Engineer to check segregation or any other deficiency.

601.7.4. The hardened concrete shall be cut over 3 m width and reversed to inspect the bottom surface for any segregation taking place. The trial length shall be constructed after making necessary changes in the gradation of the mix to eliminate segregation of the mix. The lower surface shall not have honey-combing and the aggregates shall not be held loosely at the edges.

601.7.5. The trial length shall be outside the main works. The main work shall not start until the trial length has been approved by the Engineer. After approval has been given, the materials, mix proportions, moisture content, mixing, laying, compaction plant and construction procedures shall not be changed without the approval of the Engineer.

601.8. Tolerances for Surface Regularity, Level, Thickness, Density and Strength

The tolerances for surface regularity, level, thickness, density and strength shall conform to the requirements given in Clause 903.5. Control of quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

601.9. Traffic

No heavy commercial vehicles like trucks and buses shall be permitted on the lean concrete sub-base after its construction. Light vehicles if unavoidable may, however, be allowed after 7 days of its construction with prior approval of the Engineer.

601.10. Measurements for Payment

The unit of measurement for dry lean concrete pavement shall be the cubic metre of concrete placed, based on the net plan areas for the specified thickness shown on the drawings or as directed by the Engineer.

601.11. Rate

The Contract unit rate payable for dry lean concrete sub-base shall be payment in full for carrying out the required operations including full compensation for all labour, materials and equipment, mixing, transport, placing, compacting, finishing, curing, testing and incidentals to complete the work as per Specifications, all royalties, fees, storage and rents where necessary and all leads and lifts.

PLUMBING

Description no: -54

For Sub Estimate-1A (Item-53), For Sub Estimate-3 (Item-52), For Sub Estimate-6 (Item-39)

Providing and fixing wash down water closet (uropean type WCpan) with sit cover including jet spray and stop cock

1.0 Materials:

1.1 The European Water Closet shall consist of a Wash down closet in white glazed or coloured earthenware with integral "P" or "S" trap as specified.

b. Rubber joints for inlet connection.

c. Black or any other colour of solid plastic seat and cover with chromiumplatedhinges and rubber buffers as specified

2.0 Workmanship

2.1. The pan shall be sunk into the floor and embedded in a cushion of average15cm.cement concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate or brickaggregate 40 mm. nominal size) or as specified. This concrete shall be left 115 mm below the top level of the pan so as to allow for flooring and its bed concrete.

The floorshould be suitably sloped so that the waste water is drained into the pan. The pan shallbe provided with 100 mm. 'P' or 'S' traps with approximately 50 mm. seal. The jointsbetween the pan and the trap shall be made leak-proof with cement mortar 1: 1 (1cement: 1 fine sand).

2.2 The whole work is to be carried out necessary supply, fixing etc of required size, shape, color, as per the instructions and to the satisfaction of engineer in charge

3.0. Mode of measurements & payment

3.1. The rate shall include the cost of all materials and labours involved in the operations described under workmanship.

3:2. The 'P' of 'S' trap shall include and not be paid separately.

3.3. The rate shall be for a unit of one number

Description no:-55

For Sub Estimate-1A (Item-55), For Sub Estimate-3 (Item-53), For Sub Estimate-6 (Item-40)

Prove & fixing wash basin with single hole for pillar tap at all floor levels, with C.I. or M.S. Brackets painted white including cutting holes & making good the same excluding fittings (A) vitreous china flat wash basin 550 mm x 400 mm size of approved colour with C.P. Brass waste for washbasin. 32 mm Dia

Wash basin shall be of white porcelain first quality best Indian make and it shallconform to IS: latest edition. The size of the wash basin shall be as specified in theitem. Wash basin shall be of one piece construction with continued over flowarrangements. All internal angles shall be designed so as to facilitate cleaning. Washbasin shall have single `
tap hole or two holes as specified. Each basin shall have acircular waste hole which is either related or beveled internally with 65 mm diameterat top and 10 mm depth to suit the waste fitting. The necessary stud slot to receivethe bracket on the underside of the basin shall be provided. Basin shall have aninternal soap holder recess which shall fully drain into the bowl.White glazed pedestal of the quality and color as that of the basin shall be providedwhere specified in the item. It shall be completely recessed at the back for

receptionof supply and wash pipe. It shall be capable of supporting the basin rigidly andadequately and shall be so designed as to make the height from the floor to top ofthe rim of basin 410 mm to 800 mm as directed.

Description no:-56

For Sub Estimate-1A (Item-56), For Sub Estimate-3 (Item-54), For Sub Estimate-6 (Item-42)

Providing & fixing screw down stop tap (A) 15 mm dia.

1.0. Materials:
15 mm. dia. brass screw down with bright polished finished shall conform to I.S. 7811977.The bib cock shall be best Indian make and quality.

2.0. Workmanship:
2.1.The screw down bib cock 15 mm. as specified above shall be Fixed as directed.The threaded portion shall besmeared with white or red lead and around with a Few turns of fine-spun yarn round the screwed end of the pipe. The bib cock shall be then screwed and fixed to water tight position.

3.0. Mode of measurements and payment
3.1. The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item.
3.2. The rate shall be for a unit of One Number.

Description no:-57

For Sub Estimate-1A (Item-58), For Sub Estimate-3 (Item-55), For Sub Estimate-6 (Item-44)

Providing and fixing chromium plate bottle trap with necessary coupling of approved quality for wash-basin.

Material:
The flushing valve Brass Chromium platted push cock or handle type with flushing, ofsheetall brand or approved quality, size is to be supplied and fixed as per therequirement. The whole work is to be carried out as per the instructions and to thesatisfaction of engineer in charge.
Mode of measurements & payment
The rate shall be paid for a unit of one number basis.

Description no:-58

For Sub Estimate-1A (Item-54), For Sub Estimate-3(Item-56), For Sub Estimate-6 (Item-45), For Sub Estimate-7 (Item-67)

Providing and fixing Urinal of approved quality including connection with trap and with integral longitudinal flush pipe and brass screw down stop tap.(A) 15mm dia.(A) Squating plate pattern white earthenware 550mm x 300mm.

Material:

The urinal shall be of approved quality including connecting the urinal withwaste pipe, tap etc. complete of required size, shape, color etc. Complete as per theInstructions of engineer-in-charge.

Mode of measurements & payment

The rate shall be for a unit of One Unit

Description no:-59

For Sub Estimate-3 (Item-57), For Sub Estimate-6 (Item-46)

Prove & fixing 600 mm x 450mm Bevelled edge mirror of superior glass at all floor levels, mounted on 6mm .thick A.C. sheet or plywood sheet in P.V.C. box type frame & fixed to wooden plugs with C.P. brass screws and washers etc.

1.0. Materials

1.1. The600mmx450mmsize mirrors will be of superior glass with edge rounded offer beveled as specified. Itshall be free from flaws specks, or bubble sand its thickness shall to be less than 6mm. The glass for the mirror shall be uniformly silver plated at the back and shall be free from silvering defects Silvering shall have a protective uniform covering of red load paint. The 6mm thick plywood shall conform to M-37.The 6mm. thick A.C.sheets shall conform to M-24.

2.0. Workmanship

2.1. The mirror of 600mmx450mm.size mounted on A.C.Sheet or plywood 6mmthick with C.P. brass clips shall be fixed as directed, by fixing wooden plugs in wall and C.P brass screw sand washers. The work shall be carried out in best work man like manner.

3.0. Mode of measurements & payment

3.1. The rate includes cost of all labour and materials, tools and plant etc.Required for satisfactory completion ofthis item. The rate shall be for a unit of one number.

Description no:-60

For Sub Estimate-3 (Item-58)

White porselin Kitchen Sink size 60/450/200 mm with supply and fitting.

Materials:

The C.P. bass waste trap and unions shall be of 32 mm dia and of best quality and make as approved by the Engineer in charge.

Workmanship

C.P. brass waste trap and union shall be connected to 32 mm dia. Waste pipe which shall be suitably bend towards the wall and which shall discharge into drain through a floor trap. The C.P. brass waste trap shall be provided for wash basin or sink as the case may be.

Mode of measurements and payment

The rate includes all labours and providing C.P. Brass waste trap and union including waste coupling of 32 mm dia. The rate excludes the cost of waste pipe of 32 mm dia.

The rate shall be for a unit of one number.

Description no:-61

For Sub Estimate-1A (Item-73), For Sub Estimate-3(Item-57), For Sub Estimate-6 (Item-47)

Providing and fixing PVC SWR Nahni trap IS 14375 for drain - 100 mm diameter with jali of the following nominal diameter of self cleansing deign with C.I. scread down or hinged grating including the cost of cutting and making good of the wall.

1. Materials

1.1. The cast iron (spun) Nahni trap shall conform to M-69.The C.I. hinged or screwed down cover shall be of best quality

2.0. Workmanship

2.1. The Nahni trap with 100mm diainletand 50mm diaoutlet shall be fixed as per drawing or as directed.

2.2. The Nahni trap shall be jointed with C.I. Pipe, 75mm. dia. with lead joints. The lead joints shall be done inconformation with I.S.782.-1976.

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour, materials, toolsand plants etc. required for satisfactory completion of this item including lead, jointing and testing.

3.2. The rate shall be for a unit of one number.

Description no:-62

For Sub Estimate-1A (Item-67 to 69), For Sub Estimate-1B (Item-32,33), For Sub Estimate-2C (Item-8), For Sub Estimate-2 (Item-38), For Sub Estimate-2E (Item-10),For Sub Estimate-3(Item-60,61), For Sub Estimate-6 (Item-48,49), For Sub Estimate-7 (Item-64), For Sub Estimate-10 (Item-38,39), For Sub Estimate-11 (Item-23,24)

Providing, laying and jointing in true line and level 50mm, 75mm, 110mmdiametre U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 75 mm diametre x 114 mm length x 145 mm heigh at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials.

1.0Material

The low density polythene pipe of specified diameter with 6 kg/sq.cm working pressure shall conform to IS: 3076-Latest Edition. The specifically s and fittings required shall be of best quality.

2.0Workmanship

The PVC pipes of specified diameter shall be fixed as directed. Due to thermal expansion of rigid PVC pipes, due allowance shall be made particularly in over ground pipelines forany change in length of pipeline which may occur during installation or when pipeline is in

serviceAbove ground installation of rigid PVC pipe should be undertaken after preparations are observed for their protection against direct sun rays and mechanical damage.
The rigid PVC pipe lines should not be kept exposed above ground when it passes through public places, railway lines, road side and footpaths.
PVC pipes shall be supported at the following intervals.20 mm dia 500 mm 25 mm dia 750 mm32 mm dia 900 mm Close support spacing shall be provided if recommended by the manufacturer.The guidelines indicated by the manufacturer regarding handling, transportation, storing, laying and jointing of pipes shall be kept in view during execution.
PVC pipes shall be fixed on wall with wooden plugs and suitable plastic clamp.

Jointing the Pipes:

The pipes and sockets shall be accurately cut. The ends of the pipes and fittings should be absolutely free from dirt and dust. The outside surface of the pipes and the inside of the fittings shall then be roughened with emery paper, and then solvent cement joint. Since solvent cement is aggressive to PVC care must be taken to avoid applying excessive cement to the inside of pipe sockets as any surplus cement cannot be wiped off after jointing. Empty solvent cement tins, brushes, rags, or paper unpronated with cement should not be buried in the trenches. They should be gathered not left scattered about, as they can prove to be a hazard to animals, which may chew them.
If any manufacturer recommends its own methods of jointing the same shall be adopted after necessary approval from the engineer-in-charge.

Laying of pipes in trenches:

The pipes shall be laid over uniform relatively soft fine grained soil found to be free of presence of hard objects such as large flints, rocky projections, large tree roots etc. The width of the trenches shall be minimum width required for working.
The pipes laid underground shall not be less than one meter from the ground level. They pipe shall be positioned in the trenches so as to avoid any induced stressed due to deflection. Any deviation required shall be obtained by using proper type of rubber ring joints.

Mode of measurements and payment

The relevant specifications of item 2.32(A) shall be followed except that the PVC pipes of specified dia shall be paid under this item.
The unit rate shall be for a unit of one running meter.

Description no:-63

For Sub Estimate-1A (Item-72), For Sub Estimate-3(Item-62), For Sub Estimate-6 (Item-50)

Providing and fixing S.W. Gully trap with C.I. grating brick masonry chamber and water tight C.I. cover with frame of 300 x 300 mm size (inside)with standard weight Square mouth Traps. (A) 100 X 100 mm Size – P type.

1.0. Materials:

(1) Water shall conform to M-1. (2) Cement mortar of proportion 1:5 shall conform to M-11. (3) Burnt brick shall conform to M-15. (4) The S.W. Galley trap of 100 mm. x 100 mm. size shall confirm to M-70.

2.0. Workmanship

2.1. Excavation for gulley trap shall be done true to dimensions and levels as indicated on plans or as directed. The excavation work shall generally be done as per relevant specifications of item 4.0.0.of earth work.

2.2. Fixing:

2.2.1. The gully trap shall be fixed over cement concrete 1:5:10 (1cement: 5 sand: 10 graded brick bats aggregate40 mm nominal size) foundation. 650 square and 100 mm. thick thedepth of top of concrete below the ground level shall be 675 mm. The jointing of gulley outlet to the branch drain shall be done similar to jointing of S.W. pipe ac described in item No. 24.1 (A)
2.3.Brickmasonry chamberAfter fixing and testing gulley and branchdrain, a brickmasonry300x 330mm. inside with bricks in CM 1:5 (1 cement : 5sand)shallbebuilt with a100mm. Brick work round OH; gulley trap from the top ofbed concrete up to ground level. The space between the chamber walls andthe trap shall be filled with cement concrete 1:5:10. The upper portion of the chamber i.e. above the top level of the trap shall be plastered inside with cement mortar 1:3 (1 cement: 3 sand) finished with floating coat of neat cement. The corners and bottom of the chamber shall be rounded of so as to slope towards the grating.
2.4. C.I. cover with frame 300 mm x 300 mm. (inside) size shall then be fixed on the top of the brick masonry with C.C. 1:2:4 (1 lent : 2 coarse sand : 4 graded aggregate 20 mm. nominal size) 40 mm. thick and rendered smooth. The finished top of the cover shall be left about 40 mm. above the adjoining ground level so as to exclude the surface water from entering the gulley trap.

3.0. Mode of measurements & payment
3.1. The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item as described above.
3.2. The rate shall be for a unit of one number basis.

Description no:-64

For Sub Estimate-1A (Item-78), For Sub Estimate-3(Item-63), For Sub Estimate-6 (Item-51), For Sub Estimate-2D (Item-17)

Constructing brick masonry chambrs for underground C I Inspection Chamber and bends with bricks having crushing strength not less than 35kg/sq cm in C.M. 1:5 C I cover with frame (light duty)455x610mm internal dimention total weight of cover with frame to be not less than 38kg RCC top slab with CC 1:2:4 mix (1,cement : 2,coarse sand: 4,graded aggregate 20 mm size) foundation concrete 1:5:10 inside plaster 15mm thick with C.M. 1:3 finish smooth with finishing coat of neat cement on walls and bed concrete etc (inside dimentions 500mm x 700mm x & 450mm deep) for single pipe lines with one of two inlets.

1.0. Materials: Water shall conform to M-1.Cement shall conform to M-3Coarse sand shall conform to M-5. Brick shall conform to M-15.Stone aggregate shall conform to M-12.Brick bat shall conform to M-14M.S.bar shall conform to M-18.

2.0. Workmanship
2.1. C.I. inspection chamber with provision of C.I. bends of specified size with bolts, nuts and felt washers for underground drain shall be enclosed in masonry chamber which shall be constructed asunder:
2.2. The excavation shall be done true to dimensions and level shown in one the plans oras directed.
2.3. Bed concrete shallbe15.Cms, thickC.C.1:5:10(1cement:5Coarse sand: 10 graded brick bat aggregates.The projection of bed concrete beyond the masonry walls shall be7.5cms.

2.4. Masonry walls and plaster work shall carried out.Out as per relevant specifications of item
24.40.
2.5. The cover slab shall be constructed as per relevant specifications of 24.27(I).

3.0. Mode of measurements and payment
3.1. The earth work in excavation, providing and laying C.I. inspection chamber and bends shall be measured and paid for separately.
3.2. The rate shall be for a unit of one number.

Description no:-65

For Sub Estimate-1A (Item-74,75), For Sub Estimate-3(Item-64), For Sub Estimate-6 (Item-52), For Sub Estimate-10 (Item-40), For Sub Estimate-11 (Item-25)

Providing and laying (to leve or slope)and jointing with stuff mixture of cement mortar in proportion 1:1 solt glazed stoneware pipes following normal diameters incl. testing of pipes and joints complete(B) 150mm stoneware pipes

1.0. Materials
Water shall conform to M-1(2) Cement mortar of proportion 1:1 shall conform to M-11.(3) 100mm. dia. and 150mm dia.glazed stone ware pipe shall conformtoM-71.

2.0. Workmanship
2.1. The trenches for stone ware pipe drains shall be carried out as per relevant specifications of itemNo.23.4 (A) Except that the work is for stone ware pipes of 100mm diaand 150mm dia**.**
2. Laying:
2.2.1. The pipes shall be laid accurately and perfectly true to line level sand gradients, great care shall be taken to prevents and etc. from entering the pipes. The pipes between two man holes shall be laid truly in a straight line without vertical or horizontal undulation. All junctions and changes indirection and diameter shall be made inSide man holes by means of curved tapered channels formed in Cement concrete finished smooth and benched on both sides. The body of the pipe shall rest for it entire length, on a even level bed grips being made or left on the bed to receive the sockets of the pipes.
2.3. Jointing:
2.3.1. Tarred gask in or yarn soaked in neat cement slurry shall first be placed around these pipe got to each pipe andthese pipe got shall then be placed well home into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and asking caulked home so as to fill not morethan1/4thofthetotal depth or(13mm. in depth)of the socket.
2.3.2. The remainder of the sockets shall be filled with stiff mixture of cement mortarin proportion of on part ofcement and one part of sharp sand. When the socket is fillet, a filled shall be formed round the joints with a trowel, forming an angle of 450 with the barrel of the pipe.
2.3.3. The mortar shall be mixed as necessary for immediate use.
2.3.4. After the joint is made, any extra neous materials shall be removed from the inside of the joints with a suitableScraper or "badger". The newly made joints shall be protected, until set, from the sun, dry winds, rain or frost, sacking or other suitable materials which shall be used for the purpose.
2.3.5. The mortar shall be cured for10days.

2.4. Testing of Joints:
2.4.1. If any leakage is visible the defective part of the work shall be made good at no extra cost. The pipe line shall be tested as directed.
2.4.2. As light amount of sweating which is uniform may be overlooked, but excessive sweating from a particular pipe or joints shall be watched for and taken as indicating a defect to be made good.

3.0. Mode of measurements and payment
3.1. Pounding or buttering of the fit trenches bed to the lower part of the pipe and" Grips" dug to takesocket, collars etc. are included in the rate of laying the pipes.
3.2. The measurements shall be net without any allowance for cutting, and waste. The length of bends, junctions, and other connections shall be included in the to all length of the drain pipes. Nothing extra shall be paid for the same. The rate includes necessary excavation refilling trenches etc. complete.
3.3. The rate shall be for a unit of one running meter.

Description no:-66

For Sub Estimate-1A (Item-76,77), For Sub Estimate-3(Item-65), For Sub Estimate-6 (Item-53), For Sub Estimate-10 (Item-41), For Sub Estimate-11 (Item-26)

Providing and laying CC 1:5:10(1,cement : 5,fine sand : 10draded stone aggregate 40 mm normal size) Bedding for Stoneware Pipes of following internal diameter with necessaty formwork and curing complete (A) 150mm pipes

1.0. Materials: (1) Water shall conformtoM-1(2) Cement shall conform to M-3.(3) Sand shallconform to M-6 (4)Stone aggregate 40 run nominal size shall conformtoM-12.

2.0. Workmanship
2.1. The relevant specifications of item 5.3.4.shall be followed except that the concrete work shall be carried out in trenches as bedding for stone ware pipes.The width of concrete shall be 300 mm. and average thickness of bedding shall be 112 mm the concrete shall be brought up attest to the invert level of the pipe to form a cradle and to avoid line contact between the pipe and the bed.

3.0.Modeof measurements & payment
3.1. The rate includes cost of all labourand materials required for satisfactory completion of this item.
3.2. The rate includes cost of necessary form work required if any
3.3. The rate shall be for a unit of one running meter.

Description no:-67

For Sub Estimate-1A (Item-62 to 66), For Sub Estimate-3 (Item-66,67,68), For Sub Estimate-6 (Item-55,56,57)

Providing laying and jointing in true line and level (15mm,25mm,32mm) dia. U.P.V.C. Pipe (SCH- 40) for cold water including fittings make PRINCE / SUPREME / ASTRAL / FINOLEX or equivalent as approved by Engineer In Charge. Pipe shall be fixed on the wall with the help of clamp at every two metre C/C or shall be concelled as directed including necessary fittings etc.

including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials.

1.0. Materials:
UPVC / CPVC pipes shall confirm of Schedule-40/80 of any standard brand & quality and make as approved by the Engineer-in- charge.

2.0. Workman ship:
2.2. Fixing of the tube fitting to wall ceiling and Poor's:
2.2.1. In case of fixing of tubes and fillings to the wall s or ceiling, these shall run on the surface of the wall or ceiling(not in chase) unless otherwise specified. The fixing shall be done by means of standard pattern, holder clamps keeping the pipes about 15 mm clear of the wall. When it is found necessary to conceal the pipes and when specified so, chasing may be adopted or pipe fixed in duets or resesses etc. provided that there is sufficient space to work on the pipe with usual tools. The pipe shall not ordinarily be buried in walls or solid floors, where unavoidable, pipes may be buried for short distances provided. That adequate protection is given against damage and where so required joints are not buried. Where required M.S. tubes leave shall be fixed at a place a pipe is passing through a wall or floor for expansion and contraction and other movements. In case The pipe is embedded in walls or floors, it should be painted with anti-corrosive bitu mastic paint of approved quality. The pipe should not come in contact with lime mortar or lime concrete as the pipe is affected by lime. Under the floors, the pipe shall be laid in layer of sand filling.
2.2.2. All pipes and fittings shall be fixed truly vertical and horizontal unless un avoid able. The pipes shall be fixed to walls with standard pattern clamps of required size and shape, one end of which shall be properly plugged or cemented into walls with cement mortar1:3(1cement:3 coarse sand) and the other tightened round the pipes to hold it securely. These clamps shall be spaced at regular intervals in straight leng that 2 M C/C interval in horizontal run and 2.5M.interval in vertical run. For pipe of 15 mm dia. Up to 25mm.dia.the holes in the walls and floors shall be made by drilling with chisel or jumper and not by dismantling the brickwork or concrete. However for bigger diameter pipes, the holes shall be carefully made of the smallest required size. After fixing the pipe the holes shall be made good with cement mortar1:3(1cement:3 coarse sand) and properly finished to match the adjacent surface.
2.3. Testing of joints:
2.3.1. After laying and jointing, the pipes and fittings shall be in spected under working conditions of pressure and flow. Any joint found leaking shall be re done, and al leaking pipes removed and replaced without extra cost.
2.3.2. The pipes and fillings as they are laid shall be tested to hydraulic pressure of 6Kg./sq.cm. The pipe shall be slowly and carefully Charged with water allowing all air lo escape and avoiding all shock and water hammer. The draw off takes and stop cock shall then be closed and specified hydraulic pressure shall be applied gradually. The pressure gauge must be accurate.

The pipes and fillings shall be tested in sections as the work of laying proceeds keeping the joints exposed for inspection during the testing.

3.0. Mode of measurements & payment:

3.1. The description of each item shall unless otherwise stated, beheld to include where necessary, conveyance, and delivery, handling, unloading, storing fabrication, hoisting, all

labour for finishing to required shape and size; testing, fitting in position, straight, culling and waste, return of packing etc

3.2. The length shall be measured on running meter basis of finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed lo walls, ceiling, floors etc. shall be measured and paid under this item.

3.3. All the work shall be measured in decimal system as fixed in its place, subject to tolerance given below unless otherwise stated:

(i) Dimension shall be measured to the nearest 0.01meter, (ii)Area shall be worked out to the nearest 0.01sq.meter.

3.4. All measurements of culling shall unless otherwise stated be held to include the consequent waste.

3.5.In case of filling of un equal bore, the largest bore shall be measured for the test

3.6.Testing of pipe lines filling sand joints include for providing all plant and appliances necessary for obtaining access to the work to be tested and carrying out the tests.

3.7.The rate includes galvanized steel tubing with screwed socket joints, together with all fittings(such as bends, sockets, springs, elbows, tees, crosses, short pieces, Clamp sand plugs unions etc.) and fixing complete with clamping wall-hooks, wooden Plugs etc. and also cutting, screwing and waste and for making forged (orhandmad)bends on piping as required. Connector shall be inserted, where required or directed.

The rate also includes cutting through walls, floors etc. and their making good and painting exposed threads with anti-corrosive paint as above and testing. Whore lubes arclobe fixed to wall, Ceiling and flooring, the rate shall not include painting of pipes, providing sleeve sands and Oiling under floor for which separate payment shall be made.

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

Description no:-68

For Sub Estimate-3 (Item-70), For Sub Estimate-6 (Item-58)

Providing and fixing M.I. fisher union for wash basin or sink. 32 mm dia.

Materials

The 32 mm dia M.I. fisher union shall be of best quality and make as approved by the Engineer in charge.

Workmanship:

The 32 mm dia M.I. fisher union shall be fixed to wash basin or sink in best workman like manner.

Mode of measurements & payment

The rate includes all labours and materials, tools and plants, etc. required for satisfactory completion of the Description.

The rate shall be for a unit of one number

Description no:-69

For Sub Estimate-3 (Item-71,72,73), For Sub Estimate-6 (Item-60,61)

Providing and fixing gun metal check or non return full way wheel valve at all floor levels, etc. complete. 15mm Dia. , 25mm Dia.

Materials:
The gunmetal check or non-return full way wheel valve of specified dia. Shall conform to I.S. 778 1964. The non-return valve shall be of tested quality.

Workmanship:
The gunmetal check or non-return valve shall be fully cleared of all foreign matter before fixing.

The fixing of valve shall be done by means of bolts nuts and3 mm rubber insertions with flanges of spigot and socketed tailpieces, drilled to the same specification as in case of socket and spigot and with flanges in case of flanged pipes. The jointing shall be done leak proof.

Mode of measurements and payment:
The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this Description.

The rate shall be for a unit of one number.

Description no:-70

For Sub Estimate-6 (Item-63), For Sub Estimate-2D (Item-16)

Providing and fixing Gun metal check or non-return fullway wheel valve.(D) 32mm dia.

Materials:
The gunmetal check or non-return full way wheel valve of specified dia. Shall conform to I.S. 778 1964. The non-return valve shall be of tested quality.

Workmanship:
The gunmetal check or non-return valve shall be fully cleared of all foreign matter before fixing.

The fixing of valve shall be done by means of bolts nuts and3 mm rubber insertions with flanges of spigot and socketed tailpieces, drilled to the same specification as in case of socket and spigot and with flanges in case of flanged pipes. The jointing shall be done leak proof.

Mode of measurements and payment:
The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this Description.

The rate shall be for a unit of one number.

Description no:-71

For Sub Estimate-1A (Item-84), For Sub Estimate-3 (Item-74), For Sub Estimate-5 (Item-16), For Sub Estimate-6 (Item-64), For Sub Estimate-10 (Item-42), For Sub Estimate-2D (Item-21,23,25)

RCC precast cover with supply, fitting, fixing with complete as per specification 10 ton size 700/700/90mm.

Manufacture, supply delivery at Contractor's store at site of work and fixing on top of manhole precast RCC M.20 Frame & cover suitable to drainage M.H. and as per type design including cost of reinforcement M.S. Angles or Flat, curing, mold work etc.

General Specification
R.C.C Precast manhole frame & cover shall be manufacture as per standard type design. Frame shall confirm to IS : 12592 part – II – 1991. Cover shall confirm to IS : 12592 part – I – 1988.

Inspection
Inspection of materials will be carried out at work site by the Engineer. Who shall carry out inspection as soon as material is brought on work site. Inspection will be carried out normally within one week time. The supplier has to take care of the following points.
(1) The manufacturer has to go in for one line stenciling for identifying size and class for proper separation.
(2) The unloaded material has to be stacked in manageable batches with adequate inspection space like spreading the pieces etc to permit proper inspection.

Transit Risk
The contractor shall bring goods at his own risk or it should be covered against the transit risk at its own cost.

TEST CERTIFICATE
The contractor shall always provide manufacturer's test certificate in accordance with every batch/lot of goods so manufactured and supplied.
The supplier shall also produce in addition to manufacturer's test certificate as mentioned in above, the inspection certificate issued by Engineer for the same purpose.

Mode of measurements & payment:
The rate includes all labours-, materials, tools and plant etc. required for satisfactory completion of this item as directed above.
The rate shall be for a unit of one number.

Description no:-72

For Sub Estimate-1A (Item-83), For Sub Estimate-3 (Item-75), For Sub Estimate-5 (Item-17), For Sub Estimate-6 (Item-65), For Sub Estimate-10 (Item-43), For Sub Estimate-11 (Item-27), For Sub Estimate-2D (Item-22,25,26)

RCC precast frame with supply, fitting, fixing with complete as per specification 10 ton size 700/700/90mm.

i) GENERAL: - The R.C.C. pre-cast manhole cover shall confirm to IS –12592 / 2002or its latest version and as per detailed Drawing attached herewith.

ii) SHAPES &DIMENSIONS:-
Shapes: - The shapes of pre-cast M.H. covers shall be circular only and 10 and20 MT capacity for MHS and 5MT for HC chambers.
ii.a) DIMENSION& TOLERANCES: - length, breadth &diameter of pre-cast concrete manhole covers shall be such that the maximum clearance at top between theframe& the cover shall be 5mm. The minimum thickness of HD, MD &LDCovers shall be 90, 70 & 60 mm respectively.

ii.a.i) GRADES AND TYPES:
Manhole covers and frames shall be of the following four grades and types:
Grade Designation Type/ Shape of Cover
Light Duty LD-5 Rectangular, Square, Circular
Medium Duty MD-10 Rectangular, Circular
Heavy Duty HD-20 Rectangular (Scrapper Manhole), Square, Circular Lamp hole
Extra Heavy Duty EHD-35 Rectangular (Scrapper Manhole), Square and Circular
i.a.ii) Recommended locations for placement of different grades and types/shapes of manhole covers and frames are as given in ii.a.
i.a.ii.a) LD-5 Rectangular, Square or Circular TypesSuitable for use within residential and institutional complexes / areas withpedestrian but occasional light motor vehicle traffic. These are also usedfor 'Inspection chambers'.
i.a.ii.b) MD 10 Circular or Rectangular Types
Suitable for use in service lanes / roads, on pavements for use under medium duty vehicular traffic including for car parking areas.
i.a.ii.c) HD - 20 Circular,Lamp hole, Square or Rectangular (Scrap per Manhole) Types.
Suitable for use in institutional / commercial areas / carriageways / city trunk roads/bus terminals with heavy duty vehicular traffic of wheel load between 50to 100 KN, like buses, trucks and parking areas and where the manholechambers are located in between the pavement and the middle of theroad.

iii) SAMPLE:- The contractor shall get approved sample of R.C.C. pre-cast M.H. Cover & frame & house connection chamber frame and covers and shall supplymaterials as per approved samples from approved factory.

iv) TESTS: - The contractor / manufacturer at his own cost shall give all the required tests of RCC manhole cover and frame and all the testing facilities shall be keptopen for the officers of RMC / Engineer-In-Charge at his factory.

v) RESPONSIBILITY: - The contractor shall be responsible for the materials for a period of defect liability period. After payment of final bill of the work and duringthis period he will be responsible for defects in the materials & for road accidentsdue to defective M.H. / H.C.C. Frame & covers. He shall have to replace defectivematerials during this period at his cost.

vi) LETTER OF COMMITMENT:- Contractor shall have to provide the letter of commitment in favor of Rajkot Municipal Corporation from the standard manufacturer of RCC Pre-cast M.H. / H.C.C.frame and covers to supply the desired quantity given in the e Tender document in time (i.e. well in advance not to remain any manhole or chamber open at site of work afterconstruction) with all quality control. Manufacturer shall have a long experience for preparing the RCC Pre-cast M.H. / H.C.C. frame and covers of all types i.e. HD, MD and LD as per the relevant I.S. Code of practice. A supply Schedule shall be submitted immediately on receipt of work Order.
vii) R.C.C. Manhole Covers And Frames, Following Points Should Be Considered
The Rate shall be paid per Number basis.

Description no:-73

For Sub Estimate-1A (Item-80), For Sub Estimate-3 (Item-76), For Sub Estimate-6 (Item-66), For Sub Estimate-7 (Item-66), For Sub Estimate-11 (Item-28)

Providing erecting and fixing double coated Syntex or equivalent PVC (ISI) mark water tank of required capacity each with all necessary fittings and connection etc. complete.

MATERIALS AND WORKMANSHIP:
Overhead water tanks “Reno” of" Syntax "or equivalent of cylindrical vertical tanks with closed top with of self-supported type having approved grade of polyethylene, molded to seamless sand suitable for potable water tank of capacity as mentioned in Schedule-B as per company's dimensions provided with G.I.fittings of size 25mm Dia for inlet,outlet,over flow and scour connections and float valves etc. complete placed with all fittings fixing as directed by engineer in charge.
The rate for this work will be paid per Liter basis.

Description No. 74

For Sub Estimate-2D (Item-12,13)

Providing, Lowering and laying R.C.C. NP2 Class pipe in cement mortar in proportion 1:1 of following nominal internal diameters including testing of pipes and joints etc. complete. (A) 150 mm. dia.

Materials:
The reinforced concrete light duty non-pressure pipes of specified diameter shall conform to I.S.458 latest embedment.

Workmanship:
Excavation
The excavation in trenches shall be for reinforced concrete pipes for specified diameter.

Laying:
The pipes shall be lowered into the trenches carefully, Mechanical appliances may be used. Where necessary pipe shall be laid in straight lines or with easy curves and true to line and gradient as specified. The laying of pipe shall precede upgrade of a slope. In the pipe with loose collar, the collars shall be slipped on before the next pipe is laid.

In case where the foundation conditions are unusual such as the proximity of trees or holes, under existing or proposed around in 150 mm thick cement concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40mmnominalsize) or compacted sand or gravel.

In case where the natural foundation is inadequate the pipe shall be laid either in concrete cradle, supported on proper foundation or on any other suitably designed structure. If concrete bedding issued, the depth of concrete below bottom of the pipe shall be at least $1/4^{th}$ of the internal diameter of the pipe subject to a minimum of 100 mm and maximum 300 mm. The concrete shall be extended up to the sides of the pipe at least a distance of $1/4^{th}$ of the out sided diameter for pipes 300mm and over in diameter.

The pipes shall be laid in the concrete bedding before the concrete has set. Pipes laid in trenches in earth shall be bedded evenly and firmly as far as up to the haunches of the pipe as to safely transit the load expected from the backfill through the pipe to the end. This shall be done either by excavating the bottom of the trenches to fit the curve of the pipe or by compacting the earth

under round curve of the pipe to form an even bed. Necessary provision shall be made for joints wherever required.

Jointing:
The joints shall be done by slipping the collar over and clear of the end of the pipe. The recess of the end of the pipe shall be filled with jute threading dipped in hot bitumen. The new pipe shall then be brought forwarded until bitumen ring in recess of first pipe is set into the recess of the second pipe. This process shall be repeated for two or three pipes which shall then be jacked up so as to thoroughly compress the bitumen. The quantity of jute and bitumen shall be just enough to fill the recess when pressed hard by jacking care being taken that no off set of the jute braiding shall be visible either enough to fill the recess when pressed hard by jacking care being taken that no offset of the jute braiding shall be visible either outside or inside of pipe. The collar shall then be set up over the joints covering equally both the pipe and leaving an even caulking space all around cement and sand mortar 1:1 ½ shall then be well punched or pressed home with a caulking tool within the caulking space. Care shall be taken that the underside of the joints is properly filled with mortar.

Curing:
Every joint shall be kept wet for about 10 days for maturing, the section of the pipe line laid and jointed shall be covered immediately to protect from weather effects, Minimum bore of 100 mm is considered adequate.

The joints shall be left exposed for observation.

Testing of joints:
The pipeline shall be tested as directed.
If any leakage is visible, the defective part of the work shall be made food at no extra cost.

A slight amount of sweating which is uniform may be overlooked, but excessive scatting forma particular pipe or joints shall be watched for and taken as indicating a defect to be made good.

Mode of measurements and payment:
Pounding or bottoming of the net without any allowance for cutting and waste. The length of bends, junctions and other connections shall be included in the total length of the drainpipes. Nothing extra shall be paid for the same. The rate includes necessary excavation refilling trenches etc. complete.
Except that the rate includes for laying (to level or slope in trenches etc. measured separately) making the joints as indicate and testing the stand the water test.

The measurements shall be net without any allowance for cutting and waste. The length of bends, junctions and other connections (measured along the centre line) shall be including in the total length of the pipe, the connections being numbered afterwards and paid for extra over pipes.

The size of bends, junctions etc shall suit the size of pipe. The bore (internal diameter of pipe) shall be the criterion for payment.

Nothing extra shall be paid separately for the use of mechanical appliances, where necessary, as described above.

The rate shall be for a unit of one running meter.

Description No. 75

For Sub Estimate-1A (Item-79), For Sub Estimate-2D (Item-19)

Constructing Manhole with R.C.C. top slab in 1:2:4 mix (1-cement :2-coarse sand : 4-graded stone aggregate 20mm nominal size) foundation concrete 1:3:6 mix (1-cement : 3- coarse sand :6-Brick bats 40 + 50mm size) inside plastering 15mm thick with Cement Mortar 1:5 (1-Cement : 5-coarse sand) finished with a floating coat of neat cement and making channels in cement concrete 1:2:4 mix (1-Cement :2-Coarse sand :4-stone aggregate 20mm nominal size) finished smooth complete including curing and festing (i) Inside size 900mm x 1200mm and 1.5M. deep including C.I. cover with frame size 560mm diameter total weight of cover and frame to be not less than 128 kgs. (Wt. of cover 64 Kg. and Wt. of frame 64 Kg.)(A) With 230mm thick walls of brick msonry using brick having crushing strength not less than 35Kg. / Sq.cm. in Cement Mortar 1:5 (1- Cement: 5-Coarse sand) (2)B type depth 1.50 Metre for 150mm diameter sewer.

A type depth 0.90 meter for 150mm.sewer
B type depth 1.50 meter for 150mm.sewer
C type depth 2.25 meterfor 150mm.sewer
D type depth 3.15 meter for 150mm.sewer

1.0.Materials: Water shall conform to M-1.Cement shall conform to M-3. Burnt bricks shall conform to M-15.Brick bats of 40 to 50mm. size shall conform to M-14. Stone coarse aggregate of 20mm. nominal size shall conform to M-12. Grit shall conform to M-8. Cement mortar of specified proportion shall conform to M-11. The cast iron manhole covers of 560 mm. dia. with frame shall conform to I.S.1726-1966.

2.0.Workmanship

2.1. The man holes of different type sand sizes as specified shall be constructed in sewer line at such place sandto such levels and dimension as shown in drawings of as directed.

2.2. The manholes shall be built on a bed of cementconcrete1:3:6(1cement:3coarsesand:6brick bats)(40to 50mm.nominal size)to the thickness of the bed concrete shallbe 15cms.ForManhole up to 1.M.depth and 20cms.for manholes over meter and up to over meter and up to 2 meters, depth and 30cms.for manhole so greater depth.

2.2.2. Projection of bed concrete beyond the masonry wall shall be 15cms.

2.3.Walls

2.3.1. The wall so man hole shall be carried out with burnt bricks using having bricks. Crushing strength not lessthan 35Kg/Cmsin C.M.2 in C.M.1:5(1cement:5coarsesand).The thickness of brick masonry wall shall be 230mm. The jointing face of such. Brick shall be well buttered with cement mortar before lying so as to ensure a full joint.

2.4. Plaster

2.4.1. The inside of width shall be plastered15mm thick withC.M.1:5(1cement: 5coarsesand) and finished withFloating coat of neat cement.

All angles shall be rounded to 7.50cmsradius and all rendered internal surfaces shall have hard impervious finish obtained by using a steel trowel. The external joints of masonry shall be finished smooth.

2.5.Channels& Benching:

2.5.1. Channels shall be semicircular in the bottom half and of diameter equal to the sewer. Above the horizontaldiameter, the sides shall beextended vertically to the same level asthe crown of the outgoing pipe and the topedge shall be suitably rounded off.

The branch channelssnailalsobe similarly constructed with respect to the benching but at their junction with the main channel an appropriate fall suitably rounded off in the direction of flow' he main channel shall be given.

2.5.2. The channel and benching shall be done inC.C.1:2:4 (1cement:2coarsesand:4graded stone aggregate 20mm. nominal size) rising at a sloping line fromedges of channel. The channels of the bottom of the chamber shall be plastered with C.M.1:2(1cement:2 coarse sand) and steel troweled smooth.

2.6.Cover slab:

2.6.1. The cover slab of R.C.C.1:2:4(1cement: 2courses:4gradedstoneaggregate20mm.nominal size)15cms thick reinforced with 10mm bar sat15cms C/C bothways, surface and edges finished fair. Full in R.C.C. slab so that the top of the framer mains flush with the top of R.C.C. slab.

2.7. Testing:

2.7.1. Man hole shall be tested by filling with water to a depth not exceeding1.2M as directed.

2.7.2. After completion of work, man hole cover shall be sealed by means of thick grease.

3.0. Mode of measurements and payment

3.1. The depth of manholes shall be distance between the top of the manhole cover and the invert level of themaindrain. The rate includes all labours, materials, tools, and plant etc. required for satisfactory completion of this item as directed above.

3.2. The rate shall be for a unit of the one number.

Description No. 76

For Sub Estimate-1A (Item-59,60,61), For Sub Estimate-6 (Item-43)

Brass wheel valve 25mm, 40mm, 50mm dia. fitting with fixing.

As per BOQ Specification

Mode of Measurements & Payment

The rate shall before unit of one Cubic meter.

Description No. 77

For Sub Estimate-1A (Item-59,60,61)

Providing laying and jointing in true line and level 50mm dia. U.P.V.C. Pipe (SCH- 40) for cold water including fittings make PRINCE / SUPREME / ASTRAL / FINOLEX or equivalent as approved by Engineer In Charge. Pipe shall be fixed on the wall with the help of clamp at every two metre C/C or shall be concelled as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials.

1.0. Materials:

UPVC / CPVC pipes shall confirm of Schedule-40/80 of any standard brand & quality and make as approved by the Engineer-in- charge.

2.0. Workman ship:

2.2. Fixing of the tube fitting to wall ceiling and Poor's:
2.2.1.In case of fixing of tubes and fillings to the wall s or ceiling, these shall run on the surface of the wall or ceiling(not in chase) unless otherwise specified. The fixing shall be done by means of standard pattern, holder clamps keeping the pipes about 15 mm clear of the wall. When it is found necessary to conceal the pipes andwhen specified so, chasing may be adopted or pipe fixed in duets or resesses etc. provided that there is sufficient space to work on the pipe with usual tools. The pipe shall not ordinarily be buried in walls or solid floors, where unavoidable, pipes may be buried for short distances provided. That adequate protection is given against damage and where so required joints are not buried. Where required M.S. tubes leave shall be fixed at a place a pipe is passing through a wall or floor for expansion and contraction and other movements. In case The pipe is embedded in walls or floors, it should be painted with anti-corrosive bitu mastic paint of approved quality. The pipe should not come in contact with lime mortar or lime concrete as the pipe is affected by lime. Under the floors, the pipe shall be laid in layer of sand filling.
2.2.2. All pipes and fittings shall be fixed truly vertical and horizontal unless un avoid able. The pipes shall be fixed to walls with standard pattern clamps of required size and shape, one end of which shall be properly plugged or cemented into walls with cement mortar1:3(1cement:3 coarse sand) and the other tightened round the pipes to hold it securely. These clamps shall be spaced at regular intervals in straight leng that 2 M C/C interval in horizontal run and 2.5M.interval in vertical run. For pipe of 15 mm dia. Up to 25mm.dia.the holes in the walls and floors shall be made by drilling with chisel or jumper and not by dismantling the brickwork or concrete. However for bigger diameter pipes, the holes shall be carefully made of the smallest required size. After fixing the pipe the holes shall be made good with cement mortar1:3(1cement:3 coarse sand) and properly finished to match the adjacent surface.
2.3. Testing of joints:
2.3.1. After laying and jointing, the pipes and fittings shall be in spected under working conditions of pressure and flow. Any joint found leaking shall be re done, and al leaking pipes removed and replaced without extra cost.
2.3.2. The pipes and fillings as they are laid shall be tested to hydraulic pressure of 6Kg./sq.cm. The pipe shall be slowly and carefully Charged with water allowing all air lo escape and avoiding all shock and water hammer. The draw off takes and stop cock shall then be closed and specified hydraulic pressure shall be applied gradually. The pressure gauge must be accurate.
The pipes and fillings shall be tested in sections as the work of laying proceeds keeping the joints exposed for inspection during the testing.

Mode of measurements & payment:

3.1. The description of each item shall unless otherwise stated, beheld to include where necessary, conveyance, and delivery, handling, unloading, storing fabrication, hoisting, all labour for finishing to required shape and size; testing, fitting in position, straight, culling and waste, return of packing etc
3.2. The length shall be measured on running meter basis of finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed lo walls, ceiling, floors etc. shall be measured and paid under this item.
3.3. All the work shall be measured in decimal system as fixed in its place, subject to tolerance given below unless otherwise stated:
(i) Dimension shall be measured to the nearest 0.01meter, (ii)Area shall be worked out to the nearest 0.01sq.meter.

3.4. All measurements of culling shall unless otherwise stated be held to include the consequent waste.
3.5.In case of filling of un equal bore, the largest bore shall be measured for the test
3.6.Testing of pipe lines filling sand joints include for providing all plant and appliances necessary for obtaining access to the work to be tested and carrying out the tests.
3.7.The rate includes galvanized steel tubing with screwed socket joints, together with all fittings(such as bends, sockets, springs, elbows, tees, crosses, short pieces, Clamp sand plugs unions etc.) and fixing complete with clamping wall-hooks, wooden Plugs etc. and also cutting, screwing and waste and for making forged (orhandmad)bends on piping as required. Connector shall be inserted, where required or directed.
The rate also includes cutting through walls, floors etc. and their making good and painting exposed threads with anti-corrosive paint as above and testing. Whore lubes arclobe fixed to wall, Ceiling and flooring, the rate shall not include painting of pipes, providing sleeve sands and Oiling under floor for which separate payment shall be made.
3.8. The rate shall be for a unit of one Running meter.

Description No. 78

For Sub Estimate-1A (Item-70,71)

supply and fixing PVC cowel

This work shall consist of fixing 100 & 75 mm PVC cowel Vent of approved brand and manufacture as approved by the Engineer in charge.

1.0 Mode of measurements & payment

1.1 The rate shall be for a unit of One Number.

Description No. 79

For Sub Estimate-1A (Item-82)

Providing and fixing PTMT liquid soap container 109mm wide, 125mm high and 112mm distance from wallof standard shape with bracket of the same material with snap fitting of approved quality and colour weighing not less than 105 gms.

As per standard Specification soap dish chromium plated with brackets fixed to wooden cleats with CP brass screw fixing with all fitting & accessories to make the setup complete in all respect along with making wall good as req and complete in all respect.

1.0 MODE OF MEASUREMENT AND PAYMENT:

1.1 The rate shall be for unit of one number

Description No. 80

For Sub Estimate-1A (Item-31)

Providing PVC 100 mm diameter water spouts including necessary iron grating as per drawings

As per BOQ Specification

Mode of Measurements & Payment

The rate shall before unit of one Nos.

Description No. 81

For Sub Estimate-7 (Item-65)

Providing and fixing to wall, ceiling and floor galvanised Mild steel tubes (Medium grade) of the following nominal bore, tube fitting and clamps including making good the wall ceiling and floor.(F) 50mm

As per BOQ Specification

Mode of Measurements & Payment

The rate shall before unit of one Meter.

RAJKOT MUNICIPAL CORPORATION
SOLID WASTE MANAGEMENT

CONSTRUCTION OF ELEVATED SEMICLOSED BODY REFUSE TRANSFER STATION AT MOTAMAVA RAJKOT

E- TENDER

TENDER NOTICE NO : RMC/SWM/2023-24/34

4th Attempt

VOLUME: III

TECHNICAL SPECIFICATION

TO BE SUBMITTED TO:

Environment Engineer,
RAJKOT MUNICIPAL CORPORATION,
Dr. Ambedkar Bhavan, Dhebar Road
Rajkot-360001
GUJARAT

GENERAL NOTE FOR ALL COMPONENTS:

ALL CONCRETING WORK OF GRADE M200 (CONTROLLED CONC.) OR HIGHER SHALL ONLY BE DONE AT SITE BY READY MIX CONCRETE WITHOUT FLY ASH CONTENT FOR MORE THAN 1 CUM QUANTITY, UNDER SUPERVISION OF RMC / PMC / TPI REPRESENTATIVE. MIX DESIGN OF CONCRETE SHALL BE GOT APPROVED WITH ENGINEER IN CHARGE / CONSULTANT / TPI.

FIRE HYDRANT SYSTEM

Motor driven fire pumps:
End suction type, horizontally mounted centrifugal pump (as per IS 1520), TAC approved each capable to deliver 10.80 cum/hour (180 lpm) of clear water at minimum 70 M TDH, coupled to a suitably electric motor mounted on a common base frame and ant vibration pads coupling, coupling guard and fixing bolts etc. Motor HP to be suitably selected to suit minimum discharge and residual head at the top most hydrants. The characteristic curve should have a large range of discharge points for different heads.
C I Sluice Valve
C I components of the sluice valve shall be of Grey cast iron conforming to IS 210. The valves shall be flanged having solid wedge gate valve, inside screw, hand wheel with open-close indications etc all conforming to IS 780 but of nominal pressure rating of PN 1.6 as per TAC norms.
Test Pressure at manufacturers works
Flange drillings shall normally be as per IS 1538. However, if the manufacturer drills the flanges to other standard specifications, the valves shall be supplied with a pair of matching flanges, nuts, bolts, washers; rubber insertion etc and such flanges shall have inside threads to suit pipes of same nominal size as that of the valve.
G M Valves
Gun metal components of the peets valves i.e. Gate Valves, Check Valves i.e. non-return valves, and Globe valves etc shall be of Gun Metal conforming to Grade 2 of IS 318. The valves shall be having flanged or screwed ends, hand wheel with open-close indications etc all conforming to Class-2 Valves of IS 778 (ISI marked) or imported as per ASTM.
C I non return valves
C I reflux valves, i.e. swing check type non-return valves, shall be conforming to IS 5312. Test pressures shall be same as per CI sluice valves.
M S Pipes and Fittings
All M S pipes shall be as per IS 1239 (heavy/medium quality as mentioned in the schedule of items upto 150 mm N B, as per IS 3589 (minimum 6 mm thick) above 150 mm N B, and the fittings shall be of all welded construction, butt weld type flanges shall conform to IS 6392 and gaskets of synthetic moulded rubber approved by Fire Standard. All pipes outside the building shall be laid underground at a depth of 1 mtr (approx) and laying shall be as per layout drawing, excavation, back filling of earth, cutting holes in existing structure where necessary, providing puddle collars/pipes as required & making good the damages including making the concerned portion of the structure water tight. Erection of over ground piping shall be complete with necessary pipe supports hangers with MS angles/plate/nut bolts/clamps etc with fabrication as required including providing MS puddle pipes/collars as required for punctures through walls/slabs etc. Erection of pipe lines shall also include chipping of wall; making holes inside RCC or brick walls, slabs and necessary civil works for restoration of the surface after completion of erection. The quoted tender rate shall include all the above works, as well as the cost of route markers for under ground pipe lines as per following specifications. Route marker with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) of size 60 cm x 60 cm at bottoms and 50 cm x 50 cm at the top with a thickness of 10 cm including inscription duly engraved as required (spacing approx 15 mtrs or as

directed at site). No extra payment will be made on this account.
Pressure Gauges
Pressure gauges with controlling cocks etc shall be of approved make having pressure range, bourdon material and dial size as specified in schedule of items.
Pressure Switches
Pressure switches with accessories shall be of approved make and design and shall actuate (`cut-off' and/or `make contact' as required) at pre-set pressures.
Landing Valves (Hydrant Valve)
Gun metal landing valve (internal/external Fire-Hydrants) with oblique type single outlet as per schedule of quantities complete with hose coupling adaptor of 63 mm size, instantaneous spring lock arrangement and blank cap with chain conforming to IS 5290. External Fire-Hydrants to be provided with stand posts as specified in schedule of quantities. Orifice plates may be provided where inlet pressure is required to be reduced as per WBFS requirement.
Branch Pipe
Gun metal, short type, instantaneous pattern branch pipe to suit fire hose delivery coupling of 63 mm size complete with G M nozzle of 20 mm nominal size conforming to IS 903.
Hose with Coupling
63 mm nominal internal dia hose, rubber lined woven - jacketed coupling with Type-II (Reinforced Rubber lined type) of IS 636, fire fighting delivery hose 15 M long each, fitted with gun metal coupling of 63 mm size with multi serrated tail and double instantaneous spring lock arrangement comprising of male half at one end and female half at other end complete with rubber cup washer and conforming to IS 903.
Hose Reel
Swinging hose reel conforming to IS 884 & comprising of 3 ply rubber hose of length specified in schedule of items, 20 mm (3/4") nominal bore (25 kg/cm2/350 psi bursting pressure), mild steel pressed reel with 170 degree swinging, nozzle of G M chromium plated, with non-jamming controlling handle which shall stay at the `ON' `OFF' position as set, wall brackets with `U' shaped reel carrier made of C I complete with 25 mm NB G M valve at the inlet, and orifice plates (if necessary for reducing pressure).
Air Vessel
Mild steel air vessel adequate size to take care of pressure surges during operation of the system and venting of entrapped air in the system shall be complete with air relief valve, pressure gauge, drain valve and shutt off valve at the inlet.
Valve Chamber
Valve chamber of adequate size to accommodate external valves shall be constructed as directed per site condition.
Fire-Brigade Connections
Fire-Brigade connections (inlets) to Riser and Under Ground Reservoir shall be with two numbers of 63 mm instantaneous inlets for each connection as per TAC norms. Other aspects of the connection shall be as per IS 904.
Painting
All external steel surfaces shall be thoroughly cleaned to remove rust, scale etc before applying the primer.
All underground piping shall be provided protective wrappings as per TAC norms.
All over ground piping/hose boxes/landing valves/hose reel, M S frames etc shall be painted with two (2) coats of RED LEAD primer or equivalent followed by two coats of Post Office Red coloured Synthetic enamel finish paint.
All other equipment shall be given a red oxide/zinc chromate primer and two (2) coats of synthetic enamel.

GENERAL SPECIFICATION FOR ELECTRICAL INSTALLATION WORK

Below list of items arelikely to be used in the project. However, final capacity/size/rating etc shall be decided during detailed engineering and they should be got approved from EIC.

This list should be considered as technical specifications .For any query or discrepancy follow the detail tender specifications or IS Rules decision of EIC shall be final and binding.

The list below are indicative, not exhaustive. Necessary items required to be added for satisfactory completion of the project should be considered as part of the scope of work.

1.0 INTERNAL WIRING

This section covers, definition of point wiring, system of wiring and supply, installation, connection, testing and commissioning of point wiring for light points, ceiling fan points, exhaust fan points, convenience socket outlet points, power socket outlet points etc. including fixing of light fixtures, ceiling fan, exhaust fan, wall fan etc.

1.1 STANDARDS

The following standards and rules shall be applicable:

STANDARD NO.	**PARTICULAR**
IS : 732	Code of practice for electrical wiring installation (System voltage not exceeding 650 V)
IS : 1646	Code of practice for fire safety of buildings (General) Electrical installation.
IS : 2509	Rigid non-metallic conduits for electrical wiring.
IS : 6946	Flexible (Pliable) non-metallic conduits for electrical installation.
IS : 1293	3 pin plugs and sockets.
IS : 8130	Specifications of conduits for electrical installation.
IS : 3854	Switches for domestic purpose.
IS : 3415	Fittings for rigid non-metallic conduits.
IS : 4648	Guide for electrical layout in residential building Indian electricity act and rules.

Regulations for the electrical equipment in buildings issued by the Bombay Regional Council of Insurance Association of India.

All standards and codes mean the latest.

1.2 POINT WIRING

A point shall consist of the branch wiring from the distribution board together with a switch as required, including the ceiling rose or pendant holder or swan holder, or ceiling fan box or socket or suitable termination. A point shall include, in addition, the earth continuity conductor / wire

from the distribution board to the earth pin / stud of the outlet / switch box and to the outlet points.

The point wiring shall be carried out in the under mentioned manner :

1.2.1 Supply, installation, fixing of conduits with necessary accessories, junction / pull / inspection / switch boxes and outlet boxes.

1.2.2 Supplying and drawing of wires of required size including earth continuity wire.

1.2.3 Supply, installation and connection of flush type switches, sockets, cover plates, switch plates, etc.

1.2.4 The point shall be complete with the branch wiring from the Switch board to the outlet point, Pre laid conduit with accessories, junction, pull, inspection boxes, control switch, socket, outlet boxes, ceiling roses, button / swan holder, connector etc.

1.3 POINT RATE

The rate per point shall include supply, installation, connection, testing and commissioning of point as described under “point wiring”. The measurements of the points will be enumerated.

Circuit Mains shall not be paid extra. Rate for the point shall consist of wiring from the outlet point to the switch board as required with a connector/ plate/ ceiling rose fan box with hook socket with switch. The point rate shall include in addition to phase and neutral wire a PVC insulated earth continuity wire from switch to outlet. The unit rate for the point shall consist of the circuit wiring form LDB to outlet point through switch and/or socket, switch board as required and including the outlet points with connector, fan hook box or sockets. A point shall include in addition to phase and neutral wire a PVC insulated Earth continuity wire from LDB to the final termination at outlet points. No extra rate shall be paid for circuit mains for looping switch board to switch board.

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1.4 SYSTEM OF WIRING

Unless otherwise mentioned on the drawings, the system of point wiring shall be as follows:

The system of wiring shall consist of single core, PVC insulated, 650/1100 volt grade, copper conductor FRLS wires laid through concealed PVC conduits as directed.

1.5 GENERAL

The contractor shall submit for approval, the drawing of conduit layout indicating the route of the conduits, number and size of the conduits, location of junction / inspection / pull / outlet boxes, size and location of switch boxes, number and size of wires pulled through each conduit and all other necessary relevant details prior to laying of conduits. Only after the drawings are approved, the contractor shall proceed the work of conduit laying.

Prior to laying and fixing of conduits, the contractor shall carefully examine the working drawings prepared by him and approved by the Consultant indicating the layout, satisfy himself about the

sufficiency of number and sizes of conduits, location of junction boxes, sizes and location of switch boxes and other relevant details. Any discrepancy found in the drawings shall be brought to the notice of the Owner's site representative. Any modifications suggested by the contractor shall be gotten approved before the actual laying of conduits is commenced.

In laying of conduits it is important that not more than two right angle bends are provided for each circuit and as far as possible. No junction box shall be provided in the entire length of conduit run for drawing of wires. Only switch outlets, lighting fixture outlets, equipment power outlets and socket outlets shall be considered for drawing of wires.

1.6 MATERIAL

1.6.1 PVC CONDUITS :

All non-metallic PVC conduits shall conform to IS : 9537. The conduit shall be plan and type as specified in IS : 9537 and shall be used with the corresponding accessories (Refer IS : 3419 specification for fittings for rigid non PVC metallic conduits). PVC conduits shall be rigid unplasticised, medium gauge having 1.6 – 1.8 mm. wall thickness up to 20 mm. diameter conduit and 1.8 - 2 mm. wall thickness for all sizes above 20 mm. diameter.

1.6.2 BOXES :

All the boxes for switches, sockets and other receptacles, junction boxes, pull boxes and outlet boxes shall be fabricated from 2.0 mm. thick mild sheet painted with two coats of red-oxide and then two coats of enamel paints as called for. Colour of the paints shall be as approved by the client. The boxes shall have smooth external and internal finished surface. Boxes in contact with earth or exposed to the weather shall be of 2 mm. mild steel and hot dip galvanized after fabrication. Separate screwed earth terminal shall be provided in the box for earthing purpose. All boxes shall have adequate no. of knock out holes of required diameter for conduit entry. Switch boxes to receive switches, socket outlets, power outlets, telephone outlets, fan regulators, etc. shall be fabricated to the approved shape and size to accommodate all the devices without overcrowding. Outlet boxes to receive ceiling fan shall be fitted with adequately sized rod / hook to fix ceiling fan. The boxes shall be of minimum depth of 65 mm.

1.6.3 COVER PLATE:

The cover of the boxes to receive outlet points shall be of best anodized sheet cut to shape and size or plate of approved manufacturers of switches.

1.6.4 CABLES:

The cables shall conform to IS: 694. For all internal wiring FRLS wires of 650 / 1100 volts grade, single core shall be used.

The conductors shall be plain annealed copper conductors complying with IS : 1554.

The conductors shall be circular copper conductor.

The insulation shall be PVC complying with the requirements of IS : 694. It shall be applied by an extrusion process and shall form a compact homogenous body.

The thickness of PVC insulation shall be as set out in the relevant standards

The cores of all cables shall be identified by colours in accordance with the following sequence.

Single phase	-	Red
Three phase	-	Red, Yellow, Blue
Neutral	-	Black
Earth	-	Green or Green/Yellow

Means of identifying the manufacturer shall be provided throughout the length of cable.

Unless otherwise specified in the drawings the size of the cables used for internal wiring shall be as follows:

In case of circuit wiring for lights, exhaust fans, convenience socket outlet points (P+N+E) :
3 nos. of 1.5 mm.^{2} - From switch boards to outlet points

1.6.5 SWITCHES :

Switches shall conform to IS : 3854, IS : 1293 and IS : 4615. The switches shall be single pole, single or two way and shown on the drawings or as specified. They shall be of piano(tissino type) type rated for 250 volt, and of full 5 / 15 A capacity. They shall be provided with insulated dollies and covers.

The switches shall be rocker operated with a quite operating mechanism with bounce free snap action mechanism enclosed in an arc resistant chamber. The switches shall have pure silver and silver cadmium contacts. The switches shall be flush modular type The make of the switches shall be as indicated in the drawings or BOQ or make of material or as suggested and approved by the client. The switches installed in outdoor area shall be industrial, metal clad type, and shall be provided in weather proof enclosures, complete with weather proof gasketed covers.

1.6.6 SOCKETS :

The sockets shall conform to IS : 1293. Each socket shall be provided with control switch of appropriate rating. The sockets shall be piano(tissino type) type, rated for 250 volts, and either of full 5 A or 15 A capacity, as mentioned on the drawings.

Sockets shall be of three pin type, the third in being connected to earth continuity conductor. The socket shall be flush modular type. The sockets installed in machine room, plant room or wet / damp area shall be metal clad weather proof type. The finishing and make of all the sockets shall be same as light switch. The socket shall have fully sprung contacts and solid brass shrouded terminals to ensure positive electrical connections.

The sockets shall be provided with automatic shutters, which opens only when earth pit of the plug inserts in the socket.

The socket shall be provided with three pin plug top suitable to the socket and of the same make as socket.

1.7 DRAWING OF CONDUCTORS

The drawing and joining of copper conductor or wires shall be executed with due regard to the following precautions, while drawing insulated wires into the conduits, care shall be taken to avoid scratches and kinks which may cause breakage of conductors. There shall be no sharp bends.

Insulation shall be shaved off for a length of 15 mm at the end of wire like sharpening of a pencil and it shall not be removed by cutting it square or ringing.

PVC insulated copper conductor wire ends before connection shall be properly soldered (at least 15 mm length) with soldering flux / copper solder, for copper conductor. Strands of wires shall not be cut for connecting to the terminals. The connecting brass-screws shall have flat ends. All looped joints shall be soldered and connected through terminals block / connectors. The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less. Conductors having nominal cross section are exceeding 4 sq. mm shall always be provided with crimping type cable sockets. At all bolted terminals, brass flat washer of large area and approved steel spring washers shall be used. Brass nuts and bolts shall be used for all connections.

Only certified wire man and cable jointers shall be employed to do joining work.

For all internal wiring PVC insulated wires of 650 / 1100 volts grade shall be used. The sub-circuit wiring for point shall be carried out in looping system and no joint shall be allowed in the length of the conductors. No wire shall be drawn in to any conduit, until all work of any nature that may cause injury to wire is completed. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire. Before the wires are drawn into the conduits the conduits shall be thoroughly cleaned of moisture, dust, and dirt or any other obstruction by forcing compressed air through the conduits.
Maximum permissible number of 1100 volt grade PVC insulated wires that may be drawn into rigid non metallic or PVC Conduits are given below :

Size of wires Nominal Cross section Area (Sq. mm.)	**Maximum number of wires within conduit size(mm)**				
	20	**25**	**32**	**40**	**50**
1.5	5	10	14	--	--
2.5	5	8	12	--	--
4	3	7	10	--	--
6	2	5	8	--	--
10	--	3	5	6	--
16	--	2	3	--	6
25	--	--	2	4	6
35	--	--	--	3	5

1.8 JOINTS

The wiring shall be by looping back system, and hence all joints shall be made at main switches, distribution boards, socket outlets, lighting outlets and switch boxes only. **No joints shall be made inside conduits and junction boxes**. Joints where unavoidable , due to any specified reasons, prior permission in writing shall be obtained from the client before making such connections. Joints by twisting conductors are prohibited.

1.9 LOAD BALANCING

Balancing of circuit in three phase installation shall be planned before the commencement of wiring and shall be strictly adhered to.

1.10 EARTHING

All earthing systems shall be in accordance with IS : 3043 - 1985 code of practice for earthing.

1.11 TESTING OF INSTALLATION

Before a completed installation is put into service, the following tests shall be complied with.

1.11.1 INSULATION RESISTANCE

The insulation resistance shall be measured by applying 500 volt megger with all fuses in places, circuit breaker and all switches closed.

The insulation resistance in giga ohms of an installation, measured shall not be less than 50 mega ohms divided by the number of points on the circuit.

The insulation resistance shall be measured between
EARTH TO PHASE
EARTH TO NEUTRAL
PHASE TO NEURAL
PHASE TO PHASE

1.11.2 EARTH CONTINUITY PATH :

The earth continuity conductors shall be tested for electrical continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit-breaker, measured from the connection, with the earth electrode to any point in the earth continuity conductor in the completed installation and shall not exceed one ohm.

1.11.3 POLARITY OF SINGLE POLE SWITCHES :

A test shall be made to verify that every no-linked, single pole switch is connected to one of the phase of the supply system.

1.11.4 COMPLETION CERTIFICATES :

All the above tests shall be carried out in presence of client and the results shall be recorded in a prescribed forms. Any default during the testing shall be immediately rectified and that section of the installation shall be re tested. The completed test result from shall be submitted to the client for approval.

On completion of an electric installation a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in a prescribed form as required by the local electric supply authority.

2.0 DISTRIBUTION BOARDS

DISTRIBUTION BOARDS (DB's)

Distribution Boards (DB's) shall be suitable for operation on 3 Phase/single phase, 415/240 volts, 50 cycles, neutral grounded at transformer. The DB shall be minimum di-electric strength of 2.5 KV / Sec. All Distribution Boards shall manufactured by a manufacturer listed in Appendix-I.

DB's shall comply with the latest Relevant Indian Standards and Electricity Rules and Regulations and shall be as per IS-13947-1993.

2.1 CONSTRUCTION FEATURES

DB's shall be **IP 43**& made out of 1.6 mm thick high quality CRCA sheet steel and shall be pre-treated and powder coated sheet steel used in the construction of DB shall be folded and braced as necessary to provide a rigid support for all component. DB shall be suitable for indoor / outdoor installation, wall mounting free standing type, in double door construction. The Distribution Boards shall be totally enclosed, completely dust and vermin proof and shall be with hinged doors, Neoprene gasket, padlocking arrangement. All removable/ hinged doors and covers shall be grounded by 4.0 sq mm tinned stranded copper connectors. Distribution Boards shall be suitable for the climatic conditions. Joints of any kind in sheet metal shall be seam welded, all welding, slag shall be rounded off and welding pits wiped smooth with plumber metal. The general construction shall confirm to IS-8623-1977 (Part-1) for factory built assembled switchgear & control gear for voltage up to and including 1100 V AC.

All panels and covers shall be properly fitted and square with the frame, and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with wing nuts. Self threading screws shall not be used in the construction of DBs.

Three phase boards shall have phase barriers and a wire channel on three sides. Neutral bars shall be solid tinned copper insulated bars with tapped holes and chase headed screws. For 3

phase DB's, 3. Independent neutral insulated bars shall be provided. All DB's shall be internally pre-wired using copper insulated PVC wires brought to a terminal strip of appropriate rating for outgoing feeders.

Knockout holes of appropriate size and number shall be provided in the DB's in conformity with the location of cable/conduit connections. Detachable sheet steel gland plates shall be provided at the top / bottom to make holes for additional cable entry at site if required.

Distribution Boards shall comprises of the following:

1.1.1 A panel for mounting where appropriate incoming supply circuit breaker & other auxiliaries for Control & distribution as required.

1.1.2 Installation accessories shall be part of the DB for fixing conductor and rails for mounting MCB's and RCCB's etc.. neutral bus bars & earthing bus bars required in the circuit. All busbars in the FDB shall be insulated type.

1.1.3 Service cable /interconnection shall be part of the Distribution Boards.

1.1.4 The board shall be installed at a height such that the operating is within reach of the normal human height i.e. 1.2 to 1.8 meters from finish floor level.

1.1.5 Degree of protection shall be IP-52 for indoor application, IP-54 for kitchen & laundry and IP-55 for outdoor application.

1.1.6 All three phase distribution boards shall have 4 rows and single phase distribution boards shall have single rows for housing of MCB's and RCCB's unless noted otherwise.

1.1.7 Phase segregation to be maintained in all three phase distribution boards.

1.1.8 Earthing shall be provided in each FDB's.

2.2 MINIATURE CIRCUIT BREAKER (MCB)& MCCB

MCB

Miniature Circuit Breaker shall comply with IS-8828-1996/IEC898-1995. Miniature circuit breakers shall be quick make and break type for 240/415 VAC 50 Hz application with magnetic thermal release for over current and short circuit protection. The breaking capacity shall not be less than 10 KA at 415 VAC. MCBs shall be DIN mounted. The MCB shall be Current Limiting type (Class-3). MCBs shall be classified (B,C,D ref IS standard) as per their Tripping Characteristic curves defined by the manufacturer. The MCB shall have the minimum power loss (Watts) per pole defined as per the IS/IEC and the manufacturer shall publish the values. MCB shall ensure complete electrical isolation & downstream circuit or equipment when the MCB is switched OFF.

The housing shall be heat resistant and having a high impact strength. The terminals shall be protected against finger contact to IP20 Degree of protection. All DP, TP, TPN and 4 Pole miniature circuit breakers shall have a common trip bar independent to the

external operating handle.

MCB should be having an integrated label holder with dual side din rail locking facility. Incoming & Outgoing should have facility for termination of Busbar & Cable separately.

Cable termination facility should be up to 35 sq. mm.

MCCB

The MCCB shall be thermal magnetic having features of indication and protection for overload, short circuit, earth fault. MCCB should be confirming to IS 13947 or IEC-947.

Important Parameters

Sr No	Parameters	Data
1.	Rated Operating Voltage	500 V
2.	Rated Insulation Voltage	1000 V
3.	Rated Impulse Withstand voltage	8 Kv
4.	Rated ultimate short ckt breaking capacity @ 415V	35 kA
5.	Rated Short time withstand current for 1sec	35kA
6.	Rated Short time withstand current for 3 Seconds	--
7.	Rated short circuit making capacity @ 440V ac	105kA
8.	Protection range for over load and short circuit	from 40% to 100%
9.	Utilization category	B
10.	Mechanical Life operations without Maintenance	4000
11.	Mechanical Life operations with Maintenance	4000
12.	Electrical Life operations @ 440V without maintenance	4000
13.	Number of poles	3 or 4 as applicable

The MCCB shall be with protections and having various setting range as below with 2NO+2NC auxiliary contacts.

Protection	**Current Adjustment**	**Time Adjustment**
Overload (Ir)	0.4 – 1 times In	Min.5 Setting

Short circuit	1.5 – 10 times Ir.	Min 4 Setting
Instantaneous	1.5 – 11 times In	Fixed
Earth fault	0.2 – 1 times In	Min. 4 Setting

Following constructional features are required:

- Trip free mechanism
- Total segregation between power and front shield so as to guarantee maximum operational safety.
- Operating lever should indicate true position of contacts.
- Provision for ROH with door interlock facility and pad lock facility. Adjustable shaft for ROH.

2.3 RESIDUAL CURRENT CIRCUIT BREAKER CURRENT OPERATED TYPE (RCCB)

I. System of Operation

Residual Current Circuit Breaker shall confirm to IEC 61008.RCCB shall work on the principle of core balance transformer. The incoming shall pass through the torroidal core transformer. As long as the currents in the phase and neutral shall be the same, no electro motive force shall be generated in the secondary winding of the transformer. In the event of a leakage to earth, an unbalance shall be created which shall cause a current to be generated in the secondary winding, this current shall be fed to a highly sensitive miniature relay, which shall trip the circuit if the earth leakage current exceeds a predetermined critical value. RCCB shall be current operated independent of the line voltage, current sensitivity shall be of 30 / 100 mA at 240/415 volts AC and shall have a minimum of 20,000 electrical operations.

It should provide full protection as envisaged by IE rules – 61-A, 71 – ee, 73 – ee, 1985 and also rule 50 of IE rule1956.

II. Mechanical Operation

The moving contacts of the phases shall be mounted on a common bridge, actuated by a rugged toggle mechanism. Hence, the closing /opening of all the three phases shall occur simultaneously. This also shall ensure simultaneous opening of all the contacts under tripping conditions.

III. Neutral Advance Feature

The neutral moving contact shall be so mounted on the common bridge that, at the time of closing, the neutral shall make contact First before the phases; and at the time of opening, the

neutral shall breaks last after allowing the phases to open first. This is an important safety feature which is also required by regulations.

MCB should be having an integrated label holder with dual side din rail locking facility. Incoming & Outgoing should have facility for termination of Busbar & Cable separately.

Cable termination facility should be up to 35 sq. mm.

IV. Testing Provision

A test device shall be incorporated to check the integrity of the earth leakage detection system and the tripping mechanism. When the unit is connected to service, pressing the test knob shall trip the ELCB / RCCB and the operating handle shall move to the "OFF" position.

2.4 **EARTHING**

Earthing shall be provided as per IS:3043-1987.

2.5 **PAINTING**

All sheet steel work shall undergo a process of degreasing, pickling in acid, cold rinsing, phosphating, passivaiting (seven tank processing) and then painted with electrostatic paint (Powder coating). The shade of colour of panel inside/outside shall be of Siemens gray paint shade no. RAL-7032 of IS Code No.5.

2.6 **LABELS**

Engraved PVC labels shall be provided on all incoming and outgoing feeder. Circuit diagram showing the arrangements of the circuit inside the distribution panels shall be pasted on inside of the panel door and covered with transparent plastic sheet.

2.7 **TESTING**

Testing of panels shall be as per following codes:

IS: 8623 (Part -I) 1977 for factory built assemblies of switch gear for voltages upto and including 1000 VAC.

IS: 13947 : 1993 Degree of protection

2.8 **WIRING**

In wiring a distribution panel it shall be insured that total load of various distribution panel and/or consuming devices is divided evenly between the phases and number of ways as per Consultants drawing.

3.0 MEDIUM VOLTAGE CABLES

3.1 SCOPE

This section shall cover supply of medium voltage cables.

3.2 STANDARDS

The following standards and rules shall be applicable :

IS : 1554	PVC insulated electric cables (heavy duty).
IS : 1753	Aluminium conductors for insulated cables.
IS : 3961	Recommended current ratings for cables.
IS : 8130	Aluminium conductors for insulated cables

Indian Electricity Act and Rules.

3.3 MEASUREMENTS

The cables will be measured in meters. The unit rate shall include cutting the cable into required lengths, packing , loading , unloading, insurance, transportation, delivery to stores/site as per work order, stocking in stores, testing of cables at stores etc. of medium voltage cable.

3.4 GENERAL

The medium voltage cables shall be supplied, laid, connected, tested and commissioned in accordance with the drawings, specifications, relevant Indian Standards specifications, manufacturer's instructions. The cables shall be delivered at site in original drums with manufacturer's name, size, and type, clearly written on the drums.

3.5 MATERIAL

The MV cables shall be cross linked polyethylene (XLPE) insulated PVC sheathed of 1100 volts grade aluminium or copper conductor, armoured and unarmoured heavy duty, conforming to IS : 7098 Part I IS : 1988 Part I. as asked for in the schedule of quantities.

3.5.1 All XLPE Aluminium/Copper Power cables shall be 1100 Volts grade, multi core constructed as per IS : 7098 Part-I of 1988 as follows :

a) Stranded Aluminium /Copper conductor of high conductivity upto 4 mm.^{2} size, the conductor shall be solid and above 4 mm.^{2}, conductors shall be concentrically stranded as per IEC : 328.

b) Cores laid up

c) The inner sheath should be bonded over with thermo-plastic material for protection against mechanical and electrical damage.

d) Armoring should be provided over the inner sheath to guard against mechanical damage. Armouring should be Galvanised steel wires or galvanisedsteel strips. (In single core cables used in A.C. system armouring should be non-magnetic hard aluminium Wires/Strips. Round steel wires should be used where diameter over the inner sheath does not exceed 13 mm; above 13 mm flat steel armour should be used. Round wire of different sizes should be provided against specific request.)

e) The outer sheath should be specially formulated heat resistant black PVC compound conforming to the requirement of type ST2 of IS : 5831-1984 extruded to form the outer sheath.

3.5.2 Conductor shall be of electrolytic Aluminium/Copper conforming to IS : 8130 and are compact circular or compact shaped.

3.5.3 Insulation shall be of XLPE type as per latest IS general purpose insulation for maximum rated conductor temperature 70 degree centigrade.

3.5.4 In Inner sheath laid up cores shall be bonded over with thermoplastic material for protection against mechanical and electrical damage.

3.5.5 Insulation, inner sheath and outer sheath shall be applied by extrusion and lapping up process only.

3.5.6 Armouring shall be of galvanised steel wire/flat.

Galvanised steel flat strip / round wires applied helicaly in single layers complete with covering the assembly of cores.

For cable size upto 25 Sq. mm. : Armour of 1.4 mm dia G.I. round wire

For cable size above 25 Sq. mm. : Armour of 4 mm wide 0.8 mm thick G.I. strip

3.5.7 Repaired cables shall not be used.

3.5.8 Current ratings of the cables shall be as per IS : 3961.

3.5.9 The XLPE insulated cables shall conform to latest revision IS read along with this specifications. The Conductor shall be stranded Aluminium/Copper circular/ sector shaped and compacted. In multi core cables the core shall be identified by red, yellow, blue and black coloring of insulation as following.

CORE IDENTIFICATION :

Two core	:	Red and Black
Three core	:	Red, Yellow and Blue
Four core	:	Red, Yellow, Blue and Black
Single core	:	Green, Yellow for earthing

Black shall always be used for neutral.

3.5.10 The XLPE insulated 1100 Volts grade power cables shall conform to latest IS and shall be suitable for a steady conductor temperature of 70 degree centigrade. The conductor shall be stranded Aluminium/Copper as called for in the Schedule of quantities. The outer sheath shall be as per the requirement of type ST-2 of IS:5831 of 1984.

3.5.11 The cables shall be suitable for laying in racks, ducts, trenches, conduits and underground buried installation with uncontrolled back fill and chances of flooding by water.

3.5.12 Progressive automatic in line sequential marking of the length of cables in meters at every one meter shall be provided on the outer sheath of all cables.

3.5.13 Cables shall be supplied in non returnablewooden drums as per IS : 10418.

3.5.14 Both ends of the cables shall be properly sealed with PVC/Rubber caps so as to eliminate ingress of water during transportation, storage and erection.

3.5.15 The product should be coded as per IS :- 7098 Part-I as follows :-

Aluminium Conductor A

XLPE Insulation 2X

Steel round wire armour W

Steel strip armour F

Steel Double round wire armour WW

Steel Double strip armour FF

Non-magnetic (Al.) round wire armourWa

Non-magnetic (Al.) strip armour Fa

PVC outer sheath Y

3.6 GENERAL

All cables shall be adequately protected against any risk of mechanical damage to which they may be liable in normal conditions of handling during transportation, loading, unloading etc.

The cable shall be supplied in single length i.e. without any intermediate joint or cut unless specifically approved by the client.

The cable ends shall be suitably sealed against entry of moisture, dust, water etc. with cable compound as per standard practice.

3.7 TESTING

3.7.1 FINISHED CABLE TESTS AT MANUFACTURER'S WORKS :

The finished cables shall be tested at manufacturer's works. Following routine tests for each and every length of cable and copy of test results shall be furnished for each length of cable alongwith supply. If specified, the cables shall be tested in presence of clients representative.

(a) VOLTAGE TEST :

Each core of cable shall be tested at room temperature at 3 KV A.C. R.M.S. for a duration of 5 minutes.

(b) CONDUCTOR RESISTANCE TEST :

The D.C. Resistance of each conductor shall be measured at room temperature and the results shall be corrected to 20° c. to check the compliance with the values specified in IS 8130 - 1976.

Prior to dispatching cables, and at the time of delivering the cables at stores, following tests shall be carried our :-

Insulation Resistance test between phases and phase to Neutral and phase to earth.

Continuity test of all the phases, neutral and earth continuity conductor.

Sheathing continuity test.

Earth resistance test of all the phases and neutral.

All tests shall be carried out in accordance with relevant Indian Standard Code of practice and Indian Electricity Rules. The Vendor shall provide necessary instruments, equipments and labour for conducting the above test and shall bear all expenses in connection with such tests. All tests shall be carried our in the presence of the client and results shall be recorded in the prescribed forms.

3.8 CABLE MARKING

EMBOSSING ON OUTER SHEATH :

The outer sheath shall be legibly embossed with following legend :

ELECTRIC CABLE : 1100 V, SIZE : 3.5 C x ----- mm ^{2}.

Manufacturer's Name & year of manufacturing.

3.9 SEALING, DRUMMING& PACKING

After tests at the manufacturer's works, both ends of the cable shall be sealed to prevent the ingress of moisture during transportation and storage.

Cable shall supplied in length of 500 ± 10% meters on packed non-returnable drums of sufficiently sturdy construction.

Cables of length more than 250 meters shall also be supplied on non-returnable drums.

The spindle hole shall be 110 mm minimum diameter.

Each drum shall bear on the outside flange, legibly and indelibly in the English literature, a distinguishing number, the manufacturer's name and particulars of the cable i.e. voltage grade, length, conductor size, cable type, insulation type and gross weight shall also be clearly visible. The direction for rolling shall be indicated by an arrow. The drum flange shall also be marked with manufacturer's name and year of manufacturing etc.

4.0 LIGHTING FIXTURES & ACCESSORIES

The light fixtures and fittings shall be assembled and installed in position complete and ready for service, in accordance with details, drawings, manufacturer's instructions and to the satisfaction of the Project Manager.

4.1 SCOPE :

Scope of work under this section shall include inspection at suppliers/manufacturer's premises at site, receiving at site, safe storage, transportation from point of storage to point of erection, erection and commissioning of light fittings, fixtures and accessories including all necessary supports, brackets, down rods and painting etc as required.

4.2 STANDARDS :

The lighting and their associated accessories such as lamps, reflectors, housings, ballasts etc., shall comply with the latest applicable standards, more specifically the following:

General and safety requirements for Luminaries :

Part-1 Tubular fluorescent lamps	-	IS – 1913 (Part-1)
Bi-pin lamp holders for tubular fluorescent lamps	-	IS - 3323
Electronic Ballasts for fluorescent lamps – General & Safety requirement	-	IS – 13021 (Part-1)
Electronic Ballasts for fluorescent lamps – Performance requirement	-	IS – 13021 (Part-2)
Tubular Fluorescent lamps	-	IS - 2418 (Part-1to4)
Luminaries – General requirement	-	IS – 10332 (Part-1)
Luminaries – Constructional requirement	-	IS – 10332 (Part-2)
Luminaries – Screw and Screwless termination	-	IS – 10332 (Part-3)
Luminaries – Methods of Tests	-	IS – 10332 (Part-4)
Particular requirement – General purpose Luminaries	-	IS–10332(Part-5 / Sec - 1)
Particular requirement – Recessed Luminaries	-	IS–10332 (Part-5 / Sec – 2)
Particular requirement – Luminaries for Road and Street lighting	-	IS–10332 (Part-5/Sec-3)

Particular requirement – Portable General purpose Luminaries - IS–10332 (Part-5/Sec-4)

4.3 LIGHT FITTINGS-GENERAL REQUIREMENTS :

a). Fittings shall be designed for continuous trouble free operation under atmospheric conditions without reduction in lamp life or without deterioration of materials and internal wiring. Degree of protection of enclosure shall be IP-65 for outdoor fittings except bulkhead fitting. Bulkhead fitting shall be provided with IP-54 protection.

b) Fittings shall be so designed as to facilitate easy maintenance including cleaning, replacement of lamps/ ballasts.

c). All fittings shall be supplied complete with lamps. All mercury vapour and sodium vapour lamp fittings shall be complete with accessories like ballasts, power factor improvement capacitors, starters, etc. Out door type fittings shall be provided with weather proof junction boxes (IP-55) and IP-54 Control gear boxes.

d) Each fitting shall have a terminal block suitable for loop-out connection by 1100 V PVC insulated copper conductor wires up to 4 sq.mm. the internal wiring should be completed by the manufacturer by means of standard copper wire and terminated on the terminal block.

e) All hardwares used in the fitting shall be suitably plated or anodized and passivated.

f) Earthing : Each lighting fitting shall be provided with an earthing terminal. All metal or metal enclosed parts of the housing shall be bonded and connected to the earthing terminal so as to ensure satisfactory earthing continuity throughout the fixture.

g) Painting/Finish : All surfaces of the fittings shall be thoroughly cleaned and degreased and the fittings shall be free from scale, rust, sharp-edges, and burns.

h) The housing shall be powder coated/stove-enameled or anodised as required. The surface shall be scratch resistant and shall show no sign of cracking or flaking when bent through 90 deg. over 12 mm dia mandrel.

i) Metal used in BODY of lighting fixtures shall be not less than 32 SWG or heavier if so required to comply with specification of standards. Sheet steel reflectors shall have a thickness of not less than 20 SWG. The metal parts of the fixtures shall be completely free from burns and tool marks. Solder shall not be used as mechanical fastening device on any part of the fixture.

4.4. LIGHT FITTINGS – SPECIAL REQUIREMENTS

Box Channel Type Industrial Fittings

Box type slim line channel must be in screw less construction manufactured from M.S. CRCA sheet steel powder coated with MS CRCA cover, powder coated white. Light reflection surface in Box/Channel type fittings shall be in a POLYESTER PRECOATED STEEL having a reflection factor of not less than 80%. SCREWLESS DESIGN & CONSTRUCTION Light fixtures shall be preferred due to their ease of maintenance, especially for box/channel for box/channel type fixtures.

Moisture Proof Industrial Fittings

Surface mounted totally enclosed moisture proof fixtures must be in polycarbonate body and diffuser with transparent prismatic interior and smooth exterior and frosted end. Fixture must be completely sealed with polyerethane double gasket to achieve IP 65 protection. Fixture is complete with CRCA steel white powder coated / enameled finish reflector.

18 W / 36 W Fluorescent and 36 W CFL Low Glare Light Fittings

Recessed mounted, modular fluorescent lighting fixture made of CRCA Sheet steel powder coated (white) housing, electro chemically brightened and anodised reflector, three dimensional cross louvers with concave contours, fresnel top at louver saddle to increase efficiency. The luminance of <200 cd/M^2 at 63 degree viewing angle in all directions so as to confirm Cat-2 classification of CIBSELG3

4.5 ACCESSORIES FOR LIGHT FITTINGS REFLECTORS

The reflectors shall be made of CRCA sheet steel/aluminium /Silvered glass/Chromium plated sheet copper as required. The thickness of reflectors shall be as per relevant standards. Reflectors made of steel shall have stove enameled/ vitreous enameled/epoxy coating finish. Aluminium used for reflectors shall be anodized/epoxy stove enameled /mirror polished. The finish for the reflector shall be as specified. The reflectors shall be free from scratches / blisters and shall have a smooth and glossy surface having optimum light reflecting coefficient. Reflectors shall be readily removable from the housing for cleaning and maintenance without use of tools.

4.6 LAMPS

4.6.1 TLD

Lamp shall be environment friendly low pressure mercury discharge lamp with mercury content less than or equal to 5 mg. The lamp shall have minimum lumen maintenance of 85 and CRI of 85. The lamp must comply to ROSH (Restriction of Hazardous substances) and covered by WEEE. Lamp should be fully re-cyclable. The lamp should be low on maintenance with life of 40 K hours in case of electromagnetic ballast and 65 K hours in case of HF ballast up to 10% failure. The discharge glass shall be lead free.

TLD Lamps shall be minimum tri-phosphor type and have bi-pin bases. Colour spectrum of light shall be equivalent to "PHILIPS color 84 or color 86 color 82 or "OSRAM color 21 or color 11 or color 41 (as required at site)".

The fluorescent Tubes (TLD) should have cool daylight colour designation. But Architects reserve the right to prescribe either Cool Daylight or Bright White or Incandescent Colour Designations for TLD. NO extra payment will be made over the quoted rate of bidder for this. The 36 W fluorescent tubes will have Nominal Luminous Flux of not less than 3350 lumens whether so mentioned in the Schedule of Quantities or not.

T 5 – HIGH EFFICIENCY ECO-FRIENDLY LAMPS

T-5 lamp shall be environment friendly low pressure mercury discharge lamp with mercury content less than or equal to 3 mg. lamp should have lowest CO2 emission compared to any other comparable light source (40% less than a TL-D standard lamp, 26% less than TL-D / 80). T-5 lamp shall be 100% lead free. T-5 lamp shall be designed for operation with electronic gear and well suited for dimming. Maximum lumen output to be reached at approx 35^{o}C in free burning position. T-5 lamp can be ignited from -15^{o}C to + 50^{o}C. Lamp should be fully recyclable and must comply to ROSH (Restriction of Hazardous substances) and shall be covered by WEEE. T-5 shall have 16 mm in diameter service life of TL-5 lamp should be 10% more than TL-D lamps. T-5 lamp shall have lumen efficacy of up to 104 Lux / W and shall have excellent colour rendering to En 12464 (Ra 80 to 89).

4.6.2 Compact fluorescent lamp shall have same luminous flux and power consumption as fluorescent tubes but less than half the length and more compact than U-shaped and circulator lamps. CFL shall be suitable for use with conventional control gear & standers and for HF electronic control gear. CFL lamp shall be non integral type of OSRAM / PHILIPS only.

4.7 HIGH FREQUENCY ELECTRONIC BALLAST

High frequency electronic ballast shall be used with fluorescent / Compact Fluorescent Lamps wherever specified in the schedule of quantities. High frequency electronic ballast shall comply to the following:

- IEC 927, IEC 928 for ≤10% total harmonic distortion.
- EMI / RFI – Confirming to FCC / VDE Class A/B.
- Line Transient as per IEEE C62.41.
- Ballast Crest Factor C1.7%.
- No Stroboscopic Effect
- Constant Wattage / Light output between 240 V ± 10%.
- Circuit protection for surge current and inrush current.
- Short circuits, open lamp protection
- PF > 70 for fluorescent / T5 lamp and CFL.

- Deactivated lamp protection
- Suitable for use with single and twin lamps
- RFI < 30 MHz EN 55015
- Total Harmonic Distortion (THD) ≤10%
- Immunity to interference EN 61547
- Safety EN 60928 / IEC 928 / IS 13021 (Part I)
- Performance EN 60929 / IEC 929 / IS 13021 (Part II)
- Vibrations & Bump tests IEC 68-2-6 FC

IEC 9001

- Quality Standard ISO 9001
- Environmental Standard ISO 14001
- DC Operation EN 60924
- Emergency Lighting Operation VDE 0108

Total System consumption (lamps + ballast) for
1 x 28 W T-5, shall not exceed 32 W

5. EARTHING

5.1 EARTHING

The system shall be TNS with four wire supply system (R,Y,B,N and 2 Nos. E) brought from the main L T Panel. All the non-current carrying metal parts of electrical installation and all metal conduits trunking, cable sheaths, switchgear, distribution panels, light fittings and all other parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system. All metal work such as pipe lines, ducts, cable trays, stair case railing etc shall be bonded to earth.

All earthing shall be in conformity with IS:3043 1987, and the basic system of earthing shall be TNS.

5.2 EARTHING CONDUCTORS

Earthing conductors shall be of copper / GI as mentioned in schedule of quantities and shall be protected against mechanical injury and corrosion.

5.3 SIZING OF EARTHING CONDUCTORS

The cross sectional area of earthing conductor shall not be smaller than half of the largest current carrying conductor subject to an upper limit of 80 Sq.mm. If the area of the largest current carrying conductor or bus bar exceeds 160 sq.mm then two or more earthing conductors shall be used in parallel, to provide at least half the cross sectional area of the

current carrying conductor or bus bars. All fixtures, outlet boxes, junction boxes and power circuits up to 15 amps shall be earthed with PVC insulated copper wire.

All 3 phase switches and distribution panels up to 60 amps rating shall be earthed with 2 Nos. distinct and independent 4 mm dia copper / GI wires. All 3 phase switches and distribution panels up to 100 amps rating shall be earthed with 2 Nos. distinct and independent 6 mm dia copper / GI wires. All switches, bus bar, ducts and distribution panels of rating 200 amps and above shall be earthed with minimum of 2 nos separate and independent 25 mm x 3 mm copper / GI tape.

5.4 CONNECTION OF EARTHING CONDUCTORS

Main earthing conductors shall be taken from the earth connections at the main L T panel to an earth electrode with which the connection is to be made. All joints in tapes shall be with four rivets and shall be brazed in case of copper and by welding bolting in case of GI, wires shall be connected with crimping lugs, all bolts shall have spring washers. Sub- mains earthing conductors shall run from the main distribution panel to the sub distribution panel. Final distribution panel earthing conductors shall run from sub-distribution panel.

Circuit earthing conductor shall run from the exposed metal of equipment and shall be connected to any point on the main earthing conductor, or its distribution panel. Metal conduits, cable sheathing and armouring shall be earthed at the ends adjacent to distribution panel at which they originate, or otherwise at the commencement of the run by an earthing conductor in effective electrical contact with cable sheathing. Where equipment is connected by flexible cord, all exposed metal parts of the equipment shall be earthed by means of an earthing conductor enclosed with the current carrying conductors within the flexible cord. Switches, accessories, lighting fitting etc. which are rigidly secured in effective electrical contact with a run of metallic conduit shall not be considered as a part of the earthing conductor for earthing purposes, even though the run of metallic conduit is earthed.

The plate/pipe electrode, as far as practicable, shall be buried below permanent moisture level but in no case not less than 2.5 M below finished ground level.

The plate/pipe electrode shall be kept clear of the building foundation and in no case, it shall be nearer by less than 2 M from outer face of the respective building wall / column.

The plate electrode shall be installed vertically and shall be surrounded with 150 mm. thick layers of Charcoal dust and Salt mixture.

19 mm. dia. G.I. pipe for watering, shall run from top edge of the plate / pipe electrode to the mid level of block masonry chamber.

Top of the pipe shall be provided with G.I. funnel and screen for watering the earth / ground through the pipe.

The funnel with screen over the G.I. pipe for watering to the earth shall be housed in a block masonry chamber as shown in the drawing.

The masonry chamber shall be provided with a Cast Iron hinged cover resting over the Cast Iron frame which shall be embedded in the block masonry.

Construction of the earthing station shall in general be as shown in the drawing and shall conform to the requirement on earth electrodes mentioned in the latest edition of Indian Standard IS : 3043, Code of Practice for Earthing Installation.

The earth conductors (Strips / Wires copper / Hot dip G.I.) inside the building shall properly be clamped / supported on the wall with Galvanised Iron clamps and Mild Steel Zinc Passivated screws / bolts. The conductors outside the building shall be laid at least 600 mm. below the finished ground level.

The earth conductors shall either terminate on earthing socket provided on the equipment or shall be fastened to the foundation bolt and / or on frames of the equipment. The earthing connection to equipment body shall be done after removing paint and other oily substances from the body and then properly be finished.

Over lapping of earth conductors during straight through in joints, where required, shall be of minimum 75mm. long.

The earth conductors shall be in one length between the earthing grid and the equipment to be earthed.

EARTH LEADS AND CONNECTIONS :

Earth lead shall be bare copper or Galvanisedsteel as specified with sizes shown on drawings. Copper lead shall have a phosphor content of not over 0.15 %. G.I strips buried in the ground shall be protected with bitumen and hessian wrap or polythene faced hessian and bitumen coating. At road crossing necessary Hume pipes shall be laid. Earth lead run on surface of wall or ceiling shall be fixed on saddles so that strip is at least 8 mm away from the wall surface.

The complete earthing system shall be mechanically and electrically bonded to provide an independent return path to the earth source.

5.5 **PROHIBITED CONNECTIONS**

Neutral conductor, sprinkler pipes, or pipes conveying gas, water or inflammable liquid, structural steel work, metallic enclosures, metallic conduits and lightning protection system conductors shall not be used as a means of earthing an installation or even as a link in an earthing system. The electrical resistance measured between earth connection at the main L T panel and any other point on the completed installation shall be low enough to permit the passage of current necessary to operate or circuit breakers, and shall not exceed 1 ohm. All switches carrying medium voltage shall be connected with earth by two separate and distinct connections. The earthing conductors inside the building wherever exposed shall be properly protected from mechanical injury by running the same in G I pipe of adequate size. The overlapping in strips at joints where required shall be minimum 75 mm. The joints shall be riveted and brazed in case of copper and by welding / bolting in case of GI in an approved manner. Sweated lugs of adequate capacity and size shall be used for termination of all conductor wires above 6 sq.mm size. Lugs shall be bolted to the equipment body to be earthed

after the metal body is cleaned of paint and other oily substances and properly tinned. Equipotent bonding of all metallic structures shall be done.

5.6. EARTHING

The following must always be ensured in earthing system.

- All earths must be interconnected at the earth pits. This includes generator neutrals, transformer neutrals, transformer body, lightning protection system earths, UPS earths etc.

- Extraneous conductive parts such as gas pipes, other service pipes and ducting risers and pipes of fire protection equipment and exposed metallic parts of the building structure.

5.7 The Contractor shall get the soil resistivity test done at his own cost of the area where earthing pits are to be located before starting the installation.

5.8 RESISTANCE TO EARTH

The resistance of earthing system shall not exceed 1 ohm.

5.9 SPECIFICATION FOR HOT DIP GALVANIZING PROCESS FOR MILD STEEL USED FOR EARTHING FOR ELECTRICAL INSTALLATION

GENERAL REQUIREMENTS

I. Quality of Zinc

Zinc to be used shall conform to minimum Zn 98 grade as per requirement of IS:209-1992.

II. Coating Requirement

Minimum weight of zinc coating for mild steel flats with thickness upto 6 mm in accordance with IS:6745-1972 shall be 400 g/sqm.

The weight of coating expressed in grams per square metre shall be calculated by dividing the total weight of Zinc by total area (both sides) of the coated surface.

The Zinc coating shall be uniform, smooth and free from imperfections as flux, ash and dross inclusions, bare patches black spots, pimples, lumpiness, runs, rust stains bulky white deposits, blisters.

Mild steel flats / wires shall undergo a process of degreasing pickling in acid, cold rinsing and then galvanizing. Jointing of earthing tape shall be by welding. All joints and cut ends shall be properly painted with aluminium paint.

5.10 TEST :

The entire earthing installation shall be tested as per requirements of Indian Standard Specification IS : 3043.

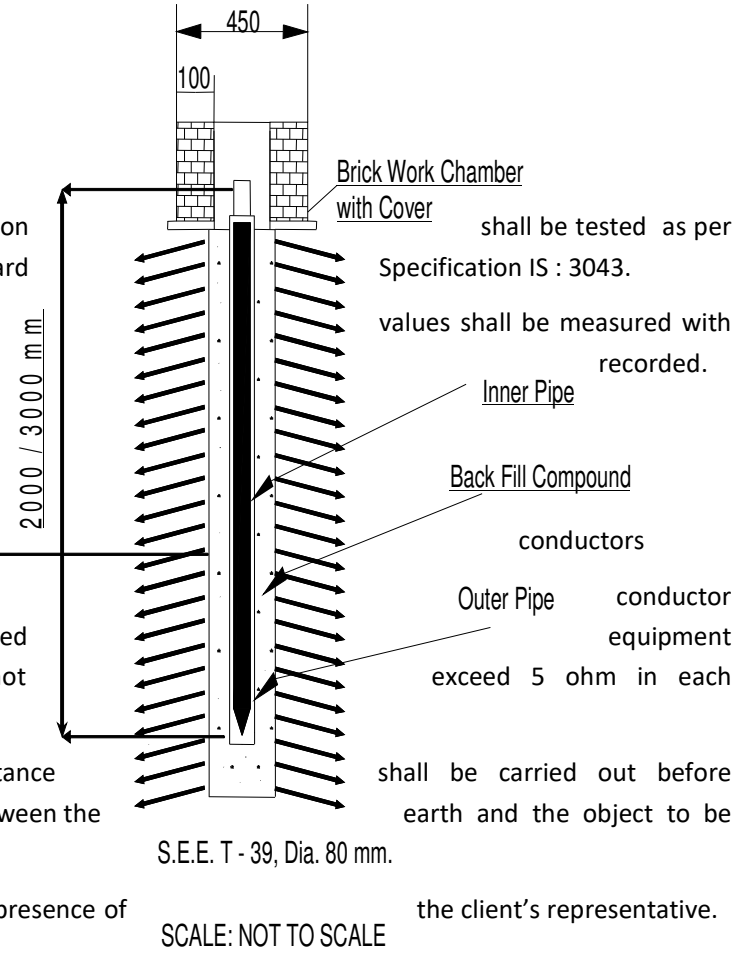
The following earth resistance values shall be measured with an approved earth megger and recorded.

1) Each earthing station
2) earthing system as a whole
3) Earth continuity conductors

Earth resistance for each earthed conductor shall be measured which shall not exceed 5 ohm in each case.

Measurements of earth resistance shall be carried out before earth connections are made between the earth and the object to be earthed.

All tests shall be carried out in presence of the client's representative.



Conformity to IE Act, IE Rules, and Standards

All Electrical works shall be carried out in accordance with the provisions of Indian Electricity Act, 2003 and Indian Electricity Rules, 1956 amended up to date (Date of call of tender unless specified otherwise). List of Rules of particular importance to Electrical Installations under these General Specifications is given in Appendix C for reference.

(13) DIESEL GENERATING SETS

Item No. 01:

Supplying and erecting, commissioning and testing diesel generating set having continuous rating, 3 phase, 415 volts, 50 cycles A.C. supply comprising of a totally enclosed air/water cooled diesel engine with multi-cylinders developing suitable BHP not less than following capacity at 1500 RPM with 10% overload for one hour in 24 hours with standard accessories like fly wheel, lubricating oil cooler, "A" class governor, heavy duty fuel wheel and lubricating oil filter, oil bath air filler, lubricating oil pressure gauge, end exhaust manifold, standard set of tools with adjustable spanners, screw drivers, feeder gauge, cylinder head to cover, joint cylinder head to exhaust, element lube oil filter, 12/24 volts electric starting equipment complete with standard battery, dynamo, cut-outs, ammeter, necessary wiring, pressure gauge, starter etc and heavy duty Residential type exhaust silencer and vertical hot air duct both logged with asbestos rope, save oil trays, exhaust piping of required length, standard wall/floor mounted fuel with level indicator and piping and drip proof alternator, self excited, self regulated, screen protected, with

excitation system, capable of delivering the rated system output at 415 volts, 3 phase, 0.8 PF, 50 Hz, 4 wire, running at 1500 RPM, conforming to IS-4722- 1968 with voltage regulation +/- 5% of rated voltage from no load to full load. Both the engine and alternator fitted on a common fabricated steel base plate with antivibration mounting engine and alternator both connected to each other by flexible flange coupling and with floor/wall mounted control panel box comprising of voltmeter ammeter, selector switches, ACB / MCCB / MCB of adequate capacity, indicator lamps duly wired with HRC fuses. The alternator & control panel shall be connected with provided suitable capacity armoured cable and complete with Acoustic enclosure (canopy) made out of 18 SWG CRCA Sheet, sound absorbing material Rockwool of 64 density & 100 mm thick conforming to IS:8183 The resin bonded rockwool covered from inside the canopy by perforated sheet with 3/4 mm holes, sound level not more than 75 dB at a distance of 1 mtr, as per PVCT norms. Erection, commissioning and satisfactory testing as per requirement with first filling of fuel, oil, etc. with guarantee of complete system for One year. & with obtaining all necessary certificate from Electrical Inspector. The Capacity and Ratings of DG sets are as below.
(G) Continuous Rating of 50 KVA ,BHP not less than 65.8 BHP

Workmanship and measurement:
Item shall be executed as per item description, manufacturers specification and instruction of engineer in charge.
Rate shall be for one number**.**

Approved Make List for Civil Works

ITEM	Approved Brands/Quality
ORDINARY PORTLAND CEMENT (OPC 53)	UltraTech, Siddhi, Binani, Sanghi, Ambuja, Hathi, Jaypee, J K Lakshmi
WHITE CEMENT	Birla White, J K White, Nihon White
TMT FE-500 OR FE- 500 D RIBBED BARS	ASR, NATIONAL, GERMAN–TMX, JINDAL, SAIL, VIZAG, TATATISCON, ELECTROTHERM (ETTMT), UTKARSH, GALLANT
AUTOCLAVED AERATED CONCRETE BLOCKS	UltratechXtralite, J K Smart Blox, Aerocon, Ecogreen, Accurate, Wonder Block, Efcon
TEAK WOOD	Valsad, Ghana, Nigeria, Bulsar, C P Teak or as approved by director project. free from knots, cracks.
FLOAT/ TINTED GLASS	Modi Guard / Asahi / Saint Gobain
INTERLOCKING PAVER BLOCKS-MACHINE PRESSED	Locally available as approved shape and size, Rubber moulded, having crushing strength not less than as described in Item.
M.S. SECTIONS	Any I.S.I.
G.I. SHEET/SSR	Jindal, ASR,Essar
INSULATION	AEROLAM/ROCKWOOL
CONSTRUCTION CHEMICALS	
ANTITERMITE TREATMENT HEPTACHLOPR	Durmet by Cynamid India, NocilPyramid ,Lyntric by Bayer India
SPECIALISED CONSTRUCTION CHEMICALS	Fair-Mat, Fisher,Fosroc, Sikka, Pidilite, Global, BASF, Dr. Fixit
WATER PROOFING MATERIALS	Fair-Mat, Fosroc, Sikka, Pidilite, BASF, Dr. Fixit, Zycosil
TILES	
CERAMIC TILES	Somany, Kajaria, Jonson, Asian, Varmora, Sunheart, Simpolo,Zealtop, Swastik, Bell
GLAZED TILES	Somany, Kajaria, Jonson, Asian, Varmora, Sunheart, Simpolo, Zealtop, Swastik, Bell
VITRIFIED TILES	Somany, Kajaria, Jonson, Asian, Varmora, Sunheart, Simpolo, Zealtop, Swastik, Bell
PAINT	
ACRYLIC PAINT	ICI, Dulux,Asian,Nerolac, Burger, Jotun, Global
OIL BOUND DISTEMPER	ICI, Dulux, Asian, Nerolac, Burger, Jotun, Global
FIRST QUALITY ENAMEL PAINT	ICI, Dulux, Asian, Nerolac, Burger, Jotun, Global
PUTTY	ICI,Dulux, Asian, Birla White Wall Care, Global,JK
WEATHER PROOF EXTERIOR EMULSION PAINT	ICI, Dulux, Asian, Nerolac, Burger, Jotun, Global
WALL TEXTURE	Jotun, Heritage, Global, Asian
ALUMINIUM	
ALUMINIUM SHEETS AND ACCESSORIES	Jindal, Hindalco, Banko, National
ALUMINIUM EXTRUDED DOOR/ WINDOW SECTION	Jindal, Hindalco, Banko, National
ALUMINIUM HARDWARE	Everite, Garnish, Crown Classic, Glider
FURNITURE / WOOD WORK	
PLY/ BLOCK BOARD	KIT Ply, Anchor, Greenply, Uniply, Century, Archidply
ADHESIVE	Fevicol SH, Araldite, SR 998, Century SH.
WOOD PRESERVATIVE	STP- Pentaphene pale, Pest Control (India)

FLUSH DOOR – DECORATIVE / NON-DECORATIVE(IS Marked)	KIT Ply, Anchor, Greenply, Uniply, Century, Archidply
PVC DOOR	Rajshree, Vikas, Sintex
LAMINATE SHEET	Century, Formica, Greenlam, Alfa-ica, Decolam, Sundek,Merino, Aerolam, Bell
WOODEN ADHESIVES	Fevicol, Blue coat, Araldite.
DOOR HARDWARE	Kich, Dorma, Palladium, Magnum, Dorset, Godrej, Arch, Ozone
DOOR CLOSER, FLOOR SPRING	Kich, Dorma, Palladium, Magnum, Dorset, Godrej, Arch, Ozone
DEAD LOCKS/ MORTISE LOCKS	Kich, Dorma, Dorset, Godrej,Arch, OZONE
Gypsum ceiling	SaintGobainGyporc/ USG BORAL/ Asian Gypsum Industries Pvt. Ltd

Notes:

a) The contractor shall produce samples of the materials for approval of the Executive Engineer/PMC. The materials of the makes out of the above as approved by the EIC shall be used on the work. EIC member has not bide to give any reason for rejection of any brand from the above list and its decision will be consider as final.

b) In respect of materials for which approved makes are not specified above, these will be of makes to be decided by the PMC/Engineer in Charge.

Approved Make List for Sanitary and Plumbing Works

ITEM	Approved Brands/Quality
SANITARY AND PLUMBING	
SANITARY WARE	Cera,Hindware,Parryware, Johnson, Somany, Tita
P.V.C. PIPES AND FITTING (UPVC/CPVC)	Finolex, Supreme, Kisan,Ashirwad, Astral, Dutron, Prince, Precision, Ajay, Waterflow
CHROMIUM PLATED WATER SUPPLY FITTINGS	Hindware, Jaquar, Aquel, Kohler, Essco, Grohe, Plumber, Cera, Somany,DCI
C.I. MANHOLE COVER	ISI approved make
PLUMBING FIXTURES	Hindware, Jaquar, Aquel, Kohler, Essco, Grohe, Plumber, Cera, Somany, DCI
PVC WATER TANK (100% VIRGIN PVC)	Syntex, Aqua, Aris
S.S. SINKS	Nirali, Navkar, Parryware
SLUICE VALVE	Kirloskar, Kartar, Sir, Krisna
NON RETURN VALVE	Kirloskar, Kartar, Krisna

Notes:

a) The contractor shall produce samples of the materials for approval of the Executive Engineer/PMC. The materials of the makes out of the above as approved by the EIC shall be used on the work. EIC member has not bide to give any reason for rejection of any brand from the above list and its decision will be consider as final.

b) In respect of materials for which approved makes are not specified above, these will be of makes to be decided by the PMC/Engineer in Charge.

LIST OF MATERIALS OF APPROVED BRAND/ MANUFACTURER (ONLY FIRST QUALITY TO BE USED (ELECTRICAL WORKS)

MAKE LIST FOR ELECTRICAL WORKS		
SR.NO.	**ITEM**	**STANDARD MAKE**
1	DRY TYPE TRANSFORMER	SCHNEIDER / VOLTAMP / KIRLOSKAR / CROMPTON
2	H.T.VCB / PANEL	ABB / SIEMENS / SCHNEIDER ELECTRIC / L&T
3	PROTECTION RELAY FOR H.T PANEL	GE / ABB / L&T / SIEMENS / SCHNEIDER
4	H.T.XLPE CABLE	POLYCAB / FINOLEX / HAVELLS/ KEI
5	H.T.JOINT (HEAT SHRINKABLE)	RAYCHEM / 3-M
6	LT PANELS	CPRI / ERDA APPROVED PANEL BUILDER. 70KA SHORT CIRCUIT WITHSTANDS STRENGTH. ACCESSORIES AS PER MENTIONED IN MAKE LIST.SUBJECT TO CLIENT CONFIRMATION.
7	DISTRIBUTION BOARDS	LEGRAND / SCHNIEDER / HAGER / L&T / SIEMENS
8	MEDIUM VOLTAGE CABLE & WIRE	FINOLEX / POLYCAB / KEI / HAVELLS
9	CABLE TRAY (ALLTYPE)	PROFAB / PRECISION / UNIVERSAL / INDIANA
10	LT SWITCH GEAR (ALL RANGE)	AS PER SPECIFIED PANEL DESCRIPTION IN BOQ. MODEL AS PER SPECIFIED IN BOQ ABB/ SIEMENS/ L&T/ LEGRAND / SCHNIEDER, C & S,Ancnor
11	LT MCCB	SIEMENS / SCHNEIDER / LEGRAND / ABB / L&T
12	LT MCB, ELCB	LEGRAND / SIEMENS / SCHNEIDER / L&T / ABB
13	LTSFU	SIEMENS / SCHNEIDER ELECTRIC / L&T / ABB
14	LT CONTACTORS	SIEMENS / SCHNEIDER ELECTRIC / ABB / L&T / LEGRAND

15	AUTO CHANGE OVER SWITCH	SCHNEIDER / ABB / L&T / SIEMENS / LEGRAND
16	STARTER (STAR-DELTA /DOL)	SCHNEIDER / ABB / L&T / SIEMENS / LEGRAND
17	SUBMERCIBLE MOTOR / MONO BLOCK PUMP SET	CROMPTON / KBL / FALCON / LUBI
18	METERS (DIGITAL)	ENERCON / SCHNEIDER /L&T / SECURE / ABB
19	RELAYS- EARTH FAULT	SIEMENS / SCHNEIDER ELECTRIC / L&T / LEGRAND
20	INDICATING LAMP	SIEMENS / SCHNEIDER ELECTRIC / ABB / KAPPA / TEKNIC
21	ELECTRIC TIMER	SIEMENS / LEGRAND / L&T
22	ROTARY SWITCH	SIEMENS / SCHNEIDER ELECTRIC / KEYCEE / SALZER
23	PUSH BUTTON AND PUSH BUTTON SET	SIEMENS / SCHNEIDER ELECTRIC / L & T/ BCH / RAAS CONTROL
24	SELECTOR SWITCH	KEYCEE / SALZER / SCHNEIDER / SIEMENS
25	ANNUNCIATOR	PROTON / EAPL
26	LUGS	DOWELL'S / 3D / JAINSON / COMET / HMI
27	BIMETALLIC LUGS	ISMAL / HMI / DOWELLS
28	CABLE GLAND	JAINSON / 3D / COMET / HMI
29	PVC CONDUITS AND ACCESSORIES	PRECISION / NIHIR / POLYCAB / ASTRAL
30	CASING CAPING	PRECISION / NIHIR / POLYCAB
31	MODULAR SWITCHES, SOCKETS & OTHER ACCESSORIES	MK / LEGRAND / HAVELLS/ANCHOR
32	PVC TAPE	STEEL GRIP / ANCHOR
33	WIRES FOR INTERNAL WIRING	FINOLEX / HAVELLS / POLYCAB /RR
34	CO AXIAL TV CABLE	DELTON /NATIONAL /HAVELLS / FINOLEX
35	CONNECTORS (COLOURS AS PER PHASE & NEUTRAL)	SALZER / ELEMEX / L&T / CONNECT WELL / PHOENIX

36	LED LIGHT FIXTURES / POST TOP LENTRAN LIGHT	PHILIPS SIGNIFY / HAVELLS / WIPRO / CROMPTON / BAJAJ AS PER MODEL SPECIFIED IN BOQ
37	LIGHTING CONTROLLER	DYNALITTE / ATCO / ANCHOR / LEGRAND / C&S
38	CEILING FAN/ EXHAUSTFAN	CROMPTON / USHA / HAVELLS / ORIENT AS PER MODEL SPECIFIED IN BOQ
39	SENSORS	MK / CRESTON / LUTRON / LEGRAND
40	COMPUTER	HP/ DELL/ LENOVO/ IBM
41	CAT6 / RJ45 / CAT6 JACK PANEL	TYCO / SYSTIMAX / SCHNEIDER –DIGI LINK / LE GRAND
42	UNDER FLOOR METAL TRUNKING / CABLE MANAGEMENT SYSTEM ONWALL	MK / LEGRAND / SCHNEIDER
43	UPS	EMERSON /NUMERIC/EATON
44	LIGHTNING PROTECTION	ASHLOK / LPI / ALSTORM
45	DG SET	CUMMINS / CROMPTON GREAVES / KOEL / VOLVO
46	DG SET AMF PANEL	AS PER THE DG SET SUPPLIER. (SWITCH GEAR AS PER MAKE LIST.)
47	TV MONITOR	HP/DELL
48	DIGITAL MULTI FUNCTION METER	SECURE/AE/ CONZERV/ENERCON
49	LT CABLE LUGS	DOWELS/3M/COMET
50	CHEMICAL EARTHING (BORE TYPE)	ASHLOK / LPI
51	CCTV SYSTEM (CAMERA, DIGITAL VIDEO RECORDER)	HONEYWELL/ SONY/ SCHNEIDER (PELCO) / PANASONIC
52	LIFT (ELEVATOR)	OTIS, MITSUBISHI, SCHINDLER, JOHNSON, Express Lift, Omega
53	SPLIT AC	HITACH/BLUE STAR/DAIKIN/MITSUBISHI/O-GENERAL/CARRIER/TOSHIBA

54	U-PVC WATER PIPE	PRINCE / SUPREME / ASTRAL / FINOLEX
55	STREET LIGHT POLE AND BRACKET	BAJAJ, TRANSRAIL, VALMONT.
56	AUDIO-VIDEO SYSTEM	BOSE, YAMAHA, SONY, EPSON, PURE LINK (AS PER BOQ SPECIFICATION)
57	RO SYSTEM	AQUA GUARD, KENT, AQUA ULTRA UV, AO SMITH.
58	WATER COOLER	USHA, CELLO, BLUESTAR.

Special Note: -

1	Client has all right to check the challans of supplier.
2	The MCB and MCB DBs must be of same make.
3	Contractor has to take Prior approval for all the make of material from Client/Consultant/PMC before execution.
4	The Client/Consultant/PMC reserves the right to select the manufacture or approved make from the above list.
5	Any make not mentioned in the above lists must be approved from Client/Consultant before execution.
6	All the material should be ISI and as per standards mentioned in specifications and BOQ.
7	In case of shortage of material or un-time delivery or change in model take prior approval from client/consultant