Gujarat University

TECHNICAL SPECIFICATIONS

Tender No: GU/ESTATE/TENNIS ACADEMY/2016-17/01

Tender Document
For

Construction of Tennis Academy at Gujarat University.

TECHNICAL SPECIFICATIONS

CIVIL AND ALLIED WORKS

SPECIFICATIONS OF MATERIALS

M-1. Water

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

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. 269- 1976. Any indication of unsoundness charge in time of setting by 30 minutes or more or decrease of more than 10 per cent in strength, of mortar 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.

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 stains or other unsightly deposits on concrete or mortar surfaces

Hard and bitter water shall not be used for curing
Potable water will generally found suitable for curing mortar or concrete.

M-2. Lime

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

The following field tests for limes are to be earned out:

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

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

Storage shall comply with J.S. 712-1973 The slaked lime, if stored, shall be kept in a weather proof and damp- proof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged" in any way shall be rejected and all rejected materials shall be removed from site of work.

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

M-3. Cement

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

M-4. White Cement

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

M-5. Coloured Cement

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

The pigments used for coloured cement shall be of approved quality and shall not exceed 10% of cement used in the mix. The mixture of pigment add cement shall be properly ground to have a uniform colour and shade. The pigments shall have such properties to provide for durability underexposure to sunlight and weather.

The pigment shall have the property such that it is neither affected by the cement nor detrimental to it

M-6 Sand

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

6.2. Coarse Sand: The fineness modulus of coarse sand shall not be less than 2.5 and shall not exceed 3 0. The sieve analysis of coarse shall be as under.

I.S. Designation	Sieve passing sieve	Percentage by weight Designation	I.S. Sieve Percentage by weight passing Sieve
4.75 mm	100	600 micron	30-100
2.36 mm	90 to 100	300 micron	50-70
1.18 mm	70 to 100	150 micron	0-50
6.3. Fine Sand :			
The fineness modulus shall	not exceed 1.0 The sieve	analysis of fine sand shall be	as under.
I.S. Designation	Percentage by weight Sieve passing	I.S. Designation	Percentage by weight Sieve passing
4.75 mm	100	600 micron	40-85
2.36 mm	100	300 micron	5-50
1.18 mm	75 to 100	150 micron	0-10

M-7. Stone Dust

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

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

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

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

M-8. Stone Grit

Grit shall consist of crushed or broken stone and be hard, strong, dense, durable, clean of proper gradation and free from skin or coating likely to prevent proper adhesion of mortar Grit shall generally be cubical in shape and as far as possible flakey elongated pieces shall be avoided. It shall generally comply with the provisions of I.S. 383-1970.

Unless special stone of particular quarries is mentioned grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious with cement.

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

IS sieve designation	Percentage by weight	I.S. Sieve designation	Percentage by weight
12.50 mm	100%	4.75 mm	0-20%
10 mm	85-100%	2.36 mm	0-25%

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

The necessary tests for grit shall be carried out as per the requirements of I.S.2386- (parts-l to VIII} 1963_r as per instructions of the Engineer-in-charge. The necessity of test will be decided by the Engineer-in-charge.

M-9. Cinder

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

Cinder aggregates shall be well burnt furnace residue obtained from furnace using coal fuel only It shall be sound clean and Free from clay Dirt ash or other deleterious matter as mentioned below

	The average grading for cinder aggregates shall b	
I.S. Designation	Percentage by weight Sieve passing	I.S. Designation
20 mm 10	100 86	4.75 mm 2.36 mm

M-10. Lime Mortar

Lime : Lime shall confirm to specification M-2, Water: Water shall conform to specification M-1 and Sand: Sand shall conform to specification M-6

Proportion of Mix:

10.2.1. Mortar shall consist of such proportions of slaked lime and sand as may be specified in item. The slaked lime and sand shall be measured by volume

10.3. **Preparation of mortar;**

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

10.4. **Storage:**

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

10.5. **Use:**

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

M-11. Cement Mortar

11.1. Water shall conform to specification M-1, Cement : Cement shall conform to specifications M-3 and Sand shall conform to M-6

11.2. **Proportion of Mix**

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

11.3. **Proportion of Mortar :**

In hand mixed mortar, cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogeneous mixture of uniform 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 from 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

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**

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

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 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 6- mm. less than the cover whichever is smaller.

IS Sieve Designation	Percentage passing for Single sized of aggregate of nominal size		
	40mm	20mm	16mm
80mm	-	-	-
63mm	100	-	-
40mm	85-100	100	-
20 mm	0-20	85-100	100
16mm	-	-	85-100
12.5mm	-	-	-
10 mm	0.5	.02	0.3
4.75 mm	-	0.5	0.5
2.35 mm	-	-	-

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. 383-1970 and 456~1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates. If she aggregates are covered with dust, they shall be washed with water to make them clean.

M-13. Black Trap or Equivalent Hard Stone Coarse

Aggregate For Design Mix Concrete .

Coarse 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.

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

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

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

M-14. Brick Bats Aggregate

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

The brick bats shall be measured by suitable boxes or 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 and nodules of free lime they shall have smooth rectangular faces with sharp corners and shall be of uniform colour.

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

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

15.3. The size of the conventional bricks shall be as under:
(9" x 4.3/8" x 2,3/4") 225 x 110 x 75 mm.

15.4. 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 + 1/8" (3.0 mm.) Width ± 1/16" (1.50 mm.) Height + 1/16" (1.50 mm.)

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

M-16. Stone

The stone shall be of the specified variety such as Granite/Trap Stone/ Quartzite or any other type of good hard stones. The stones shall be only from 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 used. The percentage of water absorption shall not be more than 5% of day weight. When tested in accordance with I.S. 1124-1974. The minimum crushing strength of stone shall be 200 Kg/.Sq. Cm. unless otherwise, specified

The samples of the stone to be used shall be got approved before the work is started

The Khanki facing stone shall be dressed by chisel as specified in the item 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 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface

M-17. Laterite Stone

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

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

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

Special corner stones shall be provided where so directed.

M-18. Mild Steel Bars

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

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

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

1.	6 mm	0.22 Kg/Rmt.	8.	20 mm.	2.47 Kg/Rmt
2.	8mm.	0.39 Kg/Rmt.	9	22 mm.	2.98 Kg/Rmt.
3.	10mm.	0.62 Kg/Rmt.	10.	25 mm.	3.85 Kg/Rmt.
4.	12mm.	0.89 Kg/Rmt.	11.	28 mm.	4.83 Kg/Rmt.
5.	14 mm	1.21 Kg/Rmt.	12.	32 mm.	6.31 Kg/Rmt.
6.	16 mm	1 58 Kg/Rmt	13.	36 mm.	7 99 Kg/Rmt. *
7.	18mm.	2.00 Kg/Rmt.	14.	40 mm.	9,86 Kg/Rmt.

M-19. High Yield Strength Steel Deformed Bars

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

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

M-20. High Tensile Steel Wires

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

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

20.3. The high tensile steel shall be free from loose mill scale, rust, oil, grease, or any other harmful matter.

Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through a pressure box containing Carborudum

20.4. The high tensile wire shall be obtained from manufacturers, 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 1.63 mm. or 1.22 mrn. (16 to 18 gauge) diameter and shall conform to I.S. 280- 1972.

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

M-22. Structural Steel

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

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

M-23. Galvanised Iron Sheets

23.1. The galvanised iron sheets shall be plain or corrugated sheets of gauges as specified in item The G.I. Sheets shall conform to I.S.277-1977. The sheets shall be undamaged in carnage 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. ridges and hips shall be of plain galvanised sheets Class - 3 of the thickness as specified in item. These shall be 600 mm. in width and properly bent up to shape without damage to the sheets in process of bending.

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

M-24. Asbestos Cement Sheets

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

24.2. **Ridges & Hips :**

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

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

M-25. Manglore Pattern Roof Tiles

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

M-26. Shuttering

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

26.2. The form work shall be sufficiently strong and shall have camber so that it assumes correct shape after deposition of the concrete and shall b-j able to resist forces caused by vibration

of live load of men working over it and other incidental leads associated with it. The shuttering shall have smooth and even surface and its joints shall permit leakage of cement grout

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

26.4. The props shall consist to bullies having 100 mm .minimum diameter measured at mid length and 80 mm. at thin end shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm. thick and minimum bearing area of 0-10 sq m laid on sufficiently hard base.

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

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

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

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

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

M- 27. Expansion Joints - Permoulded filler

27.1. The item provides for expansion joints in R.C C. frame structures for internal joints, as well as exposed joints, with the use of promoulded bituminous joint filler.

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

27.3. Thickness of the per-moulded joints filler shall be 25 mm. unless otherwise specified.

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

M-28. Expansion joints-Copper strips & hold .fasts

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

28.2. Copper sheet shall be of 1.25 mm. width and or 1 25 mm. width and the " U " shape in the middle. Copper strip shall have holdfast of 3 m.m 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 Jo be embedded in the concrete work shall be 25 mm depth of "U" to be provided in the expansion joint, in the copper plate shall be of 25 mm.

M-29. Teak wood

29.1. The teak wood shall be of good quality as required for the item to be executed. When the kind of wood is not 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, flaws, shakes, warps, twists, bends or any other defects. It shall generally be uniform in substance and of straight fibers as far as possible. It 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 for as possible. Any effort like paining using any adhesive materials made to hide the defects

shall render the pieces liable to rejection by the Engineer-in-charge.

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

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

29.5. **First class teak wood**

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

29.6. **Second Class Teak Wood:**

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

M-29.7 A Non-teak wood:

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

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

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

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

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

30.2. The face-pane! of the shutters shall be formed by gluing by the hot press process on both faces of the core with either plywood or cross-bands and face veneers. The[1] hopping, rebating, opening of glazing, venation etc., shall be provided if specified in the drawing.

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

30.4. The shutters shall be tested for-

(1) **End immersion test:** The test shall be carried out as per I.S.2202 (part-1) 1980. There shall be no delamination at the end of the test.

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

(3) **Glue adhesion test** : The flush door shall be tested for glue adhesive test in accordance with I S 2202 (part -I) 1980. The shutters shall be considered to have passed the test, if no delamination occurs in the glue lines in the plywood and if no single determination 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 hole and other permissible wood defectects shall not be considered in assessing the sample.

30.5. The tolerance in size of scud core type flush door shall-be as under:
In Nominal thickness ± 1.2 mm. In Nominal height ± 3m

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

M-31. Aluminum doors, windows, ventilators

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

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

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

M-32. Rolling Shutters

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

32.2. Guide channels shall be of mild steel deep channel section and of rolled pressed or built up (fabricated) joint less construction The thickness of sheet used shall not be less than 3 15 mm.

32.3. Hood covers shall be made of M S. Sheets not less than 0.90 mm. thick. For shutters having width 3.5 Meter and above, the thickness of M.S. sheet for the hood cover shall be not less than 1 25 mm.

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

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

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

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

M-33. Collapsible Steel Gate

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

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

(b) Pivoted M.S. flats shall be 20 mm x6 mm

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

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

M-34. Welded Steel Wire Fabric

34.1 Welded steel wire fabric for general purpose shall be manufactured form cold drawn steel wire "as drawn" or galvenised steel conforming to I.S. 226-1975 with longitudinal and transverse wire securely connected at every intersection by a process of electrical resistance welding and conforming to I.S.4948-1974. it shall be fabricated and finished in workmanlike manner and shall be free from injurious defects and shall be rust proof The type of mesh shall be oblong or square as directed The mesh sizes and sizes if wire for square 3b well as oblong 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 he free from flaws joints broken strands laminations and other harmful surface defects. Expanded metal steel sheet shall confirm to IS-412-1975. except that blank sheets need not be with guaranteed mechanical properties The size of the diamond mesh of expanded metal and dimensions of strands (width and thickness) shall be as specified. The tolerance on nominal weight of expanded metal sheets shall be of + 10 percent.

35.2. Expanded 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 Jali)

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 item. The wire shall be sound free from splits surface flaws, rough jagged and imperfect edges and other harmful surface defects and shall conform to I.S. 280-1978. Dimensions and size of wire as specified in item. The wire shall be sound free from splits surface flaws, rough jagged and imperfect edges and other harmful surface defects and shall conform to I.S. 280-1978 dimensions and size of wire as specified in item. The wire shall be sound free from splits surface flaws, rough jagged and imperfect edges and other harmful surface defects and shall conform to I.S. 280-1978.

M-37. Plywood

37.1. The plywood for general purpose shall conform I.S. 303-17-1975.

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

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

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

37.5. According to I.S. 303-1975 the plywood for general purpose shall be of the grades namely BWR, WWR and CWR depending up to the adhesives used for bonding the veneers and it will be further classified into six types namely AA, AB, AC, BB, BC and CC based on the quality of the two faces each face being of three kinds namely A, Band C

After pressing, the finished plywood should be reconditioned to moisture content not less than 8 percent and not more than 16 percent.

37.6. Thickness of plywood Boards.

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

M-38. Glass

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

38.2. **Sheet Glass**

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

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

38.2.3. Sheet glass shall be patent flattened glass of best quality and for glazing and framing purposes shall conform to I.S. 1761-1960. Sheet glass of the specified colours shall be used, if so shown, on detailed drawings or so specified For important buildings and for panes with any dimension over 900 mm plate glass of specified thickness shall be used

38.3. **Plate Glass:**

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

38.4. **Obscured Glass:**

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

38.5. **Wired Glass:**

38.5.1. Glass shall be with wire netting embedded in a sheet of planet glass. 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 be of thickness as specified in the item and of an specified shape and size as the case may be panels may be flat or curved It should be light in weight it shall be colour less or coloured or opaque as specified in the item. Colour less 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 thickens, 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 of such quality

that they can be cut, bent jointed as desired Solution for the joints shall be used as per the requirement of manufacturer.

M-40. Particle board

40.1. The particle boards used for face panels shall of best quality free from any defects. "I he particle boards shall be made with phenolmaldehyde adhesive The particle boards shall conform I S 3087-1905" Specification for wood particle board for general purpose" The size and the thickness shall be as indicated.

M-41. Expanded polystyrene or framed styroper slabs

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

M-42. Resign bonded fiber glass.

42.1. The resign bonded fiber glass tiles or roils shall be of approved make and shall be of sizes, thickness, and finish as indicated.
42.2. For test of Mineral wool thermal insulation [Blanket I S 3144-1965 shall be followed
42.3. Insulation wool blanks shall be with the following coverings on one or both sides as indicated
(1) Bituminous Hessian Kraft paper suitable for use in position where moisture has to be excluded.
(2) Hessian cloth or Kraft paper for keeping out dust
(3) G.I wire netting, suitable for surfaces to be plaster over

M-43. Fixtures and fastenings

43.1. **General:**

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

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

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

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

43.1.5. Brass and anodised aluminium fixtures and fastenings shall be bright finished

43.2. **Holdfasts:**

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

43.3. **Butt hinges:**

43.3.1. Railway standard heavy type butt hinges shall be used when so specified
43.3.2. Tee and strap hinges shall be manufactured from M S Sheet

43.4. **Siding door bolts (Aldrops):**

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

43.5. **Tower bolts (Barrel Type):**

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

43.6. **Door Latch:**

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

43.7. **Bathroom Latch:**

43.7.1. Bathroom latch shall be similar to tower bolt.

43.8. **Handle:**

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

43.9. **Door Catch:**

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

43.10. **Door Stoppers:**

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

43.11. **Wooden Door Stop with hinges:**

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

43.12. **Casement Window Fastener:**

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

43.13. **Casement stays (Straight Red Stay):**

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

43.14. **Ventilator Catch:**

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

43.15. **Pivot:**

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

M-44. Paints:

44.1. (A) Oil paints:

44.1.1. Oil paints shall be of the specified colour and as approved The ready mixed paints shall only be used.

However, if ready mixed paint of specified shade or tint is not available white ready mixed paint with approved stainer will be allowed In such a case the contractor shall ensure that the shade of the paint so allowed shall be uniform.

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

(i)Paint shall not show excessive setting in a freshly opened full can and shall easily be ready spread with a 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

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

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

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

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

44.2. **(B) Enamel paints:**

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

M-45. French Polish

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

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

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

M-46. Marble chips for marble mosaic terrazzo

46.1. The marble chips shall be of approved quality and shades. It shall be hard, sound, dense and homogeneous in texture with crystalline and coarse grains It shall be uniform in colour and free from stains 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 layer is 6 mm size The marble chips of approved quality and colours only as per grading as decided by the Engineer-in-charge shall be used for marble mosaic tiles or works

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

M-47. Flooring Tiles

47.1. (A) Plain Cement tiles;

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

47.1.2. The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During manufacture the tiles shall be subjected to pressure of not less than 140 Kg/Sq. Cm. The proportion of cement to aggregate in the backing of the tiles shall be not less than 1 .3 by weight The wearing face, through the tiles are of plain cement, shall be provided with stone chips

of 1 to 2 mm. size. The proportions of cement to aggregate in the wearing layer of the tiles shall be three parts of cement to one parts 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 conformity to requirements of I.S.1237-1980 regarding strength resistance to wear and water absorption.

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

47.1.4. The size of tiles generally be square shapes 24.85 Cm x24.85 Cm. or 25 Cm x 25 Cm The thickness of tiles shall be 20 mm.

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

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

47.2. (B) Plain Coloured Tiles:

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

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

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

47.3. (C) Marble mosaic tiles:

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

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

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

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

47.3.5. The tiles shall be prepared form cement conforming to Indian Standards or coloured port land 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 fromer 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 mm. x 250 mm. or as specified. The centre to centre distance of chequer shall not be less than 25 mm. and not more than 50 mm. The overall thickness of the tile shall be 22 mm

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

47.4.4. Tiles shall conform or relevant I.S 1237-1980.47.5.

47.5 Chequered Tiles For Stair Cases :

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

(1) The length of a tile including note shall be 300 mm

(2) The minimum thickness shall be 28 mm

(3) The nosing shall have also the same wearing layer as at the top.

(4) The nosing edge shall be rounded

(5) The front portion of the tile for a minimum length of 75 mm. from and including the nosing shall have grooves running parallel to nosing and at centers not exceeding 25 mm Beyond that the tiles shall have normal chequer pattern.

M48 Rough Kotah Storm

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

48.2. The size of the stones to be used for flooring shall be of size 600 mm x 600 mm and/or size 600 mm. x 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

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

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

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

M-49. Polished Kotah Stoics

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

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

M-50. Dholpur Stone Slab

50.1. Dholpur stone slab shall be of best quality as approve by the Engineer-m-charge The stone slab shall be without my veins, cracks, and flaws The stone slab shall be even sound and durable regular in snaps and of uniform colour

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

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

M-51. Marble Slab

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

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

51.3. Marble slabs with natural veins, if selected shall have to be laid as per the pattern given by the Engineer-in- charge. Size of the slab shall be minimum 460 mm x450 mm and preferably 600 mm 'x 600 mm. However, smaller sizes will be allowed to be used of the extent of maintaining required pattern.

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

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

M-52. Granite Stone slab

52.1. Granite shad 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 any soft veins, cracks of flaws

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

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

M-53. P.V.C. Flooring

53.1. P.V.C. sheets for P.V.C, floor covering shall be of homogenous flexible type conforming to I S 3462-1966. The P.V.C. covering shall neither develop any toxic effect while put to use nor shall give off any disagreeable odour.

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

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

(a) Thickness + 015 mm.
(b) Length or Width

(1) 300 mm. Square tiles +0.20 mm. (3) 900 mm Square tiles +0.60 mm.
(2) 600 mm. Square tiles + 0 40 mm. (4) Sheets and roll +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 sheets/tiles.

M-54. Facing Tiles

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

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

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

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

The tolerance for distortion or warpage respectively snail be as	of face or edges of individual brick from a plane surface and from a straight line
Facing dimensions	Permissible tolerance
Max. below 19 cms. - do- above 19 cms.	Max. 2.5 mm. Max. 3.0 mm.

54.5. The average compressive strength obtained as a sample of five tiles when tested in accordance with the procedure laid as per I S 1077-1976 shall be not less than 175 Kg/Sq Cm. The average compressive strength of any individual bricks shall be not less than 160 Kg / Sq.Cm.

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

54.7. The brick tiles when tested in accordance with I.S. 1077-1976, the rate of effloresecence 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 chipper) edges and corners. The glazing

shall be of uniform shade.

55.2. The tiles shall be nominal size of 150 mm x 150 mm unless otherwise, specified. The maximum variation the stated sizes other than the thickness of tile shall be plus or minus 1.5 mm. The thickness of tile snail be 6 mm. Except as above the tiles shall conform to I.S. 1977-19/0

M-56. Galavanised from pipes and fittings

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

M-57. Bib cock and stop cock

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

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

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

Diameter	Bib cock	Stop cock	Diameter	Bib cock	Stop cock
8 mm 10 mm	0.25 kg. 0.30 kg.	0.25 kg. 0.35 kg.	15 mm 20 mm	0.40 kg. 0.75 kg.	0.40 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 shall be of gate valve opening full way and of the size specified. These shall conform to I.S. 778-1971.

M-59. White glazed porcelain wash basin

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

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

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

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

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

M-61. Orissa type water closet

61.1. The Specification of Orrissa type white glazed water closet of first quality shall conform to I.S. 2256 (Part-Ill) -1981 and relevant specification of Indian type water closet except that pan will be with the integral squatting pan of size 580 mm x 400 mm with raised footrest.

M-62. Indian type water closet

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

M-62. A. Foot Rests

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

M-63. Glazed Earthen Ware Sink

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

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

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

64.1. The lipped type urinal shall be fiat back or corner type as specified in the item and shall conform to I.S 771-1979. It shall be of best Indian make and size as specified and approved by the Engineer-in-charge. The flat back of corner type urinal must be of 1st 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 of I S 774-1971. The flushing cistern shall be of best quality and free from any defects. The flushing tank shall have outlet 32 mm. diameter. The outlet shall be connected with W.C. pan by lead pipe or P.V.C. pipe as specified. The flushing tank shall be provided with inlet and outlet for fixing G.I. inlet pipes and over-flow pipes. The flushing cistern shall be provided with chromium plated handle for flushing. The flushing tank shall be provided with bracket of cast iron so that it can be fixed on wall at specified height. The brackets shall conform to I.S. 775-1970.

M-66. Cast iron flushing cistern.

66.1. The cast iron flushing cistern shall be of 15 liters capacity. It shall conform to I.S. 774-1971. The flushing cistern shall be of best quality free from any defects. The flushing cistern shall have outlet of 32 mm diameter. The lead pipe shall conform to I.S 404 (Part-l) - 1962; For fixing G.I. inlet pipes and overflow pipe 20 mm. dia. inlet and outlet shall be provided The flushing cistern shall be provided with galvanised 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 anticorrosive paint and two coats of paints The flushing cistern shall be fixed on two C I brackets The C [.brackets shall conform to I S 775-1970.

M-67. Flush cock.

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

M-68. Cast iron pipes and fittings.

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

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

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

68.4 Tolerances :

68.4.1. The Standard weights and thickness of pipes shall be as shown in the following table

A tolerance up to minus 10 per cent may however be -allowed against these standard weights

Sr. No.	**Nominal dia of Bore**	**Thickness of Pipe**	**Over all weight of Pipe excluding ears**		
			1.5 M Long	1.8 m Long	2M Long
1	75mm	5.0 mm	12.83 Kg	16.52 Kg	18.37 Kg
2	100mm	5.0 mm	18.14 Kg	21.67 Kg	24.15 Kg

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

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

M-69. Nahani Trap

69.1. Nahani trap shall be of cast iron 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 .form craze, chips and other flaws or any other kind of defects which affect serviceability The size of nahani trap shall be specified and shall be of self cleaning design.

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

69.3. The Nahani trap provided shall be with deep seal, minimum 50 mm. except at places where trap with deep seal cannot be accommodated. The cover shall be cast iron perforated cover shall be provided on the trap of appropriate size.

M-70. Gully Trap

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

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

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

The grating cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

M 71. Glazed Stone Ware pipe and Fittings

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

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

M-72. Wall Peg Rail

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

M-73. G.I. Water Spot

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

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

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

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

M-75. Crydon Ball valve

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

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

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

M-77. Selected Earth

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

77.2. The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and 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 arrangement at his own cost for land for borrowing selected earth. The stacking of material shall be done as directed by the Engineer-in-charge in such a way not to interfere with any construction all activities and in proper stacks.

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

M-78. Barbed Wire

78.1. The barbed wire shall he of galvanised steel and it shall generally conform to I.S. 278-1978. The barbed wire shall be of types-I whose nominal diameter for line wire shall be 2.5 mm. and point wire 2 24 mm. The nominal distance between two barbs shall be 75 mm unless otherwise specified in the item. The bribed wire shall be formed by twisting together two tine wires. One containing the barbs. The size of the line and point wires and barb spacing shall be as specified above. The permissible deviation from the nominal diameter of the line wire and point wire shall not exceed + 0.08 mm

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

78.3. The line and point wires shall be circular in section, free from scale and other defects and shall be uniformly galvanized. The line wire shall be in continuous length and shall not contain any welds other than those in the rod before it is drawn. The distance between two successive splices shall not be less than 15 meters.

78.4. The lengths per 100 Kg. of barbed wire I.S. type I shall be as under: Nominal 1000 meter Minimum 934 meter Maximum 1066 Meter.

Item No. 01

Excavation for foundation in loose or soft soil upto 1.5 m. depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto any lead. The rates shall be inclusive of any/all shoring, supporting of loose soil that may be needed as per codal requirements or site conditions or as per the Engineer-in-Charge's instructions. No additional amount shall be paid for dewatering.

EXCAVATION IN ALL KINDS OF SOILS

1 All excavation operations manually or by mechanical means shall include excavation and 'getting out' the excavated materials. In case of excavation for trenches, basements, water tanks etc. 'getting out' shall include throwing the excavated materials at a distance of at least one metre or half the depth of excavation, whichever is more, clear off the edge of excavation. In all other cases 'getting out' shall include depositing the excavated materials as specified. The subsequent disposal of the excavated material shall be either stated as a separate item or included with the items of excavation stating lead.

2 During the excavation the natural drainage of the area shall be maintained. Excavation shall be done from top to bottom. Undermining or undercutting shall not be done.

3 In firm soils, the sides of the trenches shall be kept vertical up to a depth of 2 metres from the bottom. For greater depths, the excavation profiles shall be widened by allowing steps of 50 cms on either side after every 2 metres from the bottom. Alternatively, the excavation can be done so as to give slope of 1:4 (1 horizontal : 4 vertical). Where the soil is soft, loose or slushy, the width of steps shall be suitably increased or sides sloped or the soil shored up as directed by the Engineer-in-Charge. It shall be the responsibility of the contractor to take complete instructions in writing from the Engineer-in-Charge regarding the stepping, sloping or shoring to be done for excavation deeper than 2 metres.

4 The excavation shall be done true to levels, slope, shape and pattern indicated by the Engineer-in-Charge. Only the excavation shown on the drawings with additional allowances for centering and shuttering or as required by the Engineer-in-Charge shall be measured and recorded for payment.

5 In case of excavation for foundation in trenches or over areas, the bed of excavation shall be to the correct level or slope and consolidated by watering and ramming. If the excavation for foundation is done to a depth greater than that shown in the drawings or as required by the Engineer-in-Charge, the excess depth shall be made good by the contractor at his own cost with the concrete of the mix used for levelling/ bed concrete for foundations. Soft/defective spots at the bed of the foundations shall be dug out and filled with concrete (to be paid separately) as directed by the Engineer-in-Charge.

6 While carrying out the excavation for drain work care shall be taken to cut the side and bottom to the required shape, slope and gradient. The surface shall then be properly dressed. If the excavation is done to a depth greater than that shown on the drawing or as required by the Engineer-in-Charge, the excess depth shall be made good by the contractor at his own cost with stiff clay puddle at places where the drains are required to be pitched and with ordinary earth, properly watered and rammed, where the drains are not required to be pitched. In case the drain is required is to be pitched, the back filling with clay puddle, if required, shall be done simultaneously as the pitching work proceeds. The brick pitched storm water drains should be avoided as far as possible in filled-up areas and loose soils.

7In all other cases where the excavation is taken deeper by the contractor, it shall be brought to the required level by the contractor at his own cost by filling in with earth duly watered, consolidated and rammed.

8 In case the excavation is done wider than that shown on the drawings or as required by the Engineer-in-Charge, additional filling wherever required on the account shall be done by the contractor at his own cost.

9 The excavation shall be done manually or by mechanical means as directed by Engineer-in-charge

considering feasibility, urgency of work, availability of labour /mechanical equipments and other factors involved. Contractor shall ensure every safety measures for the workers. Neither any deduction will be made nor will any extra payment be made on this account.

10 Mode of measurements & Payment

The work shall be measured for the work limited to the dimensions shown on drawings or directed Excavation to dimension in excess of the above will not be measured or paid for and if so ordered by the Engineer the contractor shall have to fill up the excess depth with cement concrete specified for foundation without extra payment.

Driving of sounding bars, drill holes to explore the nature of substratum up to a total length of meter distributed in 2 or 3 places in each foundation if necessary, will be considered incidental work and will not be paid for separately.

Removal of slips and blows in the foundation trenches will not be measured or paid for.

If it is necessary in the opinion of the Engineer-in-charge to carry foundation below the levels shown on the plans, the excavations for the 1.5 M of addition depth will be included in the quantity for the particular classification and will be paid for as extra at rate to be decided under the general conditions of contract unless, the contractor is willing to accept payment as tendered rates.

The rate shall be measured and paid for a unit of one cubic meter

Item No. 02

Excavation for foundation in loose or soft soil from 1.5 mt.to 3.0 mt. depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto any lead. The rates shall be inclusive of any/all shoring, supporting of loose soil that may be needed as per codal requirements or site conditions or as per the Engineer-in-Charge's instructions. No additional amount shall be paid for dewatering.

1 The relevant specifications or item No.1 shall be followed except that the excavation work shall be carried out for Depth from 1.5 M. to 3.0 M.

2 Mode of Measurement & Payment

The relevant specifications of item No. 1 shall be followed.

The excavation work of from 1.5 M. to 3.0 M. shall be measured under this item

The rate shall be for a unit of one cubic meter

Item No. 03

Excavation for foundation in loose or soft soil from 3.0 mt.to 5.0 mt. depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto any lead. The rates shall be inclusive of any/all shoring, supporting of loose soil that may be needed as per codal requirements or site conditions or as per the Engineer-in-Charge's instructions. No additional amount shall be paid for dewatering.

1 The relevant specifications or item No.1 shall be followed except that the excavation work shall be carried out for Depth from 3 M. to 5 M.

2 Mode of Measurement & Payment

The relevant specifications of item No. 1 shall be followed.

The excavation work of from 3 M. to 5 M. shall be measured under this item

The rate shall be for a unit of one cubic meter

Item No. 04

Filling available excavated earth (excluding rock) in trenches plinth sides of foundation etc.in layers not exceeding 20 cm. in depth consolidating each deposited layer by ramming, watering. etc. complete.

Workmanship

(i) The earth to be used for filling shall be free from salts, organic or other foreign matter. All clods of earth shall be broken.

(ii). As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris, brick bats: 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.

(iii) The plinth shall be similarly filled with earth 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.

(iv) The finished level of filling shall be kept to shape intended to be given to floor.

(V) 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.

(vi) 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 be used for filling the plinth.

Mode of Measurements & **Payment**

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.

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

Item No. 05

FILLING in plinth with SAND under floors including watering, raming consolidating and dressing etc. complete.

Materials

Sand shall conform to M 6.

Workmanship

The relevant specifications of item No. 3 shall be followed except that sand shall be filled in under floors, including watering, ramming, consolidating and dressing etc , complete.

Mode of Measurements & **Payment**

The relevant specifications of item No. 3 shall be followed.

The rate includes cost of collecting, carting sand with all lead and labour for filling the same in plinth under floors. The rate shall be for a unit of one cubic meter.

Item No.06

Filling in foundation and plinth with murrum or selected soil brought from out side in layer of 20 cm. the. including watering ramming and consolidating etc. complete.

Materials

Murrum shall be clean, of good binding quality and of approved quality obtained from approved pots/ quarries of disintegrated rocks which contain silicon material and natural mixture of clay of clarions origin. The size of murrum shall not be more than 20 mm

Workmanship

The relevant specifications of item No. 2shall be followed except that the murrum or selected soil shall be filled in foundations and plinth in 20 cms layer including consolidating, ramming, watering, dressing etc. complete

Mode of Measurements & **Payment**

The relevant specifications of item No. 2 shall be followed-.
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.
Rate shall be for a unit of one cubic met

Item No.07

Providing and applying general insecticide Pest Control treatment to floors , doors, cupboards, including labours, materials etc. complete as directed by EIC.

Sub-terranean termites are responsible for most of the termite damage in buildings. Typically, they form nests or colonies underground. In the soil near ground level in a stump or other suitable piece of timber in a conical or dome shaped mound. The termites find access to the super-structure of the building either through the timber buried in the ground or by means of mud shelter tubes constructed over unprotected foundations.

Termite control in existing as well as new building structures is very important as the damage likely to be caused by the termites to wooden members of building and other household article like furniture, clothing, stationery etc. is considerable. Anti-termite treatment can be either during the time of construction i.e. pre-constructional chemical treatment or after the building has been constructed i.e. treatment for existing building.

Prevention of the termite from reaching the super-structure of the building and its contents can be achieved by creating a chemical barrier between the ground, from where the termites come and other contents of the building which may form food for the termites. This is achieved by treating the soil beneath the building and around the foundation with a suitable insecticide.

Materials

Chemicals: Any one of the following chemicals in water emulsion to achieve the percentage concentration specified against each chemical shall be used:

(i) Chlorphriphos emulsifiable concentrate of 20%

(ii) Lindane emulsifiable concentrate of 20%

Anti-termite treatment chemical is available in concentrated form in the market and concentration is indicated on the sealed containers. To achieve the specified percentage of concentration, Chemical should be diluted with water in required quantity before it is used. Graduated containers shall be used for dilution of chemical with water in the required proportion to achieve the desired percentage of concentration. For example, to dilute chemical of 20% concentration. 19 parts of water shall be added to one part of chemical for achieving 1% concentration.

Safety Precautions

Chemical used for anti-termite treatment are insecticides with a persistent action and are highly poisonous. This chemical can have an adverse effect upon health when absorbed through the skin, inhaled as vapours or spray mists or swallowed.

The containers having emulsifiable concentrates shall be clearly labelled and kept securely closed in stores so that children or pet cannot get at them. Storage and mixing of concentrates shall not be done near any fire source or flame. Persons using these chemical shall be warned that absorption though skin is the most likely source of accidental poisoning. Particular care shall be taken to prevent skin contact with concentrates and prolonged exposure to dilute emulsion shall also be avoided. After handling the concentrates or dilute emulsion. Workers shall wash themselves with soap and water and wear clean clothing, especially before eating. In the event of severe contamination, clothing shall be removed at once and the skin washed with soap and water. If chemical has splashed into the eyes, they shall be flushed with plenty of soap and water and immediate medical attention shall be sought. Care should be taken in the application of chemicals to see that they are not allowed to contaminate wells or springs which serve as source of drinking water.

Treatment

(i) Once the termites have an ingress into the building, they keep on multiplying and destroy the wooden and cellulosic materials, and as such it becomes essential to take measures for protection against termites. Anti termite measures described below are necessary for the eradication and control of termites in existing building. To facilitate proper penetrations of chemical in to the surface to be treated, hand operated pressure pump shall be used. To have proper check for uniform penetration of chemical, graduated containers shall be used. Proper check should be kept so that the specified quantity of chemical is used for the required area during the operation. Chemical treatment for the eradication and control of sub-terranean termites in existing building shall be done as per IS 6313 (Part III). Treatment shall be got done only from the approved specialized agencies using the chemical procured directly by the Engineer-in-Charge from reputed and authorized dealers.

(ii) **Treatment along outside of foundations:**

The soil in contact with the external wall of the building shall be treated with chemical emulsion at the rate of 7.5 litres per square metre of vertical surface of the sub-structure to a depth of 300 mm. To facilitate this treatment, a shallow channel shall be excavated along and close to the wall face. The chemical emulsion shall be directed towards the wall at 1.75 litres per running metre of the channel. Rodding with 12 mm diameter mild steel rods at 150 mm apart shall be done in the channel. If necessary for uniform dispersal of the chemical to 300 mm depth from the ground level. The balance chemical of 0.5 litre per running metre shall then be used to treat the backfill earth as it is returned to the channel directing the spray towards the wall surface.

If there is a concrete or masonry apron around the building, approximately 12 mm diameter holes shall be drilled as close as possible to the plinth wall about 300 mm apart, deep enough to reach the soil below and the chemical emulsion pumped into these holes to soak the soil below at the rate of 2.25 litres per linear metre.

In soils which do not allow percolation of chemicals to desired depth, the uniform disposal of the chemical to a depth of 300 mm shall be obtained by suitably modifying the mode of treatment depending on site condition.

In case of RCC foundations the soil (backfill) in contact with the column sides and plinth beams along with external perimeter of the building shall be treated with chemical emulsion at the rate of 7.5 litres/sqm of the vertical surface of the structure. To facilitate this treatment, trenches shall be excavated equal to the width of the shovel exposing the sides of the column and plinth beams up to a depth of 300 mm or up to the bottom of the plinth beams, if this level is less than 300 mm.

The chemical emulsion shall be sprayed on the backfill earth as it is returned into the trench directing the spray against the concrete surface of the beam or column as the case may be.

(iii) **Treatment of Soil under Floors :** The points where the termites are likely to seek entry through the floor are the cracks at the following locations:

(a) At the junction of the floor and walls as result of shrinkage of the concrete;
(b) On the floor surface owing to construction defects;
(c) At construction joints in a concrete floor, cracks in sections; and
(d) Expansion joints in the floor.

Chemical treatment shall be provided in the plinth area of ground floor of the structure, wherever such cracks are noticed by drilling 12 mm holes at the junction of floor and walls along the cracks on the floor and along the construction and expansion joints at the interval of 300 mm to reach the soil below. Chemical emulsion shall be squirted into these holes using a hand operated pressure pump to soak the soil below until refusal or up to a maximum of one litre per hole. The holes shall then be sealed properly with cement mortar 1:2 (1 cement: 2 coarse sand) finished to match the existing floors. The cement mortar applied shall be cured for at least 10 days as per instruction of Engineer-in-charge.

(iv) **Treatment of Voids in Masonry :** The movement of termites through the masonry wall may be arrested by drilling holes in masonry wall at plinth level and squirting chemical emulsions into the holes to soak the masonry. The holes shall be drilled at an angle of 45 degree from both sides of the plinth wall at 300 mm intervals and emulsion squirted through these holes to soak the masonry using a hand operated pump. This treatment shall also be extended to internal walls having foundations in the soil. Holes shall also be drilled at wall corners and where door and window frames are embedded in the masonry or floor at ground. Emulsion shall be squirted through the holes till refusal or to a maximum of one litre per hole. Care shall be taken to seal the holes after the treatment.

(v) **Treatment at Points of Contact of Wood Work :** The wood work which has already been damaged beyond repairs by termites shall be replaced. The new timber shall be dipped or liberally brushed at least twice with chemical in oil or kerosene. All existing wood work in the building which is in contact with the floor or walls and which is infested by termites, shall be treated by spraying at the points of contacts with the adjoining masonry with the chemical emulsion by drilling 6 mm holes at a down ward angle of about 45 degree at junction of wood work and masonry and squirting chemical emulsion into these holes till refusal or to a maximum of half a litre per hole. The treated holes shall then be sealed. Infested wood work in chaukhats, shelves, joints, purlins etc., in contact with the floor or the walls shall be provided with protective treatment by drilling holes of about 3 mm diameter with a downward slant to the core of the wood work on the inconspicuous surface of the frame. These holes should be at least 150 mm centre to centre and should cover in entire frame work. Chemicals shall be liberally infused in these holes. If the wood is not protected by paint or varnish two coats of the chemicals shall be given on all the surfaces and crevices adjoining the masonry.

118.4 Measurements: All dimensions shall be measured in Sqmt correct to a cm. The measurements shall be made of the surface actually provided with anti termite treatment in Sqmt.

118.5 Rates

The rate shall include the cost of labour and all other inputs (except concentrated chemical) involved in all the operations described above including drilling, refilling and making good the holes and paid in sqmt along with furnishing Guarantee Bond as mentioned below.

A guarantee bond on appropriately stamped paper shall be given by the contractor to the Client in the manner and form prescribed below:

FORM OF GUARANTEE BOND

"I/We..... (Contractor) hereby guarantee that work will remain uneftected and will not be in any way damaged by termite or any other germs of similar types, for a period of 10 years after completion of the work of anti-termite as per the terms and conditions of the contract and contractor hereby indemnifies and agrees to save harmless the Government of Gujarat from any loss and or damage that might be caused on account of termite and or oilier similar type of germs and hereby Guarantees to make good any loss or damages suffered by the Government of Gujarat and further guarantee to redo the effective work without claiming any extra cost."

This guarantee shall remain force for the period of 10 years from the completion of the work under the contract and it shall remain binding to the contactor for period of 10 years.

The deposit at the rate of 50% of the cost of this item from the running and final bills shall be recovered and retained for the first one year after completion of, the work and 10% shall be retained for the balance of guarantee period and shall be refunded only after the completion of the guarantee period.

For Concrete Work

Item No.08

Providing and laying cement concrete 1:3:6 (1 Cement : 3 coarse sand : 6 Machine Crushed stone aggregates 40m.m. nominal size) and curing complete including cost of formwork for sub base of foundation, plinth, trenches 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 40 mm. nominal size shall conform to M-12.

Workmanship

Before stating concrete 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 and coarse aggregate shall be one part of cement. 3 parts of sand and 6 parts of stone aggregates and shall be measured by volume.

Mixing:

a. The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be allowed for smaller quantity of work if approved by the Engineer-in-charge. When hand mixing is permitted by the Engineer-in-charge in case "of break-down of machineries and in the interest of the work, it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency, However in such case 10% more cement than otherwise period 1 1/2 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose.

Transporting & Placing the Concrete:

a. 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.

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

The concrete shall be rammed with heavy iron rammers and rapidly to get the required compaction and to allow ail the interstices to be filled with mortar.

Curing:

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

Mode of Measurement & Payment

The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plans or as directed. The rate shall be for a unit of one cubic meter.

Item No.09/10

Providing and laying in position Ready Mixed M250/300 Grade concrete for all depths, heights and shapes including finishing smooth with curing complete including the cost of centering, shuttering and form work but excluding the cost of reinforcement for foundation, pedestal, ground-beams, plinth beams upto plinth level. For reinforced cement concrete work, using cement content as per approved design mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer, manufactured as per mixed design of specified grade for reinforcement cement concrete work including pumping of R.M.C. from transit mixer to site of laying, including the cost of admixtures in recommended properties as per IS:9103 to accelerate/retard setting of concrete, improve workability without impairing strength and durability as per direction of the engineer-in-charge without fly ash (minimum cement level as per latest IS:456 shall be maintained.

Providing and fixing (also removing) RCC Centering and ply shuttering for building elements of all depth, height, shape & required size including keeping the same in position during concreting and up to the removal of the same after a specified period. Rate shall include cost of all materials, labour and scaffolding required with Accro shuttering system to execute and complete the job as directed and specified by EIC. Rate shall also include for providing dowels, pipe flanges, notches, grooves, insert plates, drip moulds etc. as directed and specified by EIC.

Item No.11/12/14
Providing and laying in position Ready Mixed M200/250/300 Grade concrete for all depths, heights and shapes including finishing smooth with curing complete including the cost of centering, shuttering and form work but excluding the cost of reinforcement for super structure above plinth level.

For reinforced cement concrete work, using cement content as per approved design mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer, manufactured as per mixed design of specified grade for reinforcement cement concrete work including pumping of R.M.C. from transit mixer to site of laying, including the cost of admixtures in recommended properties as per IS:9103 to accelerate/retard setting of concrete, improve workability without impairing strength and durability as per direction of the engineer-in-charge without fly ash (minimum cement level as per latest IS:456 shall be maintained.

Providing and fixing (also removing) RCC Centering and ply shuttering for building elements of all depth, height, shape & required size including keeping the same in position during concreting and up to the removal of the same after a specified period. Rate shall include cost of all materials, labour and scaffolding required with Accro shuttering system to execute and complete the job as directed and specified by EIC. Rate shall also include for providing dowels, pipe flanges, notches, grooves, insert plates, drip moulds etc. as directed and specified by EIC.

Item N0. 13
Providing and laying in position Ready Mixed M250 Grade concrete for all depths, heights and shapes including finishing smooth with curing complete including the cost of centering, shuttering and form work but excluding the cost of reinforcement for foundation, pedestal, ground-beams, plinth beams for exposed R.C.C. work. for reinforced cement concrete work, using cement content as per approved design mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for a lead up to any distance having continuous agitated mixer, manufactured as per mixed design of specified grade for reinforcement cement concrete work including pumping of R.M.C. from transit mixer to site of laying, including the cost of admixtures in recommended properties as per IS:9103 to accelerate/retard setting of concrete, improve workability without impairing strength and durability as per direction of the engineer-in-charge without fly ash (minimum cement level as per latest IS:456 shall be maintained.

Providing and fixing (also removing) RCC Centering and ply shuttering for building elements of all depth, height, shape & required size including keeping the same in position during concreting and up to the removal of the same after a specified period. Rate shall include cost of all materials, labour and scaffolding required with Accro shuttering system to execute and complete the job as directed and specified by EIC. Rate shall also include for providing dowels, pipe flanges, notches, grooves, insert plates, drip moulds etc. as directed and specified by EIC.

1 Scope of work

(a) The section covers specifications for Item of M-250 grade concrete.

(b) The specification cover the requirements of plain and reinforced concrete for use in various components of the structures. The work covered under this section consists of furnishing all materials including formwork, equipment, labors for the manufacturer, transport, placing, vibrating, finishing and curing of the concrete for the structure and performing all the operations necessary and ancillary thereto including dewatering as required.

(c) all RMC work shall confirm IS 4925:2004 at site.

2 Description of Items:

Providing and lying reinforced controlled cement concrete of M-250 grade with cement, sand & kapachi and grit including centering, shuttering scaffolding, tamping, vibrating, finishing, curing etc. complete in R.C.C. slab, R.C.C. barrels, approach slab, etc. with all leads & lifts.

3.1 Indian Standards for reference.

1)	IS : 269 - 1976 (Third revision)	Ordinary and Low heat Portland cement.
2)	Is : 303 - 1975	Plywood of general purpose.
3)	IS : 383 - 1970 (Reaffirmed -1980)	Coarse and fine aggregate from natural sources for concrete.
4)	IS : 482 Part I - 1966	Mild steel and medium tensile steel bars.
5)	IS : 456 -1978	Code of practice for plain and reinforced concrete.
6)	IS : 460 - 1978	Test sieves.
7)	IS : 455 - 1976	Portland slag cement.
8)	IS : 516 - 1959	Method of tests for strength of concrete.
9)	IS : 650 - 1966 (Reaffirmed - 1980)	Standard sand for testing of cement.
10)	IS : 1199 - 1959	Methods of sampling and analysis of concrete.
11)	IS : 1489 - 1976	Portland pozzolona Cement.
12)	IS : 1791 - 1968	Batch type concrete mixers.
13)	IS : 2386 - 1963	Methods of tests for aggregate concrete

	(Part I to VIII)	
14)	IS : 2430 - 1969	Methods for sampling of aggregate concrete.
15)	IS : 2505 - 1980	Concrete vibrators, immersion type.
16)	IS : 2506 - 1964	Screed board concrete vibrators.
17)	IS : 2580 - 1965	Jute bags for packing cement.
18)	IS : 2722 - 1964	Portland swing weight batchers for concrete (single and double bucket type)
19)	IS : 3085 - 1965	Methods of test for permeability of cement mortar and concrete.
20)	IS : 3370 1965-1967 (all parts)	Code of practice for concrete structure for the storage of liquids.
21)	Is L 3558 - 1983	Code of practice for the use of immersion vibrators for consolidating concrete.
22)	Is : 4031 -1938	Methods of physical tests for hydraulic cement.
23)	Is : 4032 - 1968 (Reaffirmed - 1980)	Method of chemical analysis of hydraulic cement.
24)	Is : 4656 - 1968	Form vibrators for concrete.
25)	IS : 4845 - 1968	Definitions and terminology relating to hydraulic cement.
26)	IS : 4925 - 1968	Concrete batching; mixing plant
27)	IS : 4926 -1976	Ready mix concrete.
28)	IS : 4990 - 1981	Plywood for concrete shuttering works.
29)	IS : 5242 - 1979	Method of test for determining shear strength of mild steel.
30)	IS : 5512 - 1983	Flow table for use in tests of hydraulic cement and pozzolonic material.
31)	IS : 5513 - 1976	Vicat apparatus.

32)	IS : 5515 - 1983	Compaction factor apparatus.
33)	IS : 5529	Code for practice for in situ permeability test.
34)	IS : 5640- 1970	Methods of test for determining aggregates impact value of soft coarse aggregates.
35)	IS : 5816 - 1970	Methods of test for splitting tensile strength of concrete cylinders.
36)	IS : 5889 - 1970	Vibratory plate compactor.
37)	IS : 5892 - 1970	Concrete transit mixers and agitators.
38)	IS : 6461 (all Parts) - 1972	Glossary on terms relating to aggregates materials etc.
39)	Is : 6923- 1973	Method of test for performance of screed boars concrete vibrators.
40)	Is : 6925 - 1973	Method of test for determination of water soluble chlorides in concrete admixtures.
41)	Is : 7245 - 1974	Concrete pavers
42)	Is : 7320 - 1974	Concrete slump test apparatus.
43)	Is: 7861	Code of practice for stream weather concreting
44)	Is : 7861 (Part - I-1971) (Part II - 1981)	Recommended practice of weather Recommended practice for cold weather concreting)
45)	Is : 8041 - 1978	Rapid hardening Portland cement.
46)	Is : 8043 - 1970	Hydrophobic Portland cement.
47)	IS : 8112 - 1976	High strength ordinary Portland cement.
48)	Is : 8142 - 1976	Method of test for determining setting time of concrete by penetration resistance,
49)	Is : 8989 - 1978	Safely code for erection of concrete framed structures.
50)	Is : 9013 - 1978	Method of making curing and determining compressive strength of accelerated cured concrete test specimen.
51)	Is : 9077 - 1979	Code of practice for corrosion protection of steel

		reinforcement in R.B. and R.C.C. construction
52)	Is : 9103 - 1979	Admixtures for concrete.
53)	Is : 9284 - 1979	Methods of test abrasion resistance of concrete.

3.2 Other Publications:

1)	USBR	Concrete manual (Eighth edition revised print 1981)
2)	ASTM	C-156-80 Water retention test
3)	ASTM	C-491-80 Water reducing agent.
4)	ASTM	C-494- type D water deducing agent and set retarder.
5)	ASTM	E- 97 Light reflectance test.
6)	Indian Road Congress Standard Specifications and code of practice of Road Bridges.	Section-I Section-II Section-III
7)	Concrete Manual	U.S.B.R
8)	ASTM	C-494-80
9)	Design aids for reinforced concrete to IS 456 - 1978	SP-16 (S &T) 1980

IMPORTANT NOTE:

Proper test reports/papers for concreting materials and design mix Lab tests shall be performed and submitted to approval before using of RMC at site and any kind of change in design mix and/or materials of concreting shall follow the above procedure before use of RMC at site.

4 Batching of Concrete ingredients :

For all structural concreting, only Ready Mixed Concrete (RMC) manufactured at site is mandatory, weigh batching plant or obtained from approved R.M.C. supplying agencies or produced at site using mechanical mixers and weigh batchers as per item description, will be used. The R.M.C. supplying agency will supply mix design details in advance before start of delivery,

For Plant At site: The maximum capacity of the plant shall be calculated using the minimum

cycle time of the mixer after the materials to be mixed are fed into the mixer. The capacity of the plant, as calculated above, shall be for concrete with 80 mm slump. The plant shall be capable of accurate (see6.1.1and6.3.1) batching and mixing of aggregates, sand, cement, additives, ice flakes, etc. It is necessary for the contractor to specify details as an aid for manufacturer to select/design the appropriate batch mixing plant as per IS 4925:2004.

5 Materials:

5.1 Cement:

(a) Only ordinary Portland cement (O.P.C) Shall be used for R.M.C. and other R.C.C. constructions. Pozzolona Portland Cement (P.P.C) shall not be allowed.

(b) Immediately, upon receipt at the site of the work, cement shall be stored separately in dry, watertight and properly ventilated structures. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification. Sufficient cement shall be kept in stock for completion of concreting undertaken, Cement shall be used in order of receipt and cement older than 90 days shall not be used, unless the test results. Cement shall for its physical and chemical requirement, conform to IS : 269 - 1976 where ordinary portland cement is used. Sampling and testing will be done by and at the expense of the contractor. No cement shall be used until notice has been given that the test results are satisfactory.

(c) The Contractor shall create a suitable and adequate infrastructure for procuring handing, storing and conveying bulk cement to batching plant at site, with advance planning of work to be done during next seven days as approved by the Engineer-in-charge.

(d)Day to day consumption of cement shall be maintained in cement account book which shall be binding to the contractor or his authorized representative in token of acceptance. Any dispute in this regard shall be decided by the Engineer-in-charge & shall be final.

5.2 Fine aggregates:

(i) General

(a) All the aggregates shall conform to IS : 383 - 1970 or its latest edition and as directed by the Engineer-in-charge. Sand to be used shall be natural and brought form the river bed. Fine aggregates will be tested for their gradation, specific gravity, water absorption fineness modulus, soundness, petrography analysis, deleterious constituents and alkali aggregate reactivity.

(ii) Quality.

(a) Sand shall consists of hard, dense, durable and uncoated siliceous gritty materials. It shall be free from injurious amount of dust, lumps, soft and flaky particles, shale, alkali ,organic matter, loan and other deleterious substances. The maximum percentage of each of the deleterious substances in sand as delivered to the mixer shall not exceed the following values

Material passing B.S.S.	
No. 200 (Sieve No- 8)	3 % by weight
Clay lumps.	1 % by weight
Clinders & Clinkers	0.5 % by weight

Mica	2 % by weight
Total of all deleterious substances including alkali, mica coated grains, soft and flaky particles loams etc.	5 % by weight

(b) Sand shall be free form injurious amount of organic impurities and sand producing a colour darker than the standard in the colorimetric test for organic impurities shall be rejected.

(iii) Grading:

(a) Sand shall be graded so as to impart good workability and good finishing. Sieve analysis of natural sand shall conform to the following limits of gradation (IS : 383 - 1970, Table -4)/ Grading zone II

I.S. sieve designation	Cumulative Percentage of weight passing through sieve.
10 mm	100
4.75 mm	90-100
2.36 mm	75-100
1.18 mm	55-90
600 Micron	35-59
300 Micron	8-30
150 Micron	0-10

(b) The deviations from the prescribed limits of cumulative percentage passing through sieve 10 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 Micron 300 micron and 150 micron IS sieves shall be permitted provided total of such deviations do not exceed 5 percent. No deviation from the prescribed limit shall be permitted for cumulative percentage passing through 600 micron IS sieve.

(iv) Fineness Modulus.

(a) Sand shall have a fineness modulus between 2.4 to 3.0 subject to the gradation specified in the preceding paragraph.

(b) The modulus shall be computed by adding commutative percentage of sand retained on the standard screens 4.75 mm, 2.36 mm, 1.18 mm, 600 micron, 300 micron, 150 micron IS sieves and dividing the sum by 100. Gradation of sand shall be so controlled that the fineness modulus of at least 9 out of 10 consecutive test samples of finished sand shall not vary by more than 0.10 from the average of 10 test samples. Sand having any deviation from the specified range of gradation and fineness modulus shall not be permitted to be used in work without the written permission of the Engineer-in-charge.

(v) Storage:

All sand shall be stored on the site of work in such a manner as to prevent intrusion of foreign matter.

5.3 Coarse Aggregate:

(i) General:

(a) Coarse aggregates for concrete shall consist of clean, hard dense and durable crushed metal and free from vegetable matter predominantly flaky aggregates shall not be used. All coarse aggregates shall be washed and / or screened by the contractor, if required. The cost of washing and screening shall be borne by the contractor. The percentage of deleterious substance in coarse aggregate shall not exceed the following values.

Material passing 150 micron

I.S. sieve screen	1 Percent by weight
Shale	1 Percent by weight
Coal	1 Percent by weight
Soft fragments	3 Percent by weight
Other deleterious substances	1 Percent by weight
Clay lumps	1 Percent by weight

Coarse aggregates shall be tested for their gradation, specific gravity, water absorption, impact and abrasion values, soundness, petrography analysis, deleterious constituents, flakiness and elongation indices and alkali aggregate reactivity. coarse aggregates shall conform to IS ; 383 - 19702 and IS : 515 - 1959.

(b) The sum of the percentage of all the deleterious substances shall, however, not exceed 5 percent by weight. the coarse aggregate shall conform to the requirements laid down in IS : 383 - 1970 and other relevant Indian Standard Specifications.

(ii) Grading

(a) The Maximum size of coarse aggregate shall be governed by the type of work as outlined in the table given under the sub para (iv) of this clause.

(b) The gradation shall give a dense concrete of the specified strength and consistency that will work readily into position without segregation and without the use of an excessive water content.

(c) The grading of coarse aggregate shall be in the nominal sizes as mentioned in Table-II of IS : 383 - 1970 as reproduced below:

I.S. Sieve designation	Percentage passing for graded aggregate of nominal size.			
	40 mm	20 mm	16 mm	12.5 mm
40 mm	95 -10	100	-	-
20 mm	30 - 70	95-100	100	100
16 mm	-	-	90-100	-
12.5 mm	-	-	-	90-100
10 mm	10 - 35	25-55	30-70	40-85
4.75 mm	0 - 5	0-10	0-10	0-10
2.36 mm	-	-	-	-

However, the exact gradation required to produce a dense concrete of specified strength and desired workability shall be decided by the Engineer-in-charge.

(d) The materials passing through the screen shall be in the grades ranging form 20 mm (3/4") to 4.75 mm (3/16"). Each grade of material shall be stacked separately.

(iii) Storage:

(a) Aggregate shall be stacked in such a way as to prevent the admeasure of foreign materials such as soil, vegetable matter, etc. Heaps of fine and coarse aggregates shall be kept separate. When different sizes of fine or coarse aggregate are procured separately, they shall be stored in separate stock piles sufficiently away from each other to prevent the materials at the edge of the piles from getting intermixed.

(b) The aggregates shall be stock-piled adjacent to the mixer site so as to require minimum rehandling and labour when conveyed to the mixer.

(c) The aggregates shall be placed on a dry hard patch of ground, if available otherwise a platform of planks or plain galvanized iron sheets or alternatively on a floor of dry bricks or a thin layer of lean concrete.

(d) The aggregate shall be kept free from getting dirty by people through rubbish like papers, vegetable materials and bidi etc. on the stock-piles.

(e) To minimize moisture variations the stock piles shall be as large in area as possible but low and fairly uniform in height, preferably 1.25 to 1.50 meter and the lowest layer of about 30 cm. shall be allowed to act as drainage layer and not used till the end.

(iv) Following be the maximum size of coarse aggregate for the different items of work.

Sr.	Item of Work	Maximum nominal size of

No.		coarse aggregate (MSA)
(i)	Foundation floor and gravity retaining walls (mass concrete)	40 mm
(ii)	R.C.C. Rafts, piers, Abutments, Barrels, Cut off walls, Breast walls staunching ring etc.	40 mm
(iii)	R.C.C. work in Main and cross Girders, Deck slab, wearing coat kerb, parapet walls, Approach slab, pier caps, Diaphragm wall and other thin walled members and in zones of congestion.	20 mm
(iv)	For any other items of construction not covered by item (i) to (iii)	As specified in the drawing or as directed by the Engineer - in-charge on case it is not specified in drawing

(d) For heavily reinforced concrete members, as in the case of ribs of main beams, maximum size of aggregate shall usually be restricted to 5 mm less than the minimum lateral clear distance between the main bars, or 5 mm less than the minimum cover to the reinforcement, whichever is smaller. However, if required under special circumstances, the Engineer may permit an aggregate of maximum size 25 % more than this critical spacing / cover. provided that proper vibration is ensured.

5.4 Reinforcing steel

The provisions of respective section shall apply.

5.5 Water

(a) water used for mixing of concrete and mortar shall be free from injurious amounts of deleterious materials. potable water is generally considered satisfactory for mixing and curing.

(b) Where water is found to contain any sugar or and excess of acid, alkali or salt, the Engineer-in-charge will refuse to permit its use. As a guide the following table represents the maximum permissible values.

	Percent.
Organic matter	0.02
Inorganic matter	0.30
Sulphates	0.05
Alkali chlorides	0.10

PH value 6 to 8

5.6 Admixtures :

(i)General:

The Air Entraining Agent (AEA) as an admixture shall be added to the concrete batch in a solution form. It shall be batched by means of mechanical batches capable of correct measurement and in such a manner of correct measurement and in such a manner as will ensure uniform distribution of the agent throughout the batch during the specified mixing period. The amount of AEA used shall be such as to effect air entrainment from 4 to 6 percent by volume in that portion of the concrete containing aggregate smaller than the 40 mm square mesh sieve after its placement and vibration in the forms. The actual percentage of air shall be as fixed by the Engineer-in-charge and will be changed whenever necessary to meet the varying conditions encountered during construction.. The AEA shall be brought by the contractor at his cost at the worksite for the purpose of the concrete or mortar as the case may be. The resulting modification, if any, to the content or proportion for cement as a consequence thereof, shall be borne by the contractor and no extra rate for payment will be paid according to general, technical, special, specifications for concrete. The contractor will be allowed, to use any other admixture, only after prior approval of the Engineer-in-charge. Cost of such admixture shall be borne by the contractor and shall be deemed to have been included in the unit rates quoted by the contractor for relevant items.

No material other than the essential ingredients, i.e. cement aggregates and water shall ordinarily be used in the manufactured of concrete or mortar, but the Engineer-in-charge may permit the use of approved admixture for improving special characteristics of the concrete, on satisfactory evidence that its use does not in any way adversely affect the properties of concrete particularly its strength, volume changes, durability and has no deleterious effect on the reinforcement. Admixtures here allowed will generally be conforming to the relevant ASTM standards and IS : 9103 - 1979.

(ii) Tests

The contractor shall provide satisfactory facilities for easy and quick collection of adequate samples. All tests for the evaluation and approval of an admixture shall be made by and at the expense of the Contractor. The suitability of an air entraining admixture shall be determined as per the requirement of IS : 9103 - 1979.

Cost of the admixture shall be borne by the contractor.

5.7. Epoxy

Use of Epoxy for bonding fresh concrete for repairs may be permitted on written approval of the Engineer- in-Charge. Epoxy shall be applied in accordance with the instruction of the manufacturers. The cost of such repair shall be borne by the Contractor.

5.8 Concrete for Structures

Ready mix concrete shall be used for the structures designated as M-25. The mix shall be designed using respective samples of available coarse and fine aggregates as well as cement and water to achieve the required workability and strength at minimum level of placement. Mix design studies and test will be made in Government authorized laboratory or as directed by the Engineer-in-charge. The cost of these studies and test shall be borne by the contractor. Concrete Mix design approved by the Engineer-in-charge shall be used for the work, any change in design mix and/or change in material shall be approved before using at site.

5.9 Strength Requirement of Concrete

Ordinary Portland Cement (OPC)conforming to IS : 269 -1976 shall be used. The compressive strength requirements for the various grades of controlled concrete shall be as given in Table given below:

Grade of concrete	Compressive test strength in N/mm2 on 150 mmm cube after mixing conducted in accordance with IS : 516 - 1959	
	Min at 7 days	Min at 28 days
M-10	7	10
M-15	10	15
M-20	13.5	20
M-25	17.0	25

Note: In all cases, the 28 days compressive strength specified in the Table shall alone 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 for the two grades specified in the Table, such concrete shall be classified, for all purposed as concrete belonging the lower of the two grades between which its strength lies.

5.10 Proportioning Concrete:

(a) Concrete mix shall be designed on the basis of preliminary testes. The proportion of ingredients shall be such that the concrete has adequate workability for conditions prevailing on the work in question, and can be properly compacted with the means available.

(b) Except when it can be shown to the satisfaction of the Engineer-in-charge that supply of properly graded aggregates of uniform quality can be maintained till the completion of the work, grading of aggregate shall be controlled by obtaining the coarse aggregates in different sizes and blending them in the right proportions as required. Different sizes, however, shall be stacked in separate stock-piles required quantity 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, frequently 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 of cement and aggregate shall be determined by weight. Water shall either be measured by volume in calibrated tank or weighed. All measuring

equipment shall be maintained on a clean and serviceable condition. Their accuracy shall be periodically checked.

(c) It is not important to keep the specified water cement ratio constant. To this end, moisture concrete in both fine and coarse aggregate shall be determined by the Engineer-in-charge. the amount of mixing water shall then be adjusted to compensate for any variations needed in the moisture content. For determination of moisture content in the aggregate. IS : 2386 : 2963 (Part III) shall be referred to. suitable adjustments shall also be made in the weight of aggregates to allow for variations in weight of aggregates due to variations in their moisture content.

(d) The cement level for various grades of controlled concrete shall be considered as column (B) of table shown under for the purpose of working out the rates to be quoted in the Schedule-B. If cement level of mix design for this work is less than whatever mentioned in col(A) , contactor has to utilize the cement level as per col (A) as minimum cement level.

Sr. No.	Grade of concrete	Minimum Cement level required in kg cubic meter of concrete (A) as per I.S.456-2000.	Cement level Considered in kg/cum of concrete in Plans & Estimate (B)	As per Mix design cement level/ required in kg/cum of concrete as per gov. leter no. P, R, C, H -2010-67 Dt. 15 th march 2011.
1	M-15, MSA-40 M-15, MSA-20	210 240	320	280 300
2	M-20, MSA-40 M-20, MSA-20	300	400	330 360
3	M-25, MSA-40 M-25, MSA-20	300	450	370 400

(e) Actual cement level required for the aggregates to be used shall have been determined by laboratory tests & same has been mentioned in column (C) in above table as per gov. leter no. P, R, C, H -2010-67 Dt. 15 th march 2011. . The mix proportions shall be selected to ensure that the workability of the fresh concrete is suitable for the conditions of handling and placing, so that after compaction it surrounds all reinforcements and completely fills the formwork. When concrete is hardened, it shall have the required strength, durability and surface finish.

(f) A mix shall be designed to produce the grade of concrete having the required workability and characteristic strength not less than that stipulated in the table under the Para 7.7 above. However due to change in design mix as per this site condition, it becomes obligatory to use less or more cement per cubic meter of concrete, the contractor shall do the same without claiming any extra cost for getting higher cement level than whatever mentioned in col.(C). However actual use being less than the cement level specified in the table herein above column (B), the department

will deduct the cost of cement from the bill at the star rate of cement as provided in contract clause 59-A for the less consumption of cement level mentioned in column (B) of the above table.

As per latest guideline of department, concrete mix design for Gandhinagar District has been carried out and the results of various mix received is shown in column (C).

(g) The quantity of water shall be just sufficient to produce a dense concrete of required workability and strength for the job. An accurate and strict control shall be kept on the quantity of water.

(h) In the case of reinforced concrete work, workability shall be such that the concrete surrounds and properly grips all reinforcement, The degree of consistency, which shall depend upon the nature of work and methods of vibration of concrete, shall be determined by regular slump tests. The following slumps shall be adopted for different type of works.

	Type of work	Slumps allowed
i)	Mass concrete for footings and retaining walls	10 mm to 25mm
ii)	Beans, slabs and columns	25 mm to 40 mm
iii)	Thin R.C.C. section with congested steel	40 mm to 50 mm
iv)	Canal lining	70 mm to 80 mm

6 Production of concrete:

6.1 Aggregates

Washed Aggregates must be used. The water used for washing aggregates shall be clean and free form alkali, salts and other impurities. After washing fine aggregates must be stored in stock pipes with a free draining base for at least 3 days to ensure that sand delivered to the batching plant will have a reasonable uniform moisture content. The storage and handling shall be in such a manner as to prevent intermingling of various sizes of aggregates required separately for grading purposes. No foreign matter shall be allowed to be mixed up with the aggregates.

6.2 Batching:

(a) The prescribed amount of the various materials of concrete, including water, cement admixtures, the groupings of fine aggregates and each individual size of coarse aggregate shall be measured and controlled within the specified limits of accuracy. The amount of water, cement and aggregate shall be determined by weighing. In the case of fine aggregates, the surface moisture shall be determined in accordance with the method prescribed in Appendix-D of IS :

456 - 1978 and its subsequent amendment or publications. In the case of coarse aggregate, percentage of free water shall be determined by weighing a representative sample, then surface drying each particle individually with a cleaned piece of cloth and re-weighing.

(b) The proportion of various materials shall be changed as directed/approval in order to maintain the desired quantity of the concrete. The batching equipment shall be constructed and operated so that the combined inaccuracies in feeding and measuring the materials shall not exceed 1.5 percent for water and cement and 2 percent for each size of aggregate.

(c)The operation performance of each scale or other measuring devise shall be checked by test weight, and the tests shall cover the ranges of measurements involved in the batching operations. Tests of equipment in operation shall be made at least once every fortnight and adjustments, repairs or replacement, be made as necessary to meet with the specified requirement for accuracy of measurement.

(d) Aggregates shall not be batched for concrete or mortar when free water is dripping from the aggregate.

6.3 Placing :

The concrete produced in RMC plant/batching plant, when discharged from transit mixer in pump hopper shall be kept continuously agitated and pumped to destination placing point. Site made concrete shall be placed by approved method of placing. The height of any single lift of concrete shall not exceed 1.5 m for walls and 2.0 m for columns. For columns where the height of pour is more than 2.0 m, suitable arrangement in formwork should be made so that the vertical drop of concrete is restricted to less than 2.0 m. Any such arrangement should be approved from the engineer in advance before execution. High velocity discharge of concrete causing segregation of mix shall be avoided. The concrete shall be placed in the forms gently and not dropped from the height exceeding 1.5 m except in columns where the maximum allowed will be 2.0 m. Each batch of concrete will be placed in layer. Each layer of concrete shall be compacted fully before the succeeding layer is placed and separate batches shall be placed and fully compacted before the layer immediately below has taken initial set. The layers should be sufficiently shallow, to permit stitching of two layers together by vibration. Concreting of any portion or section of the work shall be carried out in one continuous operation and no interruption of concreting work will be allowed without approval of the Engineer. Plain concrete in foundations shall be placed, in direct contact, with the bottom of excavation, the concrete being deposited in such a manner, as not to get mixed with the earth. The concrete placed below the ground level shall be protected from falling earth during and after placing. Concrete placed in ground containing deleterious substances, shall be kept free from contact, with such ground and with water draining there from during placing and for a period of 7 days or otherwise instructed there after. Approved means shall be taken to protect immature concrete from damage by debris, excessive loading, abrasion, vibrations, deleterious ground water, mixing with earth and other materials and other influences, that may impair strength and durability of concrete. Before starting of work contractor will get the concrete pouring programme and its sequence approved by Engineer to avoid cold joints.

6.4 Compaction :

External, Internal (needle) and surface (screed board) vibrators of approved make shall be used for compaction of concrete

a) External/internal vibrators shall be used for compaction of concrete in foundations, columns etc. For sections such as slabs, the concrete shall be compacted by external, internal and surface type vibrators, depending on the thickness of layer to be compacted. 25mm, 40mm and 60mm dia internal vibrators may be used. The concrete shall be compacted by use of appropriate diameter vibrator by holding the vibrator in position until :

i) Air bubbles cease to come to surface

ii) Resumption of steady frequency of vibrator after short period of dropping the frequency, when the vibrator is first inserted.
iii) The tone of the vibrator becomes uniform
iv) Flattened, glistening surface, with coarse aggregates particles blended into it, appears on the surface.
After the compaction is completed, the vibrator should be withdrawn slowly from concrete so that concrete can flow in to the space previously occupied by the vibrator. To avoid segregation during vibration, the vibrator shall not be dragged through the concrete nor used to spread the concrete. The vibrator shall be made to penetrate into layer of fresh concrete below if any, for a depth about 150mm. The vibrator shall be made to operate at regular pattern of spacing. The effective radii of action will overlap, approximately half a radius to ensure complete compaction.
v) To secure even and dense surfaces free from aggregate pockets, vibration shall be supplemented by tamping or rodding by hand in the corners of forms and along the form surfaces while the concrete is plastic.
vi) A sufficient number of spare vibrators shall be kept readily accessible to the place of deposition of concrete to assure adequate vibration in case of breakdown of those in use. 25mm diameter immersion vibrators shall be used in thin sections upto 125mm, 40mm diameter immersion vibrators in fairly wide sections like beams, slabs, columns etc. and 60mm diameter vibrators in foundations, pilecaps or such large section members. Screed vibrators shall also be used for slab concreting.
vii) Plain concrete also shall be vibrated whenever and wherever directed by EIC to achieve full compaction, using needle and screed vibrators as necessary.

6.5 Curing :
Curing shall be started at the earliest by spreading wet jute cloth (hessian) and cover top with impervious sheet and subsequently cured with spraying water. In inaccessible area to start with, curing be started by spraying curing compound before starting membrane curing.

6.6 Placing temperatures :
During extreme hot weather, the concreting shall be done as per procedures set out in IS:7861, Parts I & II. Fine and coarse aggregates for concreting shall be kept shaded and the concrete aggregates sprinkled with water for a sufficient time before concreting, in order to ensure that the temperature of these ingredients is as low as possible prior to batching. The mixer and batching equipment shall be also shaded and if necessary painted white in order to keep their temperatures as low as possible. The placing temperature of concrete shall be as low as possible in warm weather and care shall be taken to protect freshly placed concrete form overheating by sunlight in the first few hours of its laying. The time of day selected for concreting shall also be chosen so as to minimize placing temperatures. In case of concreting in exceptionally hot weather the Engineer may in his discretion specify the use of ice either flaked and used directly in the mix, or blockssed for chilling the mixing water. In either case no extra payment shall be made to the contractor on this account.

6.7 Transporting Concrete

(a) Concrete shall be transported from the mixing plant to the placing position rapidly as practicable by method that will prevent segregation or loss of ingredients or slump loss in excess of 25 mm and or a loss in air concrete or more than one percent before the concrete is placed in the works. whenever the length of haul, form the mixing plant to the place of deposit is such that the concrete unduly compacts or segregates, suitable agitators or transit mixers shall be used for conveying concrete.

(b) Where the time of haul exceeds 20 minutes, mixed concrete shall be transported in suitable agitators or transit mixers as stated hereinabove.

(c) If buckets are used for conveying low-sump concrete, they shall be capable or promoting discharge in controlled quantities without splashing or segregation and shall be of such capacity that there is no splitting of batches.

7 Inspection

7.1Contractor shall give the engineer-in-charge due notice before placing any concrete in the form 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 result obtained immediately before concreting all forms shall thoroughly cleaned.

7.2. 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 labor and other persons shall be totally prohibited for reinforcement laid in position. For access to different part suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuing proper cover mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapchi or metal pieces shall not be used for this purpose.

7.3 Sampling and testing of concrete.

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

Quantity of concrete in the work	Nos. of samples	Quantity of concrete in the work	Nos. of samples.
1-5 cmt.	1	16-30 cmt.	3
6-15 cmt.	2	31-50 cmt	4
51 and above cmt.	4 + one additional for each 50 cu. Meter or part thereof.		

Note: At least one sample shall be taken from each shift. Six test specimens shall be made from each sample. Three for testing at 7 days and remaining three at 28 days the samples of concrete shall be taken on each day of concreting as per above frequency. The number of specimens may be suitable increase as deemed necessary by the engineer-in-charge when procedure of test given above revels a poor quality of concrete and in other special cases.

7.3.2 The average of the group of the cube test for each day shall not be less than the specified cubes strength of 200 kg/cm2 at 28 days 20% of the cube cast for each dry may have value less than specified strength provided the lowest value is not less than 85 % of the specific strength. If

the concrete made in accordance with the proportions give for particular grade does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made accordance with the proportions give for a particular grade shall not however be placed a higher grade on the ground that the test strength are higher than the minimum specified.

8 Stripping

8.1 The engineer-in-charge shall be informed in advance by the contractor of his intention to start the removal of form work. While fixing the time of removal of form work due consideration shall be given to local conditions character of structure, the weather and other conditions that influences the setting of concrete and of the materials used in the mixture. In normal circumstances (generally where temperature are above 20 c) and where ordinarily concrete used forms may be struck after expire on period specified.

8.2 All form work shall be removed without causing any shock or vibration as would damage the concrete. Before the soft and struts are removed, the concrete surface shall be gradually exposed, where necessary in order to ascertain that concrete has sufficiently hardened centering shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually where internal metal tiles 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 reuse 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 procedure is of good quality.

8.3 Immediately after the removal of forms, all exposed bolts etc passing though 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 filled by cement mortar all fins caused by form joints, all cavities produced by the removal of form tiles and all other holes and depressions, honeycomb spots, broken edge or corners and other defects shall be thoroughly cleaned saturated with water and carefully pointed an rendered true with mortar of cement and fine aggregate mixed in proportion used in grade of concrete that is being furnished and of as dry consistency as is possible to use. Considerable pressure shall be applied in filling 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 / honey comb in the opinion of the engineer-in-charge are of a such an extent or character as to effect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement if the portions of structure affected.

9 Payment shall be made on cubic meter of work done as per approved drawing.

10 FORM WORK:

Form Work
Ply Form work shall include all temporary or permanent forms or moulds required for forming the concrete which is cast-in-situ, together with all temporary construction required for their support.

General Requirement

It shall be strong enough to withstand the dead and live loads and forces caused by ramming and vibrations of concrete and other incidental loads, imposed upon it during and after casting of concrete. It shall be made sufficiently rigid by using adequate number of ties and braces, screw jacks or hard board wedges where required shall be provided to make up any settlement in the form work either before or during the placing of concrete.
Form shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections, care shall be taken to see that no piece is keyed into the concrete.

Material for Form Work
(a) Propping and Centering :
All propping and centering should be either of steel tubes with extension pieces or built up sections of rolled steel.

(a) **Centering/Staging :**
Staging should be as designed with required extension pieces as approved by Engineer-in-Charge to ensure proper slopes, as per design for slabs/ beams etc. and as per levels as shown in drawing. All the staging to be either of Tubular steel structure with adequate bracings as approved or made of built up structural sections made form rolled structural steel sections.

(b) In case of structures with two or more floors, the weight of concrete, centering and shuttering of any upper floor being cast shall be suitably supported on one floor below the top most floor already cast.
(c) Form work and concreting of upper floor shall not be done until concrete of lower floor has set at least for 14 days.

Shuttering:
Accro Shuttering used shall be of sufficient stiffness to avoid excessive deflection and joints shall be tightly butted to avoid leakage of slurry. If required, rubberized lining of material as approved by the Engineer-in-Charge shall be provided in the joints.
(a) Runner Joists: RSJ, MS Channel or any other suitable section of the required size shall be used as runners.
(b) Assembly of beam head over props. Beam head is an adopter that fits snugly on the head plates of props to provide wider support under beam bottoms.
(c) Only steel shuttering shall be used, except for unavoidable portions and very small works for which 12 mm thick water proofing ply of approved quality may be used.
(a)
Form work shall be properly designed for self weight, weight of reinforcement, weight of fresh concrete, and in addition, the various live loads likely to be imposed during the construction process (such as workmen, materials and equipment).
(b)
Camber: Suitable camber shall be provided in horizontal members of structure, especially in cantilever spans to counteract the effect of deflection. The form work shall be so assembled as to provide for camber. The camber for beams and slabs shall be 4 mm per metre (1 to 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 1/50th of the projected length or as directed by the Engineer-in-Charge.
(c) Walls :
The form faces have to be kept at fixed distance apart and an arrangement of wall ties with spacer tubes or bolts is considered best.
The two shutters of the wall are to be kept in place by appropriate ties, braces and studs, some of the accessories used for wall.
Removal of Form work (Stripping Time):
In normal circumstance and where various types of cements are used, forms, may generally be removed after the expiry of the following periods

Type of Form Work	Minimum Period before Removal of Form Work
a) Vertical Form Work to Column, Walls and Beams	16-24 Hours
b) Soffit Form Work to Slab (Props to be refixed immediately after removal of Form Work)	3 days
c) Soffit Form Work to Beam (Props to be refixed immediately after removal of Form Work)	7 Days
d) Props to slab	
(i) Span up to 4.5 Mtr	7 Days
(ii) Span over 4.5 Mtr	14 Days
e) Props to Beams and Arches	
(i) Span up to 6.0 Mtr	14 Days
(ii) Span over 6.0 Mtr	21 Days

Surface Treatment

(a) Oiling the Surface:

Accro Shuttering gives much longer service life if the surfaces are coated with suitable mould oil which acts both as a parting agent and also gives surface protections.

Typical mould oil is heavy mineral oil or purified cylinder oil containing not less than 5% pentachlorophenol conforming to IS 716 well mixed to a viscosity of 70-80 centipoises.

After 3-4 uses and also in cases when shuttering has been stored for a long time, it should be recoated with mould oil before the next use.

The second categories of shuttering oils / leavening agents are Polymer based water soluble Compounds. They are available as concentrates and when used diluted with water in the ratio of 1:20 or as per manufacturer specifications. The diluted solution is applied by brush applications on the shuttering both of steel as well as ply wood. The solution is applied after every use.

The design of form work shall conform to sound Engineering practices and relevant IS codes.

Inspection of Form Work

The completed form work shall be inspected and approved by the Engineer-in-Charge before the reinforcement bars are placed in position.

Proper form work should be adopted for concreting so as to avoid honey combing, blow holes, grout loss, stains or discoloration of concrete etc. Proper and accurate alignment and profile of finished concrete surface will be ensured by proper designing and erection of form work which will be approved by Engineer-in-Charge.

Shuttering surface before concreting should be free from any defect/ deposits and full cleaned so as to give perfectly straight smooth concrete surface. Shuttering surface should be therefore checked for any damage to its surface and excessive roughness before use.

Erection of Form Work (Centering and shuttering):

Following points shall be borne in mind while checking during erection.

(a) Any member which is to remain in position after the general dismantling is done, should be clearly marked.

(b) Material used should be checked to ensure that, wrong items/ rejects are not used.

(c) If there are any excavations nearby which may influence the safety of form works, corrective and strengthening action must be taken.

(d)

(i) The bearing soil must be sound and well prepared and the sole plates shall bear well on the ground.

(ii) Sole plates shall be properly seated on their bearing pads or sleepers.

(iii) The bearing plates of steel props shall not be distorted.

(iv)The steel parts on the bearing members shall have adequate bearing areas.

(e) Safety measures to prevent impact of traffic, scour due to water etc. should be taken. Adequate precautionary measures shall be taken to prevent accidental impacts etc.
(f) Bracing, struts and ties shall be installed along with the progress of form work to ensure strength and stability of form work at intermediate stage. Steel sections (especially deep sections) shall be adequately restrained against tilting, overturning and form work should be restrained against horizontal loads. All the securing devices and bracing shall be tightened.
(g) The stacked materials shall be placed as catered for, in the design.
(h) When adjustable steel props are used. They should:
1. be undamaged and not visibly bent.
2. have the steel pins provided by the manufacturers for use.
3. be restrained laterally near each end.
4. have means for centralizing beams placed in the fork heads.

(i). Screw adjustment of adjustable props shall not be over extended.

(j) Double wedges shall be provided for adjustment of the form to the required position wherever any settlement/ elastic shorting of props occurs. Wedges should be used only at the bottom end of single prop. Wedges should not be too steep and one of the pair should be tightened/ clamped down after adjustment to prevent shifting.
(k) No member shall be eccentric upon vertical member.
(l) The number of nuts and bolts shall be adequate.
(m) All provisions of the design and/or drawings shall be complied with.
(n) Cantilever supports shall be adequate.
(o) Props shall be directly under one another in multistage constructions as far as possible.
(p) Guy ropes or stays shall be tensioned properly.
(q) There shall be adequate provision for the movements and operation of vibrators and other construction plant and equipment.
(r) Required camber shall be provided over long spans.
(s) Supports shall be adequate, and in plumb within the specified tolerances.

Measurements

General: The form work shall include the following:
(a) Splayed edges, notching, allowance for overlaps and passing at angles, sheathing battens, strutting, bolting, nailing, wedging, easing, striking and removal.
(b) All supports, struts, braces, wedges as well as mud sills, piles or other suitable arrangements to support the form work.
(c) Bolts, wire, ties, clamps, spreaders, nails or any other items to hold the sheathing together.
(d) Working scaffolds, ladders, gangways, and similar items.
(e) Filleting to form stop chamfered edges of splayed external angles not exceeding 20mm wide to beams, columns and the like.
(f) Where required, the temporary openings provided in the forms for pouring concrete, inserting vibrators, and cleaning holes for removing rubbish from the interior of the sheathing before pouring concrete.
(g) Dressing with oil to prevent adhesion and
(h) Raking or circular cutting

Classification of Measurements:

Where it is stipulated that the form work shall be paid for separately, measurements shall be taken of the area of shuttering in contact with the concrete surface. Dimensions of the form work shall be measured correct to a cm. The measurements shall be taken separately for the following.
Foundations, footings, bases of columns etc. and for mass concrete
(b) Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc.

(c) Suspended floors, roofs, landings, shelves and their supports and balconies.
(d) Lintels, beams, plinth beams, girders, bressummers and cantilevers.
(e) Columns, pillars, piers, abutments posts and struts.

(f) Stairs (excluding landings) except spiral staircase.
(g) Spiral staircases (including landings).
(h) Arches, Domes, vaults, shells roofs, arch ribs, curvilinear shaped folded plates
(i) Extra for arches, domes, vaults exceeding 6 m span other than curvilinear shaped
(j) Chimneys and shafts.
(k) Well steining.
(l) Vertical and horizontal fins individually or forming box, louvers and bands facias and eaves board
(m) Waffle or ribbed slabs.
(n) Edges of slabs and breaks in floors and walls (to be measured in running metres where below 200 mm in width or thickness).
(o) Cornices and mouldings.
(p) Small surfaces, such as cantilevers ends, brackets and ends of steps, caps and boxes to pilasters and columns and the like.
(q) Chullah hoods, weather shades, chajjas, corbels etc. including edges and
(r) Elevated water reservoirs.

No deductions from the shuttering due to the openings/ obstructions shall be made if the area of each openings/ obstructions does not exceed 0.4 square metre. Nothing extra shall be paid for forming such openings.

Form work of elements measured under categories of arches, arch ribs, domes, spiral staircases, well steining, shell roofs, curvilinear folded plates & curvilinear eaves board, circular shafts & chimneys shall not qualify for extra rate for circular work.

Rate

The rate of the form work includes the cost of labour and materials required for all the operations described above is included in R.C.C. work

Item No. 15

Providing TMT Fe 500 D bar reinforcement for RCC work including bending, binding and placing in position complete up to floor two level.

1 The type of reinforcement shall be as per the item description. The contractor shall submit the test certificate from steel manufacturer as and when required. The test results shall be verified, if required in any reputed laboratory.

2 Bar bending schedule shall be made by the contractor before starting the work. The payment shall be done based on quantity worked out in bar bending schedule. The bar bending schedule shall be prepared as per SP 34.

3 All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position with 16 guage MS binding wire as approved by Engineer-in charge. The rebars shall be placed with stay blocks or metal chair spacers, metal hangers, 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 non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawing. Placing bars on layers of freshly laid concrete as the work progresses 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 at 1m c/c , Precast cover blocks in cement mortar 1:2 (1cement : 2 coarse sand) about 4 X 4 cm square section or 4 cm dia round section or PVC cover blocks shall be used to maintain the cover of the concrete members as directed by Engineer In charge or Architect. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawing. All the bars projecting

from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

4 Bars crossing each other where required shall be secured by 16 gauge GI binding wires (annealed) of size not less than 1 mm., in such manner than they do not slip over each other at the time of fixing and concreting.

5 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. Where directed and practicable overlapping bars shall not touch each other, but be kept apart by 25 mm or 1.25 times the maximum size of the coarse aggregate, whichever is greater by concrete between them. Where not feasible, overlapping bars shall 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 the span where neither shear nor bending movement is maximum in beam and slab.

6 Whenever indicated on the drawings or desired by the Architect and Engineer-in-charge, bars shall be joined 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 upset for sufficient length so that the effective cross sectional the base of threads is not less than normal cross section of the bar. Threads shall be standard threads. Steel coupling shall conform to IS : 226.

7 When permitted or specified on the drawings, joints of reinforcement bars shall be welded with appropriate welding rod as per the instructions given by Structural Engineer. The type of welding, size of fillet etc shall be as approved by Structural Engineer. Welded joints shall preferably be located at points when steel will not be subject to more than 75 % of the maximum permissible stresses and welds so staggered that any one section not more than 20 % of the rods are welded. Only electric are welding using 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 in 2 or 3 stages, previous 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 shall conform to IS: 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency of test shall be as directed. Welding shall be done by electric arc process as per IS : 816 and IS : 823.

8 At the time of concreting, a bar fitter shall remain at site to keep the reinforcement in position.

9 Rolling margin shall be checked for each lot of steel received at site. This rolling margin shall be considered for reconciliation of steel at the end of the project or after the end of each month as per the decision of engineer -in charge.

10 Mode of Measurement and Payment

10.1 Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is 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 Kg by using standard IS co-efficient. Length shall include hooks at the ends. The wastage of steel and binding wires shall not be measured and paid extra. The rolling margin of steel shall not be paid extra.

10.2 The rate for reinforcement shall include the cost of labour and material required for all operations described above like cleaning of reinforcement bars, straightening, cutting,

hooking, bending, binding, welding placing in position etc. as per the drawing or directed by the Architect or engineer-in-charge Rate shall also include the cost of GI binding wires of 16 to 18 gauge, devices like chairs, pins, spacer bars, cover blocks of PVC or cement mortar etc. for keeping reinforcement in position. The rate shall for unit of Kg.

Item No. 16

Providing, fabricating, erecting placing in position and connecting for all heights/spans MS box sections in roof trusses, columns, portal frames, beams, bracing, platforms, stairs & column nosing angle, brackets, Purlin , Girts etc. including cutting, wastage, welding (shop and site), bolting wherever necessary, with one coat of Zinc Chromate primer and two coats of synthetic enamel paint of (Approved Make and Shade) etc. all complete as directed by the Engineer in Charge.

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

2.0 Workmanship:

2.1 The steel sections as specified or required shall be cut, square and to correct lengths, as per drawings and design. The cut ends exposed to view shall be finished smooth. No. two pieces shall be welded or other wise jointed to make up the required length of member, except as indicated in the drawings 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 meaner as not to impair the strength of the metal. All operations shall be done in cold state unless otherwise directed/permitted.

2.2 Steel riveted or bolted in built up sections, frame work.

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

2.2.2 Wooden templates 12 mm to 19 mm thick or metal sheet template shall be made to correspond to each connecting gussets plate and rivet holes shall be accurately marked on them and drilled. The template 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.

2.2.3 All stiffeners shall be formed by pressure and where practicable, the metal shall not be cut and welded in making these. In major works or where so specified shop drawings giving complete details and information for the

fabrication of the 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 member shall be distinctly marked or stenciled 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 form twist, 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 splice plates and filters under stiffeners shall be cut to fit within 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 spiced 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 to be more that 3 mm at each end but where for a practical reason greater clearance is necessary, suitably designed seating shall be provided. Pins and rollers 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 together shall be accurately mechanized so that the parts connected butt against each other over the entire surfaces of contract connecting angles or channels shall be fabricated and placed in position with greater accuracy so that they are not unduly reduced in thickness by machining.
The ends of bearing stiffeners shall be machanised or ground to fit tightly both at the top and bottom. All holes shall generally be drilled to the required size and at the required size and at required position. Sub punching shall be permitted, provided it is done 3 mm or less in diameter and remade thereafter to the required size. The holes for rivets and bolts shall be larger by 0.4 to 6 mm than the nominal diameter of rivets or black bolts depending up on the diameter of rivets. Holes shall have their axis perpendicular to the surface bored through. The drilling or reamering shall be free form butts, and the holes should be clean and accurate. Holes for counter shunk bolts shall be made in such a manner that their heads fit flush with the surface after fixing. The fabrication work shall be completed in workshop as far as it is practicable to do so. Site joints shall be done with rivets and fitted bolts or black bolts, as shown in the drawings or as directed. Generally the following principles shall govern the use 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 sparingly where a force is carried through a connection without impact, vibration or reversal of stresses.

2.2.4 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 rigidly 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 as 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. Riveting 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 replaced. 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 injure the assembled, members, caulking or recouping shall not be permitted. For testing rivets, hammer weighing approximately 0.25 kg. shall be used 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.
2.2.5 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 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 that 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 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 vibrations 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 steelwork shall be painted with a coat of priming coat of red lead, as per relevant specifications of painting.

3.0 Mode of measurement and payment:

3.1 The steelwork 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 clearest, brackets, packing pieces, bolts, nuts, washers, distance pieces, separators, diaphragm gusset (taking over all square dimensions) fish plates etc. shall be added to the weight of respective items. (e) In riveted work allowance to be made of weight of rivet hands. No deductions shall be made for rivet or bolt holes excluding holes for anchor or holding down bolts. (f) For forged steel and steel casting weight shall be calculated on the basis of 850 kg/cum. (g) Unless otherwise specified an additional of 2.5 percent of the weight of structure shall be made for shop and site rivet heads in riveted 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.

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

3.3 The rate shall be for a unit of one Kg.

Item No. 17
Supplying ,installing , & fixing Anchor Bolts SIZE 1.2 mt Legnth With Nuts in concrete foundation providing, auxiliary dummy structures, if any,necessary tying and welding to reinforcement,adjustment of shuttering, greasing exposed metal surfaces and covering with jute cloths etc. complete as per drawing and specifications and directions.(Weight of bolt and Nuts shall be measured for payment)

Bolts as per approved drawing shall be placed by Civil Contractor with proper Line and level as specified in Approved Drawing. Bolts will be supplied by the supplier of PEB. Executed work will be jointly checked by Civil Contractor and Supplier of PEB and approved by Engineer in Charge to avoid discrepancy in Future.
Mode of Measurement and Payment:

Work shall be measured and paid on No Basis after joint review of Civil Contractor and supplier of PEB and approved by Engineer in Charge. Supply of anchor bolts size 1.2 will be in scope of Supplier of PEB as per approved Drawing.

Item No. 18
Providing, fabricating, erecting placing in position and connecting for all heights/spans MS structural sections (Pipes, I-section, Channel section, Angles, Insert plates etc.) in roof trusses, columns, portal frames, beams, bracing, platforms, stairs & column nosing angle, brackets, Purlin , Girts etc. including cutting, wastage, welding (shop and site), bolting wherever necessary, with one coat of Zinc Chromate primer and two coats of synthetic enamel paint of (Approved Make and Shade) etc. all complete as directed by the Engineer in Charge.

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

2.0 Workmanship:

2.1 The steel sections as specified or required shall be cut, square and to correct lengths, as per drawings and design. The cut ends exposed to view shall be finished smooth. No. two pieces shall be welded or other wise jointed to make up the required length of member, except as indicated in the drawings 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 meaner as not to impair the strength of the metal. All operations shall be done in cold state unless otherwise directed/permitted.

2.2 Steel riveted or bolted in built up sections, frame work.

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

2.2.2 Wooden templates 12 mm to 19 mm thick or metal sheet template shall be made to correspond to each connecting gussets plate and rivet holes shall be accurately marked on them and drilled. The template 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.

2.2.3 All stiffeners shall be formed by pressure and where practicable, the metal shall not be cut and welded in making these. In major works or where so specified shop drawings giving complete details and information for the
fabrication of the 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 member shall be distinctly marked or stenciled 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 form twist, 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 splice plates and filters under stiffeners shall be cut to fit within 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 spiced 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 to be more that 3 mm at each end but where for a practical reason greater clearance is necessary, suitably designed seating shall be provided. Pins and rollers 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 together shall be accurately mechanized so that the parts connected butt against each other over the entire surfaces of contract connecting angles or channels shall be fabricated and placed in position with greater accuracy so that they are not unduly reduced in thickness by machining.
The ends of bearing stiffeners shall be machanised or ground to fit tightly both at the top and bottom. All holes shall generally be drilled to the required size and at the required size and at required

position. Sub punching shall be permitted, provided it is done 3 mm or less in diameter and remade thereafter to the required size. The holes for rivets and bolts shall be larger by 0.4 to 6 mm than the nominal diameter of rivets or black bolts depending up on the diameter of rivets. Holes shall have their axis perpendicular to the surface bored through. The drilling or reamering shall be free form butts, and the holes should be clean and accurate. Holes for counter shunk bolts shall be made in such a manner that their heads fit flush with the surface after fixing. The fabrication work shall be completed in workshop as far as it is practicable to do so. Site joints shall be done with rivets and fitted bolts or black bolts, as shown in the drawings or as directed. Generally the following principles shall govern the use 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 sparingly where a force is carried through a connection without impact, vibration or reversal of stresses.

2.2.4 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 rigidly 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 as 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. Riveting 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 replaced. 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 injure the assembled, members, caulking or recouping shall not be permitted. For testing rivets, hammer weighing approximately 0.25 kg. shall be used 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.

2.2.5 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 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 that 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 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 vibrations 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 steelwork shall be painted with a coat of priming coat of red lead, as per relevant specifications of painting.

3.0 Mode of measurement and payment:

3.1 The steelwork 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 clearest, brackets, packing pieces, bolts, nuts, washers, distance pieces, separators, diaphragm gusset (taking over all square dimensions) fish plates etc. shall be added to the weight of respective items. (e) In riveted work allowance to be made of weight of rivet hands. No deductions shall be made for rivet or bolt holes excluding holes for anchor or holding down bolts. (f) For forged steel and steel casting weight shall be calculated on the basis of 850 kg/cum. (g) Unless otherwise specified an additional of 2.5 percent of the weight of structure shall be made for shop and site rivet heads in riveted 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.

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

3.3 The rate shall be for a unit of one Kg.

BRICK WORK:

Item No. 19

Brick work using common burnt clay building bricks having minimum crushing strength not less than 35 kg/ sq cm in foundation and plinth in cement mortar 1:6 (1 cement : 6 coarse sand) at any height/depth/floor upto plinth level.

Materials

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

Workmanship
Proportion:
The proportion of the cement mortar shall be 1:6 (1 cement: 6 fine sand) by volume.

Wetting of bricks:

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

Laying:

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

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

The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate course shall generally be directly one over the other. The thickness of brick course shall be kept uniform.
The brick shall be laid with frog up wards. A set of tools comprising of wooden straight edges, man son's spirit level, square half meter rub, and pins, string and plumb shall be kept on the site of work for frequent checking during the progress of work.

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

All futures, pipes, outlets of water, hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement mortar

Joints:

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

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

Mode measurements & payment

The measurements of this item shall be taken for the brick masonry fully completed in foundation up to plinth.

The limiting dimensions not exceeding those shown on the plinths or as directed shall be final. Battered tapered and curved portions shall be measured net.

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

Ends of joists, beams, posts, girders, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500 Sq.Cm.Openings not exceeding 1000 Sq.Cm. Wall plates and bed plates, bearing of slabs, chajjas and the like whose thickness does not exceed 10 Cms. and the bearing does not extend to 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, and doors and windows built into masonry and pipes etc. for concealed wiring. Forming chases of section not exceeding 350 -Sq. Cm. in masonry.

Apertures for fire places shall not be deducted nor shall be paid for separately.
The rate shall be for a unit of one cubic meter.

Item No. 20
Brick work using fly-ash bricks having crushing strength not less than 35 Kgs. / Sq.cm. In Super structure above plinth level at any height/floor level. Conventional bricks in cement mortar of 1 cement : 6 coarse sand.

Following Indian Standards are necessary ajuncts to this specifcationss.

IS NO.	TITLE
712:1984	Specification for building limes (third revision)
1727:1967	Method of test for pozzolanic materials (first revision)
3812:1981	Specification for fly ash for use as pozzolana and admixture (first revision)
3495(PART-1):1976	Method of test of burnt clay building bricks: part-1 Determination of compressive strength (second revision)
3495(PART-2):1976	Method of test of burnt clay building bricks: part-2 Determination of water absorption (second revision)
3495(PART-3):1976	Method of test of burnt clay building bricks: part-3 Determination of efflorescence(third revision)
4139:1989	Specifications for calcium silicate bricks (second version)
5454:1976	Method for sampling of clay burnt building bricks (first revision)

1.0 Workmanship

The relevant specification of item No. 16 shall be followed except that the masonry work shall be carried out above plinth level for all Levels and all heights

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

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 hole header horizontal coarse only. Minimum number of holes be left in brick 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.

For the face of brick work, where plastering is to be done, joints shall be racked out to a depth not less than thickness of joints. The face of brick work shall be cleaned and mortar dropping removed

on very same day that brick work is laid.

2.0 **Materials.**

- Fly ash 62%
- Lime 8%
- Gypsum 5%
- Sand or quarry dust 25%

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

3.0 **Physical Characteristics:**

3.1 Compressive strength should be greater than 70Kg./cm2.
The Fly-Ash bicks shall be of the following classes depending upon theiraverage compressive strength.

Class	**Average Compressive strength (N/mm^2)**	
	Not Less Than	**Less Than**
7.5	7.5	10
10	10	15
15	15	20
20	20	-

3.2 Density 1700 Kg./m3.

3.3 Weight & dimension
230 x 100 x 75mm (weight @ 3.4 to 3.6 Kg.)

3.4 Drying shrinkage:
The average Drying shrinkage of the bricks when tested by the method described in IS 4139:1989 being the average of three units, shall not exceed 0.15%

3.5 Efflorescence Test:
The bricks when tested in accordance with the procedure laid down in IS:3495 (part-3):1976, shall have the rating of efflorescence not more than "moderate" up-to class 10 and "slight" for higher classes

3.6 Water Absorption:
The bricks when tested in accordance with the procedure laid down in IS 3495(part 2):1976, after immersion in cold water for 24 hours, shall have average water absorption not more than 20% by mass upto class 10, and 15% by mass for higher classes.

4.0 **Process of manufacture**
Fly ash, Hydrated lime, quarry dust and gypsum are manually feed into pan mixer where water is added in the required proportion for in time to mixing the proportion of the raw materials is generally in the ratio depend upon the quality of raw materials. After mixing the mixture is shifted to the hydraulic brick making machine. The bricks are carried on wooden pellets to the open are where they dried and water cured for 14 days. The bricks are tested and stored before dispatch.

5.0 Mode of measurements & payment

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

5.2. No deduction shall be made from the quantity of brick work, for any extra payment made for embedding in masonry or making holes in respect of following items:
(1) Ends of joists, beams, posts, girders, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500 Sq.Cm.
(2) Openings not exceeding 1000 Sq.Cm.
(3) Wall plates and bed plates, bearing of slabs, chajjas and the like whose thickness does not exceed 10 Cms. and the bearing does not extend to the full thickness of wall.
(4) Drainage holes, and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.
(5) Iron fixtures, pipes up to 300 mm. dia hold fasts, and doors and windows built into masonry and pipes etc. for concealed wiring.
(6) Forming chases of section not exceeding 350 -Sq. Cm. in masonry.

5.3. Apertures for fire places shall not be deducted nor shall be paid for separately.

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

Item No. 21

Providing & laying half brick work using best available fly-ash bricks having minimum crushing strength of 35 kg./sq cm in cement mortar 1 cement : 4 coarse sand in super-structure and curing etc. complete at any height/floor level.

Following Indian Standards are necessary ajuncts to this specifcationss.

IS NO.	TITLE
712:1984	Specification for building limes (third revision)
1727:1967	Method of test for pozzolanic materials (first revision)
3812:1981	Specification for fly ash for use as pozzolana and admixture (first revision)
3495(PART-1):1976	Method of test of burnt clay building bricks: part-1 Determination of compressive strength (second revision)
3495(PART-2):1976	Method of test of burnt clay building bricks: part-2 Determination of water absorption (second revision)
3495(PART-3):1976	Method of test of burnt clay building bricks: part-3 Determination of efflorescence(third revision)
4139:1989	Specifications for calcium silicate bricks (second version)
5454:1976	Method for sampling of clay burnt building bricks (first revision)

1.0 Workmanship

The relevant specification of item No. 16 shall be followed except that the masonry work shall be carried out above plinth level for all Levels and all heights

The frames of doors, windows, cupboards etc. shall be housed into the brick work at the correct

location and level as directed. The heavy steel doors, window frames etc. shall be built in with work, but for ordinary steel doors and windows required opening for frames, hold-fasts, etc., shall be in the wall and frame embedded later on in order to avoid damage to the frames.

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 hole header horizontal coarse only. Minimum number of holes be left in brick 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.

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

2.0 **Materials.**

- Fly ash 62%
- Lime 8%
- Gypsum 5%
- Sand or quarry dust 25%

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

3.0 **Physical Characteristics:**

3.1 Compressive strength should be greater than 70Kg./cm2.
The Fly-Ash bicks shall be of the following classes depending upon theiraverage compressive strength.

Class	**Average Compressive strength (N/mm^2)**	
	Not Less Than	**Less Than**
7.5	7.5	10
10	10	15
15	15	20
20	20	-

3.2 Density 1700 Kg./m3.

3.3 Weight & dimension
230 x 100 x 75mm (weight @ 3.4 to 3.6 Kg.)

3.4 Drying shrinkage:
The average Drying shrinkage of the bricks when tested by the method described in IS 4139:1989 being the average of three units, shall not exceed 0.15%

3.5 Efflorescence Test:
The bricks when tested in accordance with the procedure laid down in IS:3495 (part-3):1976, shall have the rating of efflorescence not more than "moderate" up-to class 10 and "slight" for higher classes

3.6 Water Absorption:
The bricks when tested in accordance with the procedure laid down in IS 3495(part 2):1976, after immersion in cold water for 24 hours, shall have average water absorption not more than 20% by mass upto class 10, and 15% by mass for higher classes.

4.0 **Process of manufacture**

Fly ash, Hydrated lime, quarry dust and gypsum are manually feed into pan mixer where water is added in the required proportion for in time to mixing the proportion of the raw materials is generally in the ratio depend upon the quality of raw materials. After mixing the mixture is shifted to the hydraulic brick making machine. The bricks are carried on wooden pellets to the open are where they dried and water cured for 14 days. The bricks are tested and stored before dispatch.

5.0 Mode of measurement and payment

The limiting dimensions shall not exceed those shown in the plan or as directed. Any work done extra over specified dimensions shall be ignored. The rate shall be for a unit of one sq. meter for all level and all heights above plinth.

Item No. 21(A) Masonry work using concrete block

Masonry work using aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level upto floor two level in cement mortar 1:5(1 cement : 5 fine sand) completed as per technical specification. - above plinth level

1.0. Materials

(a)Aggregate shall conform to M-12. (b) Sand shall conform to M-6.(c) Cement shall conform to M-3.

1.1. The solid cement concrete blocks shall be precast with concrete of 1:3:6 mix (1 cement: 3 coarse sand : 6 graded stone aggregate)

1.2. A block shall be deemed to be solid if the solid materials is not less than 75% of the total volume of the blocks calculated form overall dimensions.

1.3. The concrete mix used for block shall be one of the following:

1.4. The actual size of the block shall be one of the following: Size : A. 39 x 30 x 19 cms. Size-B 39 x 20 x 19 cms. Size C 39 x 10 2 19 cms. The size other than those specified above may be used with the approval of Engineer-in-charge.

1.5. The blocks may be either machine made or hand made. The concrete mix, the mixing of concrete the manufacture of blocks, curing and drying shall be in accordance with para-6 to 10 under I.S. : 2185-1967.

1.6. Faces of blocks shall be flat and rectangular Surface finish shall be rendered smooth or plastered with cement mortar 1:3 coarse sand)

1.7. The average compressive strength of eight blocks when determined in the manner described-in I.S. 2185 - 1967 shall not be less than 50 Kg/Sq. Cm. of gross area. The strength of lowest individual block shall not be less than 75 percent of average compressive strength of eight blocks.

1.8. Concrete blocks shall be stored and stacked property in such a way as to avoid any contract with moisture at site. They shall be stock plied on planks or other supports free from contract with ground and covered to protect against wetting. Cement mortar of proportion 1:5 shall conform to M-11.

2.0. Workmanship

2.1. The blocks need not wetted before of during laying in the walls. In case climatic conditions so required, the top and the sides of block may only be slightly moistures so as to prevent absorption of water from the mortar and ensure the development of required bond with mortar.

2.2. Operations of laying precast cement concrete block masonry shall be carried out in accordance with instructions detailed in I.S. : 6042 -1952. The mortar shall not be spread so much ahead of the actual laying of the units that it tends to stiffen and loose, its plasticity, thereby resulting in poor bond. For most of the work, the joints, both horizontal and vertical shall be 10 mm. thick except in the case of extended joint, construction, the mortar joints shall be struck off flush with wall surface and when the mortar has stated stiffening, it shall be compressed with rounded or U-shaped tool. The mortar shall be pressed against the units with a jointing tool after the mortar has stiffened in effect intimate contract between the mortar and the masonry unit arid obtained a weather tight joint.

2.3. Quoins and closures: Special quoins blocks (with a return face equal to half the length of normal face) shall be cast for ail building blocks and slabs for external work. Proper half closures shall be cast and not cut form full size blocks. The returned ends of blocks for door windows revels and quoins shall be finished with a fair face in the mould.

2.4. Only double scaffolding shall be used. The scaffolding be strong and sound. No holes in the masonry for supporting shall be allowed.

2.5. Curing : The curing of concrete block masonry shall be carried our for 7 days.

3.0. Mode of measurements & payment

3.1. The relevant specifications of rubble masonry work shall be followed.

3.2. The work of concrete block masonry in foundation, plinth and super-structure shall be measured under this item.

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

Item No. 21(B) Masonry work using concrete block - for half brick

Masonry work using aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level upto floor two level in cement mortar 1:5(1 cement : 5 fine sand) completed as per technical specification. - above plinth level for half-brick work

1.0. Materials:

1.1. The relevant specification of item No. 24(A) shall be followed except that the precast concrete blocks shall be of size suitable for 10 cms. size partition wall i.e. size c and the proportions of cement mortar shall be in cement mortar 1:5 (1 cement : 5 fine sand).

2.0. Workmanship

The relevant specifications of item No. 24(A) shall be followed except that the work shall be for precast concrete block partition walls of 10 cms. thickness.

3.0. Mode of measurement & payment

3.1. The relevant specifications of item No. 24(A) shall be followed.

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

PLASTERING AND POINTING WORK:
Item No. 22

Providing 20mm thick double coat mala cement plaster on exterior brick/concrete work for plastering comprising of base coat of 12mm thick cement plaster in cement mortar (1 cement: 4

coarse sand) in rough finishing and 8mm thick top coat of cement mortar 1:2 (1 cement: 2 coarse sand) finished with trovel including scaffolding curing etc. complete. any height/floor level.

Materials :

1.1 Water M-1. The Cement mortar of proportion 1:3 shall conform to M-13.

2.0 Workmanship :

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

2.2 Preparation of back-ground :

2.2.1 The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, afflorescence and other foreign matter by water or by brushing. 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 to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarder is left on the surface. Trimming of projections on brick/concrete surface where necessary shall be carried out to get an even surface.

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

2.2.3 The work shall not be soaked but only damped evenly before applying the plaster. If the surface becomes 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 the building frame and cladding work are ready and thetemporary supporting ceiling resting on the wall of the floor have been removed, Ceiling plaster shall be completed before starting plaster to walls.

2.3 Applications of Plaster :

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

2.3.2 Cement plaster shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed forthwith from the site :
2.3.3 In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically. When recommending the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent area to enable the two to properly joint together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. To any corners or arrises. Horizontal joints in plasterwork shall not also

occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

2.3.4 Each coat shall be kept dam continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by handling mattings or gunny bags on the outside of the plaster and keeping them wet.

3.0 Mode of measurement & payment :

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

3.2 All plastering shall be measured in square metres unless, otherwise specified length, breadth or height shall be measured correct to a centimeter.

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

3.4 This item includes plastering upto floor two level.

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

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

3.7 For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. mt. each in area for ends of joints, beams, posts, girders, steps etc. not exceeding 0.5 sq. mt. each in area and for openings exceeding 0.5 sq.mt. and not exceeding 3.0 sq. mt. in each area deductions and additions shall be made in the following manner :
(a) No deductions shall be made for ends joints, beams posts etc. and openings not exceeding 0.5 sq. mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these opening for finish to plaster around ends of joints, beams, posts etc.
(b) Deduction for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits etc. 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 and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width or reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from 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 for opening shall be made from each plastered face of the wall.

3.9 In case of openings of area above 3 sq. 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. metre.

Item No. 23

Providing 15 mm thick cement plaster in single coat on fair side of wall for interior plastering upto at any height/floor level finished even and smooth in cement mortar 1: 3 (1 cement mortar: 3 fine sand).

1.0. Materials

1.1. Water shall conform to M-1. The cement mortar of proportion 1:4 shall conform to M-13.

2.0. Workmanship

2.1. Scaffolding:

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

2.2. Preparation of back ground :

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

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

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

2.2.4. For external plaster, the pestering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be-started wherever the building frame and cladding work are ready and the temporary supports of the 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 15x15 cms. Shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a smooth or a sandy granular texture is required Excessive toweling or overworking the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Hounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.

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

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

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

2.3.5. The plastering work shall be in single coat on rough side of half brick wall for interior plastering up to floor two level, finished even and smooth in C.M. 1:4.

3.0. Mode of measurements & payment

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

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

3.3. Thickness of the plaster shall be exclusive of he thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 15 mm at any point on this surface.

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

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

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

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

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

(b) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for ravels, jambs, soffits, sills etc. of these openings, (i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii) When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where

width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case may be.

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

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

3.10. The rate shall before a unit of One sq. meter.

Item No. 24

Providing 10 mm thick plaster in single coat on any wall for interior plastering at any height/floor level finished even and smooth in cement mortar 1:3 (1 cement : 3 fine sand).

1.0. Materials

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

2.0. Workmanship

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

2.2. Preparation of back-ground :

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

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

2.2.3. The work shall not be soaked but only damped evenly before applying the plaster. If the surface becomes dry, such area shall be moistened again.
2.2.4. For external plaster, the pestering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be-started wherever the building frame and cladding work are ready and the temporary supports of the 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 15x15 cms. shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a smooth or a sandy

granular texture is required Excessive troweling or overworking the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Hounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.

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

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

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

3.0. Mode of measurements & payment

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

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

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

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

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

3.7. For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. met each in area for ends of joints beams, posts, girders, steps etc. not exceeding 0.5 sq. mt each in area and for openings exceeding 0.5. sq. mt and not exceeding 3.00 sq. mt. in each area deductions and additions shall be made in the following manners. (a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq. mt each and no addition shall be made for reveals, jambs, soffits, sils etc. of these openings, for finish to plaster around ends of joints, beams posts etc. (b) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for ravels, jambs, soffits, sills etc. of these openings, (i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii) When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where

width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case may be.

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

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

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

Item No. 25

Providing and Applying water proofing Membrane treatment to outside R.C.C. Wall with first coat WPM 300 Water base Primer and second two coats of WPM 320 Bitumen Emulsion Waterproofing Membrane (Ardex Endura). Required Tools and Labour as per company spacifications. Material shall be of approved quality and as approved by consultant/Client. The rate is inclusive of all labor and material

1.0. Materials

1.1. Water shall conform to M-1. The cement mortar of proportion 1:4 shall conform to M-13. The tar felt shall conform to M-76. The bitumen primer shall conform to I. S. 3388-1965. The bitumen shall conform to I. S. 702-1961

2.0. Workmanship

2.1. Scaffolding:

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

2.2. Preparation of back ground :

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

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

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

2.2.4. For external plaster, the pestering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be-started wherever the building frame and cladding work are ready and the temporary supports of the 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 15x15 cms. Shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a smooth or a sandy granular texture is required Excessive toweling or overworking the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Hounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.

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

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

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

2.3.5. The plastering work shall be in single coat on rough side of half brick wall for interior plastering up to floor two level, finished even and smooth in C.M. 1:4.

3.0. Mode of measurements & payment

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

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

3.3. Thickness of the plaster shall be exclusive of he thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 15 mm at any point on this surface.

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

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

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

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

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

(b) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for ravels, jambs, soffits, sills etc. of these openings, (i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii) When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case may be.

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

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

3.10. The rate shall before a unit of One sq. meter

Item No. 26

Providing and Laying Water Proofing Treatment in sunk Portion of WC , Bath Room Etc. by applying Cement Slurry mixed with Water Proofing Compound Consisting of Applying a) First Layer of Slurry of cement @ 0.488 Kg/ Sqmt mixed with Water Proofing Compound @ 0.253 Kg/ Sqmt .This Layer will be allowed to air cure for 4 Hrs.
b) Second Layer of Slurry of Cement @ 0.242 Kg/ Sqmt mixed with Water Proofing Compound @ 0.126 Kg/ Sqmt. This layer will be allowed to air cure for 4 Hours followed with Water Curing for 48 Hours. The rate includes preparation of Surface, treatment and sealing of joints, corner, junction of Pipes and masonry with Polymer Mixed slurry.

Materials:
water shall conform to M-1. cement westher proofing paint as per asian apex duracast texture.

Workmanship:

2.1. General : The materials required for work of painting work shall be obtained directly from approved manufactures or approved dealer and brought to the site in maker's drums; kegs. etc. with seal unbroken.

2.1.2. All materials not in actual use shall be kept properly protected, lids of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of turpentine to prevent formation of skin. The materials which have become state or flat due to improper and long storage shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also, the paint shall be continuously stirred 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 reasons, things is necessary, the brand of thinner recommended by the manufacturer

shall be used.

2.1.4. The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed part o the work shall be carried out in wet, damp or otherwise unfavorable weather and all the surfaces shall be thoroughly dry before painting work is started.

2.2. Preparation of surfaces : The surfaces painting shall be cleaned of all rust, scale, dirt and other foreign matter sticking to it with wire brushes, steel wool, scrapers, sand paper etc. This surface shall then be wiped finally with mineral turpentine which shall also remove grease and perspiration of hand marks. The surface shall then be allowed to dry.

2.3. Application of primer :

2.3.1. After the preparation of the surface, the priming coat shall be applied immediately. The brushing operations are to be adjusted to the spreading capacity advised by the manufacturer of the particular primer. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing alternately in opposite directions, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off wall constitute one coat.

2.3.2. During painting, every time, after the priming coat has been worked out of the brush bristles or after the brush has been unloaded, the bristles of the brush shall be opened up by striking the brush against portion of the unpainted surface with the end of the bristles, held at right angles to the surface, so that bristles thereafter will collect the correct amount of paint when dipped again in to a paint container The prima/y coat shall be allowed to dry completely before painting is started.

2.3.3. No hair marks from the brush or clogging at pain puddles in the corner of panels angles of molding etc. shall be left on the work

2.3.4. Special care shall be taken while painting over bolts, nuts, rivets, overlaps etc.

2.3.5. The container when not in use shall be kept close and free from air so that paint does not thickness and also shall be kept guarded from dust.

2.4. Application of color :

2.4.1. Brushing operations are to be adjusted to the spreading capacity advised by the manufacture of particular paint. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the -laying off is finished. The full process of crossing and laying off will constitute one coat.

2.4.2. Each coat shall be allowed to dry completely and lightly rubbed with very fine grade of sandpaper and loose particles brushed off before next coat is applied. Each coat shall vary slightly in shade and shall be got approved from Engineer-in-charge before next coat is started.

2.4.3. Each coat the last shall be lightly rubbed down with sand paper of fine pumice stone and cleaned of dust before the next coat is applied. No hair marks from the brush of clogging of paint puddles in the corners of panels, angles of moldings etc. shall be left on the work.

2.4.4. Special care shall be taken while painting over bolts, nuts, rivets, overlaps etc. Approved best

quality brushes shall be used.

2.5 Scaffolding: Wherever scaffolding is necessary, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be white or colour washed. A properly secured strong and well tied suspended platform (zoola) may be used for white washing. Where ladders are used pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary.

3.0. Mode of measurements and payment

3.1. The new steel and other metal surface shall be measured under this item.

3.2. All the work shall be measured net in the decimal system, as executed subject to the following limits unless otherwise stated hereinafter.
(a) Dimensions shall be measured to the nearest 0.01 meter.
(b) Areas shall be worked out to the nearest 0.01 sq. meter.

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

3.4. In case of fabricated structural steel and iron work, priming coat of paint shall be included with frabation. In case of trusses if measured in sq. m. compound girders, stanchions, lattices, grader and similar work, actual area shall be measured in sq. m. and no extra shall be paid for painting on bolts heads.

Item No. 27

Providing cement grit vata, 10 cm. x 10 cm. size, quarter round concave/ triangular in cement concrete 1:2:4 including neat cement finishing, curing, hacking the RCC surface, etc. complete.

1.0 Materials :

1.1 Water shall conform to M-12 . Cement mortar shall conform to M-11.

2.0 Workmanship :

2.1 The work of cement vata of 10 cms. x 10 cms. size shall be carried out at junctions of parapets and terraces as directed. The vata shall be finished in quarter round shape. The work shall be carried out in the best workman like manner. The inter portion of rain water pipe shall be rounded off properly during constructing the vata. The work shall be cured for 7 days.

3.0 Mode of measurements & payment :

3.1 The work shall be measured for finished item in running meter.

3.2 The rate shall be for a unit of one running metre.

Item No. 28

Providing and filling machine mixed cement cinder in the ratio of 1:10 i.e. 1 part of cement and 10 parts of cinder by volume in sunk toilet at all the floors, at all levels including watering etc. completed.

Material:

Cinder

Workmanship:

The machine mixed cement Cinder in the ratio of 1:10 1 part of cement and 10 part of cinder Laying and spreding in sunk area as per instructed by engineer in chrgae.

All related machinery, tools, labour and material included in above item.

Mode of Measurement;

the rates shall be for a unit of One Cu.mt

Item No. 29

Providing and applying exterior texture paint (Flat texture/synthetic paint) of approved make on any height. The rate includes applying one brush coats of PRIMER, On prepared surface final required coat of Semi gloss Medium Textured Flexible coating with crack bridging up to 2.6 MM and VOC content less then 100g/l, required scaffolding, jhulaa, tools and labor. The texture material shall be Pure Acrylic, Environment Friendly, Protect against Salt and Carbon dioxide, with excellent anti-Carbonation, UV Resistance, Moisture vapour trasmission coating with third party test certificate applied up to 140 Microns DFT.

Materials

Water shall be conform M-1. The plastic emulsion shall conform to I.S.: 5411-1969 (part-l).

Workmanship

2.1. 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 white or colour washed A properly secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary.

2.2. Preparation of surface :

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

2.2.2. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is allowed. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with I.S; 2395 (Part 01) 1966. Before applying distempering, any unevenness shall be made good by applying putty made of plaster of pairs mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

2.3. Preparation of Mix :
This shall be done as per manufacture's instructions. The thinning of emulsion is to be done with water and not with turpentine. The quantity of thinner to be added shall be as per manufacturer instructions.

2.4. Application :

2.4.1. Before pouring into small containers for use, the paint shall be stirred thoroughly in item

container. When applying also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.

2.4.2. The paint shall be laid on evenly and smoothly by means of crossing and laying off the crossing and 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 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 moldings, etc. shall be left on the work. The full process of crossing and laying off will constitute on coat.

2.4.3. 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 proceeding coat as become sufficiently hard to resist marking by brushing being used.

2.4.4. The surface on finishing shall present a flat velvety smooth finish. It shall be even and uniform in shade without patches, brush marks, paint drops etc.

2.5. Precautions :
(a) Old brushes if they are to be used with emulsion paints, shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and kept immersed in water fusing break periods to prevent the paint from hardening on the brush.
(b) In the preparation of wall for plastic emulsion painting, no oil base petals shall be sued in filling cracks, holes etc.
(c) Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.
(d) Washing or surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of Application

Mode of measurements and payment

3.1. All the work shall be measured in the decimal system as under:
(a) Dimensions shall be measured to the nearest 0.01 m.
(b) Area in individual item shall be worked out to the nearest 0.01 sq.m.
All the work shall be measured in sq. mt. Deductions for jambs, soffits, sills etc. for openings not exceeding 0.5 sq. mt. in area, for ends of joists, posts, beams, girders, steps etc. not exceeding 0.5 sq mt. each in area and for openings exceeding 0.5 sq. mt. and not exceeding 3.0. sq. mt. each in area, deductions and additions shall be made as under.

3.2. No deductions shall be made for ends of joists, beams, posts, etc. and openings not exceeding 0.5 sq mt. each. No addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, posts etc.

3.3. No deductions for openings exceeding 0.5 sq.mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition will be made for reveals, jambs, soffits etc. of these openings :
(a) When both the faces of walls are provided with finish, deduction shall be made for one face only.
(b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for door, windows, etc. on which width of reveals is less than that of the other side. Where width of reveals on both faces of wall are equal, deduction of .50% of area of opening on each face shall be made from total area of finish.
(c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if the width of reveal on the treated side is less than that on the untreated side, but if the width of the reveal is equal or more than on the untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

3..4 In case of area of openings exceeding 3 sq. mt. each, deductions shall be made for openings but jambs, soffits, sills shall be measured.

3.5. No deductions shall be made for attachment such as casing, conducts, pipe, electric wiring and the like.

3.6. Corrugated surfaces shall be measured flat as fixed and not girth. The quantities so measured shall be increased by the following percentage and the resultant shall be included with the general areas:
(a) Corrugated steel sheets……..… 14%
(b) Corrugated A.C. sheets……..…. 20%
(c) Semi corrugated A.C. Sheets……... 10%
(d) Nainital pattern roof (Plain sheeting sheets)…….….. 10%
(e) Naintial pattern roof (with corrugated sheets)……..… 25%

3.7. Cornices and other wall features, when they are not picked out in a different finish/colour shall be girthed and included in the general area.

3.8. The rate shall include the cost of ail materials, labour, scaffolding, protective measures etc. involved in all the operations described above.

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

Item No. 30

Providing and applying paint on internal wall with Three coat Plastic emlusion paint of approved brand & manufacture & required shade on wall surfacces to give an even shade over & including a priming coat with a primer of approved brand & manufacture after throughly Brushing the surface free from mortar dropping & other foreign matter & also including preparing surface with birla white cement based putty sand papered smooth. Rete includes application for all heights.

Materials

Water shall be conform M-1. The plastic emulsion shall conform to I.S.: 5411-1969 (part-l).

Workmanship

2.1. 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 white or colour washed A properly secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary.

2.2. Preparation of surface :

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

2.2.2. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is allowed. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with I.S; 2395 (Part 01) 1966. Before applying distempering, any unevenness shall be made good by applying putty made of plaster of pairs mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

2.3. Preparation of Mix :
This shall be done as per manufacture's instructions. The thinning of emulsion is to be done with

water and not with turpentine. The quantity of thinner to be added shall be as per manufacturer instructions.

2.4. Application :

2.4.1. Before pouring into small containers for use, the paint shall be stirred thoroughly in item container. When applying also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.

2.4.2. The paint shall be laid on evenly and smoothly by means of crossing and laying off the crossing and 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 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 moldings, etc. shall be left on the work. The full process of crossing and laying off will constitute on coat.

2.4.3. 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 proceeding coat as become sufficiently hard to resist marking by brushing being used.

2.4.4. The surface on finishing shall present a flat velvety smooth finish. It shall be even and uniform in shade without patches, brush marks, paint drops etc.

2.5. Precautions :
(a) Old brushes if they are to be used with emulsion paints, shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and kept immersed in water fusing break periods to prevent the paint from hardening on the brush.
(b) In the preparation of wall for plastic emulsion painting, no oil base petals shall be sued in filling cracks, holes etc.
(c) Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.
(d) Washing or surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of Application

Mode of measurements and payment

3.1. All the work shall be measured in the decimal system as under:
(a) Dimensions shall be measured to the nearest 0.01 m.
(b) Area in individual item shall be worked out to the nearest 0.01 sq.m.
All the work shall be measured in sq. mt. Deductions for jambs, soffits, sills etc. for openings not exceeding 0.5 sq. mt. in area, for ends of joists, posts, beams, girders, steps etc. not exceeding 0.5 sq mt. each in area and for openings exceeding 0.5 sq. mt. and not exceeding 3.0. sq. mt. each in area, deductions and additions shall be made as under.

3.2. No deductions shall be made for ends of joists, beams, posts, etc. and openings not exceeding 0.5 sq mt. each. No addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, posts etc.

3.3. No deductions for openings exceeding 0.5 sq.mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition will be made for reveals, jambs, soffits etc. of these openings :
(a) When both the faces of walls are provided with finish, deduction shall be made for one face only.
(b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for door, windows, etc. on which width of reveals is less than that of the other side. Where width of reveals on both faces of wall are equal, deduction of .50% of area of opening on each face shall be made from total area of finish.
(c) When only one face of wall is treated and the other face is not treated, full deduction shall be

made if the width of reveal on the treated side is less than that on the untreated side, but if the width of the reveal is equal or more than on the untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

3..4 In case of area of openings exceeding 3 sq. mt. each, deductions shall be made for openings but jambs, soffits, sills shall be measured.

3.5. No deductions shall be made for attachment such as casing, conducts, pipe, electric wiring and the like.

3.6. Corrugated surfaces shall be measured flat as fixed and not girth. The quantities so measured shall be increased by the following percentage and the resultant shall be included with the general areas:
(a) Corrugated steel sheets……..… 14%
(b) Corrugated A.C. sheets……..…. 20%
(c) Semi corrugated A.C. Sheets……... 10%
(d) Nainital pattern roof (Plain sheeting sheets)……..….. 10%
(e) Naintial pattern roof (with corrugated sheets)……..… 25%

3.7. Cornices and other wall features, when they are not picked out in a different finish/colour shall be girthed and included in the general area.

3.8. The rate shall include the cost of ail materials, labour, scaffolding, protective measures etc. involved in all the operations described above.

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

Item No. 31

Providing and applying painting with Three coat Plastic emulsion paint on ceiling surface of approved brand & manufacture & required shade on ceiling surfacces to give an even shade over & including a priming coat with a primer of approved brand & manufacture after throughly Brushing the surface free from also including preparing surface with birla white cement based putty sand papered smooth. Rate includes application for all heights.

Materials

Water shall be conform M-1. The plastic emulsion shall conform to I.S.: 5411-1969 (part-l).

Workmanship

2.1. 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 white or colour washed A properly secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary.

2.2. Preparation of surface :

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

2.2.2. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is allowed. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with I.S; 2395 (Part 01) 1966. Before applying distempering, any unevenness

shall be made good by applying putty made of plaster of pairs mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

2.3. Preparation of Mix :
This shall be done as per manufacture's instructions. The thinning of emulsion is to be done with water and not with turpentine. The quantity of thinner to be added shall be as per manufacturer instructions.

2.4. Application :

2.4.1. Before pouring into small containers for use, the paint shall be stirred thoroughly in item container. When applying also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.

2.4.2. The paint shall be laid on evenly and smoothly by means of crossing and laying off the crossing and 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 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 moldings, etc. shall be left on the work. The full process of crossing and laying off will constitute on coat.

2.4.3. 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 proceeding coat as become sufficiently hard to resist marking by brushing being used.

2.4.4. The surface on finishing shall present a flat velvety smooth finish. It shall be even and uniform in shade without patches, brush marks, paint drops etc.

2.5. Precautions :
(a) Old brushes if they are to be used with emulsion paints, shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and kept immersed in water fusing break periods to prevent the paint from hardening on the brush.
(b) In the preparation of wall for plastic emulsion painting, no oil base petals shall be sued in filling cracks, holes etc.
(c) Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.
(d) Washing or surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of Application

Mode of measurements and payment

3.1. All the work shall be measured in the decimal system as under:
(a) Dimensions shall be measured to the nearest 0.01 m.
(b) Area in individual item shall be worked out to the nearest 0.01 sq.m.
All the work shall be measured in sq. mt. Deductions for jambs, soffits, sills etc. for openings not exceeding 0.5 sq. mt. in area, for ends of joists, posts, beams, girders, steps etc. not exceeding 0.5 sq mt. each in area and for openings exceeding 0.5 sq. mt. and not exceeding 3.0. sq. mt. each in area, deductions and additions shall be made as under.

3.2. No deductions shall be made for ends of joists, beams, posts, etc. and openings not exceeding 0.5 sq mt. each. No addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, posts etc.

3.3. No deductions for openings exceeding 0.5 sq.mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition will be made for reveals, jambs, soffits etc. of these openings :
(a) When both the faces of walls are provided with finish, deduction shall be made for one face only.

(b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for door, windows, etc. on which width of reveals is less than that of the other side. Where width of reveals on both faces of wall are equal, deduction of .50% of area of opening on each face shall be made from total area of finish.
(c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if the width of reveal on the treated side is less than that on the untreated side, but if the width of the reveal is equal or more than on the untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

3..4 In case of area of openings exceeding 3 sq. mt. each, deductions shall be made for openings but jambs, soffits, sills shall be measured.

3.5. No deductions shall be made for attachment such as casing, conducts, pipe, electric wiring and the like.

3.6. Corrugated surfaces shall be measured flat as fixed and not girth. The quantities so measured shall be increased by the following percentage and the resultant shall be included with the general areas:
(a) Corrugated steel sheets……..… 14%
(b) Corrugated A.C. sheets……..…. 20%
(c) Semi corrugated A.C. Sheets…….. 10%
(d) Nainital pattern roof (Plain sheeting sheets)…….….. 10%
(e) Naintial pattern roof (with corrugated sheets)……..… 25%
3.7. Cornices and other wall features, when they are not picked out in a different finish/colour shall be girthed and included in the general area.
3.8. The rate shall include the cost of ail materials, labour, scaffolding, protective measures etc. involved in all the operations described above.
3.9. The rate shall be for a unit of One sq. meter.

Item No.32

Providing and laying in position vitrified tiles Anti Skid (Full body matt finish) (of approved make & colour), of any size and thickness of first quality with 3-5 mm groove as per design, set in cement slurry (3.3 kg. cement/m2.) Avg. 35 mm (or more as required) thick cement mortar 1:3 bedding and laid to proper slope and level. Finishing should be done with specified Grout including curing and cleaning with mild oxalic acid etc. complete, as shown and specified, for Flooring and Dado etc. complete, as directed by Consultant / Engineer -in-charge. Grouting in Joints of 3 to 5 mm with ready mix polymer based cementitious Grout of BAL or equivalent of approved shade as approved by consultant. Basic Rate including all taxes and transportation- 110 Rs./SFT

Material:

2. water shall confirm to M-1 of specification booklet of tender.
3. cement mortar shall be confirm to M-11 of specification booklet of tender.
4. fully anti skid vitrified floor tiles shall be of shade approved by engineer in charge. The tiles shall be hard even/sound 1 regular in shape and uniformly coloured. It shall be without any soft vines and cracks of flow. The size of the tiles shall be as per drawings or otherwise specified by engineer in charge scratch hardness minimum 7 on mohr’ s scale with a density of 2.2 to 2.3.

workmanship:

each vitrified tiles cut to the required size and shape as shown in the working drawing supplied by engineer in charge. Each tiles shall be in mirror polished. All angles and edges of tiles shall be true square and free from chipping and giving a plain surface. The shade quality of Vitrified tiles shall be got approved by Engineer in charge.

Bedding for the Vitrified tiles shall be 25mm thick in cement mortar 1:3 (1 cement: 3 sand) of grey thickness as given in the description n of the sub grade shall be cleaned wetted and mopped. Mortar of the specified mix and thickness shall be than spread on the area. Sufficient to receive Vitrified tiles. The tiles shall be washed clean before laying.

It shall laid on top pressed tapped gently to bring it in with the adjoining tiles flooring. The top surface of mortar shall be corrected bit adding fresh motor of hollow and depressions. The mortar shall than be allowed to harden bit over the surface cement slurry of honey like consistence shall be applied . the joints shall be as thin as possible. 3 to 5mm groove shall be filled up by polymer based cemenititious grout (to match the shade of tiles.) the top surface shall be protected from scratches damages etc. by means of a thin layer & good quality POP & all grooves shall be protected with adhesive tape or as directed by engineer in charge.

Mode of Measurement;

The rate includes the cost of all material and labour involve in all operations described above. The flooring shall be measured on sq.mt. basis. Rates also include rubbing, sizing and cleaning of tiles etc. complete.
the rates shall be for a unit of One Sq.mt

Item No. 33

Providing and laying in position vitrified tiles skirting of (approved make & colour) & first quality as per design, set in cement slurry (3.3 kg. cement/m2.) Finishing should be done with flush pointing in white cement and pigment including curing and cleaning etc. complete, as shown and specified etc. complete as directed by Consultant / Engineer in-charge. Basic Rate including all taxes and transportation- 110 Rs./SFT

Materials:

1) Water shall confirm to M – 1 of specification booklet of tender.

2) Cement mortar shall be confirmed to M-11 of specification booklet of tender.

3) Fully polished Vitrified tiles shall be of shade approved by Engineer –In – Charge. The tiles shall be hard even / sound and regular in shape and uniformly coloured. It shall be without any soft vines and cracks of flow. The size of the tiles shall be as per drawings or otherwise specified by Engineer – In – Charge scratch hardness minimum 7 on Mohr's scale with a density of 2.2 to 2.3.

Workmanship:

2.1 Preparation of surface:- In case of brick / a block masonary wall the joints shall be raked out to a depth of at least 15 mm. While the masonary is being laid. In case of concrete wall surface shall be chiseled and roughed with wire brushes. The surface shall be cleaned and wetted thoroughly before commencing the laying work.

Laying :-

The wall surface shall be covered within 10mm thick plaster of cement mortar 1:3 mix and allowed to harden. The plaster shall be roughened with wire brushes both ways. The back of tiles shall be floated with grey cement slurry and edges with white cement slurry. The tiles shall be gently tapped in position one after

the other keeping the joints as thin as possible. Top of skirting of dado shall be truly horizontal and joints vertical or as per required pattern.

Risers of steps, skirting and dado shall rest on top of treads of flooring. Where full size tiles cannot be fixed they shall be cut to the required size and the edges to smoothened.

The groove shall be cleaned and flush pointed with polymer based grout (to match the shade of tiles). The surface shall be kept wet for seven days. After curing the surface shall be washed clean.

Colour & size shall be of the Vitrified tiles should be provided as per instruction of Engineer – In – Charge.

Mode of measurement:

The rate shall be for unit of one Sq meter.

Item No. 34

Providing and laying in position vitrified tiles Dedo of (approved make & colour) & first quality as per design, set in cement slurry (3.3 kg. cement/m2.) Finishing should be done with flush pointing in white cement and pigment including curing and cleaning etc. complete, as shown and specified etc. complete as directed by Consultant / Engineer in-charge. Base Rate at site including all taxes and transportation- 80 Rs./SFT

Materials:

1) Water shall confirm to M – 1 of specification booklet of tender.

2) Cement mortar shall be confirmed to M-11 of specification booklet of tender.

3) Fully polished Vitrified tiles shall be of shade approved by Engineer –In – Charge. The tiles shall be hard even / sound and regular in shape and uniformly coloured. It shall be without any soft vines and cracks of flow. The size of the tiles shall be as per drawings or otherwise specified by Engineer – In – Charge scratch hardness minimum 7 on Mohr's scale with a density of 2.2 to 2.3.

Workmanship:

2.1 Preparation of surface:- In case of brick / a block masonary wall the joints shall be raked out to a depth of at least 15 mm. While the masonary is being laid. In case of concrete wall surface shall be chiseled and roughed with wire brushes. The surface shall be cleaned and wetted thoroughly before commencing the laying work.

Laying :-

The wall surface shall be covered within 10mm thick plaster of cement mortar 1:3 mix and allowed to harden. The plaster shall be roughened with wire brushes both ways. The back of tiles shall be floated with grey cement slurry and edges with white cement slurry. The tiles shall be gently tapped in position one after the other keeping the joints as thin as possible. Top of skirting of dado shall be truly horizontal and joints vertical or as per required pattern.

Risers of steps, skirting and dado shall rest on top of treads of flooring. Where full size tiles cannot be fixed they shall be cut to the required size and the edges to smoothened.

The groove shall be cleaned and flush pointed with polymer based grout (to match the shade of tiles). The surface shall be kept wet for seven days. After curing the surface shall be washed clean.

Colour & size shall be of the Vitrified tiles should be provided as per instruction of Engineer – In – Charge.

Mode of measurement:

The rate shall be for unit of one Sq meter.

Item No. 35

Providing and laying 18 to 20 mm thick granite stone (Colour as Approved by Consultant) for flooring and Skirting over 25 mm (or more as required) thk. Base of cement mortar 1:6 laid over and jointed with white cement slurry including rubbing and mirror/semi-mirror polishing etc. complete. Rate Shall be inclusive of providing and fixing of Skirting of approved size and Shade. Base Rate at site including all taxes and transportation:200 Rs/SFT

Material

Water shall confirm to M-1 (1.1 to 1.5 / P 9 / V .1). Cement mortar shall confirm to M-11 (11.1 to 11.32 / P 11 / V.1).

Granite stone shall be 18 mm ot 20 mm thk.

In addition to that, it shall be of approved quality, free from defects and dressed in fashion stated under specification. The thickness shall be as stated in the schedule with 3 mm tolerance. The stone shall be of uniform in colour with straight edges. The sides of machine cut and machine polished stone shall have perfect right angle and surface on earth.

Workmanship

The sill will be having finished level with wall thickness. The bearing of granite stone shall be 18 mm to 20mm all around in masonry or RCC work. The drip for bearing shall be formed by making gissi in walls. The gissi shall be 20 mm minimum deep in walls. line level and plumb. The thickness of base of cement mortar 1:6 laid over and joint with white cement slurry . Top slab shall consist of granite stone 18 mm thick placed and fixed in line level and plumb using adhesives with BAL ENDURA make Gold Star Adhesive with Polymer Additive ADMIX AD1 in ratio of 1 Bag of BAL Gold Star Adhesive (20 Kg) with 1 Ltr. Of Admix AD1. The workmanship shall be referred to the same as done as per wall cladding. After placing the granite stone in gissi it shall be filled & finished smooth. The top slab shall be in true line & level. The projected part of horizontal facia shall be moulded in half round shape.

The stone shall be fixed truly in plumb and in perfect line as shown in plans. The surface shall be protected from sun & rain and cured for ten days and shall be fairly polished.

Mode of measurement of payment

The rate includes cost of all materials, tools, plants and labour involved in satisfactory completion of work.

The rate shall be for unit of one Sq.mt .

The work shall be carried out as per detailed drawings and directed be E.I.C.

Measurement shall be in Sq.mt.

Item No. 36

Providing and laying 18 to 20 mm thick granite stone (Colour as Approved by Consultant) for Steps Riser and Dedo over 10 mm (or more as required) thk. Base of cement mortar 1:6 laid over and jointed with white cement slurry including rubbing and mirror/semi-mirror polishing etc. complete. Rate Shall be inclusive of providing and fixing of Skirting of approved size and Shade. Base Rate at site including all taxes and transportation:200 Rs/SFT

Material

Water shall confirm to M-1 (1.1 to 1.5 / P 9 / V .1). Cement mortar shall confirm to M-11 (11.1 to 11.32 / P 11 / V.1).

Granite stone shall be 18 mm ot 20 mm thk.

In addition to that, it shall be of approved quality, free from defects and dressed in fashion stated under specification. The thickness shall be as stated in the schedule with 3 mm tolerance. The stone shall be of uniform in colour with straight edges. The sides of machine cut and machine polished stone shall have perfect right angle and surface on earth.

Workmanship

The sill will be having finished level with wall thickness. The bearing of granite stone shall be 18 mm to 20mm all around in masonry or RCC work. The drip for bearing shall be formed by making gissi in walls. The gissi shall be 20 mm minimum deep in walls. line level and plumb. The thickness of base of cement mortar 1:6 laid over and joint with white cement slurry . Top slab shall consist of granite stone 18 mm thick placed and fixed in line level and plumb using adhesives with BAL ENDURA make Gold Star Adhesive with Polymer Additive ADMIX AD1 in ratio of 1 Bag of BAL Gold Star Adhesive (20 Kg) with 1 Ltr. Of Admix AD1. The workmanship shall be referred to the same as done as per wall cladding. After placing the granite stone in gissi it shall be filled & finished smooth. The top slab shall be in true line & level. The projected part of horizontal facia shall be moulded in half round shape.

The stone shall be fixed truly in plumb and in perfect line as shown in plans. The surface shall be protected from sun & rain and cured for ten days and shall be fairly polished.

Mode of measurement of payment

The rate includes cost of all materials, tools, plants and labour involved in satisfactory completion of work.

The rate shall be for unit of one Sq.mt .

The work shall be carried out as per detailed drawings and directed be E.I.C.

Measurement shall be in Sq.mt.

Item No. 37

Providing & laying approved quality machine cut river wash finished granite of approved shade, thickness 18-20 mm. (or more as required), in floor, otta, sill, skirting, dado etc. in required sizes (not exceeding 1.5 mt x 1.0 mt) and shapes, including average 25 mm (or more as required) thick cement mortar bedding in 1:6 laid and jointed with white cement and matching pigment including rubbing, re-polishing after fixing to remove any undulation between the joints (if required) with different grades of Emery, refilling of open joints, curing, daily cleaning and mopping, as directed for at least 15 days or up to the satisfaction of the Engineer in Charge (Only finished work will be measured.) etc. all complete as per approved sample by Architect,

drawings and instruction of Engineer in Charge at all floors / all levels / all heights and all shapes. The rate includes machine cut edges of uniform thickness, rounding of edges, champhering and mirror polishing of edges, cutting in stone for electrical points/boxes etc. complete. The rate shall be inclusive of protecting the flooring by plaster of paris and plastic and/or bubble top sheets. Base Rate at site including all taxes and transportation:200 Rs/SFT

Material

Water shall confirm to M-1 (1.1 to 1.5 / P 9 / V .1). Cement mortar shall confirm to M-11 (11.1 to 11.32 / P 11 / V.1).

River wash finished Granite stone shall be 18 mm ot 20 mm thk.

In addition to that, it shall be of approved quality, free from defects and dressed in fashion stated under specification. The thickness shall be as stated in the schedule with 3 mm tolerance. The stone shall be of uniform in colour with straight edges. The sides of machine cut and machine polished stone shall have perfect right angle and surface on earth.

Workmanship

The sill will be having finished level with wall thickness. The bearing of granite stone shall be 18 mm to 20mm all around in masonry or RCC work. The drip for bearing shall be formed by making gissi in walls. The gissi shall be 20 mm minimum deep in walls. line level and plumb. The thickness of base of cement mortar 1:6 laid and jointed with white cement . Top slab shall consist of granite stone 18 mm thick placed and fixed in line level and plumb using adhesives with BAL ENDURA make Gold Star Adhesive with Polymer Additive ADMIX AD1 in ratio of 1 Bag of BAL Gold Star Adhesive (20 Kg) with 1 Ltr. Of Admix AD1. The workmanship shall be referred to the same as done as per wall cladding. After placing the granite stone in gissi it shall be filled & finished smooth. The top slab shall be in true line & level. The projected part of horizontal facia shall be moulded in half round shape.

The stone shall be fixed truly in plumb and in perfect line as shown in plans. The surface shall be protected from sun & rain and cured for ten days and shall be fairly polished.

Mode of measurement of payment

The rate includes cost of all materials, tools, plants and labour involved in satisfactory completion of work.

The rate shall be for unit of one Sq.mt .

The work shall be carried out as per detailed drawings and directed be E.I.C.

Measurement shall be in Sq.mt.

Item No. 38

Providing and laying 18 to 20 mm thick first quality mirror polished Kota or equivalent stone for flooring and Skirting over 25 mm (or more as required) thk. Base of cement mortar 1:6 laid over and jointed with white cement slurry including rubbing and polishing etc. complete. Rate Shall be inclusive of providing and fixing of Skirting of approved size and Shade.

1.0 Materials :

1.1 Water shall conform M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11polished kotah stone shall conform to M-49.

2.0 Workmanship :

2.1 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 of the slabs shall be true square and free from chippings and giving a plane surface. The thickness shall be 25 mm. (Average) as specified in the item but not less than 20 mm. At any place of the slab.

2.2 Bedding for the kotah stone slabs shall be cement mortar 1 : 6 (1 cement : 6 coarse sand) or L. M. 1 : 1.5 of average thickness 20 mm. As given in the description of the item. Sub grade shall be cleaned, wetted and mopped. Mortar of the specified mix and thickness shall be then be spread on an area sufficient to receive one kotah stone slab. The slab shall be washed clean before laying. It shall be laid on top pressed, tapped gently to bring it in level with the other slabs. It shall then be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depressions. The mortar shall then be allowed to harden bit. Over this surface, cement slurry of honey like consistency shall be applied. The slab shall then be gently placed in position and tapped with wooden mallet till it is properly padded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining the wall shall enter not less than 10 mm. Under the plaster, skirting or dado. The junction between the wall floor shall be finished neatly. The finished surface shall be true to levels and slopes as directed.

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

2.4 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 the heavy machine and then second polishing shall be done with carborundum stone of 220 to 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 of soft cloth over a clean and dry surface. Then the polish machine fitted with bobs shall be run over it.

2.5 The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

3.0 Mode of measurements & payment :

3.1 The rate shall include the cost of all materials and labor involved in all the operations described above. The kotah stone flooring shall be measured in square meters correct to two places of decimal, length and breadth shall be measured correct to a centimeter and between the finished face of skirting dado or wall plaster and no deduction shall be made nor extra paid for any opening in floor of areas upto 0.1 sq. Mt.

3.2 The rate shall be for a unit of one sq. Meter.

Item No. 39

Providing & Laying for any height/floor cement Concrete flooring 1:2:4 (1 cement :2 coarse sand :4 stone aggregate 20 mm. nominal size) laid in one layer finished with a floating coat of neat cement. Avg. 40 mm. thick or more as per requirement and instruction of EIC.

1.0. 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 of 1:2:4 proportion measured by volume shall conform to relevant specifications of ordinary grade 1:2:4 concrete.

2.0. Workmanship

2.1. The cement concrete flooring of 40 mm thick (Average) is to be laid as per the site condition. The concrete shall be mixed in a mechanical mixer at the work. Hand mixing may however be allowed for smaller quantities of work and in case of failure of machineries or as permitted by the Engineer-in-charge. It shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However is such cases 10% more cement than otherwise required shall have to be used without any extra cost. The mechanical mixing shall be done for period of 1.1/2 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose, Flooring or specified thickness shall be laid in accordance with approved pattern or as directed. Finishing operation shall depending upon the emperature and atmospheric conditions. The surface shall be left for some time till moisture disappears form it. Fresh quantity of cement shall be mixed with water to form a thick slurry and spread over the surface while the concrete is still green. Use of dry cement or cement and sand mixture sprinkled
on this surface to stiffen the concrete or absorb excessive moisture shall not be permitted. The cement slurry shall then be properly pressed twice by means of iron floats, once when the slurry is applied and he second time when cement setting and finished floated smooth The surface shall be marked with string or B.R.C. fabric jali to make the surface non-slippery as and when directed. The junction of floors with wall plaster, dedo or skirting shall be rounded off where sorequired up to 25 mm. radius. Flooring in lavatories and bath rooms shall be laid after fixing of water closet and squatting pans and floor traps which shall be plugged while laying the floors and opened after the floors are completed. Any damage done to water supply or sanitary fittings during execution of work shall be made good.

2.2. After the final set, the concrete shall be kept continuously wet. if required by ponding for a period of not less than 7 days from the date of placement.
2.3. The form work shall be provided if necessary as directed by Engineer-in-charge. Concreting shall be done as per alternate bay method with necessary centering either by mastic or cement mortar as directed

3.0. Mode of measurements & payment
3.1. 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 counter yard.
3.2. ("he rate shall be for a unit of one sq. meter.

Item No. 40

Providing and Laying broken chine mosaic flooring for terrace using 12mm to 20 mm broken pieces of glazed tiles to be laid over cement mortar 1:3 to plain or slope and to be tempered to bring mortar creme out upto surface using.

Providing & laying broken white china mosaic flooring for plain and curved surfaces, comprising of 20 to 25 mm. size broken pieces of ceramic/glazed tiles (one or more colours, as directed), laid over cement mortar 1:6 bedding including applying cement slurry at the rate of 2.75 kg per sq.m. on plain or sloped surfaces and filling joints with white cement. The flooring shall be tampered to bring the mortar cream up to the surface, including rounding of the junctions and extending them up to 15 cm. along the parapet wall. The rate shall include bands, if different colour is used, any pattern or design as per drawing and direction, curing, etc. complete. (Wall to wall measurement will be considered only including vata)

1. Material

1.0. The chemicals used in water proofing are as under.

(A) Polysiloxane polymer bound sealant of std. make as approved by Engineer in charge.

(a) Specific gravity 1.o

(b) Tensile strength 1.5 Mpa.

(c) Flexibility+25 %

(B) Acrylic modifier based on polyacryliceaster latex of std make.

(a) Viscosity at 30C--35-40 CPS

(b) Specific gravity at 30-- 1.01- 1.02

(c) PH Value --8—9

(d) Particle size -200 Ym

(C) Grey cement

The material shall be excellent adhesion- bonds to porous and non porous surface.

The material shall be having properties resistance to the effect of long term weathering & durable in all climate conditions including UV attack.

Workmanship :

The whole mosaic tile surface shall be cleaned properly. After cleaning the surface , all the tile joints shall be cut electrically operated machine cutter in to"V" grove to the width 3-5mm. Bound sealant having excellent properties of adhesion & imperviousness. of std. make as approved by engineer in charge shall be filled in proportion of 1.28 kg/ 10 smt as per good engineering practice and direction in all the tiles groove.

After filling groove by sealant the application of first coat of acrylic modifier coating based on polyacryliceaster latex mixed with cement (in proportion of 1 liter of the acrylic modifier to 2.78 kg of cement) shall be done thoroughly & properly. After it dries second coat over the surface shall be applied properly as per direction .The treatment is the cured for 3-4 days and ponds test is conducted. The coating converts in to flexible & impact resistant matrix.

The payment shall be made on appropriate stamped paper shall be given by the contractors to the Govt. office in the manner of form as prescribed.

MODE OF MEASUREMENT AND PAYMENT

For the surface area the length and breadth shall be measured current to Cm as be made not extra paid for any opening of the pipe etc. complete. Up to 0.1 Sq.mt the rate shall be include the cost of all labor and materials. Required for the operation involved for the satisfactory completion of this item.

The rate shall be for a unit of one Sq.mt. of the basis of the work done

Form of Guarantee Bond

I/ We ----------(contractor) Hereby Guarantee that work will remain in unaffected and will not be in any way damaged by water leakage on any other similar types of defects surface will get good for the period of five years after the completion of work of water proof as per the terms & condition of the contract & contractor here by identifies & agrees to save harres the Govt. of Gujarat from any loss or the similar type of the leakage and here by Guarantee to make good any loss or damage suffered by the Govt. of Gujarat further Guarantee to redo the effective work without claiming and any extra cost.

This Guarantee shall be remain force of the period of five years for the completion of the work under the contract and it shall remind bonding to the contractor for the period of five years.

The deposit at the rate of total 15% of the cost of this executed item from the running of the final bills as taken of guarantee for work shall be recovered and shall be released after the first three years after completion work of 1/3 of deposit and as half 1:3 amount shall be released for the tenth years after date of final balance of guarantee period, if no leakage is found.

Item No. 41

Providing and fixing five course water proofing treatment with bitumen felt consisting of second and forth course of blown bitument or and residual bitumen applied hot at 1.2 kg per Sqmt. Of area for each course and first course with fiber base bitumen saturaed under lay type and third course with fiber base self finished felt type 2 grade and fifth and finalcourse of stone grit 6 mm. and down size or pea sized gravel spead at 0.008 Cmt. including preparation of surface excluding grading complet.

1.0 Materials : The tar felt shall conform to M-76. The bitumen primer shall conform to I. S. 3388-1965. The bitumen shall conform to I. S. 702-1961. The grit or gravel shall conform to M-8.

2.0 Workmanship :

2.1 Preparation of surface :

2.1.1 Well-defined cracks other than hair cracks in the roof structure shall be cut to 'V' section cleaned and filled up flush with cement and slurry or with bitumen conforming to I.S. 702-1961. The surface to be treated shall have a minimum slope of 1 in 120. The grading shall be carried out prior to the application of water proofing treatment by cement mortar or line surkhi mortar or as specified in description of item.

2.1.2 The surface of room, part of parapet and gutters, drain mouths etc. Over which the water proofing treatment is to be applied, shall be cleaned of all foreign matter such as fungus, moss and dust by wire brushing and dusting.

2.1.3 Drain outlet shall be suitably placed with respect to the roof gradient to ensure rapid drainage and prevent local accumulation of water on the roof, surface, masonry drain mouth, shall be widen sufficiently and rounded with cement mortar.

2.1.4 Form cast iron drain outlets, a groove shall be cut all round to touch the treatment.

2.1.5 When a pipe passess through a roof on which water proofing treatment is to be laid, a cement, concrete angle fillet shall be built round it and the water proofing treatment taken over the fillet.

2.1.6 In case of parapet wall over 450 mm. In height for tucking in the water proofing treatment, a horizontal grooves 75 mm. Wide and 65 mm. Deep at minimum height of 150 mm. Above roof level shall be left in the vertical face at the time of construction, the horizontal face of the groove shall be shaped with cement mortar 1 : 4.

2.1.7 In case of low parapet where the height does not exceed 450 mm. No groove shall be provided and the water proofing treatment shall be carried right over the top.

2.1.8 In case of existing R.C.C. and stone wall cutting the chase for tacking in the water proofing treatment is not recommended.

2.1.9 At the junction between the roof and veridical face of the parapet wall, a fillet 75 mm. In radius shall be constructed.

2.1.10 At the drain mouths the fillet shall be suitably cut back and rounded off for easy application of water proofing treatment and easy flow or water.

2.1.11 Outlet at every low dividing wall about less than 300 mm. In height shall be rounded smooth and corners rounded off for easy application of water proofing treatment.

2.2 Priming coat :

2.2.1 Bitumen primer shall conform to I.S. 3385-1965. A priming coat consisting of bituminous solution of low viscosity shall be applied with brush on the roof and wall surface at specified per unit area to assist adhesion of bonding materials as specified in the description of the item. Where a floating treatment of water proofing with self finished bitumen felt is required i.e. Where water proofing treatment is required to be isolated from the roof structure, layer of bitumen saturated felt (underlay) shall be spread over the roof surface and tucked into the flashing grooves. To keep the underlay free from the structure no bonding materials shall be used below underlay. Overlapping to the adjoining strip of underlay shall be minimum of 75 mm. At sides and 10 mm. At ends and shall be sealed with the same bonding materials as used for the self finished felt treatment. The underlay shall be of type-1 saturated felt conforming to I.S. 1322-1970.

2.3 Laying of Felt :

2.3.1 The self-finished tar felt shall be cut to the required lengths, brushed clean of dusting materials laid out flat on the roof to eliminate curls and subsequent stretching. The felt shall be laid in length running at right angles to the direction of run off gradient commencing at the lowest level and working upto crest, so that the lower laps of the adjacent felt layer offer minimum obstruction to the flow of water. The felt shall not be laid in a single piece of very long lengths as it is likely to shrink 6 to 8 meters are suitable length. The roof shall be cleaned and dried before the felt treatment is begun. Each length shall be laid in position and rolled up for a distance of half it lengths. The hot bonding materials heated to correct working temperature as specified by manufacture shall be poured on to the roof across the full width of the felt as the later is steadily unrolled and pressed down. The excess of bonding materials which squeezes out at the ends shall be removed as the laying proceeds. The pouring shall be so regulated that correct weight of the bonding materials as per unit area is spread uniformly over the surface. When the first half of the tar felt has been bonded to the roof, the other half shall be rolled up and then unrolled on the hot bonding materials in the same way. Subsequent strips shall also be laid in the same manner. Each strip shall overlap the preceding one by at least 75 mm. At the longitudinal edges and 100 mm. At the ends. All overlaps shall be firmly bonded with hot bitumen. Streaks and trailing of bitumen near edges of laps shall be leveled by heating the overlaps with blow lamp and leveling down unevenness.

2.3.2 Third layer of bonding materials in four course treatment shall be carried out in similar manner after the flashing has been complete.

2.3.3 Water proofing treatment shall be carried out in the drain pipe or outlets by at least 100 mm. The water proofing treatment laid on the surface shall overlap the upper edge of water proofing treatment in the drain outlets by at least 10 mm. Flashing felts shall be laid as flashing. Wherever junction of vertical horizontal surface occurs longitudinal laps shall be 100 mm. The lower layer of flashing felt shall overlap the roofing felt by 100 mm. On vertical and sloping faces. Last course of flashing should not be of stone, grit or pea sized gravel but it shall be replaced by providing two coats of bitumen solution of approved quality.

2.3.4 The lower edge of flashing shall overlap the flat portion of the roof and the upper edge of the flashing shall be tucked into the horizontal groove 75 mm. Thick wide, 65 mm. Deep provided at minimum height of 150 mm. From top of the roof surface. The flashing treatment shall be firmly held in place in the grooves with wooden wedges at intervals and the grooves shall be followed with cement mortar 1 : 4 (1 cement : 4 coarse sand) or cement concrete (1 : 2 : 4) (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm. Nominal size) and surface finished smooth with the rest of wall. The cement work shall be cured for 7 days. When dry the exposed plaster joints of grooves shall be pointed with bitumen and two coats of bituminous solution shall be applied on the vertical and sloping surface of flashing.

2.3.5 After the top flashing felt layer has been laid, the penultimate layer of bonding materials shall be applied over the roofing felt and horizontal overlap and vertical and sloping surface of flashing shall be spread uniformly over the hot bonding materials on the horizontal roof surface and pressed into it with wooden roller.

2.3.6 The material for surface finish shall be spread as described in the item over top layer.

2.3.7 If ballooning occurs the defects may be rectified as under :

2.3.8 Remove the gravel on the ballooned surface. Then cut open and squeeze out the trapped vapor by firm pressure applied by hand, seal the bitumen felt so lifted back on the surface by applying additional bitumen, finally seal the cut with piece of bitumen felt with bitumen application.

3.0 Mode of measurements & payment :

3.1 The measurements for the item shall be taken as under :

(a) Water proofing of roof with bitumen shall be measured in sq. Mt. Length and breadth shall be measured correct to centimeter.

(b) Measurement shall be taken for the superficial area of roofing and flashing treatment including flashing over the parapet Wall, low dividing walls and expansion joints and at the pipe projections etc. Overlapping and tucking into flashing grooves Shall not be measured.

(c) Sloping and vertical surface of water proofing treatment shall be measured under the four or five course treatment as the case

May be irrespective of the fact that the final course of grit or gravel is replaced by bitumen primer.

(d) In measurements, no deduction shall be made for either openings or recesses for chimney stacks roof light etc. For area upto

0.40 sq. Mt. Nor anything extra shall be paid or extra labor and materials in forming such openings. For similar area

Exceeding 0.40 sq. Mt. Deduction shall be made in measurements for full opening but nothing extra shall be paid for extra Labor and materials in forming such openings.

(e) The grading (coba bedding) shall be paid separately but cleaning of surface and treating the cracks shall not be paid Separately.

(f) Cutting of horizontal grooves in parapet walls for tucking in water proofing treatment shall not be measured or paid Separately.

3.2 The rate includes cost of all materials and labor.

3.3 The rate shall be for a unit of one sq. Meter.

Item No. 42

Providing and Laying as per pattern Anti Skid tiles of approved size and make as located in the drawing (approved by client/consultant) laid over at least 25mm (or more as required) bed of cement mortar 1:4 and joints to be filled with pigments of shade and colours including related material, labour and machinery complete.make-as approved by consultant

1.0 Material :

Water shall conform pt M -1 . cement mortar shall conform to M -11 . ISO approved ceramic tiles and as per company specifications.

2.0 Workmanship:

2.1 Bedding the sub grade shall be cleaned, wetted and mopped . The bedding shall then be laid evenly over surface temped and corrected to desired and followed 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 ceramic tiles shall be laid on cement mortar bedding of 20 mm thick C.M 1:3 . The mortar shall have sufficient plasticity for laying and there shall be no lumps that would interfere with the evenness not less than 10 mm at any place and average 12 mm thickness . The proportion of the cement mortar shall be as specified in the item.

2.2 Fixing Tiles:

2.2.1 The tiles before laying shall be soaked in water for at least two hours. Near grey cement grout at 33 kg / cement sqmt of honey like consistency shall be spread over mortar bedding as directed. The edges of the tiles shall be 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 thin adjoining tiles. The tiles 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.

2.2.2 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 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 or trowel to a depth of 5mm. and loose material removed. White cement shall be used for pointing the joints (If required pigment shall be mixed with white cement , to match the shade of tiles) . After fixing the tiles finally in an even plane tiles flooring shall be kept wet and allowed to nature undisturbed for 7 days.

1.0 Cleaning:

1.1 The surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, it shall be carefully washed , cleared by dilute acid and dried. Proper precautions and measured shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.
Colour & size shall be of the ceramic tiles should be provided as per Engineer – In Charge.

2.0 **Mode of measurement:-**

2.1 The rate includes the cost of all material and labour involved in all operations described above. The flooring shall be measured on Sq. mt. basis. Rates also include rubbing , sizing and cleaning of tiles etc. complete.

2.2 The rate shall be for unit of one Sq meter.

Item No. 43

Providing and Laying as per pattern 247x122 Anti Skid swimming pool tiles with 3mm groove having low water epsortion laid over 12 mm bed of cement mortar 1:3 and joints to be filled with pigments of shade and colours including related material, labour and machinery complete.make-as approved by consultant

1.0 Material :

Water shall conform pt M -1 . cement mortar shall conform to M -11 . ISO approved ceramic tiles. And as per company specification.

2.0 Workmanship:

2.1 Bedding the sub grade shall be cleaned, wetted and mopped . The bedding shall then be laid evenly over surface temped and corrected to desired and followed to harden enough to offer a rigid cushion to tiles and to enable the mason to place wooden planks across and squat on it.

2.1.3 The ceramic tiles shall be laid on cement mortar bedding of 20 mm thick C.M 1:3 . The mortar shall have sufficient plasticity for laying and there shall be no lumps that would interfere with the evenness not less than 10 mm at any place and average 12 mm thickness . The proportion of the cement mortar shall be as specified in the item.

2.2 Fixing Tiles:

2.2.1 The tiles before laying shall be soaked in water for at least two hours. Near grey cement grout at 33 kg / cement sqmt of honey like consistency shall be spread over mortar bedding as directed. The edges of the tiles shall be 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 thin adjoining tiles. The tiles 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.

2.2.3 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 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 or trowel to a depth of 5mm. and loose material removed. White cement shall be used for pointing the joints (If required pigment shall be mixed with white cement , to match the shade of tiles) . After fixing the tiles finally in an even plane tiles flooring shall be kept wet and allowed to nature undisturbed for 7 days.

3.0 Cleaning:

3.1 The surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, it shall be carefully washed , cleared by dilute acid and dried. Proper precautions and measured shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.
Colour & size shall be of the ceramic tiles should be provided as per Engineer – In Charge.

4.0 **Mode of measurement:-**

4.1 The rate includes the cost of all material and labour involved in all operations described above. The flooring shall be measured on Sq. mt. basis. Rates also include rubbing , sizing and cleaning of tiles etc. complete.

4.2 The rate shall be for unit of one Sq meter.

Item No. 44

Fabrication,Supply and Installation of Stainless Steel (Grade 304) railing using hand rail pipe section 2.5" and baluster as round/square pipe section 2" both these pipe wall thickness not less then 16 gauge; connected with SS square pipe 2" intermidiate as per detail drawing of architeecture and 8mm thick toughned glass fixed in between ss vertical members by the SS fixers. SS base plate of 100 x 8mm. The railing system shall be floor mounted with anchor faster and base plate of 4" having 8 mm thk. Completed as per detail drawing or as directed by

the Architect / Engineering in charge with necessary fixtures fittings, brush finished, proper buffing & cleaning the welding marks etc. Shop drawing shall be submitted for approval.

Structural Steel:
1.1. All structural steel shall conform to I.S. 226-1965. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall have a smooth finish. The material shall be free from loose mile scale, rust pits or other defects affecting the strength and durability. Rivet bars, if any, shall conform to I.S. 1148-1973.
1.2. 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.

Workmanship:

2.1. The S. S. Grill shall be prepared as per the drawings or as directed for fixing to designed locations etc.
2.2. The grill shall be fabricated as per the sections shown in to the designs and patterns shown in the drawings and the weight shall be as directed and the joints shall be riveted or welded as shown in the plan or as directed. The grill so formed shall be fixed for stairs & for windows etc. as directed and as per specifications and erected in position. The grill shall be fixed with number of bolts and nuts of screws viz. bolt nut/screw per 30 cm. Of the length of outer strip subject to a minimum of 2 nos. on each side of the frame or as indicated in the drawings or as directed.
2.3. The bolts and nuts or screws shall be counter sunk and shall be fixed with the top of their heads flush with the face of frame strips.

Mode of measurement and payment:

3.1. No payment shall be made for weight of screws, bolts, nuts etc. Only weight of grill shall be paid.
3.2. The rate shall be for unit of one Rmt.

Item No. 46

Providing and fixing rolling shutters of approved make made of 80 mm wide M.S. laths inter locked to gether their entire length and jointed together at the end locks mounted on specially designed pipe shaft with bracket plates,guide channels and outside locking with push-pull operation excluding the cost of Hood cover and spring etc complete.

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

1.2. Guide channels shall be of mild steel deep channel section and of rolled pressed or built up (fabricated) joint less construction The thickness of sheet used shall not be less than 3 15 mm.

1.3. Hood covers shall be made of M S. Sheets not less than 0.90 mm. thick. For shutters having width

1.4 Meter and above, the thickness of M.S. sheet for the hood cover shall be not less than 1 25 mm.

1.5. The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire of strip of adequate strength to balance the shutters in all position. The spring pipe shaft etc .

shall be supported on strong M S of malleable C I. brackets. The brackets shall be fixed on or under the lintel as specified with-raw! plugs and screws bolts etc.

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

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

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

Item No. 45

Fabrication,Supply and Installation of Stainless Steel (Grade 304) hand railing using hand rail pipe section 2.5" these pipe wall thickness not less then 16 gauge; The railing system shall be wall mounted with anchor faster and wall fixer with all material Completed as per detail drawing or as directed by the Architect / Engineering in charge with necessary fixtures fittings, brush finished, proper buffing & cleaning the welding marks etc. Shop drawing shall be submitted for approval.

Structural Steel:
1.1. All structural steel shall conform to I.S. 226-1965. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall have a smooth finish. The material shall be free from loose mile scale, rust pits or other defects affecting the strength and durability. Rivet bars, if any, shall conform to I.S. 1148-1973.

1.2. 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.

Workmanship:

2.1. The S. S. Grill shall be prepared as per the drawings or as directed for fixing to designed locations etc.

2.2. The grill shall be fabricated as per the sections shown in to the designs and patterns shown in the drawings and the weight shall be as directed and the joints shall be riveted or welded as shown in the plan or as directed. The grill so formed shall be fixed for stairs & for windows etc. as directed and as per specifications and erected in position. The grill shall be fixed with number of bolts and nuts of screws viz. bolt nut/screw per 30 cm. Of the length of outer strip subject to a minimum of 2 nos. on each side of the frame or as indicated in the drawings or as directed.

2.3. The bolts and nuts or screws shall be counter sunk and shall be fixed with the top of their heads flush with the face of frame strips.

Mode of measurement and payment:

3.1. No payment shall be made for weight of screws, bolts, nuts etc. Only weight of grill shall be paid.

3.2. The rate shall be for unit of one Rmt.

Item No. 47

STRUCTURAL GLAZING SYSTEM-Designing, fabricating, testing, protection, installing and fixing in position semi (grid) unitized system of structural glazing (with open joints) for linear as well as curvilinear portions of the building for all heights and all levels, including:
(A) Structural analysis and design and preparation of shop drawings for the specified design loads conforming to IS 875 part III (the system must passed the proof test at 1.5 times design wind pressure without any failure), including functional design of the aluminum sections for fixing glazing panels of various thicknesses, aluminium cleats, sleeves and splice plates etc. gaskets, screws, toggles, nuts, bolts, clamps etc., structural and weather silicone sealants, flashings, fire stop (barrier)-cum-smoke seals, microwave cured EPDM gaskets for water tightness, pressure equalisation and drainage and protection against fire hazard including:

(B) Fabricating and supplying serrated M.S. hot dip galvanised / Aluminium alloy of 6005 T5 brackets of required sizes, sections and profiles etc. to accommodate 3 Dimentional movement for achieving perfect verticality and fixing structural glazing system rigidly to the RCC/ masonry/structural steel framework of building structure using stainless steel anchor fasteners/ bolts, nylon seperator to prevent bimetallic contacts with nuts and washers etc. of stainless steel grade 316, of the required capacity and in required numbers.
(C) Providing and filling, two part pump filled, structural silicone sealant and one part weather silicone sealant compatible with the structural silicone sealant of required bite size in a clean and controlled factory / work shop environment , including double sided spacer tape, setting blocks and backer rod, all of approved grade, brand and manufacture, as per the approved sealant design, within and all around the perimeter for holding glass.
(D) Providing and fixing in position flashings of solid aluminium sheet 1 mm thick and of sizes, shapes and profiles, as required as per the site conditions, to seal the gap between the building structure and all its interfaces with curtain glazing to make it watertight.
(E) Making provision for drainage of moisture/ water that enters the curtain glazing system to make it watertight, by incorporating principles of pressure equalization, providing suitable gutter profiles at bottom (if required), making necessary holes of required sizes and of required numbers etc. complete. This item includes cost of all inputs of designing, labour for fabricating and installation of aluminium grid, installation of glazed units, TandP, scaffolding and other incidental charges including wastages etc., enabling temporary structures and services, cranes or cradles etc. as described above and as specified. The item includes the cost of getting all the structural and functional design including shop drawings checked by a structural designer, dully approved by Engineer-in-charge. The item also includes the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field tests on the assembled working structural glazing as specified, cleaning and protection till the handing over of the building for occupation. In the end, the Contractor shall provide a water tight structural glazing
having all the performance characteristics etc. all complete as required, as per the Architectural drawings, as per item description, as specified, as per the approved shop drawings and as directed by the Engineerin- Charge.

Note:- 1. The cost of providing extruded aluminum frames, shadow boxes, extruded aluminum section capping for fixing in the grooves of the curtain glazing and vermin proof stainless steel wire mesh shall be paid for separately under relevant items under this subhead. However, for the purpose of payment, only the actual area of structural glazing (including width of grooves) on the external face shall be measured in sqm. up to two decimal places.

Note:-2. The following performance test are to be conducted on structural glazing system if area of structural glazing exceeds 2500 Sqm from the certified laboratories accreditated by NABL (National Accreditation Board for Testing and Calibration Laboratories), Department of Science & Technologies, India. Cost of testing is payable separately. The NIT approving authority will decide the necessity of testing on the basis of cost of the work, cost of the test and importance of the work. Performance Testing of Structural glazing system Tests to be conducted in the NBL Certified laboratories.

1. Performance Laboratory Test for Air Leakage Test (-50pa to – 300pa) & (+50pa to +300pa) as per ASTM E-283-04 testing method for a range of testing limit 1 to 200 mVhr"
2. Static Water Penetration Test. (50pa to 1500pa) as per ASTME331-09 testing method for a range up to 2000 ml."
3. Dynamic Water Penetration (50pa to 1500pa) as per AAMA 501.01-05 testing method for a range upto 2000 ml"
4. Structural Performance Deflection and deformation by static air pressure test (1.5 times desing wind pressure without any failure) as per ASTME-330-10 testing method for a range upto 50 mm"
5. Seismic Movement Test (upto 30 mm) as per AAMA 501.4-09 testing method for Qualitative test"
Tests to be conducted on site
6. Onsite Test for Water Leakage for a pressure range50 kpa to240 kpa (35psi)upto2000ml"

The structure glazing glass system installation as per company specification or supplier guidelines.

Mode of Measurement:
The rate shall be for a unit of one square meter.

Item No. 48

Providing and supplying Spandrel Glass Panels comprising of 6 mm thick heat strengthened monolithic float glass of approved colour and shade with reflective soft coating on surface # 2 of approved colour and shade so as to match the colour and shade of the IGUs in the vision panels etc. , all complete for the required performances as specified, as per the Architectural drawings, as per the approved shop drawings, as specified, and as directed by the Engineer- in- Charge. For payment, only the actual area of glass on face # 1 of the glass panels (but excluding the area of grooves and weather silicone sealant) provided and fixed in position, shall be measured in sqm.(Payment for fixing of Spandrel Glass Panels in the curtain glazing is included in cost of relevent Item). (i) Coloured tinted float glass 6mm thick substrate with reflective soft coating on face # 2, having properties as visible Light transmittance (VLT) of 25 to 35 %, Light reflection internal 10 to 15%, light reflection external 10 to 20 %, shading coefficient (0.25- 0.28) and U value of 3.0 to 3.3 W/m2 degree K etc.
The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement.

Material:
Spandrel Glass Panels comprising of 6 mm thick heat strengthened monolithic float glass of approved colour and shade with reflective soft coating on surface # 2 of approved colour and shade so as to match the colour and shade of the IGUs in the vision panels etc. , all complete for the required performances as specified, as per the Architectural drawings, as per the approved shop drawings, as specified, and as directed by the Engineer- in- Charge. For payment, only the actual area of glass on face # 1 of the glass panels (but excluding the area of grooves and weather silicone sealant) provided and fixed in position, shall be measured in sqm.(Payment for fixing of Spandrel Glass Panels in the curtain glazing is included in cost of relevent Item). (i) Coloured tinted float glass 6mm thick substrate with reflective soft coating on face # 2, having properties as visible Light transmittance (VLT) of 25 to 35 %, Light reflection internal 10 to 15%, light reflection external 10 to 20 %, shading coefficient (0.25- 0.28) and U value of 3.0 to 3.3 W/m2 degree K etc.
The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement.

Mode of measurement and payment:

3.1. No payment shall be made for weight of screws, bolts, nuts etc. Only weight of grill shall be paid.

3.2. The rate shall be for unit of one Smt.

Item No. 49

SPIDER GLAZING SYSTEM: Design supply & installation of suspended Spider Glazing system designed to withstand the wind pressure as pr IS 875 (Part-III). The Suspended System held with Spider Fittings of SS-316 Grade Steel of approved manufacturer with glass panel having 12 mm thick clear toughened glass held together with SS- 316 Grade Stainless steel Spider & bolt assembly with laminated glass fins 21 mm thick. The Glass fins and glass panel assembly shall be connected to Slab/beams by means of SS- 316 Grade stainless steel brackets & Anchor bolts and at the bottom using SS channel of 50x25x2mm using fastener & anchor bolts, non staining weather sealants of approved make, Teflon/ nylon bushes and separators to prevent bi-metallic contacts, all complete to perform as per specification and approved drawings. The complete system to be designed to accommodate thermal expansion & seismic movements etc. The joints between glass panels (6 to 8 mm) and gaps at the perimeter & in U channel of the assembly to be filled with non staining weather sealant, so as to make the entire system fully water proof & dust proof.The rate shall include all design,
Engineering and shop drawing including approval from structural designer, labour,T&P, scaffolding , other incidental charges including wastage, enabling temporary services all fitting fixers nut bolts, washer, Buffer plates, fastener, anchors, SS channel laminated glass etc. all complete.For the purpose of payment, actual elevation area of Glazing including thickness of joints and the

The specifications for glass panes and their fixing shall be the same as per IS 14900. The fillet shall either be fixed flush or projected uniformly to match with the existing work by means of nails (brads). The new fillet provided shall be painted or finished otherwise to match with the existing finish of the joinery work. The glass panes shall be cleaned with methylated spirit of all sorts of splashing and droppings of wash and paints. All rubbish and unserviceable materials shall be disposed off in the dumping ground promptly as per the direction of Engineer-in-Charge.
The spider glazing system installation as per company specification or supplier guidelines.

Mode of Measurement:
The rate shall be for a unit of one square meter.

Item No. 50

Restroom Cubical: providing and installing ZMS SS Series Restroom Cubicles with all necessary tools hardware, labour, as per the company specs.
Providing & Fixing BESCO Cubicle partition system for toilet by using following Materials 12mm thick compact laminate with core of phenol resin treat papers with black color top layer treated with special melamine resin. Adjustable legs with bottom cap of SS 316, door lock with, gravity hinges with cover – combination of mild steel and Nylon PA6
And used following Accessories
Accessories Include:
1. AlumuniumTop Rail (Stainless Steel Grade 304 with Satin Finish)
2. SS Coat Hook with Door Stopper Option (Stainless Steel Grade 304 with Satin Finish)
3. SS Gravity Hinges (Stainless Steel Grade 304 with Satin Finish)
4. SS Latch cum Occupancy Indicator (Stainless Steel Grade 304 with Satin Finish)
5. SS "U" Channel (Stainless Steel Grade 304 with Satin Finish)
6. SS "F" Channel (Stainless Steel Grade 304 with Satin Finish)
7. SS Palm Design Adjustable Foot (Stainless Steel Grade 304 with Satin Finish)
8. SS Screws & Inserts (Stainless Steel Grade 304 with Satin Finish)
9. Rubber Lining for Door Stopper
Brand and Make : as approved by consultant.

1.0 Material & Workmanship

1.1 The relevant specifications of the above decrypted item shall be followed as per the specifications given in manual of ZMS Series of Marino Brand.

2.0 Mode of measurements and payment:

2.1 The rate shall be for a single unit.

Item No. 48 to 51
Providing & fixing concealed centre point to wall ceiling & floor CPVC SDR-13.5 PIPE having National Sanitation Foundation (NSF) seal for potable water of 15 mm dia nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc complete.15.00 mm inside dia .15 mm dia, 25mm dia, 32mm dia, 50mm dia, 75mm dia, 100mm dia. Cold water pipe.

1.0. Materials

1.1. The C-PVC pipe SDR-13.5 , working pressure. The Pipes, specials and fittings required shall be of best quality (prince, Finolex or equivalent).

2.0. Workmanship

2.1. The C-PVC pipes of specified diameter shall be fixed as directed. Due to thermal expansion of C-PVC pipes, due allowance shall be made particularly in over ground pipe lines for any change in length

of pipe line which may occur during installation or when pipe line which may occur during installation or

when pipe line is in service.

2.2. Above ground installation of C-PVC pipe should be under taken after preparations are

observed for their protection against direct sun rays and mechanical damage.

2.3. The C-PVC pipe lines should not be kept exposed above ground when it passes through public

places, railway lines, road side and foot paths.

2.4. C-PVC pipes shall be supported at the following intervals:

-20 mm. dia 500 mm. -25 mm. dia 750.mm. -32 mm. dia.900 mm.

2.5. Closer support spacing shall be provided if recommended by the manufacture.

2.6. The guide lines indicated by the manufacturer regarding handling, transportation, storing, laying

and jointing pf pipes shall be kept in view during execution.

2.7. C-PVC pipes shall be fixed on wall with wooden plugs and suitable plastic clamps.

2.8. Jointing the pipes :

2.8.1. 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 C-PVC. care must be taken to avoid applying excessive cement to the inside of pipe sockets as any surplus

cement cannot be wiped of after jointing. Empty solvent cement tins, brushes, rags, or paper impregnated

with cement should not be buried in the trenches. They should be gathered not left scattered about, asthey

can prove to be a hazard to animals, which may chew them.

2.8.2. If any manufacturer recommends its own methods of jointing the same shall be adopted after

necessary approval from the Engineer-in-charge.

2.9. Laying pipes in Trenches :

2.9.1. The pipes shall be laid over uniform relatively soft fine trained soil found to be free of presence of

hard object such as large flints, rocky projections, large tree roots etc. The width of the trenches shall be

minimum width required for working.

2.9.2. The pipes laid underground shall not be less than one meter from the ground level. The 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.

3.0. Mode of measurements & payment

3.1. The relevant specifications of item 23.2. (A) shall be followed except that the C-PVC pipes of

specified dia. shall be paid under this item.

3.2. The unit rate shall be for a unit of One running meter.

Item No. 52 to 60

Providing & fixing concealed centre point to wall ceiling & floor CPVC SDR-13.5 PIPE having National Sanitation Foundation (NSF) seal for potable water of 15 mm dia nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc complete.15.00 mm inside dia .15 mm dia, 25mm dia, 32mm dia, 50mm dia, 75mm dia, 100mm dia. Cold water pipe.

1.0. Materials

1.1. The C-PVC pipe SDR-13.5 , working pressure. The Pipes, specials and fittings required shall be of best quality (prince, Finolex or equivalent).

2.0. Workmanship

2.1. The C-PVC pipes of specified diameter shall be fixed as directed. Due to thermal expansion of C-PVC pipes, due allowance shall be made particularly in over ground pipe lines for any change in length

of pipe line which may occur during installation or when pipe line which may occur during installation or

when pipe line is in service.

2.2. Above ground installation of C-PVC pipe should be under taken after preparations are

observed for their protection against direct sun rays and mechanical damage.

2.3. The C-PVC pipe lines should not be kept exposed above ground when it passes through public

places, railway lines, road side and foot paths.

2.4. C-PVC pipes shall be supported at the following intervals:

-20 mm. dia 500 mm. -25 mm. dia 750.mm. -32 mm. dia.900 mm.

2.5. Closer support spacing shall be provided if recommended by the manufacture.

2.6. The guide lines indicated by the manufacturer regarding handling, transportation, storing, laying

and jointing pf pipes shall be kept in view during execution.

2.7. C-PVC pipes shall be fixed on wall with wooden plugs and suitable plastic clamps.

2.8. Jointing the pipes :

2.8.1. 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 C-PVC. care must be taken to avoid applying excessive cement to the inside of pipe sockets as any surplus

cement cannot be wiped of after jointing. Empty solvent cement tins, brushes, rags, or paper impregnated

with cement should not be buried in the trenches. They should be gathered not left scattered about, asthey

can prove to be a hazard to animals, which may chew them.

2.8.2. If any manufacturer recommends its own methods of jointing the same shall be adopted after

necessary approval from the Engineer-in-charge.

2.9. Laying pipes in Trenches :

2.9.1. The pipes shall be laid over uniform relatively soft fine trained soil found to be free of presence of

hard object such as large flints, rocky projections, large tree roots etc. The width of the trenches shall be

minimum width required for working.

2.9.2. The pipes laid underground shall not be less than one meter from the ground level. The 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.

3.0. Mode of measurements & payment

3.1. The relevant specifications of item 23.2. (A) shall be followed except that the C-PVC pipes of

specified dia. shall be paid under this item.

3.2. The unit rate shall be for a unit of One running meter.

Item No 61
Providing and fixing PVC SWR nahni trap IS 14735 FOR DRAIN-75 mm dia meter with jalli of the following nominal diameter of self cleaning design with C.I. screwed down of hinged grating incl. cost of cutting and making good the walls & floors

.1. Nahni trap shall be of cast iron 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 .form craze, chips and other flaws or any other kind of defects which affect serviceability The size of nahni trap shall be specified and shall be of self cleaning design.

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

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

Item No 62 & 63 :
Providing and fixing to wall,ceiling and floor 6 kg/sq.cm working pressure PVC RAIN WATER pipe with 'O' ring 300 mm dia Rate inclusive of all fittings like single or double "Y" with door, reducer, coupler single T with door bend, pipe clip on wooden patti etc.complete.300 mm dia &

100mm dia

1.0. Materials

1.1. The low density polythene pipe of specified diameter with 6Kg/Sq. Cm, working pressure shall conform to I.S. 3076-1968. The specials and fittings required shall be of best quality.

2.0. Workmanship

2.1. The P.V.C. pipes of specified diameter shall be fixed as directed. Due to thermal expansion of rigid '
P.V.D. pipes, due allowance shall be made particularly in over ground pipe lines for any change in length
(163)
of pipe line which may occur during installation or when pipe line which may occur during installation or
when pipe line is in service.

2.2. Above ground installation of rigid P.V.C. pipe should be under taken after preparations are observed for their protection against direct sun rays and mechanical damage.

2.3. The rigid P.V.C. pipe lines should not be kept exposed above ground when it passes through public
places, railway lines, road side and foot paths.

2.4. P.V.C. pipes shall be supported at the following intervals :
-20 mm. dia 500 mm. -25 mm. dia 750.mm. -32 mm. dia.900 mm.

2.5. Closer support spacing shall be provided if recommended by the manufacture.

2.6. The guide lines indicated by the manufacturer regarding handling, transportation, storing, laying and jointing pf pipes shall be kept in view during execution.

2.7. P.V.C. pipes shall be fixed on wall with wooden plugs and suitable plastic clamps.

2.8. Jointing the pipes :

2.8.1. 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 P
V.C. care must be taken to avoid applying excessive cement to the inside of pipe sockets as any surplus
cement cannot be wiped of after jointing. Empty solvent cement tins, brushes, rags, or paper impregnated
with cement should not be buried in the trenches. They should be gathered not left scattered about, asthey
can prove to be a hazard to animals, which may chew them.

2.8.2. If any manufacturer recommends its own methods of jointing the same shall be adopted after necessary approval from the Engineer-in-charge.

2.9. Laying pipes in Trenches :

2.9.1. The pipes shall be laid over uniform relatively soft fine trained soil found to be free of presence of
hard object such as large flints, rocky projections, large tree roots etc. The width of the trenches shall be
minimum width required for working.

2.9.2. The pipes laid underground shall not be less than one meter from the ground level. The 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.

3.0. Mode of measurements & payment

3.1. The relevant specifications of item 23.2. (A) shall be followed except that the P.V.C. pipes of specified dia. shall be paid under this item.

3.2. The unit rate shall be for a unit of One running meter.

Item No 64 to 65:
Providing and fixing to wall,ceiling and floor U.PVC/SWR soil waste pipe with 'O' ring 75mm and 110mm dia and 75mm of ISI 13592/92. Rate inclusive of all fittings like single or double "Y" with door, reducer, coupler single T with door bend, pipe clip on wooden patti etc.complete and making good the wall,ceiling and floor.

1.0 Material

1.1. The U PVC/SWR shall be of 80 schedule(Finolex, prince or equivalent).

2.0. Workmanship

2.1. The fixing of U.PVC/SWR soil, waste and ventilating pipe shall be carried shall be carried out as under.
The pipes shall be fixed to wall with M.S. clamps The pipes will earns shall be secured with 40 mm before steel or iron barrel distance pieces or
boils and stout galvanised iron nails 10 cms long into hand wool plug fixed in walls. Access doors to fittings shall be provided with 3 mm. rubber insertion packing and secured without screws to made air and water tight. The joints shall be filled with appropriate solvent of ISI mark.

2.2. All soil pipes shall be earned up above the roof and shall have a wire ball on guarded or a cowl.

2.3. The ventilating pipe or shaft shall be carried out to a height of at least one meter above the outer covering of the roof of the building or in the case of windows in a gable wall or a dormer windows, it shall t
carried up to a ridge of the roof or at least tow meters above the top of the windows. In case of flat roof to
which access for use is provided, it shall be carried out up to a height of at least on meter above the parapet or two meters measured vertically from the top of any windows or opening which any exist up to a horizontal distance of five meters from the vent pipe into such building and in no case shall be carried out to a height less then three meters.

2.4. Where ventilating pipes are carried in pipe shafts, the shaft shall be of a minimum size of one meter. If !he shells are also used to give fight and air to rooms, the ventilating pipes must be carried

out to
a horizontal distance at root level not loss than five meter from the site of the shaft.

2.5. The U PVC/SWR pipes above parapet shall be fixed with M.S. clamps and stays. The clamps shall be made from 1.5 mm. thick MS flat or 3 mm. width band to the required shape and size to fit tightly
one the sockets when tightened with screw bolts. It shall be formed of two semi circular pieces with flanged ends on both sides, with holes to fit in the screw bolts and nuts 40 mm. dia. M.S. Bars, One end of the stay shall be bent to form a hook to be fixed with clamps by means of bolts and the other end shall be bent for embedding in wall.

2.6. The connection between the main pipe and branch pipes shall be made by using branches and bends with access doors for cleaning

2.7. The waste from lavatories, kitchens basins, sinks, baths and other floor traps shall be separately connected to respective stacks of upper floor. The waste stack of lavatories shall be connected directly to
main hole while the waste stack of other shall be separately discharged over gulley trap.

3.0. Mode of measurements and payment

3.1. The length of pipe shall be measured including all fittings along its length in running meters correct to a centimeter. No allowance shall be made for the portion of pipe length entered in the sockets of
the adjacent pipe of fittings.

3.2. The rate includes all labour, and materials, tools and plant etc. required for satisfactory completion of this item.

3.3. The rate shall be for a unit of One running meter.

Item No 66:

Providing and fixing square-mouth S.W. gully trap class SP-1 complete with C.I. grating brick masonry chamber with water tight C.I. cover with frame of 300 x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design :

1.0. Materials : (t) Water shall conform to M-1. (2) Cement mortar of proportion 1:5 shall conform to M-

1.1 (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 (I cement : 5 sand : 10 graded brick bats aggregate 40 mm nominal size) foundation. 650 square and 100 mm. thick The depth 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. Brick masonry chamber : After fixing and testing gulley and branch drain, a brick masonry 300 x 330 mm. inside with bricks in CM 1:5 (1 cement : 5 sand) shall be built with a 100 mm. brick work round OH; gulley trap from the top of bed concrete up to ground level. The space between the chamber walls and the 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.

Item No 67:

Construction brick masonary chamber for underground C.I.inspection chamber and bends with brick having crushing strength not less than 35 kg/cm2 in C:M 1:5 C.I. cover with frame (light duty) 445x610 mm internal dimensions total wight of cover with frame to be not less than 38 kg and weight of frame 15kg)R.C.C. top slab with 1:2:4 mix (1 cement; 2 coarse sand; 4 graded stone aggregate 20mm size) foundation concrete (1:5:10) at 15 cm.c/c and providing and fixing precast R.C.C. cover size 0.60 x 0.45 x 0.07 m with 40 x 40 x 5mm angle frame and foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar (1:3) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete . (A) Inside dimension 455mm x 610mm and 450mm deep for Multi purpose pipe line.

1.0. Materials :

Water shall conform to M-1. Cement shall conform to M-3. Sand shall confirm to M-6. Brick shall conform to M-15. Stone aggregate 40 mm. nominal size shall conform to M-12. coal tar shall conform to relevant M- 5.

2.0. Workmanship

2.1. The chamber shall be of size 455 mm. x 610 mm. internal clear dimensions between the masonry wall faces. The height of 500 mm. shall be measured from the top of the bed concrete to the top of the RCC frame. The size of grating indicate the clear internal dimensions of the RCC frame 40x40x5mm angle .

2.2. The excavation shall be done to true dimensions and levels.

2.3. The foundation concrete shall consist of 150 Cms x 100 Cms x 15 cms thick C.C. 1:5:10(1 cement : 5 sand : 10 graded stone aggregate 40 mm. nominal size).

2.4. The wall of the chamber shall be constructed in brick work C.M. 1:5 and 23 Cms. thick as per relevant specifications of item 6.12(8).

2.5. The walls and the bed concrete of chamber shall be plastered inside with 12 mm. thick cement plaster 1 : 3 (1 cement : 3 coarse sand) finished smooth.

2.6. The gully grating cover shall be hinged to frame to facilitate its opening for cleaning and repairs. The frames of the gully grating g shall be fixed on the top of masonry wall of the chamber in 15 cms. thick C.C. 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) laid over the full thickness of walls..

2.7. The chamber shall have connection pipe, the length of which in meter between the road gully chamber and the manhole of the drain shall not be less than 1/40 times the nominal diameter of the pipe in MM. i.e. for 150 mm* connection pipe the length shall not be cement plaster on the bed concrete.

2.8. Painting : After the completion of the work of exposed surface of the grating of the frame shall be painted with a thick coat of coal tar.

3.0. Mode of measurements and payment

3.1. The cost of connection pipes is not included in the item and shall be paid separately. However, fixing the connection pipes in the walls of gully chamber is included in the rate for gully chambers and nothing extra shall be paid for this separately.

3.2. The rate shall be for a unit of One number

Item No 68:

Extra over above item for additional depth 0.1 mt. or part thereof beyond 450mm depth for brick masonary chamber for 455mm x 610mm size.

1.0. Materials : Water shall conform to M-1. Cement shrill conform to M-3. Coarse 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-14 M.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 as under:

2.2. The excavation shall be done true to dimensions and level shown in one the plans or as directed.

2.3. Bed concrete shall be 15. Cms, thick C.C. 1:5:10 (1 cement : 5 coarse sand : 10 graded brick bat aggregates. The projection of bed concrete beyond the masonry waifs shall be 7.5 cms.

2.4. The chamber shall be of size 500 mm. x 450 mm. internal clear dimensions between the masonry wall faces. The height of 500 mm. shall be measured from the top of the bed concrete to the top of the C.I. frame. The size of grating indicate the clear internal dimensions of the C.I. frame of the grating.The excavation shall be done to true dimensions and levels.The foundation concrete shall consist of 150 Cms x 100 Cms x 15 cms thick C.C. 1:5:10(1 cement: 5 sand : 10 graded stone aggregate 40 mm. nominal size).

The wall of the chamber shall be constructed in brick work C.M. 1:5 and 23 Cms. thick as per

relevant specifications of item 6.12(8). The walls and the bed concrete of chamber shall be plastered inside with 12 mm. thick cement plaster 1 : 3 (1 cement : 3 coarse sand) finished smooth. The gully grating cover shall be hinged to frame to facilitate its opening for cleaning and repairs.The frames of the gully grating g shall be fixed on the top of masonry wall of the chamber in 15 cms. thick C.C. 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) laid over the full thickness of walls..

The chamber shall have connection pipe, the length of which in meter between the road gully chamber and the manhole of the drain shall not be less than 1/40 times the nominal diameter of the pipe in MM. i.e. for 150 mm* connection pipe the length shall not be cement plaster on the bed concrete.
Painting **:** After the completion of the work of exposed surface of the grating of the frame shall be painted with a thick coat of coal tar.

2.5. The manholes of different types and sizes as specified shall be constructed in sewer line at such places and to such levels and dimension as shown in drawings of as directed.

The manholes shall be built on a bed of cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 brick bats) (40) to 50 mm. nominal size) to the thickness of the bed concrete shall be 15 cms. for manhole up to 1. M. depth and 20 cms. for manholes over meter and up to over meter and up to 2 meters, depth and 30 cms. for manholes o greater depth. Projection of bed concrete beyond the masonry wall shall be 15 cms.

3.0. Mode of measurements & payment

3.1 The earth work in excavation, providing and laying C.I. inspection chamber and bends shall be measured and paid for separately. except that the extra shall be paid for, providing additional depth of 0.1 M. or M.

3.2. The rate shall be for a unit of One number.

Item No 69

Extra over above item for additional depth 0.1 mt. or part thereof beyond 450mm depth for brick masonary chamber for 900mm x 1200mm size.

1.0. Materials : Water shall conform to M-1. Cement shrill conform to M-3. Coarse 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-14 M.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 as under:

2.2. The excavation shall be done true to dimensions and level shown in one the plans or as directed.

2.3. Bed concrete shall be 15. Cms, thick C.C. 1:5:10 (1 cement : 5 coarse sand : 10 graded brick bat aggregates. The projection of bed concrete beyond the masonry waifs shall be 7.5 cms.

2.4. The chamber shall be of size 500 mm. x 450 mm. internal clear dimensions between the masonry wall faces. The height of 500 mm. shall be measured from the top of the bed concrete to the top of the C.I. frame. The size of grating indicate the clear internal dimensions of the C.I. frame of the grating.The excavation shall be done to true dimensions and

levels.The foundation concrete shall consist of 150 Cms x 100 Cms x 15 cms thick C.C. 1:5:10(1 cement: 5 sand : 10 graded stone aggregate 40 mm. nominal size).

The wall of the chamber shall be constructed in brick work C.M. 1:5 and 23 Cms. thick as per relevant specifications of item 6.12(8). The walls and the bed concrete of chamber shall be plastered inside with 12 mm. thick cement plaster 1 : 3 (1 cement : 3 coarse sand) finished smooth. The gully grating cover shall be hinged to frame to facilitate its opening for cleaning and repairs.The frames of the gully grating g shall be fixed on the top of masonry wall of the chamber in 15 cms. thick C.C. 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) laid over the full thickness of walls..

The chamber shall have connection pipe, the length of which in meter between the road gully chamber and the manhole of the drain shall not be less than 1/40 times the nominal diameter of the pipe in MM. i.e. for 150 mm* connection pipe the length shall not be cement plaster on the bed concrete.

Painting **:** After the completion of the work of exposed surface of the grating of the frame shall be painted with a thick coat of coal tar.

2.5. The manholes of different types and sizes as specified shall be constructed in sewer line at such places and to such levels and dimension as shown in drawings of as directed. The manholes shall be built on a bed of cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 brick bats) (40) to 50 mm. nominal size) to the thickness of the bed concrete shall be 15 cms. for manhole up to 1. M. depth and 20 cms. for manholes over meter and up to over meter and up to 2 meters, depth and 30 cms. for manholes o greater depth. Projection of bed concrete beyond the masonry wall shall be 15 cms.

3.0. Mode of measurements & payment

3.1 The earth work in excavation, providing and laying C.I. inspection chamber and bends shall be measured and paid for separately. except that the extra shall be paid for, providing additional depth of 0.1 M. or M.

3.2. The rate shall be for a unit of One number.

Item No. 70
Providing, laying (to level or slopes)and jointing with stiff mixture of cement mortar in the proportions of 1:1 (1 cement : 1 sand) ,salt glazed stoneware pipes of 150 mm dia including testing of pipes and joints complete..(B) 150mm dia

1.0. Materials

(I) Water shall conform to M-1
(2) Cement mortar of proportion 1:1 shall conform to M-11.
(3) 100mm. dia. glazed stoneware pipe shall conform to M-71.

2.0. Workmanship

2.1. The trenches for stoneware pipe drains shall be carried out as per relevant specifications of item No. 23.4 (A) except that the work is for stoneware pipes of 100 mm. dia.

2.2. Laying:

2.2.1. The pipes shall be laid accurately and perfectly true to line, levels and gradients, Great care shall

be taken to prevent sand etc. from entering the pipes. The pipes between two manholes shall be laid truly
in a straight line without vertical or horizontal undulation. All junctions and changes in direction and diameter shall be made inside manholes 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 its 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 the spigot to each pipe and the spigot 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 gaskin caulked home so as to fill not more than 1/4th of the total depth or (13 mm. in depth) of the socket.

2.3.2. The remainder of the sockets shall be filled with stiff mixture of cement mortar in proportion of one part of cement 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 extraneous materials shall be removed form the inside of the joints with a suitable scraper 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 for 10 days.

2.4. Testing of Joints:

2.4.1. If nay 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. A slight 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 take socket, 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 total 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.

Item No. 71
Provinding and fixing in position SWR PVC COWEL VENT to pipe 110 mm dia directed.

1.0. Materials

1.1. The specified dia. SWR PVC COWEL VENT pipe shall conform company specs..

2.0. Workmanship

2.1. The fixing of SWR PVC COWEL VENT pipe shall be carried out as per relevant specifications

2.2. All soil pipes shall be earned up above the roof and shall have a wire ball on guarded or a cowl.

2.3. The ventilating pipe or shaft shall be carried out to a height of at least one meter above the outer covering of the roof of the building or in the case of windows in a gable wall or a dormer windows, it shall tcarried up to a ridge of the roof or at least tow meters above the top of the windows. In case of flat roof to which access for use is provided, it shall be carried out up to a height of at least on meter above the parapet or two meters measured vertically from the top of any windows or opening which any exist up to a horizontal distance of five meters from the vent pipe into such building and in no case shall be carried out to a height less then three meters.

2.4. Where ventilating pipes are carried in pipe shafts, the shaft shall be of a minimum size of one meter. If !he shells are also used to give fight and air to rooms, the ventilating pipes must be carried out to a horizontal distance at root level not loss than five meter from the site of the shaft.

2.6. The connection between the main pipe and branch pipes shall be made by using branches and bends with access doors for cleaning

2.7. The waste from lavatories, kitchens basins, sinks, baths and other floor traps shall be separately connected to respective stacks of upper floor. The waste stack of lavatories shall be connected directly to main hole while the waste stack of other shall be separately discharged over gulley trap.

3.0. Mode of measurements and payment

3.1. The length of pipe shall be measured including all fittings along its length in running meters correct to a centimeter. No allowance shall be made for the portion of pipe length entered in the sockets of the adjacent pipe of fittings.

3.2. The rate includes all labour, and materials, tools and plant etc. required for satisfactory completion of this item.

3.3. The rate shall be for a unit of One running meter.

Item No. 72
Provinding and fixing in position SWR PVC COWEL VENT to pipe 75 mm dia directed.

1.0. Materials

1.1. The specified dia. SWR PVC COWEL VENT pipe shall conform company specs..

2.0. Workmanship

2.1. The fixing of SWR PVC COWEL VENT pipe shall be carried out as per relevant specifications

2.2. All soil pipes shall be earned up above the roof and shall have a wire ball on guarded or a cowl.

2.3. The ventilating pipe or shaft shall be carried out to a height of at least one meter above the outer covering of the roof of the building or in the case of windows in a gable wall or a dormer windows, it shall tcarried up to a ridge of the roof or at least tow meters above the top of the windows. In case of flat roof to which access for use is provided, it shall be carried out up to a height of at least on meter above the parapet or two meters measured vertically from the top of any windows or opening which any exist up to a horizontal distance of five meters from the vent pipe into such building and in no case shall be carried out to a height less then three meters.

2.4. Where ventilating pipes are carried in pipe shafts, the shaft shall be of a minimum size of one meter. If !he shells are also used to give fight and air to rooms, the ventilating pipes must be carried out to a horizontal distance at root level not loss than five meter from the site of the shaft.

2.6. The connection between the main pipe and branch pipes shall be made by using branches and bends with access doors for cleaning

2.7. The waste from lavatories, kitchens basins, sinks, baths and other floor traps shall be separately connected to respective stacks of upper floor. The waste stack of lavatories shall be connected directly to main hole while the waste stack of other shall be separately discharged over gulley trap.

3.0. Mode of measurements and payment

3.1. The length of pipe shall be measured including all fittings along its length in running meters correct to a centimeter. No allowance shall be made for the portion of pipe length entered in the sockets of the adjacent pipe of fittings.

3.2. The rate includes all labour, and materials, tools and plant etc. required for satisfactory completion of this item.

3.3. The rate shall be for a unit of One running meter.

Item No 73
Providing and fixing Wash Basin single hole for piller tap with C.I or M.S. bracket painted with including cutting holes and making good the same but including fitting (A) Vitreous chaina :(II) Flat back wash basin 550mm x 400mm size in white colour .

1.0. Materials

1.1. The white glazed earthenware wash basin shall be 550 mm. x 400mm. of 1st quality and make as approved by the Engineer-in-charge. The wash basin shall-conform to M-59.

2.0. Workmanship

2.1. The washbasin shall be fixed on the wall as and where directed. The wash basin shall be supported on a pair of M.S. or C.I. brackets fixed in C.M. 1:3 (1 cement : 3 sand). The bracket shall conform to I.S. : 775-1962. The wall plaster on the rear shall be cut to rest the top edge of the washbasin. After fixing the basing, plaster shall be made good and surface finished to match the existing one.

2.2. The brackets shall be painted white with ready-mixed paint.

2.3. The C.I. brass trap and union shall be connected to 32 mm. dia. waste pipe which shall be suitably bent towards the wall and which shall discharge into an open drain leading to a gully trap or direct in to gully-trap on the ground floor and shall be connected to a waste pipe through a floor trap on the upper floors. C.P. brass trap and union may not be provided where the surface drain or a floor trap is placed directly under the basin and the waste is discharged in to vertically.

2.4. The height of the front edge to the wash basin from the floor level shall be 80 cms.

2.5. The necessary inlet, outlet connections and fittings such as pillar cocks, CP dress waste trap waste pipe, stop cock, chain wish rubber plug etc. shall be fixed.

2.6. The payment of fittings shall be made separately under separate items.

3.0. Mode of measurements & payment

3.1. The rate includes cost of all labour, materials, tool3 and plant etc. required for satisfactory completion of this item as specified in workmanship.

3.2. The rate shall be for a unit of One number.

Item No 74:

Providing and fixing Oval or round shape Wash Basin with C.I or M.S. bracket painted with including cutting holes and making good the same but including fitting (A) Vitreous chaina : size and color selected by architect or as per detail.

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

1.0. Materials

1.1. The white glazed earthenware wash basin shall be 550 mm. x 400mm. of 1st quality and make as approved by the Engineer-in-charge. The wash basin shall-conform to M-59.

2.0. Workmanship

2.1. The washbasin shall be fixed on the wall as and where directed. The wash basin shall be supported on a pair of M.S. or C.I. brackets fixed in C.M. 1:3 (1 cement : 3 sand). The bracket shall conform to I.S. : 775-1962. The wall plaster on the rear shall be cut to rest the top edge of the washbasin. After fixing the basing, plaster shall be made good and surface finished to match the existing one.

2.2. The brackets shall be painted white with ready-mixed paint.

2.3. The C.I. brass trap and union shall be connected to 32 mm. dia. waste pipe which shall be suitably bent towards the wall and which shall discharge into an open drain leading to a gully trap or direct in to gully-trap on the ground floor and shall be connected to a waste pipe through a floor trap on the

upper floors. C.P. brass trap and union may not be provided where the surface drain or a floor trap is placed directly under the basin and the waste is discharged in to vertically.

2.4. The height of the front edge to the wash basin from the floor level shall be 80 cms.

2.5. The necessary inlet, outlet connections and fittings such as pillar cocks, CP dress waste trap waste pipe, stop cock, chain wish rubber plug etc. shall be fixed.

2.6. The payment of fittings shall be made separately under separate items.

3.0. Mode of measurements & payment

3.1. The rate includes cost of all labour, materials, tool3 and plant etc. required for satisfactory completion of this item as specified in workmanship.

3.2. The rate shall be for a unit of One number.

Item No 75
Providing and fixing wash down water closet EUROPEAN TYPE W/C PAN with intergral "P" or "S" trap including jointing the trap with soil pipe in cement mortar (1:1) (1 cement;1 fine sand vitereous china. Rate inclusive of providing and fixing seat cover of the same make.

1.0. Materials

Wash down water closet (European type W.C. Pan) shall conform to M-60. Cement mortar shah conform to M-11.

2.0. Workmanship

2.1. The closet shall be fixed to the floor by means of 75 mm. long 6.5 mm. diameter counter sunk bolts and nuts embedded in the floor concrete using rubber or before washers so as not to allow any lateral displacement The joint between the trap of W.C. and soil pipe shall ho made with C M. 1:1 (1 cement : 1 fine sand).

3.0. Mode of measurements and payment

3.1. The rate shall includes the cost of all materials and labour involved in all the operations described under workmanship.

3.2. The rate includes cost of all labour for fixing pans and sent and cover, inlet, connections etc. complete including testing the same. The payment of seat and cover shall be made separately.

3.3. The rate shall be for a unit of One number.

Item No 76
Providing and fixing 25mm dia Cromium plated Metropole flush cock including fixing in pipe line etc. complete

1.0. Materials :
Chromium plated brass half turn flush cock shall conform to M-67.

2.0. Workmanship The hall turn flush cock of specified diameter shall be fixed as directed. The flush cock shall be fixed in G.I. pipe line with necessary fittings. The joints shall be made leak proof by using spun yarn and white Zink. The fixing work shall be carried out as per relevant specifications of item No. 23.2(4).

3.0. Mode of measurements and payment

3.1. The rate includes cost of all materials and lobour required for satisfactory completion of this item including fittings.

3.2. The rate shall be for a unit of One number.

Item No 77
Providing and fixing 15mm dia Auto closing concealed urinal flush valve Code: PRS-073 Jaquar make ar equvivelant . Including all relaled matrrial etc. complete.

1.0. Materials :
Chromium plated brass half turn flush vlave shall conform to as per company specification.

2.0. Workmanship The hall turn flush cock of specified diameter shall be fixed as directed. The flush cock shall be fixed in G.I. pipe line with necessary fittings. The joints shall be made leak proof by using spun yarn and white Zink. The fixing work shall be carried out as per relevant specifications of item No. 23.2(4).

3.0. Mode of measurements and payment

3.1. The rate includes cost of all materials and lobour required for satisfactory completion of this item including fittings.

3.2. The rate shall be for a unit of One number.

Item No 78:
Providing and fixing 15mm dia wall mounted basin tap (auto closing) Including all related material etc. complete.

Item No 79:
Providng and fixing screw down bib tap of 15 mm dia 9a) Brass screw down bib tap polished bright with all related material etc. complete.

1.0. Materials :
15 mm. dia. brass screw down with bright polished finished shall conform to I.S. 781-1977. 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 be smeared 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.

Item No. 80
Providng and fixing C.P. brass Anglular cock of approved quality. (a) 15mm with all ralted material etc. complete.

1.0. Materials

1.1. The low level vitreous china (Enamel) flushing tank shall conform to M-65 except that the flushing
cistern shall be 12.5 liters low level type as mentioned in the item.

2.0. Workmanship

2.1. The low level cistern shall be firmly fixed on two C.I. or mild steel, brackets which shall be firmly
embedded in the wall in C.M. 1:4 (1 cement : 4 fine sand).

2.2. The height of the bottom of the cistern from the top of the pan shall be 30 cms of low level flushing
cistern shall be connected to the closet by means of 40 mm. dia, white porcelain enameled flush bend using Indian rubber adapts joints. The flush pipe shall be securely connected to the cistern outlet by means of coupling nut made of any non-corrosive materials, non-ferrous metal or galvanised steel. The
flush pipe from the cistern shall be connected to the closet by means of cement of red-lead.

3.0. Mode of measurements & payment

3.1. The rate shall include the cost of all materials fitting and labour involved in al! the operations described under workmanship including testing.

3.2. The rate shall be for a unit of One number.

Item No 81:
Providing and fixing S. S. Bottle Tap with necessary concealed fitting and cover panels. All the damages incurred while fixing shall be repaired to the satisfaction of the engineer in-charge . S. S. Bottle Tap shall be as approved by engineer in-charge .

1.0. Materials :
15 mm. dia. brass screw down with bright polished finished shall conform to I.S. 781-1977. 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 be smeared 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.

Item No. 82
Providing and fixing Pillar Tap, capstan head, screw down high pressure with screws,shanks and back nuts (I) 15 mm dia with all related material etc. complete.

1.0. Materials :
The capstan head pillar tap of specified dia. of C.R over brass shall be best quality and
shall conform to I.S. : 1975 - 1961. The pillar taps shall be tested quality.

2.0. Workmanship

2.1. The capstan head pillar tap of specified dia. shall be fixed as directed with required washers of
selected leather or rubber asbestos composition or of plastic as directed. The cock shall fixed with pipe
line white Zink end spun yarn, to make joint water tight. The work shall be carried out in best workman
like manner.

3.0. Mode of measurements and payment

3.1. The rate shall be for a unit of one number.

Item No 83:
Providing and fixing urinal of approved quality including connection with trap and with integral longitudinal flush pipe. (A) Squating plate pattern white earthenware 550mmx300mm Including all materials and labour etc. complete as per detail drawing and instruction of engineer-in charge

Materials :
The squatting plate pattern, white glazed earthenware urinal of 550mmx300mm shall conform to I.S. 771-1063. It shall be test India make.

2.0. Workmanship

2.1. The squatting plate urinal shall be fixed as directed.

2.2. The top edge of the squatting plate shall be flush with the finished floor level adjacent to it. It shall be embedded on a layer of 25 mm. thick cement mortar 1:8 (1 cement: 8 find sand) laid over a bed of brunt brickbat cement 1:5 :10(1 cement: 5 fine sand, 10 graded brick aggregate 20 mm. nominal size). There shall be 100 mm. dia. glazed earthenware or vitreous china channel as specified with stop and outlet pieces suitably fixed in floor in cement mortar 1:3 (1 cement: 3 coarse sand) and joint finished with white cement. The earthenware vitreous china shall discharge into 65 mm. C.P. brass outlet grating. The trap and fitting shall be fixed as directed.

3.0. Mode or measurements and payment

3.1. The rate includes .cost of all materials, tools and plants and labour required for satisfactory

completion of this item.

3.2. The rate shall be for a unit of One number

Item No 84:
Providing & Fixing magnifying mirror of approved make. Including providing & fixing screws, washers, cutting & making good the walls.size as per architecture detail.

1.0. Materials

1.1. The 600 mm. x 450 mm. size mirror snail be of superior glass with edge rounded offer beveled as specified. It shall be free from flaws specks, or bubbles and its thickness shall riot be less than 6 mm. 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 6 mm thick ply wood shall conform to M-37. The 6 mm. thick A.C. sheets shall conform to M-24.

2.0. Workmanship

2.1. The mirror of 600 mm. x 450 mm. size mounted on A.C. Sheet or plywood 6 mm thick with C.P.
brass clips shall be fixed as directed, by fixing wooden plugs in wall and C.P brass screws and washers.
The work shall be carried out in best workman 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 of this item. The rate shall be for a .unit of One number.

Item No 85:
Providing & fixing C.P. brass towel ring fixed to rawl plug with C.P. brass screws.

1.0. Materials

1.1. The C.P. brass towel rail shall be 600 x 20 mm. of best quality as approved by the Engineer-incharge
The brackets shall be of C.P. brass. The rail shall conform to I.S. 1068-1958.

2.0.Workmanship

2.1. The brackets of the towel rail shall be fixed by means of C.P. brass screws to wooden firmly embedded in the wall with C.M. 1:3 (1 cement : 3 coarse sand). The **towel** rail shall be fixed as and where
directed.

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour and materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

Item No 86:

Providing & fixing of Superior quality of approved type of design cp of Tissue paper holder with complete fittings.

1.0. Materials : The toilet paper holder shall be of best quality and make, chromium plating shall be of
grade 'B' type conforming to I.S. 1068-2958.

2.0. Workmanship

2.1. The toilet paper holder shall be fixed in position be means of screws and wooden plugs embedded in wall with cement 1:3 (1 cement : 3 coarse sand).

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour and material, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

Item No. 87
Providing & fixing of Superior quality of approved type of design Hand Dryer with complete fittings

1.0. Materials : The hand dryer shall be of best quality and make, chromium plating shall be of grade 'B' type conforming to I.S. 1068-2958.

2.0. Workmanship

2.1. The hand dryer shall be fixed in position be means of screws and wooden plugs embedded in wall with cement 1:3 (1 cement : 3 coarse sand).

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour and material, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

Item No. 88
Providing & fixing C.P. brass liquid soap dispenser 500ml of best quality of approved make.

1.0. Materials : The liquid soap dispenser 500mlshall be of best quality and make, chromium plating shall be of
grade 'B' type conforming to I.S. 1068-2958.

2.0. Workmanship

2.1. The liquid soap dispenser 500mlshall be fixed in position be means of screws and wooden plugs embedded
in wall with cement 1:3 (1 cement : 3 coarse sand).

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour and material, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

Item No. 89
Providing & fixing of Single Leaver thermostatic Diverter chrome finish for Concealed Fitting with Built in Non return Valve , concealed stop cock for hot and cold water supply controlling with Diverter Handle with provision for both telephone shower and overhead Rain shower complete with bath spout complete fittings. SINGLE LEVER THERMOSTATIC DIVERTER :With Single lever bath and shower mixer, automatic diverter:- bath/ shower concealed body for bath and shower & 46mm ceramic cartridge install with concealed body & water outlet elbow.

1.0. Materials : The Single leaver thermostatic diverter shall be of best quality and make, chromium plating shall be of company specified as per requirement

2.0. Workmanship

2.1. The Single leaver thermostatic diverter shall be fixed in position with 46 mm ciramic cartridge as per company specifications with all safety measures

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour and material, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number

Item No. 90
Providing & fixing towel rack of approved make including, providing & fixing C.P. brass screws, making holes in walls & making good.

1.0. Materials

1.1. The C.P. brass towel rack shall be of best quality as approved by the Engineer-in-charge The brackets shall be of C.P. brass. The rail shall conform to I.S. 1068-1958.

2.0.Workmanship

2.1. The brackets of the towel rack shall be fixed by means of C.P. brass screws to wooden firmly embedded in the wall with C.M. 1:3 (1 cement : 3 coarse sand). The towel rack shall be fixed as and where directed.

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour and materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

Item No. 91

Fixing stainless steel recessed type soap dish of approved make. Including providing & fixing screws, washers, cutting & making good the walls.

1.0. Materials

1.1. The stainless steel soap dish shall be of best quality as approved by the Engineer-incharge The brackets shall be of stainless steal.

2.0.Workmanship

2.1. The stainless steel soap dish shall be fixed by means of company specifications and engineer in charge

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour and materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

Item No. 92
Providing & fixing of Chrome Finish Hand Shower (Health Faucet), with 8mm Dia,1Rmt Long PVC Tube and Wall Hook accessories to complete the item. HYGIENE FAUCET : It consisting of Hand shower with trigger control, Wall shower holder, Shower hose Angle valve 15mm

1.0. Materials

1.1. The chrome finish hand shower shall be of best quality as approved by the Engineer-incharge The brackets shall be of chrome.

2.0.Workmanship

2.1. The chrome finish hand shower shall be fixed by means of company specifications and engineer in charge

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour and materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

Item No. 93
Providing & fixing in position best Indian make toilet recessed type paper holder with cover chrome finish complete in all respects including cutting and making good the walls etc.

1.0. Materials : The toilet paper holder shall be of best quality and make, chromium plating shall be of
grade 'B' type conforming to I.S. 1068-2958.

2.0. Workmanship

2.1. The toilet paper holder shall be fixed in position be means of screws and wooden plugs embedded

in wall with cement 1:3 (1 cement : 3 coarse sand).

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour and material, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

Item No. 94
Providing and fixing grab bar fabricated from 32mm dia seamless stainless steel tube 2mm thick in bath room with non slip gripping surface, polished wall flange at end of bars with heavy duty anchor fasteners & accessories.

1.0. Materials : The grab bar 32mm dia shall be of best quality and make, stainless steel shall be of specified standards IS 781:1977

2.0. Workmanship

2.1. The grab bar shall be fixed in position be means of screws and wooden plugs embedded in wall with cement 1:3 (1 cement : 3 coarse sand). and fabricated as per company specifications

3.0. Mode of measurements and payment

3.1. The rate includes cost of all labour and material, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

Item No. 95
Providing and fixing 6 inch dia rain shower 15mm dia pipe with 1feet to 2 feet long arm as per approval and all related material etc. complete.
1.0. Materials
1.1. 6inch dia rain shower shall confirm approved material with best quality and standards and makes as approved by engineer-in-charge. The inlet of shower rose shall be 15 mm dia. as directed.

2.0. Workmanship

2.1. The shower rail shall be fixed as directed with 15 mm. dia G.I. inlet pipe as the case may be.

3.0. Mode of measurements and payment

3.1. The rate includes all labours and materials, tools and plant etc. required for satisfactory completion of this item

3.2. The rate shall be for a one number.

Item No. 96 to 101
Supply, installation, testing & commissioning of gunmetal, male or female threaded isolation control valve (Ball Valve), confirming to IS 778, PN 1.0, with necessary specials, union, nipples etc., to complete the job.

(Internal Toilet Control Valve+ Shaft Area)
15mm dia
20mm dia.

25mm dia.
32mm dia.
40mm dia.
50mm dia.

1.0. Materials

1.1. The high level gun metal ball valve shall conform to is 778:1971 pn 1.0, except that the flushing cistern shall be
of 12.5 liters high level C.I. cistern as mentioned in the item.

2.0. Workmanship

2.1. The cistern shall be fixed on two C.I. or mild steel brackets which shall be firmly embedded in the
wall in cement mortar 1:4 (1 cement : 4 fine sand).

2.2. The height of the bottom of the cistern from the top of the pan shall be two meters.

2.3. The W.C. Pan shall be connected to the cistern by galvanized steel flush pipes of 32 mm. nominal
internal diameter. The flush pipe shall be fixed to wall by using clamps. The flush pipe from the cistern
shall be connected to the closet by means of cement of red-lead. The flush pipe shall be securely
connected to the cistern outlet by means of coupling nut made of any non-corrosive materials non-ferrous
metal or galvanized steel.

2.4. The chain and the pull union shall be fixed to the protruding level arm of the flushing cistern.

2.5. The whole installation shall be tested for leak-proof joints and satisfactory functioning.

3.0. Mode of measurements & payment

3.1. The rate shall include the cost of all materials, fittings, and lobour involved in all the operations
described under workmanship including testing.

3.2. The rate shall be for a unit of One number.

Item No. 102 to 107
Supply, installation, testing & commissioning of butterfly valve with dual plat flanze joint , isolation control valve confirming to latest IS , PN 1.0, with necessary specials, bolt and nuts , EPDM gasket all etc., to complete the job.

(External Vertical Shaft Riser Control + Ring Main Works)
25mm dia.
32mm dia.
40mm dia.
50mm dia.

75mm dia.
100mm dia.

1.0. Materials : The butterfly l check or not return full way wheel valve or specified dial, shall conform
to I.S. : 778-1964. The non-return valve shall be of tested quality.

2.0. Workmanship

2.1. The butter fly check or non return valve shall be fully cleared of all foreign matter before fixing. The fixing of shall be done by means of bolts nuts and 3 mm. rubber insertions with flags of spigot and
socketed tail pieces, drilled to the same specifications as in case of socket and spigot flanges in case of flanged pipes. The joining shall be done leak proof.

3.0. Mode of measurements and payment

3.1. The rate includes all labors, materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

Item No. 108 to 113
Supplying, fitting & fixing Non return valve (Spring type Dual plate type) as per API 594/598 , tested to 10 kg/sq.cm etc. complete.

25mm dia.
32mm dia.
40mm dia.
50mm dia.
75mm dia.
100mm dia.

1.0. Materials : The spring type check or not return full way wheel valve or specified dial, shall conform to I.S. : 778-1964. The non-return valve shall be of tested quality.

2.0. Workmanship

2.1. The check or non return valve shall be fully cleared of all foreign matter before fixing. The fixing of shall be done by means of bolts nuts and 3 mm. rubber insertions with flags of spigot and socketed tail pieces, drilled to the same specifications as in case of socket and spigot flanges in case of flanged pipes. The joining shall be done leak proof.

3.0. Mode of measurements and payment

3.1**.** The rate includes all labours, materials, tools and plant etc. required for satisfactory completion
of this item.

3.2. The rate shall be for a unit of One number.

Item No. 114

Providing and Fixing of 42mm solid cored both side Pre laminated Flush Door with 16 mm teakwood lapping tongued into door edges all round two side, both side 1mm thk. laminates of approved brand. also with 5 mm th. glass slit and fix glass above lintel Wooden Frame of 125mm x 75mm size in Ghana Teakwood including locks, Stopper, Floor spring/ Hinges and all Hardware materials of approved brand and make, all labour and Materials which will require for complete on site as per details and drawing or as per instruction of site In charge.Rate to include for painting all timber faces of frame in contact with wall surfaces with applying two coats of approved wood preservative and anti-insecticide paint before fixing in position and one under coat and two coats of enamel paint of approved make to exposed faces.

1.0 Materials & Workmanship:

The materials shall confirm to relevant Indian Standards.
Wooden flush door shutters (solid core):

1.1 The solid core type flush door shutters shall be 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. 2202- (Part-I) 1980. The timber shall be free from decay and insect attack. Knots and knot holes less than half the width of cross-section of the members in which they occur may be permitted. Pitch pockets, Pitch streaks and harmless pin holes shall be permissible except in the exposed edges of the core members. The commercial plywood, cross-bands shall conform to I.S. 303-1275.

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

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

1.4 The shutters shall be tested for

(1) End immersion test: The test shall be carried out as per I.S. 2202 (part-I) 1980. There shall be no de-lamination at the end of the test.

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

(3) Glue adhesion Test: The flush door shall be tested for glue adhesive test in accordance with I.S. 2202 (Part-I) 1980. The shutters shall be considered to have passed the test if no de-lamination occurs in the glue lines in the plywood and if no single de-lamination 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. De-lamination at the corner shall be measured continuously around the corner. De-lamination at the knots, knots holes and other permissible wood defects shall not be considered in assessing the sample.

1.5 The tolerance in size of solid core type flush door shall be as under:
In Normal thickness +/- 1.2 mm. In Normal height +/- 3 mm.

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

1.7 Mild Steel wire (wire gauge jail)

Mild steel wire may be galvanized as indicated. All finished steel wire shall be well cleanly drawn to the dimension and size of wire as specified in item. The wire shall be sound, free from splits, surface flaws, rough and imperfect edges and other harmful surface defects and shall conform to IS 260-1978.

1.8 Plywood

The plywood for general purpose shall conform to IS 303-1975Plywood is made by cementing together thin boards or sheets of wood in to panels. There are always an odd number of layers 3, 5, 7. 9. ply etc.

The plies are placed so that grain of each layer is at right angles to the grain in the adjacent layer.

1.8.1 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 splitting with change in moisture content.

1.8.2 Usually synthetic resins are used for gluing, phenolic resins are fussily cured in a hot press which compresses and simultaneously heat 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 up on thickness.

1.8.3 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 an atmosphere of controlled humidity until the proper amount of moisture has been absorbed.

1.8.4 According to IS 303-1975 the plywood for general purpose shall be of the grades namely BWR, WWR and CWR depending upon the adhesive used for bending 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 plywood should be reconditioned to moisture content not less than 16 percent.

1.8.5 Thickness of plywood Boards:

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

1.9 fixtures and fastenings:

General:

1.9.1 The fixtures and fastening, that is butt, hinges, tee and strap hinges, sliding door bolts, tower bolts, door latch, bath-room latch, handles, door stoppers, casement window fasteners, casement stays and ventilators catch shall be made of the metal as specified in the item of its specification.

1.9.2 They shall be iron, brass, aluminium, chromium plated iron, and chromium plated brass, copper oxidized iron, and copper oxidized brass or anodized aluminium as specified.

1.9.3 The fixtures shall be medium type. The fixture and fastenings shall be smooth finished and shall be such as will ensure ease of operations.

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

1.9.5 Brass and anodized aluminium fixtures and fastenings shall be bright or matt finished.

1.9.6 Holdfast: hold fast shall be made from mild steel flat 30 cm length and one of the holdfast shall be bent at right angle and two nos. Of 6 mm diameter holes, shall be made in it for fixing it to the frame with screws. At the other end the holdfast shall be forked and bent at right angles in opposite direction.

1.9.7 Butt hinges: railway type heavy type butt hinges shall be used when so specified.

Tee and strap hinges shall be manufactured form ms sheet.

1.9.9 Tower bolts (barrel type): tower bolts as specified in the item shall be used and shall be got approved.

1.9.10 Door latch: the size of door latch shall be taken as the length of latch.

1.9.11 Bathroom latch: bathroom latch shall be similar to tower bolt.

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

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

1.9.14 Door catch: 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 of the shutter and the other part is fixed in the wall with necessary wooden plug arrangement for appropriated fixity. The catch shall be sized 20 mm inside the face of the door easy operation of catch.

1.9.15 Wooden door stop with hinges: 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 900 mm form the floor level. The wooden doorstop shall be provided with 3 coats of approved oil paint.

1.9.16 Pivot: the base and socket plated shall be made from minimum 3 mm thick plate, and projected pivot shall not be less that 12 mm diameter and 12 mm length and shall be firmly riveted to the base plate in case of iron pivot and in single base plate in the case of brass pivot.

1.10 Readymade shutters shall be of correct size and shall fit into the door or other opening without excessive scraping of edges. Adding of battens etc., to make up-to the size shall be allowed.

2.0 Mode of measurement and payment:

2.1 The dimension of the shutter shall be measured clear size of the shutter in close position between the grooves of the frame.

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

2.3 The rate for individual item mentioned in the schedule of quantities shall include cost of shutters etc., transporting charges and labour for fixing of fixtures and fastenings except fixing of door closers and painting and polishing as specified.

Item No. 115

Providing and fixing Anodized aluminum works for Door with extruded built up standard tubular and other section of approved make confirming to IS 733 and IS 1285 , fixed with rawl plug abd screws or fixing clips ,or with expansion hold fasteners including necessary filling up of gaps at junctions, at top ,bottom and sides with required PVC/ Neoprene felt, glass of approved make etc. Aluminum sections shall be smooth, rust free ,straight.mitred and jointed mechanically wherever required including cleat angles aluminum snap beading for glazing /paneling, CP Brass/ Stainless steel screws, Stoppers, floor hing all complete as per architectural drawings and the direction of Engineer in Charge. rate incl. all type of aluminum sections for doors , windows and Vents with 5/8/12 mm th. tinted glass as per the detail Architectural dwg.

1.0 Materials

The materials shall confirm to relevant Indian Standards.

1.1 These shall be obtained from approved and established manufacturers and shall be of aluminium alloy conforming to IS: 733 and sections shall generally conform to IS: 1948. These shall be fabricated as per the drawings. The Section shall be as specified in the drawing and design. The fabrication shall be done as directed.

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

1.3 The hinges shall normal 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 in the drawing and design. A suitable lock for the operatable either from outside or inside shall be provided. in double shutter door the first closing shutter have concealed aluminum alloy bolt at top and bottom The fabrication shall be done as directed.

2.0 Workmanship:

2.1 GENERAL:

i. The unit assemblies shall be as per drawing or as directed by the Architects.
ii. The unit assemblies shall be anodized finished. Anodizing shall be minimum 20 to 25 microns thick, of matt non-directional and non-specular. Anodized surface shall be suitably protected during transportation, storage and erection.
iii. Sub units shall be together by concealed screws, Jamb member shall be self mullioning type obtaining use of separate mullions, thus increasing clear height of each unit.
iv. Joints shall either be mitered or coped. All joints shall be neat, hair line, and sealed with epoxy to make them water proof.
v. Openable shutters shall have a single row continuous neoprene or PVC weather strip to prevent air infiltration. Weather strips shall not be interrupted by any fittings.
vi. All windows shall be glazed from inside with PVC rubber or approved “Shalimar” putty. Glazing beads shall snap fit and shall be fitted without use of screws. No screws other than those on some of the hardware shall be visible.
vii. Glazing shall be approved and specially selected quality glass of thickness as specified in the Bills of Quantities.
viii. The rate shall include supplying and fixing with fittings and fixtures including approved locking arrangements.
ix. Before handing over, the aluminium work shall be washed with mild solution of non-alkali soap and water.

2.2 Steel windows shall conform to IS: 1038 and shall have brass oxidized fittings. They may be of composite sizes and assembled and fixed as per the manufacturers specifications using special mastic and putty for steel windows. The size of section shall be such as to be adequate for the specific type shown on the drawing. They shall have necessary accessories such as handles, stays, lugs, etc. The members shall be assembled with electric flush butt-welded joints/welded smooth joints as directed. These items include all types of windows such as fixed partially fixed, partially hinged, side hung, bottom hung, top hung, centre hung, etc. This item also includes windows of curved shapes and all other windows as specified and detailed by the Architects/consulting Engineers. The necessary accessories such as handles, stays, stoppers, etc. shall be brass oxidized and shall be included in this item. The rate also includes glazing panels with plain or ground glass with aluminium/teak wood beads of the required size and mastic putty of the same colour, which shall be applied for full length and not at intervals. The contractor shall provide windows with threaded holes for fixing aluminium/wooden beading, with screws, required for fixing of thickness specified.

2.3 The windows shall have glazing fixed as shown in the drawing and the glass shall be float glass sheet glass of the best quality and approved by the Architect/Consulting Engineer. It shall be transparent or translucent as required by the Architect/Consulting Engineers. It shall be free from flaws, specks, and bubbles.

2.4 The glazing units, doors, windows and ventilators shall not be built into the walls but shall be fixed in the prepared opening with lugs in masonry or with screws and jute expansion plugs in holes carefully drilled in RCC work. Mastic compound shall be provided all around the frame of the glazing unit at the junction of the frame and opening to make the junction watertight.

2.5 FIXING GLASS LOUVERS:

Louvers shall be 6 mm thick of wired glass or frosted glass with ground/polished edges as specified and of approved quality. The work shall be measured in sq.meter inclusive of frames and shall be measured outside of frames both ways according to drawing. The rate includes providing & fixing glass, beading, paints or polishing etc.

2.6 Glazing:

i. All glass shall be cut to size accurately and neatly to suit all openings to be glazed with a slight margin of about 2 to 4 mm on all sides as directed.
ii. All glass shall be back putted and externally putted up the line of the casement and filling the rebate.
iii. Glazing to steel doors and windows shall be done in compliance with the supplier's instructions, using the clips and the bends supplied.
iv. Glass in wooden doors and casements shall be sprigged in position after fixing with back putty.
v. Broken glass shall be neatly removed and replaced at the contractors' expenses.
vi. Where indicated in the Bills of Quantities, glass shall be beaded with approved beading, properly fixed and primed.
vii. Edges of glass louvers shall be grounded and left free from any sharp edges.

viii. In the case of T.W beading or other specified beading, the putty shall be applied full in line all around the windows in back, in between beading and glass and shall be of same colour as that of the windows of beading.

2.7 Thickness & Sizes of the Glass shall be as per specifications or as shown in detailed drawings.

2.8 Typical approved samples of the glazing unit shall be kept in the office of the Architect till the satisfactory completion of work. The decision of the Architect whether a unit compares well with the approved sample shall be binding as final on the concerned parties.

3.0 Mode of measurement and payment:

3.1 Width and height shall be measured outside to outside of frame and measurement shall be in Smt.

3.2 The rate also includes a coat of primer (yellow zinc chromate) before erection and after erection, 3 coats of approved enamel paint of required shade to the windows. Fixed and openable window shall be paid separately. The measurement shall be square meter of over all size of the frame as per drawing.

3.3 Notes: The work mentioned in this section shall be measured separately only in cases where it is distinctly specified in the Bills of Quantities

Item No. 116

Providing and fixing Anodized aluminum works for windows and vent with extruded built up standard tubular and other section of approved make confirming to IS 733 and IS 1285 , fixed with rawl plug abd screws or fixing clips ,or with expansion hold fasteners including necessary filling up of gaps at junctions, at top ,bottom and sides with required PVC/ Neoprene felt, glass of approved make etc. Aluminum sections shall be smooth, rust free ,straight.mitred and jointed mechanically wherever required including cleat angles aluminum snap beading for glazing /paneling, CP Brass/ Stainless steel screws, Stoppers all complete as per architectural drawings and the direction of Engineer in Charge. rate incl. all type of aluminum sections for , windows and Vents with 5/8/12 mm th. tinted glass as per the detail Architectural dwg.

1.0 Materials

The materials shall confirm to relevant Indian Standards.

1.1 These shall be obtained from approved and established manufacturers and shall be of aluminium alloy conforming to IS: 733 and sections shall generally conform to IS: 1948. These shall be fabricated as per the drawings. The Section shall be as specified in the drawing and design. The fabrication shall be done as directed.

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

1.3 The hinges shall normal 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 in the drawing and design. A suitable lock for the operatable either from outside or inside shall be provided. in double shutter door the first closing shutter have concealed aluminum alloy bolt at top and bottom The fabrication shall be done as directed.

2.0 Workmanship:

2.1 GENERAL:

x. The unit assemblies shall be as per drawing or as directed by the Architects.
xi. The unit assemblies shall be anodized finished. Anodising shall be minimum 20 to 25 microns thick, of matt non-directional and non-specular. Anodized surface shall be suitably protected during transportation, storage and erection.
xii. Sub units shall be together by concealed screws, Jamb member shall be self mullioning type obtaining use of separate mullions, thus increasing clear height of each unit.
xiii. Joints shall either be mitred or coped. All joints shall be neat, hair line, and sealed with epoxy to make them water proof.
xiv. Openable shutters shall have a single row continuous neoprene or PVC weather strip to prevent air infilteration. Weather strips shall not be interrupted by any fittings.
xv. All windows shall be glazed from inside with PVC rubber or approved "Shalimar" putty. Glazing beads shall snap fit and shall be fitted without use of screws. No screws other than those on some of the hardware shall be visible.
xvi. Glazing shall be approved and specially selected quality glass of thickness as specified in the Bills of Quantities.
xvii. The rate shall include supplying and fixing with fittings and fixtures including approved locking arrangements.
xviii. Before handing over, the aluminium work shall be washed with mild solution of non-alkali soap and water.

2.2 Steel windows shall conform to IS: 1038 and shall have brass oxidized fittings. They may be of composite sizes and assembled and fixed as per the manufacturers specifications using special mastic and putty for steel windows. The size of section shall be such as to be adequate for the specific type shown on the drawing. They shall have necessary accessories such as handles, stays, lugs, etc. The members shall be assembled with electric flush butt-welded joints/welded smooth joints as directed. These items include all types of windows such as fixed partially fixed, partially hinged, side hung, bottom hung, top hung, centre hung, etc. This item also includes windows of curved shapes and all other windows as specified and detailed by the Architects/consulting Engineers. The necessary accessories such as handles, stays, stoppers, etc. shall be brass oxidized and shall be included in this item. The rate also includes glazing panels with plain or ground glass with aluminium/teak wood beads of the required size and mastic putty of the same colour, which shall be applied for full length and not at intervals. The contractor shall provide windows with threaded holes for fixing aluminium/wooden beading, with screws, required for fixing of thickness specified.

2.3 The windows shall have glazing fixed as shown in the drawing and the glass shall be float glass sheet glass of the best quality and approved by the Architect/Consulting Engineer. It shall be transparent or translucent as required by the Architect/Consulting Engineers. It shall be free from flaws, specks, and bubbles.

2.4 The glazing units, doors, windows and ventilators shall not be built into the walls but shall be fixed in the prepared opening with lugs in masonry or with screws and jute expansion plugs in holes carefully drilled in RCC work. Mastic compound shall be provided all around the frame of the glazing unit at the junction of the frame and opening to make the junction watertight.

2.5 FIXING GLASS LOUVERS:

Louvers shall be 6 mm thick of wired glass or frosted glass with ground/polished edges as specified and of approved quality. The work shall be measured in sq.meter inclusive of frames and shall be measured outside of frames both ways according to drawing. The rate includes providing & fixing glass, beading, paints or polishing etc.

2.6 Glazing:

ix. All glass shall be cut to size accurately and neatly to suit all openings to be glazed with a slight margin of about 2 to 4 mm on all sides as directed.
x. All glass shall be back putted and externally putted up the line of the casement and filling the rebate.
xi. Glazing to steel doors and windows shall be done in compliance with the supplier's instructions, using the clips and the bends supplied.
xii. Glass in wooden doors and casements shall be springed in position after fixing with back putty.
xiii. Broken glass shall be neatly removed and replaced at the contractors' expenses.
xiv. Where indicated in the Bills of Quantities, glass shall be beaded with approved beading, properly fixed and primed.
xv. Edges of glass louvers shall be grounded and left free from any sharp edges.
xvi. In the case of T.W beading or other specified beading, the putty shall be applied full in line all around the windows in back, in between beading and glass and shall be of same colour as that of the windows of beading.

2.7 Thickness & Sizes of the Glass shall be as per specifications or as shown in detailed drawings.

2.8 Typical approved samples of the glazing unit shall be kept in the office of the Architect till the satisfactory completion of work. The decision of the Architect whether a unit compares well with the approved sample shall be binding as final on the concerned parties.

3.0 Mode of measurement and payment:

3.1 Width and height shall be measured outside to outside of frame and measurement shall be in Smt.

3.2 The rate also includes a coat of primer (yellow zinc chromate) before erection and after erection, 3 coats of approved enamel paint of required shade to the windows. Fixed and openable window shall be paid separately. The measurement shall be square meter of over all size of the frame as per drawing.

3.3 Notes: The work mentioned in this section shall be measured separately only in cases where it is distinctly specified in the Bills of Quantities

Item No. 117

Providing and fixing chicken wire mesh of gauge 0.18mm and 0.18mm wide with necessary screws and nail at joints cracks of brick work R.C.C work as per drawing and specification and direction of Engineer in-charge.
Materials

Chicken wire mesh jail , Nails

Workmanship

Fixing of chicken wire mesh of 24 gauge of 300 mm width at the junction of brick work and rcc work fixing it with nail and rawl plugs etc before applying plaster as per drawing/instruction of Clerk- Of-Work etc. complete. For all levels, heights and leads of works.

Mode of Measurements

The rate shall be for a unit of one sqm

Item No. 118

Providing and fixing Extruded aluminum section 15 Microns Regular anodized Coating (with matt-Finished and excellent outdoor durability) Louvers profile section as per detailed drawings and specifications given by Architect complete as per the following sections For Ventilation.

Materials

Materials shall be of approved quality and shall generally confirm to latest IS specifications and size of the sections are as specified in the item description. All units shall conform to AA – Aluminum Standards and data, latest edition. The contractor shall order all the materials required for the execution of work as early as necessary and ensure that such materials are on site well ahead of requirement for use in the work. The work involved calls for high standard of workmanship combined with speed and to the entire satisfaction of the Consultant.

Workmanship

The contractor shall furnish all labour, materials, equipments & appliances required for the complete execution of the work as shown on drawings and as specified herein. The contractor shall make his own arrangement for necessary scaffolding/staging, etc. for erection.
Contractor shall submit Samples prior to work. Samples shall include colour & finish samples for each finish type required.
The aluminum sections shall confirm to the following parameters also
The minimum tensile strength shall be 19kgf/m.
The maximum allowable deviation in length from a straight line shall be 0.5mm/metre.
The maximum allowable deviation from straight line shall be one degree.
The maximum permissible twist shall be 0.5 mm/meter.

The contractor shall execute the works as per working drawings provided of louver units and accessories including plans, elevations, sections & Details showing profiles, angles, spacing of louvers, unit dimensions related to openings & constructions, free areas for each size indicated.
All aluminum section shall be anodized with matt finish colour & shade anodizing shall be 6 microns thick prior to anodizing to all aluminum members shall be rendered uniform in appearance free from scratches, stains or other blemishes.

Mode of measurement and payment

Measurement shall be taken in length and width of completed dimension. The rate includes for execution of whole item and shall be paid for a unit of one sq. meter as per actual work done.

Item No. 119

ROOFING SYSTEM:TOP SHEET: TOP SHEET: Supply of colour coated LYSAGHTTRIMDEK® BARE ZINCALUME profile sheet of nominal.1015 mm effective cover width and nominal 28 mm deep ribs with subtle square fluting in the five pan at nominal 203 mm centre-to-centre. The end rib shall be designed for anti-capillary action, to avoid any seepage of water through the lateral overlap. The feed material shall be of 0.47 mm TCT with min 550 MPa yield strength, metallic hot-dipped coated with Al-Zn alloy (55% Aluminium, 43.5% Zinc, 1.5% Si) as per AS1397 / IS15961 - ZINCALUME® AZ150 (min. 150 g/m2 total on both sides)suitable for exterior application conforming to AS/NZS 2728 type-4 / IS15965 class 3of approved make. also includes all the accessories like gutter/ flashing / capping shall be made from the same material which is used for main cladding application.

Insulation: Fiberglass insulation 24 kg/Cmt density and 50mm thk. In rolled form to be placed over liner sheet. GI spacer (sub-gird) having size 50x50x50mm 1.5mm th. in z shape should be placed over purlin location above liner sheet

LINER(Bottom) SHEET: Supply of COLORBOND Zincalume FLEXICLAD Profiled Roofing sheet 1160mm cover width of 1110 mm. The end rib shall be designed for anti-capillary action, to avoid any seepage of water through the lateral overlap. The feed material shall be of 0.45 mm BMT (0.50mm TCT excluding paint thickness) COLORBOND® XRW steel- High tensile with min 550 MPa yield strength, metallic hot-dipped coated with Al-Zn alloy (55% Aluminium, 43.5% Zinc, 1.5% Si) as per AS1397 / IS15961 - ZINCALUME® AZ150 (min. 150 g/m2 total on both sides) with Super Durable Polyester COLORBOND® steel XRW quality paint system of approved color, suitable for exterior application conforming to AS/NZS 2728 type-4 / IS15965 class 3 of Tata BlueScope Steel make. The sheet shall have a total coating thickness of 35 microns, super durable polyesterCOLORBOND® XRW quality paint system of 20 microns on exposed surface and 5 micron reverse polyester coat on back surface over 5 micron primer coat on both surfaces.

The paint system should have stable resin & inorganic pigments for paint durability and Lead free for water harvesting. The steel sheet shall have brand marking of coated steel manufacturer (product details, date, mfg name, etc) on back side at regular interval confirming genuineness of the material.The steel sheet shall be fastened with nominal 40 µm zinc coated or nominal 25 µm Zinc-Tin alloy coated, Hex head, self-drilling screw as per AS 3566-2002 Class 3 fasteners with EPDM washer and also as per the requirement considering the profile shape and design load. The profile sheet, fastener size etc. shall be approved by the concern authority. All the accessories like gutter/ flashing / capping shall be made from the same material which is used for main cladding application. The measurement shall be based on finished/covered surface area.

Workmanship
The contractor has to install roofing system as per the company specifications and technical assistance. Contractor has to submit the shop drawings for the system before execution for approval.

Mode of Measurement
The out to out measurement of the roof in SMT shall be considered for the payment.

Item No. 120
Providing and laying in position approved quality pre-moulded 40 mm thick joint filler or Shalitex board or Capcell Board, sealing in expansion joints of 40 mm thickness at all locations; including sand fill, edge preparation, cleaning, drying complete in all respects as per scope of work, detailed construction drawings, site sketches, and instructions of site Er. in charge.

Polyurethane from filler shall be Capcell HD-100 of approved make. It should comply with BS 5628 Part-3. It should be semi-rigid; UV resistant, high performance laminated closed cell polyethylene foam joint filler in sheet form.
The density of polyurethane shall be 100Kgs / cum. The water absorption should be 0.012%. The operating temperature of foam filler should be between -40 c to +100 c.
It should be bitumen free and chemical resistant. It should possess excellent recovery after compression.

Mode of Measurement and Payment:
Rate shall be measured and paid in Sqmt of actual surface area.

Item No. 121
Providing and placing polysulphide sealant, over Capcell board in the expansion joints in specified locations; including sand fill, edge preparation by machine cut, cleaning, drying complete in all respects as per scope of work, detailed construction drawings, site sketches, technical specifications and directions of Engineer-in charge.

The polysulphide sealant shall be of approved make as approved by the architect or engineer-in-charge. It shall conform to relevant IS codes.

It shall be a two component polysulphide sealant. The mix ratio of both the parts should be as per manufacture's specification. It should not contain chloride or other corrosive substance.

It should accommodate continuous and pronounced cyclic movements. Material should be low in shrinkage, UV resistance, water resistant to bio-degradation. It should be water resistant to occasional spillage of dilute acids, alkalis, petrol, aviation fuels, diesel, kerosene, lubricating oils etc. It should be non-toxic.

The density of the material should be 1.58 ± 0.03 Kg / ltr. Hardness should be 16 to 22 after complete curing. Movement accommodation should be 25% for butt joints and 50% for lap joints. Joint size should be 5 to 50 mm. and depth to width ratio should be 1:2 (min). For joints with skew movement the ratio shall be 1:1

Mode of Measurement and Payment:
Rate shall be measured and paid in Rmt.

TECHNICAL SPECIFICATIONS

ELECTRICAL WORKS

TECHNICAL SPECIFICATION ELECTRICAL WORK

CONTENTS

	B	L.T. Cable and cable laying
	C	Distribution Boards
	D	L.T. Cables and Cable termination
	E	Internal Wiring
	F	LED Light Fixtures
	G	Earthing
	H	Lightening Arrestor
	I	Telephone and Computer System
	J	Video Surveillance System
3		Factory Acceptance Test for All bought out items
4		Mode of Payment
5		Safety Code
6		Testing of Installation
7		Form of Completion Certificate
8		Special conditions of Contract

1. VARIOUS CODES FOR ELECTRICAL WORKS

1.0 APPLICABLE IS STANDARDS

1.	METERS (MEASURING) FOR ANALOG METERS	IS:1248-1986
2.	INSTALLATION AND MAINTENANCE OF SWITCH GEARS	IS:3072-1975
3.	CODE OF PRACTICE FOR EARTHING	IS:3043
4.	H.D. AIR BREAKER, SWITCH GEARS AND FUSES FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4047-1977

5.	SELECTION, INSTALLATION AND MAINTENANCE OF FUSES UP TO 650 VOLTS	IS:8106-1966
6.	GENERAL REQUIREMENTS FOR SWITCH GEAR AND GEAR FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4237-1967
7.	DEGREE OF PROTECTION PROVIDED BY ENCLOSURES FOR LV S/GEARS	IS:2147-1962
8.	INSULATED CONDUCTOR RATING	IS:8084-1972
	ENCLOSED DISTRIBUTION FUSE BOARDS AND CUT-OUTS FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:2675-1983
10.	MINIATURE CIRCUIT BREAKER	IS:8828-1978
11.	FUSE WIRE USED IN RE-WEARABLE TYPE ELECTRIC FUSES UP TO 650 VOLTS	IS:9926-1981
12.	PVC INSULATED ELECTRIC CABLES HEAVY DUTY	IS:1554 (PART I)
13.	RECOMMENDED CURRENT RATING FOR CABLES	IS:3961(PART II)
14.	COPPER CONDUCTOR IN INSULATED CABLES AND CORES	IS:2982
15.	CONDUCTOR FOR INSULATED ELECTRIC CABLES AND FLEXIBLE CORDS	IS:8130
16.	MILD STEEL WIRES, STRIPS AND TAPES FOR ARMOURING CABLES	IS:3975
17.	PVC INSULATION AND SHEATH OF ELECTRIC CABLES	IS:5831
18.	ALUMINIUM CONDUCTOR FOR INSULATED CABLES	IS:1753
1.	PVC INSULATED AND PVC SHEATHED SOLID ALUMINIUM CONDUCTOR CABLES OF VOLTAGE RATING NOT EXCEEDING 1100 VOLTS	IS:4288
20.	RECOMMENDED CURRENT RATING FOR CABLE	IS: 961
21.	CODE OF PRACTICE FOR ELECTRICAL WIRING INSTALLATION SYSTEM VOLTAGE NOT EXCEEDING 650 VOLTS	IS: 732
22.	CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS GENERAL)ELECTRICAL INSTALLATION	IS: 1646

23.	RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:1653
24.	FITTINGS FOR RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:2667
25.	FLEXIBLE STEEL CONDUIT FOR ELECTRICAL WIRING	IS:3480
26.	ACCESSORIES FOR RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:3837
27.	PVC INSULATED CABLES (WIRES)	IS:694
28.	RIGID NON-METALLIC CONDUITS FOR ELECTRICAL WIRING	IS:2509
29.	FLEXIBLE (PLAYABLE) NON-METALLIC CONDUITS FOR ELECTRICAL INSTALLATION	IS:6946
30.	THREE PIN PLUGS AND SOCKETS	IS:1293
CONDUCTORS FOR INSULATED ELECTRICAL CABLES AND FLEXIBLE CODES		IS:8180
32.	SPECIFICATION FOR CONDUIT FOR ELECTRICAL INSTALLATION	IS:9537-1980
33.	ACCESSORIES FOR NON-METALLIC CONDUITS FOR ELECTRICAL WIRING	IS:3419
34.	SWITCHES7	IS:3854
35.	PLUGS	IS:6538
36.	SHUNT CAPACITORS FOR POWER SYSTEMS	IS:2834-1954
37.	HRC CARTRIDGE FUSES AND LINKS UP TO 660 VOLTS	IS:2208
38.	GENERAL AND SAFETY REQUIREMENT FOR LIGHTING FITTINGS	IS:1913-1969
39.	CODE OF PRACTICE FOR LIGHTING PUBLIC THOROUGH FARES	IS:2944-1981
40.	WATERPROOF ELECTRIC LIGHTING FITTINGS	IS:3528
41.	WATER TIGHT ELECTRIC LIGHTING FITTING	IS:3553-1966
42.	MILD STEEL TUBULAR AND OTHER WROUGHT STEEL PIPE FITTING	IS:1239-1958

43.	LUMINARIES FOR STREET LIGHT	IS:2149-1970
44.	HRC FUSES HAVING RUPTURING CAPACITY OF 90 KA	IS:9224
45.	EXHAUST FAN	IS:2312-1967
46.	CLASS I CEILING FAN	IS:374-1979
47.	DANGER NOTICE BOARDS	IS: 2551
48.	Cabinets and Boxes	UL 50
49.	Smoke Detectors for Fire Protective Signaling Systems	UL 268
50.	Control Units for Fire Protective Signaling Systems	UL 864
51.	Smoke Detectors for Duct Applications	UL 268A
52.	Thermal Detectors for Fire Protective Signaling Systems	UL 521
53.	Door Closers-Holders for Fire Protective Signaling Systems	UL 228
54.	Audible Signaling Appliances	UL 464
55.	Manually Activated Signaling Boxes	UL 38
56.	Water flow Indicators for Fire Protective Signaling Systems	UL 346
57.	Power Supplies for Fire Protective Signaling Systems	UL 1481
58.	Proprietary Burglar Alarm Units and Systems	UL 1076
59.	Visual Notification Appliances	UL 1971

NOTE:

All codes and standards means the latest where not specified otherwise the installation shall generally follow the Indian Standard codes of practice or relevant British Standard Codes of Practice in the absence of corresponding Indian Standards.

PLEASE FOLLOW:

a. Indian Electricity Act of 1910 and rules issued there under revised up to date.
b. Special Attention should be given to Rule No. 50.
c. Regulations for electrical equipment in building issued by The Bombay Regional Council of insurance Association of India.

1.2.0 General:

1.2.1 **Dimension:**

The dimensions wherever stated do not allow for waste, laps, joints, etc. but the Contractor shall provide sufficient labour and material to cover such waste, laps joints etc.

1.2.2 **The Contractors shall provide:**

All equipments necessary to carry out the electrification of the building. All the material required for the said job shall be provided by the contractor. The labour with supervision shall be provided by the contractor.

1.2.3 **Material quality:**

All the materials used in the work are to be of the very best quality of their respective kinds as specified or described, and all materials to be used in and about every part of the work may from time to time be subjected to tests by means of machines, instruments and appliances as the CLIENT AND/OR ITS ARCHITECT may direct and wholly at the expenses of the Contractor. Samples subjected to any tests, will not be returned or paid for.

1.2.4 **Rates:**

A rate for any one description of work in the schedule of quantities and rates is to be held to include each items of other classes of work as are obviously necessary for its due completion and, for these, no separate or specific charge will be admitted.

1.2.5 **Material Measurement:**

Record of all the challans and day to day usage of any sort of material shall be kept at site in duplicate.

1.2.6 **Supervising:**

The supervisors shall always carry with them the required tool box together with measuring tap and pad to note any and all the instructions given during the visit of client and or its architect.

1.2.7 **Measurements:**

The Contractors or their representative shall accompany the CLIENT AND/OR ITS ARCHITECT or his representative or the clerk-of-works when required to do so, and assist in taking the measurements and shall agree to the measurements recorded on the spot.

All measuring tapes shall be of steel and scaffolding and the Contractor shall supply ladders that may be required for taking measurements.

If the Contractors fail to accompany the clerk-of-works or any other person that has been duly authorized by the CLIENT AND/OR ITS ARCHITECT to take measurements, they shall be bound by the measurements recorded by the CLIENT AND/OR ITS ARCHITECT or his representatives.

1.2.8 **Protection:**

a) The Contractors must cover up and protect from injury from any cause all new works.

1.3.0 Materials and Workmanship:

1.3.1 **General:**

All materials brought on the site of works and meant to be used in the same, shall be the best of their respective kinds and to the approval of the CLIENT AND/OR ITS ARCHITECT. The CLIENT AND/OR ITS ARCHITECT or his representative will accept that the materials are

really the best of their kinds, when it is approved beyond doubt that no better materials of the particular kind in question are available in the markets.

1.3.2 **Samples:**

a) Samples and make of all materials shall be got approved by the CLIENT AND/OR ITS ARCHITECT and shall be deposited with him before the order for the materials is placed with the supplier. The materials brought on the work shall confirm in every respect to the respective approved samples.

1.3.3 **Check:**

The Contractors shall check each fresh consignment of materials, as it is brought on to the site of the works, to see that they conform in all respects to the specification and/or the samples approved by the CLIENT AND/OR ITS ARCHITECT.

1.3.4 **Testing:**

The CLIENT AND/OR ITS ARCHITECT will have the option to have any of the materials tested to find whether they are in accordance with the specification, and the Contractors will bear all expenses in that connection. All bills, vouchers and test certificates which, in the opinion of the CLIENT AND/OR ITS ARCHITECT or his representatives are necessary to convince him as to the quality of the materials or their suitability shall be produced for his inspection on requisition.

1.3.5 Rejection:

Any materials that have not been found to conform to the specifications will be rejected forthwith and shall be removed from the site by the Contractors at their own cost.

1.3.6 **Storing:**

The materials shall be stored or stocked on the site as directed by the CLIENT AND/OR ITS ARCHITECT and if any additional space is to be hired for this purpose, the Contractors will do so at their own expenses.

1.3.7 **Purchase:**

The CLIENT AND/OR ITS ARCHITECT shall have the power to cause the Contractor to purchase and use such materials from any particular source as may in his opinion be necessary for the proper execution of the work.

1.3.8 **Special Materials:**

Any special materials that may be required on the works which are supplied by any other person or firm selected by the CLIENT or by the CLIENT AND/OR ITS ARCHITECT on their behalf shall be taken over in writing by the Contractors for safe custody until they are required on the works when called upon to do so by the CLIENT AND/OR ITS ARCHITECT. The Contractors will be responsible for all special materials or articles, which may be supplied by specialists.

1.3.9 **Drawings, Specifications & Deviations:**

A. The drawings and specifications lay down minimum standards of equipment and workmanship. Should the tenderer wish to depart from the provisions of the specifications and drawings either on account of manufacturing practice or for any other reasons, he should clearly draw attention in his tender to the proposed points of departures and submit such complete information, drawings and specifications as will enable the relative merits of the deviations to be fully appreciated. In the absence of any deviations, it will be deemed that the tenderer is fully satisfied with the intents of the specifications and drawings and their compliance with the statutory provisions and local codes.

B. In case of discrepancy between the drawings and specifications, the tenderer shall assume the more stringent of the two and furnish his rates accordingly.

C. The Contractor shall prepare fabrication and working drawings and all work shall be as per the approved working drawings. Approval of drawings does not relieve the Contractor of his responsibility to meet with the intents of the specifications. All such drawings for approval shall be in duplicate.

D. Equipment data shall be submitted along with the filled tender. The contractor shall be responsible for any unfilled data of the data sheets and the same shall be executed according to the requirements of the Engineer in charge / Consultant without any extra cost.

E. y fittings, assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical ons as required, and all other sundry items which are useful and necessary for proper assembly and working of the various components of the work shall be deemed to have been included in the hether such items are specifically mentioned in the tender documents or not.

2. GENERAL TECHNICAL SPECIFICATIONS FOR ELECTRIC WORKS L. T. PANELS / P.C.C. / M.C.C.

1.0 TYPE OF PANEL:

All the PCC's / PDB's / MCC's shall be metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on three phase / single phase, 415 / 230 volts, 50 Hz.

The PCC's / MCC's shall be designed to withstand the and heaviest condition at site, with minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.

Should conform to Indian Electricity Act and rules (till last amendment) & approved as per FIA norms.

1.1 APPLICABLE IS STANDARDS

METERS (MEASURING) FOR ANALOG METERS	IS:1248-1958
INSTALLATION AND MAINTENANCE OF SWITCH GEARS	IS:3072-1975
H.D. AIR BREAKER, SWITCH GEARS AND FUSES FOR	
VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4047-1977
SELECTION, INSTALLATION AND MAINTENANCE OF FUSES	IS:8106-1966
UP TO 650 VOLTS	
GENERAL REQUIREMENTS FOR SWITCH GEAR AND	IS:4237-1967
GEAR FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	
DEGREE OF PROTECTION PROVIDED BY	
ENCLOSURES FOR LV S/GEARS	IS:2147-1962
INSULATED CONDUCTOR RATING	IS:8084-1972
ENCLOSED DISTRIBUTION FUSE BOARDS AND CUT-OUTS	
FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:2675-1983
FUSE WIRE USED IN RE-WEARABLE TYPE ELECTRIC FUSES	
UP TO 650 VOLTS	IS:9926-1981
CONDUCTOR FOR INSULATED ELECTRIC CABLES AND	
FLEXIBLE CORDS	IS:8130
SHUNT CAPACITORS FOR POWER SYSTEMS	IS:2834-1954

HRC CARTRIDGE FUSES AND LINKS UP TO 660 VOLTS	IS:2208
HRC FUSES HAVING RUPTURING CAPACITY OF 50 KA	IS:9224
AC ELECTRICITY METERS: PART – 1 GENERAL REQUIREMENETS AND TESTS	IS:772 PART 1
DIRECT ACTING ELECTRICAL INDICATING INSTRUMENTS	IS:1248
CURRENT TRANSFORMERS	IS:2705
ELECTRICAL RELAYS FOR POWER SYSTEMS PROTECTION	IS:3231
PHOSPHATE TREATMENT OF IRON AND STEEL FOR PROTECTION AGAINST CORR0SION	IS:3618
GUIDE FOR MARKING OF INSULATED CONDUCTOR	IS:5578
CODE OF PRACTICE OF PHOSPHATING OF IRON AND STEEL	IS:6005
FACTORY BUILT AASEMBLIES OF SWITCHGEAR AND CONTROL-GEAR FOR VOLTAGES UPTO AND INCLUDING 1000V AC AND 1200V DC.	IS:8623
GUIDE FOR UNIFORM SYSTEM MARKING AND IDENTIFICATION OF CONDUCTORS AND APPARATUS TERMINALS	IS:11353
LOW VOLTAGE FUSES	IS:13703
LV SWITCHGEAR AND CONTROL GEAR (PART 1 TO PART 5)	IS:13947
STRUCTURE CONSTRUCTION (IP-54)	IS:2147
MINIATURE CIRCUIT BREAKER (MCB)	BS:3871PART-1 1965 IS:8825 (1996)
FUSE	IS:2000-1962
AIR CIRCUIT BREAKER	IS:2516 PART 1,2,3
CONTACTORS	IS:2959 & BS:775
DIGITAL METER	IS:13779
ELECTRICAL POWER & CONTROL WIRING CONNECTION WIRING INSIDE THE MODULE FOR POWER, CONTROL	

PROTECTION	IS:694 & IS:8130
DANGER NOTICE PLATE	IS:2551-1982 & IS:5-1978
MCCB	IEC 60439-2 / IS:8623-2
SFU	IS:13947 (PART-3) & IEC
60947-3	
ELCB	BS 3871 & 4293, IS.,CEE 27

1.2 STRUCTURE :

The PCCs, MCCs & PDBs shall be metal clad enclosed and be fabricated out of high quality CRCA sheet, suitable for indoor installation, front operated and floor mounting type.

CRCA sheet steel used in the construction of PCCs / MCCs / PDBs shall be 2 mm thick for structure, 1.6 mm thick for doors, covers shrouds and 3 mm thick for gland plate and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet shall be seam welded, all welding slag grounded off and welding pits wiped smooth with plumber metal.

The PCCs / MCCs / PDBs shall be totally enclosed, completely dust and vermin proof and degree of protection being no less than IP-54 confirming to IS 2147. Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust proof. All doors and covers shall be fully gasketted with neoprene gaskets and shall be lockable.

All panels and covers shall be properly fitted and secured with the frame, and holes in the panel correctly positioned. Fixing screw shall enter into holes taped into an adequate thickness of metal or provided with bolts and nuts. Self-threading screws shall not be used in the construction of PCCs / MCCs / PDBs.

A base channel of 75 mm x 75 mm x 5 mm or as per the weight of the panel shall be provided at the bottom.

PCCs / MCCs /PDBs shall be arranged in multi-tier formation. The PCCs / MCCs / PDBs shall be of adequate size to facilitate enough space for maintenance and cooling. The size of the PCCs / MCCs / PDBs shall be designed in such a way that the internal space is sufficient for hot air movement, and the electrical component does not attain temperature more than 40 degree Celsius. Openings shall provide for natural ventilation, but the said openings shall be screened with fine weld mesh.

Knockout holes of appropriate size and number shall be provided in the PCCs / MCCs/ PDBs in conformity with number, and size of incoming and outgoing conduits / cables.

Alternatively the PCCs / MCCs / PDBs shall provided with removable sheet plates at top and bottom to drill holes for cable / conduit entry at site.

The PCCs / MCCs / PDBs shall be designed to facilitate easy inspection, maintenance and repair.

The PCCs / MCCs / PDBs shall be sufficiently rugged in design and shall support the equipment without distortion under normal and short circuit condition they shall be suitable braced for short circuit duty

1.3 PROTECTION CLASS:

All the indoor PCCs / MCCs / PDBs shall have protection class of IP - 54.

1.4 POWDER COATING:

All sheet steel material shall undergo seven-tank process after all the necessary shearing and other mechanical works are completed. After the seven-tank process powder coating treatment shall be adopted using powder of reputed make. After the powder coating is complete welding in the panel or any sort of shearing, bending or cutting activity shall not be done. The colour shall be Siemens Grey 631

1.5 CIRCUIT COMPARTMENT:

Each circuit breaker and switch fuse units shall be housed in separate compartments and shall be enclosed an all sides. Sheet steel hinged lockable door shall be duly inter locked with the breaker / switch fuse units in ON and OFF position. Safety interlocks shall be provided for non-opening of the door when the breaker is in ON position.

The door shall not form integral part of the draw out position of the circuit breaker. All instruments and indicating lamp shall be mounted on the compartment door. Sheet steel barriers shall be provided between the tires in a vertical section.

1.6 INSTRUMENT COMPARTMENT :

Separate and adequate compartment shall provided for accommodating instruments, indicating lamp, control contactors, relays and control fuses etc. These components shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, switch fuse units, busbars and connections.

1.7 BUSBARS :

The busbar shall be air insulated and made high quality, high conductivity, high strength copper and as per relevant IS code. The busbar shall be for three phases and neutral system with separate neutral and earth bar. The busbar and interconnection between busbar and various components shall be of high conductivity, hard drawn, electrolytic copper. The busbar shall be of rectangular cross section designed to withstand full load current for phase busbar and full rated current for neutral busbar and shall be extensible type on either side. The busbar shall be rated for the frame size of the main incoming breaker. The busbar shall have uniform cross section through out the length. Ratio of 1 sqmm = 1.2 A shall be adopted for tinned copper busbars.

The busbar and interconnection shall be insulated with heat shrinkable PVC sleeves and be colour coded in red, Yellow, Blue and Black to identify the three phases and neutral of the system. The busbar shall be supported on unbreakable, non hygroscopic DMC insulated supports at sufficiently close interval to prevent busbar sag and shall effectively withstand electromagnetic stresses in the event of short circuit capacity of 50 KA RMS symmetrical for one second and a peak short circuit withstand of 105 KA minimum.

The busbar shall be housed in a separate compartment. The busbar shall be isolated with 3 mm thick FRC sheet to avoid any accidental contact. The busbar shall be arranged such that minimum clearances between the busbar are maintained as per below.

Between phases	:	27 mm min.
Between phases and neutral	:	25 mm min.
Between phases and earth	:	25 mm min.
Between neutral and earth	:	23 mm min.

All busbar connection shall be done by drilling holes in busbars and connecting by chromium plated bolt and nuts. Additional cross section of busbar shall be provided in all PCCs / MCCs / PDBs to cover-up the holes drilled in the busbars. Spring and flat washers shall be used for tightening the bolts.

All connection between busbar and circuit breaker / switches and between circuit breaker/ switches and cable terminals shall be through solid copper strips of proper size to carry full rated current. These strips shall be insulated with insulating strips.

1.8 ELECTRICAL POWER & CONTROL WIRING CONNECTION :

Terminal for both incoming and outgoing cable shall be suitable for 1100 volts grade, aluminum/copper conductor PVC insulated and sheathed, armoured cable and shall be suitable for connections of solder less sockets for the cable size as indicated on the appended drawing for the PCCs, MCCs, PDBs.

Both control and power wiring shall be brought out in cable alley for ease of external connections, operation and maintenance.

Both control and power terminals shall be properly shrouded.

10% spare terminal shall be provided on each terminal block. Sufficient terminals shall be provided on each terminal block so that not more than one outgoing wire connected per terminal.

Terminal strip for power and control shall preferably be separated from each other by suitable barriers of enclosures.

Wiring inside the module for power, control protection and instrument etc. shall be done with use of 1100 V confirming to IS 694 and IS 8130. Power wiring inside the starter module shall be rated for full current rating of contactor, but not less than 4 sq mm cross section area. For current transformer circuits, 2.5 sq mm-copper conductor wire shall be used. Other control wiring shall be done with 1.5 sq mm copper conductor wires. Wires for connections to the door shall be flexible. All conductors shall be crimped with solder less sockets at the ends before connections are made to the terminals.

Control power for the motor starter module shall be taken from the respective module switchgear outgoing from R phase and Neutral. Control wiring shall have control fuse (HRC type).

Particular care shall be taken to ensure neat and orderly laying of the wiring. Identification ferrules shall be tagged to all the wire termination for ease of identification and to facilitate and testing.

"CUPAL" washers shall be used for all copper and aluminum connections.

Final wiring diagram of the PCC, MCC, PDB power and control circuit with ferrules number shall be submitted along with the PCC/MCC/PDB as one of the documents.

1.9 TERMINALS :

The outgoing terminals and neural link shall be brought out to a cable alley suitably located and accessible from the panel front. The current transformer for instrument metering shall be mounted on the disconnecting type terminal blocks. No direct connection of incoming and outgoing cables to internal components connection of the distribution board is permitted. Only one conductor may be connected in one terminal.

1.10 WIREWAYS:

A horizontal PVC wire way with screwed covers shall be provided at the top to take interconnecting control wiring between different vertical sections.

1.11 CABLE COMPARTMENT:

Cable compartment of adequate size shall be provided in the PCCs, MCCs, and PDBS for easy termination of all incoming and outgoing cables entering from top. Adequate support shall be provided in the cable compartment.

1.12 EARTHING:

Copper earth busbar of minimum 25 mm x 6 mm size shall be provided in the PCCs, MCCs, PDBS for the entire length if panel. As per the rating of the main busbars the size of earthing busbar shall be decided. The framework of the PCCs, MCCs, PDBs shall be connected to this earth busbar. Provisions shall be made for connection from earth busbar to the main earthing bar coming from the earth pit on both sides of the PCCs, MCCs, PDBs.

The earth continuity conductor of each incoming and outgoing feeder shall be connected to this earth bar. The armour shall be properly connected with earthing clamp and the clamp shall be ultimately bounded with the earth bar.

1.13 LABELS:

Engraved Aluminium sheet labels shall be provided on all incoming and outgoing feeders. Single line circuit diagram showing the arrangements of circuit inside the distribution board shall be pasted on inside of the panel door and covered with transparent laminated plastic sheet.

1.14 NAME PLATE:

A name plate with panel designation in bold letter shall be fixed at top of the central in panel. A separate name plate giving feeder details shall be provided for each feeder module door.

Inside the feeder compartment, the electrical component, equipments, accessories like switchgear, contactor, lamp, relays etc. shall suitably be identified by providing stickers.

Engraved nameplates shall be of Aluminium strip of black colour and silver letters format.

Nameplate shall be fastened by counter sunk screws / riveted and not by adhesives.

1.15 DANGER NOTICE PLATE:

The danger plate shall be affixed in a permanent manner on operating side of the panel.

The danger notice plate shall indicate danger notice both in Hindi and English and with a sign of skull and bones.

The danger notice plate in general shall meet to requirements of local inspecting authorities.

Overall dimension of the danger notice plate shall be 200 mm wide and 150 mm high. The danger notice plate shall be made from minimum 1.6 mm thick mild steel sheet and after due pretreatment to the plate, the same shall be painted white with vitreous enamel paint on both front and rear surface of the plate.

The letter, the figure, the conventional skull and bones shall etc. shall be positioned on the plate as per recommendations of IS : 2551-1982.

The said letter, the figure and the sign of skull and bones be painted in single red colour as per IS: 5-1978.

The danger plate shall have rounded corners. Locations of fixing holes for the plate shall be decided to suit design of the panel.

The danger notice plate, if possible, be of ISI certification mark.

1.16 INTERNAL COMPONENTS:

The PCC / MCC / PDB shall be equipped complete with all type of required number of air circuit breakers, switch fuse unit, contactor, relays, fuses, meters, instruments, indicating lamps, push buttons, equipment, fittings, busbar, cable boxes, cable glands etc. and all the necessary internal connections /wiring as required and as indicated on relevant drawings. Components necessary for proper complete functioning of the PCC / MCC / PDB but not indicated on the drawings shall be supplied and installed on the PCC / MCC / PDB.

All part of the PCC / MCC/ PDB carrying current including the components, connections, joints and instruments shall be capable of carrying their specified rated current continuously, without temperature rise exceeding the acceptable values of the relevant specifications at any part of the PCC / MCC / PDB.

All units of the same rating and specifications shall be fully interchangeable.

1.17 INSPECTIONS / TESTING:

Each equipment should inspect and witness by client & consultant.

The PCC / MCC / PDB shall be inspected and checked as per inspection manual of the PCC / MCC / PDB manufacturer.

Various electrical components and accessories of the PCC / MCC / PDB shall be checked as per drawing for the respective PCC / MCC / PDB.

The PCC / MCC / PDB shall be checked for rigid mounting, earthing connections, proper rating and size of components, internal wiring, etc.

All mechanical fasteners and electrical connections shall be checked and tightened before installation.

1.18 Type test:

Type test certificates for all switchgears shall be provided.

Routine Test:

Prior to dispatch of the PCC / MCC / PDB following tests shall be carried out.

Mechanical endurance test shall be carried out by closing and opening of all the ACB's, MCB's switches etc.

Over voltage and Insulation resistance test shall be carried out between phases and between phase to earth bus, keeping the isolating switch in ON position. Similar test shall be carried out keeping the isolating switch in closed position.

All the interlocks, controls and tripping mechanism of the switchgears shall be tested for their proper functioning.

High voltage test, Continuity test, Control circuit test shall be carried out.

- **L. T. SWITCHGEARS:**

GENERAL:

The type, size, and rating of the components shall be as indicated on the relevant single line diagrams0.

MINIATURE CIRCUIT BREAKER (MCB):

Miniature circuit breakers shall be quick make and break and break type conform with British standard BS: 3871 (Part-I) 1965 and IS: 8825 (1996). The housing of MCBs shall be heat resistant and having high impact strength. The fault current of MCBs shall not be less than 10000 amps, at 230 volts. The MCBs shall be flush mounted and shall be provided with trip free manual operating mechanism with mechanical "ON" and "OFF" indications.

The circuit breaker dollies shall be of trip free pattern to prevent closing the breaker on a faulty current.

The MCB contact shall be silver nickel and silver graphite alloy and tip coated with silver. Proper arc chutes shall be provided to quench the arc immediately. MCB's shall be provided with magnetic fluid plunger relay for over current and short circuit protection. The over load or short circuit devices shall have a common trip bar in the case of DP and TPN miniature circuit breakers. All the MCB's shall be tested and certified as per Indian Standard, prior to Installation.

FUSE:

Fuses shall be of high rupturing capacity (HRC) fuse links and shall be in accordance with IS : 2000-1962 and having rupturing capacity of not less than 35 MVA at 415 Volts.

AIR CIRCUIT BREAKER:

The ACB shall meet with IS : 2516 part I, II and III. Each pole of the ACB's shall be equipped with and over current, earth fault and short circuit release. The ACB's shall be equipped with under voltage trip only on those used as main incomer of all sources, bus coupler and inter connector. The trip devices shall be direct acting.

Disconnecting devices of approved type shall be provided to facilitate the removal of the circuit breakers from the housing for test and maintenance purpose.

The ACB's shall have an arc-quenching device on each pole. The ACB's shall have auxiliary contacts for signaling, interlocking etc. The ACB's shall have slow close facilities for checking contact operation and contact gap adjustment.

All contacts subject to arcing shall be tipped with arc resisting material. Main contacts shall be silver plated, multi-finger and spring-loaded type. Facilities shall be provided to isolate the circuit breaker for inspection purpose.

Interlocks shall be provided to:

Prevent the breaker from being isolated unless it is in the "OFF" position.

Prevent the breaker from being racked in to the service position unless it is in the "OFF" position.

Prevent the breaker from being accidentally pulled completely "OFF" the guide rail. Safety shutters of insulating material shall be provided to prevent access to all live contacts, when the breaker is in the inspection position or completely withdrawn.

Facilities shall be provided for earthing the circuit breaker.

Air circuit breaker shall be capable of clearing the maximum fault current, which can occur.

The breaker plates shall have an ON-OFF indicators, spring charge indicators, provision to padlock manual handle and provision to lock draw-out mechanism. Electrically operated breaker shall have provision for emergency manual closing by inserting a tool through the fuse plate. A control isolating switch shall be provided on the fuse plate to isolated the supply to the charging motor.

LT panel Main feeder shall have remote control provision for Emergency operation. Contractor shall consider emergency Push button as well as control cable for the same. Contractor shall consider all cost of cable & material in this Item. Construction shall also include the cost of fix capacitor in the Incoming supply of Transformer to panel.

MOULDED CASE CIRCUIT BREAKER:

The MCCB shall be air break type and having quick make quick break with trip free operating mechanism.

Housing of the MCCB shall be of heat resistant and flame retardant insulating material.

Operating handle of the MCCB shall be in front and clearly indicate ON / OFF / TRIP positions.

The electrical contact of the circuit breaker shall be of high conducting non-deteriorating silver alloy contacts.

The MCCB shall be provided with microprocessor based trip units. All the releases shall operate on common trip busbar so that in case of operation of any one of the releases in any of the three phases, it will cut off all the three phases and thereby single phasing of the system is avoided.

The MCCB whenever called for in the drawings shall provide an earth fault relay.

The MCCB shall provide two sets of extra auxiliary contacts with connections for additional controls at future date.

CONTACTORS:
The contactor shall meet with the requirements of IS: 2959 and BS: 775.

The contactors shall have minimum making and breaking capacity in accordance with utilization category AC 3 and shall be suitable for minimum class II intermittent duty.

If the contactor forms part of a distribution board then a separate enclosure is not required, but the installation of the contactor shall be such that it is not possible to make an accidental contact with live parts.

TRIVECTOMETER:
Flush mount 96 x 96 x 80 mm load manager type Enercon EM 6400 or equivalent meter of accuracy class 1 as per IS 13779 shall be provided. The meter shall be accurate on distorted waveforms; simultaneous sampling of voltage and amperes shall be done. It shall have low burden on PT and CT shall have bright display, shall view 3 parameters together shall have auto scaling from kilo to mega to giga units, shall have programmable CT, PT ratios with built in phase analyser. Auto scrolling shall be programmable as per user choice and communication with PC; PLC DCS shall be possible through RS 485 serial port. It shall be dust proof, tamper proof with data import export option and 10 years back up of integrated data.

Parameters to be monitored shall be Frequency, Line to line and average and line to neutral and average voltage, phase wise and average current, phase wise and total KVA, KW and P.F. reading and KWH monitoring.

User programmable facility for delta 2e and star 3e measurement, C.T. and P.T. ratios, sliding window auto sync. And auto scrolling of parameters shall be available.

Sensing shall be 3 phase, 4 wire measuring True RMS with voltage input range of 110 to 415 V nominal and current input of 5 amps or 1 amps as per field configuration. Current range shall be from 50 mA to 7.5 A and burden on PT or CT shall be app 0.2 VA.

Accuracy for kW / kWh shall be as per IS 1377 / CBIP88 and for all other parameters shall be +/- 0.5% of full scale + 0.5% of reading + 1 digit. Digital readout shall be of 3 rows of 4 digits each (12.5 mm size) with 7 segments bright red LED. Input frequency shall be 50Hz / 60Hz +/- 5%. Power factor range shall be 0.5 lag – unit – 0.8 lead.

Resolution for power parameters shall be for 4 digits and energy parameters shall be 8 digits. Display update shall be at every 15 seconds for demand parameters and 1 sec for other parameters. Display sequence shall be parameter followed by value. Temperature range shall be 0-50oC and humidity <95% non-condensing.

Display pages shall be as follows:

Instantaneous – VLL, A avg., F

VLn, A avg., F

KVA, kW, PF

Individual pages of above parameters.

Integrated - kVAh

KWh

Run hours

On hours

Interruption

CURRENT TRANSFORMER:
Where called for, CT's shall provided for current measuring. Each phase shall be provided with separate CT of class I accuracy and VA burden as shown in SLD for operation of associated metering and controls. Current transformer shall be in accordance with IS: 2705 - 1964 as amended up to date.

PUSH BUTTON:
The push button unit shall comprise of the contact element, a fixing holder, and push button actuator. The push button shall be momentary contact type. The contacts shall be of silver alloy and rated at 10 Amps. Continuous current rating. The actuator shall be of stranded type and colour as per its usage for ON, OFF and Trip.

INDICATING LAMP:
The push button unit shall comprise of the contact element, a fixing holder, and push button actuator. The push button shall be momentary contact type. The contacts shall be of silver alloy and rated at 10 Amps. Continuous current rating. The actuator shall be of stranded type and colour as per its usage for ON, OFF and Trip. Push button shall be of self-glowing type with LED lamp.

Indicating Lamp shall be LED type and shall supplied complete with translucent covers to diffuse the lamp light. Indicating lamps shall be part of push buttons.

Colour shade for the indicating lamps shall be as below:

ON indicating lamp : Green

OFF indicating lamp : Red

TRIP indicating lamp : Amber

PHASE indicating lamp : Red, Yellow, and Blue.

VENDORS DATA : TO BE SUBMITTED WITH OFFER :

Approved Makes:

Vendor shall provide information on the offered make and Cat nos. of items offered for respective Panels:

Sr. No.	Item Description	Specified Make	Vendor Confirmation
1.0	All incoming breakers in		

	main L.T. panel (SEC / DG) Air Circuit Breakers Ics=Icu=Ics(1sec) –		
1.0A	All other Breaker		
2.0	MCCB Microprocessor based release – Ics = Icu		
3.0	MCB		
4.0	SFU		
5.0	Capacitors – APP type / heavy duty type		
6.0	Contactors		
7.0	Starters		
8.0	CRCA sheet		
9.0	Gaskets		
10.0	Meters		
11.0	Indicating lamps – LED		
12.0	Push Buttons		
13.0	Connectors		
14.0	C.T.s		
15.0	APFC Relay		
16.0	Selector Switches		

Note:

All material and workmanship has to be as per latest IS / international standards.

CABLE LAYING AND TRENCHES WITH TRAYS

1.0 SPECIFICATIONS

CABLE TRENCH

Cable trench shall be dug to the minimum depth of 1 mtr and the width shall dependent on the no of cables to be kept with the layer of brick in between two cables.

BRICKS

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

of size 100 mm. x 40 mm., and 10 mm. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 6 m. B – grade brick shall be used.

SAND

Sand shall be natural sand, clean, well graded, hard, strong, durable and gritty. Sand particles should be free from injurious amounts of dust, clay, kankar nodules, soft or flaky particles of shale, alkali, salts, organic matter loam, mica or other deleterious substances and shall be got approved from the CLIENT AND/OR ITS ARCHITECT. The sand shall not contain more than 8% of silt as determined by field test, if necessary the sand shall be washed to make it clean. The sand used by civil agency shall be used.

CABLE TRAYS

Cable trays shall be fabricated from Hot Dip GI and channels of 14 gauge and shall be powder coated with 7 tank process if specified. The design shall be ladder type with optional cover. Shall be fixed or suspended from the ceiling with the help of suspenders which shall have adequate diameter to sustain the weight of the cables and channels. Also if necessary anchor fasteners shall be used for grouting purpose.

1.1 WORKMANSHIP

The cable shall be laid side by side in trench with brick covering on all the three sides. The trench shall be such that sharp bends shall be avoided while laying the cable. The bedding of fine sand under the cable shall be not less than 6 mm. The trench shall be terminated in Manholes with specified size of R.C.C. hume pipes as shown in drawing. Cable markers shall be provided through out the route of cable at 10 mtrs distance. The trenches shall be refilled after the cable are laid and the Ground level shall be done as per original after pressing the same. The cables shall be checked for insulation resistance and continuity tests shall be carried out.

1.2 MODE OF MEASUREMENT

The cable laying shall be measured in rmt. The trenches dug and refilled shall be measured in cu. Mtr. The bricks and sand bedding shall be measured in rmt. The cable trays shall be measured in rmt.

Note:

All material and workmanship has to be as per latest IS / international standards.

DISTRIBUTION BOARDS:

1.0 SPECIFICATIONS

Distribution boards shall be fabricated from 18 gauge M.S. sheet or shall be readymade as specified in the make of material list. It shall be of double door type with hinged (lockable if required) door suitable for recessed mounting in wall. Distribution boards shall be powder coated with 7-tank process application.

The distribution boards shall be provided with phase barriers, wiring channels to accommodate wires and individual per phase neutral links. There shall be separate or individual earth link as per requirement. Proper arrangement shall be made for mounting of MCB's and other accessories.

Distribution boards shall meet with the requirements of IS 2675 and marking arrangement of bus bars shall be in accordance with I.S. standards.

Bus bars shall be suitable for the incoming switch rating and sized for a temperature rise of 35° C over the ambient. Each board shall have two separate earthing terminals. Circuit diagram indicating the load distribution shall be pasted on the inside of the DB as instructed. One earthing terminal for single phase and two terminals for 3 phase DB's shall be provided with an earth strip connecting the studs and the outgoing ECU earth bar.

The top and the bottom faces of the D.B. shall be provided for conduit entry of minimum 1" dia. The faces if asked shall be kept detachable.

All outgoing feeders shall terminate on a terminal strip which in turn is interconnected to the MCB/Fuse base by means of insulated single conductor copper wires as follows

Up to 15 A	2.5 sq.mm.	40 A	10 sq.mm.
25 A	4.0 sq.mm.	63 A	16 sq.mm.
32 A	6.0 sq.mm.		

Each DB shall have indicating lamps preferably neon type denoting power availability in the board after the switch indicating lamps shall be complete with fuses.

MINIATURE CIRCUIT BREAKERS (MCB) :

MCB's shall have quick make and break non-welding self-wiping silver alloy contacts for 10 KA short circuit both on the manual and automatic operation. Each pole of the breaker shall be provided with inverse time thermal over load and instantaneous over current tripping elements, with trip-free mechanism. In case of multi-pole breakers, the tripping must be on all the poles and operating handle shall be common. Breakers must conform to BS 3871 with facility for locking in OFF position. Pressure clamp terminals for stranded/solid conductor insertion are acceptable up to 4 sq.mm. aluminium or 2.5 sq.mm. copper and for higher ratings, the terminals shall be suitably shrouded. Wherever MCB isolators are specified they are without the tripping elements.

RCCB / ELCB

The RCCB should suffices all the requirements of IS as per code IS - 12640 - 1988. The RCA should be current operated and not on line voltage.

The RCCB should ensure mainly the following functions:

i) Measurement of the fault current value.
ii) Comparison of the fault current with a reference value.
iii) The RCCB should have a torroidal transformer witch has the main conductors of primary (P - N) which check the sum of the current close to zero.
iv) All metal parts should be inherently resistant to corrosion and treated to make them corrosion resistant.
v) It should be truly current operated.
vi) It should operate on core balance torroidal transformer.
vii) Its accuracy should be ± 5 %.
viii) It should operate even in case of neutral failure.

ix) It should trip at a present leakage current within 100 mA
x) Its enclosure should be as per IP 30.
xi) Its mechanical operation life should be more than 20,000 operations.
xii) It should provide full protection as envisaged by IE rules - 61-A, 71 - ee, 73 - ee, 1985 and also rule 50 of IE rule1956.
xiii) It should conform to all national and international standards like IS: 8828-1993, IS: 12640-1988, BS 4293 - 1983, CEE 27 (International commission Rules for the approved of electrical equipment).

1.1 WORKMANSHIP

The D.B. shall be properly grouted in the wall in concealed manner taking care that the powder coating is not scratched and dents are not formed on the D.B. The MCBs and ELCBs. In the distribution boards shall be fixed as per the circuit details provided. All the wires terminating in the MCBs and the ELCBs shall be lugged for proper contact and ferrules depicting the circuit nos shall be provided. D.B.s mounted in concealed manner shall have a groove around it so as to save the finish of the plaster and colour during future opening of the door. The distribution boards shall have circuit chart tagged on the door for future maintenance. Danger notice plates shall be fitted to the distribution boards with screws and not stuck so as to assure its presence for a longer duration.

1.2 MODE OF MEASUREMENT

The distribution boards shall be measured in nos and the MCBs and ELCBs shall be measured in numbers separately.

Note:

All material and workmanship has to be as per latest IS / international standards.

1.1 KV GRADE L.T. CABLES AND CABLE TERMINATION:

1.0 SPECIFICATIONS
L. T. XLPE CABLE*:*

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 the original drums with manufacturer's name, size and type clearly written on the drums.

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 practise.

CONDUCTOR :

Uncoated, annealed copper / aluminium, of high conductivity, upto 4 mm^2 size the conductor shall be solid and above 4 mm^2 the conductors shall be concentrically stranded as per IEC : 228.

INSULATION :

Cross link polyethylene (XLPE) extruded insulation rated at 70^oc.

CORE INDENTIFICATION :

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.

ASSEMBLY :

Two, three or four insulated conductors shall be laid up, filled with non-hygroscopic material and covered with an additional layer of thermoplastic material.

ARMOUR :

Galvanised steel flat strip / round strips applied helically in single layers complete with covering the assembly of cores.

For cable size upto 10 sq mm : Armour of 1.4 mm dia G.I. round wire

For cable size above 10 sq mm : Armour of 4 mm wide 0.8 mm thick GI strip

SHEATH :

ST -2 PVC along with polypropylene fillers to be provided.

Inner sheath shall be extruded type and shall be compatible with the insulation provided for the cables.

Outer sheath shall be of an extruded type layer of suitable PVC material compatible with the specified ambient temp. of 50^oc and operating temperature of cables. The sheath shall be resistant to water, ultra violet radiation, fungus, termite and rodent attacks. The colour of outer sheath shall be black.

Sequential length marking along with size and other standard parameters shall be required at every 1.0 mtr on the outer sheath.

TESTING:

Finished cable tests at manufacturers works : The finished cables shall be tested at manufacturer's works for all the routine tests for all the length and size of cables to be delivered at site and the certificate for the same shall be furnished to client. If required the cables shall be tested in presence of the client's representative.

Voltage test: Each core of cable shall be tested at room temperature at 3 KV A.C. R.M.S. for duration of 5 minutes.

Conductor resistance test: The D.C. resistance of each conductor shall be measured at room temperature and the results shall be corrected to 20^{o}c to check the compliance with the values specified in the Is 8130 – 1976.

Cable tests before and after laying cables at site:

Insulation resistance test between phases, phase to neutral and phase to earth.

Continuity test of all the phases, neutral and earth continuity conductor.

Earth resistance test of all the phases and neutral.

All the tests shall be carried out in accordance with the relevant IS code of practise and Indian Electricity Rules. The vendor shall provide necessary instruments, equipments and labour for conducting the above tests and shall bear all the expenses in connection with such tests. All tests shall be carried out in the presence of client and the results shall be prescribed in forms and submitted.

CABLE MARKING :

The outer sheath shall be legibly embossed at every meter with following legend :

ELECTRIC CABLE : 1100 V, SIZE :___C X ____ MM^2 with Manufacturers name, year of manufacturing and ISI symbol.

SEALING DRUMMING AND PACKING :

After tests at manufacturer's woks, both ends of the cables shall be sealed to prevent the ingress of moisture during transportation and storage.

Cable shall be supplied in length of 500 mtrs or as required in non-returnable drums of sufficiently sturdy construction.

Cables of more than 250 meters shall also be supplied in non-returnable drums.

The spindle hole shall be minimum 110 mm in diameter.

Each drum shall bear on the outside flange, legibly and indelibly in the Englist 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.

CABLE TERMINATION:

Cable terminations shall be made with aluminium crimped type solder less lugs for all aluminium cables and stud type terminals. For copper cables copper crimped solder less lugs shall be used.

Crimping shall be done with the help of hydraulically operated crimping tool.

For joints where by cable is with aluminium conductor and busbars are aluminium, bimetallic lugs shall be used with compound. CUPAL type of washers shall be used.

Crimping tool shall be used for crimping any size of cable.

CABLE GLANDS*:*

Cable glands shall be of brass single compression type. Generally single compression type cable glands shall be used for indoor protected locations and double compression type shall be used for outdoor locations.

FERRULES:

Ferrules shall be of self-sticking type and shall be employed to designate the various cores of the control cable by the terminal numbers to which the cores are connected, for ease in identification and maintenance.

CABLE JOINTS:

Kit type joint shall be done and filled with insulating compound. The joint should be for 1.1 KV grade insulation.

1.1 WORKMANSHIP

Cables shall be laid in the routes marked in the drawings. Where the route is not marked, the Contractor shall mark it out on the drawings and also on the site and obtain the approval of the CLIENT AND/OR ITS ARCHITECT before laying the cable. Procurement of cables shall be on the basis of actual site measurements and the quantities shown in the schedule of work shall be regarded as a guide only.

Cables shall be laid on walls, cable trays, inside shafts or trenches. Saddling or support for the cable shall not be more than 500 mm apart. Plastic identification tags shall be provided at every 30 m.

Cables shall be bent to a radius not less than 12 (twelve) times the overall diameter of the cable or in accordance with the manufacturer's recommendations whichever is higher.

In the case of cables buried directly in ground, the cable route shall be parallel or perpendicular to roadways, walls etc unless marked on drawing by architect / consultant. Cables shall be laid on an excavated, graded trench, over a sand or soft earth cushion to provide protection against abrasion. Cables shall be protected with brick or cement tiles on all the three sides as shown on drawings. Width of excavated trenches shall be as per drawings. Back fill over buried cables shall be with a minimum earth cover of 750 mm to 1000 mm. The cables shall be provided with cables markers at every 10 meters and at all loop points.

All cables shall be full runs from panel to panel without any joints or splices. Cables shall be identified at end termination indicating the feeder number and the Panel/Distribution board from where it is being laid. Cable termination for conductors up to 4 sq.mm. may be insertion type and all higher sizes shall have compression type lugs. Cable termination shall have necessary brass glands. The end termination shall be insulated with a minimum of six half-lapped layers of PVC tape. Cable armouring shall be earthed at both ends.

In case of cables entering the buildings. It would be done duly only through pipes. The pipes shall be laid in slant position, so that no rainwater may enter the building. After the cables are tested the pipes shall be sealed with M. seal & then tarpaulin, shall be wrapped around the cable for making the entry watertight.

Testing : MV cables shall be tested upon installation with a 500 V Meggar and the following readings established:

Continuity on all phases.

Insulation Resistance.

between conductors.

all conductors and ground.

All test readings shall be recorded and shall form part of the completion documentation.

Cable joints shall be done as per regular practice and check shall be carried out for loose connections and leakages. Insulation cutting shall be done properly taking care that no area of the conductor remains exposed. Crimping shall be done with the help of hydraulic tool. Proper insulation tape shall be applied at the cable and lug joint.

Format for cable testing certificate :

a. Drum no. from which cable is taken :

b. Cable from _____ to _____

c. Length of run of this cable _____ mtr

d. Insulation resistance test

between core 1 to earth _____mega-ohm

between core 2 to earth _____mega-ohm

between core 3 to earth _____mega-ohm

between core 1 to core 2 _____mega-ohm

between core 2 to core 3 _____mega-ohm

between core 1 to core 3 _____mega-ohm

duration used :

e. High voltage test : Voltage Duration

between core and earth

between individual cores

1.2 MODE OF MEASUREMENT

The cables shall be measured in rmt and terminations on unit basis.

Note:

All material and workmanship has to be as per latest IS / international standards.

INTERNAL WIRING

1.0 SPECIFICATIONS

RIGID PVC AND FLEXIBLE PVC FRLS LHSFT CONDUITS:

All conduits shall be rigid PVC alloy low in halogens pipe having minimum wall thickness of medium gauge 1.6 to 2.0 approved by F.I.A. & I.S.I. and shall confirm to IS 9537 part 3 and complying with fire safety standards classification V-0. The temperature stability shall be from -20^{o}c - $+80^{o}$c and also shall be uV stabilised.

Up to 38 mm diameter in slab - minimum 1.8 mm. wall thickness.

Up to 38 mm diameter in floor - minimum 2.0 mm. wall thickness.

Above 40 mm. diameter - minimum 2.2 mm. wall thickness.

Flexible conduits shall be formed from a continuous length of spirally wound interlocked steel strip with a fused zinc coating on both sides. The conduit shall be terminated in brass adapters.

ACCESSORIES:

PVC conduit fittings such as bends, elbows, reducers, chase nipples, split couplings, plugs etc. shall be specifically designed and manufactured for their particular application. All conduit fittings shall conform to IS: 2667-1964 and IS: 3857-1966. All fitting associated with galvanized conduit shall also be galvanized.

WIRES:

All wires shall be single core multi-strand/ flexible copper or single strand Copper (if specified in BOQ), PVC insulated **FRLS** grade as per IS: 694 and shall be 660 V\1100 V.

All wires shall be colour coded as follows:

Phase	**Colour of wire**
R	Red
Y	Yellow
B	Blue
N	Black
Earth	Green (insulated)
Control (If any)	Grey

All off wires Same as Phase wire

SWITCHES & SOCKETS:

Switches shall be modular type with silver-coated contacts. Sockets shall be 5 pins with switch and plate type cover. Combination of multiple switch units and sockets should be used to minimize the switch boxes.

For heavy duty, metal clad sockets with M.C.B / Isolator mounted in a galvanized steel box shall be provided.

SWITCH PLATE AND BOX:

Plates of the same make, as that of switches shall be used with the modular range. Also M.S. boxes shall be taken as switch boxes.

1.1 WORKMANSHIP

The size of conduit shall be selected in accordance with the number of wires permitted under table given below. The minimum size of the conduit shall be 25 mm diameter unless otherwise indicated or approved. Size of wires shall not be less than 1.0 sq.mm. Copper or 2.5 sq.mm. Aluminium.

Nominal Dia of wires (mm)	Nominal Cross sec. Area (mm^2)	20 mm		25 mm		32 mm		38 mm	
		S	B	S	B	S	B	S	B
1/2.40	1.50	4	3	8	6	15	9	--	--
1/1.80	2.50	4	2	6	4	10	8	--	--
1/2.24	4.00	2	2	4	3	8	6	--	--
1/2.80	6.00	1	--	4	3	6	6	--	--
1/3.55	10.00	1	--	3	2	5	4	6	5

S - runs of conduits which have distance not exceeding 4.25 m. between draw boxes & which do not deflect from the straight by an angle more than 15 degree.

B - runs of conduits, which deflect, from the straight by more than 15°.

Conduits shall be kept at a minimum distance of 100 mm. from the pipes of other non-electrical services. And maintain minimum 300 mm distance between telephones, TV & Computer piping.

Separate conduits/raceways shall be used for :

Normal lights and 5 A 3 pin sockets on lighting circuit.

Separate conduit shall be laid from D.B. to switch board.

Power outlets - 15 A 3 pin 20 A/30 A, 2 pin scraping earth metal clad sockets.

Emergency lighting.

Telephones.

Fire alarm system.

Public address system & Music system.

For all other voltages higher or lower than 230 V.

T.V. Antenna.

Water level guard.

Computer Wiring

Wiring for short extensions to outlets in hung ceiling or to vibrating equipments, motors etc., shall be installed in flexible conduits. Otherwise rigid conduits shall be used. No flexible extension shall exceed 1.25 m.

Conduits run on surfaces shall be supported on metal 12 mm. thick G.I. pressure saddles which in turn are properly screwed to the wall or ceiling. Saddles shall be at intervals of not more than 500 mm. Fixing screws shall be with round or cheese head and of rust-proof materials. Exposed conduits shall be neatly run parallel or at right angles to the walls of the building. Unseemly conduit bends and offsets shall be avoided by using fabricated mild steel junction/pull through boxes for better appearances. No cross-over of conduits shall be allowed unless it is necessary and entire conduit installation shall be clean and neat in appearance.

Conduits embedded into the walls shall be fixed by means of staples at not more than 500 mm. intervals. Chases in the walls shall be neatly made and refilled after laying the conduit and brought to the finish of the wall but the building Contractor will do final finish.

Conduits buried in concrete structure shall be put in position and securely fastened to the reinforcement and got approved by the CLIENT AND/OR ITS ARCHITECT, before the concrete is poured. Proper care shall be taken to ensure that the conduits are neither dislocated nor choked at the time of pouring the concrete suitable fish wires shall be drawn in all conduits before they are embedded.

Where conduit passes through expansion joints in the building, adequate expansion fittings shall be used to take care of any relative movement.

Inspection boxes shall be provided for periodical inspection to facilitate withdrawal and removal of wires. Such inspection boxes shall be flush with the wall or ceiling in the case of concealed conduits. Inspection boxes shall be spaced at not more than 12 meters apart or two 90° solid bends or equal. All junction and switch boxes shall be covered by 6 mm clear plate. These junction boxes shall form part of point wiring or conduit wiring as the case may be including the cost of removing the cover for painting and re-fixing. No separate charges shall be allowed except where specially mentioned.

Conduits shall be free from sharp edges and burrs and the threading free from grease or oil. The entire system of conduits must be completely installed and rendered electrically continuous before the conductors are pulled in. Conduits should terminate in junction boxes of not less than 32 mm. deep.

An insulated earth wire of copper rated capacity shall be run in each conduit.

Lighting & Power Wiring :

All final branch circuits for lighting and appliances shall be single conductor/ stranded/ flexible wires run inside conduits. The conduit shall be properly connected or jointed into sockets, bends, and junction boxes.

Branch circuit conductor sizes shall be as shown in the schedule of quantities and or drawings.

All circuits shall preferably be kept in a separate conduit up to the Distribution Board. No other wiring shall be bunched in the same conduit except those belonging to the same phase. Each lighting branch circuit shall not have more than ten outlets or 800 watts whichever is lower. Each conduit shall not hold more than three branch circuits.

Flexible cords for connection to appliances, fans and pendants shall be 650/1100 V grade (three or four cores i.e. with insulated neutral wire of same size) with tinned stranded copper wires, insulated, twisted and sheathed with strengthening cord. Colour of sheath shall be subject to the CLIENT AND/OR ITS ARCHITECT'S approval.

Looping system of wiring shall be used. Wires shall not be jointed. Where joints are unavoidable, they shall be made through approved mechanical connectors. No such joints shall be made unless the length of the sub-circuit, sub-main or main is more than the length of the standard coil.

Control switches shall be connected in the phase conductors only and shall be `ON' when knob is down. Switches shall be fixed in 3 mm. thick painted or galvanized steel boxes with cover plates as specified. Cadmium plated brass screws shall be used.

Power wiring shall be distinctly separate from lighting wiring. Conduits not less than 25 mm. and wires not less than 2.5 sq.mm. copper shall be used.

Every conductor shall be provided with identification ferrules at both ends matching the drawings.

Testing: the entire installation shall be tested for :

Insulation resistance.

Earth continuity.

Polarity of single pole switches.

General: All the wiring switch board, outlet points shall be done in a concealed manner in wall & slab in PVC conduit of minimum 25 mm dia. (medium gauge) & with 650v / 1100v grade PVC insulated flexible copper conductor wire. The switches should be modular with moulded cover plates, blank plates for outlet boxes. The accessories, connectors, sockets, should be fixed

with brass chrome / cadmium plated machine screw. For fan points the rates should be with hum -free type 300 W regulators as required to complete the point wiring. The wiring shall be as per IS: 732 and IS: 4648. The wiring shall be done in a looping manner so as to avoid junction boxes at any place. All the looping shall be done only in the switchboard and outlet points. The size of the wire shall be as per the specification. Colour code shall be strictly followed.

The size of wires shall as follow :

25-32 Amp. metal clad points:

Phase / Neutral 4.0 mm^2

Earth 2.5.0 m m^2

20 Amp. out let points :

Phase / Neutral 4.0 m m^2

Earth 2.5 m m^2

Two nos. of 15 Amps. socket out let connected in parallel

from DB to first outlet

Phase / Neutral 4.0 m m^2

Earth 2.5 m m^2

from first outlet to second outlet.

Phase / Neutral 2.5 m m^2

Earth 2.5 m m^2

Light, fans, exhaust fan, 5 Amp. On board plug point, two way light points, bell point etc from switch to outlet.

Phase / Neutral 1.5 m m^2

Earth 1.0 m m^2

From D.B. to switch board – lighting / 5 A socket etc – i.e. circuit mains part of point wiring

Phase / Neutral 2.5 m m^2

Earth 1.5 m m^2

15/20 Amps. Socket outlet for AC (Single Phase/Three Phase) / Geyser

Phase / Neutral 2.5 m m^2

Earth 1.5 m m^2

15/20 Amps. Socket outlet for appliances or looped from sockets with 4 sq mm ckt.

Phase / Neutral 2.5 m m^2

Earth 2.5 m m^2

Separate pipes shall be laid for off wires and circuit mains.

Circuit mains of same phase shall be drawn in one pipe with prior permission/discussion with the consultant.

Separate phase, neutral and earthing wire of sizes recommended by consultant shall be drawn for each and every circuit mains.

Mains for lighting and on board plug points shall be of one-size higher wires than those used in off.

The point definition shall be conduiting and wiring from D.B. to S.B. and there from to final outlet point including switches and accessories, junction boxes, fan boxes, zarri work with cement –sand etc of approved make.

1.2 MODE OF MEASUREMENT

The items shall be measured on unit basis or on mtr basis as per BOQ.

Note:

All material and workmanship has to be as per latest IS / international standards.

LED LIGHT FIXTURES & FANS

1.0 SPECIFICATIONS

General Purpose Led Luminaries suitable for Office /Industry / Street Light applications. The Fixtures should be Operational for 220-240 V Single Phase 50 HZ AC , and operational from 170-280 V without significant drop in output .T he LED modules should be from Cree/Nichia/Philips Lumi Leds Only with efficiency of a min 130 lm/watt and efficacy of fixtures should be greater than 80 lm/w for both indoor and outdoor fixtures, built with Integral driver . The Min degree of Protection for Indoor Fixtures should be IP20 and IP65 for Outdoor/ Semi Indoor Fixtures. The THD of Fixtures should be strictly <10 % and drivers should be compulsarily provided with miswiring/ overload and short circuit protections .For Indoor applications the housing should be made of die cast/ Metal Housing and diffusers should be polycarbonate only, out door fixtures should be with die aluminum / extruded aluminum housing only .The Fixtures should be prewired upto the terminal block and easy to mount and Install and maintain if necessary. The fixture should comply LM79-08 certification criteria and also module should be backed with LM80-08 Certificate from the OEM. The fixtures should be warranted for a period of 3yrs from the date of Installation . The fixtures should have some kind of embossing/ engraving to identify the brand name . The manufactures should provide all kind of test report , technical details as and when called for . The fixture may be tested from govt approved Lab for Claimed parameters by the manufacturer.

1.1 WORKMANSHIP

The fixture shall be installed on wall / ceiling as directed and as per manufacturer's instruction, with necessary accessories for surface, concealed, suspended from ceiling, bracket

mounting etc. The job also includes connection of fixture with respective outlet point with heat resistant wires through heat resistance sleeve and PVC connector. The exhaust fan shall be installed complete with M.S. angle iron mounting frame/ ring, G.I. louvers, wire mesh and plug at the end of the cord including wiring & earthing etc. Proper earthing shall be provided to the fixtures.

1.2 MODE OF MEASUREMENT

The unit rate shall be considered for fitting one fixture. The rate shall include following

All fixing accessories, mounting bracket, ballast condensers and control gear wherever applicable.

Supplying and fixing Ball and socket joints wherever required.

Earthing of fittings.

Electrical connections to fittings/fans from the junction box/ceiling rose.

Installation and interconnection of Electronic regulators for ceiling fans.

Supplying and fixing 300 mm. GI down rod for ceiling fans.

Note:

All material and workmanship has to be as per latest IS / international standards.

EARTHING

1.0 SPECIFICATION

EARTH ELECTRODES

The earth electrode is the main component of the earthing system, which is in direct contact with the ground and, thus provides a means of releasing or collecting any earth leakage currents. In earthed systems, it will normally be required to carry quite a large current for a short period and so will need to have adequate mechanical and electrical properties to continue to meet the demands on them over a relatively long period, during which actual testing or inspection is difficult. The material should have good electrical conductivity and should not corrode in a wide range of soil conditions.

Galvanized steel, Copper, and Stainless steel are generally the preferred material. Aluminum is sometimes used for above ground bonding, but most of the standards forbid its use as an earthing electrode, due to the risk of accelerated corrosion. The corrosive product which is the oxide layer on the electrode is non-conductive in nature, so could reduce the effectiveness of the earthing.

The heavy flat strip is placed inside the bigger dia. pipe and the annular space between the two is filled with a special type of conductive, non-corrosive Backfill Compound. The completed Earth Electrode is heavily electroplated externally as per UL standards to enhance the life of the Electrode susceptible to corrosion (depends on the soil conditions). The water is used once during installation and fitting, and then the moisture is retained by the compound, throughout its life eliminating the use of water in regular intervals.

PROPER INSTALLATION METHOD : The Earthing Electrode can be installed by any one of the following methods depending on the soil condition.

Normal Soil:

Make a bore of 8" to 10" in diameter manually up to the electrode length (2 Mtr or 3 Mtr). Put a little quantity of Back Fill Compound (a layer of min. 3 to 4 inch) inside the pit and drop the electrode exactly in the center of the pit. Now mix the soil that has been dug out with the B.F.C. (conductive and non corrosive mixture) eliminating the stones, rocks and other bigger shapes. Now pour the above mixture in small quantity in to the pit followed by water and remove the trapped air inside the pit by poking a rod in to the mixture repeatedly. Repeat the above exercise till the pit is completely filled up. Pour sufficient water so that mixture is in paste /mud form. Al low the pit to stand for 24 hrs. and absorb the water and becomes compact. Test the earth pit and connect to the electrical circuit. Avoid excess watering. **Do not hammer the earth electrode.**

Sandy Soil:

Make a big pit of 06' x 06' and 11' deep; fill the entire pit with black cotton soil or normal soil, pour enough water so that pit is full with water, leave it for three days so that soil soaks up the water. You will notice that soil level has gone down and again top up the pit with soil & fill the water. Now after two or three days this pit is ready for earthing purpose and our earthing can be installed there by above described normal method, that will definitely give you a very good earth resistivity value. However, if the pit is filled with BFC mix soil then that will show better earth resistance value. These types of installations may needs regular watering after certain intervals that depends on the characteristics of the soil described in the "Factors determining the soil resistivity". It is to be noted that more than one earth electrode may be required to be installed and connected in parallel to bring down the earth resistance value with in safe limits.

Semi-Rocky Soil:

If enough soil is there then earthing can be done by normal method otherwise that can be done by making a big pit as in case of sandy soil. Ours is a corrosion resistant, long life and almost maintenance free earthing system in normal soil conditions & if installed properly it will give better earth resistivity value than conventional earthing system throughout there life. It is a Fit & Forget earthing system. However, these types of installations may needs regular watering after certain intervals that depends on the characteristics of the soil described in the "Factors determining the soil resistivity". It is to be noted that more than one earth electrode may be required to be installed and connected in parallel to bring down the earth resistance value with in safe limits when done on ROCKY SOIL.

BACK FILL COMPOUND (BFC)

In all cases, the backfill medium should be conductive but non-corrosive in nature, be of a relatively small particle size and should, help to retain moisture for a considerable period of time. More often than not the previous excavated soil is suitable as a backfill, but should be sieved to remove any large stones and rubbles and placed around the electrode, taking care to ensure that it is well compacted. The soil should maintain a pH value between 6.0 (acidic) to 10.0 (alkaline). Normal stiff clay is not a suitable backfill material as, if heavily compacted; it may become almost impervious to water and could remain relatively dry. It may also form large lumps, which do not consolidate around the electrode avoiding to make good contact with soil to the electrode itself.

BFC, (back fill compound) is a specially developed compound, which is capable of absorbing and retaining the moisture for a long time, it reduces the soil resistivity, it helps in faster dissipation of fault current, least fluctuation of Ohmic value and it eliminates the use of Salt, Charcoal etc. around the Earthing Electrode. It has low solubility, hence is not easily washed away, and has a low resistivity (approximately 5-10 Ohm-meters in a saturated solution). It is virtually neutral, having a pH value of between 6.2 and 6.9. should not generally cause environmental difficulties in use.

1.1 WORKMANSHIP

Following points shall be followed strictly.

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 (Hot dip G.I. strips) inside the building shall properly be clamped / supported on the wall with Galvanized 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.

Additional equipment earthing shall be done with Cu strip / Bare Cu Wire as per size indicated in drawing.

Lightening arrestors shall be installed at topmost point of the building. The quantity for the same shall be designed & specification in BOQ to cover total building area. Finial type arrestor shall be used with Cu pipe & Cu base plate. The arrestor / base plate shall be connected to separate earth pit with Cu Strip.

Following tests shall be carried out:

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.

Each earthing station

Earthing system as a whole

Earth continuity conductor

Earth conductor resistance for each earthed equipment 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.

1.2 MODE OF MEASUREMENT

Earthing stations shall be measured in units whereas earthing strips and wires shall be measured in rmt.

Note:

All material and workmanship has to be as per latest IS / international standards.

Lightening Arrestor

SCOPE

This specification covers the requirement of Design, supply, installation, testing and commissioning of lightning protection system. Vendor has to submit first design of Lightening arrestor system & submit to client / consultant for approval.

1 General

a) The Advanced Lightning Protection system shall include components as follow: air-termination(s), mechanical support(s), down-conductor(s), performance recording equipment(s) (optional) and a low impedance grounding system.
b) Installation procedures of the entire lightning protection system shall be governed by the IS: 2309, the IEC 61024, NFC17-102, UNE-21186 and UNE-EN-50164-1 standard. The manufacturer of the air-termination shall provide designs and instructions for the installation as per the former standards.
c) Prior to the installation of the system, a risk assessment survey shall be conducted to determine: the level of protection required for the structure (according to standards) and the adapted solution and design to be chosen.
d) The Advanced lightning protection system shall be mounted adequately rated for wind shear loading. Guying kits shall be provided as appropriate to local environmental conditions, or based on mast arrangement selected.
e) Each air terminal must be connected to the earth termination system by at least one-down-conductor. Two down-conductors are required when a) The horizontal projection of the conductor is larger than its vertical projection, b) When the structure is higher than 28m.

e2 Air termination

a) Manufacturing process of the air-terminal shall be ISO: 9001 certified

b) The air terminal shall have been tested in a High-Voltage laboratory with a standardized waveform: 8/20µs or 10/350µs.
c) The protection area of the air-terminal shall be determined using an acceptable method given in the following standards IS: 2309, IEC62-305 (Rolling Sphere Method), and NFC17-102 (Early Strimer Emission).
d) The air terminal shall be made of non-corrosive materials. It shall be equipped with a central rod made of copper, copper alloy or stainless steel.
e) The rod and the air-terminal tip shall have a conductive cross-sectional area larger than 120mm².
f) Lightning Air Terminal - Configured as a Spheroid which is comprised of separate electrically isolated 4panels surrounding an Earthened Central Finial. The upper section of the central finial shall be rated to withstand 200KA. The Insulation material used to electrically isolate the panels shall be comprised of base polymer which provides high Ozone & UV resistance with a di-electric strength of 24-38KV/mm & ESE terminal shall withstand a minimum Switching Impulse Voltage of 500KV tested as per NFC 17-102 & IEC Test Standard - IEC60-1:1989.The air-terminal shall guarantee a full electrical continuity between the tip and the down-conductor
g) The air-terminal shall be able to support a 200kA current or more
h) No external power supply shall be required
i) The air-terminal shall be active only during a storm
j) The air-terminal shall ensure the emission of a streamer (ionisation of the air around the tip) when a lightning strike is occurring in the protection area claimed
k) The intensity and potential of the streamer shall be controlled by the air-terminal to ensure sufficient values (above 10A and 2000V) so it can develop properly and intercept the lightning
l) The air terminal shall emit a streamer only when a lightning strike is occurring (provoking lightning strikes can induce surges!!!)
m) Performances of the air-terminal shall not be affected by extreme climatic conditions

3 Air termination support

The air terminal support shall consist of a minimal 5 meters Galvanized steel (GI), Powder Coated or steel elevation pole with a minimal diameter of 50 mm. The mast having arrengment for fixing of air terminal on the top.

The air termination support shall be fixed securely on the structure to enable the air termination and mast system to withstand maximum locally recorded wind velocities. Guy wires might be necessary to secure the system properly.

4 Down-conductor

a) Down-conductors consist of strips, braided cables or round sections.
b) Materials to be used: insulated multi-strand copper (recommended) suitable for 1.1KV insulation.
c) Minimal cross-sectional area must be 70mm²
d) Down conductors shall be routed to the earth termination as direct as possible. Sharp bends and upward sections (40cm max with a 45° slope max are acceptable) are to be avoided.
e) Down conductors shall be attached on the basis of three fixing per metre
f) Down conductors shall eventually be protected against the risk of impact by installing sleeves up to height of 2m above ground level

g) The down conductors shall be directly connected to the base of the air terminal and to the earth termination system by the mean of a test clamp.

5 Earth Termination

a) One earth termination system is to be provided for each down-conductor
b) Resistance value should be 10 ohms or less (5 ohms or less when the structure contents sensitive materials). Minumum Resistance should be achieved by using earth enhancing compound and these compound should hold and absorb the moisture for long life and does not required regular recharging of earthing system.
c) Material to be used: Bare or tin-plated copper (recommended), or stainless steel.
d) Bonding of the earth termination to the electrical earth of the building, to metallic parts of the building, to the structural reinforcing steel of the building and to arriving services is strongly recommended.

6 Performance recording equipment

a) Each protection system shall be supplied with a lightning strike recorder.
b) The lightning flash counter shall register a strike for every discharge where the peak current exceeds 1500A
c) The lightning flash counter shall have been tested and certified in a high-voltage laboratory with a 8/20μs or 10/350 μs waveform.
d) The lightning flash counter shall be installed directly on the down-conductor and as per the manufacturer instructions

7 Earthing of Air Terminal

a) Air terminal shall be connected to Maintenance free earthing Suitable i.e. (5/8””dia and 3 meter long copper bonded earth rod).
b) Maintenance free Earthing shall be based on copper bonded earth rod minimum copper bonding of 150 micron.
c) Suitable quantity shall be used of Back fill compound (Moisture Holder) as recommended by manufacturer and these earth enhancing compound should hold and absorb the moisture for long life and does not required regular recharging of earthing system.
d) Each earth pit shall be covered with using CI Cover of 12” X 12’ of GI with 6/7 mm thick.

8 Test Joint

a) Each Down conductor shall be incorporated a Test Joint, which allows disconnecting the earth electrode and thus allows to measuring its resistivity. The test joibt shall be mounted 2 meter above the ground.

9 Maintenance

a) As per the standards (IS: 2309, IEC 62-305 and NFC 17-102), the lightning protection system shall be inspected at least every 2 years.
b) A visual inspection shall be performed to make sure that: a) No extension or modification of the protected structure calls for the installation of additional

lightning protective measures, b) the electrical continuity of visible conductors is correct, c) all components fasteners and mechanical protectors are in good condition, d) no parts have been weakened by corrosion

c) Measure of the earth termination resistance shall be realized to ensure it is still below 10 ohms (or 5 ohms) Air termination system shall be checked to ensure a) It is still properly connected to the down conductor(s), b) The tip has not melt, c) The system is still in operating conditions d) It is still properly installed on the support and it can withstand high wind velocities (relatively to the local conditions).

Note:

All material and workmanship has to be as per latest IS / international standards.

TELEPHONE AND NETWORKING SYSTEM

1.0 SPECIFICATIONS

TELEPHONE CABLES AND WIRES:

The type of cables and the services shall be as follows:

Indoor – Multipair PVC sheath armoured / un-armoured as specified 0.6 mm tin Cu. Cable.

Outside -- Multipair PVC sheath armoured / jelly filled as specified 0.6 mm tin Cu. Cable.

All multi core cables and wires shall be of tinned copper conductor of not less than 0.6 mm dia and shall be colour coded twisted pairs with rip cord.

The conductor resistance shall be less than 150 ohms per KM and the insulation resistance between the conductors not less than 50 mega ohms and the nominal capacitance of about 0.1 microfarad per kilometre.

Cables laid under ground or locations subject to dampness and flooding shall be filled with polyethylene compound and shall have sufficient protection against moisture and water ingress.

All armouring shall be of galvanized steel wires and protected against corrosion by an outer sheath of PVC in the case of indoor cables and polyethylene in the case of outdoor cables. Outer sheathing must be fire retarding and anti-termite.

All un-armoured single core cables and inner sheath of armoured cables shall be provided with ripcord.

TELEPHONE TAG BLOCKS:

The telephone tag blocks shall be suitable for the multi core telephone cables and shall have two terminal blocks, cross connect type. All incoming and outgoing cables shall be terminated on separate terminal blocks and termination shall be silver soldered. The cross connecting jumpers shall be insulated wires of same diameter and screw connected.

The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosure shall be painted with 2 coats of red oxide and stove enamelled.

TELEPHONE OUTLET SOCKET:

Telephone outlet socket shall be of the same make as that of the switches and accessories. The outlet sockets shall consist of 2 A 2 Pair polyethene connector in M.S.I / PVC boxes with switch plate of the same make as that of switches and telephone socket. The telephone outlet socket unless and otherwise specified shall be jack type and not pin type.

COMPUTER WIRES :

The computer wires shall be of 4 pair enhanced Cat 5 category and shall be of the makes as specified in the tender. The wires used shall be as per the specifications laid down by AVAYA for the certification of the network installed.

COMPUTER DATA OUTLET SOCKETS:

The computer sockets shall be of e Cat 5 category and of the make specified in the tender. The sockets shall be installed in the plates of the modular switches range to be used. The sockets shall be crimped using crimping tool with the Cat 5e wire.

For clean room application the plates shall be of SS 316 with no sharp edges.

FLOOR RACEWAY :

Floor raceway of hot dip galvanised / aluminium sheet of 14 g / 2.0 mm shall be used and the dimensions for the same shall be as per the BOQ. The raceways shall be as per the make specified in the tender. The raceways shall be free of any sort of welding edges or other sharp edges to protect cutting of wires during pulling. The raceways shall be laid with use of junction boxes fabricated from 14 g hot dip GI as per drawing.

PABX SYSTEM :

Features	**Required or Not**
Technology	PCM TDM
KTS Support	Yes
ISDN BRI & PRI	Yes
E & M Support	Yes
E1 Support	Yes
Hybrid technology	Yes
External Caller ID display on console and Key phone	Yes

External Music	Yes
Paging Port	Yes
Conference facility	Yes-8 Party
Memory Storage	32 MB Secure Digital (SD) RAM
DISA Card	Yes. 4 Port. 64 different messages. 8 minutes storage
DOSA Feature	Yes
VoIP	Yes. Open Industry standard
System connectivity	V.24 Port and USB Port built in on system
Range of Key phone	Yes
Auto Redial on Key Phones	Yes
Back Lit Key Phones	Yes
USB/Comp. connectivity on Key phones	Digital-XDP. Also USB
No. of keys on Key Phones	9 to 37 keys
DSS Connectivity	60 keys
Supports PC Console	Yes
OHCA on Key Phone	Yes
Jog Dialler/Navigator Keys	4 Navigator Keys
Absence messages	Yes. On Key phones and also simple phones
Incoming call routing based on caller ID	Yes

Two way recording of external call	Yes
Personal greeting to external caller	Yes
MS Outlook integration	Yes
POP UP of incoming caller	Yes
WEB Site/URL integration	Yes
Call details/log of incoming callers	Yes
Tenant Facility	Yes
System modes	3. Day, night and lunch
Appointment reminders	Yes
19 inch variants	Yes

Passive Cabling and Components

- All category 6 UTP cables shall comply with TIA/EIA 568B Category 6 and ISO/IEC 11801 Class E Standard.
- The Category 6 Cable should consist of 4 pair of solid insulated Conductor: 23 AWG Annealed bare solid copper.
- The Category 6 Cable should provide a significant margin above the minimum Category 6 Near End Crosstalk.
- Standard Length : 305 Meters (1000 Feet)
- 4 Pair Twisted Cable
- Support for Fast and Gigabit Ethernet, IEEE
- 802.3/5/12, Voice, ISDN, ATM 155 and 622 Mbps.
- Core Color:
- Pair 1 : White – Blue
- Pair 2 : White – Orange
- Pair 3 : White – Green
- Pair 4 : White – Brown
- Approx. Cable OD: 6.5 mm
- Operating Environment: Indoor
- Electrical Specification: (at 550 MHz)
- Standards: TIA / EIA 568 B.2-1
- Impedance: 100 +/- 15 ohm

- All Category 6 Patch cords shall comply with TIA/EIA 568 Category 6 Standard.
- Should conform or exceed the EIA/TIA 568 B standards for CAT 6 Factory molded boots on RJ 45 plugs at both ends.

- Patch cords should compliance with Cat 6 standards of ISO/IEC 11801,
- Patch cords should EIA/TIA 568, EN50173 and UL, ETL, 3P.
- The Length should not be exceed more then 3 feet/1m
- The Jacketing on all Category 6 Patch Cord Shall be UL Rated.

- All Category 6 Patch cords shall comply with TIA/EIA 568 Category 6 Standard.
- Should conform or exceed the EIA/TIA 568 B standards for CAT 6 Factory molded boots on RJ 45 plugs at both

  ends.

- Patch cords should compliance with Cat 6 standards of ISO/IEC 11801,
- Patch cords should have EIA/TIA 568, EN50173 and UL, ETL, 3P.
- The Length should not be exceed more then – 7 feet/2m
- The Jacketing on all Category 6 Patch Cord Shall be UL Rated.

- I/O module have Screw cap design for better looking fronts.
- Suitable for use with all RJ45 installations including CAT5, CAT 5e and CAT6.
- RJ-45 sockets With Blanking spacer if required.
- I/O module should have Surface Single / Dual Shutter outlet with back box.
- I/O module should have Single Gang
- I/O module should have PVC-U Molded
- I/O module should be facilited with Tough shatter resistant PVC
- It should be Designed for ease of use
- I/O module should have Square in Size
- I/O module should have Uncluttered internal design

- Patch Panel Should have Rack Mount arrangement.
- Patch Panel should have RJ45 female ports on front - 110 type wire termination blocks on back.
- Patch Panel should have 24 Port-Loaded with cable Manage
- Patch Panel should be Compatible with 23 - 24 AWG solid Conductor UTP cable.

- Patch Panel Should conform or exceed the EIA/TIA 568 B.2-1 standards for CAT6

- It should be Fully Compatible with Gigabit Ethernet.
- Patch Panel have Metallic high strength and 1RU height, Should have routing rings, ties, labeling strips for identification.

- Patch Panel Should have protection on each port to protect from dust ingress and such particles by having shutter or cap.

Layer 2 24 port Gigabit Managed stackable Switch

1) Switch shall support maximum of 24-port 10/100/1000T ports
2) Should support additional 2 # Gigabit ports for connecting to sever and Inter switch connectivity
3) Shall support 4 Shared SFP slots to load 1000T/ 1000SX/ 1000LX/ 1000LHX/ 1000ZX/ 100FX fiber ports
4) Should comply to IEEE 802.3, IEEE 802.3u, IEEE 802.3ab and IEEE 802.3z with auto MDI/MDIX function
5) 100FX should be supported with out any external media converter

6) Store and forward technology
7) Should support 108Gbps switching fabric
8) Should support minimum 35.7 Mpps forwarding rate
9) Port mirroring
10) 9k jumbo frame
11) Broadcast storm control
12) IEEE 802.3x flow control

13) Should be stackable in nature
14) Either hardware based or IP based clustering with minimum 2 # additional 1G or 10G ports on-board excluding 24 ports.
15) Should support min 32 units per stack
16) Single IP management - The entire stack should be managed with Single IP

17) Should support VLAN as per IEEE 802.1Q
18) 255 LAN groups and 4K VLAN IDs
19) Port based VLAN
20) Private VLAN
21) IP subnet VLAN
22) Protocol based VLAN as per IEEE 802.1v
23) Voice VLAN
24) MAC VLAN
25) Q-in-Q
26) GVRP

27) IGMP snooping - v1/v2/v3
28) IGMP fast leave
29) MLD v1/v2 Snooping

30) IEEE 802.1d spanning tree
31) IEEE 802.1w rapid spanning tree
32) IEEE 802.1s multiple spanning tree
33) bpdu guard
34) root guard

35) IEEE 802.3ad link aggregation - LACP
36) Support 32 trunk groups and 8 ports per trunks

37) Should IEEE 802.1p based QOS
38) Classification based on ACL stream, VLAN ID, COS, IPv4 TOS precedence, IPv4 DSCP and IPv6 DSCP.
39) Granular rate limiting with limiting 64Kbps per port
40) SP - Strict priority
41) WRR weighted round robin
42) SWRR – Combination of SP + WRR

43) Sflow
44) RADIUS and TACACS+
45) Access control list with IP based ACL, MAC Based ACL and IP + MAC combination based ACL
46) IP source guard
47) Anti-Dos attacks
48) IEEE 802.1x port based security
49) IEEE 802.1X and MAC based authentication and IP+MAC+VID binding for different access clients
50) Management control by AAA and CPU processed traffic control
51) Anti ARP attack, ARP rate limit
52) Anti ICMP packet attack
53) Ring redundancy protocol

54) Static routing support
55) Should support minimum 512 static routers

56) IPv4/IPv6 Dual Protocol Stack
57) Internet Protocol, Version 6 (IPv6) Specification (RFC2460)
58) IPv6 Unicast Address Types
59) IPv6 Multicast Address Types
60) ICMPv6 Redirect
61) IPv6 Stateless Auto Configuration as per RFC2462
62) IP Version 6 Addressing Architecture (RFC2373)
63) An IPv6 Aggregatable Global Unicast Address Format (RFC2374)
64) Reserved IPv6 Subnet Anycast Addresses (RFC2526)
65) Internet Protocol Version 6 (IPv6) Addressing Architecture (RFC3513)
66) Transmission of IPv6 Packets over Ethernet Networks (RFC2464)
67) DHCPv6 Server
68) IPv6 VLAN registration
69) IPv6 Multicast with MLD v1/v2 snooping support
70) SNMP over IPv6
71) HTTP over IPv6
72) SSH over IPv6
73) DNS over IPv6

74) IPv6 Ping/tracert
75) IPv6 Telnet Support
76) IPv6 DNS Resolver
77) IPv6 RADIUS+ Support
78) IPv6 Syslog Support
79) IPv6 SNTP Support
80) IPv6 NTP
81) IPv6 FTP/TFTP Support
82) IPv6 sFlow

MIBs:

Should support the following MIB's

83) Bridge MIB
84) Ether-like MIB,
85) RFC2011 IP/ICMP MIB,
86) RFC2012 TCP MIB
87) RFC2013 UDP MIB
88) RFC2096 ip forward mib
89) RFC2233 if MIB
90) RFC2452 TCP6 MIB
91) RFC2454 UDP6 MIB
92) RFC2465 IPv6 MIB
93) RFC2466 ICMP6 MIB
94) RFC2573 SnmpV3 notify
95) RFC2574 SNMPV3
96) RFC2674 Bridge MIB Extensions (IEEE802.1Q MIB)
97) RFC2674 Bridge MIB Extensions (IEEE802.1P MIB)

98) FTP/TFTP based Firmware upgrade
99) Dual Firmware support
100) SNMP v1/v2/v3
101) Should support SNMP user IP security check
102) Syslog support
103) Industrial standard CLI based management
104) Telnet management
105) Web based GUI bases management

106) OEM should have a toll free no
107) OEM Should have service center in India.
108) OEM should have direct presence in India atleast for 10 Years.
109) OEM should have ISO 14001 Certificate.
110) OEM should have warehouse in India.

Layer 2 48 port Gigabit Managed stackable Switch

Specification for Layer 2 48 port Gigabit Managed stackable Switch

111) Switch shall support maximum of 48-port 10/100/1000T ports
112) Should support additional 2 # Gigabit ports for connecting to sever and Inter switch connectivity
113) Shall support 4 Shared SFP slots to load 1000T/ 1000SX/ 1000LX/ 1000LHX/ 1000ZX/ 100FX fiber ports
114) Should comply to IEEE 802.3, IEEE 802.3u, IEEE 802.3ab and IEEE 802.3z with auto MDI/MDIX function.
115) 100FX should be supported with out any external media converter

116) Store and forward technology
117) Should support 108Gbps switching fabric
118) Should support minimum 74Mpps forwarding rate
119) Port mirroring
120) 9k jumbo frame
121) Broadcast storm control
122) IEEE 802.3x flow control

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217) OEM Should have service center in India.
218) OEM should have direct presence in India atleast for 10 Years.
219) OEM should have ISO 14001 Certificate.
220) OEM should have warehouse in India.

8.1 WORKMANSHIP

All cables shall be on cable racks and neatly stitched together.

The connection at the tag blocks shall be silver soldered so as to achieve minimum contact resistance.

The final branch connections with single pair cables in conduits and the maximum number of cables in each conduit shall be as follows:

Conduit	diameter	Max. No. of cables
Inch	mm.	
3/4"	20	2 Nos. single pair
1"	25	6 Nos. single pair
1¼"	32	12 Nos. single pair
1½"	40	18 Nos. single pair

The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosure shall be painted with 2 coats of red oxide and stove enamelled.

8.2 MODE OF MEASUREMENT

The wires, conduits and raceways shall be measured in rmt whereas the outlet sockets, junction boxes and tag blocks shall be measured in units.

J. CCTV CAMERA

9.1 General

The work under this system shall consist of design, supply, installation, testing, training & handing over of all materials, equipment's and appliances and labor necessary to commission the said system, complete with Hi-Speed Dome Cameras, Vandal resistant varifocal dome camera, Digital Video Recorder and Monitor. It shall also include laying of cabling, necessary for installation of the system as indicated in the specification and Bill of Quantities. Any openings/chasing in the wall/ceiling required for the installation shall be made good in appropriate manner.

9.2 Equipment

The CCTV System shall comprise of Fixed dome camera, Day/Night camera, Digital Video Recorder, power supply.

Fixed IR Dome Camera:

The Dome camera unit shall be 1/2.7" 1Megapixel CMOS type Color and shall provide a minimum resolution 25/30fps@720P. Camera shall support 2.45, 3.6, 6, 8, 12 mm any size of lens, standard with 3.6mm. Camera has min illumination 0.01Lux@F1.2(AGC ON),0Lux IR on with low lux image capture, ultra clear image with noise free image at same illumination. HavingSmart IR LED.The complete unit shall be housed in a dome and base unit, both preferably

made from injection mounded plastic. It shall be possible to adjust the camera head inside the dome in both the planes so that it can be wall or ceiling mounted.

Technical Data

Camera	
Image Sensor	1/2.7" 1Megapixel CMOS
Effective Pixels	1280(H) x720(V)
Electronic Shutter	1/50s~1/100,000s
Video Frame Rate	720@25 fps
Synchronization	Internal
Min. Illumination	0.01Lux@F1.2(AGC ON),0Lux IR on
Video Output	1-channel BNC HDCVI high definition video output
Camera Features	
Max. IR LEDs Length	20m, Smart IR
Day/Night	Auto(ICR) / Color / B/W
Noise Reduction	2D
Lens	
Focal Length	3.6mm (2.8mm, 6mm, 8mm optional)
Mount Type	M12
General	
Power Supply	DC12V±10%
Power Consumption	Max 2.5W
Working Environment	-30°C~+60°C / Less than 95%RH (no condensation)
Transmission Distance	Over 500m via 75-3 coaxial cable
Ingress Protection	IP66

Digital Video Recorder

Main Features

Up to 4/8/16 cameras with 1080p realtime preview

>H.264 dual-stream video compression

>HCVR5404/5408/5416L: All channel 720P

>HDMI / VGA/BNC simultaneous video output

>4/8 channel synchronous realtime playback, GRID interface & smart search

>3D intelligent positioning with Dahua PTZ dome camera

>Support 4 SATA HDD up to 16TB, 1 eSATA up to 16TB,3 USB2.0

>Multiple network monitoring: Web viewer, CMS(DSS/PSS) & DMS

Functions & Performances

Main Processor	Embedded processor
Operating System	Embedded LINUX
Video	
Input	16 channel, BNC
Standard	NTSC(525Line, 60f/s), PAL(625Line, 50f/s)
Audio	
Input	4 channel, BNC
Output	1 channel, BNC
Two-way Talk	Reuse audio input/output channel 1
Display	
Interface	1 HDMI, 1 VGA, 1BNC
Resolution	1920×1080, 1280×1024, 1280×720, 1024×768, 800×600
Display Split	1/4/8/9/16
Privacy Masking	4 rectangular zones (each camera)
OSD	Camera title, Time, Video loss, Camera lock, Motion detection, Recording
Recording	

Video/Audio Compression	H.264 / G.711
Resolution	720P(1280×720/1280×600)/960H(960×576/960×480)/D1/4CIF(704×576/704×480) / CIF(352×288/352×240) / QCIF(176×144/176×120)
Record Rate Main Stream:	720P/960H/D1/HD1/2CIF/CIF(1~25/30fps)
Extra Stream	CIF/QCIF(1~25/30fps)
Bit Rate	48~6144Kb/s
Record Mode	Manual, Schedule(Regular(Continuous), MD), Stop
Record Interval	1~120 min (default: 60 min), Pre-record: 1~30 sec, Post-record: 10~300 sec
Video Detection&Alarm	
Trigger Events	Recording, PTZ, Tour, Video Push, Email, FTP, Spot, Buzzer & Screen tips
Video Detection	Motion Detection, MD Zones: 396(22×18), Video Loss & Camera Blank
Alarm Input	16 channel
Alarm Output	6 channel
Playback & Backup	
Sync Playback	1/4/8/16
Search Mode	Time/Date, MD & Exact search (accurate to second)
Playback Functions	Play, Pause, Stop, Rewind, Fast play, Slow play, Next file, Previous file, Next camera, Previous camera, Full screen, Repeat, Shuffle, Backup selection, Digital zoom
Backup Mode	USB Device / Network
Network	
Ethernet	RJ-45 port (10/100M/1000M)

Network Functions	HTTP, IPv4/IPv6, TCP/IP, UPNP, RTSP, UDP, SMTP, NTP, DHCP, DNS, PPPOE, DDNS, FTP, IP Filter
Max. User Access	128 users
Smart Phone	iPhone, iPad, Android, Windows Phone
Storage	
Internal HDD	4 SATA port, up to 16TB
External HDD	1 eSATA port (Max 4 SATA HDDs), up to 16TB
Auxiliary Interface	
USB Interface	3 ports (2 Rear), USB2.0
RS232	1 port, For PC communication & Keyboard
RS485	1 port, For PTZ control
General	
Power Supply	AC 100~240 V, 50/60 Hz
Power Consumption	40W
Working Environment	-10 ~+55°C / 10~90%RH / 86~106kpa

LED Screen

Screen size 42" LED Backlighting

- Full HD 1080p Resolution
- ENERGY STAR® Qualified
- Picture Wizard II (Easy Picture Calibration)

Warranty

All component, system software, parts and assemblies supplied by the contractor shall be guaranteed against defects in materials and workmanship for one year from the acceptance date. Labour to troubleshoot, repair, reprogram, or replace system components shall be furnished by the contractor at no charge to the owner during the warranty period.
All corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks.

FACTORY ACCEPTANCE TEST FOR ALL BOUGHT OUT ITEMS

Client, his consultant and their authorized representative shall have the right to inspect and test or get inspected and tested the goods at the works of the Seller or its sub suppliers any time during manufacture and prior to dispatch and to inspect within a reasonable time after arrival of goods at the ultimate destination and during and after erection, testing and commissioning. The goods shall not be deemed accepted until after the said inspection, testing and commissioning and signing of the Acceptance Certificate. Failure to make any inspection of or payment for or acceptance of goods shall in no way impair client right to reject non-conforming goods or to avail itself of any other remedies to which client may be entitled, notwithstanding client knowledge of the nonconformity, its substantiality in the case of its discovery. In the event of failure of Seller to remove the rejected goods within the time allowed, client shall have the right to dispose of the same at the seller's risk and cost. During the time the rejected goods lie with client awaiting removal by the seller, they will so lie at the seller's risk. All goods rejected by client after receipt at the destination shall be removed by the seller within a reasonable time allowed by client, not exceeding 30 (thirty) days at seller's expense and risk.

The Seller will permit client Inspectors, Consultant and their authorized representatives free access during normal working hours to his works, godown, storage or loading spot etc. and will give them all necessary assistance to perform their task including free use of all accessories, testing and control instruments. The seller shall ensure that the same facilities are granted by his sub-suppliers.

Unless specifically stated to the contrary in the order, all expenses relevant to the preparation and performance of testing, inspection and preparation of any test reports or certificates shall be borne by the Seller EXCEPT for the salaries, fees, traveling, lodging and boarding expense of the Consultant's / client's representatives. However, if the visit duration of UCJ / client's representatives is extended for the reasons not attributable to UCJ / client, the cost of the extended period of visit shall be borne by the seller.

The sellers shall carry out tests related to performance tests as described in the specifications and specified in the order. All such performance tests shall be at supplier costs. Supplier shall also provide all the tests certificates and documents as demanded by the Inspector for his satisfaction that the order has been executed as per PO specifications. All such certificates, documents in original shall be submitted to the Client before dispatch of material. The goods shall be dispatched from suppliers shop only after written confirmation from clients / or its authorized representative.

The contractor shall consider all cost towards inspection of goods by consultant / EIC at factory / manufacturers works prior to shipping for 2 persons. (travelling (Air / 1st AC) / stay etc complete)

1. MODE OF PAYMENT

The following payment will be made after deducting retention money.

Payment for various item shall be made as follows:

1.	A.) Light, Fan Plug, Bell, Etc.(Part payment of plug on Board will not be	20 % when conduits are laid in slab &

	considered	Boxes are fixed
		20 % when conduits are laid in wall & boxes are fixed.
	B.) Telephone, TV ,Computer	40 % when wires are drawn in above conduits.
		10 % when switches are fitted and testing is done.
		10 % after completion of the job.
2.	Boards , Panels, Circuit D.B. s	70 % for materials at site .
		20 % for erection.
		10 % after testing and commissioning
3.	Bus ducts, cable trays etc.	70 % for materials at site .
		10 % of labour cost after laying.
		20 % after testing and commissioning.
4.	Cables	80 % of labour cost after laying.
		20 % after testing and commissioning.
		.
5.	Earthing	70 % for materials at site .
		10 % of labour cost after earthing is complete.
		20 % after testing and commissioning.
6.	Fixing the fittings, Fans & street light poles	80 % of labour cost after fixing the fittings, fans and erecting the poles.
		20 % after testing and commissioning.

2. SAFETY CODE

6.0 Suitable scaffolds shall be provided for workmen for all work that cannot safely be done from the ground, or from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra labour shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and

handhold shall be provided on the Ladder and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal and 1 vertical).

6.1 Safe means of access shall be provided to all working platform and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 meters in length. Width between side rails in a rung ladder shall in no case be less than 30 cm. for ladders upto and including 3 meters in length. For longer ladders this width shall be increased atleast 6 mm. for each additional 30 cm. of length. Uniform step spacing shall not exceed 30 cm.

Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites shall so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lightest to protect public from accidents and shall be bound to bear expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the contractor be paid to compromise any claim by any such person.

6.2 Demolition : Before any demolition work is commenced and also during the process of the work:-

a) All roads and open areas adjacent to the work site shall either be closed or suitably protected.

b) No electric cable or apparatus, which is liable to be a source of danger over a cable or apparatus used by operator, shall remain electrically charged.

c) All practical steps shall be taken to prevent danger to persons employed, from risk or fire or explosion or flooding. No floor, roof, or other part of a building shall be so overloaded with debris or any materials as to render it unsafe.

6.3 All necessary personal safety equipment as considered adequate by the Engineer-in-charge shall be available for use of persons employed on the site and maintained in a condition suitable for immediate use; and the contractor shall take adequate steps to ensure proper use of equipment by those concerned.

a) Those engaged in handling any material, which is injurious to eyes, shall be provided with protective goggles.

b) Those engaged in welding works shall be provided with welder's protective-shields.

c) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

d) The contractor shall not employ male or female labour below the age of 18 years.

6.4 When work is done near any place where there is risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

6.5 Use of hoisting machines and tackle including their attachments, anchorage and supports shall confirm to the following:

a) i. These shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good repair and in good working order.

ii. Every rope used in hoisting or lowering materials or as a means suspension shall be of durable quality and adequate strength, and free from patent defects.

b) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine including any scaffold winch or give signals to operator.

c) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or lowering or as means of suspension, safe working load shall be ascertained by adequate means. Every hoisting machine and all rear referred to above shall be plainly marked with safe working load. In case of a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of testing.

d) In case of a departmental machine, safe working load shall be notified by the Engineer-in-charge. As regards contractor's machines the contractor shall notify safe working load of each machine to the Engineer-in-charge whenever he brings it to site work and get it verified by the Engineer-in-charge.

6.6 Motors gearing, transmission, electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards; hoisting appliances shall be provided with such means as will reduce to the minimum risk of accidental decent of load adequate precautions shall be taken to reduce to the minimum risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations, which are already energized, insulating mats working apparel such as gloves, sleeves and boots as may be necessary, shall be provided. Workers shall not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.

6.7 All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near places of work.

6.8 These safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent place at the work spot. Persons responsible for ensuring compliance with the safety code shall be named therein by the contractor.

6.9 To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the contractor shall be open to inspection by the Engineer-in-charge or his representatives and the Inspecting Officers.

6.10 Notwithstanding the above conditions 1 to 14 the contractor is not exempted from the operation of any other Act or Rule in force.

6.11 If the height at which the contractor is working is more than 12 feet then the staff should wear safety helmet and tie himself with softy belt, client/ architect have all right to ask the contractor to stop wire if the safety condition are not fulfilled.

3. TESTING OF INSTALLATION

7.0 **SCOPE**

This chapter describes the details of tests to be conducted in the completed internal electrical installations, before commissioning.

7.1 **GENERAL**

7.1.1 Tests

On completion of installation, the following tests shall be carried out:-

Insulation resistance test.
Polarity test of switch.
Earth continuity test.
Earth electrode resistance test.

7.1.2 Witnessing of tests

Testing shall be carried out for the completed installations, in the presence of and to the satisfaction of the Engineer-in-charge by the contractor. All test results shall be recorded and submitted to the Department.

7.1.3 Test instruments

All necessary test instruments for the tests shall be arranged by the contractor if so required by the Engineer-in-charge.

7.2 **INSULATION RESISTANCE**

7.2.1 The insulation resistance shall be measured by applying between earth and the whole system of conductors, or any section thereof with all fuses in place, and all switches closed, and except in earthed concentric wiring, all lamps in position, or both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure, provided it need not exceed 500 volts for medium voltage circuits. Where the supply is derived from a three wire D.C, or a polyphase A.C. system, the neutral pole of which is connected to earth either directly or through added resistance, the working pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.

7.2.2 The insulation resistance shall also be measured between all the conductors connected to one pole, or phase conductor of the supply, and all the conductors connected to the neutral, or to the other pole, or phase conductors of the supply with all the lamps in position and switches in "off' position, and its value shall be not less than that specified in sub-clause 16.2.3.

7.2.3 The insulation resistance in mega ohms measured as above shall not be less than 12.5 mega ohms for the wiring with PYC insulated cables, subject to a minimum of 1 mega ohm.

7.2.4 Where a whole installation is being tested, a lower value than that given by the formula, subject to a minimum of 1 mega ohm, is acceptable.

7.2.5 A preliminary and similar test may be made before the lamps etc. are installed, and in this event the insulation resistance to earth should not be less than 25 mega ohms for the wiring with PYC insulted cables, subject to a minimum of 2 mega ohms.

7.2.6 The term "outlet" includes every point along with every switch, except that a switch combined with a socket outlet, appliance or lighting fitting is regarded as one outlet.

7.2.7 Control rheostats, heating and power appliances and electric signs may, if required, be disconnected from the circuit during the test, but in that event the insulation resistance between the case or frame work, and all live parts of each rheostat, appliance and sign, shall be not less than that specified in the relevant Indian Standard Specifications, or where there is no such Specification, shall be not less than one mega ohm.

7.3 POLARITY TEST OF SWITCH

7.3.1 In a two wire installation, a test shall be made to verify that all the switches in every circuit have been fitted in the same conductor throughout, and such conductor shall be labeled or marked for connection to the phase conductor, or to the non-earthed conductors of the supply.

7.3.2 In a three wire or a four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted in a conductor which is labeled, or marked for connection to one of the phase conductors of the supply.

7.3.3 The installation shall be connected to the supply for testing. The terminals of all switches shall be tested by a test lamp, one lead of which is connected to the earth. Glowing of test lamp to its full brilliance, when the switch is in "on" position irrespective of appliance in position or not, shall indicate that the switch is connected to the right polarity.

7.4 TESTING OF EARTH CONTINUITY PATH

The earth continuity conductor, including metal conduits and metallic envelopes of cables in all cases, shall be tested for electric continuity. 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 shall not exceed one ohm.

7.5 MEASUREMENT OF EARTH ELECTRODE RESISTANCE

7.5.1 Two auxiliary earth electrode, besides the test electrode, are placed at suitable distance from the test electrode (see figure 14). A measure current is passed between the electrode' A' to be tested and an auxiliary current electrode 'C', and the potential difference between the electrode' A' and auxiliary potential 'B' is measured. The resistance of the test electrode 'A' is then given by:

$R=V/I$

Where,

R - Resistance of the test electrode in ohms,
V - Reading of the voltmeter in volts.
I - Reading of the ammeter in amps.

7.5.2 (i) Stray currents flowing in the soil may produce serious errors in the measurement of earth resistance. To eliminate this, hand driven generator is used.

(ii) If the frequency of the supply of hand driven generator coincides with the frequency of stray current, there will be wandering of instrument pointer. An increase or decrease of generator speed will cause this to disappear.

7.5.3. At the time of test, the test electrode shall be separated from the earthing system.

7.5.4 The auxiliary electrodes shall be of13 mm diameter mild steel rod driven upto 1 m into the ground.

7.5.5 All the three electrodes shall be so placed that they are independent of the resistance area of each other. If the test electrode is in the form of a rod, pipe or plate, the auxiliary current electrode 'c' shall be placed at least 30 m away from it, and the auxiliary potential electrode' B' shall be placed mid-way between them.

7.5.6 Unless three consecutive readings of test electrode resistance agree, the test shall be repeated by increasing the distance between electrodes A and C upto 50 m, and each time placing the electrode B midway between them.

7.5.7 On these principles, "Megger Earth Tester", containing a direct reading ohm-meter, a hand driven generator and auxiliary electrodes are manufactured for direct reading of earth resistance of electrodes.

7.6 TEST CERTIFICATE

On completion of an electrical installation (or an extension to an 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 the prescribed form as given in Appendix 'E' in addition to the test certificate required by the local Electric Supply Authorities.

4. FORM OF COMPLETION CERTIFICATE

I/We certify that the installation detailed below has been installed by me/us and tested and that to the best of my/our knowledge and belief it complies with Indian Electricity Rules, 1956, as well as the C.P.W.D. General Specifications of Electrical Works 2004.

Electrical installation at _____

Voltage and system of supply_____

1. Particulars of work:

a) Internal Electrical Installation

	No.	Total Load:	Type or system of wiring
i) Light point			
ii) Fan point			
iii) Plug point			
a) 3 pin 5 Amp.			
b) 3 pin 15 Amp.			

b) others

	Description	Hp/KW	Type of Starting
a) Motors: i)			
ii)			
iii)			

b) Other plants:

c) If the work involves installation of overhead line and/or underground cable.

d) i) Type & description of overhead line.

ii) Total length and no. of spans.

iii) No. of street lights and its description.

b) i) Total length of underground cable & its size.

ii) No. of joints: End joint:

Tee joint:

St. through joint:

II) Earthing

i) Description if earthing electrode.

ii) No. of each electrodes.

iii) Size of main earth lead.

III) Test results:

a) Insulation resistance

i) Insulation resistance of the whole system of

Conductors to earth Mega ohms

ii) Insulation between the phase conductor and neutral

Between Phase R and neutral - - Mega ohms

Between Phase Y and neutral - - Mega ohms

Between Phase B and neutral - - Mega ohms

iii) Insulation resistance between the phase conductors

in case of polyphase supply.

Between Phase R and Phase Y - - Mega ohms

Between Phase Y and Phase B - - Mega ohms

Between Phase B and Phase R - - Mega ohms

b) Polarity test
Polarity of won linked single pole branch switches.

c) Earth continuity test

Maximum resistance between any point in the earth continuity conductor including metal conduits and main earthing ……Ohms

d) Earth electrode resistance

Resistance of each earth electrode

i) - - - - Ohms

ii) - - - - Ohms

iii) - - - - Ohms

iv) - - - - Ohms

e) Lighting protective system

Resistance of the whole of lighting protective system to earth before any bonding os effected with earth electrode and metal in/on the structure……

Signature and name of Junior Engineer (E) / AE (E)

Signature and name of the Contractor

5. SPECIAL CONDITIONS OF CONTRACT

GENERAL

The complete Electrical Installation shall be carried out in strict accordance with the regulations of the electricity supply authority, Institution of Electrical Engineers, ISI Standards, fire Insurance Company insuring the building and national code of practice.

The standard conditions of contract are meant to amplify the specifications, schedule of quantities and drawings and the more stringent of the above shall apply should there be any ambiguity or inconsistency. The contractor should report the same to the Architect/Consultant and obtain clarification before submitting his tender.

All Equipments, cables etc. shall be adequately rated to suit the climatic conditions experienced in this country.

Clause in this specification shall apply equally throughout.

ORDERING

As soon as possible after the contractor receives written notification of the acceptance of his tender he shall order all the materials and equipment required to complete the contract. He shall submit to the consultant the detailed summary of all the orders placed, providing the details about the name of Supplier/Vendor, make of equipment, date of order and forecast of delivery date at site.

STANDARD OF MATERIALS

When the material and equipment is specifically described named in the specifications, it is so named or described for the purpose of establishing a standard of materials and workmanship to which the contractor must adhere. The Contractor must quote with the material as listed in the make of materials list attached later in the document. The Contractor may submit with his tender a list indicating any alternative make of material that he proposes to install. Before installing such a make the contractor shall take permission from the consultant. All materials condemned by the consultant as not approved for use are to be removed from the premises and suitable material shall be delivered and installed in their place at the expense of the Contractor. If alternatives are not offered during the tender stage then the contractor will be deemed to have submitted his tender based on all materials and equipment specified or shown on the drawings and therefore no alternative manufacturer or supplier of such material and equipment specified or shown will be considered after the contract is awarded if however the material or equipment specified or shown on the drawing is not available due to any genuine reason. The contractor shall prior to order get the written approval of the consultant for the particular material/equipment.

The Contractor shall be responsible for the safe custody of all material and shall insure them against theft damage by fire earthquake etc. A list of materials and equipment together with a sample of each shall be submitted to the consultant as directed by him within 30 days of the award of the contract.

All materials required for the works shall be new and the best of their respective kinds and shall be of uniform pattern. All materials shall be suitable for use in temperatures of $50^{o}C$ with comparative humidity.

The protective finishes detailed as follows must be provided on all materials and apparatus used on this contract to ensure that no deterioration is caused by the local climatic conditions.

All materials shall be inspected by the Contractor to ensure that finishes are in accordance with this specifications.

A. The interior fittings in all distribution boards and control units shall be properly painted.

B. All holes in distribution boards and similar equipment shall be blanked off to protect from dust and vermin where ventilation is necessary holes are to be neatly covered.

C. All cable entry holes on switchgears and similar equipment shall be fitted with PVC/Rubber Bushings.

The material supplied by the client or other agencies shall be properly inspected by the contractor before accepting so that any damage thereafter is the liability of the contractor.

WORKMANSHIP

The workmanship and method of installation shall confirm to the best standard practice. All work shall be performed by skilled tradesman to the satisfaction of the Consultant/Architects. Helpers shall have qualified supervision.

Any work that in the opinion of the consultant does not confirm to the best standard practice shall be removed and reinstated at the Contractor's expense permits certificates and licenses must be held by all tradesman for the type of work in which they are involved where such permits certificates and licenses exist under government legislation.

PROCEDURE

Throughout all stages of work the contractor shall maintain a close liaison with the consultant and with all other contractors involved in the work.

Site work shall commence immediately with the start of building work and shall proceed expenditionally in harmony with the building work so as not to delay the latter in any way. All plant to be supplied and work to be done under this specification shall be manufactured and executed in the manner set out in this specification or where not so set out the reasonable satisfaction of the consultant and all the contractors works on site shall be carried out in accordance with the such reasonable directions as the consultant may give.

The contractor in the interest of the work shall furnish a bar chart based on the chart furnished by the civil contractor stating all the starting and completion dates clearly in the format that consultant approves or in the format of the civil bar chart.

The contractor shall also furnish the time chart showing the material procurement marking the ordering date and the delivery date of the material on site. In case of delay in delivery of material at site the contractor may be asked to furnish proper reason for the delay.

The contractor if at all feels necessary shall attach the drawing schedule requirements with the tender documents.

PERMITS

The Contractor shall obtain all necessary permits prior to work commencement for the excavation of cable trenches etc. in the areas where it is suspected that existing services are present the contractor shall carry out excavation work by hand. He shall also obtain the necessary permits from the respective authorities prior to working on major items of the switchgear. All application permits shall be made in writing with a copy to the consultant.

TEMPORARY AND TRIAL USAGE

It shall be understood and agreed that temporary and trial usage by the employer of any device, machinery, apparatus, equipment or any other work or materials supplied under this contract before final completion and written acceptance of the item by the employer it is further understood and agreed that the employer shall have privilege of such temporary and trial usage as soon as the contractor shall claim that the said work is completed and in accordance with the drawings and specifications and to the manufacturer's instructions and for such reasonable length of time as the consultant shall deem suitable for making a complete and thorough test of the apparatus or system under test.

No claim for the damage will be made by the contractor for the injury to or breaking of any parts of the works which have been placed under test whether this damage has been caused by weakness, flaw or inaccuracy of structural parts or by defective material or workmanship of any kind whatsoever.

CLEANING

Before operating any of the systems the contractor shall clean out all rubbish and dirt upon completion of the contract the contractor shall ensure that all items of plant are left in a clean and tidy condition.

SETTING OUT OF WORKS

The specification and schedule of rates shall be considered as part of this contract and any work materials shown on the schedule and not called for in the specifications or vice-versa shall be executed as if specifically called for in both.

The Contractor at his own expense shall set out all his hardworks and take all his measurements and dimensions required for the erection of his materials on site making and modifications in detail to the consultant before proceeding and must allow in his tender for all such modifications and for the provision of any sketches or drawings related there to.

The position of all DB's Panels, Cable routes, fixtures, Wiring Systems, Service Outlets and control Switches shown on the drawings are to be assumed as being correct for the purpose of tendering final positions of these must be agreed with the consultant before installation.

The data given here in and on the drawings is as exact as could be secured but its complete accuracy is not guaranteed. The drawings are for the guidance of the contractor, exact locations, distances and levels will be governed by the site conditions.

AS BUILT DRAWINGS / SHOP DRAWINGS

Contractor shall make all necessary shop drawings indicating conduit / cable tray routes / qtys / sizes; cable schedule, circuiting details etc complete before starting the works and get approval of consultant / EIC.

At the completion of the works and before issue of the certificate of virtual completion, the contractor shall submit to the consultant 4 sets (HARD AND SOFT FORMAT) of layout drawings drawn at approved scale indicating the complete wiring system as installed. These drawings must provide the following minimum information :

A. Run and size of conduits, inspections, junction and pull boxes.

B. Size of conductors in the conduits.

C. Location and rating of sockets and switches controlling the light and power outlets.

D. Location and details of distribution boards, mains, switches, switchgear, main panel and other particulars.

E. A complete wiring diagram, as installed and schematic drawings showing all connections in the complete electrical system.

F. Location of outlets, junction boxes, sizes of various conduits for telephones.

G. Location of all earthing stations, routes, sizes of all earthing conductors, manholes, layout of earth link strips, etc.

H. Layout and particulars of all cables.

I. Necessary drawings with prints for approvals from local / govt. authorities.

Above indicates the general requirement. However, contractor must include all information desired by the client and Architects/Consultants in the final as built documents. Guidance for the preparation of as built document shall be had from the consultant.

MANUFACTURER'S INSTRUCTIONS

Where manufacturer's have furnished specific instructions, relating to the materials used in this job for covering, paints etc which are not specifically mentioned in this documents, manufacturer's instructions shall be followed.

GUARANTEE

At the close of the work and before issue of the final certificate of virtual completion. The contractor shall furnish written guarantee indemnifying the Architect/Consultant against defective materials and workmanship for a period as mentioned in the schedule of fiscal aspects. The contractor shall hold himself fully responsible for reinstallation or replacement, free of cost to client the following :

A. Any defective work or material supplied by the Contractor.

B. Any material or equipment damage or destroyed as a result of defective workmanship by the Contractor.

SAFETY OF MATERIAL

The Contractor shall provide proper and adequate storage facilities to protect all materials and equipment, including those issued by the owner against damage from any cause whatsoever.

COMPLETION CERTIFICATE

On completion of the Electrical Installation a certificate shall be furnished by the Contractor counter signed by the licensed supervisor, under whose direct supervision the installation was carried out. The certificate shall be in the prescribed from as required by the local authority. The contractor shall be responsible for getting the Electrical installation inspected and approved by the local authorities connected.

ENGINEER AND FOREMAN

The Contractor shall employ a competent fully licensed, qualified full time electrical Engineer and foreman to direct the work of Electrical Installation in accordance with drawings and specification. The foreman shall be available full time on site to receive instruction from Architect/Consultant or his nominee in the day to day activities throughout the duration of the contract the foreman shall correlate the progress of work in connection with all relevant requirements of the supply authorities.

LIASIONING WITH LOCAL SUPPLY COMPANY

The contractor shall be responsible for all the liasioning work with the supply company. However, all the technical assistance required for the same may be furnished by the consultant. The contractor has to fill the necessary forms and submit test reports so as to ensure that the supply is available intime. The contractor shall prepare necessary drawings for the approval of the concern government departments and has to get the necessary permissions for supply and D.G. sets etc.

SPECIFICATIONS AND SCHEDULE

The specification and schedule of rates shall be considered as part of this contract and any work or materials shown on schedule and not called for in this specifications or vice versa shall be executed as if specially called for in both. The drawings indicate the extent and general arrangement of the fixtures, controlling switches, wiring system etc. and are essentially diagrammatic. The drawing indicates the points of termination of conduit runs and are suggestive of the routes to be followed.

9.17 SUPERVISION

Supervision shall be by a competent person experienced in the nature of the work to be undertaken. This person shall be available on site for the full period of works. The Engineer may demand at any time during the contract the replacement of the contractors personnel who fails to satisfy this requirement of competent.

9.18 TOOLS AND EQUIPMENTS

The Contractor shall provide all necessary Jointing Equipment, tools, Portable power tools, test equipment etc which will be required to carry out the Electrical work. All the zarri work, except in unavoidable circumstances, shall be done with a zarri cutter.

This includes all heavy duty equipments such as Cranes, lorries, etc. for site delivery and fixing.

The contractor must have minimum following instruments :

1) 1000 / 500 V Meggar.

2) Clip on meter.

3) Earth tester.

4) Lux meter.

5) Zarri Cutter.

6) Multi Meter.

7) Drill machine upto 25 mm dia.

8) Ladders suitable for 30 ft. and above.

9) All safety equipments like helmet, safety rope etc.

10) Complete set of spanners, screw drivers etc.

SITE STORAGE

The contractor shall be responsible for the safe storage of materials on site. This includes ensuring that all equipment is handed to the client in sound undamaged order.

The Contractor shall be responsible for safe storage of materials on site, and liable for their replacement. The Contractor would be required to maintain a watch man on site an this shall remain Contractors Choice.

SPARES

The Contractor shall prepare a schedule of manufactures recommended for spares for one year maintenance.

OPERATING AND MAINTENANCE MANUALS

The Contractor shall furnish two sets of operating manuals which shall include services maintenance instructions and circuit diagram for each item of equipment.

SITE CONDITIONS

The Contractor shall take all necessary action to acquaint himself fully with site conditions. Any conditions at tendering stage will not be accepted.

After the contract is awarded the Contractor shall acquaint himself fully with existing services and obtain all necessary information to avoid any damage to the services during excavation etc.

LABELS AND NOTICES

On all switchgear identification name plates shall be fitted these will identify the substation and/ or out going ways. The labels shall be made on indestructible non deteriorating material with lettering engraved in black or white background except where otherwise specified. Fixing shall be by means of rivets or screws in addition to any adhesive. all labels shall be English/Hindi /mother language as directed by the Consultant. All pillars and mini feeder pillars in addition to identification labels shall have each way identified by a label to the same specification fitted in the feeder pillar. An indestructible “Danger 415 volts” plates should be fitted externally with a double flush danger signal. The letters to be 12 MM height minimum in signal red.

In addition each distribution board shall have a typed chart detailing particulars of the circuits controlled which shall be fixed to the inside of the door. The details shall include the circuit load, description, the type and rating of the protection device, and the cable size. A sheet of transparent rigid plastic shall be used to completely cover the chart to prevent damage.

PACKING AND RECEIPT OF MATERIAL

The contractor shall take every possible measure including appropriately strong packing, proper supervision of loading and off loading and proper transportation by the most suitable route t ensure the safe delivery to site of plant and equipment. The Contractor shall keep at

site up-to-date record of all materials received and fully annotated with details of the carrier and condition of equipment on arrival.

RECORDING OF WORK

The contractor shall keep a diary and a set of drawing recording the progress of the works and details of all instruction received. These shall be available for the consultant upon request. The contractor's site representative will submit a written report every two weeks outlining the progress of the work including work completed to date. The review of the work completed and the barchart submitted shall be done weekly and the difference in the two shall be submitted to be Consultant specifying the reasons for the difference.

On completion of work the contractor has to submit detailed reconciliation statement of all electrical materials. The loss of material shall be recovered at prevailing market rate for the material supplied by the client or other agency.

The contractor shall take permission from the employer before he takes all the unused material from the site on completion of work.

MARKING OUT

Routes and positions of systems, and positions of all electrical equipment shall be marked out by the contractor and approved by the Engineer before such items are installed.

These items shall be installed in the positions shown on the drawings, but reasonable variations may be made on site with the consent of Engineer.

FIXING

Screws fixing brick concrete or similar materials which necessitates plugging shall be made using steel woodscrews into plugs in rotary drilled holes.

Items of switch fuse gear, cable racks and trays etc. shall be fixed using corrosion resistant steel bolts fitted with expanding collars, e.g. 'Anchor Fastner' set into rotary drilled holes of the correct size all such bolts shall be provided with one number wide flange washer and one heavy spring washer.

CONTRACTORS RATES

The Contractors rates must be included the cost of transportation of materials to the site. All taxes such as sales tax, Excise and Octroi etc. and the fixing or placing in position for which the items of work is intended to be operated.

The contractor shall quote in English, in words and figures, the amount tendered by him in the Form of Schedule of rates forming part of the tender document in such a way that interpolation is not possible. The amount for each item shall be worked out and entered and requisite totals given for all items. The tendered amount for the work shall be entered in the Tender and duly signed by the tenderer.

The contractor shall include in rates quoted all expenses (travelling / lodging / boarding) for inspection of goods at manufacturers workshop for two persons from client / consultants office.

If some discrepancies are found between the rates in words and figures or the amounts shown in the tender following procedure shall be followed :

a) When there is difference between the rates in figures and words, the rate in words shall be taken as correct.

b) When the rate quoted by the tenderer in figures and words, tallies, but the amount is incorrect, the rate quoted by the tenderer shall be taken as correct.

c) When it is not possible to ascertain the correct rate, in the manner prescribed above, the rate as quoted in the words shall be adopted.

The contractor shall be liable to furnish the rate analysis for the rates quoted by them, if the architect/consultants find the rates to be non workable and ask for the analysis.

Labour rates not quoted for the items / or rates for extra items shall be decided 15 days prior to the start of the work as per the procedure listed in schedule of fiscal aspects. However, looking to the urgency of the work, if it is required to execute the item without the settlement of rate, then the rate for the same item will be finalised before making the payment.

ARCHITECTS / CONSULTANTS DECISIONS

Matters not covered by the specification given in the contract as a whole shall be covered in the relevant ISI codes. is such codes for a particular subject have not been framed, the decision of the Architect/Consultant shall be final.

The work shall be carried out under the direction and supervision of the architect / consultant or their representative at site who shall guide the representative of contractor from time to time. On acceptance of the tender, the contractor shall intimate the name of the representative who would be supervising the construction and would be responsible for taking instructions for carrying out the work.

The Architects / consultants or their representative at site shall have access to the workshops of the successful tenderer so as to ensure themselves of the quality of material and workmanship.

The Architects / Consultants decision with regard to the quality of material and workmanship will be final and binding any material rejected by the Architect / Consultant shall be immediately removed by the contractor.

DEFECTS LIABILITY PERIOD

This period of 12 months, shall be in force from the date of “Virtual completion” and minor defects if any shall be corrected / rectified within 24 hours and major defects within 3 day which shall develop during this period. However, if the same are not rectified by the Contractor within the period mentioned above the clients with the concurrence of the Architects shall get the work done at the risk and the cost of the Contractor.

OCCUPYING PART AREAS

If the owner wants to occupy areas in part, the Contractor shall have to complete the work of these areas in consultation with the owner and handover the same to the employer without affecting any of the clause of the contract agreement.

TEMPORARY WIRING

Whenever any temporary wiring is done, it has to be done so that all precaution for safety are taken and temporary wiring shall be done so that, it is not hazardous to any body. Any accident due to temporary or permanent wiring or installation shall be the responsibility of the contractor and compensation shall be paid by the contractor to all the concerned.

DEPOSITS AND PAYMENTS

Earnest Money Deposit along with Security Deposit, as specified in schedule of fiscal aspects, has to be deposited with the employer in the form of draft in the name of the client, for the fulfillment of contract. Besides EMD and security deposit, retention money at the rate of 5% of the value of each bill but upto maximum of 2.5% of the contract value shall be deducted (cash) from each running bill.

On the Architects certificate of virtual completion of the works, the contractor would be paid 50% of the above mentioned amount and the remaining 50% will be released after the rectification of the defects, if any, pointed out during the defects liability period.

The contractor can have mobilization advance of 5% of the contract value against Bank Guarantee of the same amount till the defects liability period expires. The mobilization advance will be deducted at the rate of 20% (of the mobilization advance) from each running bill till total deductions are done. 75% of the value of the contract shall be raised by contractor in parts as running bills the value of which shall not be less than 15% of the contract value. 10% of the contract value shall be paid on commissioning of the installation. 10% of the contract value shall be paid on submission of as built drawings, test certificates and Final Bill.

For the material to be procured by the contractor please refer to the mode of payment sheet attached in the document.

MAKE OF MATERIALS

LIST OF APPROVED CIVIL MATERIALS / BRANDS FOR BUILDING WORKS

Sr. No.	Item	Approved Make
1.	Cement –SRC	Ultratech, Ambuja, Siddhi ,Wonder Cement
2.	Reinforcement Steel-Fe 500 SRS	Tata-Tiscon, Vizag, SAIL, Essar, Electro TMT, ASR
3.	Structural Steel	Tata, SAIL, Essar, ASR
4.	Water proofing Compounds	Krishna Concare, Pidillite, Fosroc, Roffe, CICO or equivalent
5.	Hardeners	'Ironite', 'Ferrok', 'Hardonate'or equivalent
6.	Plastic emulsion Paints : Interior	Jotun, Asian Paints, ICI Dulux
7.	Red Oxide (For IPS Flooring)	'Shalimar', 'Garware'or equivalent,
8.	Premium Quality Weather proof paint : Exterior	Jotun jotashield, Apex Ultima, Dulux weather shield
9.	Glass/ Structural Glass	Saint Gobain LOW-e, ASAHI
10.	Ceramic Tiles	Johnson, Somani, Asian, or as approved by consultant.
11.	Vitrified Tiles (Note : Vitrified Tiles shall have to be whole body homogenous & Matt finish)	Johnson, Somani, Asian, or as approved by consultant.
12	Stone	Mirror polished kota, Machine cut river polished granite.
13.	Water proofing Membrane type	As per specification & as approved by Consultant/Client
14.	Aluminum Sections for Doors/Windows	Jindal, Bianco or as approved by Consultant/Client
15.	Teak Wood	Ghana Teak Wood as approved by Consultant/Client
16.	Ply Wood	Century, Greenply, Marino
17.	Marine ply	Century, Greenply, Marino
18.	PVC Tank	Syntex or as approved by Consultant/Client
19.	Anti termite materials	Chlorophyriphos or materials as approved by Consultant
20.	Adhesive for tiles fixing	Ardex Andura, MRF
21.	Hardware	Heltich, Dorma, Doorset, Ozone as approved by consultant
22.	Expansion joint sil flex(cap cell HD 100)	Supreme industries, Softex industries pvt.ltd. Bengal bitumen
23..	Rolling shutters	Rama shutter.co. , Akash shutter, Olympic rolling shutters
24.	Dowelling and rebarring	Hilti system or Equivalent as approved by consultant
25.	White Cement putti	Birla white cement, J K Wall putti
26.	Quartz manufacturer	Classic marble company, jayantilal & sons or as approved by consultant
27.	Stainless steel railing	Ozone, Kitch, Orbit or as approved by consultants
28.	Structural and spider glazing	Dorma, Ozone
29.	Pavers & Paving Tiles, Kerb stone	Super, Vyara, Alto or as approved by Consultant
30.	Cubical partition system for restroom	Merino-Bosco.co, Greenlam or as approved by consultants
34.	Exterior Texture	Jotun UltraTEX, Asian- duracast
35	Epoxy paint	Nerolac, Shalimar, Cico, Dubond, Berger, Asian

The successful tenderer shall have to use the makes from above only after approval of client / consultant.

LIST OF APPROVED PLUMBING MATERIALS / BRANDS FOR BUILDING WORKS

Sr. No.	Item	Approved Make
1	SWR PVC PIPE & FITTINGS 6 KG CM²; FITTINGS : 6 KG CM² ECO. DRAIN PIPE & FITTINGS	FINOLEX /PRINCE SUPREME/ ASTRAL
2	GULLY TRAP	GIRCO / TIRUMALA / SUPREME/ ASTRAL
3	RCC HUME PIPES EXTERNAL MAIN UNDER GROUND PIPE	INDIAN HUME PIPE / PRANALI
5	C.I. PIPE & FITTINGS	NICO OR EQ.
6	PPR PIPES & PPR FITTINGS	SUREME/PRINCE/
7	M.S/G.I. PIPES FOR WATER SUPPLY	TATA / JINDAL/ SWASTIK
8	ASTM/CPVC PIPE & FITTINGS FOR WATER SUPPLY	ASTRAL / SUPREME/ASHIRWAD /
9	COMPOSITE PLUMBING PIPE & COMPOSITE FITTINGS	KITEC OR EQ.
10	G.I. PIPES FITTINGS WATER SUPPLY	DRP-M / R-BRAND / ZOLOTO
11	GI TO GI JOINTS	CHAMPION / EQUIVALENT
12	SOLVENT CEMENT	SUPREME / KISSAN / FINOLEX
13	BALL VALVES	LEADER / ZOLOTO / AUDCO
14	WHEEL VALVES	LEADER / ZOLOTO/AUDCO
15	DCV / NRV	ZOLOTO/SPIREX/AUDCO
16	TAR	SHALIBIND / TIKIBOND-BS
17	SELF PRIMING SEWAGE PUMPS	HBD / GRUNDFOS
18	VALVES	AUDCO/ZOLOTO / R.B. / KBL / KSB
19	PUMPS	KIRLOSKAR / GRUNDFOSS/
20	STARTER	SIEMENS / L&T
21	PRESSURE GAUGE	BELLS / H GURU
22	BOTTLE TRAP & WASTE COUPLING	GROHE / JAQUAR / KOHLER
23	DEWATERING PUMPS	GROUNDFOSS/KIRLOSKAR/ KSB
24	HYDROPNEUMATIC SYSTEM	GRUNDFOSS OR EQUIVALENT
25	SANITARY FIXTURES	HINDWARE / PARRYWARE / CERA /KOHLER
26	PLUMBING FITTING	GROHE / JAQUAR / KOHLER or as approved by consultants.
27	METALLIC BELLOWS	BELLOW FLEX / PRICISION / DHRUV / B.D. ENGR.
28	R.O.PLANT	ION EXCHANGE /POWER H20 / THERMAX
29	SOFTENER PLANT	ION EXCHANGE /POWER H20 / THERMAX
30	SOLAR SYSTEM	SOAHEART/RACOLD/TATA-BP
31	ELECTRIC GEYSER	A-O SMITH/ RACOLD/SPHERHOT
32	HOT WATER GENERATOR	THERMAX/A.O.SMITH / KEPL/ BENCHMARK OR EQUIVALNET
33	SEWAGE TREATMENT PLANT	THERMAX / ION EXCAHNGE / EQUIVALNET

The successful tenderer shall have to use the makes from above only after approval of client consultant

LIST OF APPROVED ELECTRICAL MATERIALS / BRANDS FOR BUILDING WORKS

SR NO.	ITEM	APPROVED MAKE
1	Capacitor (APP / Heavy duty type)	Havells, Epcos, Subodhn, Schneider, Matrix
2	Main Cables Upto 185 Sq.mm	XLPE armoured cable for 1.1 KV Finolex, Havells, RR Kabel, Avocab
3	Main Cables Above 185 Sq.mm	XLPE armoured cable for 1.1 KV Finolex, Havells, RR Kabel, Avocab,
4	Glands	Double Compression type, Siemens type with rubber ring and double washers. – Comet, Standard Metal Industries
5	Distribution Boards	Legrand, Hager-Novelo, MK,
6	MCBs	Legrand-DX3, MK, Schneider
7	MCCB	Legraand DPX/DPX^3, Schenider NSX, Hager H3,
8	ACB (Should have inbuilt power metering)	Legrand DMX^3 (MP4 release), Schenider Masterpact (NT relese), ABB(EMAX)
9	Switches & Its accessories	MK Blenze, Legrand Myris, Schenider Zenselo, Havells Athena
10	Flexible Wires (FRLS)	RR Kabel, Finolex, Havells, Lapp INFRA
11	Light Fixtures (Indoor & Outdoor)	GE, Bajaj, Kesselec, Ensave
12	Chemical type earthing	Erico, Rapid, Obo, Electroearth, Greenwire
13	Cat-6	Legrand, Schneider, D-link, Havells
14	Meter (Digital)	Elmeasure, Legrand, SEMS, Conzerv, HPL
15	PVC PIPE & Accessories	1.6-1.8 mm wall thickness ISI & FIA approved & manufactured

		from virgin4 material.Precision plastic industries, Nihir, Vraj
16	Raceway	MK, Legrand
17	Lightening Arrestor	Rapid, Electroearth, Obo
18	PA System	Bosch, Boss, JBL
19	CCTV	Pelco, Honeywell,
20	Panel Vendor	Swati switchgear, Active Engineers

Consultant/Client is ask to choose any make from above. Any other item which has not mention in make list, consultant/Engineer-in-charge is final authority to suggest.