

## **SECTION-5 TECHNICAL SPECIFICATION**

## **GENERAL TECHNICAL SPECIFICATIONS**

### **1.0 General:**

All measurements shall be made in the metric system. Different items of work shall be measured in accordance with the procedures set forth in the relevant sections read in conjunction with General Conditions of Contract. The same shall not however apply in the case of lump-sum items. All measurements and computations unless otherwise indicated shall be carried nearest to the following limits :

- (i) length and breadth..... 10 mm
  - (ii) height, depth or thickness of earthwork, sub-base, bases, surfacing, and structural members .....5 mm
  - (iii) areas, .....0.01 Sq Metre
  - (iv) cubic contents..... 0.01 cubic metre.
- in recording dimensions of work the sequence of length, width and height or depth or thickness shall be followed.

### **2.0 Measurement of lead for Materials:**

Where lead is specified in the contract for construction materials, the same shall be measured as described hereunder.

Lead shall be measured over the shortest practicable route and not the one actually taken and the decision of the Engineer-in-charge in this regard shall be taken as final. Distance upto and including 100 meters shall be measured in units of 50 metres, exceeding 100 metres but not exceeding 1 KM. in units of 100 metres and exceeding 1 km. in units of 500 metres. The half and greater than half of the units shall be reckoned as one and less than half of the units ignored. In this regard, the source of the material shall be divided into suitable blocks and for each block the distance from the centre of the block to the centre of placing pertaining to that block shall be taken as the lead distance.

### **3. Surface Regularity of Sub grade & Pavement Courses :**

The surface regularity of completed sub-base courses and wearing surfaces in the longitudinal and transverse directions shall be within the tolerances indicated in Table below. The longitudinal profile shall be checked with a 3 metre long straight edge, at the middle of each traffic lane along a line parallel to the centre line of the road. The transverse profile shall be checked with a set of three camber boards at intervals of 10 metres.

#### **PERMITTED TOLERANCES OF SURFACE REGULARITY FOR PAVEMENT COURSES**

Sr. No	Type of Construction	Longitudinal Profile with 3 metre straight edge					Cross Profile
		Maximum Permissible undulation in mm	Maximum number of undulation permitted in any 300m. length exceeding in mm.				Maximum permissible variation from specified profile camber template—mm
			18	12	10	6	
1	2	3	4	5	6	7	8
1	Earth Sub grade	36	30	-	-	-	15
2	Granular / lime / Cement Stabilised Sub – base.	23	-	30	-	-	12
3	Water Bound Macadam with nominal size metal (20-50) mm	18	-	-	30	-	8
4	Semi – Dense Carpet @	15	-	-	-	20	6

**Notes:-**

1 . These are for machine laid surfaces. If laid manually, due to unavoidable reason, tolerance upto 50 percent above these values in this column may be permitted. However, this relaxation does not apply to the values of maximum undulation for longitudinal and cross profiles mentioned in columns 3 and 8 in the table.

2. Surface evenness requirements in respect of both the longitudinal and cross profiles should be simultaneously satisfied.

3. **Rectification** : Where the surface irregularity of subgrade and the various pavement courses fall outside the specified tolerances, the contractor shall be liable to rectify these in the manner described below and to the satisfaction of the Engineer-in-charge at his own cost.

(i) **Subgrade** : Where the surface is high, it shall be trimmed and suitably compacted. Where the same is low, the deficiency shall be corrected by adding fresh material. The degree of compaction and the type of material to be used shall conform to the specified requirements.

(ii) **Granular/Sub-base** : Same as at (i) above except that the degree of compaction and the type of material to be used shall conform to the specified requirements.

(iii) **Lime/Cement stabilized soil sub-base** : For Lime/Cement treated materials where the surface is high, the same shall be suitably trimmed while taking care that the material below is not disturbed due to this operation. However, where the surface is low, the same shall be corrected as described herein below.

For cement treated material, when the time elapsed between detection of irregularity and the time of mixing of the material is less than 2 hours, the surface shall be scarified to a depth of 50 mm, supplemented with freshly mixed material as necessary and recomposed to the relevant specification. When this time is more than 2 hours, the full depth of the layer shall be removed from the pavement and replaced with fresh material to specification. In either case, the area treated shall not be less than 5 metres long by 2 metres wide. This shall also apply to lime treated material except that the time criterion shall be 3 hours instead of 2 hours.

(iv) **Water Bound Macadam Base** : Where the surface is high or low, the top 75mm shall be scarified, reshaped with added material as necessary and recompacted. The area treated at a place shall not be less than 5 metres long and 2 metres wide.

(v) **Bituminous Constructions** : For bituminous constructions, other than wearing course, where the surface is low, the deficiency shall be corrected by adding fresh material and recompaction to specifications.

Where this surface is high, the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications. For wearing course, where the surface is high or low; the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications in all cases where the removal and replacement of a bituminous layer is involved, the area treated shall not be less than 5 metre long and not less than 1 lane wide.

#### 4. **Quality Control Tests During Construction :**

The materials supplied and the works carried out by the Contractor shall conform to the enclosed relevant specifications. For ensuring the requisite quality of construction, the materials and works shall be subjected to quality control test as described hereinafter, by the Engineer-in-charge. The testing frequencies set forth are the desirable minimum and the Engineer-in-charge shall have the full authority to carry out test as frequently as he may deem necessary to satisfy that the materials at work comply with the appropriate specifications. Test procedures for the various quality control tests are indicated in the respective sections of the specifications or for certain tests within this section. Where no specific testing procedure is mentioned, the test shall be carried out as per prevalent accepted engineering practice to the directions of the Engineer-in-charge.

#### 5. **Tests on embankment for Embankment Construction :**

##### 5.1 **Borrow Material:**

- (a) Sand Content (IS : 2720 Part IV)  
Two test per 8000 Cubic Metres of soil.
- (b) Plasticity Test (IS : 2720 Part-V)  
Each type to be tested. Two tests per 8000 Cubic Metres of soil.

- (c) Density test (IS : 2720 Part VII)  
Each soil type to be tested. Two tests per 8000 Cubic Metres of soil.
- (d) Moisture Content Test (IS : 2720 Part-II)  
One test for every 250 Cubic Metres of soil.

## 5.2 Compaction Control :

Control shall be exercised by taking at least one measurement of density for each 1000 square meters of compacted area, or closer as required to yield the minimum number of test results for evaluating day's work on statistical basis. The determination of density shall be in accordance with IS. : 2720 (Part XXVMI). Test locations shall be chosen only through random sampling techniques. Control shall not be based on the result of any one test but on the mean value of a set of 5-10 density determinations. The number of tests in one set of measurements shall be 5 as long as it is felt that sufficient control over borrow material and the method of compactions is being exercised. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurement shall be increase to 10. The acceptance of work shall be subject to the condition that the mean dry density equals or exceeds the specified density and the standard deviation for any set of results is below 0.08 gm/cc. However for earthwork in shoulders and in top 500 mm portion of the embankment below the sub grade at least one density measurement shall be taken for every 500 square meters of the compacted area provided further that the number of the tests in each set-of measurement shall be at least 10. In other respects, the control shall be similar to that described earlier.

## 6. Following materials shall conform to the Indian Standards shown against them :

- (1) ....Cement.....
- (2) ....Sand for masonry.
- (3).....Sand for concrete.
- (4).....Coarse aggregate.
- (5).....Mild Steel...
- (6) ....High yield strength deformed bars
  - (a) Hot Rolled..... IS : 1139
  - (b) Cold Twisted..... IS : 1786

## 7. Barrel thickness of pipes of different class shall be as under :

Sr. No.	Internal Diameter of pipe in mm	Barrel thickness (in mm).		
		NP1	NP2	NP2
1	80	25	25	-
2	100	25	25	-
3	150	25	25	-
4	250	25	25	-
5	300	30	30	-
6	350	32	32	75
7	400	32	32	75
8	450	35	35	75
9	500	-	35	75
10	600	-	40	80
11	700	-	40	80
12	800	-	45	90
13	900	-	50	100
14	1000	-	55	100
15	1100	-	60	115
16	1200	-	65	115

## **DETAILED TECHNICAL SPECIFICATIONS**

**SCHEDULE-B1- PROPOSED RCC ROAD FRONT OF BABALABHAI GAREJG VALA RESI TO SAKABHAI RES AT CHHOTAUDEPUR DIST-CHHOTAUDEPUR UNDER THE GRANT OF 15TH FINANCE YEAR 2024-25 UNTIDE GRANT**

**OR**

**SCHEDULE-B2- PROPOSED RCC ROAD FRONT OF NURUBHAI RESI TO MAIN GUTTER AT CHHOTAUDEPUR DIST-CHHOTAUDEPUR UNDER THE GRANT OF 15TH FINANCE YEAR 2024-25 UNTIDE GRANT**

### **Item No: 1**

**Box cutting the road surface to proper slop and camber for making a base of road work including removing the excavated stuff and depositing on the road side slope .....etc completed as directed directed by Engineer in Charge with all lead and lift.**

The sub grade / sub base / base to receive the water bound macadam course shall be prepared to the specified grade and camber and made of dust and other extraneous materials. Any nets of soft places shall be corrected in on approved manner and rolled until firm.

Cutting shall be paid on cross section area as established by the longitudinal level and cross sections for this purpose. The work shall be started after the initial longitudinal section of the ground and cross sections are taken and recorded.

The final surface shall confirm to proper profile, camber and super elevation etc. as directed by the Engineer. The earthwork shall be paid on sectional measurements, cross sectional etc. taken.

No allowance or payments shall be made for materials excavated prior to the taking of level by the Engineer.

The rate is inclusive of cutting in all soil and murrum including removal of all shrubs, jungle cutting, cutting stuff in slopes, side drain bank etc. complete.

This item also includes the clearing the sides and demarking the line as per requirement and cutting out the existing tress on the road side, not extra payment will be paid for.

At the time of preparing final bill, the road formation in embankment and cutting shall have be perfect condition true to grade, camber and side slope duly dressed and damages due to rain cuts etc. during entire working period shall have to be done by the contractor.

The work taken in length shall be completed in all respects viz. width, grades, camber, side drains, side slopes etc. and measurements for incomplete work shall not be taken otherwise.

### **1.0 Mode of Measurement & Payment :**

The unit rate box cutting shall include the cost of all materials, tools and plant required for excavation in all type of soils in grade and camber, line and levels and finishing as per direction of the Engineer-in-charge, excavation and all other incidental expenses for producing item of box cutting of specified breadth and depth and grade to complete the item or its components as shown on the drawings and according to these specifications.

The box cutting shall be measured for its cross section area and compacting volumes in cubic metres by the method of average areas.

The rate will be made on Cubic Meter basis of the finished work.

**Item No: 2**

**Providing & laying cement concrete 1:4:8 ( 1-cement 4-coarse sand , 8-hand broken stone aggregate 40mm nominal size) and curing complete including cost of formwork in (A) Foundation & Plinth.**

**1.0. Materials**

**1.1.** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Hand stone aggregate 40 mm. nominal size shall conform to M-12.

**2.0. Workmanship**

**2.1. General**

**2.1.1.** Before stating concrete the bed of foundation trenches shall be cleared of all loose materials, leveled, watered and rammed as directed

**2.2. Proportion of Mix:**

**2.2.1.** The proportion of cement, sand and stone aggregate shall be one part of cement. 4 parts of coarse sand and 8 parts of hand stone aggregates and shall be measured by volume.

**2.3. Mixing:**

**2.3.1.** 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.

**2.4. Transporting & Placing the Concrete:**

**2.4.1.** 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.

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

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

**2.6. Curing:**

**2.6.1.** 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.

**3.0. Mode of measurement and payment**

**3.1.** The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plans or as directed

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

**Item No: 3**

**Providing and Laying controlled cement concrete M-200 and curing complete, excluding the cost of formwork and excluding the cost of reinforcement for reinforced concrete work in (A) Foundation, Footings, Bases of Column & Mass Concrete.**

**1.0. Materials**

- 1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8. Coarse aggregate shall conform M-12.
- 1.2. The shuttering to be provided shall be of ordinary timber plank and shall conform to M-26.
- 1.3. The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

**2.0. General**

- 2.1. The concrete mix shall be designed from preliminary tests. The proportion of the concrete mix shall be 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) by volume concrete work shall have exposed concrete surface or as specified in the item.
- 2.2. The proportioning of cement and aggregates shall be done by weight and necessary precautions shall be taken in the production to ensure that the required work cube strength is attained and maintained. The controlled concrete shall be in grades of M-100, M-150, M-200, M-250, M-300, M-350 & M-400 with prefix controlled added to it. The letter M refers to mix and the numbers specify 28 days works cube compressive strength of 200 mm. cubes of the mix expressed in Kg./cm.
- 2.3. The proportion of cement, sand and coarse aggregate shall be determined of weight. The weigh batch machine shall be used for maintaining proper control over the proportion of aggregates as per mix design. The strength requirements of different grades of concrete shall be as under:

Grade of Concrete	Compressive strength of 15 cms. cubes in kg/cmt. at 28 days, conducted in accordance with I.S. 516-1959.	
	Preliminary test Min.	Work Test Min.
M 150	200	150
M 200	260	200
M 250	320	250
M 300	380	300
M 350	440	350
M 400	500	400

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

**3.0. Workmanship**

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

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

- 3.2. In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag, a reasonable number of bags shall be weighted separately to check the net weight. Where cement is weighted from bulk stocks at site and not by bags, it shall be weighed separately from the aggregate. Water, shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in clean and serviceable condition. Their accuracy shall be periodically checked.
- 3.3. It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates I.S. 2386 (Part-III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates due to variation in their moisture content. Minimum quantity of cement to be used in controlled concrete shall not be less than 220 kg./m<sup>3</sup> in plain concrete and not less than 250 kg/m<sup>3</sup> in reinforced concrete.
- 3.4 The form work shall conform to the shape lines and dimensions as shown on the plans and be constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor to safe-guard against any settlement of the form-work during the course of concreting and after concreting. The form work of shuttering, centering, scaffolding, bracing etc. shall be as per design.

#### 4.0. **Clearing and Treatment of forms:**

- 4.1. All rubbish, particularly chipping shaving and saw dust shall be removed from the interior of the form before the concrete work is placed and the-form in contact with concrete shall be cleaned and thoroughly wetted or treated. The surface shall be then coated with soap solution applied before concreting is done. Soap solution for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint. Alternatively a coat of raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coating does not get on construction joint surface and reinforced bars..

#### 5.0 **Stripping time:**

- 5.1. In normal circumstances and where ordinary cement is used forms may be struck after expiry of following periods.
  - (a) Sides of walls columns and vertical faces of beams.....24 to 48 hours.
  - (b) Beam soffits, (props, left under).....7 days.
  - (c) Removal of props slabs:
    - (i) Slabs spanning up to 4.5. m.....7 days.
    - (ii) Spanning over 4.5 mm.....14 days.
  - (d) Removal of props of beams and Arches:
    - (i) Spanning up to 6 mm.....14 days.
    - (ii) Spanning over 6 m.....21 days.

#### 6.0 **Procedure when removing the form work :**

- 6.1. All form work shall be removed without such shock or vibrations as would damage the reinforced concrete surface. Before the soffits form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened.

#### 7.0 **Centering:**

- 7.1. The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete. Watch should be kept to see that



behavior or centering and form work is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

- 7.2. The props of centering shall be provided on firm foundation or base of sufficient strength to carry the loads without any settlement.
- 7.3. The centering and form work shall, be inspected and approved by the Engineer-in-charge before concreting. But this will not relieve the contractor of his responsibility for strength, adequacy and safety of form work and centering. If there is a failure of form work or centering, contractor shall be responsible for the damages to property.

#### **8.0 Scaffolding:**

- 8.1. All scaffolding, hoisting arrangements and ladders etc. required for the facilitating of concreting shall be provided and removed on completion of work by contractor at his own expense. The scaffolding, hoisting arrangements and ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workman etc.
- 8.2. The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.
- 8.3. The rate is applicable to all condition of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as :
- (a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering propping, bolting, wedging easing, striking and removal.
  - (b) Filleting to form stop chamfered edges or splayed external angles not exceeding 20 mm: width to beams, columns and the like.
  - (c) Temporary openings in the forms for pouring concrete, if required removing rubbish etc.
  - (d) Dressing with oil to prevent adhesion of concrete with shuttering and.
  - (e) Raking or circular cutting.

#### **9.0 Re-Use:**

- 9.1. Before re-use, all form shall be inspected by Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned and joints are gone over, repaired where required. Inside surface shall be retreated to prevent adhesion of concrete.

#### **10.0. Mode of measurement & payment**

- 10.1. The consolidated cubical contents of concrete work as specified in item shall be measured. No deduction shall be made for
- (a) Ends of dissimilar materials such as joints, beams, posts, girders, girders, purling trusses, corbels and steps etc. up to 500 Sq. Cm. in section.
- 10.2. Form work shall be measured as the area in square meters to shuttering in contact with concrete except in the case of inclined member and portion of curved profile and upper side in which case on area of underside shall be measured for payment.
- 10.3. Form work to secondary beams shall be measured up to the sides of main beams but no deduction shall be made from the form work of the main beam at the inter section point. No deduction shall be made from the form work of a column at inter section of beams.
- 10.4. The rate includes cost of all materials labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing, as directed, curing and all other incidental expenses for producing concrete of specified strength. The rate includes the cost of form work.
- 10.5. The rate shall be for a unit of **one cubic meter**.

#### **Item No: 4**

**Providing ISI Mark TMT Bar Fe-500 Reinforcement for R.C.C work including bending, binding and placing in position etc. complete for all Floors.**

#### **1.0. GENERAL**

This work shall consist of furnishing and placing coated, or uncoated or high strength deformed reinforcement, bars (intentioned) of the shape and dimensions shown on the drawings and conforming to these specifications or as approved by the Engineer in charge.

#### **2.0. MATERIAL**

##### **2.1. TMT Bars**

Reinforcements may be either T.M.T. tensile steel, conforms to IS 1786-2008 bars. They may be uncoated or coated with epoxy or with approved protective coatings.

**2.2.** T.M.T. bars reinforcement for R.C.C. work shall conform IS 432 (Part II) 1982 (Reaffirmed 1995) and shall be of tested quality. It shall also comply with relevant part of IS 456-2000.

**2.3.** All reinforcement shall be clean and free from dirt, paint, grease or oil, all scale or loose or thick rust at the time of placing.

**2.4.** All steel shall be procured from original producers no re-rolled steel shall be incorporated in the work.

**2.5.** Only new steel shall be delivered to the site every bar shall be inspected before placing to its position and defective brittle or burnt bar shall be discarded cracked ends of bars shall be discarded.

##### **3.0. Pitch**

**3.1.** Distance between bars shall be as specified in drawings and as directed by the Engineer in charge all bars shall be placed at an accurate distance from each other and shall be bind tightly to maintain the desired pitch Suitable means shall be provided for holding bars securely in position.

##### **4.0. Binding wire**

**4.1.** Mild steel binding wire shall be of 1.63 mm or 1.22 mm (16 to 18 gauge diameter and shall conform IS 280-2006.

**4.2.** The use of black wire will be permitted for binding reinforcement bars. It shall be free from dirt, paint, grease or oil, oil scale or loose or thick rust and any other undesirable coating which may prevent adhesion of cement mortar at the time of binding.

**4.3.** Only new binding wire shall be delivered to the site all binding wire shall be inspected before binding to its position and defective brittle, rusted, used wire, shall be discarded.

#### **5.0. PROTECTION OF REINFORCEMENT**

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

**5.2.** Portions of uncoated reinforcing steel and dowels projecting from concrete shall be protected within one week after initial placing of concrete with a brush coat of neat cement mixed with

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

## **6.0. Workmanship**

- 6.1.** The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed by The Engineer in charge.
- 6.2.** Reinforcing steel shall conform accurate to the dimensions given in the bar bending schedules shown on relevant drawing

## **7.0. BENDING OF REINFORCEMENT**

- 7.1.** Bar bend g schedule shall be furnished by the Contractor and got approved by the Engineer before start of work.
- 7.2.** Reinforcing steel shall conform to the dimensions and shapes given in the approved bar bending Schedules.
- 7.3.** Bars shall be bent cold to the specified shape and dimensions or directed by the Engineer using a proper bar bender operated by hand power to obtain the correct radius of bends and shape.

Bars shall not be bent or straightened in a manner that will damage parent material or the coating bars bent during transport or handling shall, be straightened before being used on work and shall not be heated to facilitate straightening.

## **8.0. PLACING OF REINFORCEMENT**

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

**8.2.** Reinforcement bars shall be placed accurately in position as shown on the drawings. The bars, crossing one another shall be tied together at every intersection with binding wire (annealed), conforming to IS:280 to make the skeleton of the reinforcement rigid such that the reinforcement does not get displaced during placing of concrete, or any other operation. The diameter of binding wire shall not be less than 1 mm.

**8.3.** Bars shall be kept in position usually by the following methods:

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

**8.4.** In case of dowels for Columns and walls the vertical reinforcement shall be kept in position by means of timber templates with slots in them accurately, or with cover blocks tied to the reinforcement timber templates shall be removed after the concreting has progressed up to a level just below their location.

**8.5.** Layers of reinforcements shall be separated by spacer bars at approximately One meter intervals. The minimum diameter of spacer bars shall be 12 mm or: equal to maximum size of main reinforcement or maximum size of coarse aggregate, whichever is greater. Horizontal reinforcement shall not be, allowed to sag between supports.

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

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

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

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

## **10.0. Welding**

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

**10.2.** While welding may be permitted for T.M.T. reinforcing bars conforming to IS:432, welding of deformed bars conforming to IS: 1786 shall in general be prohibited. Welding may be permitted in case of bars of other than S 240 grade including special. Welding grade of S 500D grade bars conforming to IS:1786, for which necessary chemical analysis has been secured and the carbon equivalent (CE) calculated from the chemical composition using the formula:

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

is 0.4 or less.

**10.3.** The method of welding shall conform to IS:2751 and IS:9417 and to any supplemental specifications to the satisfaction of the Engineer.

**10.4.** Bars shall be bent cold to the specified shape and dimensions or as directed by Engineer in charge using the proper bender tool, operated by hand or power to attain proper radius of bends. Bars shall not be bend or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used in the work. Bars shall not be heated to facilitate bending.

**10.5.** Unless otherwise specified a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bane shall not be less then twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times of the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any spiting of the concrete.

**10.6.** All reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm in size and by using say blocks or metal chairs spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals, Bars shall not be allowed to sag between supports not displaced during concreting or any other operations of the work All devices used for positioning shall be of not corrodible material wooden and metal supports shall not extended to the surface of the concrete, except where shown in drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick and wooden blocs shall not be used Layers of bars shall be separated by spacer bars pre-cast mortar blocks or other approved devices. Reinforcement after bending 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 form corrosion, concrete cover shall be provided as indicated on drawings. All bars protruding from concrete and to which other bars are to be sliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

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

As far possible bars of full length shall be used in case this is not possible, overlapping of bars shall be done as directed by the Engineer in charge When practicable overlapping bars shall not touch each other, but be kept apart by 25 mm Where no 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 sheer not bending moments is maximum.

- 10.8.** Whenever indicated on drawing or desired the Engineer in charge bars shall be jointed by coupling which shall have a cross section sufficient to transmit the full stresses of bars The end of the bars that are jointed by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than the normal cross section of the bar. Threads shall be standards threads Steel for coupling shall conform to IS 226.
- 10.9.** When permitted or specified on the drawings joints of reinforcement bars shall butt-welded so as to transmit their full stresses Welded joints shall preferably be located at points when steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded Only electric are welding using a process which excludes air form the molten metal and conforms to any or 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 two or three stages previous surface shall be cleaned properly Ends of bars shall be cleaned of all loose scale rust stages 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 IS 814 Welded pieces of reinforcement shall be tested. Specimen shall be taken form the actual site and their number shall frequency to test shall be as directed by the Engineer in charge.

## **11.0 MODE OF MEASUREMENTS & PAYMENT**

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

Sr. No	Diameter of steel	weight of steel per running meter	Sr. No	Diameter of steel	weight of steel per running meter
1	6 mm	0.22 Kg / Rmt	8	20 mm	2.47 Kg / Rmt
2	8 mm	0.39 Kg / Rmt	9	22 mm	2.98 Kg / Rmt
3	10 mm	0.62 Kg / Rmt	10	25 mm	3.85 Kg / Rmt
4	12 mm	0.89 Kg / Rmt	11	28 mm	4.83 Kg / Rmt
5	14 mm	1.21 Kg / Rmt	12	32 mm	6.31 Kg / Rmt
6	16 mm	1.58 Kg / Rmt	13	36 mm	7.99 Kg / Rmt
7	18 mm	2.00 Kg / Rmt	14	40mm	9.86 Kg / Rmt

- 11.1.** Excess consumption over 5% will be charged at penal rate.
- 11.2.** Reinforcement shall be measured in length including hooks, if any, separately for different diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.
- 11.3.** The contract unit rate for coated/uncoated reinforcement shall cover the cost of material, fabricating, transporting, storing, bending, placing, binding and fixing in position as shown on the drawings as per

these specifications and as directed by the Engineer, including all labour, equipment, supplies, incidentals, sampling, testing and supervision.

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

**11.4.** The rate shall be for a unit of **One Kg.**

**Item No: 5**

**Providing formwork of ordinary timber planking so as give a rough finish including centering shuttering strutting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in. Foundation footing bases of columns etc. and mass concrete.**

**1.0. Materials**

**1.1.** The shuttering to be provided shall be of ordinary timber plank and shall conform to M-26.

**1.2.** The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

**2.0. Workmanship**

**2.1.** The form work shall conform to the shape lines and dimensions as shown on the plans and be constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor to safe-guard against any settlement of the form-work during the course of concreting and after concreting. The form work of shuttering, centering, scaffolding, bracing etc. shall be as per design.

**2.2. Clearing and Treatment of forms:**

**2.2.1.** All rubbish, particularly chipping shaving and saw dust shall be removed from the interior of the form before the concrete work is placed and the-form in contact with concrete shall be cleaned and thoroughly wetted or treated. The surface shall be then coated with soap solution applied before concreting is done. Soap solution for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint. Alternatively a coat of raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coating does not get on construction joint surface and reinforced bars.

**2.3. Stripping time:**

**2.3.1.** In normal circumstances and where ordinary cement is used forms may be struck after expiry of following periods.

(a) Sides of walls columns and vertical faces of beams.....24 to 48 hours.

(b) Beam soffits, (props, left under).....7 days.

(c) Removal of props slabs:

(i) Slabs spanning up to 4.5. m.....7 days.

(ii) Spanning over 4.5mm.....14 days.

(d) Removal of props to beams and Arches:

(i) Spanning up to 6 m.....14 days.

(ii) Spanning over 6m.....21 days.

**2.4. Procedure when removing the form work:**

**2.4.1.** All form work shall be removed without such shock or vibrations as would damage the reinforced concrete surface. Before the soffits form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened

**2.5. Centering:**

**2.5.1.** The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete. Watch should be kept to see that behavior or centering and form work is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

**2.5.2.** The props of centering shall be provided on firm foundation or base of sufficient strength to carry the loads without any settlement.

**2.5.3.** The centering and form work shall, be inspected and approved by the Engineer-in-charge before concreting. But this will not relieve the contractor of his responsibility for strength, adequacy and safety of form work and centering. If there is a failure of form work or centering, contractor shall be responsible for the damages to property.



## **2.6. Scaffolding:**

**2.6.1.** All scaffolding, hoisting arrangements and ladders etc., required for the facilitating of concreting shall be provided and removed on completion of work by contractor at his own expense. The scaffolding, hoisting arrangements and ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workman etc. **2.6.2.** The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.

**2.6.3.** The rate is applicable to all condition of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as:

- (a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering propping, bolting, wedging easing, striking and removal.
- (b) Filletting to form stop chamfered edges or splayed external angles not exceeding 20 mm: width to beams, columns and the like.
- (c) Temporary openings in the forms for pouring concrete, if required removing rubbish etc.
- (d) Dressing with oil to prevent adhesion of concrete with shuttering and.
- (e) Raking or circular cutting.

## **2.7. Re-Use:**

**2.7.1.** Before re-use, all form shall be inspected by Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned and joints are gone over, repaired where required. Inside surface shall be retreated to prevent adhesion of concrete.

## **3.0. Mode of Measurements & Payment**

**3.1.** Form work shall be measured as the area in square meters to shuttering in contract with concrete except in the case of inclined member and portion of curved profile and upper side in which case on area of underside shall be measured for payment.

**3.4.** Form work to secondary beams shall be measured up to the sides of main beams but no deduction shall be made from the form work of the main beam at the intersection point. No deduction shall be made from the form work of a column at intersection of beams.

**3.5.** The rate is for the completed item

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

## **Item No: 6**

**Providing Trimix Machine for levelling smooth finishing incl. channel fixing electric supply etc & dewatering of excess water through vacuum pump incl. transporting for machine and labour charges etc. comp. as directed.**

This work shall consist Providing Trimix Machine for levelling smooth finishing incl. channel fixing electric supply etc & dewatering of excess water through vacuum pump incl. transporting for machine and labour charges etc. comp as approved by the Engineer in charge.

### **➤ Workmanship**

The mechanical vibrator shall be installed on channel and it shall be run in forward direction of concrete placing. The vibrator shall be started and shall be used as per instruction of Engineer-in-charge.

The water shall be sucked by dewaterization equipment by spreading vacuum sheet on concrete after sufficient vibrator the floating water shall be sufficiently sucked from concrete so that the sufficient strength of concrete shall be achieved.

The mechanical trowel shall be started after dewatering from concrete. The trowel shall be run in such a way that the required finish top surface of concrete shall be achieved mat finish or glossy finish.

Immediately after compaction, concrete shall be protected against harmful effects of weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes, frost and driving

out process shall be covered with wet jute bags or the similar absorbent material approved by the Engineer-in-charge soon after the initial set, and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over the foundation concrete may be started after 48 hours of its laying but the curing of concrete shall be continued for a minimum period of 14 days.

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. Hard and bitter water shall not be used for curing.

➤ **Mode of Measurement & Payment :**

The payment will be made on Sq.m. basis of the finished work.

In reinforced concrete the volume occupied by reinforcement shall not be deducted. The slab shall be measured as running continuously through and the beam as the portion below the slab.

All necessary labour, materials Equipment, etc for sampling, preparing test cubes, curing etc. shall be provided by the Contractor. Testing of the materials and concrete may be arranged by the Engineer in charge in an approved laboratory at the cost of the contractor

The unit rate concrete shall include the cost of all materials, tools and plant required for mixing, placing in position, compacting, and cost water reducing concrete and mixture at 100 ml per bag of cement and making channel 75 mm x 75 mm required to level and slope and thickness of the concrete road leveling of placed concrete with surface vibrator and finishing with power floater and trowel light booming the surface and cutting Expansions joints by machine as directed by the Engineer in charge and finishing as per direction of the Engineer-in-charge, curing and all other incidental expenses for producing concrete of specified strength to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all centering and forms required for the work. The concrete shall be measured for its length breadth limiting dimensions to those specified on plan or as directed.

The rate shall be for a unit of one Sq.m.

**Item No: 7**

**Supplying Making and laying of Promoulded bitumenus Joint Filler 12mm Thcik with Grooving**

1. Open joints shall be constructed at the location as directed by the Engineer-in-charge using a wood strip metal plate or other suitable material which is subsequently removed. When removing the material, care shall be exercised to avoid chipping or breaking the corners of the concrete. The edge of the concrete, at the joints, shall be well finished. Reinforcement shall not extend across an open joint.
2. When performed filler is to be provided, the filler shall be placed in correct position before concrete is placed against the filler. The filler material shall form part of the joint and while concreting the slab, care shall be taken to prevent the former from being displaced. After the work is completed, the exposed face of the joint shall be cleaned of all loose materials sticking to it.
3. The material used for filling expansion joint shall be bitumen impregnated felt. Impregnated felt shall conform to the requirement of I.S. 1838, and shall be got approved from the Engineer-in-charge. The joint shall consist of large pieces and assembly of small pieces to make up the required size shall be avoided.
4. The expansion joint shall be measured in running meter. Thickness of the expansion joint will be 12 to 20mm. width of expansion joint shall be equal to full depth of the slab.



5. The rate shall include the cost of all materials, labor, equipment's & incidental charges for fixing the joints complete in all respects as per these specifications and Smt. basis.

**Item No: 1**

**Excavation for base footings upto depth 1.5 m. including sorting out and disposing of the excavated material upto 50 m lead (loose or soft soil)**

➤ **All sorts of soil**

Any soil which generally require close application of picks or jumpers or scarifies to loosen it stiff clay, gravel and stone etc. fall under this category.

**1.0. General**

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

**2.0. Clearing the site**

**2.1.** The site on which the structure is to be built shall be cleared, and all obstructions loose stone, materials and rubbish of all kind bush wood and trees shall be removal as directed The materials so obtained shall be property of the Government and shall be conveyed und stacked as directed with all lead. The roots of the trees coming in the sides shall be cut and coated with a hot asphalt

**2.2.** The rate of side clearance is deemed to be included in the rate of earth work for which no extra will be paid.

**3.0. Setting out**

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

**4.0. Excavation**

The excavation in foundation shall be carried out in true line and level and shall have the width and depth as shown in the drawings or as directed. The contractor shall do the necessary shoring and shutting or providing necessary slopes to a safe angle, at his own cost. The payment for such precautionary measures shall be paid separately it not specified. The bottom of the excavated area shall be leveled both longitudinally and transversely as directed by removing and watering as required no. earth filling will be allowed for bringing it to level, if by mistake or any excavation is made deeper or wider than, that shown on the plan or directed. The extra depth or width shall be made up with concrete of same proportion as specified for the foundation concrete at the cost of the contractor. The excavation **upto 1.5 mt. depth** shall be measured under this item.

**5.0. Disposal of the excavated stuff**

**5.1.** The excavated stuff of the selected type shall be used in filling the trenches and plinth or leveling the ground in layers including ramming and watering etc.

**5.2.** The balance of the excavated quantity shall be removed by the contractor from the site of work to a place as directed with lead up to all lead and lift.

**6.0. Mode of measurements & payment**

**6.1.** The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections given by the Engineer-in-charge. No payment shall be

made for surplus excavation made in excess of above requirements or due to stopping and sloping back as found necessary on account of conditions of soil and requirements of safety.

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

**Item No: 2**

**Excavation for base footings upto depth 1.5 m. to 3.0 m. including sorting out and disposing of the excavated material upto 50 m lead (loose or soft soil)**

➤ **All sorts of soil**

Any soil which generally require close application of picks or jumpers or scarifiers to loosen it stiff clay, gravel and stone etc. fall under this category.

**1.0. General**

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

**2.0. Clearing the site**

- 2.1. The site on which the structure is to be built shall be cleared, and all obstructions loose stone, materials and rubbish of all kind bush wood and trees shall be removal as directed The materials so obtained shall be property of the Government and shall be conveyed und stacked as directed with all lead. The roots of the trees coming in the sides shall be cut and coated with a hot asphalt
- 2.2. The rate of side clearance is deemed to be included in the rate of earth work for which no extra will be paid.

**3.0. Setting out**

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

**4.0. Excavation**

The excavation in foundation shall be carried out in true line and level and shall have the width and depth as shown in the drawings or as directed. The contractor shall do the necessary shoring and shutting or providing necessary slopes to a safe angle, at his own cost. The payment for such precautionary measures shall be paid separately it not specified. The bottom of the excavated area shall be leveled both longitudinally and transversely as directed by removing and watering as required no. earth filling will be allowed for bringing it to level, if by mistake or any excavation is made deeper or wider than, that shown on the plan or directed. The extra depth or width shall be made up with concrete of same proportion as specified for the foundation concrete at the cost of the contractor. The excavation **upto 1.5 mt. depth** shall be measured under this item.

**5.0. Disposal of the excavated stuff**

- 5.1. The excavated stuff of the selected type shall be used in filling the trenches and plinth or leveling the ground in layers including ramming and watering etc.
- 5.2. The balance of the excavated quantity shall be removed by the contractor from the site of work to a place as directed with lead up to all lead and lift.

**6.0. Mode of measurements & payment**

- 6.1. The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections given by the Engineer-in-charge. No payment shall be

made for surplus excavation made in excess of above requirements or due to stopping and sloping back as found necessary on account of conditions of soil and requirements of safety.

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

### **Item No: 3**

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

#### **1.0. Workmanship**

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

**1.2.** As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris, 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.

**1.3.** 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.

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

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

**1.6.** 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.

#### **2.0. Mode of Measurements & Payment**

**2.1.** The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.

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

### **Item No: 4**

**Providing and laying cement concrete 1:3:6 (1 Cement, 3 coarse sand, 6 crushed stone aggregates 40mm. Nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth.**

#### **1.0. Materials**

**1.1.** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. **crushed stone** aggregate 40 mm. nominal size shall conform to M-14.

#### **2.0. Workmanship**

##### **2.1. General**

**2.1.1.** Before stating concrete the bed of foundation trenches shall be cleared of all loose materials, leveled, watered and rammed as directed.

##### **2.2. Proportion of Mix:**

**2.2.1.** The proportion of cement, sand and stone aggregate shall be one part of cement. 3 parts of coarse sand and 6 parts of **crushed stone aggregate** and shall be measured by volume.

##### **2.3. Mixing:**

- 2.3.1.** 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 color 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.
- 2.4. Transporting &Placing the Concrete:**
- 2.4.1.** 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.
- 2.4.2.** The concrete shall be laid in layers of 15 cms. to 20 cms.
- 2.5.1.** The concrete shall be rammed with heavy iron rammers and rapidly to get the required compaction and to allow all the interstices to be filled with mortar.
- 2.6. Curing:****2.6.1.** 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.
- 3.0. Mode of measurement and payment**
- 3.1.** The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plans or as directed
- 3.2.** The rate shall be before a unit of **one cubic meter**.

#### **Item No: 5**

**Providing and laying controlled cement concrete M-200 and curing complete including the cost of formwork and excluding the cost of reinforcement of reinforced concrete work in**

- do -- for R.C.C. Raft
- do -- for R.C.C Wall
- do -- for Ground Beam
- do -- for Ramp Base Slab
- do -- for Stair

#### **1.0. Materials**

- 1.1.** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8. Coarse aggregate shall conform M-12.
- 1.2.** The shuttering to be provided shall be of ordinary timber plank and shall conform to M-26.
- 1.3.** The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

#### **2.0. General**

- 2.1.** The concrete mix shall be designed from preliminary tests. The proportion of the concrete mix shall be 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) by volume concrete work shall have exposed concrete surface or as specified in the item.
- 2.2.** The proportioning of cement and aggregates shall be done by weight and necessary precautions shall be taken in the production to ensure that the required work cube strength is attained and maintained. The controlled concrete shall be in grades of M-100, M-150, M-200, M-250, M-300, M-350 & M-400 with prefix controlled added to it. The letter M refers to mix and the numbers specify 28 days works cube compressive strength of 200 mm. cubes of the mix expressed in Kg./cm.

- 2.3. The proportion of cement, sand and coarse aggregate shall be determined of weight. The weigh batch machine shall be used for maintaining proper control over the proportion of aggregates as per mix design. The strength requirements of different grades of concrete shall be as under:

Grade of Concrete	Compressive strength of 15 cms. cubes in kg/cmt. at 28 days, conducted in accordance with I.S. 516-1959.	
	Preliminary test Min.	Work Test Min.
M 150	200	150
M 200	260	200
M 250	320	250
M 300	380	300
M 350	440	350
M 400	500	400

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

### 3.0. Workmanship

- 3.1. The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work question and can be properly compacted with means available except where it can be shown to the satisfaction of the Engineer-in-charge, that supply of properly graded aggregate of uniform quality can be maintained till the completion of work, grading of aggregate shall be controlled by obtaining the coarse aggregates in different sizes and bending them in the right proportions as required. Aggregates of different sizes shall be stocked in separate stock piles. The required quantity of material shall be stock piled several hours, preferably a day before use. The grading of coarse and fine aggregate shall be checked as frequently as possible, the frequency for a given job being determined by Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests.
- 3.2. In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag, a reasonable number of bags shall be weighted separately to check the net weight. Where cement is weighted from bulk stocks at site and not by bags, it shall be weighed separately from the aggregate. Water, shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in clean and serviceable condition. Their accuracy shall be periodically checked.
- 3.3. It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates I.S. 2386 (Part-III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates due to variation in their moisture content. Minimum quantity of cement to be used in controlled concrete shall not be less than 220 kg./m<sup>3</sup> in plain concrete and not less than 250 kg/m<sup>3</sup> in reinforced concrete.
- 3.4. The form work shall conform to the shape lines and dimensions as shown on the plans and be constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor to safe-guard against any settlement of the form-work during the course of concreting and after concreting. The form work of shuttering, centering, scaffolding, bracing etc. shall be as per design.
- 4.0. **Clearing and Treatment of forms:**

- 4.1. All rubbish, particularly chipping shaving and saw dust shall be removed from the interior of the form before the concrete work is placed and the-form in contact with concrete shall be cleaned and thoroughly wetted or treated. The surface shall be then coated with soap solution applied before concreting is done. Soap solution for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint. Alternatively a coat of raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coating does not get on construction joint surface and reinforced bars..

#### 5.0 Stripping time:

- 5.1. In normal circumstances and where ordinary cement is used forms may be struck after expiry of following periods.
- (a) Sides of walls columns and vertical faces of beams.....24 to 48 hours.
  - (b) Beam soffits, (props, left under).....7 days.
  - (c) Removal of props slabs:
    - (i) Slabs spanning up to 4.5. m.....7 days.
    - (ii) Spanning over 4.5 mm.....14 days.
  - (d) Removal of props t beams and Arches:
    - (i) Spanning up to 6 mm.....14 days.
    - (ii) Spanning over 6 m.....21 days.

#### 6.0 Procedure when removing the form work :

- 6.1. All form work shall be removed without such shock or vibrations as would damage the reinforced concrete surface. Before the soffits form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened.

#### 7.0 Centering:

- 7.1. The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete. Watch should be kept to see that behavior or centering and form work is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.
- 7.2. The props of centering shall be provided on firm foundation or base of sufficient strength to carry the loads without any settlement.
- 7.3. The centering and form work shall, be inspected and approved by the Engineer-in-charge before concreting. But this will not relieve the contractor of his responsibility for strength, adequacy and safety of form work and centering. If there is a failure of form work or centering, contractor shall be responsible for the damages to property.

#### 8.0 Scaffolding:

- 8.1. All scaffolding, hoisting arrangements and ladders etc. required for the facilitating of concreting shall be provided and removed on completion of work by contractor at his own expense. The scaffolding, hoisting arrangements and ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workman etc.
- 8.2. The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.
- 8.3. The rate is applicable to all condition of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as :
- (a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering propping, bolting, wedging easing, striking and removal.
  - (b) Filleting to form stop chamfered edges or splayed external angles not exceeding 20 mm: width to beams, columns and the like.

- (c) Temporary openings in the forms for pouring concrete, if required removing rubbish etc.
- (d) Dressing with oil to prevent adhesion of concrete with shuttering and.
- (e) Raking or circular cutting.

**9.0 Re-Use:**

- 9.1.** Before re-use, all form shall be inspected by Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned and joints are gone over, repaired where required. Inside surface shall be retreated to prevent adhesion of concrete.

**10.0. Mode of measurement & payment**

- 10.1.** The consolidated cubical contents of concrete work as specified in item shall be measured. No deduction shall be made for
- (a) Ends of dissimilar materials such as joints, beams, posts, girders, falters, purling trusses, corbels and steps etc. up to 500 Sq. Cm. in section.
- 10.2.** Form work shall be measured as the area in square meters to shuttering in contract with concrete except in the case of inclined member and portion of curved profile and upper side in which case on area of underside shall be measured for payment.
- 10.3.** Form work to secondary beams shall be measured up to the sides of main beams but no deduction shall be made from the form work of the main beam at the inter section point. No deduction shall be made from the form work of a column at inter section of beams.
- 10.4.** The rate includes cost of all materials labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing, as directed, curing and all other incidental expenses for producing concrete of specified strength. The rate includes the cost of form work.
- 10.5.** The rate shall be for a unit of **one cubic meter**.

**Item No: 6**

**Providing T.M.T. Bar Fe 500 / 500-D reinforcement for R.C.C. work including bending, Binding and placing in position complete up to floor two level.(up to 10 ton)**

**1.0. GENERAL**

This work shall consist of furnishing and placing coated, or uncoated or high strength deformed reinforcement, bars (intentioned) of the shape and dimensions shown on the drawings and conforming to these specifications or as approved by the Engineer in charge.

**2.0. MATERIAL**

**2.1. TMT Bars**

Reinforcements may be either T.M.T. tensile steel, conforms to IS 1786-2008 bars. They may be uncoated or coated with epoxy or with approved protective coatings.

- 2.2.** T.M.T. bars reinforcement for R.C.C. work shall conform IS 432 (Part II) 1982 (Reaffirmed 1995) and shall be of tested quality. It shall also comply with relevant part of IS 456-2000.
- 2.3.** All reinforcement shall be clean and free from dirt, paint, grease or oil, all scale or loose or thick rust at the time of placing.
- 2.4.** All steel shall be procured from original producers no re-rolled steel shall be incorporated in the work.
- 2.5.** Only new steel shall be delivered to the site every bar shall be inspected before placing to its position and defective brittle or burnt bar shall be discarded cracked ends of bars shall be discarded.



### **3.0. Pitch**

**3.1.** Distance between bars shall be as specified in drawings and as directed by the Engineer in charge all bars shall be placed at an accurate distance from each other and shall be bind tightly to maintain the desired pitch Suitable means shall be provided for holding bars securely in position.

### **4.0. Binding wire**

**4.1.** Mild steel binding wire shall be of 1.63 mm or 1.22 mm (16 to 18 gauge diameter and shall conform IS 280-2006.

**4.2.** The use of black wire will be permitted for binding reinforcement bars. It shall be free from dirt, paint, grease or oil, oil scale or loose or thick rust and any other undesirable coating which may prevent adhesion of cement mortar at the time of binding.

**4.3.** Only new binding wire shall be delivered to the site all binding wire shall be inspected before binding to its position and defective brittle, rusted, used wire, shall be discarded.

### **5.0. PROTECTION OF REINFORCEMENT**

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

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

### **6.0. Workmanship**

**6.1.** The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed by The Engineer in charge.

**6.2.** Reinforcing steel shall conform accurate to the dimensions given in the bar bending schedules shown on relevant drawing

### **7.0. BENDING OF REINFORCEMENT**

**7.1.** Bar bend g schedule shall be furnished by the Contractor and got approved by the Engineer before start of work.

**7.2.** Reinforcing steel shall conform to the dimensions and shapes given in the approved bar bending Schedules.

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

Bars shall not be bent or straightened in a manner that will damage parent material or the coating bars bent during transport or handling shall, be straightened before being used on work and shall not be heated to facilitate straightening.

### **8.0. PLACING OF REINFORCEMENT**

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

**8.2.** Reinforcement bars shall be placed accurately in position as shown on the drawings. The bars, crossing one another shall be tied together at every intersection with binding wire (annealed), conforming to IS:280 to make the skeleton of the reinforcement rigid such that the reinforcement does not get displaced during placing of concrete, or any other operation. The diameter of binding wire shall not be less than 1 mm.

**8.3.** Bars shall be kept in position usually by the following methods:

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

**8.4.** In case of dowels for Columns and walls the vertical reinforcement shall be kept in position by means of timber templates with slots in them accurately, or with cover blocks tied to the reinforcement timber templates shall be removed after the concreting has progressed up to a level just below their location.

**8.5.** Layers of reinforcements shall be separated by spacer bars at approximately One meter intervals. The minimum diameter of spacer bars shall be 12 mm or: equal to maximum size of main reinforcement or maximum size of coarse aggregate, whichever is greater. Horizontal reinforcement shall not be, allowed to sag between supports.

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

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

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

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

## **10.0. Welding**

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

**10.2.** While welding may be permitted for T.M.T. reinforcing bars conforming to IS:432, welding of deformed bars conforming to IS: 1786 shall in general be prohibited. Welding may be permitted in case of bars of other than S 240 grade including special. Welding grade of S 500D grade bars conforming to IS:1786, for which necessary chemical analysis has been secured and the carbon equivalent (CE) calculated from the chemical composition using the formula:

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

is 0.4 or less.

**10.3.** The method of welding shall conform to IS:2751 and IS:9417 and to any supplemental specifications to the satisfaction of the Engineer.

- 10.4.** Bars shall be bent cold to the specified shape and dimensions or as directed by Engineer in charge using the proper bender tool, operated by hand or power to attain proper radius of bends. Bars shall not be bend or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used in the work. Bars shall not be heated to facilitate bending.
- 10.5.** Unless otherwise specified a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bane shall not be less then twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times of the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any spiting of the concrete.
- 10.6.** All reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm in size and by using say blocks or metal chairs spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals, Bars shall not be allowed to sag between supports not displaced during concreting or any other operations of the work All devices used for positioning shall be of not corrodible material wooden and metal supports shall not extended to the surface of the concrete, except where shown in drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick and wooden blocs shall not be used Layers of bars shall be separated by spacer bars pre-cast mortar blocks or other approved devices. Reinforcement after bending 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 form corrosion, concrete cover shall be provided as indicated on drawings. All bars protruding from concrete and to which other bars are to be sliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.
- 10.7.** Bars crossing each other where required shall be secured by binding wire (annealed) of size not less than 1 mm in such a manner that they do not slip over at the time of fixing and concreting.
- As far possible bars of full length shall be used in case this is not possible, overlapping of bars shall be done as directed by the Engineer in charge When practicable overlapping bars shall not touch each other, but be kept apart by 25 mm Where no 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 sheer not bending moments is maximum.
- 10.8.** Whenever indicated on drawing or desired the Engineer in charge bars shall be jointed by coupling which shall have a cross section sufficient to transmit the full stresses of bars The end of the bars that are jointed by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than the normal cross section of the bar. Threads shall be standards threads Steel for coupling shall conform to IS 226.
- 10.9.** When permitted or specified on the drawings joints of reinforcement bars shall butt-welded so as to transmit their full stresses Welded joints shall preferably be located at points when steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded Only electric are welding using a process which excludes air form the molten metal and conforms to any or 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 two or three stages previous surface shall be cleaned properly Ends of bars shall be cleaned of all loose scale rust stages 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 IS 814 Welded pieces of reinforcement shall be tested.

Specimen shall be taken from the actual site and their number shall frequency to test shall be as directed by the Engineer in charge.

## 11.0 MODE OF MEASUREMENTS & PAYMENT

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

Sr. No	Diameter of steel	weight of steel per running meter	Sr. No	Diameter of steel	weight of steel per running meter
1	6 mm	0.22 Kg / Rmt	8	20 mm	2.47 Kg / Rmt
2	8 mm	0.39 Kg / Rmt	9	22 mm	2.98 Kg / Rmt
3	10 mm	0.62 Kg / Rmt	10	25 mm	3.85 Kg / Rmt
4	12 mm	0.89 Kg / Rmt	11	28 mm	4.83 Kg / Rmt
5	14 mm	1.21 Kg / Rmt	12	32 mm	6.31 Kg / Rmt
6	16 mm	1.58 Kg / Rmt	13	36 mm	7.99 Kg / Rmt
7	18 mm	2.00 Kg / Rmt	14	40mm	9.86 Kg / Rmt

- 11.1. Excess consumption over 5% will be charged at penal rate.
- 11.2. Reinforcement shall be measured in length including hooks, if any, separately for different diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.
- 11.3. The contract unit rate for coated/uncoated reinforcement shall cover the cost of material, fabricating, transporting, storing, bending, placing, binding and fixing in position as shown on the drawings as per these specifications and as directed by the Engineer, including all labour, equipment, supplies, incidentals, sampling, testing and supervision.

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

- 11.4. The rate shall be for a unit of **One Kg.**

### Item No: 7

**Providing and Laying Brick work using common burnt clay building bricks (Conventional) having crushing strength not less than 35 Kg./Sq. Cm. in Super Structure Above Plinth level in Cement Mortar (1:6) (1 Cement : 6 fine sand) etc. complete for any Height.**

#### 1.0. Materials

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

#### 2.0. Workmanship

##### 2.1. Proportion:

- 2.1.1. The proportion of the cement mortar shall be 1:6 (1 cement: 6 finesand) by volume.

##### 2.2. Wetting of bricks:

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

### **2.3. Laying:**

- 2.3.1.** Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete to bond; closures in such case shall be cut to required size and used near the ends of walls.
- 2.3.2.** A layer of mortar shall be spread on full width for suitable length of the lower course. Each brick shall first be properly 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.
- 2.3.3.** The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate course shall generally be directly one over the other. The thickness of brick course shall be kept uniform.
- 2.3.4.** The brick shall be laid with frog up wards. A set of tools comprising of wooden straight edges, man son's spirit level, square half meter rub, and pins, string and plumb shall be kept on the site of work for frequent checking during the progress of work.
- 2.3.5.** Both the faces of walls of thickness greater than 23 cms. Shall be kept in proper place. All the connected brick work shall be kept not more than one meter over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees.
- 2.3.6.** All fixtures, 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.

### **2.4. Joints:**

- 2.4.1.** Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be raked out as directed by raking tools daily during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to be done.
- 2.4.2.** The face of brick shall be cleaned the very day on which the work is laid and all mortar dropping removed.

### **2.5. Curing:**

- 2.5.1.** Green work shall be protected from rain 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.

### **2.6. Preparation of foundation bed:**

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

### **3.0. Mode of measurements & payment**

- 3.1.** 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.
- 3.2.** No deduction shall be made from quantity of brick work nor any extra payment made for embedding in masonry of marking holes in respect of following item.
  - (1) Ends of joints, beams, posts, girders, rafters, purlins trusses corbel, steps, etc. where cross sectional area does not exceed 500 sq.cm.
  - (2) Opening not exceed in 1000 sq.cm.
  - (3) Wall plate sand bed plates bearing of slab, chajjas and like whose thickness does not exceed 10 cms. and the bearing does not extend the full thickness of wall.

- (4) Drainage holes and recesses for cement concrete blocks to embed hold fasts for doors, window etc.
- (5) Iron fixtures, pipes up to 300 mm. dia. hold fasts of doors, and window built into masonry and pipes etc. for concealed wiring.
- (6) Forming charges of section not exceeding 350 sq.cm. in masonry.
- 3.3** Apparatuses for fire places shall not be deducted nor shall extra labour required to make splaying of jumps, throating and making trenches over the aperture be paid for separately.
- 3.4.** The rate shall be for a unit of one cubic meter.

### **Item No: 8**

**Providing and Laying 20 mm thick sand face cement plaster on Walls upto height of 10 mts. Above ground level consisting of 12mm thick backing coat of C.M 1:3 (1 Cement, 3 Sand ) and 8 mm thick finishing coat of C.M 1:1 (1 Cement, 1 Sand) etc. complete.**

#### **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.** The work shall be carried out in the coats. The backing coat (base coat) shall be 12 mm. thick in C.M. 1:3.

#### **2.2. 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.

#### **2.3. Preparation of background:**

- 2.3.1.** 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 is left on the surface. Trimming of projections on brick/concrete surfaces where necessary shall be carried out to get an even surface.
- 2.3.2.** Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.
- 2.3.3.** 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.
- 2.3.4.** 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 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.

#### **2.4. Application of plaster:**

- 2.4.1.** The plaster about 15x15cms. 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, and 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 over working the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Hounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.



- 2.4.2. 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.
- 2.4.3. 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.
- 2.4.4. 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 on the outside of the plaster and keeping them wet.
- 2.4.5. Before the first coat hardens its surface shall be beaten up by edges of wooden tapers and close dents shall be made on the surface. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days, depending upon the weather conditions. The surface shall not be allowed to dry during this period.
- 2.4.6. The second coat shall be completed to 8mm. thickness in C.M. 1:1 as described above, including raising sand facing by bushing. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per sample approved.
- 2.4.5. The plastering work shall be in single coat on rough side of half brick wall for interior plastering up to floor two levels, finished even and smooth in C.M. 1:3.
- 2.4.6 **Curing:**  
The curing shall be started overnight after finishing of plaster. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.
- 2.4.7. The finishing shall be gutka finishing with 1 cm x 1 cm grooves shall be done as directed.

### **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 the thickness of the key i.e. grooves or open joints in brickwork, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 20mm at any point on this surface.
- 3.4. This item includes plastering up to floor two levels including making necessary cornices as directed.
- 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, sills etc. of these openings, for finish to plaster around ends of joints, beams posts etc.

- (b) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for ravel, 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 and sills shall be measured.
  - 3.10. The rate shall be for a unit of **One Sq. meter. No extra payment for making necessary cornices shall be made.**

#### **Item No: 9**

**Providing and laying polished Kota stone slab flooring over 20mm(Average) thick base of cement mortar 1:6 (1-cement : 6-coarse sand) or L.M. 1:1.5 (1-Lime putty : 1.5 - coarse sand) laid over and jointed with grey cement slurry mixed with pigment to match the shade of slab including rubbing and polishing etc. complete. (A) 25mm thick**

#### **1.0. Materials**

- 1.1. Water shall conform to M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11. **25mm thick hand dressed polished blue Kota stone slab** 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 contract 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 25 mm. at any place of the slab.
- 2.2. Bedding for the polished blue kota stone slabs shall be of cement plaster 1:3 (1 cement: 3 coarse sand) or L.M. 1:1.5 of average thickness 10 mm given in the description of the item. Sub grade shall be cleaned; wetted and mopped Mortar of the specified mix and thickness shall then be spread on an area sufficient to receive one blue kota 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 walls shall enter not less than 10 mm. under the plaster, skirting or dado. The junction between the wall and 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 polishing machine fitted with bobs shall be run over it.
- 2.5. The holes required for Nahni traps, pipes and any other fittings shall be made, without any extra cost.



**3.0. Measurement & payment**

- 3.1.** The risers of steps, skirting or dado shall be measured in sq. meter Length shall be measured along the finished faces of risers, skirting or dado. Height shall be measured from finished level of treads of floor to top. Lining of pillars shall be measured under this item.
- 3.2.** The rate shall be for a unit of one sq. meter.

**SCHEDULE-B4-CONSTRUCTION WORK OF TOILET BLOCK 1)FATEPURA WATER WORK 2)NEAR GURUKRUPA 3)ALIRAJPUR NAKA HOTEL AT CHHOTAUDAIPUR. (03 Nos)**

**Item No: 1**

**Excavation for base footings upto depth 1.5 m. including sorting out and disposing of the excavated material upto 50 m lead (loose or soft soil)**

Any soil which generally require close application of picks or jumpers or scarifies to loosen it stiff clay, gravel and stone etc. fall under this category.

**1.0. General**

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

**2.0. Clearing the site**

- 2.1. The site on which the structure is to be built shall be cleared, and all obstructions loose stone, materials and rubbish of all kind bush wood and trees shall be removal as directed The materials so obtained shall be property of the Government and shall be conveyed und stacked as directed with all lead. The roots of the trees coming in the sides shall be cut and coated with a hot asphalt.
- 2.2. The rate of side clearance is deemed to be included in the rate of earth work for which no extra will be paid.

**3.0. Setting out**

After clearing the site the center lines will be given by the Engineer-in-charge. The contractor shall assume full responsibility for alignment, elevation and dimension of each and all 'parts of the work. Contractor shall supply labors materials, etc. required for setting out the reference marks and bench 'marks and shall maintain them as long as required and directed.

**4.0. Excavation**

The excavation in foundation shall be carried out in true line and level and shall have the width and depth as shown in the drawings or as directed. The contractor shall do the necessary shoring and shutting or providing necessary slopes to a safe angle, at his own cost. The payment for such precautionary measures shall be paid separately it not specified. The bottom of the excavated area shall be leveled both longitudinally and transversely as directed by removing and watering as required no. earth filling will be allowed for bringing it to level, if by mistake or any excavation is made deeper or wider than, that shown on the plan or directed. The extra depth or width shall be made up with concrete of same proportion as specified for the foundation concrete at the cost of the contractor. The excavation **up to 1.5 mt. depth** shall be measured under this item.

**5.0. Disposal of the excavated stuff**

- 5.1. The excavated stuff of the selected type shall be used in filling the trenches and plinth or leveling the ground in layers including ramming and watering etc.
- 5.2. The balance of the excavated quantity shall be removed by the contractor from the site of work to a place as directed with lead up to all lead and lift.

**6.0. Mode of measurements & payment**

- 6.1. The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections given by the Engineer-in-charge. No payment shall be made for surplus excavation made in excess of above requirements or due to stopping and sloping back as found necessary on account of conditions of soil and requirements of safety.
- 6.2. The rate shall be for a unit of **one cubic meter**.

### **Item No: 2**

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

#### **1.0 WORKMANSHIP**

- 1.1. The earth to be used for filling shall be free from salts, organic or other foreign matter all clots of earth shall be broken.
- 1.2. As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris brick bats mortar dropping etc. and filled with earth in layers not exceeding 20cms. 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 ends of crow-bars, where rammer cannot be used.
- 1.3 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.
- 1.4 The finished level of filling shall be kept to shape intended to be given to floor.
- 1.5 In case of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required shall also be as specified.

#### **2.0. Mode of Measurements & Payment**

- 2.1. The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.
- 2.2. The rate shall be for a unit of **one cubic meter**.

### **Item No: 3**

**Filling in foundation and plinth with murrum or selected soil in layers of 20cm thickness including watering, ramming and consolidating etc. complete.**

#### **1.0. Materials**

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

#### **1.0. Workmanship**

- 1.1. The earth to be used for filling shall be free from salts, organic or other foreign matter. All clods of earth shall be broken.
- 1.2. As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris, 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.
- 1.3. 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.
- 1.4. The finished level of filling shall be kept to shape intended to be given to floor.
- 1.5. In case of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required, shall also be as specified.
- 1.6. 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.

## 2.0. Mode of Measurements & Payment

- 2.1. The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.
- 2.2. The rate 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.
- 2.3. The rate shall be for a unit of one cubic meter.

### Item No: 4

Carrying out plinth treatment to post construction/existing structure by spraying chemical solution for termite control treatment including labour and material consistent with I.S.I specification. Using Chlordene and chiorpurfiles 20 EC. As per 6131\_paret-II consteration weight one percent is recommended i.e. one litre 20 EC chemical emulsion with 19 liter give 1% concentration inclusive of one litre chemical emulsion application at the rate of 5 litre chemical/sqm of surface as recommended as per I.S.

#### 1.0 General :

1.1 The item shall be carried out as per relevant specification of ISS. The specialized firms having established reputation and reputed past performance shall be got approved by Engineer-in charged.

#### 2.0 Materials :

2.1 The chemicals to be used for soil treatment shall be as following :

##### ----- Chemical Concentration -----

1. Aldrine 0.50% (By weight)
2. Chloridene 1.00% (By weight)
3. Dieldrine 0.50% (By weight)
4. Heptachlor 0.50% (By weight)

-----  
2.2 The dilution grade for preparing emulsions is given below.

Quantity of finished emulsion in liter	Quantity of concentrate required in Liters	Aldrine	Dieldrin	Chloridene	Heptachlor
30 EC	18 EC	75 EC	20 EC	20 EC	
-----	-----	-----	-----	-----	-----
100	1.67	2.28	1.00	5.00	2.50

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#### 3.0 Treatment :

3.1 After the earth filling is completed within plinth walls and before the sand is laid to the entire surface of the filled earth shall be treated with chemical emulsion at 15 liters per sqm area.

Before the plastering and flooring work has been started the walls and floors shall be given the spray of the chemical aqueous emulsion.

Finally the earth around the external periphery of the building upto a depth of 300cms. shall be treated at the rate of 50 liters per running meter of plinth wall. To facilitate this treatment M. S.rod should be driven into the soil as close as possible to the plinth wall at the interval of 30 cms. and upto a depth of 30 cms. and the rod more backward and forward in direction parallel to the wall to break up the earth so that the chemical emulsion gets mixed thoroughly with soil.

#### 4.0 Spraying Instrument :

4.1 A pressure pump shall be used to carry out spraying operations to facilitate proper penetration of chemical into the earth.

#### 5.0 Guarantee of Anti-termite Treatment :

5.1 The treatment against termite infestation shall remain fully effective for a period of not less than ten years from the date of issue of final certificate of completion of work. If at any time during this period any defects in treatment are revealed or any evidence of infestation in any part of the building or structure is noticed, the contractor shall have to rectify the defects within fifteen days of receipt of notice from the Employer. On the contractor's failure to do so, the Employer may get the same rectified through any other agency at the contractor's risk and cost and the decision of the Employer as to the cost payable by the contractor for the same shall be final and binding to the contractor. A guarantee bond on appropriate stamped paper shall be given by the contractor.

#### 6.0 Mode of Measurement:

The contract rate shall be for quantity of chemical emulsion in liters per sq. meter used as specified. The measurements shall be taken and paid on the **Smt. basis**.

#### **Item No: 5**

**Providing and laying cement concrete (1:4:8) (1 Cement, 4 Coarse sand, 8 Crushed stone aggregate 40 mm nominal) and curing complete excluding cost of formwork in foundation and plinth.**

##### **1.0. Materials**

1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Aggregate 20 mm. nominal size shall conform to M-12.

##### **2.0. Workmanship**

###### **2.1. General**

2.1.1. Before stating concrete the bed of foundation trenches shall be cleared of all loose materials, leveled, watered and rammed as directed

###### **2.2. Proportion of Mix:**

2.2.1. The proportion of cement, coarse sand and aggregate shall be one part of cement. 3 parts of coarse sand and 6 parts of aggregates and shall be measured by volume.

###### **2.3. Mixing:**

**2.3.1.** 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.

**2.4. Transporting & Placing the Concrete:**

**2.4.1.** 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.

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

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

**2.6. Curing:**

**2.6.1.** 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.

**3.0. Mode of measurement and payment**

**3.1.** The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plans or as directed.

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

**Item No: 6**

**Providing and laying controlled cement concrete M-200 and curing complete including the cost of formwork and excluding the cost of reinforcement of reinforced concrete work in**

**-- do -- for Coping**

**-- do -- for R.C.C. Slab**

**1.0. Materials**

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

**1.2.** The shuttering to be provided shall be of ordinary timber plank and shall conform to M-26.

**1.3.** The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

**2.0. General**

**2.1.** The concrete mix shall be designed from preliminary tests. The proportion of the concrete mix shall be 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) by volume concrete work shall have exposed concrete surface or as specified in the item.

**2.2.** The proportioning of cement and aggregates shall be done by weight and necessary precautions shall be taken in the production to ensure that the required work cube strength is attained and maintained. The controlled concrete shall be in grades of M-100, M-150, M-200, M-250, M-300, M-350 & M-400 with prefix controlled added to it. The letter M refers to mix and the numbers specify 28 days works cube compressive strength of 200 mm. cubes of the mix expressed in Kg./cm.

- 2.3. The proportion of cement, sand and coarse aggregate shall be determined of weight. The weigh batch machine shall be used for maintaining proper control over the proportion of aggregates as per mix design. The strength requirements of different grades of concrete shall be as under:

Grade of Concrete	Compressive strength of 15 cms. cubes in kg/cmt. at 28 days, conducted in accordance with I.S. 516-1959.	
	Preliminary test Min.	Work Test Min.
M 150	200	150
M 200	260	200
M 250	320	250
M 300	380	300
M 350		350
M 400	500	400

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

### 3.0. Workmanship

- 3.1. The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work question and can be properly compacted with means available except where it can be shown to the satisfaction of the Engineer-in-charge, that supply of properly graded aggregate of uniform quality can be maintained till the completion of work, grading of aggregate shall be controlled by obtaining the coarse aggregates in different sizes and bending them in the right proportions as required. Aggregates of different sizes shall be stocked in separate stock piles. The required quantity of material shall be stock piled several hours, preferably a day before use. The grading of coarse and fine aggregate shall be checked as frequently as possible, the frequency for a given job being determined by Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests.
- 3.2. In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag, a reasonable number of bags shall be weighted separately to check the net weight. Where cement is weighted form bulk stocks at site and not by bags, it shall be weighed separately from the aggregate. Water, shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in clean and serviceable condition. Their accuracy shall be periodically checked.
- 3.3. It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates I.S. 2386 (Part-III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates due to variation in their moisture content. Minimum quantity of cement to be used in controlled concrete shall not be less than 220 kg./m<sup>3</sup> in plain concrete and not less than 250 kg/m<sup>3</sup> in reinforced concrete.
- 3.4. The form work shall conform to the shape lines and dimensions as shown on the plans and be constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor toe safe-guard against any settlement of the form-work during the course of concreting and after concreting. The form work of shuttering, centering, scaffolding, bracing etc. shall be as per design.
- 4.0. **Clearing and Treatment of forms:**

- 4.1. All rubbish, particularly chipping shaving and saw dust shall be removed from the interior of the form before the concrete work is placed and the-form in contact with concrete shall be cleaned and thoroughly wetted or treated. The surface shall be then coated with soap solution applied before concreting is done. Soap solution for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint. Alternatively a coat of raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coating does not get on construction joint surface and reinforced bars..

## 5.0 Stripping time:

- 5.1. In normal circumstances and where ordinary cement is used forms may be struck after expiry of following periods.

(a) Sides of walls columns and vertical faces of beams.....24 to 48 hours.

(b) Beam soffits, (props, left under).....7 days.

(c) Removal of props slabs:

(i) Slabs spanning up to 4.5. m.....7 days.

(ii) Spanning over 4.5 m.....14 days.

(d) Removal of props t beams and Arches:

(i) Spanning up to 6 m.....14 days.

(ii) Spanning over 6 m.....21 days.

## 6.0 Procedure when removing the form work :

- 6.1. All form work shall be removed without such shock or vibrations as would damage the reinforced concrete surface. Before the soffits form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened.

## 7.0 Centering:

- 7.1. The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete. Watch should be kept to see that behavior or centering and form work is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.
- 7.2. The props of centering shall be provided on firm foundation or base of sufficient strength to carry the loads without any settlement.
- 7.3. The centering and form work shall, be inspected and approved by the Engineer-in-charge before concreting. But this will not relieve the contractor of his responsibility for strength, adequacy and safety of form work and centering. If there is a failure of form work or centering, contractor shall be responsible for the damages to property.

## 8.0 Scaffolding:

- 8.1. All scaffolding, hoisting arrangements and ladders etc. required for the facilitating of concreting shall be provided and removed on completion of work by contractor at his own expense. The scaffolding, hoisting arrangements and ladders etc. shall be strong enough to with stand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workman etc.
- 8.2. The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.
- 8.3. The rate is applicable to all condition of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as :
- (a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering propping, bolting, wedging easing, striking and removal.
  - (b) Filleting to form stop chamfered edges or splayed external angles not exceeding 20 mm: width to beams, columns and the like.



- (c) Temporary openings in the forms for pouring concrete, if required removing rubbish etc.
- (d) Dressing with oil to prevent adhesion of concrete with shuttering and.
- (e) Raking or circular cutting.

## **9.0 Re-Use:**

- 9.1.** Before re-use, all form shall be inspected by Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned and joints are gone over, repaired where required. Inside surface shall be retreated to prevent adhesion of concrete.

## **10.0. Mode of measurement & payment**

- 10.1.** The consolidated cubical contents of concrete work as specified in item shall be measured. No deduction shall be made for
- (a) Ends of dissimilar materials such as joints, beams, posts, girders, gables, purling trusses, corbels and steps etc. up to 500 Sq. Cm. in section.
- 10.2.** Form work shall be measured as the area in square meters to shuttering in contact with concrete except in the case of inclined member and portion of curved profile and upper side in which case on area of underside shall be measured for payment.
- 10.3.** Form work to secondary beams shall be measured up to the sides of main beams but no deduction shall be made from the form work of the main beam at the inter section point. No deduction shall be made from the form work of a column at inter section of beams.
- 10.4.** The rate includes cost of all materials labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing, as directed, curing and all other incidental expenses for producing concrete of specified strength. The rate includes the cost of form work.
- 10.5.** The rate shall be for a unit of **one cubic meter**.

## **Item No: 7**

**Providing T.M.T. Bar Fe 500 / 500-D reinforcement for R.C.C.work including bending, binding and placing in position complete upto floor two level.(upto 10 ton)**

### **1.0. GENERAL**

This work shall consist of furnishing and placing coated, or uncoated or high strength deformed reinforcement, bars (intentioned) of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer in charge.

### **2.0. MATERIAL**

#### **2.1. TMT Bars**

Reinforcements may be either T.M.T. tensile steel, conforms to IS 1786-2008 bars. They may be uncoated or coated with epoxy or with approved protective coatings.

- 2.2.** T.M.T. bars reinforcement for R.C.C. work shall conform IS 432 (Part II) 1982 (Reaffirmed 1995) and shall be of tested quality. It shall also comply with relevant part of IS 456-2000.
- 2.3.** All reinforcement shall be clean and free from dirt, paint, grease or oil, all scale or loose or thick rust at the time of placing.
- 2.4.** All steel shall be procured from original producers no re-rolled steel shall be incorporated in the work.
- 2.5.** Only new steel shall be delivered to the site every bar shall be inspected before placing to its position and defective brittle or burnt bar shall be discarded cracked ends of bars shall be discarded.
- 3.0. Pitch**

3.1. Distance between bars shall be as specified in drawings and as directed by the Engineer in charge all bars shall be placed at an accurate distance from each other and shall be bind tightly to maintain the desired pitch Suitable means shall be provided for holding bars securely in position.

**4.0. Binding wire**

4.1. Mild steel binding wire shall be of 1.63 mm or 1.22 mm (16 to 18 gauge diameter and shall conform IS 280-2006.

4.2. The use of black wire will be permitted for binding reinforcement bars. It shall be free from dirt, paint, grease or oil, oil scale or loose or thick rust and any other undesirable coating which may prevent adhesion of cement mortar at the time of binding.

4.3. Only new binding wire shall be delivered to the site all binding wire shall be inspected before binding to its position and defective brittle, rusted, used wire, shall be discarded.

**5.0. PROTECTION OF REINFORCEMENT**

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

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

**6.0. Workmanship**

6.1. The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed by The Engineer in charge.

6.2. Reinforcing steel shall conform accurate to the dimensions given in the bar bending schedules shown on relevant drawing.

**7.0. BENDING OF REINFORCEMENT**

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

7.2. Reinforcing steel shall conform to the dimensions and shapes given in the approved bar bending Schedules.

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

Bars shall not be bent or straightened in a manner that will damage parent material or the coating bars bent during transport or handling shall, be straightened before being used on work and shall not be heated to facilitate straightening.

**8.0. PLACING OF REINFORCEMENT**

8.1. The reinforcement cage should generally be fabricated in the yard at ground level, and then shifted and placed in position. The reinforcement shall be placed strictly, in accordance with the drawings and shall be assembled in position, only when structure is otherwise ready for placing of

concrete. Prolonged time gap, between assembling of reinforcements and casting of concrete, which may result in rust formation on the surface, shall not be permitted.

**8.2.** Reinforcement bars shall be placed accurately in position as shown on the drawings. The bars, crossing one another shall be tied together at every intersection with binding wire (annealed), conforming to IS: 280 to make the skeleton of the reinforcement rigid such that the reinforcement does not get displaced during placing of concrete, or any other operation. The diameter of binding wire shall not be less than 1 mm.

**8.3.** Bars shall be kept in position usually by the following methods:

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

**8.4.** In case of dowels for Columns and walls the vertical reinforcement shall be kept in position by means of timber templates with slots in them accurately, or with cover blocks tied to the Reinforcement Timber templates shall be removed after the concreting has progressed up to a level just below their location.

**8.5.** Layers of reinforcements shall be separated by spacer bars at approximately One meter intervals. The minimum diameter of spacer bars shall be 12 mm or: equal to maximum size of main reinforcement or maximum size of coarse aggregate, whichever is greater. Horizontal reinforcement shall not be, allowed to sag between supports.

**8.6.** Necessary stays, blocks, metal chairs, spacers, metal hangers supporting wires etc, or Other subsidiary, reinforcement shall be provided to fix the reinforcements firmly in its correct position.

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

**8.8.** Bars coated with epoxy or any other approved protective coating shall be placed on supports that do not damage the coating. Supports shall be installed in a manner such that planes of weakness are not created in hardened concrete. The coated reinforcing steel shall be held in place by use of plastic or plastic coated binding wires especially manufactured for the Purpose.

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

#### **9.0. Lapping**

**9.1.** All reinforcement shall be furnished in full lengths as indicated on the drawing. No splicing of bars, except where shown on the drawing; will be permitted without approval of the Engineer. The lengths of the splice shall be as indicated on drawing or as approved by the Engineer. Where practicable, overlapping bars shall not touch each other, and shall be kept apart by 25 mm or 1 1/4 times the maximum size of coarse aggregate, whichever is greater, If this is not feasible, overlapping bars shall be bound with annealed steel binding wire, not less than 1 mm diameter and twisted tight in such a manner as to maintain minimum clear cover to the reinforcement from the concrete surface. Lapped splices shall be staggered or located at points, along the span where stresses are low.

#### **10.0. Welding**

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

**10.2.** While welding may be permitted for T.M.T. reinforcing bars conforming to IS:432, welding of deformed bars conforming to IS: 1786 shall in general be prohibited. Welding may be permitted in case of bars of other than S 240 grade including special. Welding grade of S 500D grade bars conforming to

IS: 1786, for which necessary chemical analysis has been secured and the carbon equivalent (CE) calculated from the chemical composition using the formula:

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

is 0.4 or less.

**10.3.** The method of welding shall conform to IS: 2751 and IS: 9417 and to any supplemental specifications to the satisfaction of the Engineer.

**10.4.** Bars shall be bent cold to the specified shape and dimensions or as directed by Engineer in charge using the proper bender tool, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used in the work. Bars shall not be heated to facilitate bending.

**10.5.** Unless otherwise specified a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times of the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any spalling of the concrete.

**10.6.** All reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm in size and by using say blocks or metal chairs spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between supports not 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 the concrete, except where shown in drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, pre-cast mortar blocks or other approved devices. Reinforcement after bending 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 drawings. All bars protruding from concrete and to which other bars are to be lapped and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

**10.7.** Bars crossing each other where required shall be secured by binding wire (annealed) of size not less than 1 mm in such a manner that they do not slip over at the time of fixing and concreting. As far as possible bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed by the Engineer in charge. When practicable overlapping bars shall not touch each other, but be kept apart by 25 mm. Where no 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 moments are maximum.

**10.8.** Whenever indicated on drawing or desired the Engineer in charge bars shall be joined by coupling which shall have a cross section sufficient to transmit the full stresses of bars. The end of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than the normal cross section of the bar. Threads shall be standard threads. Steel for coupling shall conform to IS 226.

**10.9.** When permitted or specified on the drawings joints of reinforcement bars shall be butt-welded so as to transmit their full stresses. Welded joints shall preferably be located at points where steel will not be subject to more than 75 percent of the maximum permissible stresses and welds shall be staggered so that at any one section not more than 20 percent of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or 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 two or three stages previous surface shall be cleaned properly. Ends of bars shall be cleaned of all loose scale, rust, 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 IS 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number shall frequency to test shall be as directed by the Engineer in charge.

#### 11.0 MODE OF MEASUREMENTS & PAYMENT

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

Sr. No	Diameter of steel	weight of steel per running meter	Sr. No	Diameter of steel	weight of steel per running meter
1	6 mm	0.22 Kg / Rmt.	8	20 mm	2.47 Kg / Rmt
2	8 mm	0.39 Kg / Rmt.	9	22 mm	2.98 Kg / Rmt
3	10 mm	0.62 Kg / Rmt.	10	25 mm	3.85 Kg / Rmt
4	12 mm	0.89 Kg / Rmt.	11	28 mm	4.83 Kg / Rmt
5	14 mm	1.21 Kg / Rmt.	12	32 mm	6.31 Kg / Rmt
6	16 mm	1.58 Kg / Rmt.	13	36 mm	7.99 Kg / Rmt
7	18 mm	2.00 Kg / Rmt.	14	40mm	9.86 Kg / Rmt

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

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

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

11.4 The rate shall be for a unit of **One Kgs.**

#### Item No: 8

**Brick work using common burnt building bricks having crushing strength not less than 35 Kg./cm<sup>2</sup> in super structure for Ground Floor in C.M. (1:6) (1 Cement, 6 fine sand) racking out joints curring etc. complete directed by Engineer-in-charge.**

##### 1.0. Materials

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

##### 2.0. Workmanship

##### 2.1. Proportion:

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

##### 2.2. Wetting of bricks:

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

**2.3. Laying:**

- 2.3.1.** Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete to bond; closures in such case shall be cut to required size and used near the ends of walls.
- 2.3.2.** A layer of mortar shall bespread 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.
- 2.3.3.** The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate course shall generally be directly one over the other. The thickness of brick course shall be kept uniform.
- 2.3.4.** The brick shall be laid with frog up wards. A set of tools comprising of wooden straight edges, man son's spirit level, square half meter rub, and pins, string and plumb shall be kept on the site of work for frequent checking during the progress of work.
- 2.3.5.** Both the faces of walls of thickness greater than 23 cms. Shall be kept in proper place. All the connected brick work shall be kept not more than one meter over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees.
- 2.3.6.** All fixtures, 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.

**2.4. Joints:**

- 2.4.1.** Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exposed 12 mm. The face joints shall be raked out as directed by raking tools daily during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to done.
- 2.4.2.** The face of brick shall be cleaned the very day on which the work is laid and all mortar dropping removed.

**2.5. Curing:**

- 2.5.1.** Green work shall be protected from rain 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.

**2.6. Preparation of foundation bed:**

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

**3.0. Mode of measurements & payment**

- 3.1.** 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 oras directed shall be final. Battered tapered and curved portions shall be measured net.
- 3.2.** No deduction shall be made from quantity of brick work nor any extra payment made for embedding in masonry of marking holes in respect of following item.
- (1) Ends of joints, beams, posts, girders, rafters, purlins trusses corbel, steps, etc. where cross sectional area does not exceed 500 sq.cm.

- (2) Opening not exceed in 1000 sq.cm.
- (3) Wall plate sand bed plates bearing of slab, chajjas and like whose thickness does not exceed 10 cms. and the bearing does not extend the full thickness of wall.
- (4) Drainage holes and recesses for cement concrete blocks to embed hold fasts for doors, window etc.
- (5) Iron fixtures, pipes up to 300 mm. dia. hold fasts of doors, and window built into masonry and pipes etc. for concealed wiring.
- (6) Forming charges of section not exceeding 350 sq.cm. in masonry.
- 3.3** Apparatuses for fire places shall not be deducted nor shall extra labour required to make splaying of jumps, throating and making trenches over the aperture be paid for separately.
- 3.4.** The rate shall be for a unit of **one cubic meter**.

#### **Item No: 9**

**Brick work using common burnt building bricks having crushing strngth not less than 35 Kg./cm<sup>2</sup> in super structure for Ground Floor in C.M. (1:6) (1 Cement, 6 fine sand) racking out joints curring etc. complete directed by Engineer-in-charge.**

##### **1.0. Materials**

Bricks shall conform to M-15. Cement mortar shall conform to M-11.

##### **2.0. Workmanship**

##### **2.1. Proportion:**

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

##### **2.2. Wetting of bricks:**

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

##### **2.3. Laying:**

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

**2.3.2.** A layer of mortar shall be spread on full width for suitable length of the lower course. Each 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.

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

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

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

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

##### **2.4. Joints:**



- 2.4.1.** Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 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 be done.
- 2.4.2.** The face of brick shall be cleaned the very day on which the work is laid and all mortar dropping removed.
- 2.5. Curing:**
- 2.5.1.** Green work shall be protected from rain 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.
- 2.6. Preparation of foundation bed:**
- 2.6.1.** If the foundation is to be laid directly on the excavated bed, it shall be leveled, cleared of all loose materials, cleaned and wetted before starting masonry. If masonry is to be laid on concrete footing, the top of concrete shall be cleaned and moistened. The contractor shall obtain the engineer's approval for the foundation bed before foundation masonry is started. When pucca flooring is to be provided flush with the top of plinth, the inside plinth offset shall be kept lower than the outside plinth top by the thickness of the flooring.
- 2.7.** 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.
- 2.8.** Necessary scaffolding shall be provided. The supports of the scaffolding shall be sound and strong tied, together with horizontal pieces over which the scaffolding planks shall be fixed. Simple scaffolding shall be allowed normally. In this case scaffolding hole shall rest in hole header horizontal course 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.
- 2.9.** For the face of brick work, where plastering is to be done, joints shall be raked 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.
- 3.0. Mode of measurements & payment**
- 3.1.** The masonry work of G.F. & First floor shall be measured and paid under this item rate includes cost of all materials & labour.
- 3.2.** Brick work in parapet shall be included in the corresponding masonry item of floor immediately below the floor above which the parapet is built.
- 3.3.** No deduction shall be made from quantity of brick work nor any extra payment made for embedding in masonry of marking holes in respect of following item.
- (1) Ends of joints, beams, posts, girders, rafters, purlins trusses corbel, steps, etc. where cross sectional area does not exceed 500 sq.cm.
  - (2) Opening not exceed in 1000 sq.cm.
  - (3) Wall plate and bed plates bearing of slab, chajjas, and like whose thickness does not exceed 10 cms. and the bearing does not extend the full thickness of wall.
  - (4) Drainage holes and recesses for cement concrete blocks to embed hold fasts for doors, window etc.
  - (5) Iron fixtures, pipes up to 300 mm. dia. hold fasts of doors, and window built into masonry and pipes etc. for concealed wiring.
  - (6) Forming charges of section not exceeding 350 sq.cm. in masonry.
  - (7) Apparatuses for fire places shall not be deducted nor shall extra labour required to make splaying of jumps, throating and making trenches over the aperture be paid for separately.
- 3.4.** The rate shall be for a unit of **one cubic meter**.

#### **Item No: 10**

**Providing and fixing FRP frame size 125 x 65 mm and 35 mm thick FRP shutter with wood grain raised paneled design finish shutter having extra reinforcement on side & edges in Gel coat finish. The core of the shutter & frame is to be filed up with injected polyurethane foam done in situ alongwith embedded wooden pieces for stiffening & also taking hinges & fixtures. The whole FRP frame & Shutter is to be water proof weather proof, termite proof & resistance to mild acid/alkali. Rates are to be inclusive of S.S.hinges with fastener Sleeve & aluminium fixtures & fastenings.**

##### **1.0 SHUTTER MATERIAL:**

35 mm thick FRP single shutter in depress panel design shall be having frame size 125 x 65 mm FRP thickness fire retardant grade FRP skin and embedded wooden pieces for stiffening as well as holding hinges and fixtures all molded into one piece shutter. Core material shall be injected fire retardant grade rigid polyurethane foam done in situ having density 32 to 36 Kg/m<sup>3</sup>, compressive strength 1.8 to 2.0 kg/cm<sup>2</sup>, flexural strength 3.5 to 4.5 kg/cm<sup>2</sup>. Whole shutter shall be water proof, weather proof, termite proof and mild acid / alkali resistance.

##### **2.0 SHUTTER:**

28 mm thick depress panel FRP single shutter shall be joint less. It shall be straight and smooth and of standard shape finished in gel coat. All necessary fixtures and fastening shall be fixed where wooden piece provided.

##### **3.0 SHUTTER WORKMANSHIP:**

Shutter shall be fixed in line; level and proper manner having 2.0 to 3.0 mm play i.e. air space for smooth and easy working. Three S.S. hinges shall be fixed properly with necessary screws.

##### **4.0 SHUTTER TOLERANCE:**

1.5 mm tolerance will be allowed in thickness of shutter.

##### **5.0 SHUTTER FIXTURES AND FASTENING:**

All fixtures & fastening like S.S. aldop, tadi or baby-latch, stopper, handle shall be fixed with Shutter in usual manner. The shutter shall be fixed to frame using fixing necessary Khila or crews including drilling in granite frame as directed. During fixing of shutter if the granite frame is damage the same will be replaced by Contractors own cost without any extra payment. Product is from reputed company having ISO 9001-2000 certificate and with three years performance guarantee.

##### **6.0 MODE OF MEASUREMENT AND PAYMENT:**

Rate includes the cost of all materials, S.S. fixtures and fastening with necessary screws for fixing in position, labor, tools, equipment's etc. required for satisfactory completion of item as directed by the Engineer in charge with all lead and lift.

The payment shall be made on unit of smt. basis.

#### **Item No: 11**

**Providing and fixing glazed louverd glass windows and ventilators with teakwood frame 10cm x 7cm size including the cost of oil painting to wood work etc. complete.(A)C.M 1:3**

##### **1.0. Materials**

Indian teak wood shall conform to M-29. Glass shall conform to M-38.

##### **2.0. Workmanship**

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

## **2.2. Frames:**

**2.2.1.** All members of frames shall be exactly at right angles. The right angle shall be checked from inside surfaces of the-frames of the respective members.

**2.2.2.** All members of frames shall be straight without any warp of bow and shall have smooth surfaces well planned on the three sides exposed at right angles to each other. The surfaces touching the wall may not be planed unless it is required in order to straighten up the member or to obtain the overall sizes within the tolerances as specified.

**2.2.3.** Frame shall have dovetail joins. When clerestory windows in included, it shall be provided by having full length one piece post for door or windows and clerestory window extending the frame on top at the head to the required extent. Horns shall not be provided in the head of the frame. When no sills are provided, the vertical posts of the frame in the ground floor shall be embedded in the sill masonry for 10 cm. on upper floors, the vertical posts shall be fixed in the floor or masonry by forming notches 10 mm. deep. Slight adjustment of spacing as necessary shall be done to have the hold fasts in the joints of masonry; course. The frame shall be erected in position and held plumb with strong support form north sides and built in masonry as it is being built. The transom shall be through tenoned into the mortises of the jamb post to the full width of the jamb post and the thickness of the tenon shall be not less than 15 mm.

## **2.3. Tolerance:**

Unless specially mentioned otherwise tolerance of + 1.5. mm shall be allowed for each wrought face.

**2.4.** The tenons shall be closely fitting into the mortises and suitably pinned with wood dowels not less than 10 mm. dia. meter. The depth of rebates for housing the shutter shall be as shown in the detailed drawing or as directed.

**2.5.** The concrete surface of tenon and mortise shall be treated before putting together with an adhesive of approved make.

**2.6.** Minimum number of three hold-fasts shall be fixed on each side of door and windows frames, one at the center point and the other two at 30 mm. from the top and bottom of the frames. In case of windows and ventilators frames. The size c. each hold-fast shall be 300 x 25 x 6 mm. and of mild-steel with split end. The hold fasts shall be fixed with screws to frames.

**2.7.** Mild steel hold fasts shall be protected with a coating of coal asphalt tar. The surface of frame abutting the masonry or concrete faces shall be properly treated by applying a coat of approved coating.

The specifications shall be followed for frame work except that the frame work of 10 x7 cms. size of required size ventilators shall be provided with glazed glass louvers. The glass louvers shall be provided as directed. In the groove of 1.25 cms. depth made in frames, the thickness of glass shall be 5 mm. and glass shall be glass of best quality. The ventilation blades shall slope done towards the outside at an angle of 450.

## **3.0. Mode of measurements and payment**

**3.1.** The area of opening within the frame in which louvers are fixed shall be measured in sq. meters.

**3.2.** The rate included painting 3 coats to wood work with ready mix paint.

The rate shall be far a unit of one square meter.

## **Item No: 12**

**Providing and fixing M. S. grills of required pattern to wooden frames of window etc. with M. S. flats at required spacings and frame around square or round bars with round headed bolts and nuts or by screws. (B) Plain Grills**

### **1.0. Materials**

The structural steel shall conform to M-22.

### **2.0. Workmanship**

- 2.1.** The M.S. Grill shall be prepared as per the drawing or as directed for fixing to required pattern in gaps of openings including frame work etc.
- 2.2.** The grill shall be fabricated to the designs and patterns shown in the drawings and the weight shall be as directed, and the joints shall be reverted or welded as shown in the plan or as directed. The grill so formed shall be fixed into the frames of the windows etc. before they are erected in position. The outside strip frame of the grill shall be housed to its full thickness into the recess cut into the frame of the windows etc. The grill shall be fixed to the frame with number of bolts and nuts or screws viz. bolt nut/screw per 30 cm. of the length of outer strip subject to minimum of 2 Nos. on each side of the frame or as indicated in the drawing 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 the frame strips.

### **➤ Applying primer coat**

#### **1.0. Materials**

The enamel paint shall conform to M-44 B.

#### **2.0. 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; keng. 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. Application of paint:**
  - 2.2.1.** 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.
  - 2.2.2.** Each coat shall be allowed to dry completely and lightly rubbed with very fine grade of sand-paper 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.

- 2.2.3. 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 or clogging of paint puddles in the corners of panels, angles of moldings etc. shall be left on the work.
- 2.2.4. Special care shall be taken while painting over bolts, nuts, rivets, overlaps etc. Approved best quality brushes shall be used.

### **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 fabrication. In case of trusses if measured in sq. m. compound girders, stanchions, lattices, grader and similar work, actual area shall be measured in sq.m. and no extra shall be paid for painting on bolts heads, nuts, washers etc. No addition shall be made to the weight calculated for the purpose of measurements of steel and iron works for paint applied on shop or at site.
- 3.5. The different surfaces shall be grouped into one general item, areas of uneven surfaces being converted into equivalent plain areas in accordance with the table given as per Annexure-II for payment.
- 3.6. No payment shall be made for weight of screws, bolts nuts etc. only weight of grill shall be paid.
- 3.7. The rate shall be for a unit of **one kg.**

### **Item No: 13**

**Providing 15 mm. thick cement plaster in single coat on Rough (similar) side of single or half brick walls for interior plastering upto floor two level and finished even and smooth in. (II) cement mortar 1 : 4 (1 cement : 4 sand) Extra over item 58 to 64 for finishing with a floating coat of neat cement slurry. (upto 10 ton)**

#### **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 background:**

- 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 peasting 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 15x15cms. 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 over working the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. 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 on the outside of the plaster and keeping them wet.

**2.3.5.** The plastering work shall be in single coat on brick / concrete walls for interior plastering up to floor two levels, finished even and smooth in **C.M. 1:4.**

**2.3.6** The coat of cement and fines and mortar of proportion 1:1 (15 mm thick about) shall be applied to the plastered surface with a trowel to provide uniform texture while the base coat is still plastic.

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

**2.3.8. Curing:** All the plaster work shall be kept damp continuously for a period 7 days.

**2.3.9.** Providing necessary grooves between structural members as directed by Engineer in charge.

**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 the thickness of the key i.e. grooves or open joints in brickwork, 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 for all floors.

**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 cornice sif 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, sills etc. of these openings, for finish to plaster around ends of joints, beams posts etc.
  - (b) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, (i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii) When two faces of wall are plastered with different types of plasters or if one 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 and sills shall be measured.
- 3.10 The payment shall be made for a unit of 1.0 sq.mt of work done over and above the finishing of work of base coat.
- 4.0. The rate shall be for a unit of **one sq. meter**.

#### **Item No: 14**

**Providing 10 mm. thick cement plaster in single coat on brick/concrete walls for interior plastering up to floor two level and finished even and smooth in. (II) cement mortar 1 : 4 (1 cement:4 sand) Extra over item 58 to 64 for finishing with a floating coat of neat cement slurry. (upto 10 ton) Extra over items 58 to 71 for plastering on ceilings and soffits of stairs upto floor two level instead of plastering on walls.**

##### **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 and soffits of stairs plaster which shall be independent of the walls.

##### **2.2. Preparation of background:**

- 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 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 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 15x15cms. 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 over working the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. 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 on the outside of the plaster and keeping them wet.

**2.3.5.** The plastering work shall be in single coat on fair side of brick / concrete work for interior plastering up to floor two levels and finished even and smooth in **C.M. 1:4**.

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

**2.3.7.** In any continuous face of wall the finishing treatment should be carried out continuously and day lo daybreaks made to coincide with architectural breaks in order to avoid unsightly Junctions  
The smooth concrete shall be suitably say read to provide necessary bond before plastering.

**2.3.8. Curing:** All the plaster work shall be kept damp continuously for a period 7 days.

**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 the thickness of the key i.e. grooves or open joints in brickwork, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum **10mm** 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, sills etc. of these openings, for finish to plaster around ends of joints, beams posts etc.
  - (b) Deduction for openings exceeding 0.5 sq.mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, (i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii) When two faces of wall are plastered with different types of plasters or if one 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 and sills shall be measured.
- 3.10. The payment shall be made extra for this work over and above the plaster work
- 3.11. The rate shall be for a unit or 1 Kg of water proofing materials used in 1 bag of weighing 50Kg. cement used extra over the rate of plastering work.
- 3.12. The rate shall be for a unit of **one sq. meter**.

#### **Item No: 15**

**Providing and Laying 20 mm thick sand face cement plaster on Walls upto height of 10 mts. Above ground level consisting of 12mm thick backing coat of C.M 1:3 (1 Cement, 3 Sand ) and 8 mm thick finishing coat of C.M 1:1 (1 Cement, 1 Sand) etc. complete.**

##### **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. The work shall be carried out in the coats. The backing coat (base coat) shall be 12 mm. thick in C.M. 1:3.

##### **2.2. 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.

##### **2.3. Preparation of background:**

- 2.3.1. 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 is left on the surface.

Trimming of projections on brick/concrete surfaces where necessary shall be carried out to get an even surface.

- 2.3.2. Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.
- 2.3.3. 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.
- 2.3.4. 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 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.

#### **2.4. Application of plaster:**

- 2.4.1. The plaster about 15x15cms. 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, and 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 over working the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Hounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.
- 2.4.2. 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.
- 2.4.3. 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.
- 2.4.4. 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 on the outside of the plaster and keeping them wet.
- 2.4.5. Before the first coat hardens its surface shall be beaten up by edges of wooden tapers and close dents shall be made on the surface. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days, depending upon the weather conditions. The surface shall not be allowed to dry during this period.
- 2.4.6. The second coat shall be completed to 8mm. thickness in C.M. 1:1 as described above, including raising sand facing by bushing. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per sample approved.
- 2.4.5. The plastering work shall be in single coat on rough side of half brick wall for interior plastering up to floor two levels, finished even and smooth in C.M. 1:3.
- 2.4.6 **Curing:**

The curing shall be started overnight after finishing of plaster. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.
- 2.4.7. The finishing shall be gutka finishing with 1 cm x 1 cm grooves shall be done as directed.

### **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 the thickness of the key i.e. grooves or open joints in brickwork, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 20mm at any point on this surface.
- 3.4.** This item includes plastering up to floor two levels including making necessary cornices as directed.
- 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, sills etc. of these openings, for finish to plaster around ends of joints, beams posts etc.
  - (b) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, (i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii) When two faces of wall are plastered with different types of plasters or if one 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 be for a unit of **One Sq. meter. No extra payment for making necessary cornices shall be made.**

### **Item No: 16**

**Distempering (Three Coat) with oil bound washable distemper of approved brand and manufacture and of required shade on wall surfaces to give an even shade over and including a primer coat with alkali resistance primer of approved brand after thoroughly brushing the surface to give an even shade free from foreign matter and also including preparing the surface even and smooth.**

#### **1.0. Materials**

- 1.1.** Oil bound washable distemper and primer shall be of approved brand and manufacture. The distemper shall be of required colour and shade and the same shall conform to I.S. : 428-1969. The shade shall be approved by Engineer in charge. Birla or Asian acrylic lappy (putty) and primer shall be of approved brand and manufacture.

#### **2.0. Workmanship**

The distempering shall be carried out on wall surfaces to give an even shade.

## **2.1. Scaffolding**

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

## **2.2. Preparation of surface:**

- 2.2.1.** The undecorated surface to be distempered shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for at least 2 months before applications of distemper.
- 2.2.2.** All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a 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 Paris mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

### **2.2.3 The lappy (putty) shall be carried out on wall surfaces to give an even shade.**

## **2.3. Priming coat:**

- 2.3.1.** A priming coat of distemper primer of approved manufacture and shade shall be applied over the papered surface in case of new work on undecorated surface. If the distemper priming is done after the wall surface dries completely, the distemper primer shall be applied.
- 2.3.2.** Application of primer shall be done as under: The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours before oil bound distemper or paint is applied.
- 2.3.3.** Oil bound distemper is not recommended to be applied within six months of the completion of wall plaster.

## **2.4. Preparation of oil bound distemper:**

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

## **2.5. Application of Distemper coat:**

- 2.5.1.** For undecorated surfaces, after the primer coat is dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub out priming coat. All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately by vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after a time interval of at least 24 hours between consecutive coats to permit proper drying of the preceding coat. The finished surface shall be even and uniform without patches, brush marks, distemper drops etc.
- 2.5.2.** Sufficient quantity of distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room which cannot be completed on the same day.
- 2.5.3.** 15 cm. double bristled distemper brush shall be used. After day's work brushes shall be thoroughly washed in hot water with soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

- 2.6. Protective measurements :** The surfaces of doors, windows, floors, articles of furniture etc. and such other parts of the buildings as are not to be distempered shall be protected from being splashed upon. Such surfaces shall be cleaned of distemper splashes if any.
- 3.0. Mode of measurements and payment**
- 3.1.** Priming coat of distemper primer, scraping of surface spoiled by struck roots, removal of oil and grease spots, treatment for infraction of effloresces., mould moss, fungi, algae and lichen and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.
- 3.2.** All the work shall be measured net in the decimal system as in place subject to the following limits unless otherwise stated hereinafter:
- (a) Dimensions shall be measured to the nearest 0.01 m.
  - (b) Area in individual items shall be worked out to the nearest 0.01 sq. m. All work shall be made for ends of joints, beams, posts etc. and openings, not exceeding 0.5 sq.mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, posts etc.
- 3.3.** Deductions of opening exceeding 0.5 sq.m. but not exceeding 3 sq. m. each shall be made as follows and net addition shall be made for reveals, jambs, soffits etc. of these openings :
- (a) When both the faces of wall are provided with same finish, deductions shall be made for one face only.
  - (b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for doors, windows etc. on which width of reveals is less than that of the other side but no deduction shall be made on the other side. Where the width of reveals on the both the faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of finish.
  - (c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveal is equal or more than that on untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.
- 3.4.** In case of opening of area exceeding 3 sq. m. each deduction shall be made for openings but jambs, sills and soffits shall be measured.
- 3.5.** No deductions shall be made for attachments such as casings, conduits, pipes, electric wiring and the like.
- 3.6.** Item includes removing nails, making good holes, patches with materials similar in composition of distemper.
- 3.7.** The extra rate shall be paid for carrying out distemping work on ceiling/sloping roofs over and above.
- 3.8.** The rate includes cost of all materials, labours, scaffolding, protective measures etc. involved in all the operations described above. This shall also include conveyance, delivery, handing, unloading, storing work etc.
- 3.9.** The rate shall be for a unit of one sq. meter.

#### **Item No: 17**

**Finishing wall with Weather Proof Acrylic Emulsion Exterior Paint on wall surface (three coat) to give and even shade and of approved brand and manufacture including thoroughly brooming and brushing the surface to remove all dirt, and remains of loose powdered material.**

**General:**

This work shall consist of painting the walls with weather proof acrylic emulsion paint of approved brand & manufacture and of required shade on exterior wall surfaces of the shape and dimensions shown on the drawings and conforming to these specifications or as approved by the Engineer in charge.

#### **MATERIALS**

##### **1.0 Exterior acrylic emulsion paint**



Exterior acrylic emulsion paint shall be of specified colour as approved by Engineer in charge the ready mixed exterior acrylic emulsion paint shall not be allowed, If however ready mix emulsion paint of specified shade or tint is not available white ready mixed paint with approved Steiner will be allowed in such case the contractor shall ensure that the shade of the paint so allowed shall be uniform exterior emulsion paint shall meet with the following general requirements

1. Exterior acrylic emulsion paint shall not show excessive setting in freshly opened full can and shall easily be redepressed with a paddle to a smooth homogeneous state. The exterior acrylic emulsion paint shall show no curding, livering cracking or colour separation and shall be free from lumps and skins.
2. The exterior acrylic emulsion paint as received shall brush easily possess good leveling properties and show no running or sagging tendencies.
3. The exterior acrylic emulsion paint shall not skin within 48 hours in a three quarters filled closed container
4. The exterior acrylic emulsion paint shall dry to a smooth uniform finish free from roughness grit unevenness and other imperfections
5. Ready mix exterior acrylic emulsion paint if allowed for specified shade, shall be used exactly as received from the manufacturers and generally according to their instruction and without any admixtures whatsoever.

## **2.0 WORKMAN SHIP**

### **2.1 Scaffolding:**

Where scaffolding is required, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be distempered. A properly secured strong and well tied suspended platform (joola) may be used for distempering. Where ladders are used, pieces of old gunny bags.

### **3.0 Application coat:**

The exterior acrylic emulsion paint on wall surfaces shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacturer only. Sufficient quantity of distemper required for a day's work shall be prepared.

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

- 3.2 Sufficient quantity of the exterior acrylic emulsion paint shall be mixed to finish one room at a time.

### **3.0 MODE OF MEASUREMENT & PAYMENT:**

- 3.1. The unit rate wall painting with two coats of exterior acrylic emulsion paint and one coat of priming coat shall include the cost of all materials, tools and plant required for mixing, cleaning brushing sand papering & painting with all required specials and Lapi compound, finishing as per direction of the Engineer-in-charge, and all other incidental expenses for producing pipe line work of specified diameter to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all scaffolding and forms required for the work.
- 3.2 The rate of wall painting with exterior acrylic emulsion paint shall include the cost of all labour, materials tools and plant scaffolding and all incidental expenses as described herein above.



- 3.3. The wall painting with exterior acrylic emulsion paint shall be measured for its length and height limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one square meter.
- 3.4. The payment will be made on **square meter** basis of the finished work.

**Item No: 18**

**Providing & Laying 24 "x 24" vitrified 8 mm thick tile flooring over 20 mm ( average) base of cement mortar 1:6 (1: cement : 6 coarse sand ) on new surface or fixing on existing flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry including finished with flush pointing & cleaning the surface etc. complete for antiskit . (upto 10 ton)**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. **24" x 24" glazed vitrified 8 mm to 10mm thick tiles** of standard quality shall conform to relevant Indian standard. The size& color of vitrified tiles shall be approved by Engineer in charge.

**2.0. Workmanship**

**2.1. Bedding:**

2.1.1. The sub grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface tamped and corrected to desired level and allowed to harden enough to offer a rigid cushion to tiles and to enable the mason to place wooden planks across and squat on it.

2.1.2. The **vitrified flooring tiles** shall be laid on cement mortar bedding of 20 mm. thick in C.M. 1:6 (1 cement: 6 coarse sand) on existing surface flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall be cleared and well wetted. The mortar shall then be spread in thickness not less than 10 mm. at any place and average 20 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. Neat gray cement grout at 33 kg/Cement/Sq.mt. of honey like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.

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

**2.3. Cleaning:**

2.3.1. 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 measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.

**3.0. Mode of measurements & payment**

3.1. The work done shall be measured in sq.mt. for visible area of work done. The length and width of the flooring shall be measured not between the faces of skirting or dado or plastered face of wall as the case may be. The paving under dado or skirting shall not be measured. No deduction shall be made not extra paid for

any opening in the floor of area up to 0.1 sq.mt. Nothing extra shall be paid for laying the floors at different levels in the same rooms.

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

### **Item No: 19**

**Providing and laying white glazed tiles 6mm thick in flooring, treads of steps and landing laid on a bed of 12mm thick cement mortar 1:3 (1 Cement : 3 Coarse Sand) finished with flush pointing in white cement.**

#### **1.0. Materials**

Water shall conform to M-1 Cement mortar shall conform to M-11 White glazed tiles shall conform to M-55

#### **2.0. Workmanship**

##### **2.1. Bedding :**

2.1.1. The sub grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface tamped and corrected to desired level and allowed to harden enough to offer a rigid cushion to tiles and to enable the monsoon to place wooden planks across and squat on it.

2.1.2. The white glazed tiles shall be laid on cement mortar bedding of 12 mm. thick in C.M. 1:3. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall be cleared and well wetted. The mortar shall then be spread in thickness 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. Neat gray cement grout at 33 kg/Cement/Sq. mt. of honey like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.

2.2.2. The tiles shall not have staggered joints. The joints shall be true to centre line both ways. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed they shall be cut (Sawn) 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 5 mm. and loose material removed. White cement shall be used for pointing the joints. After fixing the tiles finally in an even plane the flooring shall be kept wet and allowed to nature undisturbed for 7 days.

##### **2.3. Cleaning :**

2.3.1. 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 measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.

### **3.0. Mode of measurements & payment**

3.1. The work done shall be measured in sq. mt. for visible area of work done. The length and width of the flooring shall be measured not between the faces of skirting or dedos or plastered face of wall as the case may be. The paving under dedo or skirting shall not be measured. No deduction shall be made not extra paid for any opening in the floor of area-up to 0.1 sq.mt. Nothing extra shall be paid for laying the floors at different levels in the same rooms.

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

#### **Item No: 20**

**Providing and laying white glazed tiles 6mm thick in skirting risers of steps and dado on 10mm thick cement plaster 1:3 (1 cement : 3 coarse sand) and pointing in white cement jointed with white cement slurry.**

##### **1.0. Materials**

Water shall conform to M-1 Cement mortar shall conform to M-11 White glazed tiles shall conform to M-55

##### **2.0. Workmanship**

###### **2.1. Preparation of Surface:**

In case of brick masonry wall, the joints shall be raked out to a depth of least 15 mm. while the masonry is being laid. In case of concrete wall the surface shall be chiseled and roughed with wire brushes. The surface shall be cleaned and wetted thoroughly before commencing the laying work.

###### **2.2. Laying ;**

2.2.1. The wall surface shall be covered with 10 mm. thick plaster of cement mortar 1:3 mix and allowed to harden. The plaster shall be roughened with wire brushes both way. The back of tiles shall be floated with grey cement slurry set and edges with white cement slurry in bedding mortar. The tiles shall be gently tapped in position on after the other keeping the joints as thin as possible. Top of skirting or dedo shall be truly horizontal and the joints vertical or as per required pattern.

2.2.2. Risers of steps, skirting and dedo shall rest on top of treads or flooring. Where full size tiles cannot be fixed, They shall be cut to the required size and the edges be smoothened.

2.2.3. The joints shall be cleaned and flush pointed with white cement. The surface shall be kept wet for seven days. After curing the surface shall be washed clean.

##### **3.0. Mode of measurements and payment**

3.1. The rate shall include the cost of all materials and labour required for various operations described above. Risers of steps: skirting and dedo shall be measured in square meters, length and height shall be measured along the finished face of the skirting or dedo including curves, where special such as covers. internal and external angles, etc., used. The length and height shall be measured correct to the centimeter except in case of risers and skirting where height shall be measured correct to 3 mm

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

### **Item No: 21**

**Providing and laying polished Granite tiles 18 mm thick in risers of steps, skirting Dedo and pillars laid on 10 mm thick cement mortar 1 : 3 (1 cement : 3 coarse sand) and jointed with gray cement slurry mixed with pigment to match the shade of slab including rubbing, polishing, Moulding etc. complete. For Doors & Windows Edges.**

#### **1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. Polished Granite stone slab 18mm thick shall conform to ISO 13006. The size, thickness and shade & quality of polished granite stone shall be got approved from Engineer in charge before use.

#### **2.0. Workmanship**

##### **2.1. Preparation of Surface:**

In case of brick masonry wall, the joints shall be raked out to a depth of least 20 mm. while the masonry is being laid. In case of concrete wall the surface shall be chiseled and roughed with wire brushes. The surface shall be cleaned and wetted thoroughly before commencing the laying work.

##### **2.2. Laying ;**

**2.2.1.** The wall surface shall be covered with 10 mm. thick plaster of cement plaster 1:3 mix and allowed to harden. The plaster shall be roughened with wire brushes both way. The back of tiles shall be floated with grey cement slurry set and edges with white cement slurry in bedding mortar. The tiles shall be gently tapped in position on after the other keeping the joints as thin as possible. Top of skirting or dedo shall be truly horizontal and the joints vertical or as per required pattern.

**2.2.2.** Risers of steps, skirting and dedo shall rest on top of treads or flooring. Where full size tiles cannot be fixed. They shall be cut to the required size and the edges be smoothened.

**2.2.3.** The joints shall be cleaned and flush pointed with grey cement. The surface shall be kept wet for seven days. After curing the surface shall be washed clean.

#### **3.0. Mode of measurements and payment**

**3.1.** The rate shall include the cost of all materials and labour required for various operations described above.

**Risers of steps :** skirting and dedo shall be measured in square meters, length and height shall be measured along the finished face of the skirting or dedo including curves, where special such as covers internal and external angles, etc. used. The length and height shall be measured correct to the centimeter except in case of risers and skirting where height shall be measured correct to 3 mm.

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

## **Item No: 22**

**Providing and laying broken china mosaic flooring for terrace using 12mm to 20mm broken pieces of glazed tiles to be laid over cement mortar 1:3 to plain or slope and to be tempered to bring mortar crème out upto surface using white cement including rounding off junctions and extending them upto 15cm along the wall, clearing with water and oxalic acid. etc. as directed.**

### **1.0 MATERIAL - WATER:**

- 1.1 Water shall not be salty brackish and shall be clean, reasonably clear and free objectionable quantities of silt and traces of oil injurious 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 huddling of water shall be clean. Water shall conform to the Standard Specification in I.S. 455 - 1978.
- 1.2 If required by the Engineer in charge, it shall be tested by comparison with distilled water compression 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 50 minutes or more or decrease of more than 10 percent strength of mortar prepared with distilled water sample when compared with the result obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.
- 1.3 Water for curing, mortar concrete or masonry should not be too acidic/too alkaline.
- 1.4 It shall be free of elements which significantly affect the hydration reaction or otherwise interface with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.
- 1.5 Hard and bitter water shall not be used for curing.
- 1.6 Potable water will generally found suitable for curing mortar or concrete.

### **2.0 CEMENT**

- 2.1 Cement shall be ordinary Portland slag cement as per I.S. 1624 - 1974 or Portland slag cement as per I.S.455-1976.
- 2.2 Cement shall be stored above the ground level in perfectly and dry and water tight sheds. Wherever bulk storage containers are used, there capacity should be sufficient to cater to the requirements at site and should be cleaned at least once every 3 to 4 months. The aggregate shall be stored in such a way as to prevented mixture of foreign materials. Different size of fine or coarse aggregate shall be stored in separate stock piles sufficiently away from the each other to prevent inter mixing the materials.

### **3.0 SAND**

- 3.1 Sand shall be natural sand, clean, well graded, hared, strong, durable and gritty particular free from immures amounts of dust, clay, kankar, modules, soft or flaky particles shall alkali salts, organic matter, learn mica or other deleterious substance and shall be got approved from the Engineer in charge. The sand shall not contain more than 8percent of slit as determined by field test if necessary, the sand

**COARSE SAND** - The fineness modules of coarse sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse sand be as under :

<b>I.S. Sieve Designation</b>	<b>% by wt. passing</b>
4.75 mm	100
2.36 mm	90 to 100
1.18 mm	70 to 100
600 MC	30 to 100
300 MC	85 to 70
150 MC	00 to 50

- 3.2 FINESAND:** The fineness modules shall not exceed 1.0 the sieve analysis of fine sand be as under:

<b>I.S. Sieve Designation</b>	<b>% by wt. passing</b>
4.75 mm	100
2.36 mm	100
1.18 mm	70 to 100
600 MC	40 to 85
300 MC	05 to 50
150 MC	00 to 10

- 3.3** Materials shall be stored as to prevent their deterioration of their quality and fitness for the work. Any material which has deterioration or has been damaged or is otherwise considered defective by the Engineer in charge shall not be used in the work.

**1.4 WATER PROOFING COMPOUND**

Water proofing compound shall be of approved quality and make as approved by Engineer in charge.

**1.5 CHINA MOSAIC TILE PIECES**

China mosaic tiles pieces shall be of 50 mm to 90 mm nominal size, tiles pieces shall be made from hard and good quality of tiles.

**1.7 WHITE CEMENT**

White cement shall be of approved make it shall confirm definition of I.S. 8042-E-1978 the sample of white cement shall be approved by Engineer in charge.

**WORKMANSHIP**

- A** First of all surface of the entire terrace shall be cleaned by thoroughly brooming and then by wire brushes. All the loose material, dust and debris shall be removed thoroughly from the entire surface of the terrace.  
All joints and cracks shall be racked off and cut in trench which shall be filled by neat cement slurry admixed with water proofing compound. The joints with parapet shall be racked up to 30 cm height and shall be applied by neat cement slurry admixed with water proofing compound. Neat cement slurry shall be prepared and a water proofing compound of approved make shall be mixed with the slurry in proportion specified by the manufacturer of the compound and shall be laid throughout the surface of the terrace by the use of brushes mala etc. Cement slurry shall be prepared by adding adequate quantity of water so as to spread it uniformly on the surface. Applying neat cement slurry 2.75 Kgs./Smt. of cement admix with water proofing compound after cleaning the surface.
- B** (b) laying cement concrete using brick bats 25mm to 100mm size with 50% cement mortar 1:3 (1 Cement: 3 Coarse Sand) admixed mortar proofing compound over 20mm thick layer of cement mortar 1:5 to required slope including rounding of junctions of walls and slabs
- C** After two days of proper curing applying a second coat of cement slurry on entire surface of the terrace.
- D** The entire surface shall be finished with 20 mm thick C.M. 1:4 and China mosaic tilling in true level and slope as directed by Engineer in charge and finally finishing the surface with trowel with white cement slurry (Specification of white glazed tiles flooring shall be followed for the execution of this item).
- E** Finishing the surface with 20 mm thick C.M. 1:3 and China mosaic tilling and finally finishing the surface with trowel with white cement slurry.
- F** After two days proper curing the terrace shall be flooded for 15 days.

**7.0 MODE OF MEASUREMENT AND PAYMENT**

- 7.1** The unit rate of flooring shall include the cost of all materials, tools and plant required for mixing, laying of base layer in true level and slope as required applying and placing broken

pieces of china mosaic tile in position, compacting, finishing, curing, providing treatment of 30 cm high all over the length of parapets and corners and sill of doors etc. and all other incidental expenses for producing flooring work to complete the structure of its components as shown on the drawings and according to these specifications. Item shall also include the cost of making, fixing of all scaffolding and forms required for the work.

The rate of plastering shall include the cost of all labour, materials, tools and plants, scaffolding and all incidental expenses as described herein above.

- 7.2** The plaster work shall be measured for its length and width, limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one Square Meter.
- 7.4** A guarantee bond on appropriately stamped paper shall be given by the contractor to the Department in the manner and form prescribed below.
- 7.3** The payment will be made on **Square Meter** basis of the finished work.

**FORM OF GUARANTEE BOND**  
**(For water proofing work)**

Name of Work:-

Agreement No. :-

I \_\_\_\_\_ hereby guarantee that work will remain unaffected and will not be in anyway damaged by water leakages or any other similar type of defect surface will remain good for the period of five years after completion of the work of water proof as per the terms and conditions of the contract and the contractor that might be caused on account of bad materials or workmanship and or the similar type of cause and hereby guarantee to make good any loss or damage suffered by the Govt. of Gujarat and further guarantee to redo the effective work without claiming any extra cost.

The guarantee shall remain in force for the period of five years from the completion of the work under the contract and it shall remain bonding to the contractor for period of 5 years.

The deposit at the rate of **20%** of the cost of this executed item from the running or the final bills as taken of guarantee for work shall be recovered and shall be released after the first three years after completion of the work for 1/3 of deposit and as half 1/3 amount shall be released for the fourth years after date of final balance of guarantee period, if no leakage is found.

➤ **MODE OF MEASUREMENT AND PAYMENT**

The length and breadth shall be measured correct to cm. as per the dimension of the sanctioned plants. No deduction shall be made not extra for paid for any opening for pipes etc. up to 0.1 sq.mt. The rate shall include the cost of all labour and materials required for the operation involved. For satisfactory completion of work & measurement shall be paid on unit of Sq.m. of finished work.

**Item No: 23**

**Providing, Supplying, Lowering and Laying in standard length ISI mark rigid unplasticised PVC pipes suitable for potable water with ring fit joint including cost of rings, as per IS Specification no. 4985/1988 including all local and central taxes, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to the departmental stores and including cost of jointing material etc. complete.75 MM**

**U-PVC PIPES:**

**UNPLASTICIZED PVC PIPES**

For Indian manufacturers a valid license issued by the Bureau of Indian Standards for marking the PVC pipes with ISI mark is a mandatory requirement both for PVC pipes & rings

**STANDARDS:**



- The UPVC Pipes to be manufactured, supplied and delivered under the scope of this contract shall be manufactured in accordance and confirming to IS:4985-2000 or its latest revision or amendments or other authoritative standard that ensure at least a substantially equal quality to the IS:4985-2000 or its latest revision or amendments
- Electrometric sealing ring shall be as per specification of IS – 5382-1985, and ISO: 4633-1996 or it shall be EPDM rubber ring.
- The dimensions, material compositions, tests etc. shall be as per IS:4985-2000 or with its latest revision or amendments.
- The minimum wall thickness weight shall be as per Appendix I of the tender.
- The colour of pipes shall be as per IS 4985-2000
- Bureau of Indian Specifications (BIS) / Indian Standard (IS) shall mean the Latest version issued by BIS.

The material from which the pipes are made shall consist substantially of unplasticized polyvinyl chloride conforming to IS: 10151, to which may be added only those additives that are absolutely needed to facilitate the manufacture of the polymer, and the production of sound, durable pipes of good surface, finish, mechanical strength and opacity.

The bulk density of the UPVC compound shall be 0.50 to 0.53 and the density of UPVC pipe shall be 1.40 to 1.46 g / cm<sup>3</sup>.

The additional of the manufactures own rework material shall comply to clause 4.2 of IS: 4985.

PVC resin of suspension grade K-66/K-67 shall be used for extrusion of UPVC pipe.

- In line with BIS 4985-2000 the tolerance on outside diameter of the pipe shall be as under:

Nominal outside Diameter	Min. outside diameter in mm		Outside diameter at any point in mm	
	Minimum	Maximum	Minimum	Maximum
90	90	90.3	88.9	91.1
110	110	110.4	108.6	111.4
140	140	140.5	138.3	141.7
160	160	160.5	158.0	162.0
180	180	180.6	177.8	182.2
200	200	200.6	197.6	202.4
250	250	250.8	247.0	253.0
225	225	225.7	222.3	227.7
280	280	280.9	276.6	283.4
315	315	316	311.2	318.8

- “The pipes shall be transported to the store by flat floored trucks in pre packed wooden crate. The height of crate should not be exceeding more than 2 meters. The both ends of packaging unit (crate) shall be covered with plastic sheet to ensure adequate protection during transport. At the time of packing and stacking of pipes, the sockets shall be alternated within the pipe of pipes and shall project sufficiently for the pipes to be correctly supported along their whole length. The pipes shall rest uniformly on the vehicle bed over their whole length during transport to avoid sagging or deformation.

The packing material like wooden crate, plastic sheet etc. shall be the property of tenderer and he is permitted to reuse the packing material for transporting next batch of pipes”.

- The pressure rating of pipes shall be in accordance with IS 4985 with a maximum continuous working pressure at 27<sup>o</sup> C. of 6 & 10 kg/cm<sup>2</sup>. This working pressure shall be down graded for ambient underground soil temperature of 45<sup>o</sup> C. as per the figure given in IS 4985 for design purposes.
- The pipes when subjected to internal hydrostatic pressure in accordance with IS: 12235-1986 (part – 8) shall not burst during the prescribed test duration. The temperature, duration and test and induced internal stress shall conform to the parameters given below:

Sr. No.	Test	Temp. (°C)	Min. duration (h)	Induced Stress (Mpa)	Requirements
1	Type test	60	1000	10	No failure
2	Acceptance Test	27	1	36	No failure

- The integral socket of the pipe shall be tested for internal hydrostatic pressure in accordance with ISO: 3603 and ISO 1167.
- The UPVC pipe shall not contain vinyl chloride monomer (VCM) exceeding 1 ppm when determined by means of gas phase chromatography using the "headspace" method according to IS: 10151.
- The wall of the socket and the wall of the plain pipe shall not transmit more than 0.2% of visible light falling on them when tested in accordance with IS:12235 (part -3).

The pipes shall be supplied in straight length of 6 meters with tolerance of +20mm and -0mm. The effective length of socket pipe shall be considered as shown in figure 2 of IS 4985.

All plastic and non plastic material for components of the UPVC piping system e.g. Elastomeric sealing ring, lubricants, when in permanent or in temporary contact with water which is intended for human consumption, shall not adversely affect the quality of the drinking water.

Concentrations of chemicals, biological agents or other substance leached from pipe materials in contact with drinking water and the values of the relevant physical parameters, shall not exceed the maximum values recommended by IS: 10500.

The pipe material shall be in accordance with IS 4985, clause 6.3.

- The quality control system and sampling model shall be as under:

Quality Control System and Sampling Model				
Order of Tests to be conducted	By Manufacturer	By Third Party Inspection / PMC representative	Codes/Standards to be followed	Remark
Raw Material 1) Resin K-valve Particle size dis. Bulk density 2) PVC compo und density	Laboratory test certificates from the original manufacturer of resin and confirmation of the same by the pipe manufacturer in their laboratory. Both test certificates have to be presented during inspection	Verification of test certificates and witness of sample test at pipe manufacture's laboratory at discretion	IS: 4669	For every batch of PVC resin used prior to formulation of compound
Process Check Degree of fusion of extruded	Minimum specimen extrusion condition or	May witness test during inspection	ASTM D 2152	Test shall be conducted on samples form each

Quality Control System and Sampling Model				
Order of Tests to be conducted	By Manufacturer	By Third Party Inspection / PMC representative	Codes/Standards to be followed	Remark
UPVC pipe by Acetone immersion test.	moulding condition per day			machine
On line Check Quality Outside diameter Wall thickness Length of pipe surface finish Socket dimensions	Each & every pipe shall be checked by the manufacturer during extrusion of pipe	Sample testing shall be done for acceptance of the lot as per sampling procedure given Appendix – A, Table -5 of IS 4985	IS: 4985 ISO: 2045 Specification	Wall thickness shall also be checked by cutting the pipe at any place by the inspector
Finished product check. Reversion test Stress relief test	Min. 2 samples per machine per shift shall be tested	Sample testing shall be done as per IS 4985, Table 6&7	IS: 4985 IS: 12235 Part 5&6	Test records shall be submitted to PMC on request
Drop impact test Internal Hydrostatic pressure test. Pressure test for integral joint	Min. 1 samples per machine per shift	Sample testing shall be done as per IS 4985, Table-8	IS: 4985 IS: 12235 Part 8&9 ISO 3603 ISO 1167	Whenever the pipe is cut for hydrostatic test, the inspector will also verify the pipe thickness
Capacity Effect on water	Min. one sample for every change in compound formulation	One sample per 100 km of length of supply at the discretion of inspector	IS: 4985 IS: 12235 Part 3,4&10	Test records shall be submitted to PMC on request
Long term hydrostatic test	Min. 3 samples of different diameter from the regular production lot.	May witness test during inspection	Is: 4985 IS: 12235	Test records shall be submitted to PMC on request
Density	Min. one sample per machine per shift	Min 5 samples per lot	IS: 8543 part 1/ sec 2	Reconfirmati on may be done at store by checking the samples at the approved laboratory
Ash content	Min. one sample per machine	Min 5 samples per lot	MTNL Standard/ ISO: 3451-5	Reconfirmati on may be done at store

Quality Control System and Sampling Model				
Order of Tests to be conducted	By Manufacturer	By Third Party Inspection / PMC representative	Codes/Standards to be followed	Remark
	shift			by checking the samples at the approved laboratory
Vicat softening temp.	Min. one sample per machine per shift	Min. one sample per lot.	ISO : 2507	

#### TEMPERATURE VARIATIONS:

All the pipes to be manufactured, supplied and delivered shall be subjected to weather conditions like sun, dust, rain, wind as available in State of Gujarat. They shall be also subjected to carry and convey drinking water under variable temperature conditions ranging from 4 C<sup>0</sup> to 45 C<sup>0</sup>.

#### MARKING :

The methods of marking all the pipes to be delivered under scope of contract shall ensure that all the information will remain legible even after transportation, storage in open space etc. In general the legible and indelible marking upon the goods shall indicate the followings;

- i) Certification mark on each pipe.
- ii) Manufacturers brand name and/or trademark.
- iii) Purchasers mark as "NAGAR SEVASADN, be inscribed.
- iv) The outside diameter and pressure rating.
- v) Batch number or lot number.
- vi) Inspector's mark on each pipe
- vi) Any other important matter that the manufacturer or purchaser deems fit to be inscribed.

#### ELASTOMERIC SEALING RING

These sealing ring shall be Saturnine Butadiene in red color as specified in IS. The lubricant applied for jointing of elastomeric rubber ring shall be of good quality and comply the following specifications:

- a) Must have paste like consistency and be ready for use, preferably soap jelly.
- b) Has to adhere wet and dry surfaces of UPVC pipes and rubber ring.
- c) Must be non-toxic.
- d) Must be water-soluble.
- e) Must non-affecting physic-chemical and organoleptic properties of drinking water carried on the pipe.
- f) Must not have an objectionable odour.
- g) Must not harmful to the skin.

Elastomeric sealing ring shall be in accordance with one of the types (Type - 1 to Type – 6) as per ISS 5382. These sealing rings shall be EPDM rubber ring. The sealing ring shall be with ISI mark.

In case of imported EPDM Ring, such rings shall conform to relevant International Standards or the Standards of country of origin, which are equivalent or higher than the Bureau of Indian Standard Specifications. In case of manufacturers who have applied for getting a BIS certification mark, it would be mandatory for such bidders to produce the BIS certification license on or before the date of opening of the price bids. An undertaking in this regard shall have to be provided along with the technical bid.

The rubber sealing rings shall be vulcanized from Ethylene Propylene (EPDM) with strengths as per table 2 of IS 5382-1985.

**TYPE TEST:**

- a) Type test capacity, test for effect on water, test for resistance to Sulfuric Acid, internal Hydrostatic pressure test for 1000 Hrs. shall be carried out at least once at any time during the contract. Or shall be taken at least once during every six months irrespective of the ordered quantity.
- b) The said type test shall be taken by the NAGAR SEVASADN 's representative or third party inspection agency at the in-house laboratory of the manufacturer

**COLOR OF PIPES:**

- The color of the pipes shall be as per IS 4985-2000.
- The pipes shall bear ISI mark confirming to IS:4985-2000 or its latest amendment/revision if any.

**TEST FOR PVC RESIN & PIPE:****Test For PVC Resin**

It shall be sufficient to show the certificate of chemical test (in accordance with IS 4669) to the inspecting authority to confirm the 'K' value to be 64 to 67 as per clause No. 6.1.2. of IS 4985-2000

**Specific Gravity and Ash Content Tests:****a) Density:**

These tests shall be carried out by the inspection agency as per the IS:4985-2000 OR its latest revision OR amendments. The value shall be between 1.40 and 1.46 as per the ISS clause No. 10.6

**b) Sulphate Ash content:**

When tested as per Annex B, of IS 4985-2000, the sulphated ash content in the pipe shall not exceed IS standard.

c) Other test shall be carried out as per ISS 4985-2000 or its latest revision or amendment

**TOLERANCE IN WEIGHT OF PIPES:**

(-) 1% tolerance in actual weight of pipes shall be allowed but in overall weight there should not be any minus tolerance i.e. minus tolerance may be compensated in overall weight. If the tolerance is in minus, the consignment shall be outright rejected. The weight of pipes as given in Appendix-I shall be considered. If required the consignee can weight the whole lot of supply for verification.

**Quality Assurance**

The manufacturer shall have a laid down Quality Assurance Plan for the manufacture of the products offered which shall be submitted along with the tenders.

Unit weight and minimum wall thickness of unplasticized ring fit type PVC pipes are as per IS 4985-2000.

The bidder shall have to arrange for random testing of pipes brought on site, in CIPET in the presence of NAGAR SEVASADN, representative and on satisfactory report from the CIPET the payment of pipes will be made.

**Item No: 24**

**Providing and fixing wash down water closet European type W.C. Pan with integral "P" or "S" trap and PVC flushing cistern with a pair of C.L.I. or Mild Steel Brackets, complete with fittings such as lead valve siphon, 15mm nominal size brass ball valve with polythene float, C.P. Brass handle unions and couplings for connections with inlet, outlet and over flow pipes, 40 mm dia flush bend including cutting holes in walls and making good the same connecting the flush bend with cistern and closet etc. comp. incl plastic sheet cover including jointing trap with pipe in C.M. 1:1 ( Cement : 1 fine sand) (a) Viterous China - (i) In White Color.**

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.

**1.0. Materials**

Wash down water closet (European type W.C. Pan) shall conform to M-60. Cement mortar shall 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 be made with C.M. 1:1 (1 cement : 1 fine sand).

**3.0. Mode of measurements and payment**

**3.1.** The rate shall include 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 seat 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.

**G.I. inlet connection for flush pipe with W.C. Pan.**

**1.0. Materials**

**1.1.** The G.I. inlet connection for flush pipe shall conform to M-56.

**2.0. Workmanship**

**2.1.** The flush pipe from the cistern shall be connected to the closet by means of cement or red-lead.

**3.0. Mode of measurements & payment**

**3.1.** The rate shall include the cost of all materials, fittings and labour involved in all the operations described under workmanship including testing.

**3.2.** The rate shall be for a unit of One number.

**Providing and Fixing Plastic Seat Cover**

**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.

**25mm dia flush cock**

**1.0. Materials :** Chromium plated brass half turn flush cock shall conform to M-67.

**2.0. Workmanship**

The half 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 labour required for satisfactory completion of this item including fittings.

**3.2.** The rate shall be for a unit of One number.

100mm size P or S Trap

**1.0. Materials :** The 100 mm. size 'P' or 'S' trap for water closet shall conform to M-62. Cement mortar shall conform to M-11.

**2.0. Workmanship**

**2.1.** The 'P' or 'S' trap shall be fixed with pan cast iron pipe with C.M. 1:1. The pan shall be provided with a 100 mm. 'P' or 'S' trap as specified in the item with an approximately 50 mm. seal. The joint between the pan and the trap shall be made leak-proof with cement mortar 1:1 (1 cement : 1 fine sand).

**3.0. Mode of measurements and payment**

**3.1.** The rate shall include the cost of all materials and labour involved in the operations described under workmanship including testing.

**3.2.** The rate shall be for a unit of one number.

**Item No: 25**

**Providing and fixing G.I. Inlet Connection for flush pipe with W.C. Pan.**

**1.0. Materials**

1.1. The G.I. inlet connection for flush pipe shall conform to M-56.

**2.0. Workmanship**

2.1. The flush pipe from the cistern shall be connected to the closet by means of cement or red-lead.

**3.0. Mode of measurements & payment**

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

3.2. The rate shall be for a unit of One number.

**Item No: 26**

**Providing and fixing 430mm x 260mm x 350mm size white earthen ware flat back or corner type urinal of approved quality including. Connections the urinal with waste pipe, stop tap etc. complete.**

**P/F Urinal****1.0. Materials:**

The white earthenware flat back or corner type urinal of size 430 mm. x 260 mm. x 350 mm. shall conform to M-64.

**2.0. Workmanship**

2.1. The urinals shall be fixed in position by using wooden plugs and screws and shall be at a height 65 cms. From the Moor level to the top of the lip of urinal, unless otherwise directed. The wooden plugs shall be of 50 mm. x 50 mm. at base tapering to 38 mm. x 38 mm. at top 50 mm. in length shall be fixed in wall in steel waste pipe which shall discharge in the channel or floor a tap. The connection between the urinal and flush or waste pipe shall be made by means of putty or white lead mixed with chopped hemp.

**3.0. Mode of measurements and payment**

3.1. The rate shall includes cost all labours, materials, tools and plants etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number

**15mm dia Stop tap****1.0. Materials**

The chromium plated brass screw down stop tap of 15mm dia shall conform to IS. : 781 -1977. The stop tap shall be of tested quality and approved by Engineer in charge.

**2.0 Workmanship**

The stop tap shall be fixed in position by means of Jam nut and socket. The stop tap shall be fixed near the inlet of the water meter or as directed. The joints shall be done with white zinc and spun yarn. The joint shall be tested for leak proofing. All necessary testing should be carried out.

**3.0. Mode of measurements and payment**



- 3.1. The rate includes cost of 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: 27**

**Providing and fixing screw down bib tap of following size (A) Brass screw bib tap polished bright - 15mm**

**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: 28**

**Providing and fixing gun metal chek or non return fullway wheel valve. (A) 15 mm Dia.**

**1.0. Materials :**

The gun metal 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 gun metal 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: 29**

**Providing and fixing 100 mm dia sand cast iron grating for gully, floor or nanhi trap.**

**1.0. Materials**

1.1. The- 100 mm. dia. sand cast iron gratings for gulley, floor or Nahni trap shall be of best quality and make as approved.

**2.0. Workmanship**

2.1. The CAST IRON grating shall be provided to gulley trap floor or Nahni trap as the case may be in best workmen like manner.

### **3.0. Mode of measurements and payment**

3.1. The rate shall include cost of all labour, materials, tools and plants, etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

#### **Item No: 30**

**Providing and fixing Cast Iron (Spun nahni trap of the 100mm. Inlet and 50mm. Dia outlet having self cleaning design with C. I. Screwed down or hinged grating and stainless steel jali at F.F.I. Including cost of making cuts in walls slab floor etc. and making them as per original testing etc. complete as directed by Engineer-in-charge.**

#### **1.0. Materials**

1.1. The cast iron (spun) Nahni trap shall conform to M-69. The C.I. hinged or screwed down cover shall be of best quality

#### **2.0. Workmanship**

2.1. The Nahni trap with 100 mm. dia inlet and 50 mm. dia. outlet shall be fixed as per drawing or as directed.

2.2. The Nahni trap shall be jointed with C.I. Pipe, 75 mm. dia. with lead joints. The lead joints shall be done in conformation with I.S. 782.-1976.

### **3.0. Mode of measurements and payment**

3.1. The rate includes cost of all labour, materials, tools and plants etc. required for satisfactory completion of this item including lead, jointing and testing.

3.2. The rate shall be for a unit of one number.

#### **Item No: 31**

**Providing and fixing S.W. gulley trap with C.I. grating brick masonry chamber and water tight C.I. cover with frame of 300mm x 300mm size (inside) with standard weight.(i) Square mouth traps.(B) 150mm x 100mm size P or R type**

**1.0. Materials :** (1) Water shall conform to M-1. (2) Cement mortar of proportion 1:5 shall conform to M-11. (3) Burnt brick shall conform to M-15. (4) The S.W. Galley trap of 100 mm. x 100 mm. size shall conform 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 gulley trap shall be fixed over cement concrete 1:5:10 (1 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 as 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 off 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: 32**

**Providing, laying and constructing brick masonry chamber for underground C. I. Inspection Chamber and bends with bricks having crushing strength not less than 35Kg./Cm<sup>2</sup> on C. M. (1:5) (1 cement, 5 Sand) C. I. Cover with frame (light duty) of 455mm x 610mm internal dimension total weight of cover with frame to be not less than 38.00 Kgs. (Wt. of Cover 38 Kgs. and wt. of Frame 15 Kgs.) with R.C.C. top slab with 1:2:4 (1 cement, 2 Coarse sand, 4 graded stone (Kapachi) ) foundation concrete 1:5:10 (1 cement, 5 Coarse sand, 10 brick bats of 40mm nominal size) inside plaster 15mm. thick with C. M. 1:3 (1 cement, 3 Coarse sand) finished smooth with a floating coat of neat cement slurry on walls and bed concrete including curing etc. complete as directed by Engineer-in-charge.**

**Inside dimensions 455mmx 610mm and 450mm deep for single pipe line.**

**1.0. Materials :** Water shall conform to M-1. Cement shall 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 walls shall be 7.5 cms.

**2.4.** Masonry walls and plaster work shall be carried out as per relevant specifications of item 24.40.

**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 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.

**2.5.** The cover slab shall be constructed as per relevant specifications of 24.27 (I).

**3.0. Mode of measurements and payment**

**3.1.** The earth work in excavation, providing and laying C.I. inspection chamber and bends shall be measured and paid for separately.

**3.2.** The rate shall be for a unit of One number.

**Item No: 33**

**Providing laying and jointing in true line and level 25mm dia. U.P.V.C. Pipe ( SCH- 40) for cold water including fittings as approved by Engineer In Charge. Pipe shall be fixed on the wall with the help of clamp at every two metre C/C or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials.**

**1.0. Materials**

- 1.1.** The pipes shall be standard I.S.I. mark U.P.V.C. pipe (SCH-40) for cold water of specified dia.
- 1.2.** The fittings, clamps etc. required for specified dia. bore pipes shall be of best quality and makes as approved by the Engineer-in-charge. Necessary accessories with inner/ outer brass thread shall be used as required and instruction by Engineer in charge.

**2.0. Workmanship****2.1. Cutting, Laying & Jointing**

- 2.1.1.** When the tubes are to be cut or rethreaded, the ends shall be carefully filed out so that no obstruction to bore is offered. The ends of the tubes shall then be threaded conforming to the requirements of I.S. 554-1955 with pipe dies and taps carefully in such a manner that it will not result in slackness of joints when the two pieces are screwed together.
- 2.1.2.** The taps and dies shall be used only for straightening screw threads which have become bent or damaged and shall not be used for turning of the threads so as to make them slack as the latter procedure may not result in the water tight joint. The screw threads for tube and fitting shall be protected from edge until they are fitted.
- 2.1.3.** In jointing the tubes, the inside of the socket and the screwed end of the tubes shall be oiled and smeared with white or red lead and wrapped around with a few turns of fine spun yarn round the screwed end of the tube. The end shall then be tightly screwed in the socket, tees, etc. with a pipe wrench. Care shall be taken that all times free from dust and dirt during fixing. But from the joints shall be removed after screwing. After laying the open ends of the pipes shall be temperately plugged to prevent access of water, soil, or any other foreign matter. Jointing shall be carried out with proper chemical adhesive material and allow to dry.
- 2.1.4.** Any threads exposed after jointing shall be painted or in the case of underground piping thickly coated with approved anti-corrosive paint to prevent corrosion.

**2.2. Fixing concealed to wall, ceiling & floors.**

- 2.2.1.** In case of fixing concealed cement point to walls or ceilings, these shall run on the surface of the wall, or ceiling (not in chase) unless otherwise specified. The fixing shall be done by means of standard pattern, holder clamps keeping the pipes about 15 mm. clear of the wall. When it is found necessary to pattern, holder clamps keeping the pipes about 15 mm. clear of the wall. When it is found necessary to conceal the pipes and when specified so, chasing may be adopted or pipe fixed in ducts or recesses etc. provided that there is sufficient space to work on the pipe with usual tools. The pipe shall not ordinarily be buried in walls or solid floors, where

unavoidable, pipe may be buried for short distances provided that adequate protection is given against damage and where so required joints are not buried. Where required M.S. tube sleeve shall be fixed at a place a pipe is peasant through a wall or floor for expansion and contraction and other movements. In case the pipe is embedded in walls or floors, it should be painted with anti-corrosive bitumastic paint of approved quality. The pipe should not come in contact with lime mortar or lime concrete as the pipe is affected by lime. Under the floors, the pipe shall be laid in layer of sand filling.

- 2.2.2.** All pipes and fittings shall be fixed truly vertical and horizontal unless unavoidable. The pipes shall be fixed to walls with standard pattern clamps of required size and shape, one end of which shall be properly plugged or cemented into walls with cement mortar 1:3 (1 cement : 3 coarse sand) and the other tightened round the pipes to hold it securely. These clamps shall be spaced at regular intervals in straight lengths at 2 MC/C interval in horizontal run and 2.5 m. interval in vertical run. For pipe of 15 mm. dia. up to 25 mm. dia the holes in the walls and floors shall be made by drilling with chisel or jumper and not by dismantling the brick work or concrete. However for bigger diameter pipes the holes shall be carefully made (1 cement : 3 coarse sand), and properly finished to match the adjacent surface.

**2.3. Testing of joints :**

- 2.3.1.** After laying and jointing, the pipes and fillings shall be inspected under working conditions of pressure and flow. Any joints found liken shall be redone, and ail leaking pipes removed and replaced without extra cost.
- 2.3.2.** The pipes and fittings after they are laid shall be tested to hydraulic pressure of 6 Kg./Sq cm. The pipe shall be slowly and carefully charged with water allowing all air to escape and avoiding all shocks and water hammer. The draw off takes and stop cock shall then be closed and specified hydraulic pressure shall be applied gradually. The pressure gauge must be accurate. The pipes and fittings shall be tested in sections as the work laying proceeds, keeping, the joints exposed for inspection during the testing.

**3.0. Mode of measurements and payment**

- 3.1.** The description of the item shall, unless otherwise stated be held to include where necessary conveyance and delivery, handling, unloading, storing fabrication, hoisting, all labour for finishing to required shape and size, setting, fitting in position straight, cutting and waste return of packing etc.
- 3.2.** The length shall be measured on running meter basis of finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed to wall, ceiling. floors etc shall be measured and paid under this item.
- 3.3.** All the work shall be measured in decimal system as fixed in its place, subject to tolerance given below unless otherwise stated.
- (i) Dimension shall be measured to the nearest 0 01 meter.
- (ii) Area shall be worked out to the nearest 0.01 sq. meter.

- 3.4. All measurements of cutting shall unless otherwise stated be held to include the consequent waste.
- 3.5. In case of fitting of unequal bore, the targets bore shall be measured for the test.
- 3.6. Testing of pipe lines fittings, and joints include for providing all plant appliances necessary for obtaining access to the work to be tested and carrying out the tests.
- 3.7. The rate includes U.P.V.C. pipe (SCH-40) with screwed socket joints to gather with all fittings (such as bends, sockets springs, elbows, tees, crosses, short pieces, clamps and plugs, unions etc.) and fixing complete with clamping wall hooks, wooden plug etc. and also curing, screwing and waste and for making forged (or hand made) bends on piping as required. Connector shall be inserted where required or directed. The rate also includes cutting through walls, floors etc. and their making good and painting exposed threads with anti-corrosive paint as above and testing where tubes are to be fixed to wall, ceiling and flooring, the rates shall not include painting of pipes, providing sleeves and sand filling under floor for which separate payment shall be made.
- 3.8. The rate shall be for a unit of one running meter.

**Item No: 34**

**Providing, laying and jointing in true line and level 15 mm dia U.P.V.C. Pipe (SCH-40) for cold water including fittings make as Prince/ supreme/ astral/ finolex or equivalent as approved by Engineer In Charge. Pipe shall be fixed on the wall with the help of clamp at every two meter c/c. or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials.**

**1.0. Materials**

- 1.1. The pipes shall be standard I.S.I. mark U.P.V.C. pipe (SCH-40) for cold water of specified dia.
- 1.2. The fittings, clamps etc. required for specified dia. bore pipes shall be of best quality and makes as approved by the Engineer-in-charge. Necessary accessories with inner/ outer brass thread shall be used as required and instruction by Engineer in charge.

**2.0. Workmanship**

**2.1. Cutting, Laying & Jointing**

- 2.1.1. When the tubes are to be cut or rethreaded, the ends shall be carefully filed out so that no obstruction to bore is offered. The ends of the tubes shall then be threaded conforming to the requirements of I.S. 554-1955 with pipe dies and taps carefully in such a manner that it will not result in slackness of joints when the two pieces are screwed together.
- 2.1.2. The taps and dies shall be used only for straightening screw threads which have becoming bent or damaged and shall not be used for turning of the threads so as to make them slack as the latter procedure may not result in the water tight joint. The screw threads for tube and fitting shall be protected from edge until they are fitted.
- 2.1.3. In jointing the tubes, the inside of the socket and the screwed end of the tubes shall be oiled and smeared with white or red lead and wrapping around with a few turns of fine spun yarn round the screwed end of the tube. The end shall then be tightly screwed in the socket, tees, etc. with a pipe wrench. Care shall be taken that all times free from dust and dirt during fixing. But from the joints shall be removed after screwing. After laying the open ends of the pipes shall be

temperately plugged to prevent access of water, soil, or any other foreign matter. Jointing shall be carried out with proper chemical adhesive material and allow to dry.

- 2.1.4.** Any threads exposed after jointing shall be painted or in the case of underground piping thickly coated with approved anti-corrosive paint to prevent corrosion.

## **2.2. Fixing concealed to wall, ceiling & floors.**

- 2.2.1.** In case of fixing concealed cement point to walls or ceilings, these shall run on the surface of the wall, or ceiling (not in chase) unless otherwise specified. The fixing shall be done by means of standard pattern, holder clamps keeping the pipes about 15 mm. clear of the wall. When it is found necessary to pattern, holder clamps keeping the pipes about 15 mm. clear of the wall. When it is found necessary to conceal the pipes and when specified so, chasing may be adopted or pipe fixed in ducts or recesses etc. provided that there is sufficient space to work on the pipe with usual tools. The pipe shall not ordinarily be buried in walls or solid floors, where unavoidable, pipe may be buried for short distances provided that adequate protection is given against damage and where so required joints are not buried. Where required M.S. tube sleeve shall be fixed at a place a pipe is passed through a wall or floor for expansion and contraction and other movements. In case the pipe is embedded in walls or floors, it should be painted with anti-corrosive bitumastic paint of approved quality. The pipe should not come in contact with lime mortar or lime concrete as the pipe is affected by lime. Under the floors, the pipe shall be laid in layer of sand filling.

- 2.2.2.** All pipes and fittings shall be fixed truly vertical and horizontal unless unavoidable. The pipes shall be fixed to walls with standard pattern clamps of required size and shape, one end of which shall be properly plugged or cemented into walls with cement mortar 1:3 (1 cement : 3 coarse sand) and the other tightened round the pipes to hold it securely. These clamps shall be spaced at regular intervals in straight lengths at 2 MC/C interval in horizontal run and 2.5 m. interval in vertical run. For pipe of 15 mm. dia. up to 25 mm. dia the holes in the walls and floors shall be made by drilling with chisel or jumper and not by dismantling the brick work or concrete. However for bigger diameter pipes the holes shall be carefully made (1 cement : 3 coarse sand), and properly finished to match the adjacent surface.

## **2.3. Testing of joints :**

- 2.3.1.** After laying and jointing, the pipes and fittings shall be inspected under working conditions of pressure and flow. Any joints found leaky shall be redone, and all leaking pipes removed and replaced without extra cost.
- 2.3.2.** The pipes and fittings after they are laid shall be tested to hydraulic pressure of 6 Kg./Sq cm. The pipe shall be slowly and carefully charged with water allowing all air to escape and avoiding all shocks and water hammer. The draw off takes and stop cock shall then be closed and specified hydraulic pressure shall be applied gradually. The pressure gauge must be accurate. The pipes and fittings shall be tested in sections as the work laying proceeds, keeping, the joints exposed for inspection during the testing.



### **3.0. Mode of measurements and payment**

- 3.1.** The description of the item shall, unless otherwise stated be held to include where necessary conveyance and delivery, handling, unloading, storing fabrication, hoisting, all labour for finishing to required shape and size, setting, fitting in position straight, cutting and waste return of packing etc.
- 3.2.** The length shall be measured on running meter basis of finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed to wall, ceiling. floors etc shall be measured and paid under this item.
- 3.3.** All the work shall be measured in decimal system as fixed in its place, subject to tolerance given below unless otherwise stated.
  - (i) Dimension shall be measured to the nearest 0.01 meter.
  - (ii) Area shall be worked out to the nearest 0.01 sq. meter.
- 3.4.** All measurements of cutting shall unless otherwise stated by held to include the consequent waste.
- 3.5.** In case of fitting of unequal bore, the targets bore shall be measured for the test.
- 3.6.** Testing of pipe lines fittings, and joints include for providing all plant appliances necessary for obtaining access to the work to be tested an carrying out the tests.
- 3.7.** The rate includes U.P.V.C. pipe (SCH-40) with screwed socket joints to gather with all fittings (such as bends, sockets springs, elbows, test, crosses, short pieces, clamps and plugs, unions etc.) and fixing complete with clamping wall hooks, wooden plug etc. and also curing, screwing and waste and for making forged (or hand made) bends on piping as required. Connector shall be inserted where required or directed. The rate also includes cutting through walls, floors etc. and their making good and painting exposed threads with anti-corrosive paint as above and testing where tubes are to be fixed to wall, ceiling and flooring, the rates shall not include painting of pipes, providing sleeves and sand filling under floor for which separate payment shall be made.
- 3.8.** The rate shall be for a unit of one running meter.

### **Item No: 35**

**Providing and fixing to wall ceiling and floor 10.0 kgf/cm<sup>2</sup> working pressure poluthene pipes of the following outside dia. low density, complete with special falnge compression type fittings, wall clips etc. including making good the wall celling and floor.(75mm)**

#### **1.0. Materials**

- 1.1.** The low density polythene pipe of specified diameter with **10.0 Kg./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.C. 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 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, as-they 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 description of the item shall, unless otherwise stated be held to include where necessary conveyance and delivery, handling, unloading, storing fabrication, hoisting, all labor for finishing to required shape and size, setting, fitting in position straight, cutting and waste return of packing etc.
- 3.2. The length shall be measured on running meter basis of finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed to wall, ceiling, floors etc shall be measured and paid under this item.
- 3.3. All the work shall be measured in decimal system as fixed in its place, subject to tolerance given below unless otherwise stated.  
 (i) Dimension shall be measured to the nearest 0 01 meter. (ii) Area shall be worked out to the nearest 0.01 sq. meter.
- 3.4. All measurements of cutting shall unless otherwise stated by held to include the consequent waste
- 3.5. In case of fitting of unequal bore, the targets bore shall be measured for the test.
- 3.6. Testing of pipe lines fittings, and joints include for providing all plant appliances necessary for obtaining access to the work to be tested an carrying out the tests.
- 3.7. The rate includes P.V.C. pipes with screwed socket joints. to gather with all fittings (such as bends, sockets springs, elbows, test, crosses, short pieces, clamps and plugs, unions etc.) and fixing complete with clamping wall hooks, wooden plug etc. and also curing, screwing and waste and for making forged (or handmade) bends on piping as required. Connector shall be inserted where required or directed. The rate also includes cutting through walls, floors etc. and their making good and painting exposed threads with anti-corrosive paint as above and testing where tubes are to be fixed to wall, ceiling and flooring, the rates shall not include painting of pipes, providing sleeves and sand filling under floor for which separate payment shall be made.
- 3.8. The unit rate shall be for a unit of **one running meter**.

### **Item No: 36**

**Providing erecting and fixing double coated syntex PVC ISI or equivalent PVC (ISI) mark water tank of required capacity each with all necessary fittings & connection etc. complete on terrace**

#### **2.0 WORKMANSHIP**

- 2.1 Tank shall be approved quality and as per IS standard make. Material used in manufacturing tank shall be confirmed to relevant IS code. The material of tank and lead and fittings which may come in contact of water should be such that it does not impart any taste, colour or odour. It does not have any toxic effect and it does not contaminate the water. Thereby making it unpotable.
- 2.2 The tank shall be fixed properly in a level position and making all required necessary correction like inlet outlet flushing overflow and air vent. Tank shall be satisfying the standards of public health.

#### **3.0 MODE OF MEASUREMENT AND PAYMENT**

- 3.1 The unit rate of **PVC Water tank** shall include the cost of all materials, tools and plant required for lifting to required height with all lead and lift, placing and fixing in position, all required specials and jointing adhesive compound, finishing as per direction of the Engineer-in-charge, and all other incidental expenses for producing **PVC water tank** work of specified diameter to complete the structure or its components as shown on the drawings and according to these specifications, they shall also include the cost of making, fixing and removing of all scaffolding and forms required for the work.
- The rate of PVC Water tank shall include the cost of all labour, materials, tools and plant scaffolding and all incidental expenses as described herein above.
- 3.2 The **PVC water tank** work shall be measured for its volume to specified capacity to those specified on plan or as directed. The rate shall be for a unit of one litre basis.
- 3.3 The payment will be made on **litre** basis of the finished work.

### **Item No: 37**

**Providing and fixing white vitreous china flat back wash basin of 550mm x 400mm size with single hole for pillar tap with C.I. or M.S. brackets painted white including cutting holes and making good the same. Rates including providing and fixing 32mm dia C.P. Brass waste couplin, 32mm dia M.I. Fisher unit, Brass screw down stop tap of 15mm dia pillar tap capstan head, screw down high pressure with screws, shanks, back nuts, PVC pipe & 32mm dia flexible waste pipe up to Nani Trap etc. complete as directed by engineer in charge.**

#### **P/F Wash Basin**

##### **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.

**P/F C.P. Brass Waste 32mm dia**

**1.0. Materials**

**1.1.** The C.P. brass trap and unions shall be of 32 mm. dia. and of best quality and make as approved by the Engineer-in-charge

**2.0. Workmanship**

**2.1.** C.P. brass waste trap and union shall be connected to 32 mm dia waste pipe which shall be suitably bent towards the wail which shall discharge into drain through a floor trap The C.P brass waste trap shall be provided for wash basin or sink as the case may be.

**3.0. Mode of measurement & payment**

**3.1.** The rate includes all labours and providing C.P. brass waste trap and union including waste couplings of 32 nun fin. The rate excludes the cost of waste pipe of 32 mm. dia.

**3.2.** The idle shall be for a unit of One number.

**Providing and Fixing M.I. Fisher union 32mm**

**1.0. Materials**

**1.1.** Tho 32 mm dia M.1. Fisher union shall be of best quality and made as approved by the Engineer-in-charge.

**2.0. Workmanship**

**2.1.** The 32mm dia M I. Fisher union shall be fixed to wash basin or sink in best workman like manner.

**3.0. Mode of measurements and payment**

**3.1.** The rate includes all labours .and materials, tools and plants etc. required for satisfactory completion of the item.

**15mm dia Stop Tap**

**1.0. Materials**

The chromium plated brass screw down stop tap of 15mm dia shall conform to IS. : 781 -1977.

The stop tap shall be of tested quality and approved by Engineer in charge.

**2.0 Workmanship**

The stop tap shall be fixed in position by means of Jam nut and socket. The stop tap shall be fixed near the inlet of the water meter or as directed. The joints shall be done with white zinc and spun yarn. The joint shall be tested for leak proofing. All necessary testing should be carried out.

**3.0. Mode of measurements and payment**

- 3.1. The rate includes cost of 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.

**15mm dia pillar tap**

- 1.0. Materials : The C.P. brass pillar tap, swan neck (Heavy duty) of specified dia. shall be best quality and shall conform to I.S. : 1975 - 1961. The pillar taps shall be tested quality & as approved by Engineer in charge.
- 2.0. Workmanship
  - 2.1. The C.P. brass pillar tap, swan neck (Heavy duty) 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 be 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.

## **DETAILED TECHNICAL SPECIFICATIONS**

### **GENERAL**

#### **1. Wiring Rules :**

The installation generally shall be carried out in conformity with relevant Indian Standard Specifications and code of practices prevalent. Indian Electricity Rules 1956 and Indian Electricity Act. 1910 as amended from the time to time.

#### **2. Definition :**

The definition of terms shall be in accordance with Indian Standard code of Practice for Electrical wiring Installation IS-732-1982 except for the definition of point in case of Internal Electrical Installation. For definition of point wiring and measurement of Electrical works IS-59008-1970 shall be referred to.

#### **3. Voltage and Frequency of Supply :**

All current consuming devices shall be suitable for frequency of 50 C/s and system of voltage meant for unless otherwise specified.

#### **4. Layout of wiring and its description:**

(i) The wiring shall be carried out as per Schedule "power" wiring must be in screwed conduit and shall be kept separate and distinct from lighting wiring. All wiring must be done on the distribution system with main and branch distribution boards at convenient centers and without isolated fuses. All conductors shall be run as far as possible along the walls and ceiling as to be easily accessible and capable of being thoroughly inspected. The balancing of circuits will be arranged before hand by the Executive Engineer Electrical Division.

(ii) Within one month of the taking over the installation, the Contractor shall supply to the Executive Engineer, Elect. Division a complete set of wiring diagrams of the same on drawings to be supplied when available by the Executive Engineer, Electrical Division, and to the satisfaction of the Executive Engineer, Elect. Dn, and these wiring plans shall be "Drawings" within the meaning of the term as used in the General Conditions of contract.

#### **5. Conductors :**

All conductors unless otherwise specified shall not be less than 1.5 Sq. mm. for point wiring and 2.5 Sq. mm. for mains. Conductors for power and lighting circuits shall be of adequate size to carry the designed circuit load without exceeding the permissible thermal limits for the installation, and such sizes will be stipulated in specifications and or drawings.

#### **6. Cables :**

**6.1** All cables shall conform to relevant Indian Standards.

**6.2** Conductors of all cable except the flexible cable shall be of aluminum. The smallest aluminum conductors for the final circuit shall have nominal cross sectional area of not less than 1.5 Sq. mm. The minimum size of the aluminum conductors for power wiring shall be 4 Sq. mm.

**6.3.1** Conductors of flexible cables shall be of copper. The minimum cross sectional area of such a cables shall be 14.0193 mm. The flexible cable shall have uniform and adequate insulation.

**6.3.2** Unless the flexible cables and conductors are protected by armor or though rubber or PVC Sheath, these shall not be used in workshops and other places where they are liable to mechanical damage.

**6.3.3** Core flexible cables shall be used for connecting single phase Appliances for phase, neutral & earth connections.

### **7. Fall of Potential :**

The cross sectional area of all conductors inside buildings shall be so proportioned to their lengths that the drop in voltage between main fuses and the farthest point of any lump shall not exceed three percent of the voltage of the consumer's with all the consuming devices in use.

**7.1** If the CABLE SIZE is increased to avoid the voltage drop in circuit current rating of the cable shall be more than that for which the circuit is designed. In each circuit or sub circuit every cable shall have a current rating not less than that of the fuse which protects the circuit or sub circuit respectively for current higher than the full load current.

### **8. Ratings of lamps and fans socket outlets : Points and exhaust fans**

**8.1** Incandescent lamps installed in residential and non-residential buildings shall be rated at 60 watts & 100 watts respectively.

**8.2** Table fans and ceiling fans shall be rated at 60 watts, exhaust fan shall be rated according to their capacity.

**8.3** 5 Amp. socket outlet points and 15 Amp. socket outlet points shall be rated at 100 watts and 1000 watts respectively for the purpose of load assessment unless values of the load are known or specified.

### **9. Tests :**

**9.1** Before the installation is commissioned following tests shall be carried out :

- (1) Insulation Resistance test
- (2) Polarity Tests of Switches
- (3) Earth Continuity tests
- (4) Earth Electrodes Resistance test

**9.2.1.1** The insulation resistance shall be measured 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 direct current pressure of not less than twice the working pressure provided that it need not exceed. 500 volts for medium voltage circuits where the supply is derived that it need not exceed. 500 volts for medium voltage circuits where the supply is derived from the three wire D.C. or a poly phase. A.C. System, the neutral pole of which is connected to earth either direct or through added resistance, the working pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.

**9.2.1.2** The insulation resistance shall also be measured between all conductors 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 lamps in position and switches in 'OFF' position and its value shall be not less than in that specified in Sub-Clause 9.2.1.3.



**9.2.1.3** The insulation resistance in Megohms measured as above shall not be less than 50 Megohms divided by the number of outlet or when PVC insulated cables are used for wiring 12.5 Megohms divided by number of outlets.

**9.2.1.4** Where a whole installation is being tested, a lower value than that given by the formula, subject to a minimum of 1 Megohm is acceptable.

**9.2.1.5** A preliminary and similar test be made before lamps, etc. are installed and in this event the insulation resistance to earth should be not less than 100 Megohms divided by the number of outlet or when PVC insulated cables are used for wiring 25 Megohms divided by number of outlets.

**9.2.1.6** The term "Outlet" includes every switch except that a switch combined with a socket outlet, appliance or lighting fitting is regarded as one outlet.

**9.2.1.7** Control rheostat heating and power appliance and electric sign 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 Specification or where there is no such specification shall be not less than half a Megohm.

#### **9.2.2 Polarity Test :**

**9.2.2.1** In a two wire installation a test shall be made to verify that all switches in every circuit have been fitted in the same conductor throughout & such conductor shall be labeled or marked for connection to the phase conductor or to the non-earthed conductor of the supply.

**9.2.2.2** 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 conductor of the supply.

**9.2.2.3** 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.

#### **9.2.3 Earth Continuity Test :**

The earth continuity conductor including metal conduits and metallic envelops of cables in all cases shall be tested for electric continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

##### **9.2.3.1 Earth Electrode Resistance Test :**

Earth electrode Resistance test may be carried out by Megger Earth Testers containing a direct reading ohm-meter, a hand driven generator and auxiliary electrodes.

**9.3** On completion an electric installation (addition and alteration) 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-'B' in addition to the test certificate required by Local Electrical Supply Authorities.

#### **10. Joint and looping back :**

Unless with the sanction of Executive Engineer Divisions all joints in conductor shall be means of approved mechanical connectors in suitable and approved junction boxes but looping back system shall be preferable. In wiring unless otherwise specified Phase and live conduct shall be looped at the switch box where as a neutral conductor can be looped from light, fan or socket. In non-residential buildings, neutral and earth continuity wire shall be brought to each of the switch boards should be of adequate size to accommodate at least one number of 5 Amps. socket outlet and control switch in future.

## **11. Switches :**

Main Switchgears, Switch Board and their location :

**11.1** All main switches (other than those of iron clad pattern) carrying current of 10 Amp. and above shall be fitted for back connections and shall be suitably protected.

**11.2** All switches and circuit breakers shall be constructed in accordance with the I. S. 4237-1967. General requirement for switchgear and control gear for voltage not exceeding 1000 volts and other relevant I.S. provided also that spring shall be either of phosphor bronze or if steel shall be copper or Nickel plated and that handle shall be so fastened that they do not tend to unscrew or become loose.

**11.3** All main switches shall be either of metal clad enclosed pattern or of any insulated enclosed pattern which shall be fixed at close proximity to the point of entry of supply.

**11.4** Switch boards shall not be erected above gas, stoves, or sinks or within 2.5 m. of any washing unit in the washing rooms of laundries or in the bath rooms, lavatories, toilets or kitchens.

**11.5** Switch boards, if unavoidably fixed in places likely to be exposed to weather, to drip or to abnormal moist temperature the outlet casing shall be weather proof and shall be provided with glands or bushing of adopted to receive screwed conduit according to the manner in which cables are run PVC and double flanged bushes shall be fitted in the holes of the switches for entry and exit of wires.

**11.6** A switch board not be installed so that its bottom is within 1.25 m. above the floor unless the front of the switch board is completely enclosed by a door or the switch board is located in a position to which only authorized persons have access.

**11.7** Switch boards shall be recessed in the wall if so specified in the schedule of work or in the special specification. The front shall be fitted with hinged panel of other suitable material such as Bakelite in wood frame with locking arrangement, the outer surface of door being flush with the walls. Ample room shall be provided at the back for connections and at the front between the switchgear mountings and the door.

**11.8** Equipments which are on the front of a switch board shall be so arranged that inadvertently personal contact with live parts is unlikely during the manipulation of switch gears, changing of fuses or like operations.

**11.9** No holes other than the holes by means of which the panel is fixed shall be drilled closer than 1.3 cms. from any edge of the panel.

**11.10** The various live parts, unless they are effectively screened by substantial barriers of non-hygroscopic, no-inflammable insulating material, shall be so spaced that space shall not be maintained between such parts and earth.

**11.11** The arrangement of gear shall be such that they shall be readily accessible and their connections to all instruments and apparatus shall also be traceable.

**11.12** In every case in which switches and fuses are fitted on the same pole, these fuses shall be so arranged that the fuses are not alive when their respective switches are in the off position.

**11.13** No fuses other than fuses in instrument circuit shall be fixed on the back of or behind a switch board panel or frame.

**11.14** All the metal switchgears and switch boards shall be painted, prior to erection with one coat of antirust primer. After erection they shall be painted with two coats of approved enamel or aluminum paint as required on all sides whenever accessible.

**11.15** All switch board connected to medium voltage and above shall be provided with 'Danger Notice Plate' conforming to relevant Indian Standards.

## **12. Control at Point of Commencement of Supply :**

**12.1** There shall be a linked main switchgear with fuse on each live conductor of the supply mains at the point of entry. The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of a linked switchgear. The neutral shall also be distinctly marked. In this connection Rule 32 (2) of the Indian Electricity Rules, 1966 (See Appendix - 'A') shall also be referred.

**12.2** The main switchgear shall be situated as near as practicable to be termination of service line and shall be easily accessible without the use of any external aid.

**12.3** On the main switchgear, where the conductor of a two wire system or an earthen neutral conductor of a multi-wire system or a conductor which is to be connected thereto, an indication of a permanent nature shall be provided to identify the earthen neutral conductor. In this connection Rule 32 (1) of Indian Electricity Rules, 1956 (See Appends 'S') shall be referred.

**13.0 Switch Board & Distribution Boards :** Metal clad switch gear shall preferably be mounted on any of the following types of Board.

**13.1 Hinged type Metal Boards :** These shall consist of a box made of sheet metal not less than 2 mm. thick and shall be provided with a hinged cover to enable the board to swing open for examination of the wiring at the back. The joints shall be welded. A teak wood board, thoroughly protected both inside and outside with good insulating conforming to IS-347-1952 specification for varnish shellac for general purpose, and of not less than 6.5 mm. thickness, shall be provided at the back for attachment of incoming and outgoing cables. There shall be a clear distance of not less than 2.9 cm. between the teak wood board and the cover, the teak wood board and the cover, the distance being increased for larger boards in order that on closing of the cover, the insulation of the cables is not subjected to damage and no short length of cables is subjected to excessive twisting or bending in any case. The board shall be securely fixed to the wall by means of rag bolts, plugs of wooden Gutties and shall be provided with a locking arrangement and earthing stud. All wires passing through the metal board shall be bunched. Alternatively, hinged type metal boards shall be made of sheet mounted on channel or angle iron frame.

**Note :** *Sub type of boards are particularly suitable for small switch-boards for mounting metal-clad switchgear connected to supply at low voltages.*

**13.2 Fixed type Metal Boards :** These shall consist of an angle of channel of iron frame fixed on the wall or on floor and supported on the wall at the top if necessary. There shall be a clear distance of one meter in front of the switch board. If there are attachments of base connections at the back of the switch board Rules 51 (1) (c) of Indian Electricity Rules, 1956 shall apply.

**NOTE :** Such type of boards are particularly suitable for large switchboard for mounting large number of switchgears of higher capacity metal clad switchgears or both.

**13.3 Teakwood Boards :** for small installations connected to a single phase 230 volts supply teak wood boards may be caused as main boards or sub-board. These shall be of seasoned teak or other durable wood with solid back impregnated with varnish of approved quality with all joints dovetailed.

**13.4** In large size medium voltage installations, before proceeding with actual construction of the boards, a proper drawing showing the detailed dimensions and design including the disposition of the mountings, which shall be symmetrically and neatly arranged for arriving at the overall dimensions, shall be prepared and approved by the Engineer-in-charge.

**13.5 Recessing of Boards :** Where so specified the switch boards shall be recessed in the wall. The front shall be fitted with hinged panel of teak wood or other suitable materials such as balelite, or with unbreakable glass doors in teak wood frame with locking arrangement, the other surface of the door being flush with the walls. Ample room shall be provided at the back for connection and at the front between the switchgear mountings.

### **13.6 Arrangement of Apparatus :**

**(a)** Equipment which is on the front of switch board shall be so arranged that inadvertently personal contact with live parts is unlikely during the manipulation of switches, changing of fuses or like operation.

**(b)** No apparatus shall project beyond any edge of panel. No fuse body shall be mounted within 2.5 cm. of any edge of the panel and no hole other than holes by means of which the panel is fixed shall be drilled closer than 1.3 cms from any edge of the panel.

**(c)** The various live parts, unless they are effectively screened by substantial barriers of non-hygroscopic, non-inflammable isolating material, shall be so spaced that an arc cannot maintain between such parts and earth.

**(d)** The arrangement of the gear shall be such that they shall be readily accessible and their connections to all instruments and apparatus shall also be easily traceable.

**(e)** In every case in which switches and fuses are fitted on the same pole, these fuses shall be so arranged that the fuses are not alive when their respective switches are in the 'OFF' position.

**(f)** No fuses other than fuses instrument circuit shall be fixed on the back of or behind a switch board panel or frame.

### **13.7 Marking of Apparatus :**

**(a)** Where a board is connected to voltage higher than 250 volts, all the apparatus mounted on it shall be marked in the following colors to indicate the different poles or phases to which the apparatus of its different terminals may have been connected.

#### **Alternating Current**

Three-phase-red  
Yellow & Blue  
Natural-Black

#### **Direct Current**

Three wire system-2 outer wires  
Positive red & Negative Blue  
Natural -Black

Where fuse-wire three phase wiring is done, the neutral shall be in one colour and the other three wires in another colour.

(b) Where a board has more than one switch, each such switch shall be marked to indicate which section of the installation it controls.

(c) All markings required under the rule shall be clear permanent.

### **13.8 Main & Branch Distribution Board :**

**13.8.1** Main and branch distribution boards shall be of any type mentioned in 13.1

**13.8.2** Main distribution boards shall be provided with a switch or air circuit breaker on each pole of each circuit a fuse on the phase or live conductor and a link on the neutral or earthed conductor of each circuit. The switches shall always be linked.

### **13.8.3 Branch Distribution Board :**

**13.8.3.1** Branch distribution boards shall be provided with a fuse or a miniature circuit breaker or both the adequate rating setting chosen on the live conductor of each circuit and the earthed neutral conductor shall be connected to a common link and be capable of being disconnected individually for testing purposes. At least one spare circuit of the same capacity shall be provided on each branch distribution board.

**13.8.3.2** In residential installations, lights and fans may be wired on a common circuit, such sub-circuit shall not have more than total of ten points of lights, fans and socket outlets. The load of such circuit shall be restricted to 800 watts. If a separate fan circuit is provided, the number of fans in the circuit shall not exceed ten. Power sub-circuits shall be designed according to the load but in no case shall there be more than two outlets on each sub-circuits.

**13.8.3.3** In industrial and other similar installations requiring the use of group control of switching operation, circuits, for socket outlets may be kept separate from fans and lights. Normally fans and lights may be wired on a common circuit, however, if need sub-circuit shall not exceed 3000 Watts. In case of new installation, all circuits and sub-circuits shall be designed by making provision of 20 percent increase in load due to any future modification. Power sub-circuits shall be designed according to the due to any future modification Power sub-circuits shall be designed according to the load but in no case shall there be more than four outlets in each sub-circuits.

### **13.9 Installation of Distribution Boards :**

**13.9.1** The distribution fuse-boards shall be located as near as possible to the centre of the load they are intended to control.

**13.9.2** These shall be of either metal-clad type, or all insulated type. But, if exposed to weather or damp situations, they shall be of the weather proof type and, if installed where exposed to explosive dust, vapor or gas, they shall be of flame proof type.

**13.9.4** Where two or more distribution fuse boards feed low voltage these distribution boards shall be :

- (1) Fixed not less than 2 m. apart, or
- (2) Arranged so that it is not possible to open two at a time, namely they are interlocked and the metal case is marked 'Danger 415 Volts', or
- (3) Installed in a room or enclosure accessible to only authorized persons.

**13.9.5** All distribution boards shall be marked 'Lighting', 'Power', as the case may be and also marked with the voltage and number of phases of the supply. each shall be provided with a circuit list giving details of each circuit which it controls and the current rating of the circuit and size of fuse-element.

**13.9.6** Triple pole distribution boards shall not be generally used for final circuit distribution unless specific approval of Engineer-in-charge is obtained. In special cases where use of Triple pole distribution boards are inevitable they shall be of H.R.C. fuse type only.

#### **13.10 Wiring and Distribution Board :**

**13.10.1** In wiring a branch board, total load of the consuming devices shall be divided, as far as possible, evenly between the number of ways of the boards leaving the spare circuit for future extension.

**13.10.2** All connection between pieces of apparatus or between apparatus and terminals on a board shall be neatly arranged in a definite sequence following the arrangement of the apparatus mounted thereon, avoiding unnecessary crossing.

**13.10.3** Cables shall be connected to a terminal only be soldered or welded or crimped lugs using suitable sleeve, lugs or ferrules unless the terminal is of such a form that it is possible to securely clamp them without the cutting away of cable strands.

**13.10.4** All bare conductor shall be rigidly fixed in such a manner that clearance of At least 2.5 cms. is maintained between conductor of opposite polarity or phase and between the conductors and any material other than insulating material.

**13.10.5** If required a pilot lamp shall be fixed and connected through on independent single pole switch and fuse to the bus-bars of the board.

**13.10.6** In a hinged type board, the incoming and outgoing cables shall be fixed at one or more points according to the number of cables on the back of the board leaving suitable space in between cables and shall also, if possible be fixed at the corresponding points on the switch board panel. The cables between these points shall be arranged to on the switch board panel. The cables between these points shall be arranged to form a "U" or "S" shaped loop which shall be of such length as to allow the switchboard panel to swing through an angle of not less than 90°.

#### **14.0 Capacity of Circuits :**

**14.1** Lights and fans may be issued on a common circuits and such a circuit shall not have more than a total of ten points of lights, fan and socket outlets, or a load of 800 watts whichever is less. The power circuits shall be designed with a maximum of two outlets per circuits generally when load is not known or specified. In non-residential buildings at important District centers however one outlet per circuit may be preferred. The circuit shall be designed based on the loading of the circuit where not specified, the load shall be taken as 1 KW per outlet, Where the load is more than 1 KW it should be controlled by a isolator switch or miniature circuit breaker.



## **15.0 Passing Through Walls and Floors :**

**15.1** Where conductors pass through walls one of the following methods shall be employed. Care shall be taken to see that wires pass very freely through protective pipe or box and that the wires pass through in a straight line without any twist or cross in wires, on either ends of such holes.

(a) A teak wood box intending through the whole thickness of the wall shall be buried in the wall and casings or conductors shall be carried so as to allow 1.3 cms. air space on three sides, of the casing conductor.

(b) The conductor shall be carried either in a rigid steel conduit conforming to "IS : 1653-1964 specification for Rigid Steel conduits of Electrical wiring (Revised) or a rigid non-metallic conduit conforming to \*IS : 2509-1963 specification for Rigid Non Metallic conduits for Electrical Installations, or in a porcelain tube of such size which permits easy drawing in. The end of conduit shall be neatly bushed with porcelain, wood or other approved material.

(c) Insulated conductors while passing through floors shall be protected from mechanical injury by means of rigid steel conduit (see \* IS 1653-1964) to height not less than 1.5 m. above the floors and flush with the ceiling below. This steel conduit shall be earthed and securely bushed.

**15.2** Where a wall tube passes outside a building so as to be exposed to weather, the outer end shall be belt mounted and turned down wards, and properly bushed on the open end.

## **16.0 Fixing to Walls and Ceilings :**

Plugs for ordinary walls or ceilings shall be of well seasoned teak or other approved hardwood not less than 5 cm long 2.5 c. square on the inner end and 2 cm. square on the outer end. They shall be cemented into walls to within 7.5 mm of the surface, the remaining being finished according to the nature of the surface plaster or lime punning.

**16.1** Where owing to irregular crossing or other reasons the plugging of the walls or ceiling with wood plugs presents difficulties, the wood casing, wood batten, metal conduit or cleat (as the case may be) shall be attached to the wall or ceiling in an approved in the walls before they are plastered.

**16.2** To achieve neatness, plugging of walls or ceiling may be done by an approved type of asbestos, metallic or a fiber fixing plug.

## **17.0 Branch Switches :**

Where the supply is derived from a three-wire or four-wire source, and distribution is done on the two wire system, all branch switches shall be placed in the outer or live conductor of the circuit and no single-phase switch or fuse shall be inserted in the middle wire, earth or earthed neutral conductor of the circuit, Single-pole switches (other than for multiple control) caring not more than 15 amperes may be of tumbler type which shall be 'ON' when the handle known is down.

## **18.0 Fittings :**

Where conductors are required to be threaded through tubes or channels formed in the metal work of fittings these must be free from sharp angles or projecting edges and such size that will enable them to be weired the conductors used for the final sub Circuits without removing the boarding, taping or outer covering. As far as possible, all tubes and channels should be of sufficient size to permit 'Looping back' of wires cables and flexible cords other than those designed for high temperature shall not be used for wiring fittings except for portable fittings. All fittings must have not less than a half inch male nipple. Fittings and lamp holders for gas filled lamps shall be adequately ventilated.



**18.1** Where light fitting is supported by one or more flexible cords, the maximum weight to which the twin flexible cords may be subjected shall be as follows :

<b>Nominal cross sectional Area cord.</b>	<b>No. &amp; Dia in mm of wires.</b>	<b>Max Permissible Wight Kg.</b>	<b>mm<sub>2</sub></b>
0.5	16/0.2	1.7	
0.75	24/0.2	2.6	
1.0	32/0.2	3.5	
2.5	48/0.2	5.3	
3.5	80/0.2	8.8	
4 1	28/0.2	14.0	

**8.2** No inflammable shade shall form a part of light unless such shade is well protected against all risks of fire. Celluloid shade or light fitting shall not be used under any circumstances.

### **8.3 Fitting of Wire :**

The use of fitting wire shall be restricted to the internal wiring and the lighting fittings. Where fitting wire is used for wiring, the sub-circuit loads shall be terminated in a ceiling zone or connector from which they shall be carried into the fitting.

### **9.0 Lamp Holders :**

Lamp holders for use on brackets and the like shall be in accordance with "IS : 1258-1967, specification for Bayonet lamp holder and all those for use flexible panants shall be provided with cord grips. All lamp holders shall be provided with shade carriers. Where centre contact Edison screw lamp holders are used, the outer or screw contacts shall be connected to the middle wire, the natural, and the earthed conductor of the circuit.

### **20. Outdoor Lamps :**

External and road lamps shall have weather proof fittings of approved design so as to effectively prevent the admission of moisture. An insulating distance piece of moisture proof materials shall be inserted in the fittings. Flexible cord and cord grip lamp holders shall not be used where exposed to weather. In verandahs and similar exposed situations where pendants are used, they shall be of fixed road type.

### **21.0 Lamps :**

All incandescent lamps, unless otherwise required and suitably protected, shall be hung at a height of not less than 2.5 m above the floor level, They shall be in accordance with IS : 418 : 1957 specification for Tungsten Filament General service electric lamps

### **22.0 Fans, Regulators and Clamps :**

#### **22.1.0 Ceiling fans :**

Ceiling fans including their suspension shall conform to \* IS 374-1960 specification for electric ceiling fans and regulators (Revised) & to the following requirements :

(a) All ceiling fans shall be wired to ceiling roses or to special connector boxes, to which fans rod wires shall be connected and suspended from hooks or shackles with insulators between hooks and

suspension rods. There shall be no joint in the suspension rod, but if joints be unavoidable then such joints shall be screwed to special couplers of 5 cm minimum length and both ends of pipes shall touch together within couplers, and shall in addition be secured by means of split pins; alternatively, the two pipes may be welded.

**(b)** Fan clamps shall be of suitable design according to the nature of construction of ceiling on which these clamps are fitted. In all cases fan clamps shall be fabricated from tested new metal of suitable sizes and they shall be as close fitting as possible. Fan clamps for reinforced concrete roofs shall be buried with the casting and due care shall be taken that they shall serve the purpose. Fan clamps for wood beams shall be of suitable flat iron fixed on two sides of the beam and according to the size and section of the beam one or two mild steel bolts passing through the beam shall hold both flat irons together. Fan clamps for steel joist shall be fabricated from tested flat iron to fit rigidly to the bottom flange of the beam. Care shall be taken during fabrication that the metal does not crack while hammering to shape. Other fan clamps shall be made to suit the position, but in all cases care shall be taken to see that they are rigid and safe.

**NOTE :** *All fan clamps shall be so fabricated that fans revolve steadily.*

**(c)** Canopies on top and bottom of suspension rod shall effectively hide suspensions and connections to fan motors, respectively.

**(d)** The lead-in-wire shall be nominal cross-sectional area not less than 1.0 mm<sup>2</sup> with copper and 1.5 mm<sup>2</sup> with aluminum and shall be protected from abrasion.

**(e)** Unless otherwise specified, the clear distance between the ceiling and the floor shall not be less than 2.75 m.

#### **22.2.0 Exhaust Fans :**

For fixing of an exhaust fan, a circular hole shall be provided in the wall to suit the size of the frame which shall be fixed by means of rag-bolts embedded in the wall. The hole shall be neatly plastered with cement and brought to the original finish of the wall. The exhaust fan shall be connected to exhaust fan point which shall be wired as neat to the holes as possible by means of a flexible cord, care being taken that the blades rotate in the proper direction.

#### **23.0 Attachment of fittings and accessories :**

**23.1** In other than conduit wiring, all ceiling crosses, brackets, pendants and accessories attached to walls or ceilings shall be mounted on substantial teak wood block twice varnished after all fixing holes are made in them. Blocks shall be not less than 4 cms. deep. Brass screws only shall be used only shall be used for attaching fittings and accessories to their base blocks.

#### **24.0 Interchangeability :**

Similar part of all switches, lamp holders, distribution fuse-boards ceiling roses, brackets, pendants, fans and all other fittings of the same type shall be interchangeable in each installation.

#### **25.0 Conduit Wiring System :**

**25.1.1** Type and size of conduit - All conduit pipes shall be conforming to IS : 1653- 1964, furnished with galvanized or stove enameled surface. All conduit accessories shall be of threaded type and under no circumstances pin grip type or clamp type accessories be used. No steel conduit less than

16 mm. in diameter shall be used. The number of insulated conductors that can be drawn into rigid steel conduit are given in Table II

**25.1.2 Bunching of cables** - Unless otherwise specified, insulated conductors of AC supply and DC supply shall be bunched in separate conduits.

**25.1.3 Conduit - joints** : conduit pipes shall be joined by means of screwed couplers accessories only (\*IS L 2667-1964).

**Specification for Fittings for Rigid Steel Conduits for Electrical Wiring)**

: In long distance straight runs of conduit, inspection type couplers at reasonable intervals shall be provided or running threads with couplers and jam-puts (in the latter case the bare threaded portion shall be treated with anti-corrosive preservative) shall be provided. Thread on conduit pipes in all cases shall be between 11 mm to 27 mm long sufficient to accommodate pipes of full threaded portion of couplers or accessories Cut ends of conduit pipes shall have no sharp edges nor any of buries left to avoid damage to the insulation of conductors while pulling them through such pipes :

**TABLE - II**  
**MAXIMUM PERMISSIBLE NUMBER OF 250-V**  
**GRADE SINGLE CORE CABLES THAT CAN BE DRAWN INTO RIGID STEEL**  
**CONDUIT**

**(CLAUSE 6.5.1.1)**

Size of cable		Size of conduit (mm.)													
Nominal No. and		16	:	20	:	25	:	32	:	40	:	50	:	63	:
Crossect- Dia. In		:		:		:		:		:		:		:	
ional area. mm of wires		:		:		:		:		:		:		:	
S		B	S	B	S	B	S	B	S	B	S	B	S	B	
1.0	1/1.12 5	4	7	5	13	10	20	14	-	-	-	-	-	-	-
1.5	1/1.40 4	3	7	5	12	10	20	14	-	-	-	-	-	-	-
2.5	1/1.80 3	2	6	5	10	8	18	12	-	-	-	-	-	-	-
4	1/2.24 3 (3/1.06*) (7/0.85)	2	4	3	7	6	12	10	-	-	-	-	-	-	-
6	1/2.80 2 (7/1.06*)	-	3	2	6	5	10	8							
10	1/3.55+	-	-	2	5	4	8	7	-	-	-	-	-	-	-
	7/1.40*	-	-	2	-	4	3	6	5	8	6	-	-	-	-
16	7/1.70	-	-	-	-	2	-	4	3	7	6	-	-	-	-
25	7/2.24	-	-	-	-	-	3	2	5	4	7	6	9	7	
35	7/2.50	-	-	-	-	-	2	-	4	3	7	5	8	6	
50	7/3.00+	-	-	-	-	-	-	-	-	2	-	5	4	6	
	19/1.80	-	-	-	-	-	-	-	-	2	-	5	4	6	

**For Cu. Conductors only. + For Al. conductor only.**

**NOTE 1** The cable shows the maximum capacity of conditions for the simultaneous drawing-in of cables. The table applies to 250 volts grade cable. The columns headed 'S' apply to runs of conduit which have distance not exceeding 4.25 M between draw in boxes, and which do not deflect from the straight by angle of more than 15°. The columns headed 'B' apply to runs of conduit which deflect from the straight by an angle of more than 15°.

**NOTE 2** In case of inspection type draw-in box has been provided and if the cables is first drawn through one straight conduit, then through the drawn box, and then through the second straight conduit, such systems may be considered as that of a straight conduit even if the conduit deflects through the straight by more than 15°.

**25.1.4 Protection against dampness** - In order to minimize condensation or sweating inside the tube, all outlets of conduit system shall be property drained and ventilated, but in such a manner as to prevent the entry of insects as far as possible.

**25.1.5 Protection of conduit against rust** : The outer surface of the conduit pipes, including all bends, unions, tees junction boxes, etc., forming part of the conduit system shall be adequately protected against rust particularly when such system is exposed to weather. In all cases, no bare threaded portion of conduit pipe shall be allowed unless such bare threaded portion is treated with anti-corrosive preservative or covered with approved plastic compound.

**25.1.6 Fixing of conduit** - Conduit pipes shall be fixed by heavy gauge saddles, secured to suitable wood plugs or any other approved plug with screws in an approved manner at an interval of not more than one meter but on either side of couplers bends or similar fittings. Saddles shall be fixed at a distance of 30 cm. from the centre of such fittings.

**25.1.7 Bends in conduit** - All necessary bends in the system including diversion shall be done by bending pipes, or insuring suitable solid or inspection type normal bends, elbows or similar fittings; or by fixing cast iron inspection boxes whichever is more suitable. Conduit fitting shall be avoided as far as possible. On conduit system exposed to weather, where necessary, solid type fitting shall be used. Radius of such bends in conduit pipes shall be not less than 7.5 cm. No length of conduit shall have more than the equivalent of four quarter bends from outlet, the bends at the outlets not being counted.

**25.1.8 outlets** - All outlets for fitting switches etc. shall be boxes of suitable metal or any other approved outlet boxes for other surface mounting or flush mounting system.

**25.1.9 Conductor** - All conductor used in conduits wiring shall preferably be stranded. No single-core cable or nominal Cross-sectional area greater than 130 mm<sup>2</sup> shall be enclosed in a conduit and used for alternating current.

**25.1.10 Erection and earthing of conduit** - The conduit of each circuit or section shall be completed before conductors are drawn in. The entire system of conduit after erection shall be tested for mechanical and electrical continuity throughout and permanently connected to earth conforming to the requirements specified under 7 by means of special approved type earthing clamp efficiently fastened to conduit pipe in a workman like manner for a perfect continuity between each wire and conduit. Gas or water pipes shall not be used as earth medium. If conduit pipes are liable to mechanical damage they shall be adequately protected.

**25.2 Recessed Conduit wiring system with Rigid Steel conduits -**

Recessed conduit wiring system shall comply with all the requirements for surface conduit wiring system specified in 6.5.1.1 to 6.5.1.10 and addition, conform to the requirements specified in 6.5.2.1 to 6.5.2.4.

**25.2.1 Making of chase** - The chase in the wall shall be neatly made and be of ample dimensions to permit the conduit to be fixed in the manner desired. In the case of buildings under construction, chases shall be provided in the wall, ceiling etc., at the time of their construction and shall be filled up neatly after erection of conduit and brought to the original finish of the wall.

**25.2.2 Fixing of conduit in chase** - The conduit pipe shall be fixed by means of staples or by means of saddles not more than 60 cm. apart. Fixing of standard bends or elbows shall be avoided as far as practicable and all curves maintained by bending the conduit pipe itself with a large radius which will permit easy drawing in of conductors. All threaded joints of rigid steel conduit shall be treated with some approved preservative compound to secure protection against rust.

**25.2.3 Inspection boxes** - Suitable inspection boxes shall be provided to permit periodical inspection and to facilitate removal of wires, if necessary. These shall be mounted flush with the wall. Suitable ventilating holes shall be provided in the inspection box covers.

**25.2.4 Type of accessories to be used** - All outlets such as switches and wall sockets, may be either of flush mounting type or surface mounting type.

**(a) Flush mounting type** : All flush mounting outlets shall be of cast iron mild steel boxes with a cover of approved insulating material or shall be a box made of suitable insulating material. The switches and other outlets shall be mounted on such boxes as would be approved. The metal box shall be efficiently earthed with conduit by an approved means of earth attachment.

**(b) Surface mounting type** - If surface mounting type outlet box is specified, it shall be of any approved insulating material and outlet mounted in an approved manner.

**25.2.5** When crossing through expansion joints in buildings, the conduit sections across the joint may be through flexible conduits of the same size as the rigid conduit.

**25.3 Conduit Wiring system with Rigid Non-Metallic Conduits** : Rigid Non- Metallic conduits are used for surface, recessed and concealed conduit wiring.

**25.3.1 Type and size** - All non metallic conduits used shall conform to IS : 2509- 1963-The conduit may be either threaded type or plain type as specified in IS : 2509-6913\* and shall be used with the corresponding accessories (See IS : 3419-1965) specification for Fittings for Rigid Non-Metallic Conduits).

**25.3.2 Bunching off cables** - Conductors of AC supply and DC supply shall be bunched in separate conduits. The number of insulated cables that may be drawn into the conduits are given in Table III. In this table space factor does not exceed 40 percent.

**TABLE – III**

**MAXIMUM PERMISSIBLE NUMBER OF 250 VOLTS GRADE SINGLE -  
CORE CABLE THAT MAY BE DRAWN INTO RIGID NON-METALLIC CONDUITS**

Size of cable		Size of conduit (mm.)					
Nominal	No. &	16	20	25	32	40	50
Cross Sectional	Diameter			(Number of Cables, Max)			
Area	in mm. of						
	wires						
mm2							
1.0	1/1.12*	5	7	13	20	-	-
1.5	1/1.40	4	6	10	14	-	-
2.5	1/1.80	3	5	10	14	-	-
	3.1.06*						
4	1/2.24	2	3	6	10	14	-
	7/0.85*						
6	1/2.80	-	2	5	8	11	-
	7/1.06*						
10	1/3.55+	-	-	4	7	9	-
	7/1.40*						
16	7/1.70*	-	-	2	4	5	15
25	7/2.24	-	-	-	2	2	6
35	7/2.50	-	-	-	-	2	5
50	7/300+	-	-	-	-	2	3
	19/1.80						

**\* For copper conductors only.**

**+ For aluminum conductors only.**

**25.3.3 Conduit joints** - Conduit joints shall be joined by means of screwed or plain couplers depending on whether the conduits are screwed or plain. Where there are long runs of straight conduit. Inspection type couplers shall be provided at intervals. For conduit fittings and accessories reference may be made to IS : 3419-1965.

**25.3.4 Fixing of conduits** - The provision of 25.1.6 shall apply except that the spacing between saddles or supports is recommended to be 60 cms. For rigid non-metallic conduits.

**25.3.5 Bends in conduit** - Wherever necessary, bends or diversions may be achieved by bending the conduits (See 6.5.3.9) or by employing normal bends, inspection bends, inspection boxes, elbows or similar fittings.

**25.3.6.** Conduit fittings shall be avoided, as far as possible on outdoor system.

**25.3.7 Outlets** - All the outlets for fittings. switches, etc., shall be boxes of substantial construction. In order to minim use condensation or sweating inside the conduit, all outlets of conduit system shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects, etc. as far as possible.

**25.3.8** For use with recessed conduit wiring system the provisions of 6.5.2.1 to 6.5.2.4 shall apply.

**25.3.9** Heat may be used to soften conduit for bending and forming joints in case of plastic conduits. As the material softens when heated, fitting of conduit in close proximity of hot surfaces should be avoided. Caution should be exercised in the use of the conduit in locations where the ambient temperature is 50°C or above. Use of such conduits in place where ambient temperature is 60°C or above is prohibited.



## **PVC INSULATED P.V.C. SHEATHED OR T.R.S. WIRING SYSTEM**

### **26.0 GENERAL :**

This system of wiring, is suitable for low pressure installation, and shall not be used in places exposed to sun and rain nor in damp places, provided they are sheathed in the special approved protective covering and well protected to withstand dampness.

#### **26.1 Attachment to walls and ceiling :**

**26.1.1** All cables on brick walls, stone or plastered walls ceiling shall be run on well seasoned, perfectly straight and well varnished on four sides, teak wood or any approved hardwood battens not less than 10 mm finished thick, width of which shall be such as to suit total width of cables laid on the batten, prior correction, these shall be painted with one coat of varnish or approved paint of colour to match with surrounding. These battens shall be secured to wall and ceilings by flat head wood screws to raws plug or phill plug at an interval not exceeding 75 cm. Wood plug can be used only with special approval of the Engineer-in-charge. The flat head wood screws shall be counter within wood batten and smoothed down with file. **26.1.2** Where wiring is to be carried out along the face of the rolled steel joints, a wooden batten of adequate width shall first be laid on the same and dipped to it as inconspicuously as possible. The wiring should then be fixed to this backing in the ordinary way. Where wiring passes through structural steel work, the hole shall be suitably bushed to prevent the abrasion of the cables.

**26.1.3 Attachment to false ceiling :** In no case, the open wiring shall be run above the false ceiling without the approval of Engineer-in-charge

**26.2.0 Link dips :** Only aluminum alloy clips/joint clips shall be used. The thickness shall be 0.32 mm (30 SWG) for lengths of 25 mm to 40 mm and 40 mm (28 SWG) for lengths of 50 mm to 80 mm. The width shall not be less than 8 mm in all these cases. Link clips/joint clips shall be so arranged that one single clip shall not hold more than two core or three single core TRS of PVC insulated and PVC sheathed up to 2.5 sw. mm. above while a single clip shall hold a single twin core or two single core cables. The clips shall be fixed on varnished wood batten switch iron pins and spaced at interval of 15 cm both in the case of horizontal and vertical runs.

**26.3.0 Bends in wiring :** The wiring shall not in any circumstances be bent so as to form an abrupt right angle but must be rounded off at the corners to radius not less than six times the overall diameter of the cable.

#### **26.4.0 Protection of wiring form Mechanical Damage :**

**26.4.1** In cases where there are chances of any damage to wiring, such wiring shall be drawn complying with the all the requirements of conduit wiring system.

**26.4.2** Such protective covering shall in all cases be fitted on all down drops within 1.5 m. from the floor or from floor level up to the switch board whichever is less.

**26.5.0 Passing through floors:** All cables taken trough floor shall be enclosed in heavy gauge steel conduit extending 1.5 m. above the floor or up to the switch board, whichever is less and flush with the ceiling below or by means of any approved type of metallic covering. The ends of all conduits or pipes shall be neatly bushed with porcelain wood or other approved material. The conduit pipes, shall be security earthed.

**26.6.0 Passing through walls:** When conductors pass through walls, any one of the following methods shall be employed. Care should be taken to see that wires pass very freely through

protective pipe or box and that wires pass through in a straight line without any twist or cross in wires on either ends of such holes.

**(a)** A box of teak wood or approved hard wood extending through the hole thickness of the wall shall be buried in the wall and casings or conductors shall be carried so as to allow 1.3 cm air space on the three sides of the casing or conductor.

**(b)** The conductors shall be carried in an approved heavy gauge solid drawn or lap weld conduit or in a porcelain tube of such a size that it permits easy drawing in, the ends conduit shall be neatly bushed with porcelain, wood or other approved material.

**26.6.1** Where a wall tube passes outside a building so as to be exposed to weather, the outer end shall be mounted and turned downwards and properly bushed on the open end. The conduit shall be neatly arranged so that the cables enter them without bending.

**26.7.0 Buried cables:** The TRS or PVC sheathed cable shall not normally be buried directly in plaster. Where so specific in the special specification they may be taken in teak wood channeling of ample capacity or conduit pipe buried in the wall.

**26.8.0 Stripping of outer covering** - While cutting and stripping of the outer covering of the cable care shall be taken that the sharp edge of the cutting instrument does not touch the inner insulation of the conductors. The protective outer covering of the cables shall be stripped off near connecting terminal and this protective covering shall be maintained up to the close proximity of connecting terminals as far as practicable. Care shall be taken to avoid hammering on link clips with any metal instrument after the cables are laid. Where junction boxes are provided they shall be made moisture proof with a plastic compound.

## **27.0 PAINTING WORK IN GENERAL:**

**27.1 Paints :** Paints, oils varnishes, etc., of approved make in original to the satisfaction of the Engineer-in-charge shall only be used.

**27.2 Preparation of surface :** The surface shall be thoroughly cleaned and dusted before painting is started. The proposed surface shall be inspected by Engineer-in-charge or his authorized agent and shall have received the approval before painting is commenced.

**27.3 Application :** Paint shall be applied with brush. The paint shall be spread as smooth & even as possible. Particular care shall be paid to rivets, nuts, bolts and cover lapping. Before drawing cut, it shall be continuously stirred in the smaller containers with a smooth stick while it is being applied. Each coat shall be allowed to dry out sufficiently before a subsequent coat is applied.

**27.4 Scope :** Painting on old surface in indoor situations will not include primer coat except where specially mentioned in the schedule of work or special specification. However, where rust has formed on iron and steel surfaces the spots will be painted with one anti-rust primer coat.

**27.5 Precautions :** All furniture fixtures glazing floors, etc., shall be protected by covering. All stains, smears, splashes, dropping of every kind shall be removed. While painting of wiring etc. it shall be ensured that painting of wall ceiling etc., is not spoiled in any way.

**27.6 Painting of conduit and accessories:** After installation surface of conduit pipes, fittings switch and regulator boxes, etc. shall be painted with two coats of approved enamel paint or aluminum paint as required to match the finish of surrounding wall, etc.

## **28 Link clip :**

The clip for batten wiring shall be of Aluminum conforming to I. S. specification No.2415-1975.

## **APPENDIX - 'A'**

**Important Clauses Of Indian Electricity Rules, 1956 Following Clauses Of Indian Electricity Rules, 1956 Shall In Particular Be Taken Care Of In The Execution Of Electrical Works**

<b>Clause No 3.</b>	<b>Subject</b>	<b>Authorization.</b>
29.	Construction, installation, protection, operation and maintenance of electric supply lines and apparatuses.	
31.	Cut-out on consumer's premises.	
32.	Identification of earthed and earthed neutral conductors and position of switches and cut-out therein.	
33.	Earthed terminal on consumer's premises.	
36.	Handling of electric supply lines and apparatus.	
41.	Distinction of circuits of different voltages.	
42.	Accidental charge.	
43.	Provisions applicable to protective equipment.	
44.	Instructions for restoration of persons suffering from electric Shock.	
45.	Precautions to be adopted by consumers, owners, electrical Contractors, Electrical workmen and suppliers.	
46.	Periodical inspection and testing of consumer's installation.	
48.	Precautions against leakage before connection.	
50.	Supply to consumers.	
51.	Provisions applicable to medium, high voltage installations.	
58.	Point of commencement of supply.	
59.	Precautions against failure of supply; Notice of failures.	
61.	Connection with earth, (Low and Medium Voltage system).	
64.	Use of energy of high and extra-high voltage system.	
67.	Connection with earth. (High & Extra-high voltage system).	
68.	General conditions as to transformation and control of energy.	

### **All Clauses under Chapter VIII on Overhead Lines.**

137.	Mode of entry.
138.	Penalty for braking seal.
139.	Penalty for breach of rule 45.
140.	Penalty for breach of rule 82.
141.	Penalty for breach of rules.

## **APPENDIX - 'B'**

### 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 Specification for Electrical Works 1972.

Electrical Installation at \_\_\_\_\_ Voltage.

#### **(1) Particulars of Works :**

<b>(a)</b> Internal Electrical Installation system of	No. Total Load	Type of wiring.
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**(i)** Light point

**(ii)** Fan point

**(iii)** Plug point

**(a)** 3 pin 5 Amp.

**(b)** 3 pin 15 Amp.

#### **(b) Others :**

Description	HO/KW	Type of starting
<b>(a)</b> Motor: (i)		
<b>(ii)</b>		
<b>(iii)</b>		

#### **(c) Other Plants:**

#### **(d) if the work involves installation of overhead line/or underground cable :**

- (a)** (i) Type & Description of overhead line.
- (ii)** Total length & No. of spans.
- (iii)** No. of street light & its description
- (b)** (i) Total length of underground cable & its size.
- (ii)** No. of joint.
- End joint:
- Tee joint:
- St. through joint:

#### **(2) Earthing :**

- (i)** Description of earthing electrode :
- (ii)** No. of earth electrodes :
- (iii)** Size of main earth lead :

#### **(3) Test Results :**

<b>(a)</b> Insulation Resistance :	
<b>(i)</b> Insulation resistance of the whole system of conductors to earth	Megohms
<b>(ii)</b> Insulation resistance between the phase conductors and neutral	Megohms
Between phase R and neutral	Megohms
Between phase Y and neutral	Megohms
Between phase B and neutral	Megohms

(iii) Insulation resistance between the phase conductors in case of polyphase supply.

Between phase R & phase Y

Megohms

Between phase Y & phase B

Megohms

Between phase B & phase R

Megohms

**(b) Polarity Test:**

Polarity of non-linked single pole branch switches.

**(c) Earth continuity Test:**

Maximum resistance between any point in the earth continuity conductor including metal conduits & main earthing lead. Ohms

**(d) Earth Electrode Resistance:**

Resistance of each 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 is effected with electrode and metal in/on the structure.

Signature of Supervisor

Signature of Contractor

Name & Address

Name & Address

## **SPECIFICATION**

All Specification, standard, publication etc. specified mean the latest standards, publication etc. pertaining to Electrical Installation and should conform to the following wherever applicable.

- (1) Indian Electricity Act. 1910 with its amendments.
- (2) Indian Electricity Rules, 1956 and its amendments.
- (3) Indian Electricity supply Act. 19948.
- (4) Regulation for Electrical Equipment in building by I.E.F. London.
- (5) The Factory Act, 1948 and its amendments.
- (6) I. S.-732-1982 Part-I, II & III code of practice for Electrical wiring and fittings in buildings for low and medium voltages.
- (7) I. S. 4064-1967 H. D. Air break switches and fuses for Voltages not exceeding 1100 volts.
- (8) I.S. 3043 - Earthing code of practice for
- (9) I.S. - 1554 Part-I 1970 PVC insulated (Heavy duty) Electrical Cables for working voltages up to and including 1100 volts.
- (10) I.S. : 694 - 1964 Part - II - PVC insulated cable with Aluminum conduits (revised) for voltages up to 1100 volts.
- (11) I.S. : 5908-1970 Electrical installations in buildings method of measurements of.
- (12) I.S. : 4237-1967 General requirement for switchgear and control for voltage not exceeding 1000 volts.
- (13) I.S. 1653-1964 - Rigid steel conduits for electrical wiring (revised)
- (14) I.S. : 2509-1973 - Rigid steel conduits for electrical installation. (First revision)
- (15) I.S. : 1258 - 1967 - Bayonet lamp holders (First revision)
- (16) I.S. : 418-1957 - Tungsten-Filament General service electric lamps (Third revision)
- (17) I.S. : 374-1966 - Fans and Regulators, ceiling type, electric (second revision)
- (18) I.S. : 2667-1964 Fittings for rigid steel conduits for electrical wiring.
- (19) I.S. : 3419-1976 - Fitting for rigid non-metallic conduits (First revision)
- (20) National Electric Code, 1986

## **ANNEXURE - I**

### **Abstract of the Wiring Rules of the Institution of Electrical Engineer (referred to in the specification) DEFINITIONS (See Clause 2 of the Specification)**

#### **Systems :**

All electrical system in which all the conductor and apparatus are electrically connected to a common source of supply.

**(1) Earthed:** Effectually connected to the general mass of the earth, Solidly earthed means earthed without the intervention of a fuse, switch, circuit breaker, resistor reactor or solenoid.

**(2) Uninsulated Conductor:** A conductor without provision, by the interposition of a dielectric or otherwise, for its insulation from earth.

**(3) Bare :** Not covered with insulating material.

**(4) Dielectric :** Any material which offers high resistance to the passage of the an electric current.

**(5) Bunch Conducted :** When more than one conductor is contained within a single duct or groove or when they are run enclosed and not spaced apart from each other.

**(6) Points :** In wiring as per I.S. : 5908-1970-Method of measurements of electrical installation in buildings.

**(7) Switch Board :** An assemblage of switchgear with or without instruments, but the term does not apply to a group of local switches in a final sub-circuit where each switch has its own insulating base.

**NOTE :** *In the Electricity (Factories Act) special regulations, 1908 and 1944 the term "Switchboard" includes "Distribution board".*

**(8) Single pole switch :** A switch suitable for closing and or opening a circuit on one phase or pole only.

**(9) Linked switches :** A switch the blades of which are so linked mechanically as to make or break all poles simultaneously or in a definite sequence.

**(10) Fuse Switch :** A switch the moving part of which carries one or more fuses.

#### **(11) Three Wire System :**

**(a) Outer Conductor:** Those between which there is the greatest difference of potential. This use of the word outer must not be confused with the use of the work when applied to the external conductor of a concentric main.

**(b) Neutral Conductors:** The term includes the neutral conductor of a 3 phase 4 wire system, the conductor of a single phase or d. c. installation which is earthed by the supply undertaking (or otherwise at the source of the supply) and the middle wire of common return conductor of a 3 wire D. C. or single phase A.C. system.



**(12) Semi enclosed machine:** One in which the ventilating openings in the frame are covered with

-

(a) Grids expanded metal or wire gauge, with openings of less than 1/4 inch so as to obstruct free ventilation.

(b) Wire gauge, in which the opening are less than 1/4 inch but not less than 3/32 inch (diameter or width) :

(c) Screens with smaller openings than the above.

**(13) Totally - enclosed Machine:** One in which the enclosing case and bearings are dust proof and which does not allow circulation of air between the inside and outside of the case.

**(14) Pipe Ventilated Machine:** An enclosed machine in which the frame is so arranged that the ventilating air may be conveyed to it through a pipe attached to the frame, the ventilation opening maintained by the fanning action produced by the machine - itself.

**(15) Forced draught Machine:** An enclosed machine in which the ventilating air supply is maintained by an independent fan external to the machine itself.

**(16) Protected Machine:** One having end shield bearings and in which there is free access to the interior without opening doors or removing covers.

**SWITCHES AND CIRCUIT BREAKERS**  
**(See clause II of Specifications)**

**(17) Switches and Circuit Breakers :**

Switches and circuit breakers (rules 2b.36 and 37) whether fixed separately or combined with lamps, holders or fittings, must comply with the following requirements :

**(a)** Overt heading must not take place at the point of contact or elsewhere, when the full current flows continuously.

**(b)** They must be so constructed or arranged that the contacts cannot accidentally close when left open.

**(c)** The basis must be of incombustible, non-conducting and moisture proof material.

**(d)** Circuit breaker must be so arranged and placed that no combustible material is endangered by their action.

**(e)** Unless placed in an engine room or in a compartment especially arranged for the purpose, they must have their live parts covered. The covers must be of incombustible material and must be either non-conduction or of rigid metal and clear of all internal mechanism. For more than 6 amperes, at pressures exceeding 125 Volts metal covers must be lined with insulating material.

**(f)** In positions where they are liable to injury or come into contract with goods, they must be further protected by an open fronted box or other suitable guard.

**(g)** Handles must be insulated and so arranged that the hand cannot touch live metal, or be injured through and adjacent fuse blowing.

**(h)** Switches having a handle projecting through an open slot in the cover, must not be used.

**Signature of Contractor**

Chief Officer  
Chhota udepur Municipality

## **SECTION F-1A**

### **GENERAL REQUIREMENTS**

#### **1.1 Scope of works :**

The work covered by electrical specification consists supplying and installing, electrical wiring system complete in strict accordance with this specification and the applicable drawing and subject to the terms and conditions of the contract. It includes.

- (a) Conduit and wiring system for fans, lighting points, clocks, sockets, etc., including fixing of lighting fixtures and fans etc., **and miscellaneous points.**
- (b) Conduit and wiring system for **exhaust fans sockets etc.**
- (c) Panel boards, distribution boards.
- (d) Complete power and lighting
- (e) Grounding system.
- (f) Conduits system.
- (g) Street lighting system
- (h) Other miscellaneous electrical

#### **1.2 Completeness of Contract:**

Any work fittings accessories or apparatus which may not have been specifically mentioned in the specification but which are necessary in the equipment for efficient working of the plant should be deemed to be included in the contract and should be executed and provided by the Contractors. All plant and apparatus should be complete in all the details, whether such details, are mentioned in the specifications or not. Three prints and one permanent negative of each of the finally approved drawings incorporating all the modifications proposed by the Department should be submitted. No modifications should be made in a drawing already approved by the Engineer-in-charge without his prior consent. Approval of the Contractor's drawing will not relieve the Contractor of any part of his obligation to meet all the requirements of the contract

#### **1.3 Guarantee :**

The performance of all the equipment's and the installations should be guaranteed at least for a minimum period of one year from the date of taking over the installation by the Department. All equipments must comply with the relevant IS-BS specifications.

#### **1.4 Interchangeability:**

All corresponding parts of similar plant and equipment should be interchangeable in every way.

#### **1.5 Tools:**

All special tools required for dismantling and assembly of the equipment covered by the contract shall be supplied as obligation under the contract. A list of items to be supplied by the Contractor should be submitted along with the tender.

## **SECTION F-2A**

### **Specifications for Electrical Installation in Buildings**

#### **1 GENERAL :**

**1.1** These specifications relate to the electrical installations in the buildings of P.W.D. Electrical. The specifications cover general requirements to be fulfilled. These general specifications are supplemented by the specifications for the particular buildings separately attached.

**1.2** These specifications are governed by the General conditions of the contract attached hereto.

#### **1.3 APPLICABLE RULES AND REGULATIONS :**

**1.3.1** Installation shall be carried out in conformity with the regulations for electrical equipment's of buildings, published by the institute of Electrical Engineers London (14th Edition 1966 and as amended up to date) hereinafter referred to as the I.E.E. wiring regulations. Where these specifications or the special specifications for the particular building attached hereto are at variance with the I.E.E. regulations these specifications or special specifications as the case may be, shall be followed. The installation shall also comply with the requirements of the Indian Electricity Act. 1910 as amended up to date and rules issued there under and also the regulations for the electrical equipments of buildings issued by the Bombay Regional Council of Engineer Association of India. Where not specified otherwise, the installation should generally follow the Indian standard codes of practice and in their absence the relevant British Standard of practices. All the materials shall comply with the relevant Indian Standard or British Standard specifications.

#### **1.4 DEFINITIONS :**

**1.4.1** The definitions of terms in the I.E.E. Regulations shall apply in general.

#### **1.5 DRAWINGS:**

**1.5.1** The preliminary drawings only indicate the general scheme of requirement. The exact position of all points, control switch boxes, runs of wiring and/or conduits joint boxes, inspection boxes, mains, and sub-distribution boards, mains etc., shall be got approved by the Engineer-in-charge. All circuits shall be clearly numbered in wiring diagrams and building plans. The detailed design of a switch-board, special fixture or any other part of the electrical installation as may be called for by the engineer-in-charge shall also be supplied by the Contractor and should be got approved by the Engineer-in-charge. Three sets of completion drawings and wiring diagrams showing the installations as executed shall be supplied by the Contractor along with the completion certificate.

#### **1.6 MATERIALS :**

All Materials shall be new and of the best quality conforming to the relevant I.S.B.S. specifications. They must be the products of reliable manufacturers of many years of standings. All like parts of materials shall be interchangeable. In case of equipments such as circuit breakers, switch fuses etc., a descriptive and illustrated literature shall accompany the tender. The names of manufacturers of various materials shall be furnished in proforma in Appendix-I Sample of materials wherever required should be approved by the application of suitable paints. The supply of all equipments, switchgears etc. shall be complete with accessories, fittings and mountings as may be required for their proper performance, and as specified in the relevant IS-BS Code of Practice and Standards.

#### **1.7 WORKMANSHIP :**

**1.7.1** Good workmanship and neat finished appearance are the prerequisites for complying with the clauses of these specifications. With a view to ensure fine workmanship the tenderers shall employ licensed wiremen with an experience of not less than 5 years in the type of work they are engaged.

The work should be done under supervision of licensed Electrical Supervisors with good educational qualifications and considerable experience.

**1.7.2** Tenderers shall furnish the names of Supervisor and their wiremen who will be engaged in this work with details of their experience.

### **1.8 CO-OPERATION WITH CIVIL AND OTHER WORKS CONTRACTORS :**

**1.8.1** The tenderer, after the award of the contract, shall co-operate with the civil and other Contractors and shall co-ordinate his work with the work of other Contractors with the least amount of dislocation and in reference to the other works Tenderers shall go through the drawings carefully and shall furnish the Engineer-in charge with all the details of openings in the walls etc. they may be required for concealing any of the electrical equipments or accessories. Where the Contractor fails to furnish such information as may be required for the purpose of concealing the equipments etc., they shall be made at his (Contractor) cost and expense. Any alteration to parts of the building shall be carried out with prior permission of the competent authority. All chases of the structural work shall be made good at the contractor's expense and brought to the original shape finish and colour.

### **1.9 TESTING :**

The electrical Contractor shall be completely responsible for the testing and commissioning of those installations covered by these specifications in compliance with the standard procedure, in obtaining permission of the Government Electrical Inspector. Any modification which is demanded by Government Electrical Inspector shall have to be carried out within the scope of the contract. The contractor shall submit four copies of drawings of installations as per regulations for shall be provided by the Contractor for carrying out the installation work. All tests shall be carried out in the presence of the Engineer-in-charge or his authorized representative and his approval obtained for the test results.

### **1.10 COMPLETION CERTIFICATE AND MAINTENANCE GUARANTEE :**

**1.10.1** After the completion of the installation and testing, the Contractor should furnish a certificate in the proforma in Appendix-III, at the time of taking over the installation by the Department. The installation shall be guaranteed for period of 12 months from the date of taking over by the Department. During the period of guarantee all defects in material or in workmanship shall be rectified or replaced free of cost to the Department.

### **1.11 TENDERER'S ABILITY :**

**1.11.1** In order to enable the Department to assess the ability of the tenderer to execute the work, the tenderer shall furnish evidence of his experience and capacity to carry out the work of the magnitude and nature.

### **1.12 RATES :**

**1.12.1** The rates of items shall include all taxes, transport, loading and unloading charge and all such charges that may be required to be incurred for the supply and installation of the materials at site. The rates shall be firm and variations in the market are not entertained. Break up figures as required in the schedule of work shall also be furnished. As far as possible indigenous materials only shall be included for supply. Where it is unavoidable, imported items may be included and tenderer should clearly indicate materials, quantity, rate and amount of these items.

### **1.13 STORAGE SPACE :**

No covered storage space will be provided by the Department. The Contractor has to make his own arrangement. However, the Department may give an open space near the place of execution where the Contractor can build his own stores for executing the work.

### **1.14 DEPARTURE FROM SPECIFICATIONS :**

The tenderer should clearly indicate departure, if any, from the specifications with reasons for the same.

### **1.15 EXTRA ITEMS:**

Rates for extra items shall generally be derived from the rates already available in the schedule. Where it is not possible, the rates shall be mutually agreed upon and the Contractor shall furnish a detailed analysis of the rates claimed by him.

## **2. TECHNICAL SPECIFICATIONS :**

### **2.1 Supply System :**

The wiring installing shall be suitable for 3 phase 4 wire, 400-400 v 50 cycles system of supply. Colour code of different phase shall be followed as per standard.

### **2.2 Wiring for Lights and Fans :**

**2.2.1** Looping system of wiring shall be adopted. No joints shall be made at intermediate runs of cables and where they are unavoidable, such joints shall be through approved mechanical connections.

#### **2.2.2 Point Wiring :**

Point wiring shall consist of the branch wiring from the switch board together with the controlling switch or push as far as and including the ceiling rose or any other approved connector or socket, outlets. In case of more than one light being controlled by one switch the wiring up to the ceiling rose of the first light including the switch shall be considered as primary, point, Loop wiring from light shall be considered as a 'Secondary' point and rates shall be quoted separately, including final connections to fixtures and plugs.

#### **2.2.3 Conductors :**

No conductor for final sub circuit wiring for light and socket outlets shall have a cross section less than that of 2.5 sq. m (aluminium).

#### **2.2.4 Loading :**

No final sub-circuit radiating from the fuse board of a sub-distribution board and wires with 25 sq. m. (At.) cable shall carry more than 10 lights, fans or socket outlets or a connected load of 800 watts whichever is greater. The following wattages may be assumed for estimating the load on each sub-circuit unless otherwise known or specified.

Incandescent Lamps	100 watts
Ceiling fans	60 watts
5-A Socket Outlets (lighting)	100 watts
4. ft. fluorescent tube	50 watts
5. ft. fluorescent tubes	100 watts

In each sub-distribution board at least one way preferably two ways shall be left spare for future requirement. A wiring diagram giving the details of the exact utilization of the ways shall be prepared and fixed in the sub-distribution board itself or any other easily accessible place. The ways of sub-distribution board shall accordingly be numbered.

#### **2.2.5 Local Control Switches (General) :**

Local control switches for circuit carrying not less than 5-A shall be piano type and shall conform to relevant I.S. Standards. The switch shall be 'ON' when the knob is in the down position. All local control switches shall be connected in the phase or live conductor only and not in the neutral conductor, switch box is 1.3 mtr. from the finished floor level unless otherwise stated. All switch boxes shall be provided with 1/8" thick Perspex cover fixed to the switch box with chromium plated counter sunk screws (brass).

### **2.2.5A Switches (Two way) :**

(a) Two way switches shall be piano type single pole, double throw, 250V, suitable for flush mounting and of 5A capacity as per the drawings. All switches shall be recessed in an embedded metal box.

(b) Each box shall have suitable outlet for fixing conduits directly.

(c) Each box shall have Perspex cover painted inside with the wall colour, if required.

(d) Each switch shall be suitable for the position in a corridor stairway wiring.

### **2.2.5.B Switch Boxes (General) :**

Electrical circuits shall be written suitably on the cover of all switch boxes, as approved by the Engineer-in-charge (Elect). Whenever different phase are terminated in a switch box bake lite partition shall be provided. Each case shall be provided with a G. I. Earth stud nut and washers for earth connectors.

### **2.2.6 Ceiling Rose :**

Ceiling rose shall be used on circuits having a voltage normally exceeding 200V. Only one flexible cord shall be attached to a ceiling rose. Only 3-pin 5A socket outlet shall be provided in lighting circuits. All socket outlets shall be provided with control switch and they shall be mounted in switch boxes in an approved manner.

### **2.2.7 Fittings :**

These shall be of approved type as specified in the tender schedule. The sub circuits leads should terminate in a ceiling rose or conductor in the fitting and internal connection made their form. Wherever these fitting are suspended they shall be done so through the conduits and ball and socket joints. All fittings shall be grounded by a G. I. conductor not less than 16 S. W. G.

### **2.2.8 Flexible wiring :**

Flexible cords of not less than 23/0076 size shall be used. The weight of suspension shall be governed by I.E.E. Regulations.

### **2.2.9 Ceiling Fans :**

All ceiling fans shall be wired to ceiling rose and suspended from a hook shackle or clamp and insulated from the same. All joints in the suspension road shall be screwed and secured by means of split pins. The fan clamps supplied by the Contractor shall be suitable for the ceiling or proof member as the case may be. For concrete roofs, fan hooks shall be buried in concrete during construction in an approved manner and securely bound to the reinforcement.

### **2.2.10 Conduits and Earthing :**

All conduits feeding lighting and fan circuits shall be provided with earth continuity G.I. conductor as specified for power wiring. All conduits shall be as specified for power wiring.

### **2.3.1 Point wiring :**

Point wiring for power shall be as defined under section 2.2.2 and shall include the switches and sockets.

### **2.3.2 Loading :**

All distribution board for power wiring shall be not less than 15A per way. Loading per way shall not exceed normally 100 watts. The following loads may be assumed if exact figures are not known :

3-Pin 15A Outlets	1000 Watts
3-Pin 5A Outlets	100 Watts



### **2.3.3 Wiring for Motors :**

**2.3.3.1** Final sub-circuits loop in motors shall be connected to separate ways of the Distribution board even if the current in the sub-circuit is less than 15A. No looping is permissible.

**2.3.3.2** All wiring shall be carried in H. G. conduit as specified in I. S. specification for gauge for different sizes of conduits. When the motor is resiliently mounted flexible conduit with approved adopters shall be used for the last few feet. Where cables are used sufficient loop shall be left.

**2.3.3.3** All switch fuse units controlling circuits feeding motor shall be provided with H.R.C. fuses or as specified.

**2.3.3.4** The frame of every motor and its association control gear shall be earthed by two separate and distinct connections to earth. Connector shall be capable of carrying 3 times the rating of fuse or 1.1/2 time the setting of the circuit breakers but in no case less than No. 8 S.W.G. or 7064 or equivalent cross section of copper. Where practicable, the earth connection shall be visible for periodical inspection. Gas or water pipes shall not be used for earth connections.

### **2.3.3.5 Socket Outlets and Control Switches 5A and 15A :**

All socket outlets shall be of 3 pin type, the third pin being connected to the earth stud of nearest distribution board by separate earthing wire. The socket shall conform to I. S. : 1293/1938. single pole, piano type. Each socket outlets shall be provided with a control switch of appropriate rating and as specified. The switch and socket shall be mounted inside the iron clad box provided with 1/8" Perspex cover as directed by the Engineer-in-charge or as specified in schedule of quantities. Inside switch box ample space shall be available around switches for connecting wires to switches. All socket outlets for power shall be mounted at the skirting level unless otherwise specified or as directed by the Engineer-in-charge.

The three phase plug receptacles shall have their earth terminals connected by independent earth wires to ring main earth strips on the building. In building where explosion proof fixtures are installed single phase plug receptacles as well as light points shall be connected to ring main ground bus installed in the building by separate earth wires of approved size.

Socket outlet shall have some provision not to receive the matching plug unless the grounding pin is in correct position. The grounding pin of the plug shall make the contact first and break the contact last at the time of inserting or removing the plug respectively.

The grounding terminal shall be connected to the enclosed metal body by providing G.I. stud. nut washers weld to the box Each unit shall be suitable for flush mounting as required and indicated in the applicable drawings.

Combination unit of socket outlet and switch shall be complete with necessary internal wiring. The switch/socket shall be mounted on M. S. bracket enclosed in a box.

### **2.4 Conduit Wiring :**

**2.4.1** Where conduit wiring is adopted the type and size of the conduit shall be as indicated in the drawing. The minimum of the conduit shall be 19 mm.

**2.4.2** The Contractor shall thoroughly study the structural arrangements of the buildings and wherever necessary, shall in consultation with Department's representatives at site, make suitable adjustments in the cable routings, earthing arrangements, and location boxes, fitting etc. with a view to avoid interference with any part of the building, structure, equipment or any other work in the building or to effect any improvement in the arrangement.

### **2.4.3 Protection of conduit against rust :**

Conduit shall be given two coats of oxide paint before they are placed in position. All exposed conduit shall be painted after installation with the colour as approved by the Engineer-in-charge. This do not apply to galvanized conduit.

#### **2.4.3 A Protection against insects and damp :**

In order to minimize condensation or sweating inside the conduit, system shall be properly drained and ventilated in such a manner as to prevent the entry of insects.

**2.4.4** Conduit shall first be installed as a complete system without cables and shall be continuous from outlet to outlet from fitting to fitting and mechanically and electrically connected to all boxes and fittings.

### **2.5 SPECIFICATION FOR POWER CONTROL AND TELEPHONE CABLES :**

#### **1. SCOPE :**

i. The specifications cover the supply and installation of medium voltage power and control cables either in ground or trench depending on the conditions at site including accessories for the same. The work in general, consists of supplying, laying terminating and connecting all. 1.1 KV APLSTS PVC power and control cables.

ii. The Contractor shall supply all accessories including jointing and terminating materials, compound, tapes supporting materials, cleats cable lugs, concrete stabs, bricks sand, cable markers etc., as required to make the installation work including digging and back filling of the trenches as required.

#### **II. SPECIFICATIONS :**

i. All power cables to be supplied mentioned as 'APLSTS' in the Schedule should be mass impregnated non-draining, paper insulated lead sheathed, double steel tape armored and must comply with the latest IS BS specifications.

ii. All cabling materials such as cable compound, cable lugs, tapes shall be of approved quality acceptable to the type recommended by the manufacturer of the cable for which it is used and approved by the Department.

iii. Installation of all equipment shall also conform to the applicable Codes and practice as per the IS and shall be executed to comply with the latest Indian Electricity rules as regards the surety, earthing of equipments and other essential provision specified therein.

iv. Only approved make of cable be used. ICC and CCI will be preferred.

v. The cables shall generally be laid as per IS Code of Practice.

#### **III. GENERAL RULES FOR CABLE LAYING :**

i. Installation shall be carried out in a neat, workmen like manner by skilled experienced and competent workmen in accordance with the standard practices.

ii. Cables shall be laid preferably in one piece length to avoid joints. If straight joint are found necessary, these can be introduced with prior approval of the Engineer-in charge.

The cost of the straight joint however, shall not be borne by the Department. But in no case joint shall be within the conduit G.I. pipe and duct.

**iii.** proper care should be exercised in handling the cable to avoid formation of kink etc. and should it become necessary a cable be bent to a radius not less than 20 times the overall diameter of the cable.

**iv.** Method of installation, routing of cable etc., shall in every case be subject to the Department's approval and the Contractor shall modify and or certify at no extra cost to the Department any portions of the installation which do not meet with the Department's approval. All damages to the civil or other works on this account shall be made good by the Contractor at no extra cost to the Department. The electrical Contractor while notifying the building Contractor for such work shall furnish the proper drawings, fully explaining the work involved or indicate at site actual work to be carried out as may be required by the building Contractor. The electrical Contractor shall also notify the building contractor in writing, for finishing up as required, of any such work as soon as the electrical work with respect to the same has been completed.

**v.** Where cables pass through hume pipes, Contractor shall fix hard wood bushed round the cables at the ends of hume pipes. Where the cables pass through the floors or chambers and in such other situations as the Engineer shall require, the Contractor shall seal cable holes in a manner approved by Engineer-in-charge. Where cables pass through roads, nallahs, etc., cables must be protected by Class 'A' Hume pipe of diameter not less than 6" (15 cm)

**vi.** The cable route shall be the shortest and there shall be minimum interference with built up areas, lawns etc.

**vii.** Care shall be exercised for providing suitable props for supporting other service lines on earth at the time of excavation. Where cutting of a lawn become inevitable it should be with the approval of the Engineer-in-charge.

**viii.** Excavation of the trenches shall be executed with vertical sides and the trenches shall be kept as straight as possible. The exact location of each trench shall be settled by the Engineer-in-charge on the site when the contractor is in a position to commence each portion of the work. The trench shall be not less than 1/2 meter wide and 90 cms deep. If more cables are to be laid, the width should be suitably increased.

**ix.** After the cables are laid, the trench shall be filled in layers, the earth in each layer being well rammed by spraying water and consolidated and sufficient allowance made for settlement. The extra earth over the trench should be removed from the place of trench to a place as decided by the Engineer-in-charge at site.

**x.** Ends of cables shall be properly sealed to prevent entry of moisture prior to installation.

**xi.** Where it is as specified as 1/2 core in multicore cables, the 1/2 core shall be a neutral conductor having reduced section.

**xii.** For all multicore cables each core and tails shall be brought out, marked and or colored in an approved manner.

**xiii.** Cables termination shall be done with suitable compression brass glands in the case of PVC cables and cast iron trifurcating boxes in the case of APLSTS cables. The armor should be connected to the right main earth in building with duplicate earth wires as per the relevant IS/BS specifications. The core isolation over each conductor shall however be retained throughout the run of the conductor up to the end where lugs shall be fitted thereon for connections. The lugs shall be fitted by means of approved solder and flux as a lead, and Eyre No. 7 liberally used. The joint shall be mechanically strong and pressure tested.

## **2.6 DISTRIBUTION BOARDS AND PANELS :**

### **General Requirements :**

**2.6.1** All distribution panels shall comply with I.E.E. Rules 60-61. A clear distance of 0.91b meter in front of the switch board shall be kept. Where bare connections or attachments are provided at the back of the switch board the space behind the panel shall be either less than 0.299 meter or more than 0.762 main width. There shall be a passage way from the furthers outstanding part of any attachment or conductor. If the space behind the switch board exceeds 0.76 main width there shall be a passage way from either end of the switch board clear to height of 1.928 m width 0.299 m. All wiring connection shall be made neatly and securely.

**2.6.2** For crocoites carrying more than 10 Amps. tinned cable sockets shall be used. All connections shall be so made as to form their own diagram. Circuit shall be clearly numbered to correspond to wiring diagram. Names of the distribution boards shall be painted as directed by the Engineer-in-charge. All the switch fuse units and isolators D.Bs. shall be complete with earthing lugs neutral bar link. H.R.C. fuses and of approved make.

**2.6.3** Skeleton type panels shall have rigid framework adequately braced and supported. The switch and distribution boards shall be neatly arranged in the frame. The details of the framework and the arrangement of switches shall be got approved by the Engineer-in-charge before the panel is fabricated.

**2.6.4** All cubical type panels shall have rigid supporting frames adequately braced over which sheet metal shall be neatly secured. All switches, distribution boards etc. shall be neatly arranged on the panels and all connections made form the back of switches. The panels shall be rendered dust and vermin-proof. The interior of the panels shall not be accessible to unauthorized persons.

**2.6.5** The recess type boards shall be embedded in wall in a cupboard with a metal hinged door with locking arrangement. In all recessed conduit work in distribution boards shall be recessed. Where recessing is not possible, free standing panel may be provided as approved by the Engineer-in-charge.

**2.6.6** All individual components i.e. switch fuse units D. Bs. etc. shall be connected by earth continuity wire of appropriate size with the main earth bus of the panel D. B. etc. The panel switches or D.Bs. shall be earthed by not less than 2 distinctive paths to earth. Earthing of metallic parts of exposed metal shall not be effected through any structural metal work which houses the installation. Where metallic parts are not required to be earthed and are liable to become alive should the installation of the contractor become defective such metallic parts shall be separated by durable non-conducting material from any structural work.

**(a)** power panels shall be 3 phase, 4 wire, 400/230 volts for the distribution of 3 phase or single phase power loads. Lighting panels shall be 3 phase, 4 wire 400 230 volts for single phase lighting load distribution on all 3 phase.

**(b)** All panels shall be done or protected front type with no mechanical or electrical defects.

**(c)** Bus bars shall be of electrolytic copper or aluminum as specified and the properly tinned sizes as indicated on applicable drawings as required.

**(d)** All knockouts for branch circuits, conduit entries shall be drilled in and files as required. For lighting panels the top and bottom cover plates shall be removable type.

**(e)** Main disconnects device for all panel boards shall be of switches of disconnect type and of the size as indicated. It shall be mounted directly below the panel or through a short thread conduit of required size.

(f) The main disconnect for all panel boards shall have an entry suitable for PVC armored cable from bottom.

(g) All panel boards shall be provided with an earthing terminal and plug for connection to the grounding system.

(h) Temperature rise of all electrical parts shall not be more than 300° C with full load measured at room temperature.

(i) Buses shall be securely supported so that ordinary vibrations will not cause any of the parts to become loose.

(j) All barriers and supports of current carrying parts shall be of moisture resistant insulating material and shall not be adversely affected by arcing.

(k) The locations of panels shown in the drawings are only tentative. Panels may be located at place approved by the Engineer-in-charge.

(l) All civil works connected with fixing such as grouting chasing and making good shall be the tenderer's responsibility.

(m) Wires adequate capacity with proper size of lugs shall be used for interconnections.

(n) Panel should be self-supported on angle channel iron framework. It should be preferably of bolted construction in case of transportation and flexibility. The frame shall be of the required size for the mounting of the equipment on it. It shall be bolted or grouted rigidly after leveling and alignment.

(o) The cupboard and D. B. should be of such size so as to be accommodated in the existing room as per I. S. rules and I. S. codes of practice for installations of medium voltage switchgear.

(p) Fabrication drawing showing the detailed dimensions and panels and its components indicating the frame work earthing positioning of switches, D. Bs. cable boxes, adopter chambers etc. shall be furnished to the Engineer-in charge. Panel should be guaranteed for satisfactory operations for a period of one year after handing over.

(q) The panel should be painted with anticorrosive paint suitable for humid and salty atmosphere on two coats of primer.

#### **Switch Gears, Powers Panels D. B. and S. F. Us.**

**2.6.8** The main bus bar shall have continuous current rating as specified with neutral bar having half of full load rating of the phase bus bar. The sizes of the bus bars shall be so selected that the current density in bar does not exceed 150 amps. per sq.mm. for copper. The length of bus-bar chamber should be as suitable length to fix all the switches etc. as per prevailing standards. Clear spacing of two adjacent buses shall be 1.1/2" Minimum bar should be taped all along with colour coated 11 KV grade PVC tape. The maximum internal support for each unsupported length shall exceed 600 mm.

The bus bar shall be of copper/aluminum and fabricated to the relevant standards specification. In case aluminum bus bar is used special with high conductivity aluminum bus bar alloy E 91 C frame conforming to E. S. S. 2898 shall be used. The current density shall not exceed 800A per sq. inch. Hylam barriers will be provided over the joints to prevent any short circuit.

The bus bar enclosing shall be made out of not less than 16 gauge M. S. sheets construct on with angle iron support. All interconnections between bus bars S. F. Us. and D. Bs. shall be of adequate size and details of such interconnection shall be furnished to the Engineer-in-charge for his approval.

The bus bar shall be air insulated extensible type rectangular one. The bus bars chamber shall be dust tight by providing gaskets secured properly so as to tender it vermin proof. The Combination Fuse-switch unit should comply with IS 4064 BS 861 and BBS 2510 wherever applicable. It should be suitable to accommodate High Reputing Capacity Cartridge Fuse links complying with IS 2208 or BS 88 and having certified returning capacity of not less than 35 MVA at 440 volts (AC5 duly). The switch gear (panels D. Bs. etc.) shall be installed generally as per IS-Part I 3072 and as specified and shown in drawings.

All fuse switch units shall be provided with non-deteriorating HRC fuse links complying with IS 2208-1962 and having rupturing capacity of 35 MVA at 415 volts or as specified.

All switches above 60 amps. rating shall be provided with suitable size adapter boxes. All switches mounted on the top of the bus bars shall be provided with detachable type reverse entry adapter boxes. Suitably engraved labels shall be provided for each circuit as well as for the board.

A meter with sector switches and LMH meter shall be provided where specifically mentioned. Small wiring for the inter-connecting shall be colour coded and provided with numbered figures for easy identification of circuits.

(a) The distribution boards should be totally enclosed metal clad complying with B. S. 214. The M. S. sheet steel enclosures for recessed D. Bs. shall be of not less than 14 gauge.

(b) The D. B. shall be with hinged door and the locking arrangements as approved by the Engineer-in-charge.

(c) All the components shall be enclosed in the enclosure. The mounting of D. B. shall be got approved by the Engineer-in-charge before carrying out the installing.

(d) The D. Bs. shall have proper size cut outs for conduits entry or cable entry or cable entry as required and these shall be made on site.

(e) Adequate spacing shall be provided inside the D. Bs. for easy removal of the fuses and carry out the interconnection.

(f) A set of insulating barriers have to be provided between incoming breakers switches and fuses.

**Switch fuse Units :**

(a) All the D.P.T.P. and T.P.N. switch fuse units shall be totally enclosed ion clad quick make, quick break type to best Indian make conforming to the I.S. or B.S. 3185 specifications. All the switch fuse units shall have mechanical interlock with a door so that the door cannot be opened when the switches are in 'ON' position. The switches should be of double break isolation type to ensure safely.

(b) Each T.P. & T.P.N. switch fuse unit shall be earthed with two distinct earth connections.

(c) Suitable insulator shall be provided between phase.

(d) There shall be suitable natural link in the fuse box.



(e) All T. P. & T.P.N. switch fuse units shall be rated for 500 volts and D.P. (required for single phase supply) and S.P.N. switches for 250-volts.

(f) The H.R.C. cartridge fuse shall conform to H. S. 88 (1952).

The O.C. Bs. ACB shall be suitable for 400/440 volts 3 phase 50 cycle supply capable of interrupting a fault MVA. of not less than 31. The circuit breaker shall conform to the BSS-936-1940 BSS 3659 with such tripping arrangements as many as required under special specifications for the building. Efficient and fool-proof mechanical interlocking shall be provided for the safe operation and maintenance. The rate shall be inclusive of the first filling of oil.

### **2.7 Instrumentation :**

The instruments and meters wherever shall be housed in special sheet steel box located between switch fuses units and bus bar chambers. The instruments etc. shall be mounted on the hinged cover with their dial flushed. All instruments shall have protective H. R. C. fuse links. All interconnections and small wiring shall be neatly dressed arranged and duly colored for easy identification of circuits. Meters shall be provided as required in the Schedule. Meters shall be dead head and be suitable for 400/440 volt 3 phase 4 wire 50 cycles (in balanced load) supply. Each selector switch shall be 3 point and of minimum 250 volts grade with silver tipped contacts suitable for metering circuits. Current transformer shall be of 5VA burden and 250V grade. Even unit shall be prewired and interconnected to the system for its required indicating performance. Indicating Lamps shall have independent circuit fuse.

### **2.8 FIXING OF LIGHTING FIXTURES :**

1. Location of fixtures their manner of fixing mounting height etc. indicated in relevant drawing. Actual location and levels shall however be arrived at site in coordination with other services etc. and prior approval of the Engineer-on-charge regarding the actual location, manner of fixing shall be obtained before the work is taken up in hand.

2. In all cases the Contractor shall provide necessary interconnection wiring earthing painting etc. all necessary for complete installation. The Contractor shall also test and commission the fixtures during completion of the work.

3. General arrangement of fixtures layout as indicated in drawings. Care shall be taken to see that all light fixtures are in a row in a room or particular area, are in absolute line and plumb and are symmetrically disposed with respect to finished surfaces of walls columns beams etc.

4. The inter-connections wiring from the light outlet point up to the fixture shall be carried out by means of flexible copper wire of section not less than 1.5 mm<sup>2</sup>.

5. All fixtures suspended by means of conduits shall be done with all and socket joints or as per approved design.

### **2.9 Telephone System :**

1. Empty conduits shall be done, recede or exposed to surface along with pull boxes, junction boxes and telephone outlet boxes, in areas and location as indicated in the relevant drawing as per materials and methods as described in regard to conduits under section "Wiring in Conduits" except the G. I. pull wires of gauge not less than 20 SWG shall be kept pulled through conduits in all sections so that in future telephone wires can be pulled easily.

2. Location shown on the drawing are approximate and final location shall be decided in the field by the Engineer-in-charge.



## **SECTION - G**

### **SPECIFICATION FOR EARTHING**

#### **Installation of Earthing Plates :**

All installation of earthing shall conform to Indian Electricity Rules, IS-3043 latest edition and I.E.E. The copper earth plates should be tinned before installation. The earth plates of copper 60 cm x 60 cm x 3.515 mm thick size as mentioned in the schedule should be in separate pits at least 150 cms to 300 cms. away from the building at a depth necessary to reach moist earth surface but with a minimum depth of 2.5 mtr from the finished ground level up to the top vertical dodge of earth electrode. The earth plate shall be thoroughly cleaned to remove all dirt from the surface and be tinned properly for electrical contact with the main ground. Each earth pit should be provided with 38 mm. dia. G.I. pipe 2.5 Mts. long or more depending upon the depth of pit over the vertical edge of earth plate (with top end of pipe provided with a closed to coupler). Alternative layers of salt and coke shall be provided surrounding the plate. The pits shall be filled when the plates are in position and with type approval of Engineer-in-charge.

To facilitate watering the pit, a concrete compartment should be made with funnel with mesh and cover plate as per rules provided in ISI regulations. The masonry enclosures shall be 25 cm x 25 cm (deep) with C. I. lid of 23 cm x 30 cm size. After installation, the earthing resistance of each earth plate should be measured by resistance meggar in the presence of Engineer-in-charge, three days after the completion of earthing work, and the value should conform to regulations.

**Signature of Contractor**

**Chief Officer**  
Chhota udepur Municipality

**LIST OF APPROVED ELECTRICAL PRODUCTS (FOR THE)**  
**LIST OF APPROVED PRODUCT**

<p><b>CHAPTER-I</b> <b>WIRING</b> <b>1.1 SHOCKPROOF ACCESSORIES</b> <b>(A) Concealed / Surface Type</b> Any 'I.S.I.' marked switches and accessories approved by the engineer in charge of work. <b>(B) Mini Modular Type</b> 1. ANCHOR 2. VINAY 3. ELLE <b>(C) Modular Type</b> <b>A. CATEGORY - I</b> 1. ANCHOR 2. SG 3. ELLEYS <b>B. CATEGORY - II</b> 1. MK 2. TOYOMA 3. LK 4. NORTHWEST <b>1.2 RIGID PVC PIPES / OVAL PIPES &amp; FITTINGS.</b> <b>FIA Approved &amp; ISI marked (Emossed)</b> 1. VRAJ 2. NIHIR 3. PRECISION 4. SHRINATH <b>1.3 OVAL / CASING &amp; CAPING &amp; PVC TRUNKING</b> 1. PRECISION PLASTIC 2. CENTUR 3. M.K. 4. SHREENATH 5. TOYOMA 6. L.K.</p> <p><b>CHAPTER-II</b> <b>LAMPS &amp; FITTINGS</b> <b>2.1 FILAMENT LAMPS / FLOURESCENT TUBES</b> <b>(A) CAT.I</b> ANY ISI MARKED <b>(B) CATEGORY - II</b> 1. SURYA 2. BAJAJ 3. PUSKAR 4. OSRAM <b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON</p>	<p><b>2.2 MERCURY WAPOUR LAMPS</b> <b>(A) CAT - I</b> ANY ISI MARKED <b>(B) CATEGORY - II</b> 1. SURYA 2. BAJAJ 3. OSRAM 4. MYSORE 5. MYNA <b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON <b>2.3 SODIUM WAPOUR LAMPS</b> <b>(A) CATEGORY - I</b> ANY ISI MARKED <b>(B) CATEGORY - II</b> 1. PUSKAR 2. OSRAM 3. BAJAJ 4. SURYA 5. MYNA <b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON <b>2.4 COMPACT FLOURESCENT LAMPS</b> <b>(A) CATEGORY - I</b> ANY OTHER THAN FOLLOWING MAKE <b>(B) CATEGORY - II</b> 1. ANCHOR 2. OSRAM 3. SHAH 4. ORPAT 5. INDOASIAN 6. JOY LIGHTING 7. DECON 8. ARCO 9. SAMAY 10. MYNA <b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON <b>2.5 METAL HALIDE LAMPS</b> <b>(A) CATEGORY - I</b> ANY ISI MARKED <b>(B) CATEGORY - II</b> 1. PUSKAR 2. SURYA 3. OSRAM 4. BAJAJ MYNA <b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON</p>
<p><b>2.6 ENERGY SAVING FLOURESCENT TUBE FITTINGS (Box Type / Industrial Type /Mirror Optic / Mirror Light / street Light)</b> <b>(A) CATEGORY - I</b> ANY OTHER THEN FOLLOWING MAKE <b>(B) CATEGORY - II</b> 1. DECON</p>	<p><b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON <b>2.9 SODIUM VAPOUR LAMP FITTINGS (POST TOP LANTERN / STREET LIGHTS)</b> <b>(A) CATEGORY - I</b> 1. KUMAR 2. GLOLUX</p>

<p>2. SHAH 3. HAVELLS 4. ASIAN 5. SHAKTI 6. MYNA <b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON <b>2.7 FLOURESCENT TUBE FITTINGS</b> <b>[ ELECTRONICS BALLAST]</b> <b>(Box Type / Industrial Type /</b> <b>Mirror Optic / Mirror Light / Street</b> <b>Light)</b> <b>(A) CATEGORY - I</b> <b>ANY OTHER THEN FOLLOWING MAKE</b> <b>(B) CATEGORY - II</b> 1. SURYA 2. ARCO 3. ANCHOR 4. SHAKTI 5. DECON 6. HAVELLS 7. SHAH 8. FIXOLITE 9. MYNA 10. JOYLIGHTING 11. PRESTOLITE <b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON <b>2.8 MERCURY VAPOUR LAMP FITTINGS</b> <b>(POST TOP LANTERN / STREET</b> <b>LIGHTS)</b> <b>(A) CATEGORY - I</b> <b>ANY OTHER THEN FOLLOWING MAKE</b> <b>(B) CATEGORY - II</b> 1. SURYA 2. ARCO 3. SHAKTI 4. DECON 5. HAVELLS 6. BAJAJ 7. FIXOLITE 8. MYNA 9. JOYLIGHTING</p>	<p>3. G-LITE <b>(B) CATEGORY - II</b> 1. SURYA 2. ARCO 3. SHAKTI 4. BAJAJ 5. CANARA 6. FIXOLITE 7. MYNA 8. JOYLIGHTING 9 HAVELL'S 10 PRESTOLITE <b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON <b>2.10 FLOOD LIGHTS WITH</b> <b>BC / ES/ /MV / SV / MH / LAMPS</b> <b>(POST TOP LANTERN / STREET LIGHTS)</b> <b>(A) CATEGORY - I</b> 1. ARCO 2. GLOLUX 3. G-LITE 4. TWINKLE 5. KUMAR <b>(B) CATEGORY - II</b> 1. SURYA 2. FIXOLITE 3. DECON 4. SHAKTI 5. BAJAJ 6. JOYLIGHTING 7 HAVELL'S 8. PRESTOLITE <b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON <b>2.11 TABLE FANS</b> <b>(A) CATEGORY - II</b> 1. DECON 2. BAJAJ <b>(B) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON <b>2.12 ELECTRONIC BALLAST</b></p>
10. PRESTOLITE	<p><b>(A) CATEGORY - I</b> 1. KUMAR 2. MARVEST 3. KELTRON 4. JOYLIGHTING</p>
<p><b>2.12 (B) CATEGORY - II</b> 1. ANCHOR 2. SHAH 3. ASIAN 4. OSRAM 5. OPAL 6. HAVELL'S 7. ACON <b>(C) CATEGORY - III</b> 1. PHILIPS 2. CROMPTON <b>CHEPTE-III</b> <b>SWITCHGEARS &amp; DISTRIBUTION BOARDS</b> <b>3.1 CAST IRON CLAD SWITCHES WITH</b> <b>REWIREBLE FUSE</b> <b>(A) CATEGORY - I</b> <b>ANY OTHER THEN FOLLOWING MAKE</b> <b>(B) CATEGORY - II</b> 1. NEW</p>	<p><b>(B) CATEGORY - III</b> 1. L&amp;T 2. SIEMENS 3. C&amp;S 4. GE 5. HAVELLS <b>3.4 MOULDED CASE CIRCUIT BREAKERS</b> <b>(A) CATEGORY - II</b> 1. HAVELLS 2. CROMPTON 3. STANDARD <b>(B) CATEGORY - III</b> 1. L&amp;T 2. C&amp;S 3. G.E. 4. SIEMENS 5. BCH <b>3.5 AIR CIRCUIT BREAKERS</b> <b>(A) CATEGORY - III</b></p>

2. MODI 3. SUPER 4. PEW <b>(C) CATEGORY - III</b> 1. KEW 2. STENLY <b>3.2 METAL CLAD SWITCHES WITH REWIREBLE FUSE (63A - 100 A)</b> <b>(A) CATEGORY - I</b> 1. SIGMA <b>(B) CATEGORY - II</b> 1. MODI 2. HPL 3. SUPER 4. TRISUL 5. KEW 6. STANDARD <b>(C) CATEGORY - III</b> 1. HAVELLS 2. L&T 3. CROMPTON <b>3.3 METAL CLAD SWITCHES WITH HRC FUSE</b> <b>(A) CATEGORY - II</b>	1. G.E. 2. SIEMENS 3. L&T 4. CROMPTON 5. C&S <b>3.6 CHANGE OVER SWITCHES</b> <b>(A) CATEGORY - I</b> 1. MODI 2. SIGMA <b>(B) CATEGORY - II</b> 1. STANDARD 2. HAVELLS 3. SUPER 4. KEW 5. C&S 6. HPL <b>(C) CATEGORY - III</b> 1. L&T 2. CROMPTON 3. G.E. 4. SIEMENS <b>3.7 MCB &amp; MCB DISTRIBUTION BOX</b>
1. STANDARD 2. SUPER 3. CROMPTON 4. KEW 5. HPL	<b>(A) CATEGORY - I</b> 1. SIGMA 2. BALKAM 3. S.G.
<b>3.7 (B) CATEGORY - II</b> 1. HAVELLS 2. STANDARD 3. HPL 4. KEW 5. INDO-ASIAN 6. AECO-MEFA 7. SUPER 8. ANCHOR 9. ELECON-CLIPSAL <b>(C) CATEGORY - III</b> 1. L&T 2. MDS 3. G.E. 4. CG SNEIDER <b>3.8 ELCB &amp; RCCB</b> <b>(A) CATEGORY - I</b> 1. S.G. 2. SIGMA <b>(B) CATEGORY - II</b> 1. STANDARD 2. ANCHOR 3. SUPER 4. INDO-ASIAN 5. AECO-MEFA 6. HPL 7. ELECON-CLIPSAL <b>(C) CATEGORY - III</b> 1. L&T 2. MDS 3. HAVELLS 4. G.E. 5. C.G.SNEIDER <b>3.9 TIME SWITCHES</b> 1. L&T 2. MDS 3. INDO-ASIAN 4. C&S <b>3.10 ENERGY METER</b> 1. HPL 2. L&T	<b>CHEPTER-IV</b> <b>CABLES &amp; WIRES</b> <b>4.1 ALLUMINIUM &amp; COPPER XLPE CABLES</b> <b>(ALL Type)</b> 1. UPTO 35 SQ.MM ANY ISI MARKED <b>4.2 ALLUMINIUM &amp; COPPER XLPE CABLES</b> <b>(ALL Type)</b> <b>ABOVE 35 SQ.MM &amp; UP TO 185 SQ.MM</b> 1. CAPCAB 2. DICABX 3. FINOLEX 4. R R CABLE 5. POPULAR 6. POLYCAB 7. AVOCAB 8. HMT 9 LOOKMAN 10 POWERCAB <b>4.2 ALLUMINIUM &amp; COPPER XLPE CABLES</b> <b>(AL Type)</b> <b>ABOVE 185 SQ.MM</b> 1. DICABS 2. AVOCAB 3. POLYCAB 4. CCI 5. INCAB 6. HMT 7. R R CABLE <b>CHEPTER-V</b> <b>FANS</b> <b>5.1 CEILING FANS &amp; TABLE FANS</b> 1. LAZER 2. ANCHOR 3. POWERPACK 4. CROMPTON 5. BAJAJ 6. ORIENT 7. ALMONDARD

3. G.E.	8. KHAITAN 9. INOVA 10. CINNI 11. USHA 12. GEC 13. REMI 14. ORIENTS <b>5.2 EXHAUST FANS, BRACKET FANS &amp; PEDESTAL FANS</b> <b>(A).CATEGORY - I</b> 1. LAZER 2. POWERPACK 3. ANSU
4. C&S 5. ANCHOR 6. HAVELLS 7. INDO-ASIAN	4. EPC 5. NOVA 6. REMI 7. KHAITAN 8. ORIENT 9. USHA
<b>(B) CATEGORY - II</b> 1. CROMPTON 2. G.E.C. 3. BAJAJ 4. ALMONARD <b>CHEPTER-VIII</b> <b>AIRCONDITIONERS, WATER COOLERS &amp; WATER HEATERS</b> <b>8.1 SERVO CONTROLLED VOLTAGE STABILIZER &amp; ELECTRONICS POWER CONDITIONERS</b> 1. SUVIK 2. KELTRON 3. KEPREJ 4. GELCO 5. RIDER 6. TOCONSI <b>8.2 ON LINE UPS</b> 1. SUVIK 2. KELTRON 3. KEPREJ <b>8.3 WATER HEATERS</b> <b>A. CATEGORY - I</b> 1. LAZER 2. POWERPACK 3. BAJAJ 4. USHA <b>B. CATEGORY - II</b> 1. SPHEREHOT 2. RECOLD 3. VENUS <b>CHEPTER-IX</b> <b>MOTOR PUMPS</b> <b>9.1 MOTOR PUMP STARTERS &amp; STARTER ACCESSORIES</b> <b>A. CATEGORY - II</b> 1. CROMPTON 2. JYOTI 3. HAVELLS 4. ANCHOR 5. PECO <b>B. CATEGORY - III</b> 1. L & T 2. SIEMENS 3. BHARITA CUTTLER HAMMER 4. ALSTHOM 5. C& S <b>9.2 PANNEL ACCESSORIES</b> 1. STANDARD 2. L&T 3. MEW	3. TULLU 4. HARSHA 5. AUE 6. SAGA <b>(B) CATEGORY III</b> 1. CROMPTON 2. KIRLOSKAR 3. SIEMENS <b>9.4 OPEN WELL TYPE HORIZONTAL MONO BLOCK PUMPS</b> <b>(A) CATEGORY - I</b> 1. TOPLAND 2. PRIME 3. SABAR <b>(B) CATEGORY - II</b> 1. UNEEL 2. LUBI 3. KIRLOSKAR 4. CROMPTON 5. PRIMA <b>9.5 STARTER PANELS</b> 1. L& T 2. SUECO 3. SAMUDRA 4. SUN 5. LUBI 6. BCH <b>9.6 SUBMERSIBLE PUMPS</b> <b>(A) CATEGORY - I</b> 1. TOPLAND 2. AROMA 3. JASCO 4. SABAR 5. PRIMA <b>(B) CATEGORY - II</b> 1. CROMPTON 2. CALAMA 3. AMRUT <b>(C) CATEGORY - III</b> 1. KSB 2. UNEEL 3. KIRLOSKAR 4. LUBI. <b>CHEPTER-X</b> <b>SUBSTATION EQUIPMENTS</b> <b>10.1 (A) CATEGORY - II</b> 1. VOLTAMP 2. SKP 3. YULE <b>(B) CATEGORY - III</b>

4. KAYCG 5. ANCHOR 6. UNIVERSAL 7. IMP	
<b>9.3 SINGLE PHASE MONO BLOCK PUMPS (A) CATEGORY - II</b> 1. LUBI 2. PRIME	1. ALSTOM 2. CROMPTON 3. KIRLOSKAR 4. L & T

### **Approved Vendor List of LED Lights & Cable**

	<b>LED Lights List</b>	<b>Cable List</b>
<b>1</b>	Phillips	Finolex
<b>2</b>	Havells	R.R. Cable
<b>3</b>	Osram	Anchor
<b>4</b>	Eveready	Polycab
<b>5</b>	Wipro	
<b>6</b>	Oreva	
<b>7</b>	Bajaj	
<b>8</b>	SYSKA	
<b>9</b>	Charlston	
<b>10</b>	Moserbaer	
<b>11</b>	NTL Lemnis ( Pharox)	
<b>12</b>	Surya	
<b>13</b>	Fiem	
<b>14</b>	GE	
<b>15</b>	HPL	
<b>16</b>	Halonix	
<b>17</b>	C&S	
<b>18</b>	Crompton & Greaves	
<b>19</b>	Delta	
<b>20</b>	Sujana	
<b>21</b>	Usha Lexus	
<b>22</b>	Dynel	
<b>23</b>	MIC	
<b>24</b>	Reiz	
<b>25</b>	Giltz	
<b>26</b>	Orient ( Birla)	

નોંધ: ઉપરોક્ત કંપની મેક એલ.ઈ.ડી. અને કેબલ પૈકી છોટાઉદેપુર નગરપાલિકા જે કંપનીની એલ.ઈ.ડી અને કેબલ સપ્લાય કરવાનું જણાવશે તે કંપનીની એલ.ઈ.ડી. સપ્લાય કરવાની રહેશે. આ બાબતે કોઈપણ પ્રકારના વિવાદ કરવાના રહેશે નહીં. જેની ખાસ નોંધ લેવી

**Signature of Contractor**

**Chief Officer  
Chhota udepur Nagarpalika  
Chhota udepur**

## **SCHEDULE FOR TESTING OF MATERIALS**

**For ensuring quality control and workmanship, various tests prescribed below for materials shall Be taken at periodical intervals as stipulated below.**

<b>Sr. No.</b>	<b>Brief Description of Materials to be tested (2)</b>	<b>Qty. of Materials (3)</b>	<b>Prescription of test which shall be carried</b>	<b>Frequency @ which test shall be carried out</b>	<b>Total No. of Test 'to betaken.</b>
<b>1</b>	25 to 90 H. B.Metal 40 to 63 H. B.Metal 40 to 50 M. C.Metal 20 to 50 M. C.Metal Kapachi		- Gradation Test - Impact Value - Flakiness Index - Water absorption test - Sp. gravity	1 to 100 Cmt. - 1 Test 100 to 500 Cmt. - 3 Test 500 to 1500 Cmt. - 5 Test 1500 to 5000 Cmt. - 7 Test	
<b>2</b>	Grit		- Stripping Value, gradation, Water absorption, Sp. gravity	One test per work	
<b>3</b>	Murum		- P. I. Value - C.B.R.	One test per work	
<b>4</b>	Quarry spall		- C.B.R. - Gradation	One test per work	
<b>5</b>	Asphalt		- Penetration Test as per Specification	<b>Tanker Test</b> 1 1 2to15 2 16to50 3	
<b>6</b>	Tack Coat		- Binder temperature for application - Rate of spread of binder	Irregular close in intervals Two test per day.	
<b>7</b>	Carpet & Seal coat mix		- Grading - temperature of binder in boiler, aggregates in the dryer and mix at the time of laying and rolling (Binder content vide 45 IMD 2172) Rate of Spreaded mix materials.	One test on individual constituents and mixed aggregates from the dryer for each 100 tons of mix subject to minimum of Two tests per plant per day. One Test for each 100 tons of mix subjects to mini. of Two per day plant. Regular control through checks on layer thickness.	
<b>8</b>	Bricks		- Water absorption - Effloresce - Size - Compressive Strength	1 Test @ 50,000 Bricks	
<b>9</b>	Cement		Consistency - Compressive Strength - Initial & Final setting time - Fineness - Soundness - Specific Gravity - Chemical analysis	1 Test / 50 M.T. 2 Tests / 100 M.T. 3 Tests / 200 M.T. 4 Tests / 400 M.T. 5 Tests / 500 M.T. 6 Tests / 600 M.T.	
<b>10</b>	Steel (TMT / M.S.)		- Tensile strength - Yield Stress - Elongation - Size - Bend - Rebend	1 Test / 40 M.T. 1 Test / 40 M.T. 1 Test / 40 M.T. 1 Test / 40 M.T. 1 Test / 20 M.T. 1 Test / 20 M.T.	
<b>11</b>	C.C. Cube in M-150 M-200, M-250, M-300,		- Compressive Strength	1 to 5 C.mt. - 1 Set 6 to 15 C.mt. 2 Sets 16 to 20 C.mt. - 3 Sets 20 to 50 C.mt. - 4 Sets 51 above - 4 One	



	M-350 Grade			additional sample for each 100 C.mt. / or.	
<b>12</b>	Coarse Sand		C.B.R., silt content, sieve analysis	One Test per work	
<b>13</b>	Sand (For concrete work)		<ul style="list-style-type: none"> <li>- Specific Gravity</li> <li>- Alkali Reactivity</li> <li>- Petrography Exa.</li> <li>- Gradation</li> <li>- Silt Content</li> <li>- Water absorption test</li> </ul>	2 Tests per season or change of river	
<b>14</b>	Crushed stone Aggregate (For concrete work)		<ul style="list-style-type: none"> <li>- Gradation</li> <li>- Water absorption</li> <li>- Impact Value</li> <li>- Abrasion Value</li> <li>- Soundness Test</li> </ul>	1 Sample / 150 Cum. or 2 Sample / Season each source.	
<b>15</b>	Water for all item pertaining to water		<ul style="list-style-type: none"> <li>- Portability</li> <li>- Salinity</li> <li>- Chemical analysis</li> </ul>	One sample for each source of supply	
<b>16</b>	Earthwork for Embankment		<ul style="list-style-type: none"> <li>- Sand content</li> <li>- Atterberg's limit</li> <li>- Density test</li> <li>- Moisture content</li> <li>- C.B.R.</li> </ul>	2 Test / 8000 Cum 2 Test / 8000 Cum 2 Test / 8000 Cum 1 Test / 250 Cum. 1 Test / work	
<b>17</b>	Cement concrete		- Mix design	One time test for each concrete grade beyond M-200	

## **LIST OF REGISTERS TO BE MAINTAINED AT SITE**

### **ANNEXURE – 1**

**FOLLOWING DOCUMENTS/REGISTERS TO BE MAINTAINED AT SITE FOR ENSURING PROPER  
QUALITY CONTROL OF WORK IN PROGRESS.**

1. A complete set of Contract Documents
2. A Complete set of drawings (tender drawings and Good for Execution Drawings)
3. A complete set of change in specification or scope if any and approval thereof.
4. Master Test Register for Material for field Test.
  - i) Lab Report
  - ii) Lab/Field Test.
5. Register for bricks testing. Lab/Field
6. Concrete Pouring Card
7. Bitumen Test Register
8. Paint Register
9. Empty Bags Of Cement Shall Be Deposited On Monthly Basis At Store Of Chhota udepur Nagarpalika Chhota udepur And Same Shall Be Recorded In Store Register For Cement.
10. Register for approval of samples for various materials.
11. Site Order Book.
12. Register showing defects noticed during execution of work and compliance reports.
13. Hindrance Register

**APPROVED LIST OF MATERIALS**  
**LIST OF APPROVED MAKE / MANUFACTURER/ BRAND OF MATERIALS FOR CIVIL**  
**ITEMS**

The following are approved brand makes/manufacture's makes listed below. In case it is established that material as listed below is not available in the market, approved equivalent material and finished of any other specialized brand names/ manufacturer's makes may be used as per approval of Architect.

Material certificate: Material tests as required by the Engineer, if any, shall be carried out by the Contractor from the approved laboratories and the tests reports shall be submitted in the required formats before use of such material. The Engineer shall have the right to reject any material or work, if he finds that the quality of material used/intended to be used and work are not satisfactory. The Contractor shall make good such defective material or the works at his own cost (within the contract price) and without causing any delay to the completion time as specified in the TENDER.

No	Item	Approved make
1	Cement	Ambuja, Ultratech, JK Laxmi, Jaypee, Sanghi, Siddhee, ACC or approve by Architect/EIC
2	White Cement	Birla, J.K
3	Sand	Locally available & as approved sample
4	Aggregates	Vadagam or approved by Client
5	Bricks	As per approved sample by Client
6	Reinforcement bar/TMT Bars	Sail ,Tata, Rinl, Jindal , Vizag , GUJ NRE, Kamdhenu, National Electotherm, ASR Thermax, Gallant, Sanghi, Friends, Vinayak, Varsana, Utkarsh, Aditya, Grace, God
7	Structural steel	Sail ,Tata, Rinl, Jindal, Essar, Vizag, Asian, Appolo
8	Paver blocks	Vyara, Super, Sona tiles, Asian or equivalent
9	Shuttering plywood	Kitply, Anchor, Green, Pragati or equivalent
10	Anti-termite treatment	Pest control India, Bayer-Premise, Rallis India-Termex, Item Secure
11	Waterproofing compound	Pidilite, Sikka, Balendura, Fosroc, Kerakoll, BASF, Sunanda Chemical
12	Weather sealant	Kerakoll, Down corning, Fosroc, Sikka, Dr. Fixit(Pidilite), Bostik, Wacker
13	Joint Filler / silicon paint	Wacker, Dowcorning, Sika, Chokshi, Saudal.
14	Tile adhesive	Saint gobain - Weber, Balendura , Kerakoll, Pidilite ,Roff , Myk Laticrete
15	Epoxy grouting	Myk Laticrete, Dubond, Kerakoll, Bal Endura, Fosroc , Saint Gobain –Weber, Pidilite
16	Paint, primer	Jotun, Asian, Berger, Nerolac, Indigo, ICI
17	Putty	Birla , Berger, Asian
18	Polish	MRF, Asian, ICI, Taralac

19	Water stops	Arti Cables, Fixopan
20	Granite	As per approved sample
21	Vitrified tiles/ Glazed tiles/ Ceramic tiles	Varmora, Sunheart, Nitco, Kajaria, Somany, Asian, Simpolo, Motto, Silon, Johnson
22	Glass Mosaic	Pavit, Italia, Bissaza , Piccolo
23	Auto sensor Door	Dorma, Geze , Ozone
24	Glass door hardware & fittings	Dorma, Geze, Haffle, Enox, Kitch
25	Door Window & Furniture Hardware	Kitch, EPPW, Dorma, Palladium, Ozon, Magnum, Yale.
26	Adhesives	Fevicol, Kitcol, Araldite, BAL.
27	Anchor fastener / bolts	Hilti. Fischer, Mungo
28	Linseed oil	Saffola
29	Floor spring	Ozone, Everite, Hemco, Godrej, Hyper, Starling, Dorma , Enox
30	Door closer	Godrej, Dorma, Enox , Eficient Gadget, Yale
31	Locks	Godrej, Dorset, Yale, EPPW, Dorma, Kitch.
32	Glass	Modiguard, Saint-Gobain, Asahi, HNG
33	Wood	Teak, Sal sycamore, Merandi
34	Flush door- decorative / non decorative	Greenly-door, century- door, Archidply - door, Eurodoor, Nippon, Duro
35	MS Rolling shutter	Sarvottam, Suryoday, Gandhi, Sagar
36	Ply (BWP - IS 710 & BWR 303)	Green ply, Euro ply, Nippon, Duro, Century, Silicon(evoke)
37	Laminate	Greenlam, Century, Merino, Euro, Royal touch, Formica, Nippon
38	Veneer	Greenlam, Century ply, Euro ply, Timex, Natural Decowood
39	MDF	Nuwood ,Maftalal, Duratuff
40	Prelam particle board	Novapan, Bhutan. (exterior grade only)
41	Cement bonded particle board	NCL (Bison board), Everest (Eternite), Shera
42	Compact sheet	Vir, Bloom, Formica.
43	Alluminium heavy duty section	Jindal, Domal series, Hindalco, Banco, Gujarat Extrusion
44	Sanitary vessels	Kohler, Jaquar, Hindware, Cera, Parryware , Johnson
45	Sanitary accessories	Kohler, Jaquar, Hindware, Cera, Parryware, Johnson
46	Hand drayer	Euronics , Cera, Jaquar
47	Toilet Cubical	Marino, Greenlam, Matalium, T-Line
48	CPVC & UPVC , PVC pipe	Prince, Supreme, Astral, Finolex, Ashirvad flow guard,
49	Polycarbonate sheet	Makrolon, Lexan, Bayer, Dunpalon, Sabic, Coxwell
50	Anchor fastener and bolts	Hilti, Fischer
51	Gypsum board false ceiling	Saint gobain, USG Boral, Ecotone, Hilux
52	Grid ceiling	Aerolite, Saint gobain, Armstrong, Anutone
53	Accoustic Ceiling	Armstrong , Anutone , Aerolite, Saint gobain
54	Metal ceiling	Metalium , Supersill , USG Boral, Aerolite

55	ACP	Aludecor, Alucobond, Alston, Alstrong, Eurobond, VIVA
56	Acoustic paneling	Artois, Ecotone, Aerolite
57	Glass film	3M, Avery, Garvey,
58	Modular Glass Partition	Sonic, Kubik, Otic, Ozone
59	Carpet flooring	Welspun, Unitex, Ecosoft, Tarkett, Flotex, Solarbrite, Rosetta, Dubond, Sorona
60	Wooden flooring	Vista, Pergo, Armstrong, Mikasa, Ecosoft, Quick step
61	Roller blinds	Vista, Hunterdouglas, Ferrari
62	Hardware & fittings	Hettich, Haffle, Enox, Ebco, kitch
63	Aluminium profile handles & frames	Olive, Hettich, Haffle, Enox, Ebco, kitch
64	Door hardware & accessories	Geze, Haffle, Enox, Dorma, Kitch, Ozone, kitch
65	PVC edge beading	Rehau, Dolken
66	Furniture	Monarch, Amardeep, HOFF, Godrej, Wipro
67	Glass wool/ synthwool	Rockwool, Twiga, AcoSonic
68	Compactor	Kompress, Wipro, Godrej, HOFF
69	Artificial stone	Emcer, Kalinga, CMC, AGL, Johnson
70	Vinyl	Welspun, Solarbrite, Tarkett, Unitex, Responsive, LG
71	Window locks cum handle	Alualpha, Giessee or equivalent.
72	Filler rubber of glass panel	EPDM quality only
73	Wool felt/weather strip	Anand, red-diplex Ltd or equivalent
74	Rust Remover	Feovert (Krishna Conchem), Roff Rust Clear (Pidilite Industries)
75	Polymer bonding agent	Monobond (Krishna Conchem), Roff Bond Repair (Pidilite Industries)
76	Non-shrink grout	Polygrout -HS (Krishna Conchem), Roff Grout GP (Pidilite Industries)
77	Super plasticizer for jacketing	Supercon-100 (Krishna Conchem), Roff Plast 330 / Concrete Master
78	Rebar and Anchor Fasteners	Hilti or Fischer OR Mungo.
79	Acrylic SBR base bonding agent	Mono-bond SBR (Krishna Conchem), CICO, BASF, Pidilite
80	Epoxy Bonding	EPI bond 21 LP (Krishna Conchem), Roff Concrete Bond (Pidilite)
81	Modular Kitchen	Timbor Home, Tiara furniture system, Godrej interio
82	PVC Sleeve	Supreme / Astral / Prince
83	Expansion Board	Capcell HD Board
84	Expansion Joint	Pidilite / Roof/Laticrete or mentioned in BOQ
85	Expansion Joint System	3R as per Item description
86	Water Proofing	BASF/ Fosroc / Sika or mentioned in BOQ
87	Overdeck Insulation	BASF/ Fosroc / Sika or mentioned in BOQ
88	PVC spacer	BAL Endura / Kerakoll / BASF
89	PVC Flooring	Armstrong, Gerflor, Tarkett
90	Self Levelling Chemicals	Ardex / BASF / Cico / Sika

91	Anti-bacterial Paint	Sikka / Liquid Plastic/SSK/Viessmann/artilin / BASF /Huntsman
92	Galvalume roofing sheet	Jindal,Mansha,Eashar
93	Pre coated Sheet	J.S.Eng., Fielders, Rama, Shree Precoated, S.Kumar
94	Floor stamping	Ultratech, Vyara, Flexstone or Equivalent
95	WPC door	Alstone , Flexibond or equivalent
96	Roofing shingles	Saint Gobain , Malarkey , Technicol , Dockey or equivalent
97	Fiber Cement sheet board	Ecopro, Everest , Shera , CK Birla Group
98	Roof Gutter	Saint Gobain , Malarkey , Technicol or equivalent

## PLUMBING MAKE LIST

Sr.No.	Item	Approved Make
1.	SWR PVC PIPE & FITTINGS 6 KG CM <sup>2</sup> ; FITTINGS : 6 KG CM <sup>2</sup>	ASTRAL / SUPREME/PRINCE/FINOLEX
2.	ECO. DRAIN PIPE & FITTINGS	SUPREME/ ASTRAL
3.	GULLY TRAP	GIRCO / TIRUMALA / SONIA/ SUPREME/ASTRAL
4.	STONE WARE PIPES FOR INTERNAL UNDER GROUND DRAIN PIPE	GIRCO / TIRUMALA / SONIA
5.	RCC HUME PIPES EXTERNAL MAIN UNDER GROUND PIPE	INDIAN HUME PIPE / PRANALI
6.	M.S/G.I. PIPES FOR WATER SUPPLY	TATA / JINDAL/ SWASTIK
7.	ASTM/CPVC PIPE & FITTINGS FOR WATER SUPPLY	ASTRAL / SUPREME/ASHIRWAD / FINOLEX
8.	COMPOSITE PLUMBING PIPE & COMPOSITE FITTINGS	KITEC OR EQ
9.	G.I. PIPES FITTINGS WATER SUPPLY	DRP-M / R-BRAND / ZOLOTO
10.	GI TO GI JOINTS	CHAMPION / EQUIVALENT
11.	SOLVENT CEMENT	SUPREME / KISSAN / FINOLEX
12.	BALL VALVES	LEADER / ZOLOTO / AUDCO
13.	WHEEL VALVES	LEADER / ZOLOTO/AUDCO
14.	DCV / NRV	ZOLOTO/SPIREX/AUDCO
15.	TAR	SHALIBIND / TIKIBOND-BS
16.	SELF PRIMING SEWAGE PUMPS	HBD / GRUNDFOS
17.	VALVES	AUDCO/ZOLOTO / R.B. / KBL / KSB
18.	PUMPS	KIRLOSKAR / GRUNDFOSS/XYLEM
19.	STARTER	SIEMENS / L&T
20.	PRESSURE GAUGE	BELLS / H GURU
21.	BOTTLE TRAP & WASTE COUPLING	JAQUAR / HINDWARE/KOHLER
22.	DEWATERING PUMPS	GRUNDFOSS/KIRLOSKAR/ KSB
23.	HYDROPNEUMATIC SYSTEM	GRUNDFOSS OR EQUIVALENT
24.	EOT CRANE WITH HOIST	INDEF / ELECTROMECH / SAFEX / WH-BRADY / EQUIVALENT
25.	METALLIC BELLOWS	BELLOW FLEX / PRICISION / DHRUV / B.D.ENGR.
26.	ELECTRIC GEYSER	A-O SMITH/ RACOLD/SPHERHOT
27.	HOT WATER GENERATOR	THERMAX/A.O.SMITH / KEPL OR EQUIVALNET



No	Item	Approved Make
<b>LT PANELS,LT CABLES SWITCHGEAR &amp; ACCESSORIES</b>		
1	ENCLOSURE MANUFACTURER	ACTIVE ENGINEERS, ELMEX, AD ENTERPRISE, ACCESS CONTROL PANELS.
2	MCB/ELCB/RCCB/ELMCB	LEGRAND, ABB,HAGER,SCHNEIDER,C&S, L&T,SEIMENS
3	MCCB/ACB	LEGRAND, ABB, SCHNEIDER,SIEMENS,L&T
4	DISTRIBUTION BOX	LEGRAND, ABB,HAGER,SCHNEIDER,C&S, L&T,SEIMENS
5	CHANGEOVER SWITCH	HH ELECON,L&T, ABB, HPL,C&S
6	CAPACITOR	L&T, EPCOS,CONZERV,DATAR,POWERMATRIX,ABB
7	PUSH BUTTON	SIEMENS,ABB,L&T,SCHNEIDER
8	INDICATING LIGHT	SIEMENS,ABB,L&T
9	TIMERS	L&T,SIEMENS,ABB,CONZERV
10	SELECTOR SWITCH	L&T,SEIMENS,KAYCEE
11	AUTOMATIC TRANSFER SWITCH	L&T,HPL,CUMMINS,HAVELLS
12	CTs	KAPPA,L&T,AREVA,MAXWELL
13	PTs	KAPPA,L&T,AREVA,MAXWELL
14	CONNECTORS	L&T, SCHINDER,SEIMENS,ABB
15	PROTECTION RELAY	AREVA,L&T,ABB,SEIMENS
16	ANALOG/DIGITAL METER/LOAD MANAGER/MFM	CONSERV,L&T,SCHNEIDER/ABB/HPL
17	IRON CLAD SWITCH WITH REWIREABLE FUSE/SFU	KEW, TRISHUL,SUPER,C&S
18	METALCLAD SWITCH WITH REWIREABLEFUSE/S FU	HAVELLS, KEW,C&S, INDOASIAN
19	MAIN LT CABLE	AVOCAB,FINOLEX,PRIMECAB,POLYCAB,DIAMONDPOWER,RRCABLE,HAVELLS
20	CABLE GLANDS	COMET, HMI, DOWELLS, SIEMENS,CROMPTON,HEX
21	CABLE LUGS	DOWELLS,JOHNSON,HEX
22	BUSDUCT	L&T,SCHNEIDER,C&S,SEIMENS,LEGRAND

INTERNAL WIRING, FIXTURES & ACCESSORIES		
1	RIGID FR PVC CONDUIT	NIHIR,PRECISION,POLYCAB,BEC, Power Flow
2	ACCESSORIES OF CONDUIT	NIHIR,PRECISION,POLYCAB,BEC
3	COPPER FLEXIBLE WIRES	AVOCAB,FINOLEX,POLYCAB,RRCABLE,HAVELLS ,Caliplast
4	TISSINO TYPE SWITCHES & SOCKETS	POINTER-TRUMP, SSK-TOPLINE PC, ANCHOR-PENTA CHEERY
5	MODULAR TYPE SWITCHES & SOCKETS	LEGRAND-MYRIUS, MK-WRAP ROUND, ANCHOR-WOODS,HAVELLS-CRABTREE-ATHENA
6	PVC TAPE	STEEL GRIP,ANCHOR
7	M.S. CONDUIT	BEC,AKG,STEEL CRAFT
8	LIGHT FIXTURES & LAMPS	OSRAM, XAL WIPRO, PHILIPHS, NIRVANA, GE, CG, , JAQUAR ,ENDO , TISVA ,LT
9	CEILING FAN & EXHAUST FAN	USHA,CG,ORIENT,HAVELLS
10	CALL BELL	ANCHOR/ORPAT/MAX
11	WATER COOLER	VOLTAS,USHA,BLUESTAR
12	GEYSER	RECOLD,HAVELLS,BAJAJ,SPHEREHOT
13	MOTOR PUMP SET	CROMPTON,AMRUT,KSB,UNEEL,KIRLOSKAR
CABLE TRAY, RACEWAY & ACCESSORIES		
1	CABLE TRAY	INDIANA,RUSHABH,PROFAB
2	ALUMINIUM FLOOR RACEWAY	MK OR APPROVED BY CONSULTANTS
3	GI FLOOR RACEWAY	MK OR APPROVED BY CONSULTANTS
4	PVC WALL RACEWAY	MK, PROFAB,LEGRAND
	<b>UPS &amp; INVERTER</b>	
1	UPS	NUMERIC,EATON,APC, BPE
2	INVERTER	SUVIK,SUKAM,MEGATECH
3	SMF BATTERY	PANASONIC,EXIDE,GLOBAL (YUASA)
4	RACK	FABRICATED
STREETLIGHT POLES, FIXTURES & ACCESSORIES		
1	GI POLES	FABRICATED
2	MS POLES	FABRICATED
3	SMC PRESS MOULDED JUNCTION BOX	SYNTEX OR AS APPROVED BY CONSULTANTS
LIGHTNING PROTECTION & EARTHING SYSTEM		

1	AIR TERMINAL	MAP, LPI, INDESCO
2	SUPPORTING GAYED MAST	MAP, LPI, INDESCO
3	LIGHTNING STROKE RECORDER	MAP, LPI, INDESCO
4	COPPER BONDED ROD & CHEMICAL COMPOUND	MAP, LPI, INDESCO
5	ELECTROLYTIC/CHEMICAL EARTHING KIT	GRESLO, GALAXY EARTHING

ELV SYSTEM & ACCESSORIES		
1	FIRE ALARM PANEL & DISPLAY PANEL	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
2	REPEATER PANEL	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
3	ADDRESSABLE & CONVENTIONAL SMOKEDTECTORS	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
4	INTELLIGENT SMOKE & HEAT DETECTORS	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
5	ADDRESSABLE & CONVENTIONAL HEAT DETECTORS	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
6	ADDRESSABLE & CONVENTIONAL BEAMDETECTORS	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
7	FAULT ISOLATOR	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
8	RESPONSE INDICATOR	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
9	MANUAL CALL POINT	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
10	ADDRESSABLE HOOTER	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
11	FIRE CABLE	RRCABLE, FINOLEX,DELTON,POLYCAB, AVOCAB ,Caliplast
12	RJ-45 SOCKET OUTLET (COMPUTER & TELEPHONE)	LEGRAND-MYRIUS, MK-WRAP ROUND, ANCHOR-WOODS, HAVELLS-CRABTREE- ATHENA, PLEXONICS, AECONNECT
13	RJ-11 TELEPHONE SOCKET	LEGRAND-MYRIUS, MK-WRAP ROUND, ANCHOR-WOODS,HAVELLS-CRABTREE- ATHENA, PLEXONICS
14	CAT-6 CABLE	TYCO ELE(AMP), SCHINDER ELE.(DIGILINK), R&M,SYSTIMAX,MOLEX, PLEXONICS, AECONNECT
15	CAT-6E CABLE	TYCO ELE(AMP), SCHINDER ELE.(DIGILINK), R&M,SYSTIMAX,MOLEX, PLEXONICS, AECONNECT
16	TELEPHONE TAG BOX	KRONE
17	TELEPHONE PAIR WIRE	RRCABLE, FINOLEX,DELTON,POLYCAB
18	NETWORK SWITCH	CISCO,HP, PLEXONICS, , D LINK, AECONNECT, NETGEAR

19	ETHERNET SWITCH	CISCO,HP, PLEXONICS , D LINK , , AECONNECT, NETGEAR
20	PATCH CORDS	CISCO,HP, PLEXONICS , D LINK , , AECONNECT, NETGEAR
21	U RACKS	VERO PRESIDENT,VALRACK,SPIDER OR APPROVED BYCONSULTANTS, AECONNECT
22	PUSH BUTTON PHONE	PANASONIC,BEETEL,SONY OR APPROVED BY CONSULTANTS,PRAMODA
23	PROGRAM PHONE	PANASONIC,BEETEL,SONY OR APPROVED BY ONSULTANTS,MATRIX
24	AMPLIFIER (POWER & BOOSTER)	JBL, AUDIOQUEST,BOSCH,AVTRON
25	AUDIO MIXER	JBL, AUDIOQUEST,BOSCH, AVTRON
26	CD/DVD/FM PLAYER	JBL, AUDIOQUEST,BOSCH, SONY, AVTRON
27	MICROPHONE	JBL, AUDIOQUEST,BOSCH, AVTRON
28	MULTIPLEXER	JBL, AUDIOQUEST,BOSCH, AVTRON
29	CEILING AND WALL SPEAKER	JBL, AUDIOQUEST,BOSCH, AVTRON
30	GOOSENECK MIC	JBL, AUDIOQUEST,BOSCH, AVTRON
31	WIRELESS MIC	JBL, AUDIOQUEST,BOSCH, BEYERDYNAMIC
32	STAND MIC	JBL, AUDIOQUEST,BOSCH
33	SPEAKER CABLE	RRCABLE, FINOLEX,DELTON,POLYCAB,CALIPLAST
34	2 MP HD IR VERIFOCAI CAMERA	AVTRON,HONEYWELL,SONY, SCHNEIDER (PELCO), HIKVISION,CPPLUS
35	2 MP FIX DOME CAMERA	AVTRON,HONEYWELL,SONY, SCHNEIDER (PELCO), HIKVISION,CPPLUS
36	DOME CAMERA	AVTRON,HONEYWELL,SONY, SCHNEIDER (PELCO), HIKVISION, CPPLUS
37	DIGITAL VIDEO RECORDER	AVTRON,HONEYWELL,SONY, SCHNEIDER (PELCO), HIKVISION,CPPLUS
38	NETWORK VIDEO RECORDER	AVTRON,HONEYWELL,SONY, SCHNEIDER (PELCO), HIKVISION, CPPLUS
39	LED/LCD DISPLAY UNIT	SONY, SAMSUNG,PANASONIC,LG

Sr. No.	Description	Make
1	VRF	DAIKIN, O GENERAL, HITACHI, MITSUBISHI, BLUESTAR / TOSHIBA
2	Treated Fresh Air Unit	Zeco / Citizen / Ethos
3	Dx Type Condensing Unit	DAIKIN, O GENERAL, HITACHI, MITSUBISHI, BLUESTAR / TOSHIBA
4	Ventilation Fan	Kruger/Nicotra/System Air
5	Grills/ Jet Nozzel	Caryaire /System Air /Ruskin Titus
6	Nitrile Insulation	K Flex/ Armacell /Areoflex
7	Copper pipes	Maxflow / Mandev
8	Drain Pipe	Prince/Finolex/ Astral
9	GI Sheet	Jindal/Tata
10	Electrical Cables	Polycab/Finolex Eq Approve

Only above said material is to be used as per Schedule “B”

Notes:

The consultant / Nagarpalika reserves the right to select the manufacturers or approved make from the above list and also to make changes (add or delete names of other makes) in this list during the execution of the contract,

Tenderers should quote rates of various items considering supply/ use of first preference make of material selected by him. Second preference make material would be accepted by the consultant if they are satisfied that first preference make

material cannot be supplied/ used by Tenderers due to any specific reasons. However, the final decision for accepting second preference makes or accepting only first preference would be that of the consultant.

Note:

All the material/ makes listed above and other than as specified above shall be used after obtaining prior approval from the architect/ Eng. in charge equivalent material listed in complete tender document should only be used in case the specified material or not available the equivalent material should be used after obtaining prior approval from the architect/Eng-in-charge. Any extra item has to be approved in advance and then execute the same else university will not be liable for payment of such item. If any items are not included in the tender and need to do on site then contractor has to give RA (rate analysis) for the same.

TENDERER'S SEAL AND SIGNATURE.